Dubbo Quarry Continuation Project
Environmental Impact Statement

Prepared for Holcim (Australia) Pty Ltd
January 2021

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Holcim

Environmental Impact Statement

Dubbo Quarry Continuation Project

Report Number

J180313 RP1

Client

Holcim (Australia) Pty Ltd

Date

28 January 2021

Version

Final

Prepared by

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28 January 2021

Approved by

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28 January 2021

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

Executive Summary

ES1 Introduction

Holcim (Australia) Pty Limited (Holcim) is seeking development consent for the construction and operation of two new resource areas, the Western Extension Area (WEA) and Southern Extension Area (SEA), at Dubbo Quarry (the quarry) approximately 1.9 kilometres (km) west of the city of Dubbo on Sheraton Road.

Holcim is a leading international construction material company that has a long-standing history in Australia since 1901, Holcim has demonstrated the ability to establish and operate quarrying operations to a high standard, now owning and operating 65 quarries across Australia. Holcim is the Australian division of LafargeHolcim Ltd.

The quarry produces high quality basalt aggregates for use in the construction industry in concrete, asphalt, road base and other applications. The quarry produces many types of road base, including premium road base frequently used by local councils and Transport for NSW (TfNSW). Precoated sealing aggregates from crushed basalt are also produced. The quarry sells products to civil construction projects, engineering projects, subdivision developments, industrial projects, commercial and domestic customers.

The quarry operates under Development Consent SPR79/22 (existing consent) granted by the former Talbragar Shire Council on 18 March 1980. The existing consent for the quarry operations does not specify a production rate; however, production is restricted by the capacity of its processing infrastructure which can handle up to 500,000 tonnes per annum (tpa).

Accessible basalt resources within the land to which the existing consent applies (the existing site) are close to being exhausted. Holcim is, therefore, seeking planning approval to extract material outside of the existing site to allow the quarry to continue operating. This is referred to as the Dubbo Quarry Continuation Project (the project).

To facilitate the project, a State significant development (SSD) is required under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). A development application (DA) for SSD must be accompanied by an environmental impact statement (EIS).

The purpose of this EIS is to inform government authorities and other stakeholders about the project, provide a description of the potential social, economic and environmental impacts and the measures that will be implemented to minimise, mitigate, manage and monitor potential impacts. This EIS addresses the specific requirements provided in the Department of Planning, Industry and Environment (DPIE) Secretary's Environmental Assessment Requirements (SEARs), which were issued on 3 April 2020 for the project.

ES2 Project area

The project area is in the Orana Region of NSW. It is located within the Dubbo Local Government Area (LGA) managed by Dubbo Regional Council (DRC) and zoned RE2 Private Recreation, IN3 Heavy Industrial and RU1 Primary Production under the *Dubbo Local Environmental Plan 2011* (Dubbo LEP). The project area is located on Lots 221 and 222 DP 1247780 and Lot 100 DP 628628.

Land-uses surrounding the project area include Regional Quarries Australia's South Keswick Quarry to the immediate north, Neoen Energy's South Keswick Solar Farm further north, and rural residential properties. There are five residential properties within 1 km of the project area, with the closest residential property being approximately 215 m from the boundary of the WEA.

Other nearby land-uses include a school precinct 1.3 km north-west of the project area, a commercial precinct at the intersection of Sheraton Road and the Mitchell Highway, and an aged care facility to the west of the commercial precinct.

Topography in and around the project area features undulating slopes and plains. The highly modified Eulomogo Creek runs through the project area. The project area and surrounding land is generally cleared with some sparse remnant vegetation mostly along Eulomogo Creek. Historic land use within the project area has resulted in extensive vegetation clearance and cultivation.

ES3 Project overview

The project involves:

- continued quarrying operations in the existing site with a maximum extraction and processing rate of 500,000 tpa consistent with current operations;
- development of two new resource areas to the west and south of the existing site (the WEA and SEA, respectively) with 500,000 tpa extraction rate, which will have noise attenuation and visual amenity bunds constructed around the perimeters, where possible;
- construction of a new internal access road to connect with Sheraton Road, north of the existing access road and intersection with Sheraton Road (the 'proposed access road');
- construction of a new internal haul road to connect the existing site with the SEA (the 'southern haul road'), which will require construction of a crossing across Eulomogo Creek (the 'Eulomogo Creek crossing');
- modification of the existing water management infrastructure within the existing quarry area; and
- construction of new water management infrastructure to service the WEA and SEA.

The WEA and SEA have been designed to extract the resource in the project area as efficiently and economically as possible, whilst avoiding or minimising adverse impacts to the environment and community and delivering a range of socio-economic benefits to the region.

The project will extend the quarry life by up to 25 years, dependent on future quarrying and processing rates.

There will be no change to the existing fixed infrastructure or method of quarrying and processing. Hours of operation will remain as per current operations, with the exception of processing and extractive hours which will commence at 7 am instead of 6 am. The project will utilise the existing quarry workforce during operations. Some additional contractors will be required during construction of the Eulomogo Creek crossing (up to 6 persons) and the proposed access road (up to 9 persons).

Progressive rehabilitation will be undertaken concurrently with extraction of the WEA and SEA where possible. The future land use for the site will be identified prior to quarry closure and will be agreed with the landowner, consistent with the appropriate land zoning and strategic planning context.

The project is classified as SSD under clause 7 of the State Environmental Planning Policy (State and Regional Development) 2011 (State and Regional Development SEPP) as it is development for the purpose of extractive industry that extracts from a total resource of more than 5 million tonnes.

ES4 Impact assessment

Numerous comprehensive technical assessments have been undertaken to assess all potential environmental and social impacts associated with the project. The assessments have also identified suitable mitigation measures to avoid or mitigate those impacts.

The findings of the detailed technical assessments are summarised in the body of this EIS and are provided in full in the appendices. The following sub-sections provide an overview of the main findings; however, to gain a proper understanding of the project and identified impacts, the detailed assessments should be read in their entirety.

ES4.1 Noise and blasting

The project will generate noise during construction of the Eulomogo Creek crossing and the proposed access road. Construction noise management levels (NMLs) will be exceeded at two of the closest noise sensitive receivers. However, noise generating construction work will be relatively short in nature (up to eight weeks) and during standard hours (day) only.

During operation of the project, NMLs will be exceeded at several assessment locations. Significant noise generating operational work will occur during stripping activities which will last up to four weeks per stripping event. Outside of stripping events, during general quarry operations, noise levels will decrease significantly.

No exceedance of the relevant sleep disturbance screening criteria is predicted due to site operations. Potential impacts of blasting were also assessed in the NVIA, with permissible maximum instantaneous charges (MICs) recommended for each project area to ensure compliance with the relevant airblast overpressure and ground vibration criteria. Road traffic noise levels under a worst-case maximum production scenario are predicted to satisfy the relevant criteria.

ES4.2 Air quality

Emissions generated by the project will principally consist of particulate matter emissions from loading and unloading materials (topsoil, subsoil and rock), conveying and transfer of rock, rock sizing, hauling materials and wind erosion of exposed areas.

Three emission scenarios (existing and two future scenarios) were considered to quantify particulate matter impacts from the project and to understand the significance of the proposed operations compared to current operations.

The results of the dispersion modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition[1]) are below the applicable impact assessment criteria at all assessment locations for both the existing and proposed scenarios.

Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods.

[1] Total suspended particulate matter (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), and particulate matter less than 2.5 (µm) in aerodynamic diameter ($PM_{2.5}$).

ES4.3 Biodiversity

The project has been designed to avoid significant clearing and to minimise the impacts to biodiversity values. Particular efforts were made to avoid those woodland areas with larger patch size and greater connectivity to other areas of habitat outside of the disturbance area.

The majority of vegetation within the project area is highly degraded and of low quality. The project will require clearance of 5.82 ha of native vegetation that will be cleared for the project. This will require an offset to be provided to retire 132 ecosystem credits. The disturbance area has low importance for threatened flora or fauna species. Targeted surveys did not detect any threatened species and no species credits are required. Additionally, there will be no significant impacts to Matters of National Environmental Significance (MNES).

ES4.4 Aboriginal heritage

An Aboriginal cultural heritage assessment was undertaken for the project. A search of the Aboriginal Heritage Information Services (AHIMS) database identified 78 sites within a 10 km x 10 km search area centred on the project area. There are no AHIMS sites recorded within the project area. During a site visit, four Aboriginal sites were identified within the project area. No modified trees, ceremonial sites, Aboriginal stone arrangements, rock art or burials were identified within the project area.

The project will require the removal of one identified Aboriginal site, DQ-IF1, which consists of an isolated artefact and is assessed as a site of low archaeological significance. The design of the current project avoids impact to all remaining identified Aboriginal sites. Relocation by a qualified archaeologist is proposed for Aboriginal site DQ-IF1. All other identified sites within the project area will be conserved under the project.

ES4.5 Historic heritage

Searches of National, State and local heritage registers, including Section 170 registers and the NSW State agency heritage register were undertaken for the project. There were no items or heritage conservation areas identified occurring within the vicinity of the project area. Further, the project area does not currently contain any structures that could be considered having potential to be of historical heritage significance.

ES4.6 Surface water

Changes to the existing water management system are proposed under the project. This will beneficially impact receiving water quality and natural flow regime of Eulomogo Creek.

The culverts beneath the Eulomogo Creek crossing will have a capacity for 20% annual exceedance probability (AEP) events being 83 m^3/s. In an 1% AEP event, a flood level of 3 m will extend for up to 300 m upstream, which is within the quarry's property boundary.

There will be no significant change to the amount of operational water used, apart from additional water used for dust suppression purposes. This will continue to be sourced from runoff within the project area.

ES4.7 Groundwater

The project has been designed to avoid interception of groundwater with the floor level of pits being the maximum recorded groundwater level. There will be no impact to local groundwater users, both landowners and potential groundwater dependent ecosystems, as there will be no groundwater take or change to groundwater levels or quality as a result of the project.

ES4.8 Land resources

The project area contains soils with different land and soil capability (LSC). The WEA contains LSC class 2 and 3, which is capable of most land uses including cropping with cultivation, grazing, horticulture, forestry and nature conservation. The SEA contains LSC class 5 and 6, which is limited to grazing, forestry, nature conservation, and very occasional cultivation for (dryland) pasture establishment.

Rehabilitation of the project area will aim to reinstate the previous land use as much as possible, including reinstating the LSC classes. In addition, post-operational land uses are proposed to be consistent with the capabilities of the LSC classes.

As the project is for the continuation of an existing quarry, and is within an established quarry precinct, existing compatibility with land uses in the vicinity of the project area is expected to continue. Potential additional amenity impacts are proposed to be managed and mitigated where reasonable and feasible.

ES4.9 Rehabilitation

The project area will be progressively rehabilitated during operation of the project, where possible. The aim will be to reinstate the previous land use as much as possible whilst enhancing biodiversity values diminished due to past agricultural land uses.

ES4.10 Traffic and transport

Project-related heavy vehicles during the project will have no significant impact to the capacity of the local or regional road network and will not significantly impact the performance of the intersection of Sheraton Road and Mitchell Highway. The Mitchell Highway and Sheraton Road in proximity to the quarry are considered to have good local traffic safety conditions currently given the low number of reported crashes (one crash per year), which is expected to continue through project operation. However, a road safety audit was prepared for the project as requested by the SEARs. The audit identified several potential safety items, most of are the result of school bus and light vehicle traffic movements on Sheraton Road.

ES4.11 Social

Social impacts and benefits were identified through consideration of the findings of technical reports as well as perceptions of the local community gathered during community engagement activities completed for the project.

The project will result in several positive social benefits to the community, including access to short and long term employment, land use opportunities post-rehabilitation and also contributions to continued economic growth and development of the local area and the region.

Negative social impacts include noise and dust impacts affecting the amenity and health of the surrounding community, road safety on Sheraton Road, impacts to waterways and destruction of culturally significant indigenous artefacts or items. Mitigation and management measures are proposed to minimise the potential social impacts of the project.

ES4.12 Economic

The project will result in a number of key benefits to the region. The project will ensure continued employment opportunities for the existing quarry workforce and ancillary quarry workers for the life of the project. The project will also provide continued competitive supply of construction materials for major developments including road development in the local and regional areas for State and local government authorities.

ES4.13 Hazards and risks

Potential hazards and risks considered for the project include risks to public safety, in particular the transport, handling and use of any hazardous or dangerous goods. The project will not change the volume, type or frequency of dangerous good stored at or transported to the existing site which are currently below screening thresholds for potentially hazardous industry.

ES4.14 Bushfire

The project area is partially mapped as bushfire prone (Vegetation Category 1 and buffer) on the DRC bushfire prone land map. Potential bushfire risks include damage to infrastructure associated with the project and surrounding native flora and fauna or threaten the safety of the workforce. Several bushfire prevention and protection measures will be implemented during construction and operation of the project to mitigate the risk of bushfires.

ES4.15 Visual

Elements of the project with visual effects include the quarry pits/void, bund walls, existing built infrastructure and proposed surface infrastructure. There are three existing rural residences within the area of theoretical visibility that will have high or moderate visual impacts resulting from the project. At these residences moderate visual effects are associated with the proposed voids and bunding, and to a lesser extent with the proposed and existing surface infrastructure. Holcim currently have an agreement with one of the residences and are currently in consultation with the remaining two landholders.

For all other existing rural residences, the impact is assessed to be low or non-existent, due to both viewing distance and the presence of intervening structures and vegetation. The project will have low to non-existent visual impacts to other sensitive receptors including community facilities, major tourism sites, function centres, public vantage points, and visually sensitive lands.

ES5 Evaluation of merits and conclusion

The project's evaluation of merits has considered several factors, including the demand for basalt, the suitability of the site, the results of community and stakeholder engagement and the environmental impacts of the project as summarised above. The project is considered to be consistent with the objects of the EP&A Act including the principles of Ecologically Sustainable Development.

The project will provide a range of direct and indirect benefits to the local and regional areas and the State.

The project will allow the sustained delivery of high quality basalt products to local and regional markets. These products are used for the production of concrete, asphalt, road base and other applications. Due to forecasted population growth in NSW, the Federal and State governments propose to deliver a number of large infrastructure and capital works projects across the region. Therefore, there will be a sustained demand for high quality construction products to meet the demands of the future.

The project area is located in a strategic and central location, which will continue to benefit both Holcim and its customers. It is sufficiently distances from dense residential areas, minimising environmental impacts to the closest urban environment. In addition, a staged approach will be implemented to reduce potential land use conflicts.

Further, the project design has been refined as a result of technical assessments prepared for the EIS, to minimise potential environmental and social impacts.

Certification

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979.

EIS prepared by

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Applicant

Holcim (Australia) Pty Limited

Description of development

Continuation of Dubbo Quarry operations and expansion into two new resource areas referred to as the Western Extension Area (WEA) and Southern Extension Area (SEA). Refer to Chapter 2 of the EIS for a detailed description of the proposed development.

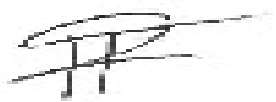
Land to be developed

Sheraton Road, Dubbo, NSW

Refer to Table 1.1 of this EIS for a detailed description of the land to be developed.

Certification

We certify that the contents of this EIS have been prepared in accordance with Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*, Schedule 2 of the Environmental Planning and Assessment Regulation 2000 and the NSW Department of Planning, Industry and Environment and Planning Secretary's Environmental Assessment Requirements issued for the development. To the best of our knowledge, it contains all available information that is relevant to the environmental assessment of the development to which the statement relates. The information contained in this EIS is neither false nor misleading.



Rachael Thelwell
Associate Director
28 January 2021

Dr Philip Towler
Associate Director
28 January 2021

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Photographs

1 Introduction

1.1 Background

Dubbo Quarry (the quarry) is a basalt quarry owned and operated by Holcim (Australia) Pty Limited (Holcim), located approximately 1.9 kilometres (km) west of the city of Dubbo on Sheraton Road. The quarry falls within the Dubbo Regional Council local government area (Dubbo LGA), which is managed by Dubbo Regional Council (DRC). The regional and the local context of the quarry are shown in Figure 1.1 and Figure 1.2, respectively. The quarry is located on the former Lot 1 DP 623367 which was subject of a boundary adjustment in 2018 that formed Lots 221 and 222 DP 1247780. Features of the existing site are shown in Figure 1.3.

The quarry produces high quality basalt aggregates for use in the construction industry in concrete, asphalt, road base and other applications. The quarry produces many types of road base, including premium road base frequently used by local councils and Transport for NSW (TfNSW). Precoated sealing aggregates from crushed basalt are also produced. The quarry sells products to civil construction projects, engineering projects, subdivision developments, industrial projects, commercial and domestic customers.

The quarry operates under Development Consent SPR79/22 (existing consent) granted by the former Talbragar Shire Council on 18 March 1980. The existing consent for the quarry operations does not specify a production rate; however, production is restricted by the capacity of its processing infrastructure which can handle up to 500,000 tonnes per annum (tpa). The quarry currently operates at an average production rate of approximately 350,000 tpa.

Accessible basalt resources within the land to which the existing consent applies (the existing site) are close to being exhausted. Holcim is, therefore, seeking planning approval to extract material outside of the existing site to allow the quarry to continue operating. This is referred to as the Dubbo Quarry Continuation Project (the project).

1.2 Project overview

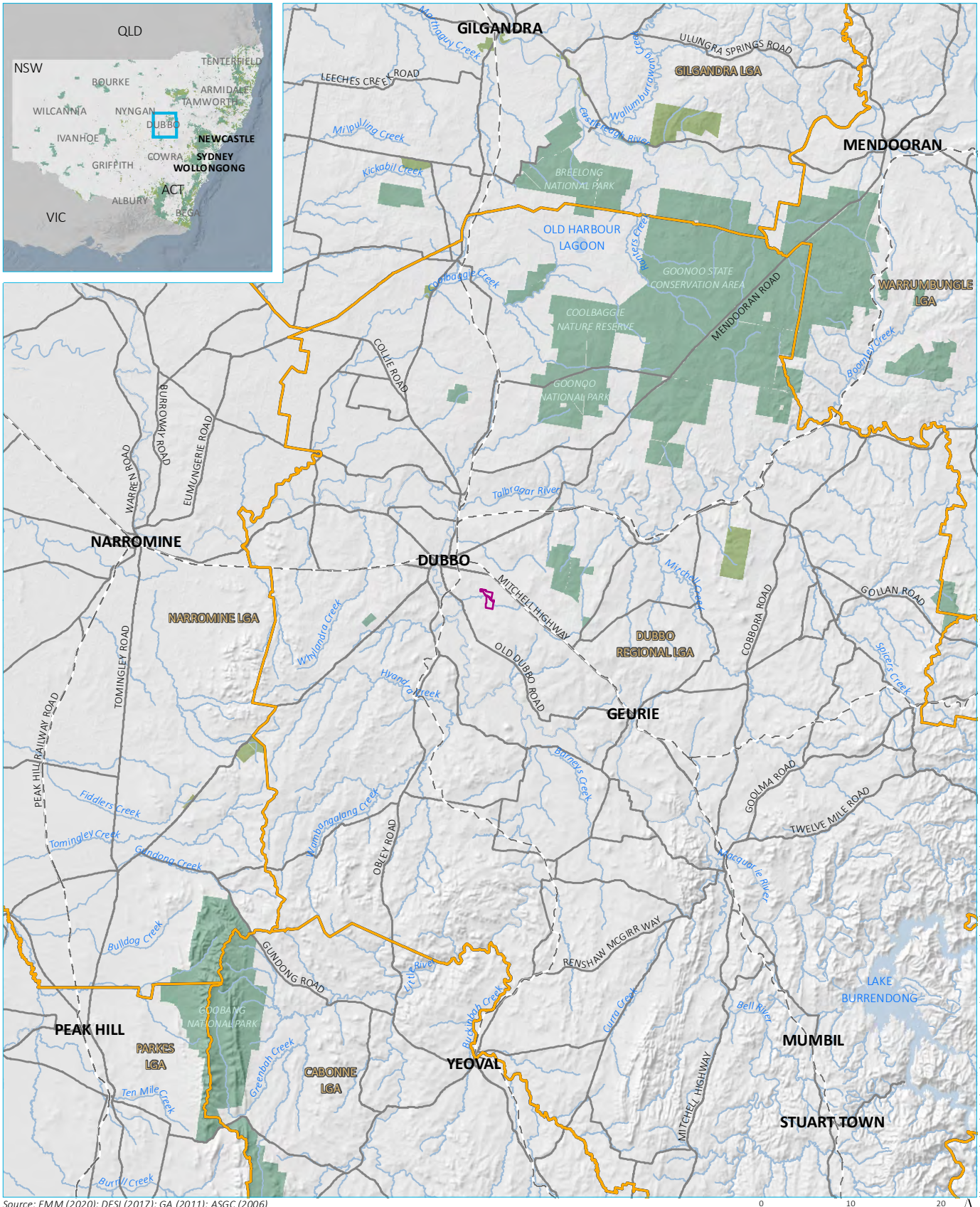
The project involves continued operations in the existing site and the development of two new resource areas, the Western Extension Area (WEA) and Southern Extension Area (SEA). The project area is shown in Figure 1.2 and described in Table 1.1.

The project includes the construction or modification of the following site components:

- a new internal quarry access road which intersects with Sheraton Road just north of the existing intersection with Sheraton Road, which is referred to as the 'proposed access road';
- a new internal haul road to connect the existing site with the SEA, which will include construction of a culvert type crossing across Eulomogo Creek and is referred to as the 'Southern haul road';
- modifications to the existing water management infrastructure within the existing site; and
- additions to the existing water management infrastructure to service the WEA and SEA.

Consistent with current operations, a peak production rate of 500,000 tpa is proposed for the project. The project will extend the quarry life by up to 25 years, dependent on future quarrying and processing rates.

There will be no change to the existing fixed infrastructure or method of quarrying and processing. Hours of operation will remain as per current operations (refer Section 2.3.11).



Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006)

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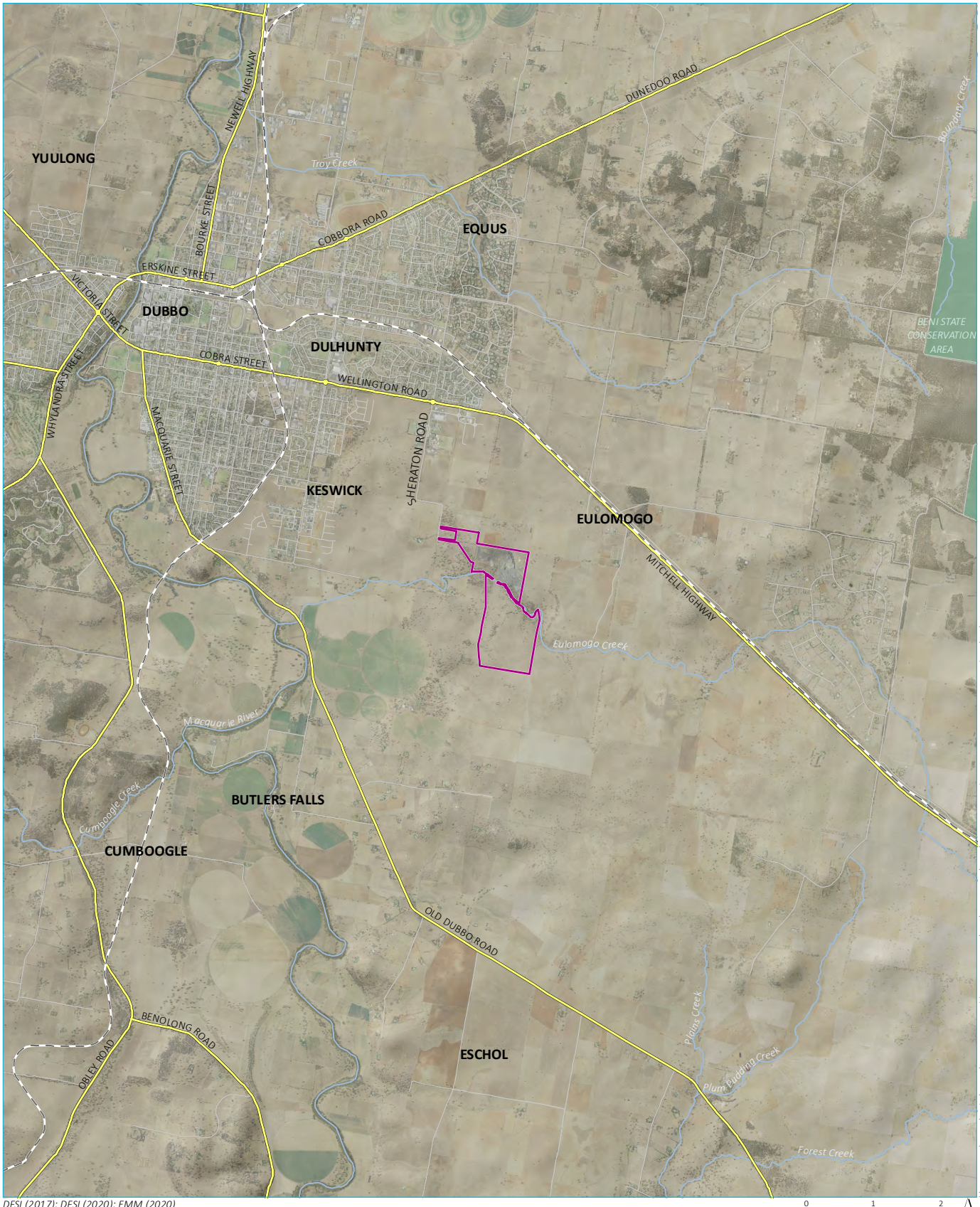
KEY

- Project area
- Rail line
- Major road
- Named watercourse
- Named waterbody
- Local government area
- NPWS reserve
- State forest

Regional setting

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 1.1

EMM
creating opportunities



DFSI (2017); DFSI (2020); EMM (2020)

0 1 2 km

GDA 1994 MGA Zone 55

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KEY

- Project area
- Rail line
- Major road
- Minor road
- Named watercourse
- NPWS reserve

Local setting

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 1.2

EMM creating opportunities

KEY

- Pit boundary
- Surveyed site boundary
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)

Site feature

1. In pit dam
2. West pit
3. Rehabilitation area
4. V-notch weir
5. Pump 1
6. East pit
7. Pump 2
8. Pump 2 storage pond (holding)
9. Primary crusher
10. Tertiary crusher
11. Secondary crusher
12. Diesel store
13. Workshop
14. Stockpile area
15. Pug mill
16. Laydown area
17. Site office
18. Toilets
19. Truck parking
20. Culvert
21. Settling pond
22. Current site access
23. Transformer station
24. Jet patcher/ paveline loading facility
25. Bitumen emulsion plant
26. Spare part storage
27. Employees car park
28. Pre coat plant
29. Pump house
30. Pit water storage
31. Main control centre
32. West pit pond
33. Tertiary Screen

Existing site

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 1.3

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Table 1.1 Project area

Lot/DP	Land owner's consent details	Location description	Approximate size within project area
Lot 222 DP 1247780 (formerly Lot 1 DP 623367 and part Lot 22 DP 793541)	Holcim (Australia) Pty Limited is the owner of this lot and has provided consent for the application.	East of Sheraton Road, contains the existing site, the WEA, proposed access road, and part of the southern haul road.	52.37 ha total 10.18 ha disturbance
Part Lot 100 DP 628628	Owned by an adjacent landowner. Holcim has entered into a Land Use Agreement to be able to quarry on Lot 100 DP 628628, with the owners of this land lot. Land owner's consent is in the process of being obtained.	South of the existing site on the southern side of Eulomogo Creek, contains the SEA and part of the southern haul road.	88.07 ha total 18.12 ha disturbance
Part Lot 221 DP 1247780 (formerly Lot 1 DP 623367)	Owned by an adjacent landowner. Land owner's consent is in the process of being obtained.	West of the existing site, contains part of the existing quarry access road.	0.72 ha total No disturbance
N/A	Crown Land. Holcim has submitted a request for Land Owner's consent concurrent with the submission of the EIS.	Land perpendicular to Eulomogo Creek between Lot 222 DP 1247780 and Lot 100 DP 628628 contains part of the southern haul road and the proposed crossing of Eulomogo Creek.	0.19 ha 0.19 ha disturbance

The project is classified as State significant development (SSD) under Part 4, Division 4.7 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). A development application (DA) for SSD must be accompanied by an environmental impact statement (EIS). On 3 April 2020, the Secretary of the Department of Planning, Industry and Environment (DPIE) issued Secretary's Environmental Assessment Requirements (SEARs) for the EIS for the project. The SSD application number is SSD-10417.

A new SSD consent under Division 4.1 of the EP&A Act is required to develop and operate the project.

EMM Consulting Pty Limited (EMM) has been engaged by the applicant to prepare this EIS which accompanies the DA to DPIE.

Existing power and telecommunications lines, near the proposed access road and WEA, will require realignment to facilitate extraction in the WEA. These activities will be subject to separate approvals from relevant service providers (Essential Energy and NBN Co) under Part 5 of the EP&A Act.

A detailed description of the project is provided in Chapter 2.

1.3 The applicant

Holcim is the applicant for the project with its relevant details provided in Table 1.2. Holcim is a leading international construction material company that has a long-standing history in Australia since 1901, previously operating under the well-known Readymix and Humes brands. Holcim has demonstrated the ability to establish and operate quarrying operations to a high standard, now owning and operating 65 quarries across Australia.

Holcim also runs a successful concrete supply business from a network of more than 150 concrete plants, 900 mixer trucks and mobile and on-site facilities, as well as 12 precast concrete factories.

Holcim is the Australian division of LafargeHolcim Ltd, a Swiss-based leading global construction materials and solutions company that employs around 90,000 employees in more than 80 countries.

Table 1.2 Applicant details

Requirement	Detail
Applicant	Holcim (Australia) Pty Limited
Postal address	Level 8 799 Pacific Highway Chatswood NSW 2067
Contact	Luke Edminson (Planning and Environment Manager NSW)
Contact details	Level 8 799 Pacific Highway Chatswood NSW 2067 Luke.edminson@lafargeholcim.com

1.4 Existing environment

1.4.1 Regional context

Dubbo LGA is located within the Orana Region of NSW which covers the central and north western parts of NSW, an area of over 199,000 square kilometres (km^2). It extends from the Warrumbungle Ranges in the east to the flat plains of Cobar and Bourke in the west, and north to the Queensland border. Major localities include Dubbo, Cobar and Mudgee; however, Dubbo has grown as the geographic centre and is considered the functional and economic centre of the region, serving as a hub for connections to dispersed rural communities (DPE 2017a). In the 2016 Australian Bureau of Statistics (ABS) census, there were 38,943 people residing in Dubbo (ABS 2016) and approximately 51,400 within the Dubbo LGA (DPE 2019b).

Three major highways traverse Dubbo LGA, all of which pass through the city of Dubbo, the Newell Highway, Golden Highway and Mitchell Highway (Figure 1.1).

Newell Highway (route A39) is a national highway which provides a major link between south-eastern Queensland and Victoria via central NSW and carries a large amount of freight between the eastern states. The Golden Highway (route B84) is a state highway running eastwards from Dubbo towards Newcastle. Mitchell Highway (route A32) is a state-owned highway which connects the northern/central-western region of NSW to central/south-western region of Queensland.

The southern part of Mitchell Highway forms part of the National Highway A32 corridor, which stretches from Sydney to Adelaide via Dubbo and Broken Hill. Mitchell Highway extends westwards through the city of Dubbo to Narromine and south-east through Orange and Bathurst.

The project area lies within the Brigalow Belt South Bioregion, and predominantly falls within the Talbragar Basalts ecosystem and Dubbo Basalts landscape unit. The topography of the Dubbo Basalts landscape unit is characterised by slightly elevated plains and low hills on flat lying Tertiary volcanics (basalt and Trachyte). The elevation across this landscape generally ranges from 300 to 330 m Australian Height Datum (AHD).

The climate of Dubbo is classified as warm temperate. Summers are hot with an average maximum temperature of 31.9–33.0 °C. Winters are cool with an average minimum temperature of 2.6–4.1 °C. Long-term monthly average rainfall in Dubbo ranges from 42.7–60.7 mm.

1.4.2 Local context

i Land uses

The project area is currently used for quarrying activities and as pastoral land. Land-uses surrounding the project area include the MAAS Group's South Keswick Quarry to the immediate north of the existing site, Neoen Energy's South Keswick Solar Farm further north, and rural residential properties. The existing site is accessed via Sheraton Road, which connects to Mitchell Highway approximately 2 km north-west of the existing site access.

The area immediately surrounding the site is sparsely populated. There are five residential dwellings within 1 km of the site, with the nearest occupied residences situated approximately 215–250 m from the boundary of the proposed WEA.

The Southlakes residential estate is located approximately 1.6 km to the west of the site and is the most densely populated area near the quarry. The Southlakes estate is approved for a further 51 lots which will extend the estate to approximately 1 km west of Sheraton Road.

Other land-uses near the site include a school precinct, 1.3 km north-west of the project area, which includes St John's College, St John's Primary School, and Dubbo Christian School; a commercial precinct at the intersection of Sheraton Road and the Mitchell Highway; and an aged care facility west of the commercial precinct.

Under the *Dubbo Local Environmental Plan 2011* (Dubbo LEP), the project area is zoned RE2 Private Recreation, IN3 Heavy Industrial, and RU1 Primary Production (refer Figure 4.1).

ii Environmental characteristics

Topography in and around the project area features undulating slopes and plains ranging in elevation from 280–310 m AHD predominantly on a westerly aspect, with local relief along Eulomogo Creek and within the existing quarry void.

The geology of the project area is dominated by basalt deposits and outcropping, with areas of sandstone outcrops. Soils are characterised by friable surface soils with moderate to high susceptibility to erosion. Undisturbed soils typically comprise strongly structured reddish-brown friable or cracking clay loams and light clay topsoils, with a dark reddish-brown clay subsoil at 40 m.

The project area is within the catchment system of the Macquarie River which is located approximately 2.7 km to the west. Eulomogo Creek runs through the project area with associated second and first order ephemeral drainage lines. The creek is within an agricultural landscape and is highly modified, with several farm dams in its upper reaches. The existing quarry site is within a catchment area that drains from the east (eastern watercourse).

A drainage line enters the existing quarry boundary from the north-east corner and drains above the stockpile area and quarry access road and enters the in-pit dam via a culvert.

The project area and surrounding land is generally cleared with some sparse remnant vegetation mostly along Eulomogo Creek. Historic land use within the project area has resulted in extensive vegetation clearance and cultivation.

1.4.3 Existing site description

The existing site is shown in Figure 1.3. In general, the site covers a quarry pit, processing infrastructure, product stockpiles, water management system and access road. The quarry pit consists of two interconnected pits (West Pit and East Pit) which cover much of the existing site.

Extraction is currently occurring in the south-east corner of the East Pit. The In-Pit Dam, Pump 2 Storage Pond, West Pit Pond and Settling Pond are used as part of the on-site surface water management system.

Extractive materials are stored in two stockpile areas to the east and south-east of the existing site. Rehabilitation areas are confined to the southern pit face of the West Pit.

The quarry access road is from Sheraton Road and connects to the existing site through part of a neighbouring property, formerly owned by Holcim, that was sold in a land swap agreement. The access road runs parallel between the quarry pit and the northern boundary of the existing site before turning southwards towards the site infrastructure area.

Existing site components include the following buildings and surface infrastructure:

- crushing plant and ancillary processing equipment including:
    - primary, secondary and tertiary crushers;
    - primary, secondary, tertiary and quaternary screens;
    - conveyors to transfer product for processing;
    - pugmill;
- site administration/office building with a separate amenities block;
- pre-coat plant;
- site workshop shed;
- light vehicle and truck parking areas;
- two laydown areas;
- existing culvert under the quarry access road;
- stockpile areas;
- on-site water management system; and
- diesel and bitumen storage.

Utilities to the existing site include power and telecommunication lines. A septic system is maintained for sewage and potable water is obtained from rainwater.

The power line is located along the southern part of the internal access road and within the WEA. Once it reaches the western boundary of the existing site it travels south along the edge of the quarry, and turns east below the rehabilitation area ending at the high voltage transformer and the main switch just before the quarry processing/stockpile area.

Key aspects of the existing site are shown in Photograph 1.1 to Photograph 1.4.

Photograph 1.1 In-pit dam

Photograph 1.2 Quarry administration/office building

Photograph 1.3 **Processing infrastructure**

Photograph 1.4 **Pugmill**

1.5 The need for the project

The quarry provides construction materials that are essential to the local and regional construction industry. Once accessible basalt resources within the land are exhausted, production at the quarry will be halted, removing a key local supply of construction materials. The quarry is an important local employer in the Dubbo LGA. The project will allow for the existing socio-economic benefits of the quarry to continue for a period of up to 25 years.

Further justification for the project is given in Chapter 3.

1.6 Project alternatives

A review of feasible alternatives has been undertaken to demonstrate that the project constitutes the most appropriate option to meet social, environmental and economic outcomes. Alternatives considered by the applicant as part of the scoping for the project include:

- undertaking the project in its current form;
- alternative project design(s); and
- not proceeding with the project, or the 'do nothing option'.

These alternatives are considered below.

1.6.1 Project history and design process

Holcim has been considering potential expansion options at the quarry for a number of years, noting that the currently accessible basalt resource within the existing quarry boundary is nearing exhaustion and a planning approval is required to allow the quarry to continue operating.

Initial options focussed on expansion to the north-west into the adjacent Lot 22 DP 793541 (now referred to as the WEA), which is owned by Holcim. This will have provided a cost effective and efficient expansion to the existing operation, that will allow the quarry to continue to operate for a further 7–8 years. Holcim held a pre-lodgement meeting with DRC in December 2018 to discuss the proposed expansion, associated issues and impacts, and the appropriate approval pathway, including potential for modification of the existing consent or through a new development application. At this meeting, DRC advised that unless otherwise justified, a new development application was the most appropriate approval mechanism, and due to the size of the expansion and potential increase in environmental impacts (predominantly biodiversity related) that it will also be considered Designated Development pursuant to Schedule 3 of the EP&A Act.

Subsequently, Holcim continued investigation of the geology and resource characteristics and identified potential for expansion to the south of the existing quarry into part Lot 100 DP 628628, for which an access licence agreement with the landowners of this lot (now referred to as the SEA) has been entered into to. Expansion into this area provides access to a substantially larger quantity of resource (approximately 5.37 Mt) that will facilitate ongoing operation of the quarry for up to 25 years.

EMM undertook preliminary environmental investigations across the identified land parcels during 2018–2019, including desktop constraints identification and analysis, preliminary biodiversity surveys, Aboriginal due diligence, and engagement with stakeholders. During this period, Holcim also undertook further geological investigation, including resource drilling, and design refinement in response to identified environmental constraints in order to identify a preliminary extraction plan and infrastructure layout that avoids and minimises potential environmental impacts as much as possible (refer Figure 2.1)

During the EIS preparation phase of the project, changes to existing and proposed operational practices/infrastructure were considered and adopted, where feasible and reasonable, to reduce the magnitude of predicted environmental impacts (in particular for noise and surface water).

The project design in its current form is considered to achieve a balance between the operational needs of the quarry now and into the future, demand for construction materials to support the development of infrastructure within the region and State, existing environmental constraints, and maintaining the existing amenity of nearby residential properties.

1.6.2 Alternatives not proposed

A number of alternatives have been considered to date that have been excluded from further consideration, as follows:

1. A number of other locations surrounding the site have been explored but were unable to be progressed for various operational or commercial reasons.

2. Expansion to the north of the existing quarry – the basalt resource extends north of the current extraction area and Holcim were originally considering expansion into this area, however the site under consideration was purchased by the Maas Group and now forms part of their South Keswick Quarry.

3. The quarrying of resource beneath the plant and office facilities within the existing quarry. Holcim has explored design options for relocation of these facilities to allow extraction of this material; however, the costs of relocating infrastructure is very high and will constrain internal access roads/movements.

4. Holcim considered an alternate option to the current proposed extent of the SEA, which extended into the adjacent property west of the SEA's western boundary, however this was dismissed on consideration of topography and potential for visual impacts for receptors generally west of the quarry.

5. The depth and extent of proposed extraction has been reduced in response to environmental constraints identified during preliminary investigations, including:

    a) extraction plans will be designed to avoid interaction with groundwater – as outlined in Section 6.8, Holcim has installed a network of groundwater monitoring bores across the site, monitoring data from which will inform final design that will avoid interaction with groundwater; and

    b) a number of plant community types (PCTs) have been identified within the preliminary investigation area that are listed as threatened ecological communities (TECs). Holcim has undertaken a number of design refinements to relocate and reduce the pit extent within the SEA in response, in order to reduce potential impacts to these TECs as far as practical (refer Section 6.4).

On a smaller scale, a number of alternative project elements were considered in the project design as part of the EIS preparation phase. Based on initial findings of the Noise and Vibration Impact Assessment (NVIA), modifications were made to existing or proposed plant and equipment to reduce noise emissions at sensitive receivers. The use of mobile plant (primary crusher and screen) in the SEA was considered and ultimately removed from the project due to the potential for higher noise levels. Further, the quarry's primary screen/secondary crusher has no noise attenuation currently built in. Operation of this plant component unmitigated was initially considered and discounted due to the potential for higher noise emissions and the opportunity to improve on existing amenity. The installation of noise attenuation, through the partial enclosing of the plant, was then incorporated into the project design. A noise attenuation and visual amenity bund was also incorporated into the project design as a pre-emptive measure.

Staged stripping events were incorporated into the project design as an alternative to large scale stripping to reduce the duration of stripping activities and associated noise emissions, to minimise exposed areas that could contribute to dust emissions from wind erosion, and to allow the continued agricultural use of unused parts of the project area.

Progressive rehabilitation of disturbed areas is proposed, as opposed to rehabilitation towards the end of the project life. Progressive rehabilitation will not interfere with ongoing quarry operations and will provide the benefit of minimising exposed areas that could contribute to dust emissions from wind erosion. It will also ensure that Holcim's commitment to rehabilitate the project area is achieved in a timely and progressive manner.

1.6.3 Do nothing option

The 'do nothing' option will have significant implications for the quarry's continued ability to operate and to supply essential construction materials to the region. It does not allow the efficient use of an existing resource to meet the product demand/needs of current and projected infrastructure, building and development projects locally and within the region. Not proceeding with the project will mean that the opportunity to recover substantial reserves of basalt resource (approximately 7.86 Mt) from the project area within an existing quarrying precinct, and using mostly existing infrastructure, will not be realised.

Without the project, the quarry will continue to operate in accordance with the existing consent. The quarry will, however, not be able to assist in meeting the demand of its current customers (including DRC and TfNSW) and for planned regional projects beyond the short-term. It will also exhaust the existing resources within the next 2–3 years, thereafter require decommissioning of existing surface infrastructure and facilities.

In the long term, the 'do nothing' option will result in the loss of jobs and income opportunities for the quarry's existing workforce of 12 FTE, 25 contractor truck drivers, 28 regular and 10 irregular contractors.

If demand for construction materials is not able to be met using the resources within the project area, a new quarry may be required within the region to meet the ongoing and future product demand. However, the current site has many strategic benefits which will reduce direct environmental impacts and result in efficient use of existing resources approved for this purpose (ie use of the surrounding road network and infrastructure already approved for quarrying operations).

1.7 The purpose of this report

This EIS accompanies an SSD application made under Part 4, Division 4.7 of the EP&A Act. It has been prepared in accordance with the EP&A Act, the Environmental Planning Assessment Regulation 2000 (EP&A Regulation) and has considered the draft *Preparing an Environmental Impact Statement: Guidance for State Significant Project* guidelines (DPE 2019a) (draft EIS guidelines).

This EIS addresses the SEARs issued on 3 April 2020 and the requirements of the relevant government agencies attached to the SEARs. The SEARs and where they are addressed in the EIS are detailed in Appendix A.

This EIS is accompanied by the following appendices and technical reports:

- Appendix A: Secretary's Environmental Assessment Requirements checklist;
- Appendix B: Stage plans;
- Appendix C: Mitigation measures table;
- Appendix D: Noise and vibration impact assessment (EMM 2020a);
- Appendix E: Air quality impact assessment (EMM 2020b);

- Appendix F: Biodiversity development assessment report (BDAR) (EMM 2020c);
- Appendix G: Aboriginal cultural heritage assessment ACHA) (EMM 2020d);
- Appendix H: Surface water assessment (EMM 2020e);
- Appendix I: Contamination database searches and historical aerial photos;
- Appendix J: Rehabilitation and landscape management strategy (EMM 2020f);
- Appendix K: Traffic impact assessment (EMM 2020g); and
- Appendix L: Social impact assessment (EMM 2020h).

2 Project description

2.1 Introduction

Holcim is seeking SSD consent under Division 4.1 of Part 4 of the EP&A Act to continue and expand the operations of the Dubbo Quarry. The project is known as the Dubbo Quarry Continuation Project (SSD 10417).

The project involves:

- continued quarrying operations in the existing site with an extraction and processing rate of up to 500,000 tpa;
- development of two new resource areas to the west and south of the existing site (the WEA and SEA, respectively) which will have noise attenuation and visual amenity bunds constructed around the perimeters, where possible;
- construction of a new internal access road to connect with Sheraton Road, north of the existing access road and intersection with Sheraton Road (the 'proposed access road');
- constructing a new internal haul road to connect the existing site with the SEA (the 'southern haul road'), which will require construction of a road with culverts across Eulomogo Creek (the 'Eulomogo Creek crossing');
- modification of the existing water management infrastructure within the existing quarry area; and
- construction of new water management infrastructure to service the WEA and SEA.

The WEA and SEA have been designed to extract the resource in the project area as efficiently and economically as possible, while avoiding or minimising adverse impacts to the environment and community, and delivering a range of socio-economic benefits to the region.

The proposed project components are shown on Figure 2.1.

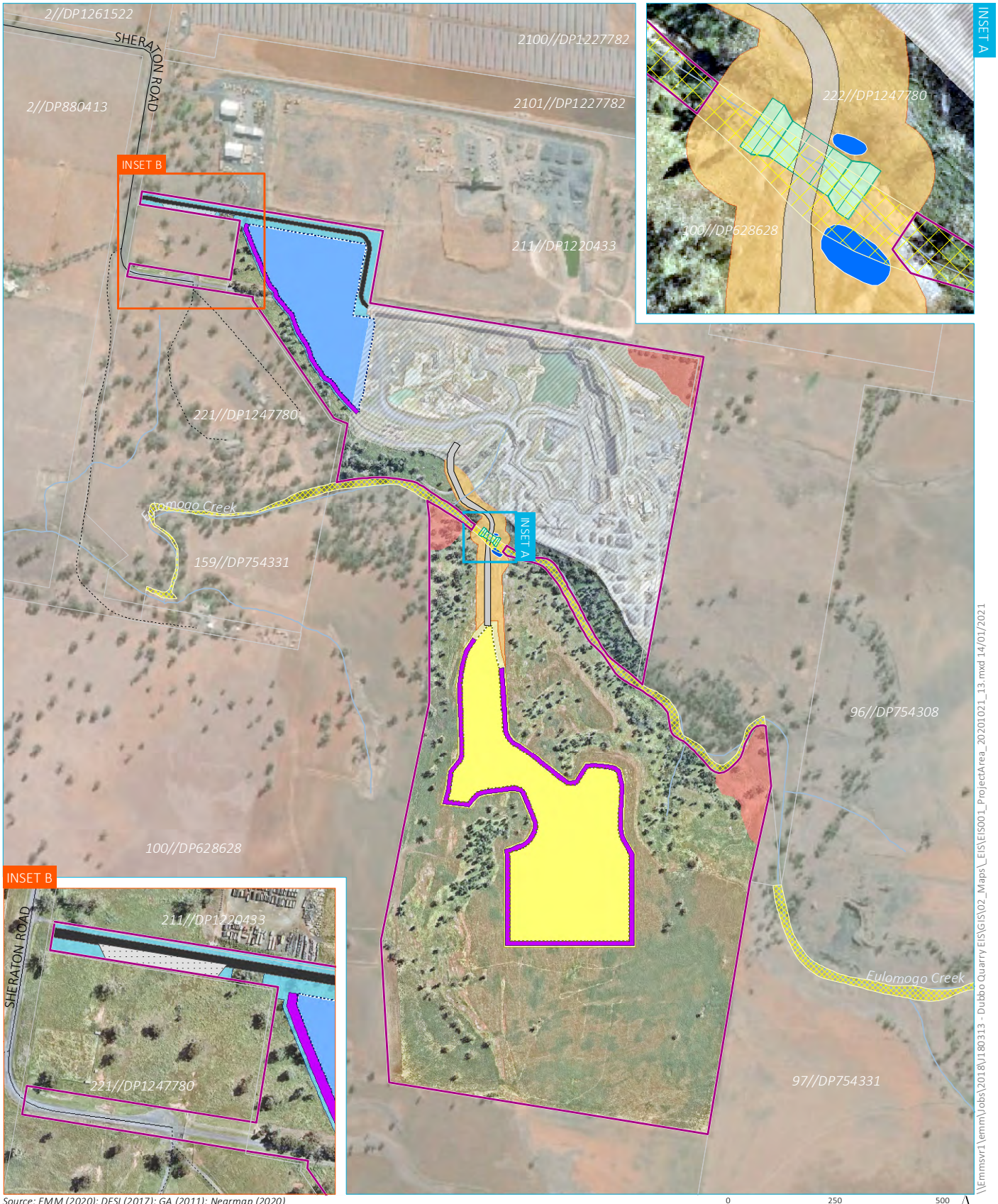
2.2 Project area

The project area includes the existing quarry, the two extension areas (ie quarry pits), ancillary development and disturbance. The WEA and SEA are shown as dark blue and dark yellow in Figure 2.1, respectively. There are four disturbance areas within the project area which include the existing quarry disturbance area (shown as grey hatching in Figure 2.1); and three new disturbance areas: western disturbance area, southern disturbance area and haul road disturbance area (shown as light blue, light yellow and orange in Figure 2.1, respectively). The project area boundary and its components are discussed further below for each disturbance area.

The boundaries of the disturbance areas were designed to avoid the clearance of native vegetation where possible. Further details of vegetation clearance are given in Section 6.4.

2.2.1 Existing quarry disturbance area

The existing disturbance area is the perimeter of the existing site within Lot 222 DP 1247780 as well as the portion of the existing quarry access road within Lot 221 DP 1247780. All disturbance within this area has occurred under the existing consent. New infrastructure within this area is limited to modification of the existing settling pond (as detailed in Section 2.3.6vii) and part of the proposed haul road where it connects to the existing site. The total size of this area is approximately 33.67 ha.



Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

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KEY

- Project area
- Sediment pond
- Aboriginal protection zone
- Indicative existing disturbance area
- Proposed haul road
- Indicative proposed water crossing
- Bund wall
- Proposed access road
- Truck tarping area
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)
- Crown land

Project area

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 2.1

EMM
creating opportunities

2.2.2 Western disturbance area

The western disturbance area is proposed to be located within Lot 222 DP 1247780, immediately west and north-west of the existing site. The total size of this area is 9.22 ha. As shown in Photograph 2.1, this area is predominantly cleared pasture land with some remnant vegetation.

Photograph 2.1 Western Extension Area looking north-east. Existing access road, tarping area and bund wall along western boundary of the West Pit visible in photo.

This area includes the WEA, the proposed access road, a truck tarping area, a bund wall and vehicle access track along the western perimeter of the WEA, and associated disturbance. The existing quarry access road Sheraton Road transects this area, as shown in Figure 2.1. To allow the WEA to be fully developed, part of the existing access road will need to be quarried and a new proposed access road will be constructed to the north and east of the WEA connecting to the quarry access road. An existing truck tarping area within the WEA will also be quarried and a new truck tarping area constructed near the site access point.

2.2.3 Southern disturbance area

The southern disturbance area is proposed to be located within Lot 100 DP 628628, which is located south of the existing site, below the Eulomogo Creek riparian corridor. The total size of this area is 16.85 ha. As shown in Photograph 2.2, this area is predominantly disturbed pastural land with some remnant vegetation. This area includes the SEA and a bund wall and vehicle access track that extends around the perimeter of the SEA except for the proposed haul road access point.

Photograph 2.2 Southern disturbance area

2.2.4 Haul road disturbance area

The haul road disturbance area is located within both Lot 222 DP 1247780 and Lot 100 DP 628628 connecting the existing quarry disturbance boundary to the southern disturbance boundary. The area also includes a portion of Crown Land which lies over the Eulomogo Creek riparian corridor. The total size of this area is 2.42 ha. As shown in Photograph 2.3, this area has some disturbed pastural land and remnant native vegetation. This area includes the proposed southern haul road and the Eulomogo Creek Crossing, two proposed sedimentation ponds – north and south of Eulomogo Creek, and associated disturbance.

Photograph 2.3 **Approximate location of the haul road disturbance area on the southern side of Eulomogo Creek looking towards the existing processing area**

2.3 Proposed operations

2.3.1 Resource description

The type of resource proposed to be extracted under the project is basalt, an igneous hard rock. Two types of basalt resources will be extracted: fresh basalt and altered basalt. The depth of fresh basalt and the quarry is between 10 and 15 m. Geochemical testing (Geochempet 2019) identified the characteristics of the fresh basalt as:

- finely crystalline and variably glassy;
- contains <1% of vesicles;
- unweathered to slightly weathered;
- fresh to lightly altered;
- average secondary mineral content about 6% (5% green to yellowish smectite clay, 1% zeolite and <1% iddingsite and calcite);
- hard (not easily scratched); and
- strong (resistant to permanent deformation by flow or fracture).

Geochempet 2019 determined that the rock is suitable for use as concrete aggregate, is predicted to be suitable for use in road base, asphalt/sealing aggregate (subject to bitumen stripping and polishing tests) and rail ballast (subject to compliance with Durability Criteria of CT147/AS2758.7). They also predicted it to be suitable for use as rip rap and marine armour rock, provided blocks of sufficient size can be obtained free of weak or permeable joint and other penetrative defects.

Altered basalt varies from fresh basalt in that it is softer with a higher clay content, is less dense and contains more vesicles. When blended with fresh basalt it makes a good road base product. The depth of altered basalt at the quarry varies between 1 and 3 m and is located at the base of the fresh basalt.

2.3.2 Resource areas and volumes

The project includes continued extraction within areas of the existing site and extraction within the two new resource areas, WEA and SEA. The depth of each quarry pits has been designed to be above the groundwater table (refer Section 0 for detailed information on groundwater heights).

Extraction within the existing site will be limited to extracting from the floor of the existing quarry pit to remove remaining true basalt and altered basalt. The existing pit floor will be extracted to a maximum depth of RL 280 m. Areas of extraction are within the West Pit and will be developed in an east–west direction.

The void within the WEA will be extracted in an approximate area of 6.46 ha and to a maximum depth of RL 283 m. Fresh basalt resources will be extracted to a depth of RL 285 m across the entire pit, working in a south-east to north-west direction. Altered basalt resources will then be extracted to a depth of RL 283 m working in a north-west to south-east direction to allow progressive rehabilitation of the pit floor behind the working face.

The void within the SEA will be extracted to an approximate area of 13.56 ha. The SEA will be extracted to RL 286 m at its northern end, working southwards and finishing at a depth of RL 288.5 m at its southern end. Deeper resources (fresh and altered basalt) are present in this area; however, the depth of extraction will be constrained to avoid intersecting the groundwater table.

Overburden, including soil and weathered rock, is also present within the WEA and SEA. This is not suitable for processing as a saleable product and will be used for progressive rehabilitation or stored in the bund walls or dedicated emplacement areas for future rehabilitation use.

Approximate resource and overburden volumes from the resource areas that will be accessed during the project are:

- 56,780 m^3 (153,306 t) basalt (altered) from the existing quarry pit;
- 844,424 m^3 (2.35 Mt) basalt (fresh and altered) and 45,182 m^3 (112,955 t) overburden from the WEA; and
- 1,916,811 m^3 (5.37 Mt) basalt (fresh) and 108,305 m^3 (194,949 t) overburden from the SEA.

The project will allow for the total extraction of approximately 2,810,295 m^3 (7.86 Mt) of basalt resources.

2.3.3 Production rate and duration

The project involves operations of a rate of up to 500,000 tpa for extraction, processing, and storage of extractive materials. This is consistent with the quarry's EPL and the capacity of existing processing infrastructure. The quarry's actual production rate will be dependent on future market forecasts and demand for quarry products.

The quarrying of the WEA and SEA, as well as continued extraction from the existing pit, will extend extractive activities at the quarry by up to 25 years. Following project approval, quarrying will commence in the WEA with all fresh basalt resources extracted within approximately 9 years. Quarrying in the SEA will commence two years after project approval for approximately 20–23 years.

2.3.4 Quarrying method

i Overview

Quarrying will be undertaken in stages. First, overburden and vegetation will be removed to access the basalt resource. The overburden will be used for rehabilitation or stored for future rehabilitation use in the bund walls and dedicated emplacement areas.

The target resource will be recovered through blasting and the development of benches to ensure the quarry pit remains stable. Crushing and screening of the quarried basalt will occur at the existing processing facility, with processed product being stockpiled on site as per current procedures and transported off-site by truck. These steps are described in further detail below.

ii Overburden and vegetation removal/stripping

a Method

Establishment of the WEA and SEA will require vegetation to be cleared using a dozer or excavator in clearly defined areas. Cleared vegetation will be mulched and used in rehabilitation.

The overburden will be stripped using a dozer or an excavator. Overburden will be used in bund wall construction or transported by dump truck for use in rehabilitation. Topsoil and subsoil will be kept separate to allow them to be used effectively in rehabilitation.

b Phasing

The WEA will be stripped in two phases:

6. the WEA up to the existing quarry access road; and

7. once quarrying has reached the existing quarry access road, the remainder of the WEA will be stripped.

This will allow the continued use of the existing access road until the proposed access road has been constructed.

Once quarrying commences in the SEA, stripping will occur once every two years, to allow for an area of approximately two years' worth of quarrying. This will minimise the disruption on the landowners, who could continue to use the non-active parts of the project area for grazing of cattle. Fencing, a minimum of 100 m from the blast face, will be installed for the safety of livestock.

Stripping will be undertaken during daytime hours only (7 am– 6 pm) for approximately 4 weeks in duration, per stripping event.

iii Bund wall construction

a Method

Where the overburden is to be used in construction of bund walls, it will either be stripped and pushed using a dozer or stripped with an excavator and loaded into dump trucks for placement. The bund walls will be constructed to a height of 4 m and a width of 10 m. The bund walls will consist mostly of subsoil with an upper layer of 100 mm topsoil. Once formed, the bund walls will be compacted via track rolling with a bulldozer and then the topsoil will be spread over the bund and hydro-mulched with cover crops and appropriate grass species to minimise erosion and weed infestation. The bund walls will remain until the quarry ceases production, at which point the materials will be repurposed for rehabilitation of the quarry's final landform.

b Phasing

The bund walls will be constructed in phases consistent with the overburden and vegetation removal as described above.

iv Resource recovery

The WEA and SEA will be extracted using a number of benches which will be established using standard hydraulic rock drills and blasting techniques. Blasts will be carried out no more than once per week and only between the hours of 9 am to 5 pm, Monday to Friday. Blasting currently occurs using NONEL (non-electric) detonators.

The removal of altered basalt will be undertaken using an excavator to remove the material from the pit floor and create a working face. Rock will be placed into dump trucks and taken to the processing infrastructure.

v Processing

From the void, basalt will be loaded onto dump trucks by an excavator or front-end loader. It will be then transported to the existing processing infrastructure to be fed through the existing primary, secondary and then tertiary crushers. The processing plant operates at up to 320 t per hour. Basalt is transported between each crusher via a system of conveyors. As part of the crushing process, the basalt will be passed through each of the crushers and a series of screens between each crusher. This will sort the crushed basalt into various size categories. The quarry currently sells a number of products, including:

- crusher dust < 5mm;
- aggregates (40mm, 20 mm, 14 mm, 10 mm, or 7 mm);
- stabilised and bound road bases (40 mm or 20 mm);
- rail ballast (65 mm)
- spalls (100–200 mm); and
- blast rock/shot rock.

Over the life of the project, innovations and customer requirements may change and, therefore, the types and sizes of products sold at the quarry may vary.

vi Stockpiling and distribution

There are two stockpile areas currently within the quarry site. The combined maximum capacity of these areas is 150,000 tpa. Maximum stockpile heights are 8 m.

The existing stockpile areas will continue to be used to store aggregate produced by the crushing and screening process. Product will continue to be transported to the stockpile area using a dump truck and front-end loader.

Product trucks will continue to be loaded from the stockpiles using a front-end loader. Trucks will be weighed coming in and out of the site at the weigh bridge located at the administration office.

vii Other processes

The quarry currently operates a Jet patcher/Paveline loader that supplies aggregate and bitumen emulsion products used for road repairs.

The existing Pre-coat Plant supplies pre-coated aggregates (in sizes 20 mm, 14mm, 10mm, 7mm, or 5mm) to road sealing contractors at a rate of up to 185 t per hour.

The quarry's Pug Mill blends road base and aggregate products at a rate of 200–250 t per hour.

These processes will continue under the project with changes to existing infrastructure required.

2.3.5 Sequencing

Nominal extraction plans for each quarry stage have been developed (Appendix B). These assume that each stage takes five years to complete at an assumed extraction rate of 350,000 tpa of fresh basalt. As described in Section 2.3.3, the actual extraction rate, and hence the length of time to complete each stage, may vary.

A description of the activities within each stage and post-quarrying are detailed below.

i Quarry stage 1 (nominally Years 1–5)

The WEA's first stripping event and construction of part of the WEA's bund wall (from the West Pit to the existing access road) will commence in Year 1. Once stripping has been completed, extraction will commence in the WEA, starting at the most eastern extent and moving west.

A small amount of extraction (10,000 tpa) will continue to occur within the existing quarry pit to extract the remaining altered basalt from the West Pit floor.

The WEA's second (and final) stripping event will occur in about the fifth year of Stage 1. The final section of the WEA bund wall is also expected to be fully constructed by the end of Stage 1.

The following project elements will be constructed within the first two years of operations:

- proposed access road and truck tarping area;
- southern haul road and Eulomogo Creek crossing; and
- modification and additions to the existing water management infrastructure.

Until the new internal access road is constructed, the existing quarry access road and the existing connection with Sheraton Road will continue to be utilised under the project.

Quarrying of the SEA will commence in Year 3 at a rate of 100,000 tpa, until the WEA has been fully extracted of true basalt. The first stripping event within the SEA will occur in Year 3 with a second event potentially undertaken in Year 5.

Rehabilitation of the East Pit faces will commence during this period.

ii Quarry stage 2 (nominally Years 6–10)

Extraction of fresh basalt within the WEA will continue in this stage. Small amounts of altered basalt (around 10,000 tpa) will be extracted within the existing quarry pit. The rate of extraction within the SEA will increase as extraction in the WEA is completed. Stripping in the SEA will occur about once every two years.

Rehabilitation of the East Pit faces will be completed in this period. Rehabilitation of the East Pit floor, the West Pit faces and the WEA pit faces will commence in this period.

iii Quarry stage 3 (nominally Years 11–15)

Extraction will primarily occur in the SEA with small amounts of altered basalt extraction (around 10,000 tpa) occurring within the existing quarry pit. Stripping in the SEA will occur about once every two years.

Rehabilitation of the East Pit floor, the West Pit faces and the WEA pit faces will be completed.

iv Quarry stage 4 (nominally Years 16–20)

Extraction will primarily occur in the SEA with small amounts of altered basalt extraction (around 10,000 tpa) occurring within the WEA. Stripping in the SEA will occur about once every two years.

Rehabilitation of the WEA pit floor (where altered basalt has been extracted to RL 283) will commence. Rehabilitation of the SEA's northern pit faces will commence.

v Quarry stage 5 (nominally Years 21–25)

Extraction will primarily occur in the SEA. Extraction in the WEA will be completed in this stage. Stripping in the SEA will occur about once every two years.

Rehabilitation of the WEA pit floor (where altered basalt has been extracted to RL 283) will continue in this stage. Rehabilitation of the SEA's northern pit faces will be completed.

vi Post quarrying

Rehabilitation of the remaining SEA pit faces and pit floor and WEA pit floor will be completed.

All buildings, plant, machinery, tanks, footings, slabs, pipelines, power lines and road pavements will be removed unless required for an alternate post-quarrying land use to be determined later in the project's life. All water management areas will be rehabilitated apart from the In-pit Dam which will remain as a water storage.

2.3.6 Access

i Quarry access road

The primary access point to the project area for heavy and light vehicles will continue to be via Sheraton Road.

The proposed access road will connect to the new intersection on Sheraton Road and will extend within the 30 m road corridor of Lot 222 DP 1247780 and along the northern and eastern boundary of the WEA to connect to the existing internal access road. The proposed access road has a disturbance corridor of between 15–18 m along the straights and 30 m at bends to allow for batters and drainage channels. The road will be graded and sealed with line markings applied.

The new internal access road will be 10-m wide in order to accommodate simultaneous incoming and outgoing truck movements. The conceptual road design has allowed for the simultaneous turning of trucks up to 20 m long within the site which is the typical size of the quarry's product trucks currently. Throughout the quarry operation, some larger trucks may need to access the site for delivery of equipment and other purposes. Additional traffic management measures will be implemented during access of the quarry site by trucks greater than 20 m (see Section 6.11.4 for further detail).

A truck tarping area will be located near the site access, adjacent to the proposed access road and within the road corridor of Lot 222. This area will provide for the temporary parking of trucks to check vehicles, uncover/cover loads prior to entering or exiting the site. A colourbond shed and associated concrete slab, located within the existing truck tarping area, will be relocated to the new tarping area.

The existing quarry identification sign will be moved to the new site access and a new security gate installed at the new access location.

Development Consent D2017-640, granted by Dubbo Regional Council on 16 August 2018, allowed for the construction of a new intersection on Sheraton Road with the proposed entry/exit to Lot 222 DP 1247780 approximately 175 m north of the existing access point. Therefore, construction of the site access intersection is not included in the project. It is noted that Development Consent D2017-640 limits trucks accessing the site at the new intersection to 19 m long. A modification to Development Consent D2017-640 will be required to allow larger trucks sizes as needed for the project.

ii Haul roads

Haul roads are internal roads used for the movement of equipment and personnel in and out of extraction areas and the transport of product to the processing infrastructure. The southern haul road, which will connect the existing quarry area to the SEA, will be a two-lane unsealed road around 450 m in length. The haul road will be 15-m wide, narrowing to a single lane (10-m wide) where it crosses Eulomogo Creek. The disturbance boundary shown on Figure 2.1 allows for construction of batters along the length of the haul road.

Informal haul roads will also be developed within the WEA and SEA to connect to the existing quarry pit and southern haul road.

iii Creek crossing

A culvert-based crossing of Eulomogo Creek is proposed. Preliminary engineering designs of two options were prepared by Pitt and Sherry. Option 1 includes five 2.1-m diameter precast pipes and Option 2 includes five 3.0 x 2.1-m rectangular box culverts. Both options are similar in terms of the overall design concept and include the following common aspects:

- the haul road will be a single land road to minimise the disturbance footprint and will be slightly skewed relative to the culvert alignment (which will be parallel to the creek). The road surface will be a 400-mm thick concrete pavement;
- the culverts will be approximately 27-m long and will be located within the creek channel zone with invert levels that are similar to the creek bed levels;
- headwalls and scour protection will be provided at the inlet and outlets;
- 1.4-m high vehicle safety berms will be constructed on either side of the haul road; and
- the height from the culvert invert to the top of the safety berm will be approximately 3.9 m.

Both design options have been assessed for the project with a preferred option to be chosen following approval. Concept design drawings for both options are provided in the surface water assessment (Appendix H).

iv Vehicle access tracks

Vehicle access tracks will be constructed around the perimeter of the new resource areas to allow maintenance access if needed such as fencing repairs. The tracks will be up to 4-m wide and will be cleared of vegetation and levelled with a dozer and/or front end loader.

ter management system and usage

v Existing water management system

The quarry's existing water management system includes four key storages: the West Pit Pond, In-Pit Dam, Pump 2 Storage Pond, and the Settling Pond (refer Figure 1.3). Water is collected from several sources, including runoff from the quarry area and the eastern watercourse catchment and from groundwater inflows into quarry pits.

When the available capacity of these storages is exceeded by excessive runoff from the catchments, water collected in the West Pit Pond and the Pump 2 Storage Pond overflows into the In-Pit Dam via a surface drain or subsurface flow. Water in the In-Pit Dam is then pumped to the Settling Pond or discharged to the Rehabilitation Area.

Groundwater inflows are known to occur into the In-Pit Dam and Pump 2 Storage Pond. Holcim holds Water Access Licence (WAL) 43440 to extract this groundwater.

vi Existing water usage

The quarry operation uses between 68 to 74 mega litres per year (ML/year) of process water for haul road dust suppression. The site operates a 13 kL capacity water cart to spray haul roads which completes approximately 15 loads a day and is filled from a pump at the In-Pit Dam. For dust suppression in the processing plant, 18 ML/year of water is sprayed onto conveyors and stockpiles. The water is extracted from the Pump 2 Storage Pond to two 50-kL process water tanks which are filled every 2 days on average. Water from the In-Pit Dam is also used to irrigate the Rehabilitation Area (which is approximately 1 ha).

Drinking water is delivered to the site by truck. Water for the amenities is sourced from rainwater tanks located near the office. When empty, these tanks are also filled with water from the Pump 2 Storage Pond. Wastewater from amenities is discharged to a septic tank, which is then discharged to an absorption trench. The septic tank is periodically pumped out by an approved licensed contractor as required.

Existing water licence entitlements for the quarry are detailed in Section 6.7.3.v.

vii Proposed water management system

The project will include new additions and modifications to the existing water management system. These include:

- the construction of four new water storages, including sumps in the WEA and SEA and two sedimentation ponds near the proposed southern haul road either side of Eulomogo Creek (refer Figure 2.1); and
- combination of the In-Pit Dam and the Pump 2 Storage Pond to form a single water storage in the East Pit; and
- increase in the capacity of the Settling Pond from 2.4 ML to 4.9 ML.

The East Pit water storage will receive water from groundwater inflows, and from dewatering of existing and new water storages, including the Settling Pond, after rainfall events. When full, the East Pit water storage will be discharged downstream of the Settling Pond in Eulomogo Creek. An assessment of the impacts associated with these changes to the existing water management system, including proposed discharges to Eulomogo Creek and construction of the Eulomogo Creek Crossing, is provided in Section 6.7.

viii Proposed water usage

As part of the project, additional water will be required for dust suppression of proposed haul roads. Between 166 and 181 ML/year of water will be required, which will continue to be sourced from the water management system. This water may be sourced from other parts of the water management system, for example water from the SEA sump may be used for dust suppression on haul roads south of Eulomogo Creek.

Water sourced from the water management system can also be used for irrigation of bund walls in the WEA and SEA and rehabilitation areas if required. No additional water will be required for dust suppression in the processing plant. There will be no change to other components of the water management system, including the use of trucked in potable water or collection of rainwater for amenities.

2.3.7 Utilities

The existing site is connected to the electricity grid. Existing electricity and telecommunication lines (copper cable line) will need to be realigned to allow for the development of the WEA and proposed access road. The location of the new alignment will be confirmed during detailed design. This will be completed in consultation with the relevant electricity and telecommunications provider and under a separate approvals process.

2.3.8 Fuel usage, storage and wastes

Approximately 26 kL of fuel per month will be used to operate the fleet and equipment during construction and operation of the project. Fuel is delivered to the site and stored in an appropriately bunded fuel farm. The fleet and equipment are refuelled at dedicated refuelling bays with appropriate environmental protection controls. Waste oil is stored at the fuel farm in a 2,000 L container. When full this is collected by a licensed contractor.

Other wastes generated at the quarry include general waste and recyclable products produced at the administration building. These wastes are put into wheelie bins which is collected by a licensed contractor and taken to landfill or recycling station.

2.3.9 Fleet and equipment

Construction of the new internal access and haul road will be completed using standard road building equipment, including excavators, loaders, graders and dump trucks. The Eulomogo Creek crossing will be constructed using similar equipment in addition to concrete agitator trucks, cranes and piling equipment.

The indicative fleet and equipment used for modelling the impacts of construction and operation of the project is provided in Table 2.1. The fleet and equipment may vary over the life of the quarry depending on the rate of extraction (up to 500,000 tpa), changes to equipment specifications, economics or other factors.

Table 2.1 Required fleet or equipment

Activity	Required fleet or equipment
Operation	
General operations	1 primary crusher (with rock breaker)
	1 secondary crusher
	1 tertiary crusher
	1 conveyor drive, 22 conveyors
	4 screens
	1 pugmill/generator
	1 front end loader (FEL (WA 500))
	2 FEL (980 loading RT)
	1 FEL (WA 470)
	1 excavators
	2 water pumps
	2 dump trucks
	2 watercarts
Stripping	1 excavator
	2 dump trucks
	1 dozer (D11)
Drilling	2 drills (1500 diameter)
Construction	
Construction of the southern haul road and proposed access road	grader, scraper and dozer
Construction of Eulomogo Creek crossing	concrete agitator trucks, cranes, piling equipment

2.3.10 Hours of operation

There is no restriction on operating hours in the quarry's current approval. Under the project, hours of operation will be formalised to:

- 5 am–6 pm Monday to Saturday for general operations (two shifts);
- 7 am–6 pm Monday to Saturday for production (processing and extraction);
- 4 am–6 pm Monday to Saturday for loading and transport (Sundays or public holidays for emergencies); and
- maintenance activities 24 hours/day, 7 days per week.

Blasting will be undertaken no more than once per week between 9 am and 5 pm, Monday to Friday.

Construction of the proposed access road and Eulomogo Creek crossing will occur within standard construction hours:

- 7 am–6 pm Monday to Friday;
- 8 am–1 pm Saturdays; and
- no construction on Sundays or public holidays, unless approval is provided by the Secretary.

2.3.11 Workforce

The quarry currently employs 12 full-time equivalent (FTE) employees, 25 contractor truck drivers, 28 regular and 10 irregular contractors. The project will utilise the existing quarry workforce during operations. Additional contractors will be required during construction of the Eulomogo Creek crossing (up to 6 persons) and the proposed access road (up to 9 persons) in addition to the existing workforce of the quarry.

2.3.12 Vehicles and parking

The site currently allows for parking of up to 20 light vehicles and 6 trucks, which can be expanded during peak production periods through relocation of earth bunding used for segregation. There will be no changes to the location or size of the parking area.

The existing truck tarping area will be quarried through as the WEA is fully developed. A new truck tarping area will be established east of the Sheraton Road intersection within the 30 m road corridor of Lot 222 DP 1247780. It will be approximately 0.2 ha and will be graded and covered in road base but not sealed. The area will be used by truck drivers as a waiting bay or to cover/uncover their loads prior to leaving/entering the site. The existing drivers rest area within a metal shed will be relocated from the existing truck tarping area to the new area.

2.3.13 Rehabilitation and end of project requirements

Progressive rehabilitation will be undertaken concurrently with extraction of the WEA and SEA where possible. The general sequencing of rehabilitation is detailed in Section 2.3.5. A rehabilitation and landscape management strategy has been completed for the project, which is summarised in Section 6.10 and provided in full in Appendix J. A rehabilitation management plan will be prepared for the quarry should the project be approved. The future land use for the site will be identified prior to quarry closure and will be agreed with the landowner, consistent with the appropriate land zoning and strategic planning context.

Once extraction has been completed in a pit, or part of a pit will no longer be used, the pit walls will be recontoured via blasting and dozing to have an overall gradient of approximately 1(v):3(h) or 18° consistent with rehabilitation undertaken to date on the south-western wall of the west pit.

The SEA pit floor will be re-shaped so that it is free draining to Eulomogo Creek. The floor of the West pit generally drains to Pond 1 at the eastern end of the pit. The floor of the WEA will be shaped so that it free drains to Pond 1. Subsoil and topsoil will be respread on the pit floors at sufficient depth to re-establish the pre-quarrying Land and Soil Capability (LSC) class. If there is a soil deficit onsite, soil or other suitable materials with applicable waste exemptions will be imported for this purpose. Soils in the floor of the pits will be contour scarified, ameliorated if required, and seeded with pasture species.

Following completion of the project, site infrastructure will be dismantled and recycled where possible or disposed of at an appropriately licensed waste facility. Equipment will be removed from the existing site and recycled where possible or disposed of at an appropriately licenced waste recycling facility.

Once quarrying has ceased a contamination assessment will be undertaken in the quarry pits and infrastructure areas and any contaminated materials either bioremediated on site or taken to an appropriate disposal facility.

3 Strategic context

3.1 Introduction

This chapter addresses the strategic context of the project, with consideration of social and economic trends, existing and future natural and built environment, and Government plans and policies. The chapter also outlines the project's strategic need and potential benefits, in accordance with the draft EIS guidelines (DPE 2019a).

3.2 Project location

The project is located within the Dubbo Regional LGA, in the Orana Region of NSW. Major localities within the Orana region include Dubbo, Cobar and Mudgee. Mining, agriculture, transport and public administration, health and community services have been identified as the major industries within the Orana region (RDA Orana 2019). In the 2016 Australian Bureau of Statistics (ABS) Census, there were 38,943 people residing in the city of Dubbo (ABS 2016) and approximately 51,400 within the Dubbo Regional LGA (DPE 2019b).

Dubbo Regional LGA is the geographic centre and is considered the functional and economic centre of the region, serving as a hub for connections to dispersed rural communities (DPE 2017). Dubbo Regional LGA is at the junction of the Golden, Newell and Mitchell highways. Dubbo Regional LGA also benefits from the Dubbo City Regional Airport and the Main Western Rail Line, both of which connect the region to key Australian cities such as Sydney, Brisbane, Melbourne, Canberra, and Newcastle. In the future, Dubbo is proposed to be linked with the Brisbane to Melbourne Inland Rail.

The project is, therefore, located in a strategic and central location which will benefit both the applicant and its customer base. The benefits of the project's location include its:

- proximity to the city of Dubbo;
- proximity to major transportation routes, including the Mitchell Highway;
- compatibility with surrounding land uses, as the project area is within an established quarrying area;
- sufficient distance from urban residential areas, minimising any residual environmental impacts to the closest urban environment;
- ability to accommodate internal manoeuvring of heavy vehicles, handling and storage of materials; and
- ability to utilise existing road infrastructure.

3.3 Dubbo Regional LGA social and economic trends

NSW Government's 2019 Population Projections indicate that the population of Dubbo Region is projected to increase by 7,400 people between 2016 and 2041, from 51,400 to 58,800 (DPE 2019b). However, the population of the Central West and Orana regions is expected to increase to more than 300,000 people by 2036, with people expected to live mainly in regional centres such as Dubbo (DPE 2017). One of the key drivers of population increase is families moving to the region from surrounding areas, attracted by the prospect of the region's social and economic opportunities.

The quarry is ideally located near Dubbo, with forecast growth and ongoing demand for materials from Council and TfNSW planned projects, thereby minimising haulage distances and costs for materials for these local projects. In line with the population increase, the NSW, Federal and local governments have plans to deliver a number of infrastructure and capital works projects in the region including, but not limited to (DPE 2017; DPE 2019b):

- $24.4 million (M) for the Taronga Western Plains Zoo visitor experience, comprising of major enhancements to the zoo;
- $10 M Destination Dubbo International Ready plan for the construction of tourist projects in Dubbo;
- investment in the Dubbo Health Innovation Precinct, a hub for health, business and education which includes $241.3 M for the Dubbo Base Hospital redevelopment;
- $10 M investment into Fitzroy Street and Cobra Street Roundabout upgrade to improve traffic flow in Dubbo; and
- $140 M towards construction of a third bridge crossing at Dubbo.

Therefore, the project is well-placed to supply construction materials for these projects, as well as for forecast growth and development across the region well into the future.

3.4 Alignment with strategic planning instruments

3.4.1 The Central West and Orana Regional Plan 2036

The Central West and Orana Regional Plan 2036 (the Regional Plan) was released by DPE in 2017 to guide land use planning priorities and decision making in the Central West and Orana Region for the next two decades. The region covered by the plan comprises the Cabonne, Orange, Blayney, Bathurst Regional, Lithgow, Oberon, Lachlan, Parkes, Forbes, Weddin and Cowra LGAs (Central West), and the Bogan, Warren, Coonamble, Gilgandra, Narromine, Warrumbungle and Dubbo Regional Mid-Western Regional LGA's (Orana). The Regional Plan provides an overarching framework to guide local land use plans, development proposals and infrastructure funding decisions. The implementation component of the Regional Plan includes priority actions and medium-long term actions.

The four key outcomes for the region as outlined in the Regional Plan are:

1. the most diverse regional economy in NSW;
2. a stronger, healthier environment and diverse heritage;
3. quality freight, transport and infrastructure networks; and
4. dynamic, vibrant and healthy communities.

The project, therefore, aligns with a number of directions and actions set out in the plan, which directly and indirectly support the achievement of these four goals. The project is consistent with Goal 1, as it will ensure the continued contribution of quarrying to the diversity of local economic development and employment in Dubbo. It will continue to supply locally sourced and financially competitive quarry products required for current customers (refer Section 1.1), as well as forecast growth and economic and industrial development across the region. The Regional Plan also sets a number of 'directions' for each goal. The project is consistent with Direction 10 of the Regional Plan which is to 'promote business and industrial activities in employment lands'. The project will ensure the continued long-term use of the existing site as a quarry, being an industrial land use.

The project will also ensure the continued employment of the existing workforce in addition to local contractors required for maintenance and construction activities.

In accordance with Division 13, this EIS considers the potential impacts of the project to ensure appropriate mitigation measures can be implemented to protect surrounding environmental values through the prevention or minimisation of such impacts (refer sections 6.2 to 6.16). The footprint of the WEA and SEA have been progressively refined through initial phases of the project and as the result of technical environmental studies completed to avoid impacts to surrounding native vegetation and Eulomogo Creek.

3.4.2 Dubbo Region Community Strategic Plan 2040

The Dubbo Region Community Strategic Plan (the DRC Strategic Plan) (DRC 2018) was developed by DRC to guide and influence the actions and initiatives of DRC, the community, government, and community stakeholders through to 2040.

The key future aspiration outlined in the DRC Strategic Plan relevant to the project is "our hard and our social infrastructure supports our population growth and allows for the development of a diverse regional economy". The feedback provided by the local community as part of the preparation of the DRC Strategic Plan shows that the local community has the desire to achieve ongoing economic prosperity through diverse employment opportunities. The community also cares about the provision of key infrastructure and services that enhance the quality of life and maintain economic growth.

Key objectives outlined in the DRC Strategic Plan that align with the project include:

- 2.2 our road transportation network is safe, convenient and efficient;
- 2.3 infrastructure meets the current and future needs of the community;
- 2.4 our transportation networks are planned to accommodate future growth and development of the LGA;
- 3.2 employment opportunities are available in all sectors of our economy
- 3.5 the long-term economic growth of the LGA is realised;
- 3.5.4 new businesses and industry are established in the LGA; and
- 3.5.5 businesses and industry are encouraged to grow, diversify and upskill workers.

The project will contribute to the local economy by providing direct and indirect employment opportunities (see Section 6.13)**.** The project will also provide a much-needed resource for current and future development, building and infrastructure projects, which are projected to increase. The improvements in infrastructure will consequently enable and support various streams of service provision within the region, boosting the economy and liveability and thereby improving long-term social and economic outcomes.

3.5 Need for quarry product

Construction materials are vital to delivering the infrastructure required to support economic and population growth in NSW.

In 2018, the Cement Concrete & Aggregates Australia noted that demand for heavy construction materials in NSW was at an all-time high and CCAA forecasts that the demand will continue due to the active building and construction market, stimulated by ongoing population growth and infrastructure investment (CCAA 2018).

An estimated 7.86 Mt of untapped basalt resource is available within the project area for the manufacture of roads, hardstand and other similar infrastructure. The project will extend the life of the quarry for up to 25 years and will allow for the continued support of the forecasted demand for construction materials in the Dubbo Regional LGA as well as for NSW.

The project will ensure Holcim can continue to directly contribute to the need for basalt products required for a range of local and regional infrastructure projects. The increase in local population and subsequent government investment into infrastructure projects is expected to place further demand on quarry products.

3.6 Economic needs analysis

There are a few key economic benefits that have been identified to result from the project. The primary economic benefit will be the continued provision of high-quality construction material product to the Dubbo Region in a competitive way. This includes the supply of high-quality construction material to DRC and TfNSW, as well as other local and regional customers.

The project will also indirectly contribute to the local economy through the employment of the construction and operational workforces. The construction phase will require up to 6 contractors for construction of the Eulomogo Creek crossing and up to 9 contractors for construction of the proposed access road, in addition to the existing workforce of the quarry.

There will be no change to the existing workforce numbers with the operational phase requiring 12 FTE employees, 25 contractor truck drivers, 28 regular and 10 irregular contractors.

The project will allow the retainment of the existing workforce and short-term employment of contractors. This will result in positive flow-on impacts to the local economy from household expenditure as a result of wages and salaries paid; and purchasing of goods and services for construction of project elements.

All economic benefits of the project, including the overall benefit to the construction industry, are considered in more detail in Section 6.13.

4 Statutory context

4.1 Introduction

This chapter identifies the key relevant statutory requirements for the project having regard to the EP&A Act and EP&A Regulation, other NSW and Commonwealth legislation, and environmental planning instruments.

This section has been set out in accordance with the draft EIS guidelines, to cover the following:

- power to grant approval (ie approval pathway);
- permissibility;
- other approvals;
- pre-conditions to exercising the power to grant approval; and
- mandatory matters for consideration.

Detailed consideration of relevant statutory requirements is given in the assessment sections of the EIS.

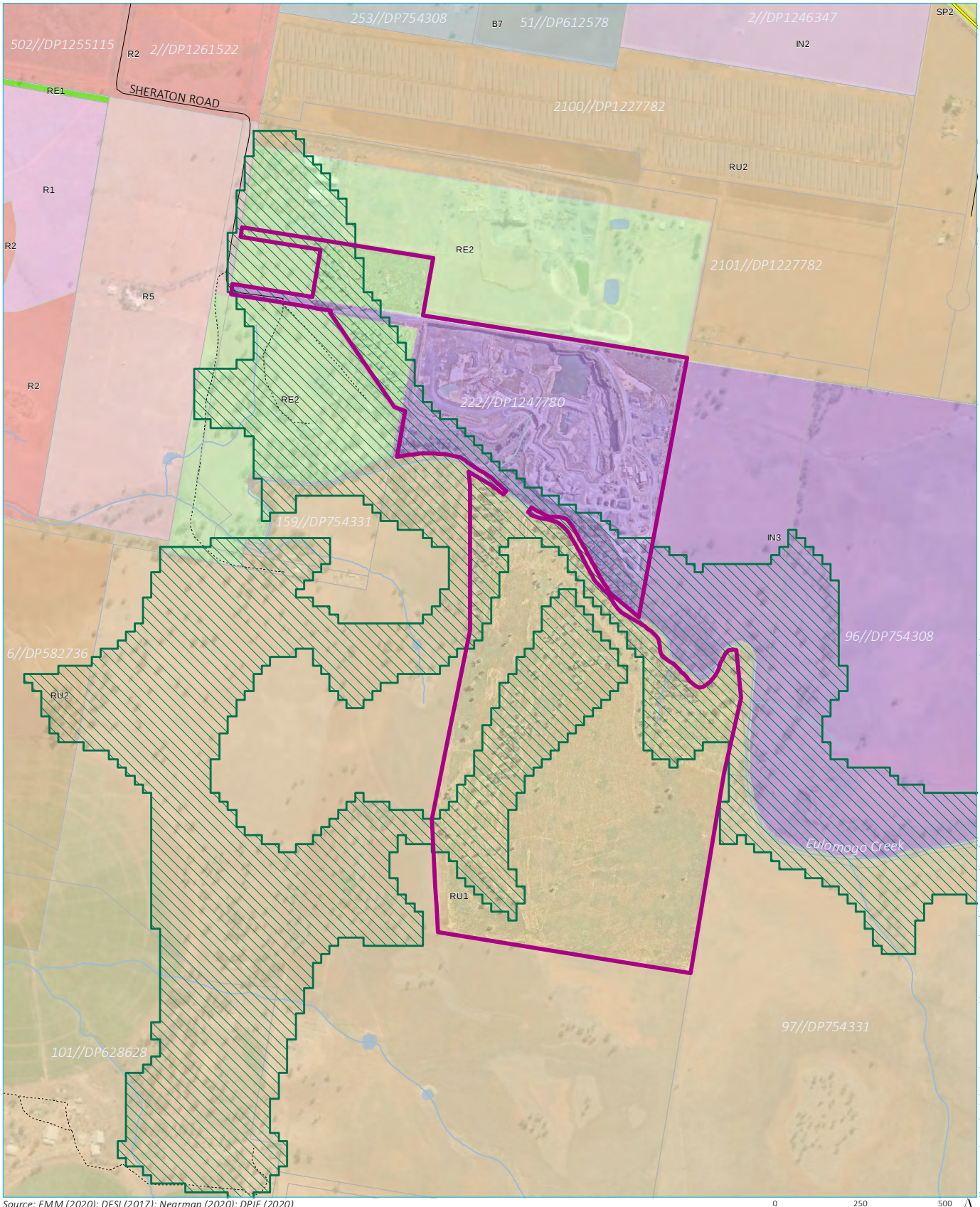
4.2 Approval pathway

The EP&A Act defines the statutory framework for planning approval and environmental assessment in NSW. The EP&A Act is administered by the Minister for Planning and Public Spaces, statutory authorities, and local councils.

Part 4 of the EP&A Act relates to development assessment; Part 4, Division 4.7 relates to the assessment of development deemed to be significant to the State (ie SSD). The project is determined to be SSD under clause 7 of the State Environmental Planning Policy (State and Regional Development) 2011 (State and Regional Development SEPP) as it is development for the purpose of extractive industry that extracts from a total resource of more than 5 million tonnes. Parts of the project area are also an environmentally sensitive area of State significance as it is mapped under the Dubbo Local Environmental Plan 2011 (Dubbo LEP) as having terrestrial biodiversity values (see Figure 4.1).

The Minister for Planning and Public Spaces or the Independent Planning Commission (IPC) is the consent authority for the project under section 4.5 of the EP&A Act. The IPC is the consent authority for SSD if it is for development that meets the requirements of Clause 8A of the State and Regional Development SEPP. The Minister may also, pursuant to section 2.4 of the EP&A Act, delegate the function of determining an application for approval to a range of persons or public authorities, including a person employed in DPIE or IPC. A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before preparing an EIS, the applicant must request SEARs which specify what must be addressed in the EIS. The SEARs for the project are discussed in Section 1.4 and a table noting where each requirement is addressed is provided in Appendix A.

The EIS will be placed on public exhibition for a minimum of 28 days by DPIE and submissions will be sought from local and State government agencies and the community. Any submissions received by DPIE will be reviewed and forwarded to the applicant to consider and respond to (via a response to submissions (RTS) report). Following receipt of the RTS report, DPIE will prepare its assessment report considering this EIS, all submissions received during the exhibition process, and the RTS report. DPIE's assessment report will be considered by the consent authority before the DA is determined.



Source: EMM (2020); DFSI (2017); Nearmap (2020); DPIE (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

KEY

- Project area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary (data does not align with surveyed site boundary)

Dubbo LEP terrestrial biodiversity

- High value natural resource

Dubbo LEP landuse zoning

- B7 Business Park
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- SP2 Infrastructure

Land zoning

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 4.1

EMM creating opportunities

4.3 Permissibility

The project area is zoned IN3 Heavy Industrial, RE2 Private Recreation, and RU1 Primary Production under the Dubbo LEP (see Figure 4.1). Extractive industries are permissible with consent within the IN3 and RU1 zones. Extractive industries are prohibited within the RE2 zone. However, Section 4.38(3) of the EP&A Act states, in relation to SSD, that:

> (3) Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.

4.4 Other approvals

This section identifies other approvals that are required to carry out the project and explains why they are required. These approvals are outlined in Table 4.1 and have been grouped into the following categories:

- *integrated approvals*: which are approvals that cannot be refused and are required to be issued consistently under section 4.42 of the EP&A Act if the project is approved;
- whether approval is required under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *other approvals*: approvals that are not expressly integrated into the SSD assessment process; and
- *approvals not required*: approvals that will have been required if the project was not SSD as per section 4.41 of the Act.

Table 4.1 Approvals and licenses required

Approval	Requirement
Integrated approvals	
An environment protection licence (EPL) under Chapter 3 of the NSW *Protection of the Environment Operations Act 1997*	A variation to the quarry's existing EPL may be required.
EPBC Act approval	
An approval under Part 3, Division 1 of the EPBC Act	The project has been referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for potentially significant impacts to matters of national environmental significance (MNES). The referral concluded that the project is unlikely to have a significant impact on MNES.

Table 4.1 Approvals and licenses required

Approval	Requirement
Other approvals	
	None required for the project.
Approvals not required	
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974* (NP&W Act)	An Aboriginal object will be disturbed by the project as detailed Section 6.5.
A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act 2000* (WM Act)	The project will have required a controlled activity approval, if not for section 4.41 of the Act.

4.5 Pre-conditions to exercising the power to grant approval and mandatory considerations

Pre-conditions to exercising the power to grant approval for the project are provided in Table 4.2. The mandatory conditions that must be satisfied before the determining authority may grant approval are listed in Table 4.2.

Table 4.2 Preconditions to being able to grant approval for the project

Statutory reference	Pre-condition	Relevance	Section in EIS
State Environmental Planning Policy (Infrastructure) 2007, Clause 104(3)	Before determining a development application for traffic generating development, the consent authority must give written notice of the application to RMS [TfNSW] within 7 days after the application is made.	The project is traffic generating development as it is for industry that has a site area of 20,000 m^2 or greater with access to a road.	Not applicable.
State Environmental Planning Policy No 64 –Advertising and Signage, Clause 8	A consent authority must be satisfied that signage viewed from a public place is consistent with the objectives of the Policy and satisfies the assessment criteria specified in Schedule 1.	The existing business identification sign will be relocated to the new access on Sheraton Road. No new signage is proposed.	Section 2.3.6i

Table 4.3 Mandatory considerations for the project

Statutory reference	Mandatory consideration	Section in EIS
Considerations under the EP&A Act and Regulation		
Section 1.3	relevant objects of the Act	Chapter 7
Section 4.15	relevant environmental planning instruments: State Environmental Planning Policy (Infrastructure) 2007 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 State Environmental Planning Policy No 33 – Hazardous and Offensive Development State Environmental Planning Policy No 55 – Remediation of Land State Environmental Planning Policy No 64 – Advertising and Signage Dubbo Local Environmental Plan 2011	See below
	Dubbo Development Control Plan	See below
	the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality	Chapter 7
	the suitability of the site for the development	Section 7.3
	the public interest	Chapters 3 and 7

Table 4.3 Mandatory considerations for the project

Statutory reference	Mandatory consideration	Section in EIS
Mandatory relevant considerations under EPIs		
State Environmental Planning Policy (Infrastructure) 2007, Clause 104(3)	(i) any submission that RMS provides in response to that notice within 21 days after the notice was given (unless, before the 21 days have passed, RMS advises that it will not be making a submission),	Not applicable
	(ii) the accessibility of the site concerned, including— (A) the efficiency of movement of people and freight to and from the site and the extent of multi-purpose trips, and (B) the potential to minimise the need for travel by car and to maximise movement of freight in containers or bulk freight by rail, and	Section 0
	(iii) any potential traffic safety, road congestion or parking implications of the development.	Section 0
State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007, Clause 12(2)	Before determining an application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must— (a) consider—	
	(i) the existing uses and approved uses of land in the vicinity of the development, and	Section 1.4, Section 6.9
	(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and	Section 6.8.1
	(iii) any ways in which the development may be incompatible with any of those existing, approved or preferred likely uses, and	Section 6.8.1

Table 4.3 Mandatory considerations for the project

Statutory reference	Mandatory consideration	Section in EIS
	(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii), and	Section 6.8.1, Chapter 7
	(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).	Section 6.8.1, Appendix C
State Environmental Planning Policy No 33 – Hazardous and Offensive Development, Clause 8	Departmental guidelines: Applying Sepp 33 HIPAP No. 3 – Risk Assessmente HIPAP No. 12 – Hazards	Section 6.13.1
State Environmental Planning Policy No 55 – Remediation of Land, Clause 7	As the development will involve a change of use on land on which development for a purpose referred to in Table 1 to the contaminated land planning guidelines is being, or is known to have been, carried out, a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.	Section 6.8.1
Dubbo Local Environmental Plan 2011	Objectives and land uses for RU1, IN3 and RE2 zones	Section 6.8.1
	Clause 7.3 Earthworks	Section 6.8.1
Considerations under other legislation		
Biodiversity Conservation Act 2016	The likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values.	Section 6.4

5 Engagement

5.1 Introduction

This chapter provides an overview of the outcomes of community and stakeholder engagement activities undertaken for the project by Holcim and EMM (on behalf of Holcim). The engagement program included a number of communications methods to ensure community members directly or indirectly affected by the project, as well as other stakeholders such as State and local government agencies, were kept informed about the project throughout the scoping and assessment process.

As part of the engagement process, a social impact assessment (SIA) has been prepared to examine the likely social impacts of the project on the nearby local and regional communities (Appendix L). The SIA has been prepared in accordance with the *Social impact assessment guideline for State Significant mining, petroleum production and extractive industry development* (SIA Guideline) (DPE 2017), relevant legislation and guidelines. While the details of the SIA are provided in Section 0 of this report, this chapter summarises the engagement requirements, activities, and outcomes.

It is important to note that during operation of the quarry, Holcim have maintained a relationship with many of its surrounding neighbours and is considered to be a respectful member of the local community. For the past 40 years the quarry has operated with minimal complaints despite not having restrictive conditions imposed within its existing consent.

5.2 Engagement requirements and approach

5.2.1 Overview

In accordance with the objects of the EP&A Act, the SIA Guidelines and project's SEARs requirements, engagement has been an important part of the preparation of the project's EIS. The EP&A Act objects include:

> (j) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The *Dubbo Quarry Extension Project Scoping Report* (the Scoping Report) for the project was prepared by EMM on behalf of Holcim and submitted to DPIE on 19 December 2019 (EMM 2019a). The Scoping Report was informed by preliminary stakeholder liaison and meetings and community workshop undertaken by Holcim and EMM (refer Table 5.3 and Table 5.4). The Scoping Report outlined Holcim's commitment to meaningful community and stakeholder engagement and consultation, which will inform the EIS.

Engagement has also been undertaken in accordance with the relevant requirements of the final SEARs re-issued for the project on 3 April 2020, in which DPIE emphasised the importance of consultation with different community and stakeholder (including government agency) groups. To inform the preparation of the SEARs, DPIE invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were considered by the Secretary for the DPIE when preparing the SEARs.

Given the constrained circumstances brought on by the current COVID-19 pandemic, the engagement approach had to be slightly amended in line with Federal and State government COVID-19 recommendations and measures. Therefore, some components of consultation were undertaken using other means as opposed to face to face interaction, and face-to-face stakeholder consultation was not possible during most of 2020.

However, given that Holcim has undertaken engagement activities with key government agencies, stakeholders and community groups right from the initial feasibility stage of the project, sufficient consultation data has been collected to prepare the EIS and SIA, and to derive the outcomes presented in this chapter and in Section 6.12 and in Appendix L respectively. The full engagement methodology is provided in Chapter 2 of Appendix L.

5.2.2 SEARs requirements

The SEARs requirements for engagement and where they are addressed in this report are provided in Table 5.1.

Table 5.1 SEARs requirements

Requirement	Addressed
During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, Aboriginal stakeholders, community groups and affected landowners. In particular you must: • consult with: – affected landowners; – community groups; – local schools; – Aboriginal stakeholders; – Dubbo Regional Council; – Biodiversity and Conservation Division within DPIE, including the Heritage Branch; – EPA; – Division of Resources and Geoscience within DPIE; – Department of Primary Industries (including Agriculture and Fisheries) within DPIE: – Crown Lands and Water Divisions within DPIE; – Forestry Corporation of NSW; – Heritage NSW; – Central West Local Land Services; – NSW Department of Education; – NSW Health; – Water NSW; – NSW Rural Fire Service; and – Transport for NSW; and	Section 5.3 Community consultation outcomes Section 5.4 Agency consultation outcomes
• establish a Community Consultative Committee (CCC) for the project in accordance with the *Community Consultative Committee Guidelines for State Significant Projects*, and consult with the committee during the preparation of the EIS.	Section 5.2.4 Community Consultative Committee
The EIS must: • describe the consultation process used and demonstrate that effective consultation has occurred;	Section 5.2.3 Stakeholder engagement tools
• describe the issues raised;	Section 5.3 Community engagement outcomes Section 5.4 Agency consultation outcomes
• identify where the design of the development has been amended and/or mitigation proposed to address issues raised; and	Chapter 7 Evaluation of merits Section 0

Table 5.1 SEARs requirements

Requirement	Addressed
• otherwise demonstrate that issues raised have been appropriately addressed in the assessment.	Section 5.3 Community consultation outcomes Section 5.4 Agency consultation outcomes

5.2.3 Stakeholder engagement tools

Stakeholder engagement for the project used several different communications methods to consult, record and respond to stakeholders and is outlined in Table 5.2. Although initial consultation was undertaken face to face, the variety of methods used was, in part, in consideration of COVID-10 restrictions. Collectively, the diversity of methods used was also to ensure stakeholders were fully informed of the project and could use at least one of several options to provide feedback on the project during project scoping and preparation of the EIS.

Table 5.2 Overview of engagement tools

Engagement activity	Description
Emails and/or letters	Emails and/or letters were sent to the Community Consultative Committee (CCC) and Registered Aboriginal Parties(RAPs) inviting them to participate in face to face and online consultation meetings. Emails and/or letters were also sent to relevant government agencies consulted throughout the scoping and preparation of the EIS and associated technical assessments.
Telephone	Phone calls were made to various government agency officials, in particular to DPIE and DRC project contacts, throughout the project scoping and EIS preparation stages of the project.
Project email address and telephone	Email addresses and telephone lines were provided as part of the consultation process, both on the website and in the newsletters distributed in person and online.
Letter invitations	Letter invitations were sent to community workshop invitees.
Stakeholder meetings and/or site visits	Separate meetings were held with the following stakeholders: • DPIE; • DRC; and • MAAS Group. The NSW Environment Protection Authority (EPA) visited the quarry on 26 June 2019.
Community information sheet	A community information sheet was distributed to SIA community workshop participants and via community Facebook groups within the Dubbo region. The community information sheet included information about: • the scope and location of the proposed project; • the planning assessment process; • the SIA; and • relevant contact information.

Table 5.2 Overview of engagement tools

Engagement activity	Description
Community workshops	The purpose of community workshops was to inform the community about the project and provide opportunities for the community to give feedback. Community workshops were held both during the scoping and preparation stages of the EIS: • one community workshop on 17 July 2019; and • two community workshops on 23 July 2020.
Online survey	An online survey was administered to the public during the period between 29 July 2020 to 21 September 2020, seeking community input on any impacts concerning the project. The survey included open ended, multiple choice, and rating-style questions which provided both qualitative and quantitative data. Respondents also had the opportunity to provide their contact details for any follow up information or consultation regarding the project.
Social media (Facebook)	Both the community information sheet and the online survey were distributed using Facebook and in the following manner: • on five separate occasions to Dubbo Community Group Facebook group, which has 3,100 group members (24 August, 7, 9, 17 and 18 September 2020); and • on four separate occasions to Spread the Word in Dubbo & Wellington Facebook group, which has 654 group members (4, 7, 9 and 17 September 2020).
Newspaper advertisements	• A public notice was placed in the local newspaper, the *Dubbo Daily Liberal* on 27 May 2019 inviting all Aboriginal persons and organisations who hold cultural knowledge relevant to Aboriginal objects and places in the project area to register their interest by 10 June 2019 (refer Appendix A of Appendix G). • The online survey was also published in print and online editions of the *Daily Liberal*, which has a readership of 9,000, on 12 and 14 September 2020.

5.2.4 Community Consultative Committee

A CCC was formed to provide an opportunity for Holcim, the local community, DRC and other interested parties to have an open discussion about the project and the current quarry including environmental performance and community relations. CCC members currently include representatives from:

- Holcim;
- Dubbo Christian School;
- Dubbo Catholic School; and
- DRC.

The results of CCC meetings are summarised in Table 5.3.

5.3 Community engagement outcomes

The results of the engagement actions that were undertaken as part of the community engagement initiatives are summarised below. The results should be considered along with the results of the SIA (refer Section 6.12 and Appendix L), which provides further detail and context on project social impacts to local and regional stakeholders.

A summary of participation by engagement activity is provided in Table 5.3, with further discussion provided below the table.

Table 5.3 Participation by engagement activity

Stakeholders	Method	Participation issues raised and outcomes
Scoping and technical assessment preparation stage		
Wider community and community groups	Face to face at the 17 July 2019 **community workshop** (scoping phase)	The following issues were raised and responded to at this community workshop: • road safety within school precinct to the north; • additional truck movements resulting in further deterioration of existing roads; • the quarry moving closer to the school precinct as well as residential zoned land; and • potential decrease in house prices for existing and future residential dwellings.
Registered Aboriginal Parties (RAPs)	On 27 May 2019, EMM sent **letters** inviting registrations via post and email to the Aboriginal parties identified by agency requests.	A number of government agencies were consulted about which Aboriginal parties to invite for consultation (refer Appendix G). Emails and/or letters were sent out to 16 organisations and/or individuals identified during this process, to which the following parties registered an interest in being consulted for the project: • Dubbo Local Aboriginal Land Council (Dubbo LALC); and • Dubbo City Council Aboriginal Community Working Party. Consultation with RAPs has been undertaken in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010), with two RAPs involved in a three-day archaeological field survey undertaken for the project in July 2019 (refer Appendix G).
	Letter sent to all RAPs on 11 June 2019; and the **draft ACHA report** sent to all RAPs on 4 August 2020.	In accordance with the guidelines, consultation with RAPs has continued during the preparation of the EIS during which the ACHA was prepared (refer Section 6.5 and Appendix G). To date, the following additional consultation has taken place: • A letter was sent to all RAPs on 11 June 2019 detailing fieldwork methodology, details and requirements as well as a request for cultural information about the project area. Responses were requested by 9 July 2019; however, no responses were received. • A draft ACHA was sent to the RAPs on 4 August 2020. The RAPs were invited to provide comment on the report as well as the significance of cultural heritage relevant to the project area. A follow up email was sent in September 2020, however no responses or comments on the draft ACHA were received.

Table 5.3 Participation by engagement activity

Stakeholders	Method	Participation issues raised and outcomes
Stakeholder meetings	A face to face **meeting** was held with MAAS Group on 18 July 2019	Issues raised in the meeting by MAAS Group were initially summarised in the Scoping Report, and are also provided below: • blasting and relative vibration impacts on nearby properties; • truck movements and driver behaviour in and around school zones; • ability of local roads to accommodate traffic; • the cumulative impacts of the proposal need to be considered within the existing context; • groundwater, contamination and flood impacts on surrounding dairy farmers; • potential visual impacts especially for properties to the south, along Angel Park Road; and • need for consideration of the creek and potential salinity issues. Issues were discussed in the meeting and considered throughout further consultation with DPIE and DRC. The above issues were also addressed in technical reports prepared for this EIS, in particular: • noise and vibration is considered in Section 6.2; • truck movements, driver behaviour and local network capacity are addressed in 0; • cumulative impacts for noise and vibration, and air quality are considered in Sections 0 and 6.2.6; • surface water and groundwater are addressed in Section 6.7 and Section 0, respectively; and • visual impacts are addressed in Section 6.16.
EIS preparation stage		
CCC	Face to face **meetings** on 2 November and 14 December 2020	Topics of discussion raised by CCC members during the meetings included: • impacts of traffic flows and the volume of traffic created by the project; • the education of contractors driving on site; • proposed interactions with groundwater; • concerns about a concrete batching plant; • management of vegetation fragmentation and land-use plans on the southern edge of the project area; and • water use and wastewater. In response to the above concerns, Holcim clarified that there is not a batching plant currently on site or proposed as part of the project. Other matters raised are addressed in relevant technical assessments and sections of this EIS (as outlined above).
Wider community	**Community information sheet**	As outlined in Table 5.2, the community information sheet included a description of the project and provided relevant contact information should members of the community wish to provide feedback or raise concerns.

Table 5.3 Participation by engagement activity

Stakeholders	Method	Participation issues raised and outcomes
	Online survey	The survey received six responses with 66.7% representing residents of Dubbo and 33.3% business owners. Half of the survey respondents reported having previous communications with Holcim either as a customer, on behalf of their business, or as a council representative and contact for the quarry. Majority of respondents indicated they were in support of the project, with 66.7% in support, 16.7% indicating neutral and 16.7% in opposition. The local businesses that participated in the survey were in strong support of the project due to previous interaction with Holcim. Concerns which resulted in an opposition of the project were related to noise and speed of trucks driving from Sheraton Road. A list of potential impacts (positive and negative) that are often associated with mining and resource extraction project was also provided within the survey.
	Face to face **community workshop** from 1:00 pm to 2:30 pm on 23 July 2020	Out of the 23 community members invited to participate in the two community workshops, 11 community members attended the two face to face workshops. Community workshop participants represented a range of stakeholder groups for the project and included project neighbours, local residents, local school representatives, real estate representatives, Dubbo Chamber of Commerce representatives, DRC staff and MAAS Group (the owners and operations of the neighbouring South Keswick Quarry and local residential developers) representatives. Stakeholders who participated in the workshops expressed a range of concerns relating to the following: • land, property, amenity, and future rehabilitation of the project; • the long-term impacts of the quarry, specifically related to the future subdivisions and amenities within the first years of the project; • potential amenity issues relating to noise, dust, air, vibration, and litter; • rehabilitation of the existing site and WEA was encouraged by workshop participants and of great importance to the stakeholders to ensure that future land uses are viable; • a common theme mentioned within the workshops was the existing high liveability standards of Dubbo; • road and traffic impacts, including road safety and specifically with school zones and trucks travelling through school zones during drop-off and pick-up times; • water and water security vulnerability within the two; • increasing salinity in Eulomogo Creek; and • presence of Indigenous artefacts within the creek. The stakeholders also expressed support for a number of initiatives: • the opportunities that arise from the project if there are prospects for economic growth and ongoing employment; • for Dubbo to become self-sufficient, a 'leading in-land city' and remain as the 'hub of the west'; and • the need for procurement of local cement and metal works in order to support the local industry. As previous noted, all of the issues raised at the community workshop meetings and throughout the engagement process have been considered in the technical assessments and this EIS (areas relevant to each of the environmental and/or social aspects). Further discussion follows this table.
	Face to face **community workshop** from 5:00 pm to 6:30 pm on 23 July 2020)	

A number of key themes were raised by community members and stakeholder groups including local businesses. Key concerns centred around environmental and social issues outlined in Table 5.3, all of which were addressed at the workshop meetings and in the SIA (refer to Appendix L) or their respective sections (and corresponding technical assessments) in this EIS. All key issues were discussed and addressed in consultation with DPIE and DRC, or other relevant agencies as required (ie EPA).

Community and stakeholder (including agency) feedback, and the various technical assessments undertaken as part of this EIS have assisted with refining the proposed project footprint area of the WEA and SEA. In particular, the BDAR report informed Holcim's decision to avoid, minimise and mitigate impacts by identifying biodiversity values within the two extension areas. As a result, the extraction footprint has been significantly refined as outlined in Section 6.4.

Furthermore, discussions with DRC and the local community have prompted a road safety audit of Sheraton Road, which was undertaken by Bitzio Consulting and identified seven safety items. The safety items are discussed further in Section 0. Ongoing consultation between Holcim, the DRC and other relevant stakeholders located on Sheraton Road will be undertaken, primarily through the CCC, to address these issues.

Overall, the findings from community engagement demonstrate that stakeholders are in support of the opportunities that arise from the project if there are prospects for local and regional economic growth and ongoing employment. Holcim has committed to ongoing engagement in community consultation to support local values, sustain liveability, and to ensure ongoing benefits for the local community and the surrounding environment.

5.4 Agency consultation outcomes

Agency consultation during the scoping and preparation of this EIS, and consultation outcomes, are outlined in Table 5.4.

Table 5.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
Pre-lodgement			
DRC	A **pre-lodgement** meeting was held via teleconference on 19 December 2018 with Holcim, EMM and DRC.	The pre-lodgement meeting was held with DRC to discuss Holcim's plans to expand the quarry, the approval pathway and any initial questions or concerns DRC may have.	A number of key issues for consideration were taken from the meeting, and subsequently used to draft the Scoping Report.
Scoping report			
Heritage NSW Dubbo LALC DRC Central West Local Land Services National Native Title Tribunal Native Title Services Corp Office of the Registrar	A **letter** was sent to these agencies on 9 May 2019.	As noted in Table 5.3, a letter was sent to the listed agencies requesting advice on which Aboriginal parties to invite for consultation and all known heritage matters to be taken into consideration.	Four responses were received from Heritage NSW, Dubbo LALC, National Native Title Tribunal and Office of the Registrar. A total of 16 organisations and/or individuals were identified.

Table 5.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
DPIE	A **scoping meeting** was held with Holcim, EMM and DPIE on 2 July 2019.	The scoping meeting identified the key issues for consideration in the assessment of potential impacts, project design and timing, and approach to stakeholder engagement.	A copy of these meeting notes was included in Appendix O of the Scoping Report, however most of the issues identified were either responded to at the meeting, or through ongoing consultation. Key issues identified were also taken into consideration in the different technical assessments and the EIS. The project has since been refined and amended to mitigate and manage any potential residual impacts, as discussed in this EIS (refer Section 1.6.1).
DRC	A **meeting** was held with Holcim, EMM and DPIE on 17 July 2019.	This meeting identified a number of issues for consideration for the project. These issues were summarised in further detail in the Scoping Report, and included the following: potential land use conflict of extraction operations within the WEA with potential future development of residential zoned land to the west of the site; proposed extraction within the proposed SEA likely being more favourable, compared to the WEA, from a potential land use conflict and amenity impact perspective; potential public safety associated with traffic and single inbound/outbound site access route via Sheraton Road; potential future roads and road extensions identified in the *Dubbo City Planning and Transportation Strategy 2036*; confirmation of potential groundwater issues/impacts; a Planning Agreement in place between DRC and Regional Hardrock Pty Ltd related to ongoing maintenance of Sheraton Road; and staging proposal extraction to reduce potential land use conflicts and amenity impacts on future residential areas proposed to the west.	Quarry staging has been incorporated into the project to avoid/reduce potential land use conflicts (refer 1.6.2). Issues identified in the meeting with DRC were taken into consideration in the technical assessments undertaken for the project.

Table 5.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
EIS preparation			
DPIE		Ongoing consultation, in the form of phone calls, has taken place throughout the preparation of the EIS and associated technical assessments.	This consultation has guided the preparation process.
DRC	May 2020	Consultation, in the form of phone calls, has taken place during the preparation of the traffic impact assessment (TIA).	This consultation has guided the TIA preparation process. In particular, consultation with DRC's Traffic Engineer which provided advice on the local road network. On behalf of Holcim, EMM's Traffic Engineer contacted DRC in May 2020, to enquire about the possible diversion of heavy vehicles generated by the quarry from the currently approved path (via Sheraton Road) to Boundary Road. However, DRC's Traffic Engineer explained that Boundary Road is a newly built road which will service new residential developments located at either side of the road and that it will not be suitable for heavy vehicles. DRC's future strategic plans were also discussed, and the possibility of using other routes in the future, however, it was agreed that Sheraton Road is the only available approved route at present.
NSW Crown Lands	Phone call on 23 July 2020 Email on 31 July 2020	NSW Crown Lands were consulted about land ownership consent for the area of Crown-owned land along Eulomogo Creek (refer Table 1.1).	Request for Landowner's Consent forms and information requirements were provided by NSW Crown Lands. Information requirements are detailed in this EIS which will be submitted alongside the Request for Landowner's Consent.
EPA	Site visit on 26 June 2019	The EPA undertook a site visit of the quarry to discuss the project and future EPL arrangements.	Further discussions about potential amendments to the EPL were deferred until submission of the project application.

Table 5.4 Summary of government agency consultation

Stakeholder	Consultation methods	Outcomes	Response
DRC, Biodiversity and Conservation Division within DPIE (including the Heritage Branch) EPA Division of Resources and Geoscience within DPIE Department of Primary Industries (including Agriculture and Fisheries) within DPIE Crown Lands and Water Divisions within DPIE Forestry Corporation of NSW Heritage NSW Central West Local Land Services NSW Department of Education NSW Health Water NSW NSW Rural Fire Service Transport for NSW	A letter was sent to these agencies on 17 December 2020	A letter was sent to the agencies in accordance with the consultation requirements of the SEARs informing them of the pending EIS finalisation and inviting further comments and/or an opportunity to consult further during EIS exhibition.	Acknowledgement of receipt was received from TfNSW and DPI (agriculture and water divisions) as well as an automated message from Council. TfNSW advised they willn't be providing any comments until the EIS exhibition. No other responses have been received at the time of EIS lodgement.

5.5 Ongoing consultation

The community and stakeholder (including agency) engagement undertaken to date is part of ongoing engagement. This engagement will include operation of the CCC and engaging key government agencies. Other agencies will be consulted as required.

Regular community updates will be provided about any ongoing matters or changes at the quarry via the CCC and Holcim's website. Any community queries and concerns directed to Holcim will be responded to promptly.

6 Assessment of impacts

6.1 Introduction

The potential environmental impacts of the project are identified in the Scoping Report (EMM 2019a). The assessment approach for each environmental aspect was determined based on the potential environmental impacts and the SEARs. The environmental aspects for which stand-alone technical reports were prepared are detailed in Table 6.1. The findings of each technical report are summarised in this chapter. The potential impacts of the project on historic heritage, groundwater, economic, hazards, bushfire and visual impacts are assessed in this chapter alone with no stand-alone technical report prepared.

Table 6.1 Environmental assessments

Environmental aspect	Technical assessment	EIS section
Noise and vibration (including blasting)	Appendix D	Section 6.2
Air quality	Appendix E	Section 6.3
Biodiversity	Appendix F	Section 6.4
Aboriginal heritage	Appendix G	Section 6.5
Historic heritage	N/A	Section 6.6
Surface water	Appendix H	Section 6.7
Groundwater	N/A	Section 6.8
Land resources	Appendices I and J	Section 6.9
Rehabilitation	Appendix J	Section 6.10
Traffic and transport	Appendix K	Section 6.11
Social	Appendix L	Section 6.12
Economic	N/A	Section 6.13
Hazards	N/A	Section 6.14
Bushfire	N/A	Section 6.15
Visual	N/A	Section 6.16

6.2 Noise and blasting

6.2.1 Introduction

A noise and vibration impact assessment (NVIA) has been prepared by EMM for the project and is included in Appendix D. The NVIA assessed the potential operational noise, construction noise, blasting (vibration) and road traffic noise impacts associated with the project.

6.2.2 Assessment approach

i Assessment requirements

The noise and vibration SEARs requirements for the project are listed in Table 6.2.

Table 6.2 Noise and vibration SEARs requirements

SEARs requirement
Noise and blasting – including:
– a detailed consideration of cumulative impacts of developments in the area, and having particular regard to potential impacts on sensitive receivers to the west;
– proposed blasting hours, frequency and methods;
– a detailed assessment of the likely blasting impacts of the development (including ground vibrations, overpressure, flyrock, visual and fumes/odour) on people, animals, buildings/structures, infrastructure and significant natural features, having regard to the relevant ANZEC guidelines; and
– a detailed assessment of the likely construction, operational and off- site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and the NSW Road Noise Policy respectively, and having regard to the Voluntary Land Acquisition and Mitigation Policy;

The NVIA has been prepared in accordance with the SEARs and relevant noise and blasting policies including:

- Industrial Noise Policy, (EPA 2000);
- *Noise Policy for Industry* (NPfI) (EPA 2017);
- *Interim Construction Noise Guideline* (ICNG) (DECC 2009);
- *NSW Road Noise Policy* (RNP) (EPA 2011);
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC 1990);
- Australian Standard AS 2187.2-2006 'Explosives – Storage and use – Part 2: Use of explosives' (Standards Australia 2006); and
- *Imperial Chemical Industries (ICI) Explosives Blasting Guide* (ICT Technical Services 1995).

ii Assessment locations

The area surrounding the quarry is mostly cleared farmland with some rural residences, a solar farm, a separate basalt quarry and several schools. The closest noise-sensitive locations were selected for assessment to assess the potential noise and vibration impacts across the surrounding area. Noise sensitive locations were selected to represent the range and extent of potential noise impacts from the project. The details of these noise sensitive locations are summarised in Table 6.3 and shown on Figure 6.1.

It is noted that R1 currently has a negotiated agreement in place with Holcim. Impacts to this receiver have, therefore, not been assessed in the NVIA.

Table 6.3 Sensitive receiver assessment locations

Assessment location ID	Receiver type	Easting	Northing
R1*	Residential	655384	6427170
R2	Residential	655320	6426775
R3	Residential	654875	6427538
R4	Residential	655838	6428439
R5	Residential	657491	6427569
R6a	Residential	654596	6425165
R6b	Residential	654523	6425082
R7	Residential	655905	6424191
R8	Residential	655746	6424154
R9	Commercial	654823	6428948
R10	School	654942	6429244
R11	School	655013	6429009
R12	School	655075	6429237
R13	Residential	656466	6428804
R14	Residential	657233	6428009
R15	Residential	657502	6427973
R16	Residential	657768	6427678
R17	Industrial	656274	6427898
R18	Residential	653862	6427551
R19	Residential	654038	6427592
R20	Residential	656647	6424074
R21	Residential	656142	6423858
R22	Residential	657799	6427195
R23	Residential subdivision (approved)	655196	6428133

Notes: * A negotiated agreement between the landowner and Holcim is currently in place.

iii Assessment criteria

a Construction

Construction noise criteria is provided in the ICNG. The ICNG provides two methodologies to assess construction noise emissions, being a quantitative or qualitative approach. The construction noise criteria consider a quantitative approach under the ICNG. This method requires noise emission predictions from construction activities at the nearest assessment locations and assessment against ICNG recommended noise management levels (NMLs).

The construction noise criteria for the project is summarised in Table 6.4, and considers NMLs levels for residences and other land uses as recommended in the ICNG.

Table 6.4 Project construction noise management levels

Assessment locations	Receiver type	Assessment period	Adopted RBL[1]	NML $L_{Aeq,15min}$, dB
R1–R8, R13–R16, R18–R22	Residential	Day (ICNG standard hours[1])	35[2]	45
R10–R12	School	When in use	n/a	45 (55 external[3])
R9	Commercial	When in use	n/a	70
R17	Industrial	When in use	n/a	75

1. Monday to Friday 7 am to 6 pm; Saturday 8 am to 1 pm; and no construction work on Sundays or public holidays.
2. The NPfI minimum RBL of 35 dB for the day period has been adopted in accordance with the ICNG.
3. External level based on an external-to-internal noise reduction of 10 dB in accordance with the ICNG.

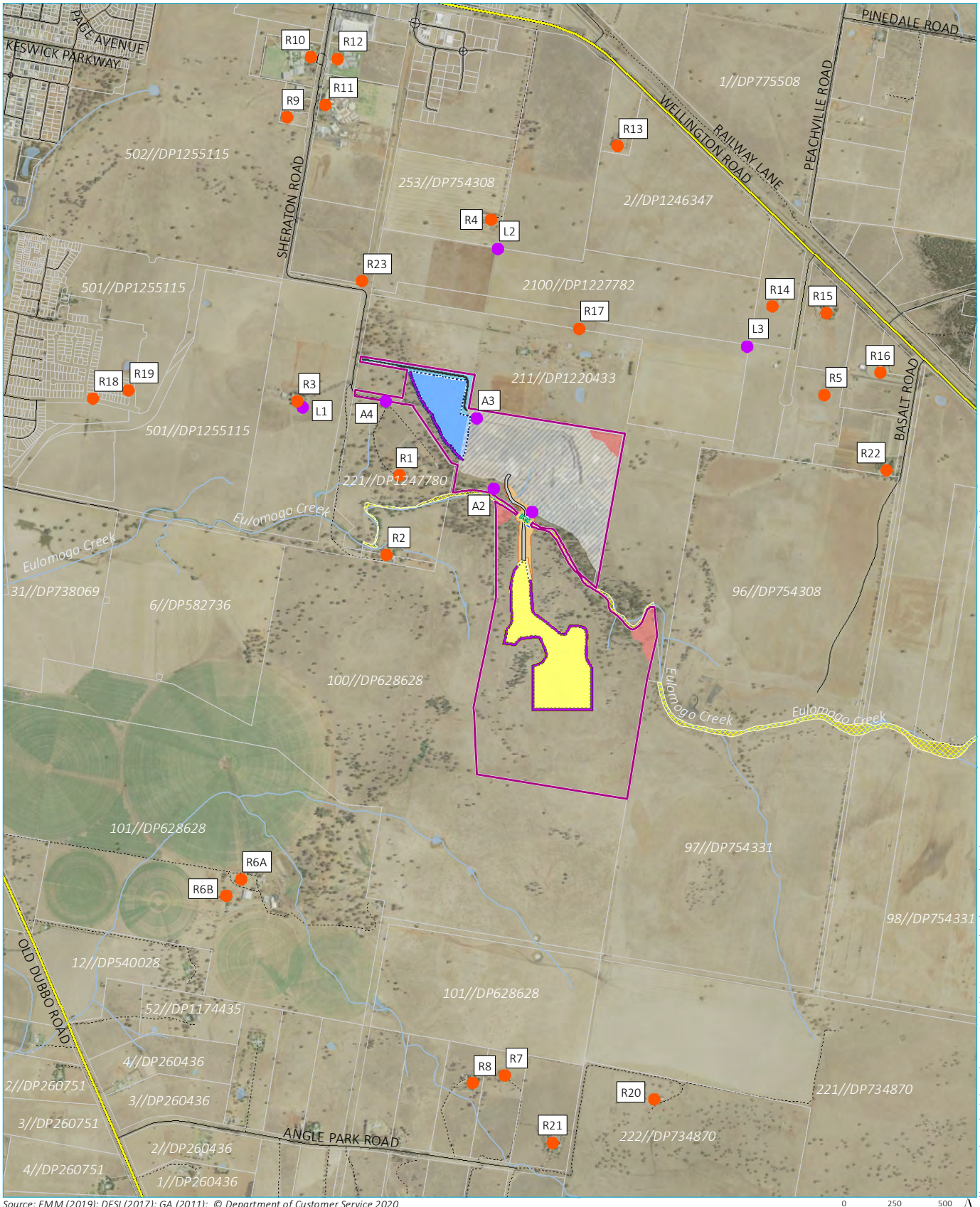
b Operational

Operational noise will result from use of plant and equipment and road traffic. Currently, the quarry does not have noise limits stipulated in the current development consent or EPL 2122. Operational assessment criteria have, therefore, been established in accordance with the NPfI, with the aim to protect the community from excessive intrusive noise and preserve amenity for specific land uses. This includes project specific noise trigger levels for intrusiveness and amenity noise levels.

The NPfI derived project intrusive noise levels are 40 dB $L_{Aeq,15min}$ and 35 dB $L_{Aeq,15min}$ for day and night periods respectively at residential receivers (refer Table 6.3). The intrusiveness noise levels require that $L_{Aeq,15min}$ noise levels from the quarry during the relevant operational periods (day and night) do not exceed the rating background levels (RBL) by more than 5 dB.

Project amenity noise levels were assessed based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road or rail traffic. Where the measured existing industrial noise approaches the recommended amenity noise level (RANL), it needs to be demonstrated that noise levels from new developments will not contribute to existing industrial noise such that the RANLs are exceeded.

Project amenity noise levels are summarised in Table 6.5.



Source: EMM (2019); DFSI (2017); GA (2011); © Department of Customer Service 2020

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KEY

- Reciever location
- Noise monitoring location
- Project area
- Sediment pond
- Aboriginal protection zones
- Indicative existing disturbance area
- Proposed haul road
- Indicative proposed water crossing
- Bund wall
- Proposed access road
- Truck tarping area
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary (data does not align with surveyed site boundary)
- Crown land

Sensitive receiver assessment locations

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.1

EMM
creating opportunities

Table 6.5 Project amenity noise levels

Assessment locations	Indicative amenity area	Assessment period[1]	Project amenity $L_{Aeq,period}$ noise level[2] (RANL -5), dB
R1–R8, R13–R16, R20–R22	Residential – Rural	Day	45
		Night	35
R18, R19	Residential – Suburban	Day	50
		Night	35
R23	Approved subdivision – Suburban	Day	50
		Night	35
R10–R12	School classroom – Internal	Noisiest 1-hour when in use	30 (40 external)[3]
R9	Commercial	When in use	60
R17	Industrial	When in use	65

Source: NPfI (EPA 2017)

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays. It is noted that the site does not operate during the evening period (ie 6 pm to 10 pm).
2. Project amenity noise level is the RANL (Table 2.2 of NPfI) minus 5 dB in accordance with Section 2.4 of the NPfI.
3. External level based on an external-to-internal noise reduction of 10 dB as per the NPfI.

As per the NPfI, the Project Noise Trigger Levels (PNTLs) are the more stringent of operational noise criteria and consider the measured background noise levels, intrusive noise levels and amenity noise levels for receivers. The PNTLs for the project are summarised in Table 6.6.

Table 6.6 Project noise trigger levels

Assessment locations	Assessment period[1]	Intrusiveness noise level $L_{Aeq,15min}$, dB	Amenity noise level[2] $L_{Aeq,15min}$, dB	PNTL[3] $L_{Aeq,15min}$, dB
R1–R8, R13–R16, R20–R22	Day	40	48	40
	Night	35	38	35
R18, R19	Day	40	53	40
	Night	35	38	35
R23[4]	Day	n/a	n/a	n/a
	Night	n/a	n/a	n/a
R10–R12	Noisiest 1-hour when in use	n/a	40[5]	40
R9	When in use	n/a	63	63
R17	When in use	n/a	68	68

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.
2. The project amenity $L_{Aeq,15min}$ noise level is the RANL $L_{Aeq,period}$ +3 dB as per the NPfI, unless noted otherwise.
3. The PNTL is the lower of the calculated intrusiveness or amenity noise levels.
4. Residential vacant land approved for subdivision; hence amenity criteria apply as per the VLAMP as described later.
5. Noisiest 1-hour.

c Sleep disturbance

The quarry's hours of operation coincide with 1 hour (6 am–7 am) of the night-time period as determined by the NPfI. A sleep disturbance assessment in accordance with the NPfI has, therefore, been completed for the project. The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where the development night-time noise levels at a residential location exceed:

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

The sleep disturbance screening criteria to be applied during the project for residential receivers (refer Table 6.3) is summarised in Table 6.7.

Table 6.7 Sleep disturbance screening criteria

Residential assessment locations	Adopted night RBL, dB(A)	Maximum noise level event screening criteria, dB	
		RBL +5 dB or standard[1]	RBL +15 dB or standard[1]
		$L_{Aeq,15min}$	L_{Amax}
R1–R8, R13–R16, R18–R22	30	40	52

1. Whichever is greater.

d Blasting

The limits adopted by regulators for blasting are consistent with those provided in the ANZECC guideline *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*. The blasting criteria addresses two main effects of blasting including:

- airblast noise overpressure; and
- ground vibration.

Airblast overpressure and ground vibration limits for the quarry are stipulated in the quarry's EPL, which are consistent with the criteria recommended in the ANZECC guideline. These limits are summarised in Table 6.8 and will be applied to the project.

Table 6.8 Project airblast overpressure and ground vibration criteria

Blasting emission	Limits	Allowable exceedance
Airblast overpressure	115 dB ($L_{linear\ peak}$)	5% of the total number of blasts over 12 months
	120 dB ($L_{linear\ peak}$)	Nil
Ground vibration	5 mm/s (PPV)	5% of the total number of blasts over 12 months
	10 mm/s (PPV)	Nil

Vibration criteria to prevent structural damage is provided in the Australian Standard AS 2187.2-2006 *Explosives - Storage and Use - Use of Explosives* and BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2*. The recommended criteria to be applied to the project is summarised in Table 6.9. This criterion addresses transient vibration which could cause damage to residential and industrial buildings.

Table 6.9 Structural vibration criteria

Line	Type of building	PPV in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

e Road traffic noise

The principal guidance to assess the impact of the road traffic noise on assessment locations is the RNP. The road traffic noise assessment criteria for residential land uses and non-residential land uses, as outlined in the RNP for road categories relevant to the project, are listed below:

- residential:
  - 60 dB $L_{Aeq,15hr}$ (external) for daytime hours (7 am–10 pm) on freeway/arterial/sub-arterial roads;
  - 55 dB $L_{Aeq,9hr}$ (external) for night-time hours (10 pm–7 am) on freeway/arterial/sub-arterial roads;
  - 55 dB $L_{Aeq,1hr}$ (external) for daytime hours (7 am–10 pm) on local roads; and
  - 50 dB $L_{Aeq,1hr}$ (external) for daytime hours (10 pm–7 am) on local roads;
- school classroom:
  - 40 dB $L_{Aeq,1hr}$ (internal) when in use.

6.2.3 Existing environment

i Background noise

Background noise levels or RBLs measured by MAC Acoustics (2016) for the adjacent South Keswick Quarry Project have been applied to the project to gain an understanding of the existing background noise levels. This included three noise monitoring locations (refer Figure 6.1). The results are summarised in Table 6.10.

These background noise levels are below the applicable thresholds of 35 dB for the day period and 30 dB for the evening and night periods as per the NPfI. These thresholds have been applied to residential assessment locations (refer Table 6.3). Additionally, it was noted that noise from existing quarry operations were barely audible at the time of noise monitoring and was considered to have negligible influence on measured background noise levels.

Table 6.10 Background noise levels (MAC Acoustics 2016)

Noise monitoring location	Period[1]	RBL, dB(A)	Measured $L_{Aeq,period}$ noise level[2], dB
L1	Day	30	47
	Evening	27	36
	Night	20	39
L2	Day	32	44
	Evening	30	40
	Night	21	41
L3	Day	34	45
	Evening	29	53
	Night	19	44

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am, Sunday to Friday and 10 pm to 8 am Saturday and public holidays.
2. The energy averaged noise level over the measurement period and representative of general ambient noise.

ii Existing quarry noise

Operator attended noise monitoring was completed as part of the NVIA to gain an understanding of existing noise levels from the quarry. This included the measurement of sound power levels of existing plant and equipment at the quarry and noise levels at four off-site locations surrounding the quarry.

6.2.4 Impact assessment

i Overview

Noise impacts from the project have been assessed for the construction and operational phases, in addition to project-related noise which may cause sleep disturbance, blasting impacts and road traffic noise.

Construction noise will be generated from construction of the proposed access road and the Eulomogo Creek crossing. Operational noise will be generated from stripping and drilling to develop the WEA and SEA and general quarrying activities once the WEA and SEA are operational.

ii Construction

Construction noise was measured against the noise assessment criteria, which was developed in accordance with the ICNG and summarised in Table 6.4. To determine the worst-case noise from the proposed construction activities, construction noise levels predicted for each activity were added to noise levels from existing general daytime operations.

It was found that noise from construction of the proposed access road and Eulomogo Creek crossing will remain within the noise assessment criteria, apart from:

- exceedance at R2 by 3 dB from construction of the proposed access road;
- exceedance at R3 by 1 dB from construction of the proposed access road; and
- exceedance at R2 by 2 dB from construction of the Eulomogo Creek crossing.

Construction noise levels are not predicted to exceed the highly noise affected NML of 75 dB at any residence.

For noise from construction of the proposed access road and the Eulomogo Creek crossing, NMLs will be exceeded at closest assessment locations R2 and R3. As noted in the NVIA, there is limited opportunity due to proximity of residential assessment locations, site location and local topography to provide significant noise mitigation during construction. Further, the duration of the construction works is relatively short (up to eight weeks) and during standard hours (day) only. Construction mitigation measures to address noise generation from work practice methods and plant and equipment are provided in Section 6.2.5i.

iii Operation

For residual noise from stripping operations, the PNTL will be exceeded at several receivers. Stripping operations will be temporary in nature for approximately 4 weeks per stripping event. Exceedances will decrease by at least 8 dB once stripping operations are completed, in addition to significantly lower noise levels predicted for general quarry operations. The exceedances for stripping operations at receivers during years (Y) 1, 2 and 21 of the project are listed below:

- Y1 (WEA):
  - PNTL is significantly exceeded (by >5 dB and >RANL) at R2–R4, R10–R12 and R14;
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R5–R6b, R13, R15, R16, R18, R19 and R22;
  - PNTL is marginally exceeded (by 3-5 dB and <RANL) at R7, R8 and R20; and
  - PNTL is negligibly exceeded (by 2 dB) at R21 and R23;
- Y3 (northern section of SEA):
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is marginally exceeded (by 4 dB and <RANL) at R3;
- Y21 (southern section of SEA):
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is negligibly exceeded (by 2 dB) at R3.

During drilling operations, the PNTLs will be exceeded at several receivers. Despite exceedances of the PNTLs, there will be no material change to existing site noise levels at the receivers. Considering this, no additional operational noise impacts are predicted from the project during drilling operations at any of the receivers.

The project's operational noise has been predicted for the daytime and night time periods. For the daytime period, PNTLs will be exceeded at several locations, including:

- Existing (existing pit):
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is negligibly exceeded (by 1 dB) at R3;

- Y1 (WEA):
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is negligibly exceeded (by 2 dB) at R3;
- Y3 (northern section of SEA):
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is negligibly exceeded (by 2 dB) at R3;
- Y21 (southern section of SEA)
  - PNTL is moderately exceeded (by >5 dB and <RANL) at R2; and
  - PNTL is negligibly exceeded (by 2 dB) at R3.

Despite moderate exceedances of the PNTLs, there will be no material change to existing site noise levels at assessment location R2. Considering this, no additional operational noise impacts are predicted from the project during operations at this receiver.

For the night-time period, PNTLs have been exceeded for several locations, including:

- Existing (existing pit):
  - PNTL is significantly exceeded (by >5 dB and >RANL) at R2;
  - PNTL is moderately exceeded (by >5 dB and ≤RANL) at R3–R5, and R14;
  - PNTL is marginally exceeded (by 3-4 dB and ≤RANL) at R13, R15, R16 and R22; and
  - PNTL is negligibly exceeded (by 1 dB) at R19;
- Y1 (WEA):
  - PNTL is marginally exceeded (by 4 dB and ≤RANL) at R3. Site noise contributions are improved on existing levels; and
  - PNTL is negligibly exceeded (by 1 dB) at R2 and R23. Site noise contributions at R2 are improved on existing levels;
- Y3 (northern section of SEA):
  - PNTL is marginally exceeded (by 4 dB and ≤RANL) at R3. Site noise contributions are improved on existing levels; and
  - PNTL is negligibly exceeded (by 1 dB) at R2 and R23. Site noise contributions at R2 are improved on existing levels;
- Y21 (southern section of SEA):
  - PNTL is marginally exceeded (by 3 dB and ≤RANL) at R3. Site noise contributions are improved on existing levels; and
  - PNTL is negligibly exceeded (by up to 1 dB) at R23.

Due to the change in night-time operations under the project, future site $L_{Aeq,15min}$ noise levels are predicted to decrease at most assessment locations from existing noise levels. For R23, operational noise levels will satisfy the Voluntary Land Acquisition and Mitigation Policy (VLAMP) noise trigger level for vacant land. In addition, operation of the project through all time periods will not introduce new equipment and, therefore, new noise with annoying characteristics (tonal or intermittent noise) is not anticipated.

Site noise levels are predicted to satisfy the relevant low frequency noise threshold levels as per the NPfI during night-time operations.

iv Sleep disturbance

The sleep disturbance criteria (Table 6.7) were applied to the night-time period to assess the potential for operations to cause sleep disturbance at nearby residential receivers. This considers the worst-case scenario of noise levels predicted for the night-time period and based upon existing and future quarry operations.

Maximum L_{Amax} noise levels are predicted to satisfy the NPfI screening criteria for sleep disturbance at all residential assessment locations during noise-enhancing meteorological conditions. Therefore, it is unlikely that the project will cause sleep disturbance at any residential receivers.

v Blasting and flyrock

The NVIA notes the allowable maximum instantaneous charge (MIC) for blasting in order to maintain the blasting criteria summarised in Table 6.8 and Table 6.9. The allowable MIC values has been determined to maintain the applicable criteria at the nearest residential receivers, as summarised in Table 6.11.

Table 6.11 Allowable blast MIC for nearest residential receivers

Proposed pit	Nearest residential assessment locations[1]	Distance to blast[2]	Allowable MIC based on predictions	Airblast overpressure level (Linear peak)	Ground vibration level (PPV)
WEA	R3	580 m	56 kg	115 dB	<5 mm/s
	R2	610 m	62 kg	115 dB	<5 mm/s
	R4	810 m	110 kg	115 dB	<5 mm/s
	R14	1605 m	433 kg	115 dB	<5 mm/s
SEA	R2	635 m	68 kg	115 dB	<5 mm/s
	R3	1370 m	315 kg	115 dB	<5 mm/s
	R5	1670 m	468 kg	115 dB	<5 mm/s

Notes: 1. Other residential assessment locations are situated at a greater distance from proposed blast locations.
2. Based on the worst-case approximate geographical distance to the nearest proposed blast location.

The allowable MIC to maintain the relevant blasting criteria at specified distances is summarised in Table 6.12.

Flyrock is rock that is propelled during blasting and is a common occurrence in quarry operations. Flyrock can be propelled in all directions of the blast face and presents a potential hazard to quarry employees and offsite. The potential for flyrock and the propulsion distance is managed through blasting design and implementation of safety protocols. Further consideration of flyrock will be given during the Response to Submissions phase of the project.

Table 6.12 Recommended blast MIC for the project based on distance to receiver

Blast distance to receiver	MIC to satisfy the 95% airblast overpressure and ground vibration criteria
580 m	56 kg
600 m	60 kg
700 m	82 kg
800 m	107 kg
900 m	136 kg
1.0 km	168 kg
1.1 km	203 kg
1.2 km	242 kg
1.3 km	284 kg
1.4 km	329 kg
1.5 km	378 kg

vi Road traffic noise

Road traffic noise from the project has been calculated for Sheraton Road for residential receivers and inside classrooms.

For the nearest residential receiver (R3), road traffic noise will remain within the applicable criteria.

Road traffic noise levels have also been predicted for the internal classroom areas (R11) according to the worst-case (busiest) traffic period while the school is in use. With open classroom windows, existing road traffic noise already exceeds the relevant criteria. Assuming classrooms have closed windows, the project road traffic noise will exceed the relevant criteria by 2 dB. A 1 to 2 dB increase in noise level is generally considered to be negligible by the EPA, as per the NPfI, as this level of change in noise is largely imperceptible to the human ear in an environmental context. Additionally, the RNP states that where existing road traffic noise criteria are already exceeded, any increase in total traffic noise level should be limited to 2 dB. Further, this peak site traffic period occurs during the morning or afternoon school zone timing, so it is likely that only limited classes will be in session at these times.

Predicted road traffic noise from the project will remain within the applicable criteria and are not expected to cause significant road traffic noise impacts.

6.2.5 Mitigation measures

Noise and vibration mitigation measures will be implemented in accordance with a noise management plan (NMP) and blasting management plan (BMP) prepared for the project.

i Construction

The NVIA notes that there is limited opportunity due to proximity of residential assessment locations, site location and local topography to provide significant noise mitigation for construction activities. Further, the duration of the construction works are relatively short (up to eight weeks) and during standard hours (day) only in accordance with the ICNG. Construction mitigation measures to address noise generation from work practice methods and plant and equipment suggested in the NVIA include:

- work practice methods:
  - regular reinforcement (such as at toolbox talks) of the need to minimise noise;
  - review and implementation of feasible and reasonable mitigation measures to reduce noise;
  - avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents;
  - develop routes for the delivery of materials and parking of vehicles to minimise noise;
  - where possible, avoid the use of equipment that generates impulsive noise; and
  - notify potentially affected residents prior to the commencement of works;
- plant and equipment:
  - where possible, choose quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks;
  - operate plant and equipment in the quietest and most efficient manner; and
  - regularly inspect and maintain plant and equipment to minimise noise level increases, to ensure that all noise attenuation devices are operating effectively.

ii Operation

The project was designed iteratively to manage potential operational noise impacts. This included 'at the source' mitigation of the primary screen/secondary (cone) crusher and construction of the bund along the boundaries of the WEA and SEA.

In addition, to address the predicted residual noise impacts, particularly for night-time operations, negotiated agreements will be considered by Holcim in consultation with affected landowners. Architectural treatment of affected dwellings (eg improved glazing, acoustic insulation and mechanical ventilation/ air-conditioning) will also be considered in consultation with affected landowners.

iii Blasting

The project will adopt good industry practice blast management including real time monitoring of all blasts. It is noted that blasting is generally undertaken no more than once per week and that blast criteria adopted herein are applied to all development, including relatively larger scale mining operations where blasting occurs daily throughout the year. The BMP will include blasting design considerations to minimise the potential for flyrock.

iv Negotiated agreements

Holcim will use its best endeavours to negotiate noise agreements with the owners of R2 and R3 to mitigate the noise impacts of the project in accordance with Clause 12A of the Mining SEPP and the VLAMP. Holcim will commence discussions with the landowners in early 2021 and will report on the progress of noise agreement negotiations in the Submissions Report for the project.

6.2.6 Conclusion

During project operation, NMLs will be exceeded at several assessment locations and range from negligible (1–2 dB) to significant (>5 dB and >RANL). However, future noise levels are generally predicted to be relatively unchanged compared to existing operational noise levels and are predicted to decrease for the night period. Further, no noise complaints have been received to date from the surrounding community in relation to existing quarry operations.

As noted in the NVIA, operational exceedances will result from stripping operations which will last for approximately 4 weeks, per stripping event. Once stripping activities cease, noise levels will decrease by at least 8 dB in addition to significantly lower noise levels predicted for general quarry operations. Following stripping, operational noise levels are predicted to be relatively unchanged compared to existing operational noise levels.

Operational mitigation measures will be implemented to minimise noise emissions. Additionally, negotiated agreements as per the VLAMP, may need to be considered to address the predicted residual noise impacts. The application of negotiated agreements will be subject to Conditions of Approval and imposed noise limits.

Construction noise levels will exceed criteria at two receptors by 1–3 dB. These exceedances will be short in duration and mitigation measures are recommended to manage construction noise levels.

Maximum permissible MICs are recommended for each project area to ensure compliance with the relevant airblast overpressure and ground vibration criteria during blasting.

Road traffic noise levels under a worst-case maximum production scenario are predicted to satisfy RNP assessment requirements.

6.3 Air quality

6.3.1 Introduction

An air quality impact assessment (AQIA) has been prepared by EMM for the project and included as Appendix E. The AQIA was prepared in accordance with relevant SEARs requirements and assessment criteria outlined in Section 6.3.2.

The AQIA documents the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emission calculations, dispersion modelling of calculated emissions and assessment of predicted impacts relative to criteria (including cumulative impacts).

6.3.2 Assessment approach

i Assessment requirements

The air quality SEARs requirements for the project are listed in Table 6.13.

Table 6.13 Air quality SEARs requirements

SEARs requirements
A detailed assessment of potential construction and operational air quality impacts, in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW, and with a particular focus on dust emissions including $PM_{2.5}$ and PM_{10}, and having regard to the Voluntary Land Acquisition and Mitigation Policy.
A detailed consideration of cumulative impacts of developments in the area having particular regard to sensitive receivers to the west.

The AQIA has also been prepared with consideration of the following legislation and requirements, including:

- the NSW EPA provided a list of requirements for the AQIA, which are addressed in the AQIA and this section (refer Table 1.3 of Appendix E);
- the statutory framework for managing air emissions in NSW, which is provided in the *Protection of the Environment Operations Act 1997* (POEO Act). Specifically, the primary regulations for air quality made under the POEO Act which are:
  - Protection of the Environment Operations (Clean Air) Regulation 2010; and
  - Protection of the Environment Operations (General) Regulation 2009;
- VLAMP;
- the guidelines specified by the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Approved Methods for Modelling) (EPA 2016).

ii Assessment criteria

The main air pollutants emitted will include particulate matter, specifically: total suspended particulate matter (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), and particulate matter less than 2.5 (µm) in aerodynamic diameter ($PM_{2.5}$). Particulate matter pollutants (TSP, PM_{10}, and $PM_{2.5}$) were assessed as the key pollutants with regards to both magnitude of emissions generated by the project and the associated compliance with impact assessment criteria at surrounding receptors.

A number of combustion-related gaseous pollutants are also expected to be emitted from the combustion of diesel in quarrying equipment during construction and operation of the project, including oxides of nitrogen (NO_x), including nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), and volatile organic compounds (VOCs). However, gaseous combustion emissions from quarrying equipment does not generally result in significant off-site concentrations and are unlikely to comprise ambient air quality goals. Accordingly, with the exception of PM, combustion emissions have not been quantitatively assessed.

In accordance with the Approved Methods for Modelling, the AQIA provides a refined dispersion modelling assessment approach:

- emissions were estimated for all relevant activities, using best practice emission estimation techniques;
- dispersion modelling using a regulatory dispersion model (AERMOD) was used to predict ground-level concentrations for key pollutants at surrounding sensitive receptors; and
- cumulative impacts were assessed, taking into account the combined effect of the project with existing baseline (background) air quality and the emissions generated by the adjacent South Keswick Quarry (refer Section 6.3.4).

The impact assessment criteria for particulate matter are presented in Table 6.14.

Table 6.14 Impact assessment criteria for particulate matter

PM metric	Averaging period	Impact assessment criteria
TSP	Annual	90 µg/m^3
PM_{10}	24-hour	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24-hour	25 µg/m^3
	Annual	8 µg/m^3
Dust deposition	Annual	2 g/m^2/month (increment only)
		4 g/m^2/month (cumulative)

Notes: µg/m^3: micrograms per cubic metre; g/m^2/month: gram per square metre per month.
Source: Approved Methods for Modelling (EPA 2016).

iii Assessment locations

The nearest sensitive locations to the quarry are listed in Table 6.3 and shown in Figure 6.1. As noted in Section 1.4.2, there are five residential dwellings within 1 km of the quarry, with the nearest occupied residence (R1) situated approximately 215 m from the boundary of the proposed WEA. R1 currently has a negotiated agreement in place with Holcim.

6.3.3 Existing environment

i Introduction

Consideration of cumulative impacts is required to assess how a project will interact with existing and future sources of emissions to determine compliance with impact assessment criteria. Cumulative impacts are assessed by considering the existing baseline (background) air quality and the potential future development that is not captured by historical background monitoring data.

ii Meteorological conditions

Meteorological conditions have been described and characterised in Appendix E using data from the nearest meteorological station to the project, which is the Bureau of Meteorology's (BoM) Dubbo Airport Automatic Weather Station (AWS), located approximately 10.5 km north-west of the project area.

iii Baseline air quality

Apart from the existing quarry operations, the existing air quality environment is expected to be primarily influenced by existing surrounding operations such as the South Keswick Quarry, wind generated dust from exposed areas, surrounding traffic and movement along unsealed and sealed roads, seasonal emissions from household wood heaters, and long-range transport of tiny particles into the region. More remote sources which contribute episodically to suspended particulates in the region include dust storms and bushfires.

All of the listed emission sources are accounted for in the monitoring data analysed in the AQIA and summarised in this section.

Given that there is no site specific or DPIE air quality monitor in the vicinity of the project, the baseline air quality in the assessment has been determined by drawing on the air quality monitoring data resources from other regional areas with similar characteristics. The AQIA determined that the general air quality surrounding the project is likely to be similar to other regional areas in NSW and, therefore, Tamworth and Bathurst air quality data was used to characterise the baseline (background) air quality for the project.

In summary, the following background values were adopted for the cumulative assessment:

- 24-hour PM_{10} concentration – daily varying with a maximum of 45.6 µg/m^3;
- annual average PM_{10} concentration – 14.7 µg/m^3;
- 24-hour $PM_{2.5}$ concentration –daily varying with a maximum of 14.5 µg/m^3;
- annual average $PM_{2.5}$ concentration – 6.9 µg/m^3;
- annual average TSP concentration – 36.7 µg/m^3; and
- annual average dust deposition concentration – 2 g/m^2/month.

6.3.4 Predicted impacts

i Emission sources

Emissions generated by the project will principally consist of particulate matter emissions from loading and unloading materials (topsoil, subsoil and rock), conveying and transfer of rock, rock sizing, hauling materials and wind erosion of exposed areas.

The project will include some minor construction activities which have the potential to generate dust emissions. Construction phase emissions will principally consist of particulate matter emissions related to the construction of a new quarry access road, the crossing of Eulomogo Creek, and modifications to the existing water management infrastructure within the existing quarry. These will be constructed within the first two years of the project with the construction activity with the longest duration being the creek crossing which will take approximately nine weeks. Given the short timeframe and small-scale of the construction activities, no further assessment is warranted.

A detailed description of the emissions sources associated with the existing and proposed operations at the quarry is presented in Chapter 5 of Appendix E. The AQIA considers three emission scenarios to quantify particulate matter impacts from the project and to understand the significance of the proposed operations compared to current operations. These scenarios are:

- existing scenario – existing pit operations only;
- proposed (Scenario 2) – extraction occurring in both the WEA and SEA with additional 'floor rock' excavated from the existing pit; and
- proposed (Scenario 3) – majority of extraction occurring in the SEA with floor rock extracted from the WEA.

A graphic summary of the contribution to annual dust emissions by source type is provided in Figures 5.4–5.6 of Appendix E, while calculated annual emissions by emissions source is presented in Tables 5.1–5.3 of Appendix E for the three considered scenarios. Emission estimates for the South Keswick Quarry are shown in Table 5.4 of Appendix E.

The total emissions for each of the scenarios considered, as well as for the South Keswick Quarry, are presented in Table 6.15.

Table 6.15 Calculated annual TSP, PM_{10} and $PM_{2.5}$ emissions for the three considered scenarios

Total emissions attributed to quarry operations	Calculated annual emissions (kg/annum) by source		
	TSP	**PM_{10}**	**$PM_{2.5}$**
The project			
Existing scenario	28,417.1	11,646.0	1,843.7
Scenario 2	31,563.2	11,524.3	1,774.7
Scenario 3	46,012.7	16,536.9	2,355.0
Neighbouring site			
South Keswick Quarry	40,968.0	13,498.0	2,633.0

The results show that Scenario 3 (extraction occurring only in the SEA) will result in higher TSP, PM_{10}, $PM_{2.5}$ emissions compared to the other two scenarios assessed. The increase can mostly be attributed to hauling activities of quarry product and by-product, and wind erosion of exposed areas. While Scenario 2 will result in higher TSP emissions, the emissions for PM_{10}, $PM_{2.5}$ will be very close to the existing scenario. Again, activities that will generate the most emissions of each parameter for Scenario 2 involve trucks hauling quarry product and by-product and wind erosion of exposed areas.

Activities that have the potential to create the highest level of emissions in all scenarios include:

- trucks hauling rock to hopper at crushing plant;
- trucks hauling rock to product stockpiles;
- trucks unloading rock to product stockpiles;
- trucks hauling materials off-site (paved);
- wind erosion of stockpiles and exposed areas;
- wind erosion of WEA (exposed);
- wind erosion of existing pit exposed areas;

A range of mitigation measures and management practices will be employed on-site to manage particulate matter emissions from the project.

ii Air dispersion modelling

Atmospheric dispersion modelling was completed using the AERMOD model system. Hourly meteorological observations from 2017, collected from the BoM's Dubbo Airport AWS, were used as input to the dispersion modelling.

Predicted incremental TSP, PM_{10}, $PM_{2.5}$, and dust deposition levels from existing and proposed scenarios are presented in Table 6.16 for each of the assessment locations. The results show that at some locations predicted concentrations are higher in the existing scenario, whereas at others they are higher in the proposed scenarios. These differences will be largely related to the spatial movement of activities in these scenarios. It is noted that the change between scenarios is generally minor.

Table 6.16 Incremental concentration and deposition results for the three scenarios

Assessment location ID	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)																	
	Existing scenario only						Scenario 2 only						Scenario 3 only					
	TSP		PM_{10}		$PM_{2.5}$	Dust deposition	TSP		PM_{10}		$PM_{2.5}$	Dust deposition	TSP		PM_{10}		$PM_{2.5}$	Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual	Annual	24-hour maximum	Annual	24-hour maximum	Annual	24-hour maximum
Criterion	90	50	25	25	8	2	90	50	25	25	8	2	90	50	25	25	8	2
R1	0.9	3.6	0.5	0.7	0.1	0.1	1.2	3.6	0.6	0.6	0.1	0.1	0.8	2.8	0.4	0.5	0.1	0.1
R2	0.3	2.2	0.2	0.4	<0.1	<0.1	0.4	2.1	0.2	0.3	<0.1	<0.1	0.6	2.5	0.3	0.4	<0.1	0.1
R3	0.3	2.4	0.1	0.4	<0.1	<0.1	0.4	2.2	0.2	0.4	<0.1	<0.1	0.3	1.4	0.1	0.2	<0.1	<0.1
R4	0.1	1.7	0.1	0.3	<0.1	<0.1	0.2	1.1	0.1	0.2	<0.1	<0.1	0.2	1.7	0.1	0.3	<0.1	<0.1
R5	0.1	1.0	0.1	0.2	<0.1	<0.1	0.1	0.9	<0.1	0.1	<0.1	<0.1	0.1	1.0	0.1	0.1	<0.1	<0.1
R6a	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1	0.1	0.5	<0.1	0.1	<0.1	<0.1
R6b	<0.1	0.2	<0.1	0.0	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1	0.1	0.5	<0.1	0.1	<0.1	<0.1
R7	<0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	0.4	<0.1	0.1	<0.1	<0.1	0.1	0.7	<0.1	0.1	<0.1	<0.1
R8	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.0	<0.1	<0.1	0.1	0.6	<0.1	0.1	<0.1	<0.1
R9	<0.1	0.8	<0.1	0.2	<0.1	<0.1	0.1	1.0	<0.1	0.2	<0.1	<0.1	0.1	1.1	<0.1	0.2	<0.1	<0.1
R10	<0.1	0.5	<0.1	0.1	<0.1	<0.1	0.1	0.9	<0.1	0.2	<0.1	<0.1	0.1	1.1	<0.1	0.2	<0.1	<0.1
R11	<0.1	0.8	<0.1	0.1	<0.1	<0.1	0.1	1.0	<0.1	0.2	<0.1	<0.1	0.1	1.2	<0.1	0.2	<0.1	<0.1
R12	<0.1	0.7	<0.1	0.1	<0.1	<0.1	0.1	0.8	<0.1	0.1	<0.1	<0.1	0.1	1.1	<0.1	0.2	<0.1	<0.1
R13	0.1	0.6	<0.1	0.1	<0.1	<0.1	0.1	0.7	<0.1	0.1	<0.1	<0.1	0.1	0.9	<0.1	0.1	<0.1	<0.1
R14	0.1	0.9	0.1	0.2	<0.1	<0.1	0.1	0.9	0.1	0.1	<0.1	<0.1	0.1	0.9	0.1	0.1	<0.1	<0.1
R15	0.1	1.0	<0.1	0.2	<0.1	<0.1	0.1	0.9	<0.1	0.1	<0.1	<0.1	0.1	0.9	<0.1	0.1	<0.1	<0.1
R16	0.1	0.7	<0.1	0.1	<0.1	<0.1	0.1	0.7	<0.1	0.1	<0.1	<0.1	0.1	0.8	<0.1	0.1	<0.1	<0.1
R17	0.2	1.5	0.1	0.3	<0.1	<0.1	0.3	1.1	0.1	0.2	<0.1	<0.1	0.3	2.1	0.1	0.3	<0.1	<0.1
R18	0.1	0.6	0.1	0.1	<0.1	<0.1	0.1	0.6	0.1	0.1	<0.1	<0.1	0.1	0.6	0.1	0.1	<0.1	<0.1

Table 6.16 Incremental concentration and deposition results for the three scenarios

Assessment location ID	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)																	
	Existing scenario only						Scenario 2 only						Scenario 3 only					
R19	0.1	0.9	0.1	0.2	<0.1	<0.1	0.1	0.8	0.1	0.1	<0.1	<0.1	0.1	0.8	0.1	0.1	<0.1	<0.1
R20	<0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1	0.1	0.8	<0.1	0.1	<0.1	<0.1
R21	<0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	0.3	<0.1	0.1	<0.1	<0.1	<0.1	0.7	<0.1	0.1	<0.1	<0.1
R22	0.1	0.7	<0.1	0.1	<0.1	<0.1	0.1	0.8	<0.1	0.1	<0.1	<0.1	0.1	0.8	0.1	0.1	<0.1	<0.1
R23	0.1	1.1	0.1	0.2	<0.1	<0.1	0.2	2.5	0.1	0.4	<0.1	<0.1	0.2	1.7	0.1	0.3	<0.1	<0.1

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.

The predicted concentrations and deposition rates for all pollutants and averaging periods are below the applicable EPA assessment criterion at all assessment locations. Except for dust deposition, the assessment criteria listed are applicable to cumulative concentrations. Analysis of cumulative impacts is provided in the following section.

iii Cumulative results

Cumulative impacts (ie the project together with the baseline air quality) at each of the assessment locations surrounding the quarry have been assessed in the following way, and are presented in Table 6.17:

- for 24-hour average concentrations, each daily-varying predicted 24-hour average concentration for PM_{10} and $PM_{2.5}$ from the quarry has been combined with the corresponding concentrations from the adopted 2017 background concentration datasets; and

- for annual average concentrations, the predicted annual average concentrations have been paired with the corresponding background annual average concentration.

Predicted cumulative TSP, PM_{10}, $PM_{2.5}$, and dust deposition levels from the quarry's existing and proposed scenarios are presented in Table 6.4 of Appendix E for each of the assessment locations. The results show that the predicted cumulative concentrations and deposition rates for all pollutants and averaging periods are below the applicable EPA assessment criterion at all assessment locations.

The quarry currently implements, and will continue to implement under the project, particulate matter control measures that are consistent with accepted industry best practice measures.

6.3.5 Mitigation measures

i Legislative requirements

The quarry will continue to comply with the POEO requirements as follows:

- as a scheduled activity under the POEO regulations, the quarry operates under EPL 2212 issued by the EPA and is required to comply with requirements including emission limits, monitoring and pollution-reduction programmes (PRPs);

- the quarry does not feature significant odour-generating emission sources and is, therefore, unlikely to generate odorous emissions; and

- no large-scale open burning is performed on-site.

ii Best practice dust control

From the data considered in the AQIA, it has been concluded that the most significant sources of particulate matter emissions from the project's operations are associated with material handling, hauling and wind erosion. To manage particulate matter emissions from the quarry's existing and proposed operations, a range of mitigation measures and management practices are required.

Table 6.17 Cumulative concentration and deposition results for the three scenarios

Assessment location ID	Predicted cumulative concentration (µg/m³) and deposition rate (g/m²/month)																	
	Existing scenario only						Scenario 2 only						Scenario 3 only					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition	TSP	PM_{10}		$PM_{2.5}$		Dust deposition	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual	Annual	24-hour maximum	Annual	24-hour maximum	Annual	24-hour maximum
Criterion	90	50	25	25	8	2	90	50	25	25	8	2	90	50	25	25	8	2
R1	37.9	45.7	15.8	14.6	7.1	2.1	37.9	45.7	15.9	14.7	7.1	2.1	37.9	45.7	15.7	14.6	7.1	2.1
R2	37.2	45.7	15.2	14.5	7.0	2.0	37.2	45.7	15.2	14.5	7.0	2.0	37.2	45.7	15.3	14.5	7.0	2.0
R3	37.9	45.7	15.4	14.6	7.1	2.1	37.9	45.7	15.5	14.6	7.1	2.1	37.9	45.7	15.5	14.6	7.1	2.1
R4	38.3	45.8	15.6	14.8	7.1	2.1	38.3	45.8	15.6	14.8	7.1	2.1	38.3	45.8	15.6	14.8	7.1	2.1
R5	36.8	46.4	14.8	14.5	6.9	2.0	36.8	46.3	14.8	14.5	6.9	2.0	36.8	46.4	14.8	14.5	6.9	2.0
R6a	36.8	45.7	14.8	14.5	6.9	2.0	36.8	45.7	14.8	14.5	6.9	2.0	36.8	45.7	14.8	14.5	6.9	2.0
R6b	36.8	45.7	14.8	14.5	6.9	2.0	36.8	45.7	14.8	14.5	6.9	2.0	36.8	45.7	14.8	14.5	6.9	2.0
R7	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0
R8	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0
R9	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0
R10	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0
R11	37.1	45.7	14.9	14.5	6.9	2.0	37.1	45.7	14.9	14.5	6.9	2.0	37.1	45.7	14.9	14.5	6.9	2.0
R12	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0
R13	37.1	45.7	14.9	14.6	6.9	2.0	37.1	45.7	14.9	14.6	6.9	2.0	37.1	45.7	14.9	14.6	6.9	2.0
R14	36.9	47.4	14.8	14.5	6.9	2.0	36.9	47.3	14.8	14.5	6.9	2.0	36.9	47.3	14.9	14.5	6.9	2.0
R15	36.8	46.9	14.8	14.5	6.9	2.0	36.8	46.8	14.8	14.5	6.9	2.0	36.8	46.8	14.8	14.5	6.9	2.0
R16	36.8	46.3	14.8	14.5	6.9	2.0	36.8	46.2	14.8	14.5	6.9	2.0	36.8	46.3	14.8	14.5	6.9	2.0

Table 6.17 Cumulative concentration and deposition results for the three scenarios

Assessment location ID	Predicted cumulative concentration (µg/m³) and deposition rate (g/m²/month)																	
	Existing scenario only						Scenario 2 only						Scenario 3 only					
R17	39.2	49.4	16.0	14.9	7.2	2.2	39.2	49.5	16.0	14.9	7.2	2.2	39.2	49.5	16.0	14.9	7.2	2.2
R18	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0	37.0	45.7	14.9	14.5	6.9	2.0
R19	37.1	45.7	15.0	14.5	6.9	2.0	37.1	45.7	15.0	14.5	7.0	2.0	37.1	45.7	15.0	14.5	6.9	2.0
R20	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0
R21	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0	36.7	45.7	14.7	14.5	6.9	2.0
R22	36.8	45.8	14.8	14.5	6.9	2.0	36.8	45.8	14.8	14.5	6.9	2.0	36.8	46.1	14.8	14.5	6.9	2.0
R23	38.9	45.8	15.8	14.9	7.1	2.2	38.9	45.8	15.9	14.9	7.1	2.2	38.9	45.8	15.9	14.9	7.1	2.2

Measures implemented at the quarry and included in the emissions estimation (where emission reduction factors exist) for both the existing and proposed scenarios include:

- water sprays at conveyor transfer points;
- scrapers used to clean conveyor belts;
- cyclone and water injection on drills;
- minimising truck and dozer travel speeds;
- ensure dozer routes are kept moist with the use of water carts;
- minimising trucks and FEL drop height;
- watering of exposed areas where practical;
- watering unpaved haul routes;
- paved haul routes;
- bunds in the SEA and WEA;
- partial and full rehabilitation; and
- watering at coal crusher and screen.

In addition to the above measures, Table 5.5 of Appendix E provides an overview of relevant applicable best practice dust control management measures as listed in the NSW Coal Benchmarking Study: International Best Practice to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining (the Best Practice Report) (Katestone 2011).

6.3.6 Conclusion

The results of the dispersion modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) are below the applicable impact assessment criteria at all assessment locations for both the existing and proposed scenarios.

Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods.

A range of best practice dust mitigation measures will continue to be employed at the quarry. These include the use of water carts and sprays, paved roads, watering conveyor transfer point, watering exposed areas where possible, and progressive rehabilitation of exposed areas. These measures have been taken into account in the emissions estimation and modelling of each scenario.

6.4 Biodiversity

6.4.1 Introduction

A biodiversity development assessment report (BDAR) has been prepared by EMM for the project and included as Appendix F. The BDAR was prepared in accordance with the *Biodiversity Assessment Method* (BAM; OEH 2017), the SEARs for the project and key biodiversity legislation and government policy listed in Section 6.4.2.

The following terminology is used throughout the BDAR and this section:

- 'disturbance area': the area directly impacted by the project;
- 'study area': the area over which field surveys were undertaken, which comprises of the disturbance area plus additional areas that were excluded from the disturbance area to avoid impacts to biodiversity; and
- 'search area': a 10 km buffer from the study area in which database searches were conducted.

6.4.2 Assessment approach

The biodiversity SEARs requirements for the project are listed in Table 6.18.

Table 6.18 Biodiversity SEARs requirements

SEARs requirement
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 Methodology and documented in a Biodiversity Development Assessment Report;
A strategy to offset any residual impacts of the development in accordance with the *Biodiversity Offset Scheme.*

The project has been assessed against the legislation and government policy, including:

- EPBC Act;
- EP&A Act;
- *Biodiversity Conservation Act 2016* (BC Act);
- *Fisheries Management Act 1994*;
- *Biosecurity Act 2015*; and
- State Environmental Planning Policy Koala Habitat Protection 2019 (Koala SEPP).

6.4.3 Existing environment

i Bioregions and landscapes

The disturbance area is located within the Brigalow Belt South IBRA Bioregion and the Talbragar Valley Slopes IBRA subregion. Two BioNet NSW Landscapes (formerly Mitchell Landscapes) intersect with the disturbance area, including Dubbo Basalts and Goonoo slopes. The majority (92%) of the site is Dubbo Basalts and the remainder (8%) Goonoo Slopes. Accordingly, the Dubbo Basalts BioNet NSW Landscape was selected for the BDAR.

ii Waterways and wetlands

The study area is within the catchment system of the Macquarie River which is located approximately 2.7 km east of the project area. Eulomogo Creek traverses the project area. The creek is an ephemeral third-order watercourse. The creek is within an agricultural landscape, is highly modified, and has several farm dams in its upper reaches.

iii Plant community types

Field surveys identified one Plant Community Type (PCT) within the disturbance area (refer Figure 6.2):

- PCT 599 – Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion.

Three other PCTs were recorded within the study area; however, the project's disturbance boundary was designed to avoid impacts to these:

- PCT 81 – Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion;
- PCT 201 – Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion; and
- PCT 435 – White Box – White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion.

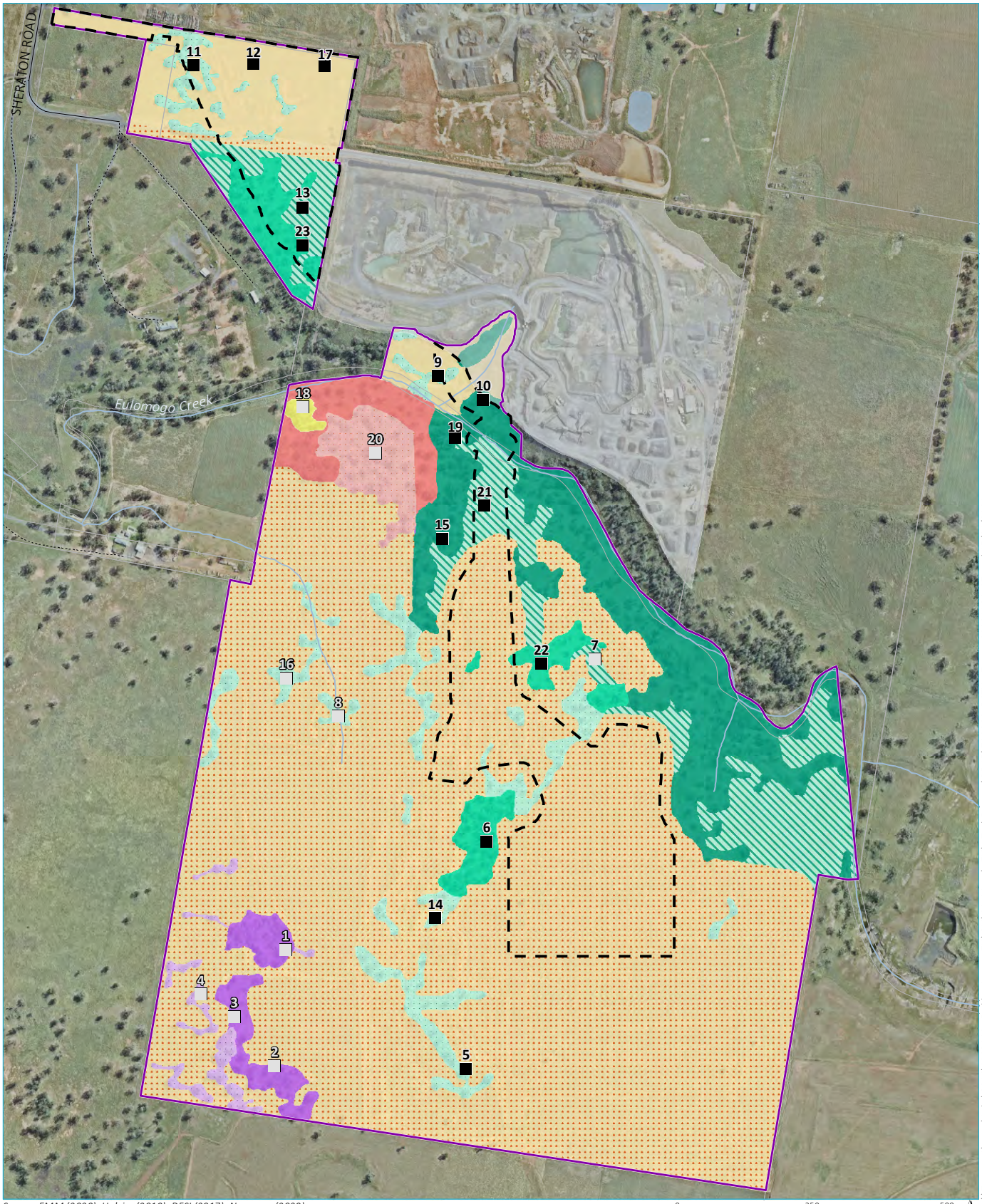
iv Vegetation description

a Overview

The vast majority of the study area is land classed as cultivated land (refer Figure 6.2). The most comparatively densely vegetated area is the woodland alongside Eulomogo Creek, which is part of a wooded patch of approximately 60 ha in size.

The study area does not include any mapped biodiversity corridors. The Dubbo LEP maps woodland areas within the study area as having high biodiversity values; however, this is not linked to an identified connectivity corridor.

The design of the disturbance footprints of the WEA and the SEA was iteratively revised to avoid vegetated areas where possible and to minimise impacts where vegetated areas could not be avoided.



Source: EMM (2020); Holcim (2019); DFSI (2017); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

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KEY

- Study area
- Disturbance area
- Indicative existing disturbance area
- Watercourse/drainage line
- Waterbody
- Minor road
- Vehicular track
- Cadastral boundary (data does not align with surveyed site boundary)

Biometric plot

- Included in BAM assessment
- Excluded from BAM assessment

Plant community types

- 201 - medium
- 435 - medium
- 435 - poor
- 599 - DNG
- 599 - medium
- 599 - other
- 599 - poor
- 81 - medium
- 81 - poor
- Cultivated land
- Exotic - grassland

Plant community types and vegetation zones within the disturbance area and study area, including plot locations

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.2

EMM creating opportunities

b Western Extension Area

The majority of the WEA is covered by exotic grassland and native pasture used for grazing livestock. The existing woodland is patchy and highly modified by past agricultural practices. The ground cover of the woodland areas and native pasture areas are dominate by grazing tolerant grasses and unpalatable shrubs. Native midstorey species are entirely absent.

c Southern Extension Area

The SEA is almost entirely composed of cropped land, being regularly tilled and sown. Very small patches of woodland also occur, though the groundcover is dominated by exotic species.

The proposed southern haul road, linking the proposed SEA to the existing site includes areas of derived native grassland and areas of higher quality woodland associated with the vegetation either side of Eulomogo Creek.

d Paddock trees

Six paddock trees were assessed within the disturbance area, which were assigned to PCT 599.

v Threatened species habitat

Given that the majority of the disturbance area has been cleared for grazing, the WEA and SEA are considered to be of low habitat value for threatened species. Of the 526 hollow-bearing trees recorded in the study area (refer Figure 6.2), 17 were identified within the disturbance area, with the majority containing small hollows mostly suited to nesting Eastern Rosellas and other smaller species. Medium and large hollows may provide habitat value for larger arboreal mammals and hollow nesting birds. Blakely's Red Gum and Yellow Box are both more likely to provide intermittent foraging resources for nectivorous birds.

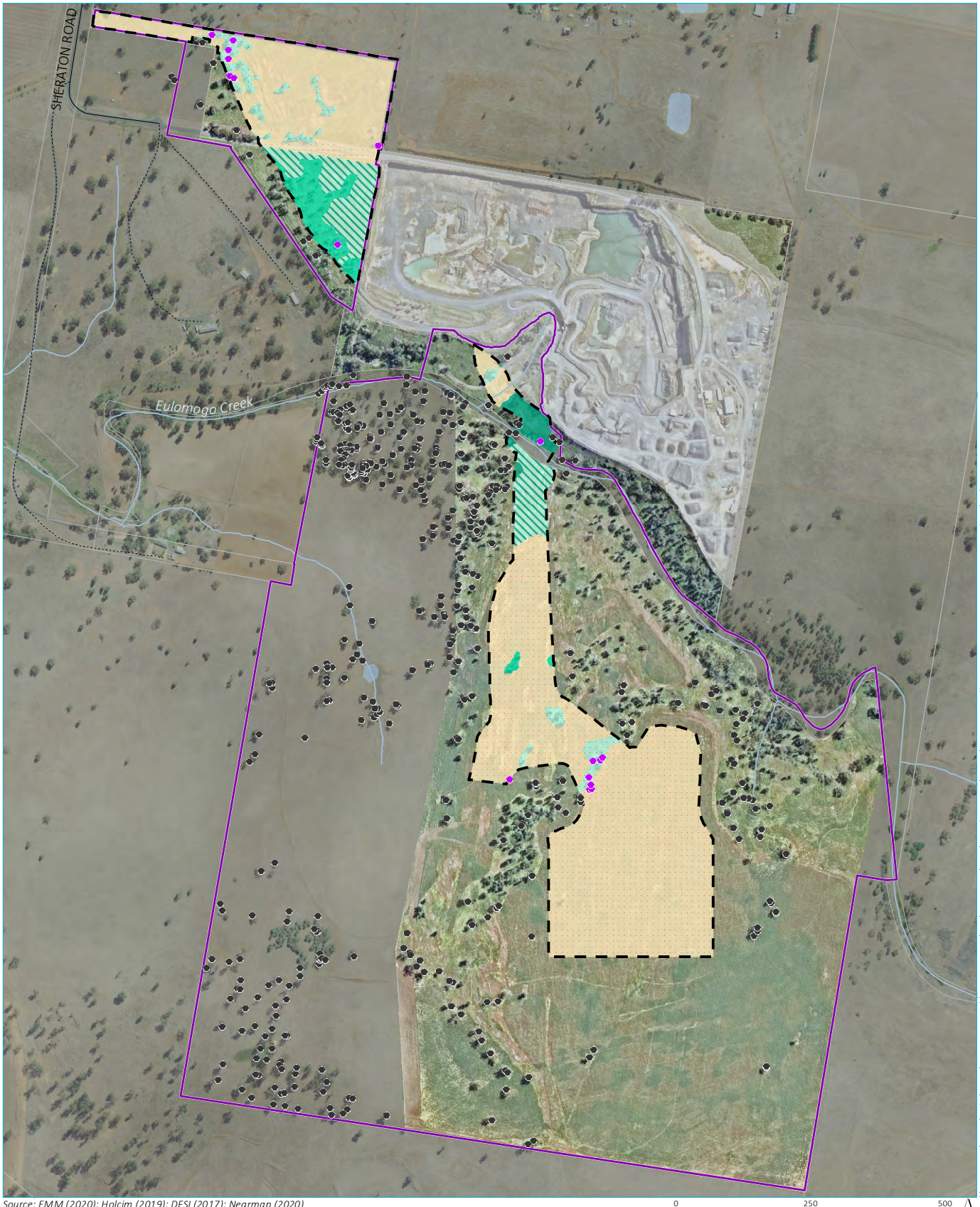
Eulomogo Creek is a third-order watercourse, which has been substantially modified by a series of small dams in its upper reaches. The modifications will have substantially reduced the amount and duration of flow. Eulomogo Creek is not mapped as key fish habitat within the study area. In accordance with policy and guidelines for the fish habitat conservation and management (DPI 2013) the creek within and upstream of the development footprint is considered 'Class 4 - unlikely key fish habitat' given that there is intermittent flow following rain events, with little or no flow or free-standing water or pools post rain events.

a Threatened flora species

No threatened flora species were recorded within the disturbance area opportunistically or during targeted surveys. One threatened ecological community (TEC) listed under the EPBC Act was recorded within the disturbance area, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

b Threatened fauna species

The Grey-crowned Babbler and Yellow-Bellied Sheathtail Bat, were recorded during surveys. Both, however, are ecosystem credit species and do not generate species credits under the BAM. Both species are listed as being "vulnerable" under the BC Act.



Source: EMM (2020); Holcim (2019); DFSI (2017); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

\\Emmsvr1\emm\Jobs\2018\J180313 - Dubbo Quarry EIS\GIS\02_Maps_EIS_TechReports\BDAR\ECO006_HollowBearingTrees_20201126_06.mxd 14/01/2021

KEY

- Study area
- Disturbance area
- Indicative existing disturbance area
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)
- Minor road
- Vehicular track

Hollow bearing tree

- Within disturbance area (17)
- Outside disturbance area (509)
- Cropped
- Exotic - grassland

599 - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion

- Poor
- Medium
- DNG
- Other

Hollow bearing trees

Dubbo Quarry Continuation Project
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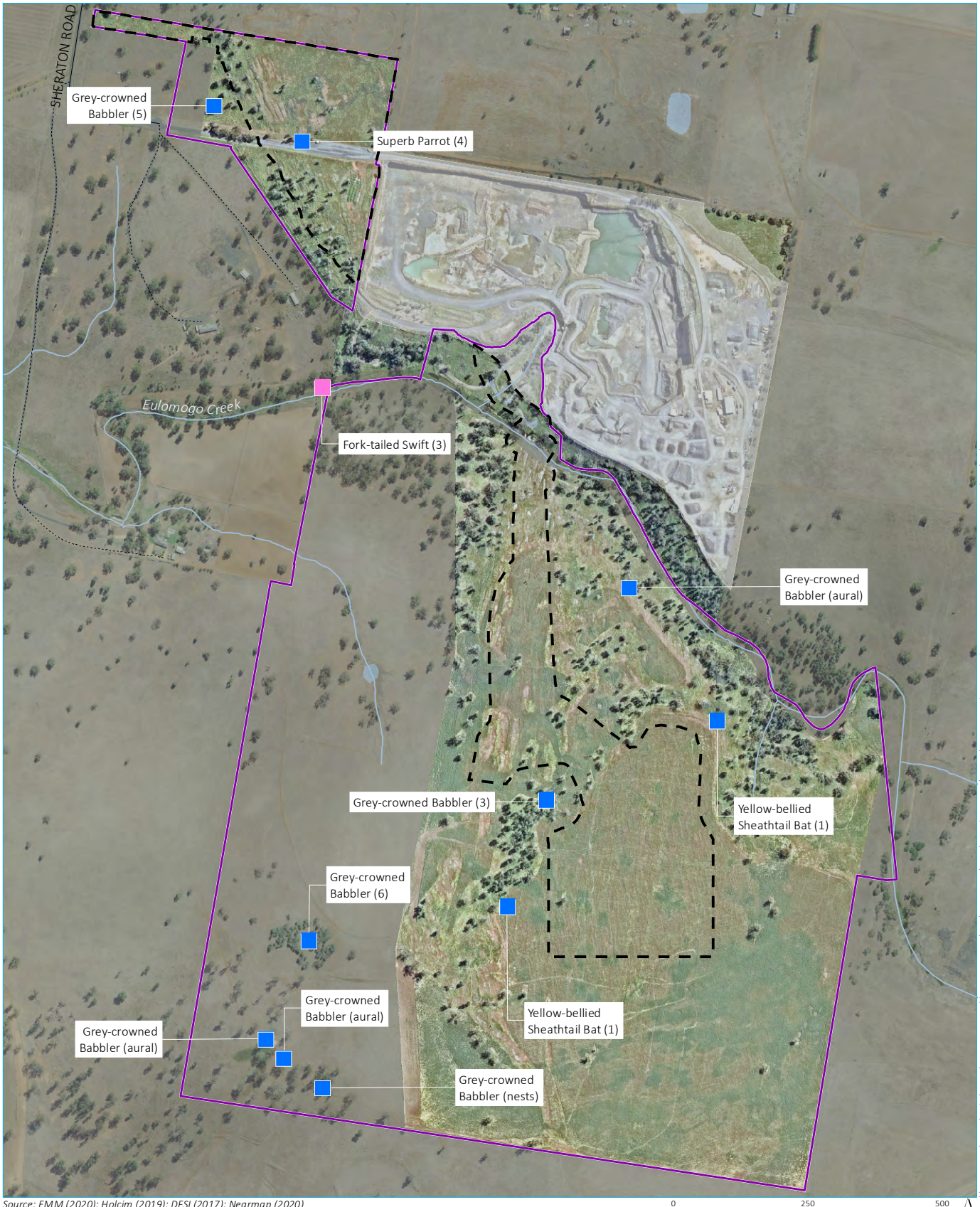
Figure 6.3

EMM creating opportunities



Source: EMM (2020); Holcim (2019); DFSI (2017); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

\\Emmsvr1\emm\Jobs\2018\J180313 - Dubbo Quarry EIS\GIS\02_Maps_EIS_TechReports\BDAR\ECO009_ThreatenedMigratorySpecies_20201126_03.mxd 14/01/2021

KEY

- Study area
- Disturbance area
- Indicative existing disturbance area
- Watercourse/drainage line
- Waterbody
- Minor road
- Vehicular track

Recorded fauna

- Migratory species
- Threatened species

Threatened and migratory fauna recorded

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.4

EMM creating opportunities

6.4.4 Impact assessment

i Impact avoidance and minimisation

The study area was approximately 124 ha, for which a biodiversity constraints assessment was completed, including vegetation mapping, habitat mapping and BAM plots.

The project has been designed to avoid areas of ecological sensitivity where possible. The disturbance area has been designed and refined to avoid any potential impacts to the three PCTs identified adjacent to the Eulomogo Creek corridor and within the northern part of the SEA (refer Figure 6.2 and Section 6.4.3iii). As a result, over 40 ha of vegetation was avoided, as outlined in Table 6.1 of Appendix F.

ii Impacts to vegetation on site

The additional disturbance area associated with the project is approximately 28.48 ha. The majority of this area has already been cleared and approximately half of the WEA, and some parts of the SEA, consist of exotic vegetation. A total of 5.82 ha within the additional disturbance area is considered to contain native vegetation.

The key direct impact is clearing of limited native vegetation and threatened species habitat. The project will remove vegetation; however, the majority of clearing is anticipated to have a limited impact, given that vegetation will be retained outside of the disturbance area. This will maintain connectivity characteristics comparable to those which currently exist.

The exception is the proposed southern haul road between the SEA and the existing site, which will bisect woodland vegetation alongside Eulomogo Creek. The southern haul road will create a disconnect, up to 15 m wide, in woodland along Eulomogo Creek.

Offsets are required to compensate for clearing native vegetation and threatened species habitat. To offset the residual impacts, 132 ecosystem credits are required, comprising 127 credits from clearing of vegetation communities and 5 credits from clearing of paddock trees.

A summary of the ecosystem credits required for all vegetation zones and paddock trees, including changes in vegetation integrity score, is provided in Table 6.19. A credit report for area offsets and paddock trees is provided in Appendix D of Appendix F.

Table 6.19 Summary of ecosystem credits required for all vegetation zones for the project

PCT	Vegetation zone name	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
Zone 1: 599 - Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Medium	0.64	64.3	0.0	-64.3	21
Zone 2: 599 - Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Other	1.25	58.6	0.0	-58.6	36

Table 6.19 Summary of ecosystem credits required for all vegetation zones for the project

PCT	Vegetation zone name	Area (ha)	Vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
Zone 2: 599 - Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Poor	1.18	40.7	0.0	-40.7	23
Zone 4: 599 - Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	DNG	2.75	32.7	0	-32.7	45
Paddock trees: 599 - Blakely's Red Gum - Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion	Paddock trees	-	-	-	-	5

iii Impacts to threatened species, including migratory species

No species credit species were recorded no credits are required for impacts to threatened species.

iv Serious and irreversible impacts

White Box-Yellow Box-Blakely's Red Gum Woodland was considered as potentially meeting the serious and irreversible impacts (SII) principle[2]. Four zones of PCT 599 meet the TEC listing of White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland), a total of 5.82 ha. This community was assessed in accordance with Section 10.2.2.1 of the BAM in Section 6.4 of Appendix F. It was concluded that the project will not have a significant impact on this community given the small area of impact and the amount of community of equivalent condition that will be retained.

The removal of Box Gum vegetation will have a little impact on connectivity of the community given that vegetation will be retained outside of the disturbance area, both in the WEA and the SEA. This will maintain connectivity characteristics similar to those that currently exist. The proposed southern haul road between the SEA to the existing site will affect the Box Gum woodland vegetation alongside Eulomogo Creek. This disruption to continuity of vegetation is unlikely to affect highly mobile species, with smaller and less mobile fauna species more likely to be affected.

v Other potential direct, indirect and prescribed impacts

There will be an increased risk of fauna vehicle strikes and associated fauna mortality within the WEA and SEA. The risk is considered minor given the lack of threatened fauna recorded and the low general fauna abundance. The risks will be minimised by the implementation of the proposed mitigation measures outlined in Table 6.20.

[2] refer *Appendix 3- Guidance to assist a decision-maker to determine a serious and irreversible impact* of the BAM (OEH 2017).

Construction activities, which will take place in the vicinity of watercourses, have the potential to impact on aquatic ecology by the release of sediment-laden water. Mapped watercourses within the existing site and the study area are already highly disturbed, and the project is generally not expected to cause any further biodiversity impacts to the watercourses. The proposed Eulomogo Creek crossing will consist of a concrete culvert situated on an area of bedrock, with little vegetation present. This bed rock is impervious and is highly resistant to erosion. Therefore, construction of the crossing is unlikely to change the characteristics of the creek bed significantly.

The project does not require large inputs or storage to chemicals/liquids which pose a risk to groundwater contamination and, therefore, potential impacts to groundwater dependent ecosystems are limited to low volume sources such as fuel and oil from construction equipment which will be stored and used in accordance with existing strict procedures. Management measures will be implemented to mitigate any potential groundwater impacts (refer Section 6.8).

Unmitigated indirect impacts to biodiversity that could arise as a result of the project include:

- increased noise, vibration and dust levels;
- artificial lighting impacting nocturnal species behaviour; and
- increase in weeds and pathogens.

vi Impact to Matters of National Environmental Significance

To support a determination as to whether the project is likely to have a 'significant impact' on threatened species the *Matters of National Environmental Significance – Significance Impact Guidelines 1.1* (DoE 2013) have been applied. Assessments of significance have been completed for the following Matters of National Environmental Significance (MNES) (refer to Appendix F);

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland - Critically Endangered Ecological Community;
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered species;
- Swift Parrot (*Lathamus discolor*) – Critically Endangered species;
- Superb Parrot (*Polytelis swainsonii*) – Vulnerable species;
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable species;
- White-throated Needletail (*Hirundapus caudacutus*); and
- Fork-tailed Swift (*Hirundapus caudacutus*) – Migratory species.

Assessment findings are summarised below:

- **threatened species:**

  Superb Parrot (vulnerable) was recorded flying over the study area. Regent Honeyeater, Swift Parrot, White-threated Needletail and Corben's Long-eared Bat are also considered as having potential to occur. Assessment of significance has been completed for these five species in Appendix E of Appendix F. The assessment predicted negligible impacts to the species given the sub-optional nature of the habitat present and the small area of clearance.

- **threatened ecological communities:**

  White Box-Yellow Box Blakey's Red Gum Grassy Woodland and Derived Native Grassland. PCT 599- Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South Bioregion and Nandewar Bioregion (CEEC listed under the EPBC Act) is aligned with Box Gum woodland CEEC and 0.64 ha will be cleared for the project. An assessment of significance concluded that the project will not have a significant impact given the small area of impact and the amount of retained community of equivalent condition.

- **migratory species:**

  Nine migratory species have been recorded or are predicted to occur within the locality. One species, Fork-tailed Swift was recorded flying over the periphery of the study area, for which an assessment was completed (Appendix E of Appendix F). The disturbance area does not provide important habitat for an ecologically significant proportion of any of these species.

- **wetlands of national importance:**

  The disturbance area does not contain and is not adjacent to any wetlands of international importance (Ramsar wetlands). There are no wetlands of international importance downstream of the disturbance area.

Overall, the assessments predicted that there will be no significant impacts to MNES are as a result of the project. On this basis the project is recommended as a non-controlled action. A Referral under the EPBC Act for the project has been completed and submitted to DAWE.

vii Impacts not requiring offsets

Areas not requiring offsets include existing roads, and cleared and highly disturbed land, in accordance with Section 10.4 of the BAM (OEH 2017). A total of 5.70 ha of exotic grassland was mapped within the disturbance area, with a vegetation integrity score that is below the threshold for offsetting.

6.4.5 Mitigation measures

i Overview

Holcim has undertaken significant steps to avoid, minimise and mitigate impacts by:

- identifying biodiversity values through comprehensive, rigorous and thorough biodiversity surveys; and

- revising the disturbance area to consider the direct and indirect impacts and work through an iterative design process involving the design team and ecologists, with multiple iterations of design footprint to achieve a feasible project with the least biodiversity impact.

ii Offsets

A total of 132 ecosystem credits are required to offset the residual impacts of the project, comprising 127 credits from vegetation communities and 5 credits from paddock trees (refer Appendix D of Appendix F). Holcim's approach to meeting offsetting requirements to compensate for the project impacts are outlined in Section 6.6 of Appendix F.

iii Mitigation measures

Measures to mitigate residual impacts are provided in Table 6.20.

Table 6.20 Biodiversity management measures

Impact	Action and outcome	Responsibility	Timing
Direct impact/prescribed impact			
Clearing of native vegetation	Avoiding and minimising clearing impacts to these PCTs where possible. Clearing limits will be clearly marked to prevent clearing beyond the extent of the disturbance area. Tree clearing and disturbance will be limited to the disturbance area. Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' will be installed. The locations of 'No Go Zones' will be included in site inductions.	Construction site manager.	Prior to and during vegetation clearing.
Clearing of hollow bearing trees/habitat trees, resulting in fauna injury and mortality	Limiting removal of trees (including dead trees) to that required within the disturbance area during the installation of project infrastructure. A clearing procedure will be implemented during the clearing of the disturbance area, as follows: • preclearance surveys will be completed to determine if any nesting birds are present; and • a suitably trained fauna handler will be present during hollow-bearing tree (including dead hollow-bearing trees) clearing to rescue and relocate displaced fauna if found on-site. Appropriate exclusion fencing will be installed around trees and woodland to be retained within the disturbance area during construction in accordance with Standards Australia (2009).	Construction site manager and suitably trained fauna handler.	Prior to and during tree clearing.
Vehicle collision with fauna	The site speed limit will 40 km/hr.	Construction site manager.	During construction and operation.

Table 6.20 Biodiversity management measures

Impact	Action and outcome	Responsibility	Timing
Direct impact/prescribed impact			
Disturbance of river/creek beds and banks during crossing construction (including construction of creek crossings).	An erosion and sediment control plan will be prepared in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) prior to commencement of construction. Disturbed areas will be stabilised and rehabilitated as soon as possible to reduce the exposure period. Source controls, such as mulching, matting and sediment fences, will be utilised where appropriate. A specific creek crossing sub-plan will be included as part of the CEMP.	Construction site manager.	Design stage, during vegetation clearing and construction.
Indirect impact			
Transfer of weeds and pathogen to and from site.	Appropriate wash down facilities will be available to clean vehicles and equipment prior to arrival and when leaving site.	Construction site manager.	Design stage, during vegetation clearing and construction.
Artificial lighting impacting fauna behaviour	Lighting will comply with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting.	Construction site manager.	During construction and operation.

iv Rehabilitation

Rehabilitation of disturbed land is detailed in Section 6.10.

6.4.6 Conclusion

A BDAR has been completed in accordance with the BAM (OEH 2017). The project area is partially cleared with some small patches of woodland and scattered trees. The largest patches of woodland are associated with Eulomogo Creek which intercepts the disturbance area.

The majority of the community vegetation within the project area is highly degraded and of low quality.

The project has been designed to avoid significant vegetation clearing and to minimise the impacts to biodiversity. Particular effort was made to avoid those woodland areas within the study areas that had larger patch size and greater connectivity to other areas of habitat outside of the disturbance area. A total of 5.82 ha of native vegetation will be cleared for the project. This will require an offset to be provided to retire 132 ecosystem credits.

Based on both habitat assessments and field surveys, the disturbance area has low importance for threatened flora or fauna species. Targeted surveys did not detect any threatened species and no species credits are required.

An assessment within the disturbance area was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required.

The project is not predicted to have significant impacts to MNES.

6.5 Aboriginal heritage

6.5.1 Introduction

A preliminary Aboriginal cultural heritage assessment (ACHA) has been prepared by EMM for the project and is included in Appendix G. The ACHA assesses the potential Aboriginal cultural heritage impacts associated with the project.

6.5.2 Assessment approach

i Assessment requirements

The Aboriginal cultural heritage SEARs requirements are listed in Table 6.21.

Table 6.21 Aboriginal cultural heritage SEARs requirements

SEARs requirement
An assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage; and

The ACHA was prepared in accordance with SEARs requirements and with consideration of the following:

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) (DECCW 2010a);
- *Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW* (DECCW 2010b);
- *Aboriginal Consultation Requirements for Proponents* (DECCW 2010c); and
- *Australian International Council on Monuments and Sites* (ICOMOS) *Burra Charter* (Australia ICOMOS 1999).

ii Aboriginal stakeholder consultation

Aboriginal consultation has been undertaken in accordance with procedures set out in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010c).

The consultation process identified a total of 16 organisations and/or individuals. Of these, two registered an interest in the project:

- Dubbo Local Aboriginal Land Council (Dubbo LALC); and
- Dubbo City Council Aboriginal Community Working Party (Dubbo AC Working Party).

The listed Aboriginal individuals and/or communities are the 'registered' Aboriginal parties (RAPs) for the project. The RAPs attended the field survey and were invited to provide comment on the field survey methodology and draft ACHA.

6.5.3 Existing environment

i Desktop assessment

Over the past 40 years, there have been a number of archaeological studies of the Dubbo region. These provided baseline data for identifying Aboriginal sites within the project area in consideration of the regional landscape context. These assessments are summarised in Appendix G.

A search of the Aboriginal Heritage Information Services (AHIMS) database on 25 February 2019 (ID 401606), and an updated search on 16 July 2020 (ID 521010), identified 78 sites within a 10 km x 10 km search area centred on the project area (refer Figure 6.5). The search identified that there are no AHIMS sites recorded within the project area; however, there are 13 sites within 1 km which are detailed in Table 4.2 of Appendix G.

Artefact scatters and isolated finds represent the dominant site type for this area representing 48.7% of the site assemblage, followed by culturally modified (carved or scarred) trees which account for 38.5% of AHIMS registrations.

ii Field survey

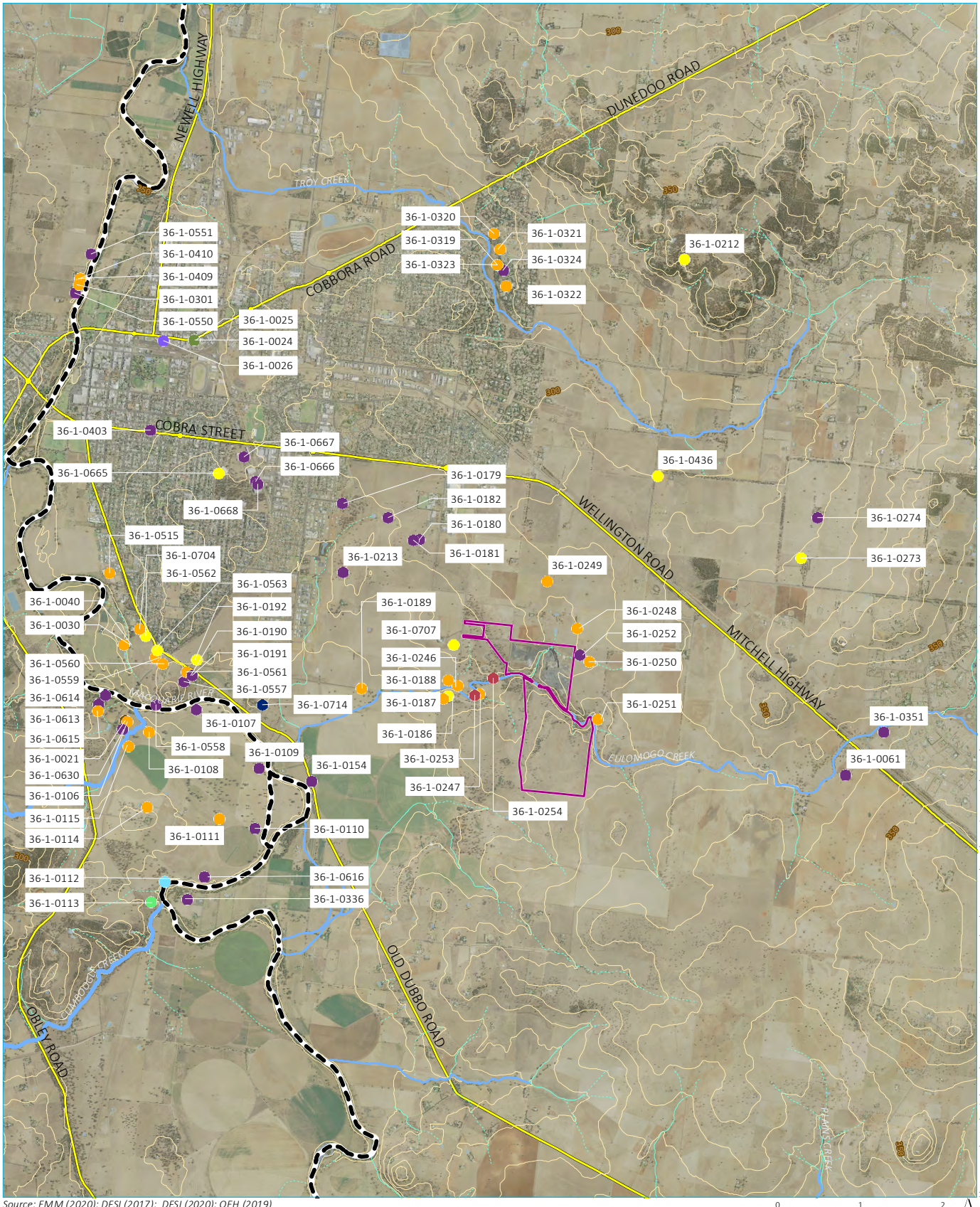
The project area was surveyed between 16–18 July 2019, in the presence of the RAPs. At the time of the survey, the exact footprint of the two proposed new resource areas (WEA and SEA) was not known and, therefore, a wider survey area was inspected.

Four Aboriginal sites were identified within the survey area, (Table 6.22and Figure 6.6). Photographs of the isolated finds and artefact scatter are provided in Appendix G.

Table 6.22 Aboriginal sites identified

Site name	Site type	Location (GDA 94 Zone 55)	Landform
DQ-IF1	Isolated find	655715E 6427521N	Flat (undulating plain)
DQ-IF2	Isolated find with PAD	655881E 6426981N	Watercourse (terrace)
DQ-OS1	Artefact scatter with PAD	656469E 6427311N	Flat (undulating plain)
DQ-OS2	Artefact scatter with PAD	656615E 6426343N	Watercourse (terrace)

No ceremonial sites, Aboriginal stone arrangements, rock art or burials were identified within the survey area. No modified trees were identified; however, further assessment is required (see Section 6.5.4). Finds within the survey area are representative of a continuous archaeological character. More sites are likely to be found in similar landscape contexts throughout pastoral properties in the locality.



Source: EMM (2020); DFSI (2017); DFSI (2020); OEH (2019)

0 1 2 km
GDA 1994 MGA Zone 55

N

KEY

Project area
Major road
Contour (10 m)

Strahler stream order
1st order
2nd order
3rd order
4th order
9th order

AHIMS site type
Artefact scatter
Artefact scatter and midden
Artefact scatter with PAD
Artefact scatter, midden and scarred tree
Artefact scatter, axe grinding groove and mound (oven)
Axe grinding groove
Burials and carved tree
Carved tree
Isolated find
Quarry
Scarred tree

AHIMS search

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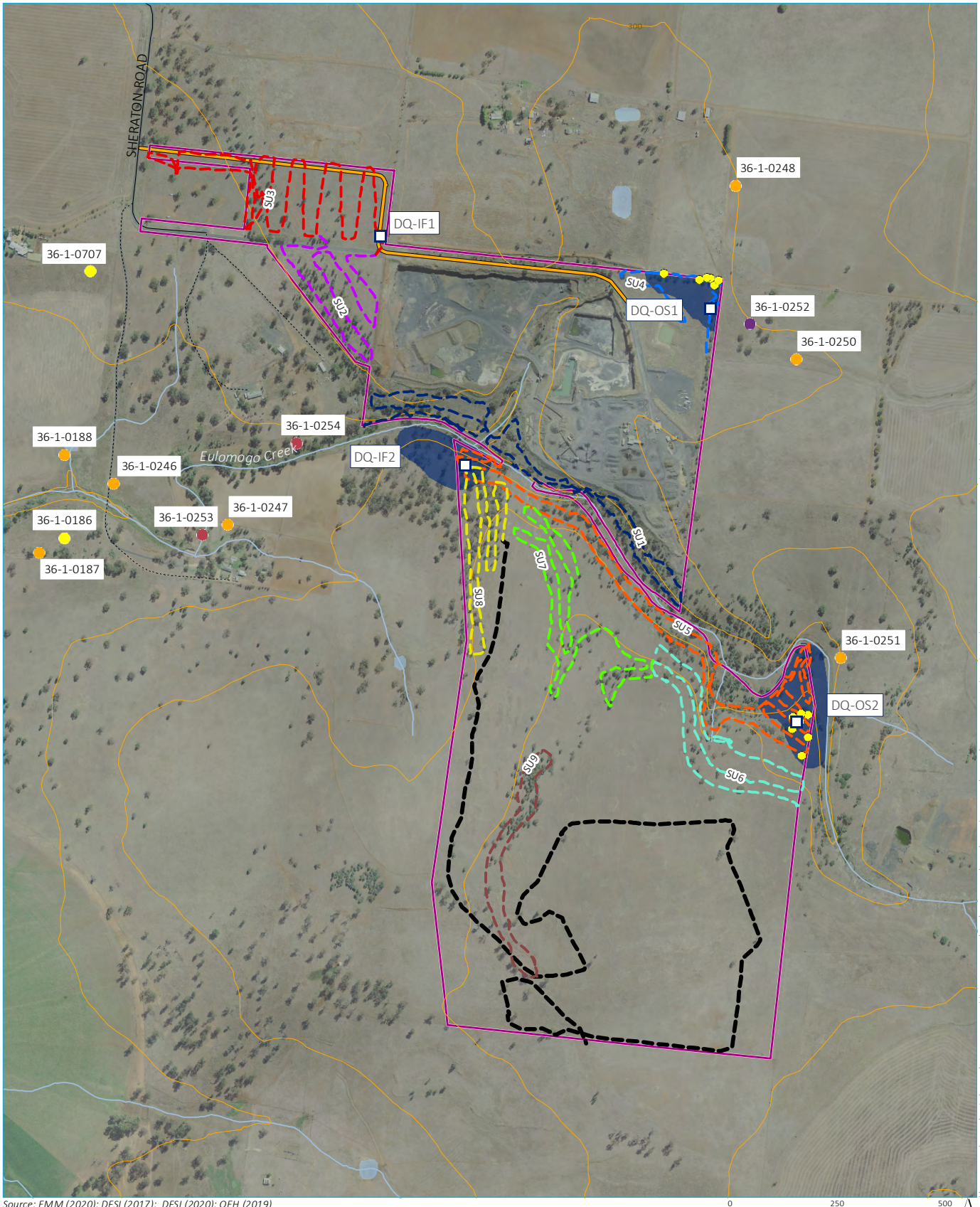
Figure 6.5

EMM
creating opportunities

\\Emmsvr1\emm\Jobs\2018\J180313 - Dubbo Quarry EIS\GIS\02_Maps_EIS_TechReports\ACHA\ACHA005_AHIMS data and the project area_20201203_05.mxd 15/01/2021



Source: EMM (2020); DFSI (2017); DFSI (2020); OEH (2019)

0 250 500 m

GDA 1994 MGA Zone 55

N

KEY

- Project area
- Proposed access road
- Contour (10 m)
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Aboriginal site
- Aboriginal site
- Artefact
- Vehicle inspection

AHIMS site type

- Artefact scatter
- Axe grinding groove
- Isolated find
- Scarred tree

Survey transect

- SU1
- SU2
- SU3
- SU4
- SU5
- SU6
- SU7
- SU8
- SU9

Archaeological survey results

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Figure 6.6

EMM creating opportunities

\\Emmsvr1\emm\Jobs\2018\J180313 - Dubbo Quarry EIS\GIS\02_Maps_EIS_TechReports\ACHA\ACHA006_ArchaeologicalSurveyResults_20201203_05.mxd 15/01/2021

6.5.4 Impact assessment

A summary of the potential archaeological impact of the project on known Aboriginal sites within the survey area is provided in Table 6.23.

Table 6.23 Archaeological impact summary

Site name	AHIMS site number	Significance	Impact type	Impact assessment	Consequence of impact
DQ-IF1	44-4-0383	Low	Direct	Total loss	Total loss of value
DQ-IF2	44-4-0384	Moderate	None	No impact	No loss of value
DQ-OS1	36-1-0773	Low	None	No impact	No loss of value
DQ-OS2	36-1-0774	Moderate	None	No impact	No loss of value

One Aboriginal site, DQ-IF1, is located within the project's disturbance footprint. The design of the project avoids impact to all remaining identified Aboriginal sites. The site DQ-IF1, which contains an isolated artefact within a heavily disturbed context, is assessed as a site of low archaeological significance. The project will have a negligible loss of the Aboriginal archaeological record in the area.

It is acknowledged that the site has high cultural significance to the Aboriginal community as it provides tangible evidence of the use of the area by Aboriginal people.

Further assessment is required to determine whether any mature paddock trees within the SEA development footprint, which are currently obscured by rock, have cultural scarring. This additional assessment will be completed at the Response to Submissions stage.

6.5.5 Mitigation measures

i Management of identified sites within the survey area

Avoidance is proposed for three sites: DQ-IF2, DQ-OS1 and DQ-OS2. The three sites will be protected by a semi-permanent or permanent boundary fence around the visible extent of the sites and/or the PAD areas to avoid inadvertent impacts.

The isolated artefact from Aboriginal site, DQ-IF1, will be relocated by a qualified archaeologist and RAP representatives prior to any impacts to the site.

Management measures proposed are summarised in Table 6.24.

Table 6.24 Site significance, impact, and management summary

Site name	AHIMS site number	Site type	Significance	Impact type	Project component	Minimum buffer required (m)	Management strategy
DQ-IF1	44-4-0383	Isolated find	Low	Direct	Haul road	N/A	Relocation
DQ-IF2	44-4-0384	Isolated find with PAD	Moderate	None	Nil	20 m	Avoidance
DQ-OS1	36-1-0773	Artefact scatter with PAD	Low	None	Nil	50 m	Avoidance
DQ-OS2	36-1-0774	Artefact scatter with PAD	Moderate	None	Nil	50 m	Avoidance

ii Special procedures

Special procedures will be implemented if ancestral remains or new sites are discovered during extraction works. These procedures are detailed in Appendix G and summarised below.

In the event that known or suspected human remains are encountered, the following procedure will be followed as soon as the suspected remains are discovered:

- all work in the immediate vicinity will cease and the site supervisor notified;
- the NSW Police and the State coroner to be notified;
- contact Heritage NSW for advice on identification; and
- if it is determined that the skeletal material is of Aboriginal ancestry, the RAPs will be contacted and consultative arrangements will be made to discuss ongoing care or reinterment of the remains.

In the event of discovery of new Aboriginal sites within the development footprint, the following procedure will be followed:

- the immediate vicinity (an approximate 20 m buffer from the visible extent of the site) will be secured to protect the find;
- an archaeologist and select RAPs to determine the significance of the objects(s); and
- any new sites must be registered in the AHIMS database.

In the event that newly identified sites will be impacted by the project and cannot be avoided, they will be managed in a manner commensurate with their assessed significance, consistent with the management measures provided for the identified sites similar.

iii Aboriginal Heritage Management Plan

An Aboriginal Heritage Management Plan will be developed in consultation with DPIE, the RAPs and Heritage NSW. It will provide details of:

- all Aboriginal sites identified during the archaeological investigation for the project;
- management measures and their progress towards completion;
- measures to ensure ongoing consultation and involvement of project RAPs;
- protocols for newly identified sites;
- protocols for educating staff and contractors of their obligations relating to Aboriginal cultural heritage values through a site induction process;
- protocols for suspected human skeletal materials;
- protocols for the ongoing care of salvaged Aboriginal objects; and
- provisions for review and updates for the AHMP.

6.5.6 Conclusion

The iterative design process has resulted in avoidance of impacts to the majority of Aboriginal sites located within the project area.

Aboriginal site DQ-IF1 is the only known site to be impacted by the project. DQ-IF1 consists of an isolated artefact with no associated sub-surface deposit. It has been assessed herein as being of low archaeological significance, whilst acknowledging that it is of cultural significance to the Aboriginal community.

6.6 Historical heritage

6.6.1 Introduction

A desktop assessment of potential impacts to historical heritage from the project is provided below.

6.6.2 Assessment approach

The historical heritage SEARs requirements are listed in Table 6.25.

Table 6.25 Historical heritage SEARs requirements

SEARs requirement
Identification of historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items

6.6.3 Existing environment

The National, State and local heritage registers were searched on 19 July 2020. There were no heritage items or heritage conservation areas identified as occurring within the vicinity of the project area. The nearest heritage item is over 1.7 km to the west of the project area and is identified as the "Old Dubbo Homestead" in Schedule 5 of the Dubbo LEP. The "Old Dubbo Homestead" is located at 29 Old Dubbo Road, Dubbo (Lot 31, DP 738069).

Within the project's disturbance footprint, existing structures are limited to a small Colorbond-clad shed adjacent to the tarping area that is 5–10 years old and farm fencing (star pickets and barbed wire) that is approximately 15 years old. Structures within the existing quarry disturbance footprint were built during operation of the quarry (ie from 1980 onwards). Historical aerial photographs of the project area (see Appendix I) do not show any other structures within the existing and proposed disturbance footprints.

6.6.4 Impact assessment

There are no previously recorded historical heritage items within the project area. The project area does not currently contain any structures that could be considered having potential to be of historical heritage significance.

The project will not impact on any offsite recorded heritage items or heritage conservation areas given that the closest is over 1.7 km from the disturbance area.

6.6.5 Mitigation measures

Whilst it is highly unlikely that any items of heritage significance are present within the project area, all workers and contractors will be informed of their obligations under the NSW *Heritage Act 1977*. If any potential heritage items are uncovered during the course of the works, work will immediately cease in the area. If potential items are determined to be heritage significance, the Heritage Council of NSW and relevant Commonwealth department will be contacted.

6.6.6 Conclusion

The project will not impact recorded historical heritage items or heritage conservation areas. Mitigation measures have been proposed in the unlikely event that any potential heritage items are uncovered during operation of the project.

6.7 Surface water

6.7.1 Introduction

A surface water assessment (SWA) has been prepared by EMM for the project and included in Appendix H. A flood study was completed by GRC Hydro (Appendix A of the SWA) to assess the flood characteristics of the creek crossing.

The project will include changes to the existing water management system and the construction of new water management infrastructure to service the WEA and SEA. Discharges to Eulomogo Creek are proposed so the impacts of these discharges have been assessed based on the results of water quality sampling from Eulomogo Creek and key water storages, and the preparation of water balance models for the existing and proposed water management systems.

Potential flooding impacts from construction of the proposed crossing across Eulomogo Creek have also been assessed using flood modelling.

6.7.2 Assessment approach

i Assessment requirements

The surface water SEARs requirements are listed in Table 6.26.

Table 6.26 Surface water SEARs requirements

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

ii Water quality sampling

Water quality sampling of Eulomogo Creek and several water management dams at the existing site was completed by Holcim from 2013 to 2018 and by EMM on 9 June 2020 (Table 6.27).

Table 6.27 Water quality sampling program for the project

Location of sampling	Number of samples	
	Holcim sampling	EMM sampling
Eulomogo Creek - upstream of site	20	1
Eulomogo Creek - downstream of site	41	1
Macquarie River – downstream of Eulomogo Creek confluence	26	-
East Pit (In-Pit Dam)	45	1
East Pit (Pump 2 storage pond)	45	1
Settling Pond	45	1
Settling Pond overflows	24	-
West Pit pond	-	1

The following parameters were measured:

- pH;
- electrical conductivity;
- turbidity;
- total suspended solids;
- total dissolved solids;
- oxidised nitrogen;
- total nitrogen;
- total kieldahl nitrogen;
- ammonia;
- chemical oxygen demand;
- total phosphorus and reactive phosphorus; and
- dissolved metals.

iii Water balance model

Water balance models have been prepared for the existing and proposed water management systems. These consider how water is managed during a full range of weather conditions. They provide estimates of water take, project water security and discharge regimes.

6.7.3 Existing environment

i Natural environment

The following watercourses are located within the existing site:

- Eulomogo Creek is a 3rd order watercourse that flows west towards the Macquarie River. The creek is located to the south of the existing quarry. The SEA will be located to the south of the creek and a crossing is proposed for a haul road that will provide access between the existing quarry and the SEA.
- Two 1st order ephemeral flow watercourses flow into the existing quarry pits (referred to as the eastern watercourse and northern watercourse). These watercourses are shown in Figure 6.7.

There are no watercourses in the WEA or SEA. All runoff from these areas currently flows into Eulomogo Creek via ephemeral drainage lines.

ii Existing water management system

The existing water management system collects water from the following sources:

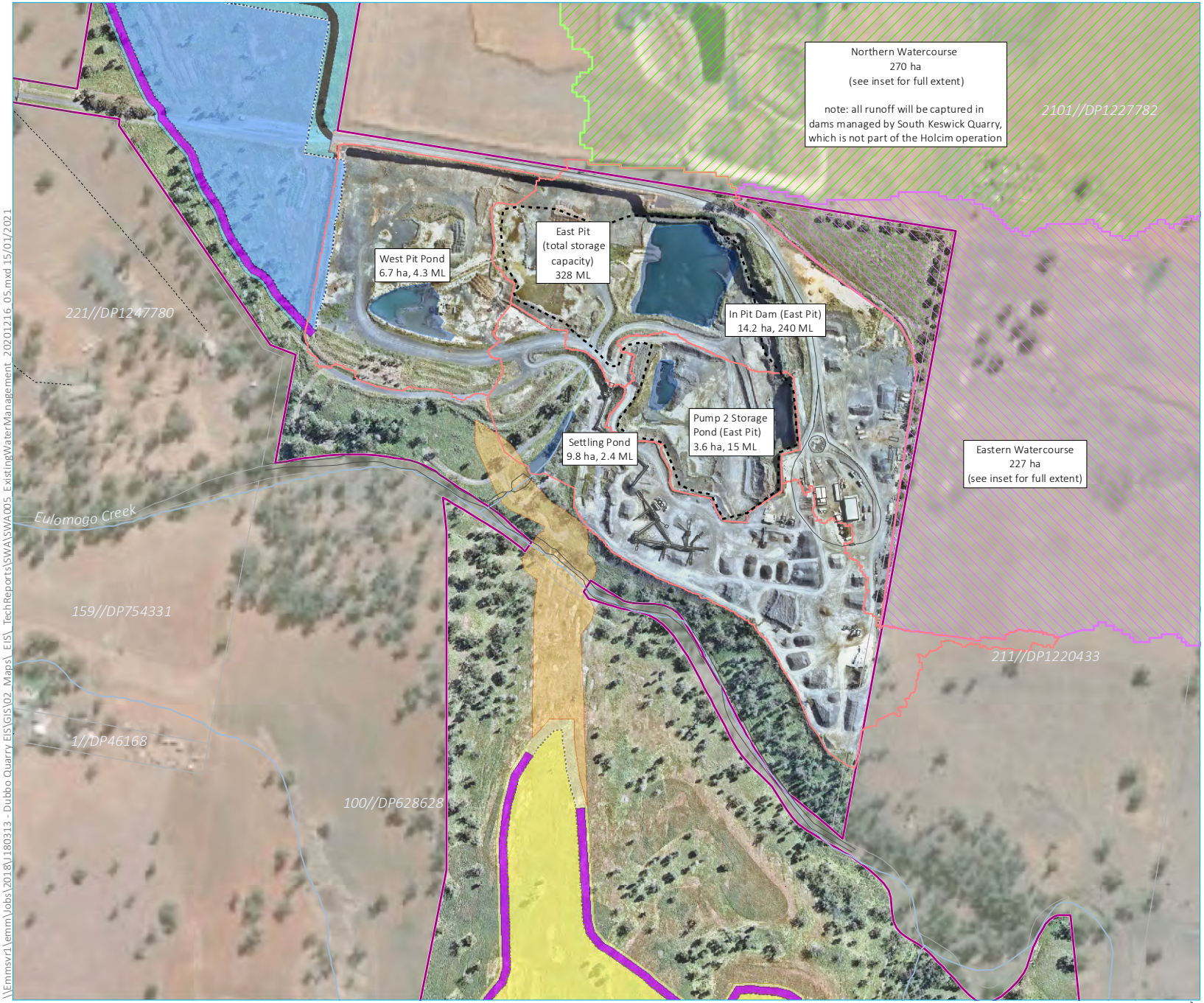
- runoff from the quarry area;
- runoff from the eastern watercourse catchment;
- runoff from the northern watercourse catchment (only in the event that South Keswick Quarry's water management dams overflow); and
- groundwater inflows into quarry pits.

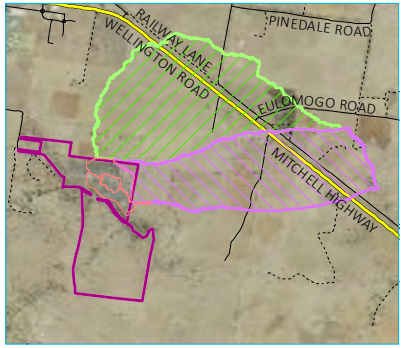
The existing water management system includes four key water storages (Figure 6.7):

- West Pit Pond;
- In-Pit Dam (East Pit);
- Pump 2 Storage Pond (East Pit); and
- Settling Pond.

When full, water collected in the West Pit Pond and the Pump 2 Storage Pond (East Pit) overflow into the In-Pit Dam (East Pit) via a surface drain or subsurface flow, respectively. Water in the In-Pit Dam (East Pit) is pumped to the Settling Pond or discharged at the Rehabilitation Area in the West Pit. When full, water in the Settling Pond is discharged to Eulomogo Creek. This occurs when:

- available storage capacity is exceeded by excessive runoff from the catchments; or
- the In-Pit Dam or the Pump 2 Storage Pond in the East Pit is dewatered via pumping into the Settling Pond.





KEY

- Project area
- Existing project infrastructure
- The Eastern Watercourse - 277 ha
- The Northern Watercourse - 270 ha
- Existing water management dam
- East Pit (total storage capacity)
- Catchment boundary
- Bund wall
- Proposed access road
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Watercourse/drainage line
- Vehicular track
- Cadastral boundary (data does not align with surveyed site boundary)

Source: EMM (2019); DFSI (2017); Nearmap (2020); ASGC (2006)

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Existing water management system layout

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.7

EMM
creating opportunities

Groundwater inflows are known to occur into the In-Pit Dam (East Pit) and Pump 2 Storage Pond (East Pit). Water is extracted from the In-Pit Dam (East Pit) for dust suppression on the haul roads and from the Pump 2 Storage Pond for dust suppression in the processing plant.

A diagram of the existing water management system is provided in Figure 6.8.

The results of the water balance model for the existing water management system are summarised below:

- the existing water management system is generally in surplus (ie inflows exceed operational water use);
- approximately 90% of inflows occur from runoff from the eastern watercourse and groundwater inflows into the East Pit; and
- discharges from the Settling Pond into Eulomogo Creek have occurred most years due to the dewatering of the East Pit into the Settling Pond.

iii Water quality

The *NSW Water Quality and River Flow Objectives* (DECCW 2006) reference Default Guideline Values (DGVs) from ANZECC/ARMCANZ (2000) water quality guidelines. The ANZECC/ARMCANZ (2000) water quality guidelines have been replaced by the ANZG (2018) guidelines, which have a stated long-term objective of providing regional DGVs for the Murray-Darling basin and other regional basins in Australia. These DGVs are yet to be incorporated into the ANZG (2018) guidelines.

The *Macquarie-Castlereagh water quality management plan* (NSW DoI 2018) provides water quality targets for the Macquarie-Castlereagh water resource plan area, which encompasses the site. As these targets were developed using catchment specific data, they are considered more relevant than the default values referenced in (DECCW 2006) and are, therefore, adopted as DGVs for this assessment.

The water quality targets are presented in Table 6.28. It is noted that catchment scale water quality targets do not make allowance for site specific factors that may influence water quality.

Table 6.28 Water quality targets – Macquarie-Castlereagh water resource plan

Indicator	Target
Targets for water-dependent ecosystems	
Turbidity	The annual median value should be < 20 NTU
Total phosphorus	The annual median value should be < 35 ug P/L
Total nitrogen	The annual median value should be < 600 ug N/L
Dissolved oxygen	The annual median value should be >8 mg/L or within the 90-110% range
pH	The annual median value should be within the 7.0-8.0 range
Temperature	Between the 20th and 80th percentile of the natural monthly water temperature range
Toxicants	The trigger values for slightly-moderately disturbed ecosystems described in the ANZECC/ARMCANZ (2000) guidelines apply.
Salinity	Median value 504 µS/cm 80th percentile 744 µS/cm
Targets for irrigation water	
Salinity	744 µS/cm

Table 6.28 Water quality targets – Macquarie-Castlereagh water resource plan

Indicator	Target
Targets for town water supply	
General target	Refers to the targets for raw water supply that are provided in the Australian Drinking Water Guidelines (2011).
Targets for recreational use	
Blue-green algae	• ≥ 10 µg/L total microcystins; or ≥ 50,000 cells/mL toxic Microcystis aeruginosa; or biovolume equivalent of ≥ 4 mm3 /L for the combined total of all cyanobacteria where a known toxin producer is dominant in the total biovolume; or • ≥ 10 mm3 /L for total biovolume of all cyanobacterial material where known toxins are not present; or • Cyanobacterial scums consistently present

iv Water use

Potable water is delivered to the site by truck. Water for the amenities is sourced from rainwater tanks located near the office. When empty, these tanks are also filled with water from the Pump 2 Storage Pond (East Pit). Wastewater from amenities is discharged to a septic tank, which is then discharged to an absorption trench. The septic tank is periodically pumped out by an approved licensed contractor as required.

Operational uses of water include dust suppression for the haul roads and processing plant (Table 6.29).

Table 6.29 Existing water usage

Water use	Description	Annual water use
Haul road dust suppression	Application via a 13-kilolitre (kL) water cart which completes approximately 15 loads a day.	Between 68 and 74 megalitres per year (ML/year) for wet and dry years, respectively.
Processing plant dust suppression	Water is used for conveyor and stockpile dust suppression within the processing plant. Two 50-kL water tanks are used over approximately 2 days during dry conditions.	18 ML/year

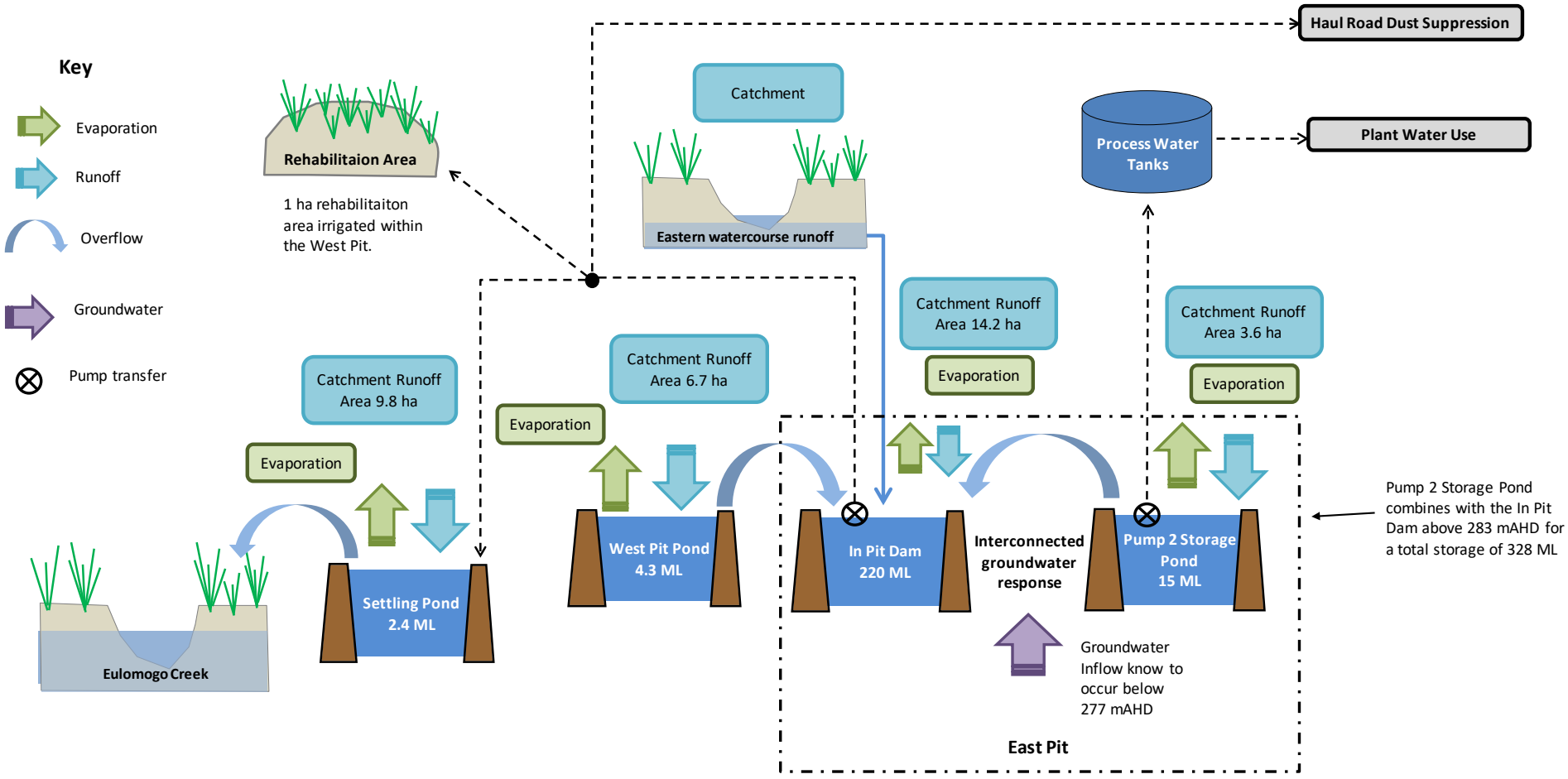


Figure 6.8 **Existing water management system diagram**

v Water licences

Holcim currently holds the following water access licences (WALs):

- WAL 43440 for 136 ML of surface water within the Maryvale Guerie Creek Water Source; and
- WAL 34573 to account for 90 ML of groundwater inflows into the East Pit within the Gunnedah-Oxley Basin MDB (Other) Management Zone of the Gunnedah-Oxley Basin MDB Groundwater Source.

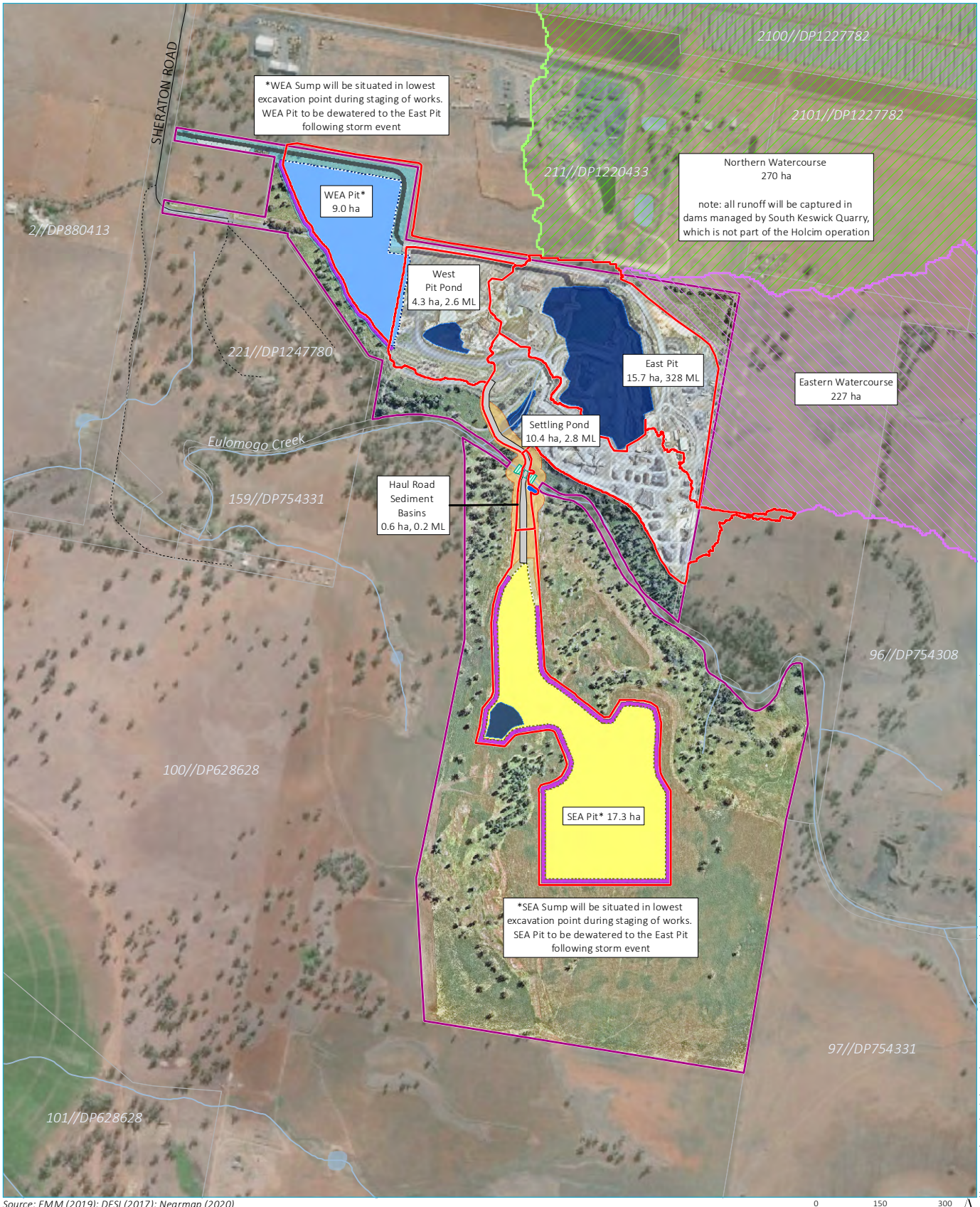
6.7.4 Impact assessment

i Proposed water management system

The project will include the following modifications and additions to the existing water management system.

- The In-Pit Dam and the Pump 2 Storage Pond will be combined into a single water storage – the East Pit. The water level in the East Pit will generally be maintained at or above a level that restricts groundwater inflows. However, during dry periods, water in the East Pit may be drawn down to a level that enables groundwater inflows to occur up to Holcim's existing WAL entitlement of 90 ML/year.
- The capacity of the Settling Pond will be increased from 2.4 ML to 4.9 ML. Water captured in the Settling Pond will be dewatered to the East Pit within 5 days following the cessation of rainfall. These modifications will achieve compliance with the methods recommended in *Managing Urban Stormwater: Volume 1* (Landcom 2004) and *Volume 2E* (DECC 2008). Any overflows or pumped dewatering from the East Pit will be discharged directly downstream of the Settling Pond, just upstream of Eulomogo Creek.
- Sumps are to be constructed in the WEA and SEA. These will be situated at the lowest excavation point during staging of works. Water from sumps within the WEA and SEA will be pumped to the East Pit or managed in a way that does not require discharge of surplus water. For example, water that accumulates in the SEA sump could be used within the SEA for haul road dust suppression and irrigation of bund walls and rehabilitation areas.
- Two sedimentation ponds will be constructed adjacent to the proposed southern haul road, north and south of the proposed crossing of Eulomogo Creek.

The water storages described above are shown in Figure 6.9. A diagram of the existing water management system is provided in Figure 6.10.



Source: EMM (2019); DFSI (2017); Nearmap (2020)

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KEY

- Project area
- Proposed sub catchment
- The Eastern Watercourse - 227 ML
- The Northern Watercourse - 270 ML
- Proposed water management dams
- Proposed sedimentation pond
- Indicative existing disturbance area
- Proposed haul road
- Indicative proposed water crossing
- Bund wall
- Truck tarping area
- Proposed access road
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)

Proposed water management system layout

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.9

EMM creating opportunities

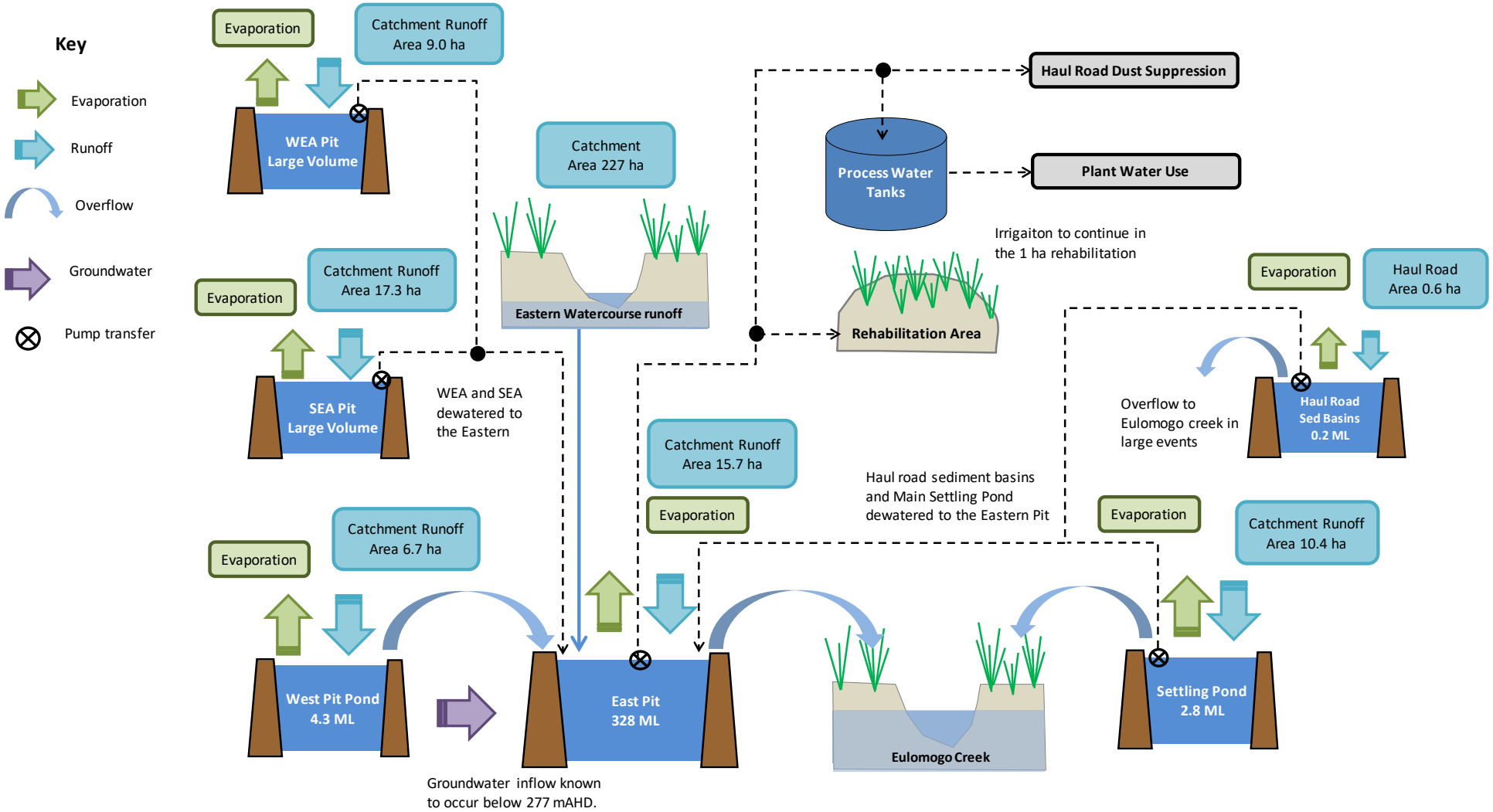


Figure 6.10 **Proposed water management system diagram**

ii Water usage

There will be no change to the amount of water used for dust suppression in the processing plant (Table 6.29). The project will require an increased amount of water used for dust suppression on haul roads in comparison to existing water usage.

Table 6.30 Comparison of existing and proposed water usage

Water use	Existing annual water usage	Proposed annual water use
Haul road dust suppression	Between 68 and 74 mega litres per year (ML/year) for wet and dry years, respectively.	Between 166 and 181 ML/year for wet and dry years, respectively.
Processing plant dust suppression	18 ML/year	18 ML/year

iii Predicted flooding impacts

A culvert-based crossing is proposed to connect the SEA to the existing site. The design of which will be defined during detailed design of the project from two options (refer Appendix C of Appendix H). Option 1 includes five 2.1-m diameter precast pipe. Option 2 includes five 3.0 x 2.3-m rectangular box culverts.

A flood study was completed by GRC Hydro (Appendix A of Appendix H) to assess the flood characteristics associated with Option 2 (the larger option and thus more obstructive). The flood study found that:

- peak flows at the crossing are estimated to be 83, 111 and 201 cubic metres per second (m^3/s) for the 20%, 10% and 1% Annual Exceedance Probability (AEP) events, respectively; and
- hydraulic modelling results characterise flooding within Eulomogo Creek as being confined to the channel and immediate overbank areas. No flood waters are predicted to enter existing quarry pits or impact existing infrastructure. Typical velocities range from 2.5 to 3.5 m/s for the 20% and 1% AEP events, respectively; and
- the culverts will have capacity similar to the 20% AEP peak flow, being 83 m^3/s. The crossing will create a flood level impact of up to 3 m in an 1% AEP event due to the construction of the safety berm and concrete pavement; and
- the flood level impact will extend for 300 m, upstream of the crossing, be confined to the creek channel zone and immediate surrounds and occur only within the quarry site. Localised increases in velocities are expected immediately downstream of the culvert due to the concentration of flows through the culverts.

Flooding is not anticipated to impact on quarry operations as the duration of flooding of Eulomogo Creek is less than 24 hours. Operations can continue during this time on the northern side of Eulomogo Creek. During flooding, access to the southern side of Eulomogo Creek can be achieved via an alternate light vehicle access road (through the landowners property and driveway access to Old Dubbo Road), facilitating storm event preparation (such as moving plant items) and personnel evacuation.

iv Discharges to Eulomogo Creek

The project will significantly improve current surface water discharges to Eulomogo Creek due to the design of the proposed water management system, which will reduce the frequency and magnitude of discharges (Table 6.31).

Table 6.31 Comparison of discharge regimes to Eulomogo Creek

Component of water management system	Units	Existing operation			Proposed operations		
		Dry year	Median year	Wet Year	Dry year	Median year	Wet Year
Sediment basin overflows	ML/year	5	18	35	0.4	3.6	16
East Pit dewatering	ML/year	126	231	376	0.0	0.0	153
Total discharges	**ML/year**	**131**	**249**	**411**	**0.4**	**3.6**	**169**

Notes: 1. Dry year referes to a typical 10th percentile rainfall year
2. Wet year refers to a typical 90th percentile rainfall year

The reduction in frequency and magnitude of discharges is expected to beneficially change receiving water quality and improve the natural flow regime of Eulomogo Creek, specifically:

- nutrient loads in discharges will be reduced as groundwater inflows into the East Pit (the main source of nutrients) will be substantially reduced – this may reduce the risk of blue-green algae blooms in downstream watercourses;
- discharges are not expected to be turbid or sediment-laden;
- salt loads in discharges are expected to be significantly reduced which will contribute to achieving salinity targets applied as the project's DGVs; and
- discharges will only occur during or shortly after wet weather events when streamflow is high and, consequently, will not increase metal or toxin concentrations in the receiving water.

v Water balance model

Based on the water balance model, the key outcomes of the proposed water management system will be:

- groundwater inflows into new and existing quarry pits will be minimised (from approximately 191 ML/year to 27 ML/year in a dry year scenario); and
- the frequency and magnitude of discharges from the East Pit and sedimentation dams will be substantially reduced (with minor discharges predicted only from sediment basin overflows during dry years and median years, and discharge volumes during wet years decreasing from 411 ML/year to 169 ML/year).

vi Licencing

As surface water and groundwater take will not exceed amounts stipulated in the WALs, no changes to the WALs are proposed as part of the project.

6.7.5 Mitigation measures

The water balance modelling completed for the proposed water management system predicts that the project will effectively reduce discharges to Eulomogo Creek. As described above, this will beneficially impact the natural water quality and flow Eulomogo Creek. This is consistent with objectives for uncontrolled streams and major regulated rivers stipulated in *NSW Water Quality and River Flow Objectives* (DECCW 2006).

All surface water management will be constructed in accordance with the methods recommended in *Managing Urban Stormwater: Volume 1* (Landcom 2004) and *Volume 2E* (for mines and quarries) (DECC 2008). Holcim will continue monitoring water quality and levels in groundwater and surface water in the water storages and Eulomogo Creek.

A water management plan will also be prepared which details the management measures that will be implemented to manage quarry groundwater inflows and to monitor surface water levels and water quality.

Contingency measures to address excess water within the water management system are provided in Table 6.32.

Table 6.32 Contingency measures

Trigger	Contingency measure
Groundwater inflows exceed existing WAL allocations.	• If practical, maintain higher water levels in pit sumps to reduce groundwater inflows. • Acquire additional WAL entitlements.
The water management system is in surplus and discharges from the East Pit are required frequently, outside of significant wet weather events.	• Irrigation activities can be expanded to include the proposed bund walls around the WEA and SEA, new rehabilitation areas established progressively during the project life and unused haul roads. This will substantially increase water use. • There is potential for Holcim to supply water to nearby irrigators for beneficial use.

6.7.6 Conclusion

Modifications to the existing surface water system are proposed as part of the project, with the primary aim of minimising discharges to Eulomogo Creek.

The water balance model results predict that the proposed water management system will result in substantially less discharges to Eulomogo Creek during wet periods and will decrease in groundwater inflows. In addition, the assessment found that the proposed new discharge location and regime will beneficially impact receiving water quality and natural flow regime of Eulomogo Creek.

A flood study for the Eulomogo Creek crossing study found that culverts beneath the crossing will have a capacity for 20% AEP events (83 m^3/s). A flood level impact of 3 m in an 1% AEP event will extend for up to 300 m upstream and only within the quarry site.

Runoff collected in the key storages will continue to be used for dust suppression purposes. Water usage for dust suppression on the haul roads will be increased from 68 ML/year to 166 ML/year for wet years and from 74 ML/year to 181 ML/year for dry years.

The proposed water management system will be constructed in accordance with *Managing Urban Stormwater: Volume 1* (Landcom 2004) and Volume 2E (DECC 2008) in addition to several proposed management and monitoring plans.

6.8 Groundwater

6.8.1 Introduction

The project design has given consideration to measured groundwater levels and proposed a maximum pit depth is above the groundwater table to avoid interactions with groundwater. A qualitative desktop groundwater assessment is provided below.

6.8.2 Assessment approach

i Assessment requirements

The groundwater SEARs requirements and are listed in Table 6.33.

Table 6.33 Groundwater SEARs requirements

SEARs requirement
Water – including:
– an assessment of the likely impacts on the quality and quantity of existing surface and ground water resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives;
– an assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users; and
– a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;

ii Methodology

As the proposed base of the WEA and SEAs will be above the measured groundwater table, potential interaction with groundwater will be avoided. As described below, the project represents a low to negligible risk to the quantity and quality of regional and local groundwater sources. Therefore, numerical groundwater flow modelling was not necessary but a qualitative desktop groundwater impact assessment was undertaken.

Searches of the WaterNSW real-time water data website were used to identify registered groundwater bores within the project area and its surrounds. Groundwater level monitoring data has been collected within the project area since August 2019.

6.8.3 Existing environment

i Geological setting

Based on the *Dubbo 1:100,000 Geology Map* (National Geoscience Mapping Accord 2000), the project area is within the south-western extension of the geological Gunnedah-Oxley Basin. The Lachlan Fold Belt is to the immediate south and east of this location, and is represented by Silurian and Devonian aged units. The Gunnedah-Oxley Basin is dominated by marine and non-marine Permian and Triassic sedimentary rocks which extend from the Sydney Basin in the south to the Bowen Basin in QLD (DPIE 2019). The Permian and Triassic strata are unconformably overlain by mapped Jurassic volcanic and sedimentary rocks, as well as Tertiary Basalts. However, there is evidence that the mapped Jurassic Pilliga Sandstone is in fact Triassic Napperby Formation and the mapped Napperby Formation west of the project site is Tertiary alluvium (Parsons Brinckerhoff 2003).

The project targets a Tertiary Basalt deposit. There are a number of smaller basalt deposits in the area likely due to successions of lava flows (Environmental Earth Sciences 2013). The thickness of the basalt undulates and based on the registered bore logs, the target basalt unit is estimated to be between 1 to 40 m in thickness (WaterNSW Real Time data).

Around the project area there are large deposits of Quaternary Alluvium associated with the Macquarie and Talbragar Rivers. A deposit of outcropping Quaternary Alluvium (most likely Tertiary alluvium or Quaternary colluvium) is mapped overlying the target basalt unit in the northern end of the deposit. There are remnant Tertiary alluvial deposits across the local area so it is possible that these ancient deposits may be more extensive at depth (Environmental Earth Sciences 2013).

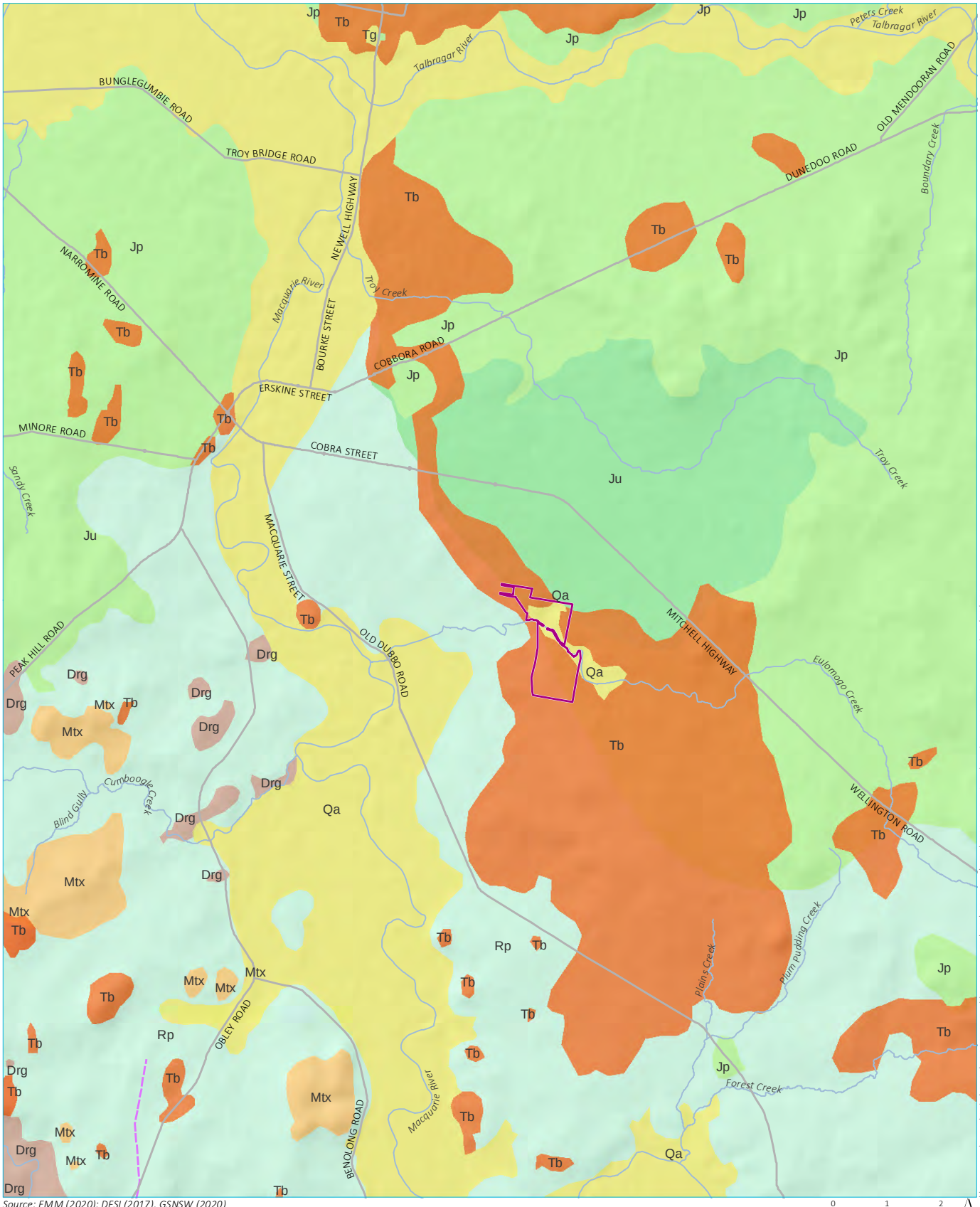
Underlying the alluvium and basalt to the north of the project area are Triassic sedimentary deposits (incorrectly mapped as Jurassic Pilliga Sandstone). The Triassic Napperby Formation is the most widespread. The Triassic Napperby Formation, comprising a siltstone interbedded with sandstone, forms the basement unit and outcrop is widespread. The Triassic Napperby Formation that is mapped to the west of the site beneath the city of Dubbo is in fact a high level (Tertiary) alluvial terrace. The Permian units noted elsewhere in the Gunnedah-Oxley Basin are absent. To the south-west of the project area there are Devonian volcanics.

Table 6.34 provides the stratigraphy and Figure 6.11 shows the geological outcrop, both for the project area and surrounds. Figure 6.11 is based on the *Dubbo 1:100,000 Geology Map* (National Geoscience Mapping Accord 2000); however, more recently published literature (ie Parsons Brinckerhoff 2003) indicates the Pilliga Sandstone south of the Talbragar River is mostly Napperby Formation, and the Napperby Formation beneath Dubbo is mostly Tertiary Alluvium.

Table 6.34 Project area and regional geological units

Age	Name	ID	Description
Quaternary	Quaternary Alluvium	Qa	Alluvial silt, clay and sand, variable humic content. Pebble to cobble sized unconsolidated alluvium
		Qc	Colluvial gravel, sand, silt and clay; may include some eluvial in situ regolith deposits
Tertiary	Tertiary Basalt	Tb	Tholelites, alkali basalt, basanite, nephelinite, limburgite, trachyte and rare obsidian
		Tg	Sub-basaltic and/or high level quartz or polymictic gravels, sands
Jurassic	Pilliga Sandstone	Jp	Massive to cross-bedded coarse pebbly lithic-quartz sandstone, minor fine grained sandstone and siltstone
	Purlawaugh Formation	Ju	Ferruginised red siltstone, carbonaceous mudstone, fine to medium grained lithic quartz sandstone, ironstone and minor coal
Mesozoic	Undifferentiated	Mx	Trachyte, quartz trachyte, rhyolite
Triassic	Napperby Formation	Rp	Finely laminated quartzose sandstone, claystone and siltstone interbedded with thick, massive or cross-bedded sandstone; minor conglomerate. Common bioturbation and mudcracks
Devonian	Hyandra Creek Group	Drx	Rhyolite, dacite and tachylite
	Gregra Group	Dgx	Limestone, calcareous sandstone, crystal-lithic sandstone, breccia, siltstone, tuff

Source: Dubbo 1:100,000 Geology Map



Source: EMM (2020); DFSI (2017), GSNSW (2020)

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KEY

- Project area
- Major road
- Named watercourse

Statewide geology (250k)

- Fault interpreted from geophysical data

Geological units

Quaternary

- Quaternary alluvium (Qa, Qc)

Tertiary

- Tertiary Basalts (Tb, Tg)

Jurassic

- Pilliga Sandstone (Jp)
- Purlawaugh Formation (Ju)

Mesozoic

- Undifferentiated mesozoic igneous rocks (Mtx)

Triassic

- Napperby Formation (Rp)

Mid Devonian (Dgx)

- Hyandra Creek (Drg)
- Gregra Group (Drx)
- Toongi Group (S-Do)

Regional geology

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Figure 6.11

EMM
creating opportunities

ii Hydrogeological setting

The following groundwater systems are likely to be present below the project area and surrounds:

- a localised system associated with Tertiary Basalt deposits;
- a localised system associated with outcropping and buried alluvial and colluvial deposits; and
- a regional, porous rock system associated with the sedimentary basement rocks.

The basalt units are unconfined low-permeability units. Groundwater flow in the basalt is expected to be via fractures, joints and fissures, ie secondary porosity, with the volume of groundwater in the unit dependent on rainfall. These systems are expected to receive direct rainfall recharge with subsequent discharge at geological contacts, springs and to the underlying regional groundwater system.

Alluvial groundwater is found in the unconsolidated outcropping alluvial and colluvial deposits adjacent to the major and minor watercourses and as buried deep leads below some basalt flows. These deposits are relatively shallow and fresh as the water table responds directly to rainfall recharge. Reference to bore log GW061634 indicates a 4 m thick coarse gravel lens underlying a basalt deposit approximately 2 km south of the site, and at GW014999 a 3 m thick gravel lens underlying basalt approximately 1 km east of site. Environmental Earth Sciences (2013) reported buried sand and gravel deposits south of the project area around Toongi, some of which are hydraulically connected to the outcropping alluvial deposits. The Macquarie River is both a recharge and discharge feature for the alluvium (Parsons Brinckerhoff 2003).

The Triassic sedimentary basement rocks form a regional porous rock groundwater system. Groundwater flow is via both primary porosity with water movement around the rock grains, as well as via secondary porosity with water movement through fractures made up of a combination of joints, bedding plane separation, faults and cavities within the rock mass (DPIE 2019). Areas of high flow are encountered where there is a high density of open and interconnected fractures. Recharge to these systems is primarily through infiltration from rainfall, runoff and surface water within the outcropping areas. However, inflow can also occur from downward percolation of groundwater from overlying permeable strata that coincides with layers of the sedimentary sequences that have sufficient permeability for groundwater exchange to occur (DPIE 2019).

There is limited information on the degree of connection between the Gunnedah-Oxley Basin sedimentary basement sequences and the overlying Tertiary and Quaternary strata. However, in areas where permeable sedimentary rocks underlie or adjoin the basalt and alluvial systems there is expected to be potential for groundwater exchange to occur depending on the relative hydraulic heads (DPIE 2019).

iii WaterNSW real-time water data

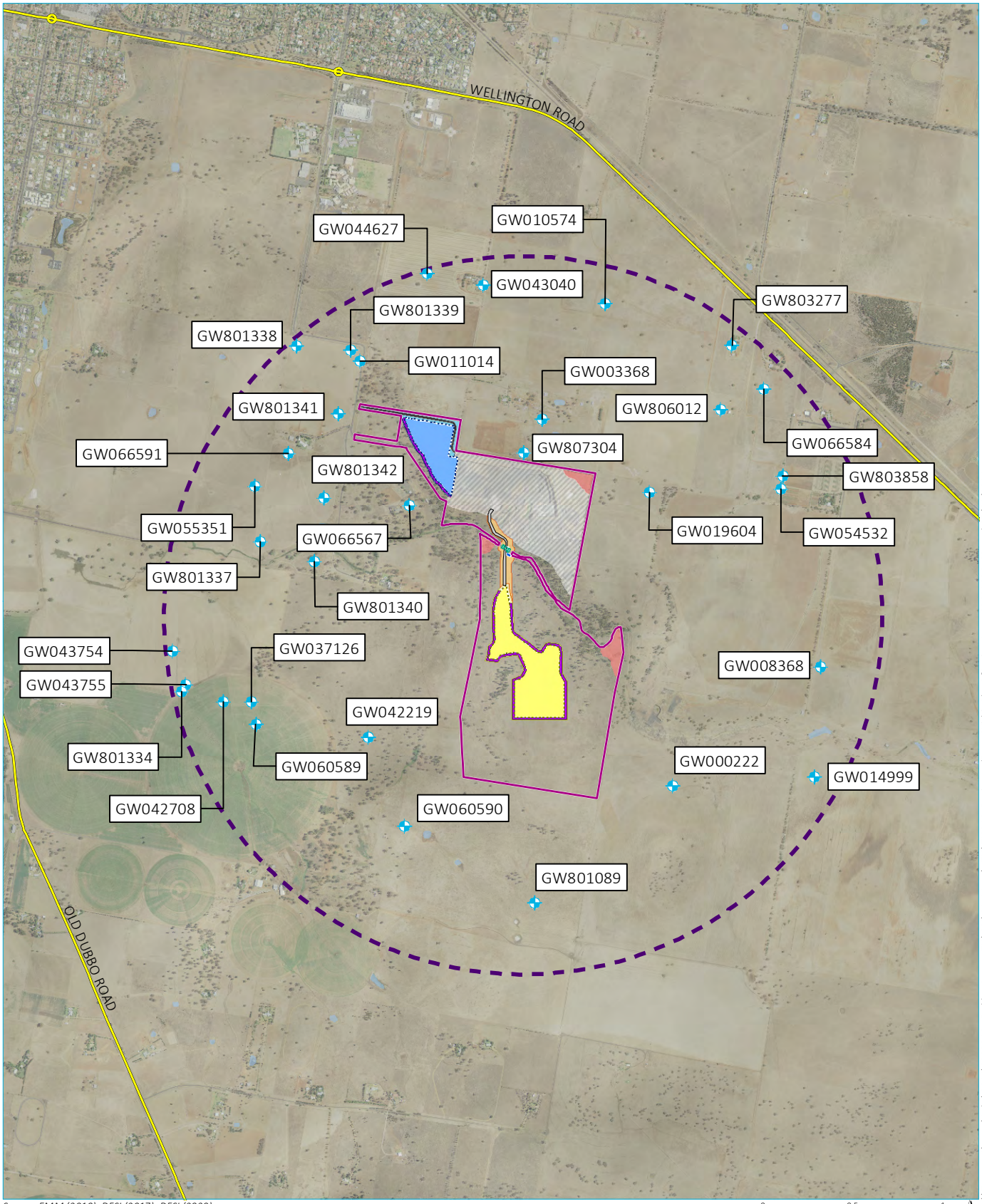
A search of the WaterNSW real-time water data website indicates that there is moderate groundwater use around the project area. In a 2 km radius there are 33 registered groundwater bores. Details of these bores are included in Table 6.35 and locations are shown in Figure 6.12.

Reference to the target lithology shows landowner bores target all three groundwater sources: basalt, buried alluvium and porous sedimentary rock. The deepest bore is 149 m and the majority of the bores are for stock and domestic supply. There is a large range of groundwater yield; the maximum yield from the basalt was 7 L/s, the maximum yield from the sandstone was 1.5 L/s and the maximum yield from the alluvium was 126 L/s. The high yield from the alluvium production bore is an outlier as this bore in located in the deep Quaternary/Tertiary alluvium that exists to the west of the site. Bore yields from the local alluvium are unlikely to exceed 5 L/s.

Table 6.35 Registered bores in a 2 km radius

Bore ID	Bore depth (m)	Screen interval (mbgl)	Target formation	Water bearing zone (mbgl)	Yield (L/s)	Purpose
GW000222	17.5	-	Basalt	-	-	Stock
GW003368	49.68	-	Sandstone	43.9	-	Stock
GW008368	76.2	14.9-15.7 16.2-16.8	Basalt	15.2-16.7	0.7	Stock
GW010574	84.7	-	Sandstone, shale	-	-	Stock
GW011014	67.1	-	Sandstone, shale	-	-	Stock
GW014999	41.2	-	Gravel	32.6-40.9	0.52	Stock
GW019604	41.2	-	Sandstone	38-41	1.5	Stock
GW037126	57.9	-	Gravel	41.4-56.3	17.4	Local Government
GW042219	12.2	-	-	-	-	Stock
GW042708	49.4	31.6-34 42.6-45.6 45.7-48.7	Gravel	41.4-48.7	126.3	Local Government
GW043040	87.8	-	Basalt and alluvium	-	-	Stock, domestic
GW043754	76.2	42-45.6 54.2-57.2	Alluvium gravel	-	-	Test bore
GW043755	61	42.9-46.5	Alluvium gravel	41.1	21.2	Test bore
GW044627	68.6	-	Sand, sandstone	-	-	Stock, domestic
GW054532	33	-	Basalt and alluvium	11.5-12.0 Basalt 25.5-26.0 Clay	1.3	Domestic, Farming, Industrial, Irrigation
GW055351	0	-	-	-	-	Stock
GW060589	12.5	-	-	-	-	Stock
GW060590	11	-	-	-	-	Stock
GW066567	30	12-30	-	-	2.1	Domestic, stock
GW066584	62	44-59	Sandstone, sand	-	1.5	-
GW066591	93	Backfilled	sandstone, basalt	-	-	-
GW801089	45	-	-	-	-	Test bore
GW801334	46	-	Gravel / sandstone	-	-	Stock
GW801337	65	-	Gravel / sandstone	-	-	Stock
GW801338	149	-	Sandstone, mudstone	-	-	-
GW801339	29	-	Basalt, clay, sand	-	-	-
GW801340	53	-	Sandstone, mudstone	11	-	Stock
GW801341	83	-	Sandstone, mudstone	-	-	-
GW801342	72	-	Siltstone / sandstone	-	-	Stock
GW803277	50	30-50	Shale, sandstone	45	1	Domestic, stock
GW803858	50	10-45	Basalt	30-33	7	Domestic, Stock
GW806012	49	-	-	-	-	-
GW807304	43	-	-	-	-	-

Notes: mbgl = meters below ground level, L/s =litres per second, NA = not applicable



Source: EMM (2019); DFSI (2017); DFSI (2020)

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GDA 1994 MGA Zone 55

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KEY

- Project area
- Project area- 2 km buffer
- Registered bore
- Sediment pond
- Aboriginal protection zone
- Proposed haul road
- Indicative proposed water crossing
- Proposed access road
- Truck tarping area
- Indicative existing disturbance area
- Bund wall
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Major road

Registered bores within a 2 km radius

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Figure 6.12

EMM creating opportunities

iv Water sharing plans

The project area sits within alluvial, porous rock and fractured rock groundwater resources and the relevant water sharing plans are:

1. the Gunnedah-Oxley Basin Murray Darling Basin (MDB) Groundwater Source, within the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources* 2020;

2. the Lachlan Fold Belt MDB Groundwater Source, within the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020* (underlying the Gunnedah-Oxley Basin); and

3. the Upper Macquarie Alluvial Groundwater Source *(Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources* 2020) associated with the Macquarie River alluvium to the west of the project area.

v Baseline monitoring

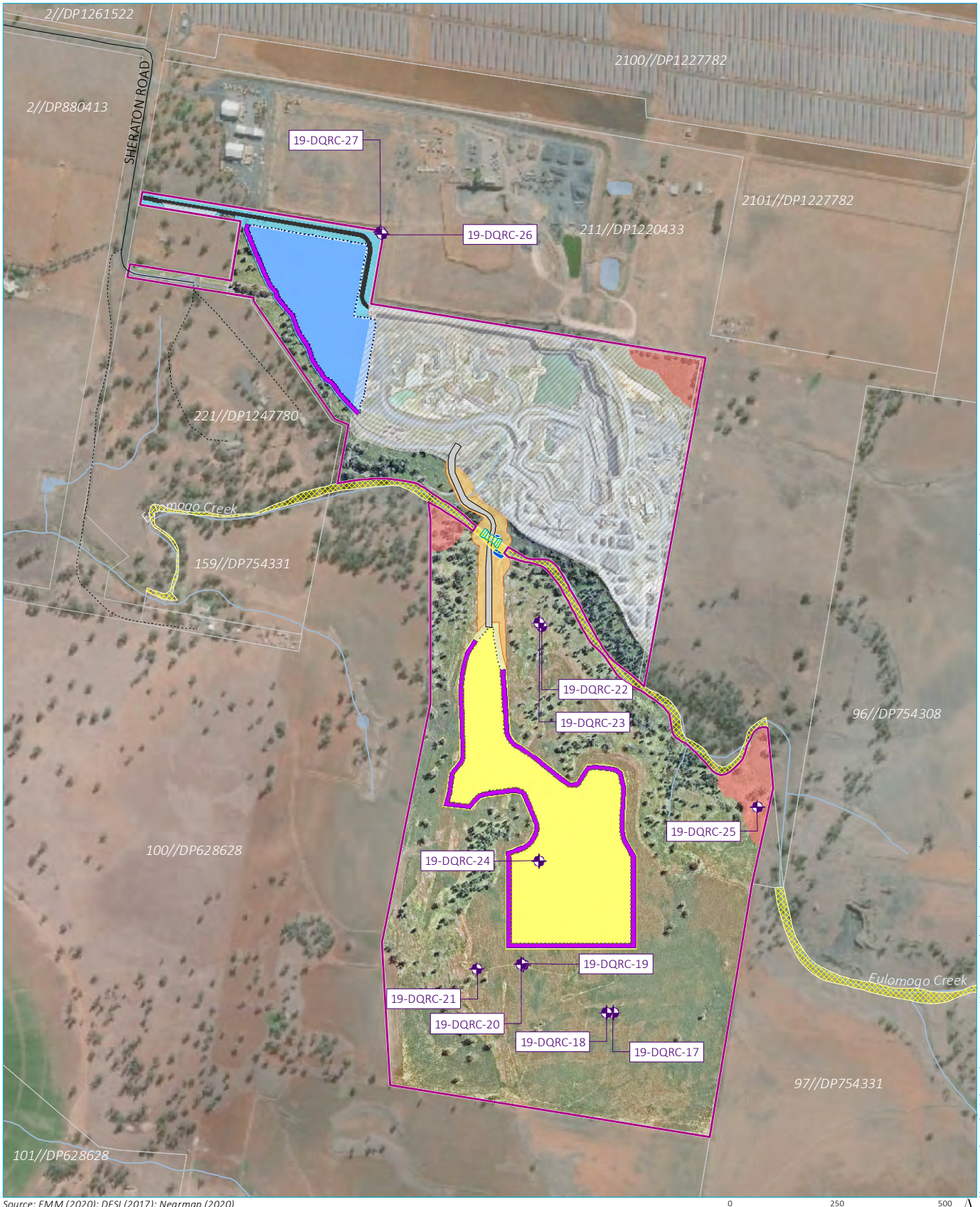
Holcim installed 11 groundwater monitoring bores for the extension project in August 2019. An overview of the installations is provided in Table 6.36 and their locations are shown in Figure 6.13.

The groundwater monitoring network intercepts the target basalt formation and underlying buried alluvium both in the project area and its surrounds. The bores targeting the basalt have been screened at the base of the basalt unit.

Table 6.36 Project groundwater monitoring bores

ID	Project area location	Total depth (m)	Total depth (mAHD)	Screen interval (mbgl)	Target formation
19-DQRC-17	SEA	31.0	274.4	23–29	Buried alluvium
19-DQRC-18	SEA	20.0	285.2	13–19	Basalt
19-DQRC-19	SEA	26.5	278.2	19.5–25.5	Buried alluvium
19-DQRC-20	SEA	22.7	281.9	15.7–21.7	Basalt
19-DQRC-21	SEA	39.2	265.1	31.2–37.2	Basalt and buried alluvium/clay
19-DQRC-22	SEA	25.9	270.2	21.9–24.9	Buried alluvium/clay
19-DQRC-23	SEA	19.0	276.9	11–17	Basalt
19-DQRC-24	SEA	20.3	283.7	13.3–19.3	Basalt
19-DQRC-25	SEA	17	275.2	11–17	Buried alluvium
19-DQRC-26	WEA	25.1	274.7	18–24	Buried alluvium/clay
19-DQRC-27	WEA	16.1	283.7	9.1–15.1	Basalt

Notes: mbgl = meters below ground level, mAHD = meters Australian Height Datum



Source: EMM (2020); DFSI (2017); Nearmap (2020)

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KEY

- Groundwater monitoring bore
- Project area
- Sediment pond
- Aboriginal protection zone
- Indicative existing disturbance area
- Proposed haul road
- Indicative proposed water crossing
- Bund wall
- Proposed access road
- Truck tarping area
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)
- Crown land

Groundwater monitoring bores

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Figure 6.13

EMM creating opportunities

Groundwater levels in the quarry's monitoring bores have been manually monitored over a 13-month period, from August 2019–September 2020. A total of five sampling events were undertaken during this period.

An overview of the manual measurements is provided in Table 6.37. A hydrograph for the bores targeting the basalt groundwater system in the SEA is provided in Figure 6.14 which plots groundwater elevation with rainfall data collected from the Dubbo Airport Bureau of Meteorology Station (BoM: 65070).

Table 6.37 Overview of groundwater level measurements

ID	Extraction area location	Target formation	Minimum groundwater level (mAHD)	Maximum groundwater level (mAHD)
19-DQRC-17	SEA	Buried alluvium	Dry	279.2
19-DQRC-18	SEA	Basalt	Dry	288.0
19-DQRC-19	SEA	Buried alluvium	Dry	Dry
19-DQRC-20	SEA	Basalt	Dry	Dry
19-DQRC-21	SEA	Basalt and buried alluvium/clay	Dry	276.3
19-DQRC-22	SEA	Buried alluvium/clay	Dry	276.4
19-DQRC-23	SEA	Basalt	Dry	282.0
19-DQRC-24	SEA	Basalt	Dry	285.0
19-DQRC-25	SEA	Buried alluvium	Dry	Dry
19-DQRC-26	WEA	Buried alluvium/clay	Dry	Dry
19-DQRC-27	WEA	Basalt	Dry	Dry

Notes: mAHD = meters Australian Height Datum

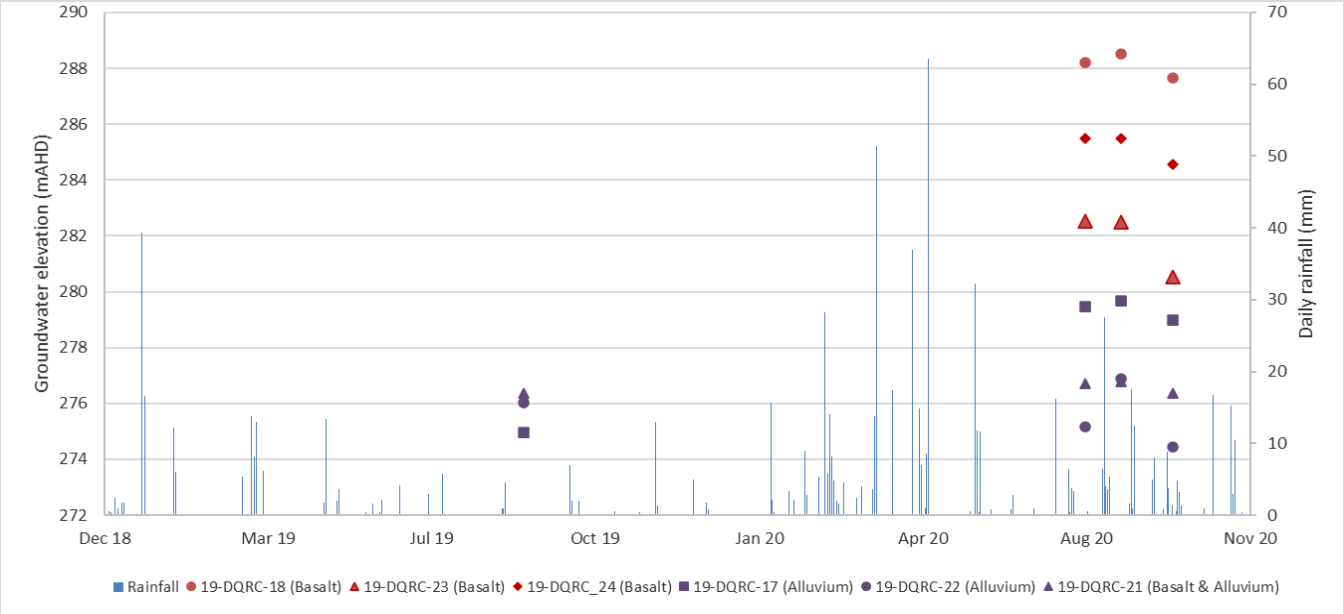


Figure 6.14 SEA – groundwater hydrographs

Five of the eleven bores were dry during all sampling events. These five bores target both the basalt and buried alluvium. This included the two bores in the WEA. All bores were dry in the November 2019 sampling event, following extreme drought conditions. In August 2020, the groundwater levels had risen, by a maximum of 5.7 m in the basalt system and 4.7 m in the buried alluvium, following high and sustained rainfall between February and April 2020. Monitoring in September 2020 shows a decline in all groundwater levels following lower rainfall. Groundwater level monitoring indicates parts of the basalt and buried alluvial groundwater systems are highly responsive to rainfall recharge and are also capable of becoming dry in extreme drought conditions. Based on the available data, the basalt unit does not store groundwater for extended periods across the project area, with discharge from the system likely to the underlying alluvial and porous rock aquifers and/or springs.

Groundwater monitoring bore 19-DQRD-24, targeting the basalt unit and the only bore within the project area, had a maximum groundwater elevation of 285 mAHD which equates to a water level of 18 mbgl.

There is no groundwater quality data available from the quarry's groundwater monitoring bores.

vi Sensitive receivers

a Landholder groundwater use

The WaterNSW real-time water data website has been searched to identify records of registered bores within and surrounding the project area. There are 33 registered bores within a 2 km radius of the centre of the project area (Table 6.35). Of these 33 bores, four are registered for local government or as test bores. The remaining 29 bores are registered for stock and domestic, commercial, or are not listed and were conservatively considered to be for stock and domestic purposes. The average bore depth is 53 m and groundwater use is expected to be for livestock and other anthropogenic uses.

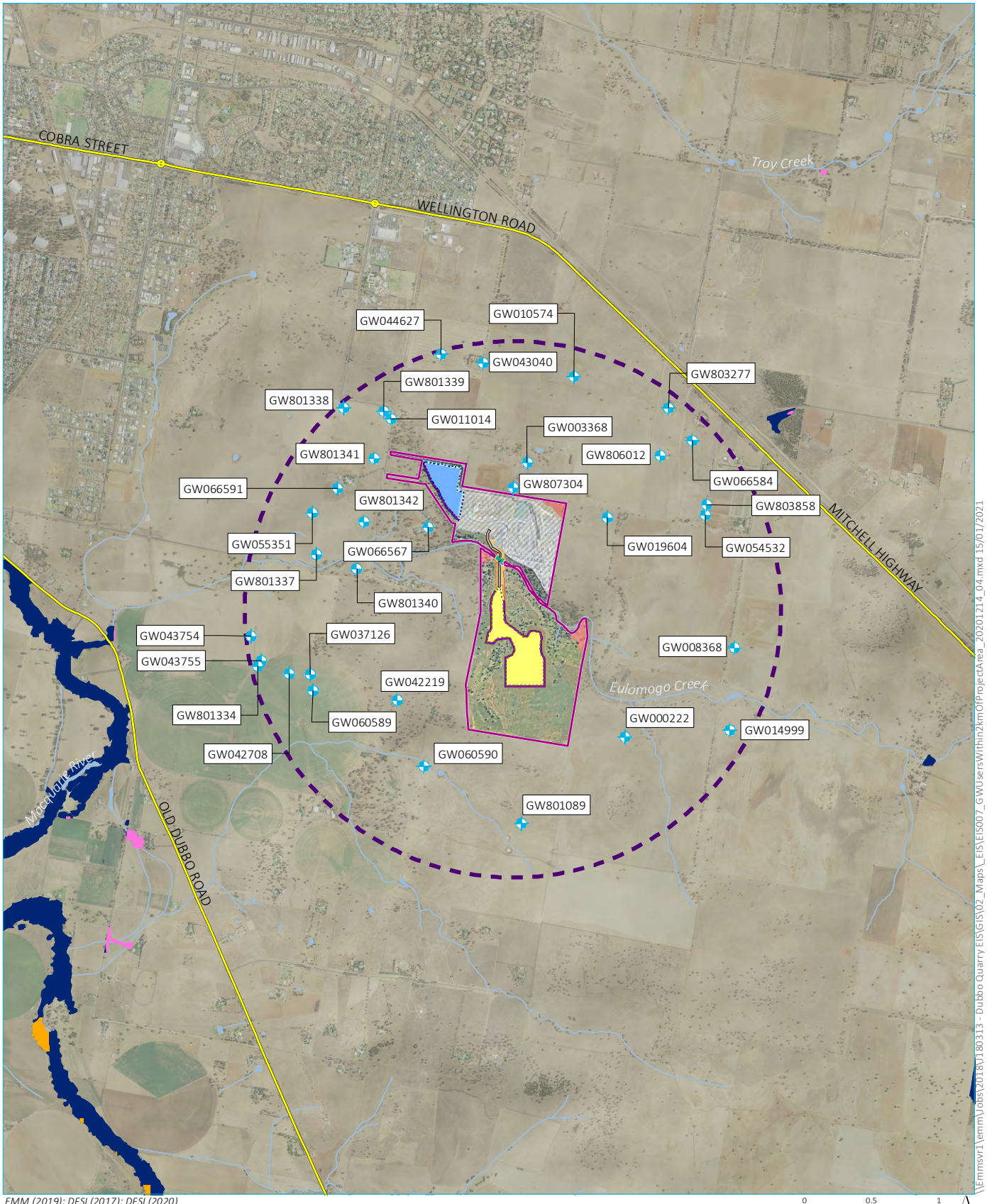
b Groundwater dependent ecosystems

Groundwater can support surface (above ground) and subsurface (below ground) ecosystems that are assessed as beneficial users of groundwater. The NSW Water Sharing Plans relies on the *HEVAE Vegetation Groundwater Dependent Ecosystems Value* dataset layers to map the high priority vegetation ecosystems that may be groundwater dependent ecosystems (GDEs).

The BDAR (Appendix F) did not find any GDEs within the project area.

A review of the *HEVAE* dataset shows there are no potential GDEs in the project area or the 2 km area surrounding the project area. Medium potential GDEs are associated with Macquarie River and associated alluvial aquifers to the west.

The potential for project-related activities to affect the shallow alluvial system sufficiently to cause an impact to a nearby GDE is considered negligible.



EMM (2019); DFSI (2017); DFSI (2020)

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KEY

- Project area
- Project area- 2 km buffer
- Registered bore

GDE HEVAE Category

- High
- Medium
- Low

- Sediment pond
- Aboriginal protection zones
- Proposed haul road
- Indicative proposed water crossing
- Proposed access road
- Truck tarping area
- Bund wall
- Indicative existing disturbance area

- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area
- Major road
- Waterbody
- Watercourse/drainage line

Groundwater users within 2 km of the project area

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Figure 6.15

EMM creating opportunities

6.8.4 Impact assessment

The extent of the project, including the excavation depths, is shown in the staging plans (refer Appendix B). Interception of groundwater during extraction is not anticipated as the base of the quarry pit will remain at least 1 m above the groundwater table. By the end of project life, the maximum pit depth in the north and centre of the SEA is 286 mAHD, which is above the recorded maximum groundwater level of 285 mAHD. In the southern end of the SEA the maximum pit depth is 288.5 mAHD, 200 m further south the maximum recorded groundwater level is lower at 288 mAHD.

The two bores within the WEA were dry and were drilled to a maximum depth of 274.7 mAHD. The proposed maximum pit depth for the Camerons Pit expansion is 283 mAHD, which is approximately 8 m above the base of the bores.

It is not anticipated that dewatering of groundwater from the pit will be required and there will be no groundwater 'take' as a result of the project. Therefore, a detailed groundwater assessment or WAL and aquifer interference approval under the *Water Management Act 2000* are not required. It is predicted that there will be no impact to local groundwater users, both landowners and potential GDEs, as there will be no groundwater take or change to groundwater levels or quality as a result of the project.

6.8.5 Mitigation measures

Groundwater management controls relating to groundwater take will not be required as the base of the extraction areas will be 1 m above the groundwater table. The risk of the project affecting groundwater resources is considered low to negligible; however, ongoing groundwater level monitoring is proposed to ensure quarrying occurs above the groundwater. Diver loggers were installed in eight of the monitoring bores in December 2020. Data from the loggers will be downloaded every three months. The bores will be dipped monthly until such time that a sufficient baseline has been achieved.

The potential for detrimental impacts to groundwater quality from a contamination event will be mitigated through standard construction environmental management including:

- development and implementation of an Operational Environmental Management Plan (OEMP) which will detail relevant procedures, including but not limited to:
    - plant and equipment refuelling;
    - vehicle wash down and/or cement truck washout; and
    - notification requirements to the EPA for incidents that cause material harm to the environment;
- development and implementation of a site-specific spill management plan as part of the OEMP; and
- all fuels and combustible liquids will be managed and handled in accordance with *AS 1940 The storage and handling of flammable liquids*, the WH&S Act and Regulation and the *Storage and Handling of Dangerous Goods – Code of Practice 2005* (WorkCover 2005).

6.8.6 Conclusion

The proposed base of the WEA and SEAs will be at least 1 m above the measured groundwater table. Therefore, potential interaction with groundwater will be avoided and the project represents a low to negligible risk to the quantity and quality of regional and local groundwater sources. It is precited that there will be no impact to local groundwater users, both landowners and potential GDEs, as there will be no groundwater take or change to groundwater levels or quality as a result of the project.

6.9 Land resources

6.9.1 Introduction

This section provides an assessment of the project's land use permissibility against relevant local and State legislation, in addition to a summary of the land and soil capability assessment (LSCA) completed for the project by Landloch Pty Ltd (Landloch) (refer Appendix A of Appendix J). The LSCA characterises the exiting environment and soil types, identifies erosion and sedimentation hazards and provides appropriate management measures and rehabilitation strategies.

6.9.2 Assessment approach

i Assessment requirements

The land resources SEARs requirements are listed in Table 6.38.

Table 6.38 Land resources SEARs requirements

SEARs requirement
Land Resources – including a detailed assessment of:
– potential impacts on soils and land capability (including potential erosion and land contamination) and any proposed mitigation, management and remedial measures (as appropriate);
– potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); and
– the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements in Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007, paying particular attention to the adjacent quarry and agricultural land use in the region;

ii Methodology

a Land and soil capability assessment

A desktop assessment was undertaken using existing information on soils and soil environment for the WEA and SEA. This included reviewing available topographic, geological, vegetation and soil mapping, aerial imagery, and associated reports for the study area and surrounding region. This information was used to draft 'preliminary mapping units' (also referred to as soil mapping units), which are areas of land that are expected to share similar soil landscape attributes.

The field work targeted preliminary mapping units for ground observation. Four sites were adopted for ground observation within the WEA, and 12 sites within the SEA. Laboratory analysis of soils was undertaken by a National Association of Testing Authorities (NATA) and Australian Soil and Plant Analysis Council (ASPAC) accredited laboratory. Soil characteristics and erosion potential were determined and used to identify appropriate erosion and sediment control practices.

The LSCA considered the following standards and guidelines:

- Australian Soil and Land Survey; Guidelines for Surveying Soil and Land Resources (McKenzie et al 2009);
- Australian Soil Classification (Isbell 2002);
- Australian Soil Survey and Land Survey Field Handbook (The National Committee on Soil and Terrain 2009);
- The Land and Soil Capability Assessment Scheme (NSW OEH 2012); and
- Soil and Landscape Issues in Environmental Impact Assessment (NSW Department of Land and Water Conservation 2000).

The LSCA assessed each of the preliminary mapping units against the LSC framework, which is based on the evaluation of eight main hazard and limitations for each soil mapping unit, including water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and rockiness and mass movement. There are also eight classes used to describe each of the land management units, ranging from extremely high capability land to extremely low capability land.

iii Contamination

For consideration of potential for contamination the following was undertaken:

- database searches to assess elements of environmental inputs including historical land use, land zoning, geology, hydrogeology and topography conducted by Land Insight and Resources Pty Ltd (refer Appendix I) which includes a list of all searches and data sources;
- review of historical aerial imagery (for changes over time);
- online searches for specific historical information and other relevant documents; and
- review of acid sulfate soil maps for the site and surrounding land.

6.9.3 Existing environment

i Geology

The study area comprises the two new extension areas (WEA and SEA). The geology of the study areas predominantly consists of the Tholeiitic Alkali Basalt. There is also a unit of Quaternary Alluvium located within the northern edge of the SEA and within the existing Quarry.

The study area is located in the Wongarbon soil landscape, which is considered to have the following features (Murphy and Lawrie 1998):

- moderate to high fertility;
- friable surface soils;
- high water holding capacity;
- moderate to high erosion hazard when cultivated; and
- moderate to high shrink-swell potential.

The LSCA notes that the basalts are highly weathered and fractured, and water easily percolates through the vertical joints in the rock. Small areas of land are affected by moderate to high salinity. The study areas are situated on the plateau and upper slopes, which are considered hydrological recharge zones.

ii Soils

Two soil types were identified across the study area, both of which are classed as *Ferrosols* according to the Australian Soil Classification (Isbell 2002). They are differentiated from each other by soil depth, and include:

- soil type 1: moderately deep ferrosol (0.5 to <1.1 m deep); and
- soil type 2: shallow ferrosol (0.25 – 0.5 m deep).

Both soil types were encountered within the SEA, while only soil type 1 was found to be present within the WEA. Table 4.1.1 of the LSCA shows that the identified soil types have slow to moderate permeability, moderate drainage, and very slow to very rapid runoff (depending on slope). For the purposes of identifying LSC classes, the soil types have been further defined into 5 soil mapping units (refer Table 9 of the LSCA).

Furthermore, several areas of rock outcrops were observed during the field work component of the LSCA. The rock outcrops were primarily located on the crests and upper slopes, with some of the outcrops quite large covering an area of more than 1 ha.

Soils within 500 m of the project area are classified as having a low probability of occurrence of acid sulfate soils (ASS) in accordance with the Atlas of Australian Acid Sulfate Soil, where potential ASS may occur within the upper 1 m soil profile of wet/riparian areas. Therefore, it is considered that there is a low risk of ASS and specific ASS mitigation measures will not be required as part of the project.

The site is identified as having a moderate salinity hazard under the Western Central West Hydrogeological Landscapes, except for a small area of very high hazard rated land in the north-eastern corner of the site.

iii Land and soil capability classes

As summarised in the LSCA, there are 8 LSC classes which range from extremely high capability land to extremely low capability land. Land capability is a function of landscape features and processes and is influenced by terrain, soil and climatic attributes.

A LSC provides information on the land use best suited to an area and is based upon the biophysical characteristics of the land, the extent the biophysical characteristics will limit a particular land use and current technologies that are available to manage the land. The main biophysical characteristic that informs LSC classes is the relevant soil mapping unit, which have been defined for the project area by Landloch (2019).

The existing LSC classes in the project area are shown on Figure 6.16. The WEA contains LSC classes 2 and 3 which are capable of a variety of land uses, including cropping, grazing, horticulture, forestry and nature conservation. LSC classes 2 and 3 have very high to high capability for which any limitations are manageable. The SEA contains mostly LSC Class 5 and small areas of LSC Class 6. LSC Class 5 has moderate to low land capability restricted to grazing, forestry and nature conservation. The SEA is limited by shallow soils and rock outcrops.

iv Contamination potential

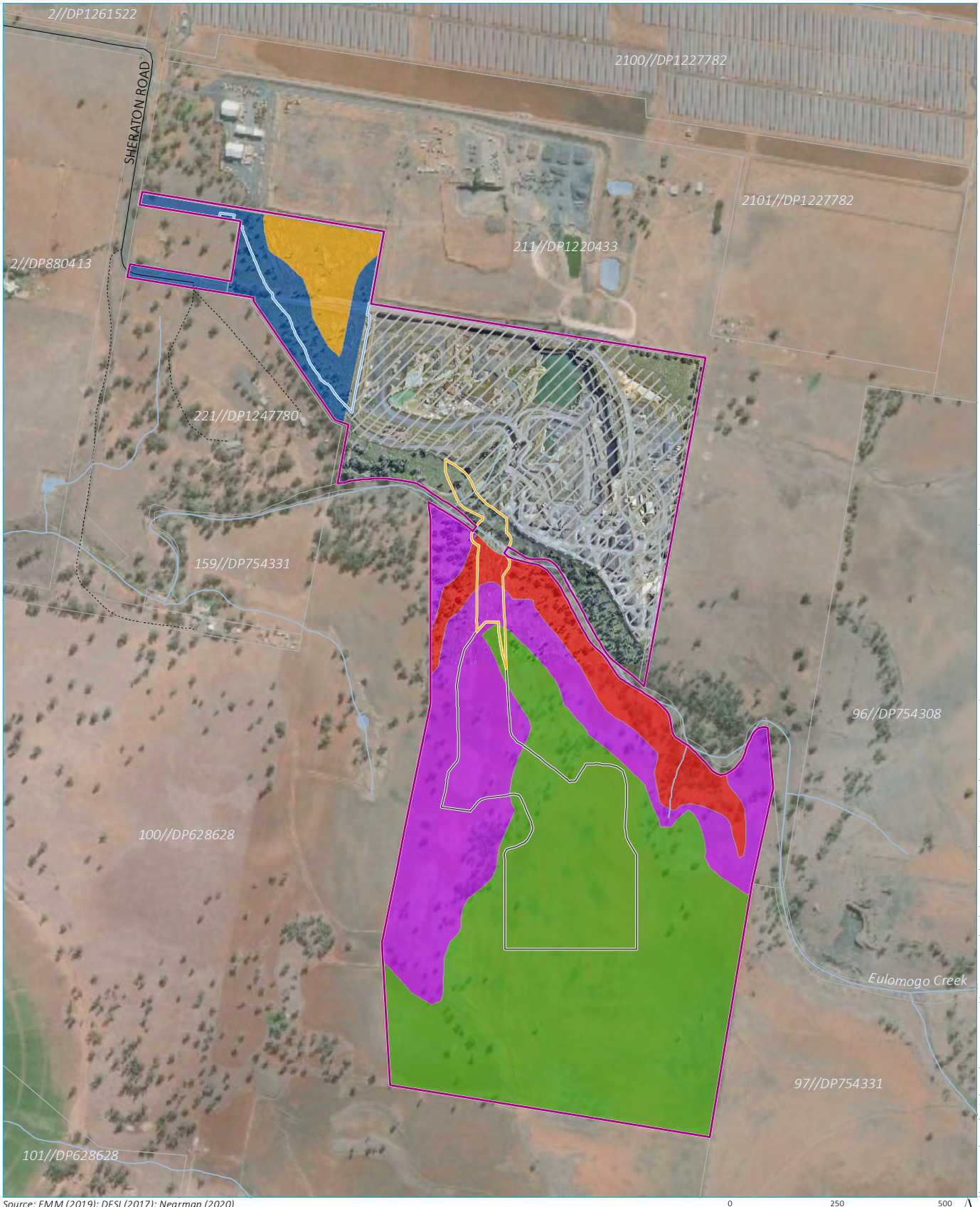
Review of historical aerials for the period 1964-2020 indicate that the historical and current land uses at the site are primarily freehold agricultural, with the exception of the existing quarry which was first established in the early 1980's with the majority of current ground disturbance and construction of surface infrastructure completed by 1991. The historical aerials are provided in Appendix I.

Table 6.39 shows a summary of the potential sources of contamination and associated contaminants of potential concern (CoPCs) identified as an outcome of the historical review.

Table 6.39 Summary of potential sources of historical contamination and CoPCs

Potential sources of contamination	CoPCs	Likelihood of contamination/release mechanisms
Chemical storage	BTEX/TRH/PAHs/VOCs/metals/phenols/nutrients	Potential – leaks or spills from any hazardous chemicals used or stored at the existing operational quarry site.
Potential ACM used in buildings, utilities and pipework and potentially impacted soils	ACM[5]	Potential – based on the age of buildings (1980s) present and past (refer to Appendix C).
Acid mine drainage	Heavy metals	Potential – sulfidic rock material excavated and exposed to oxygen by the operational quarry has the potential to generate acidic leachate referred to as acid mine drainage (AMD), which can migrate across the site.
Potential application of herbicides/pesticides for pest control	OCP[6]/OPP[7]	Potential – pesticides may have been applied to the land used for agricultural production.

Notes: BTEX – Benzene, toluene, ethylbenzene, and xylene, TRH – Total recoverable hydrocarbons, PAHs – Polycyclic aromatic hydrocarbons, VOCs – Volatile organic compounds, ACM – Asbestos containing material, OCP – Organochlorine pesticides, OPP – Organophosphorus pesticides



Source: EMM (2019); DFSI (2017); Nearmap (2020)

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Soil mapping units

- Project
- Indicative existing disturbance
- Western disturbance area
- Haul road disturbance
- Southern disturbance

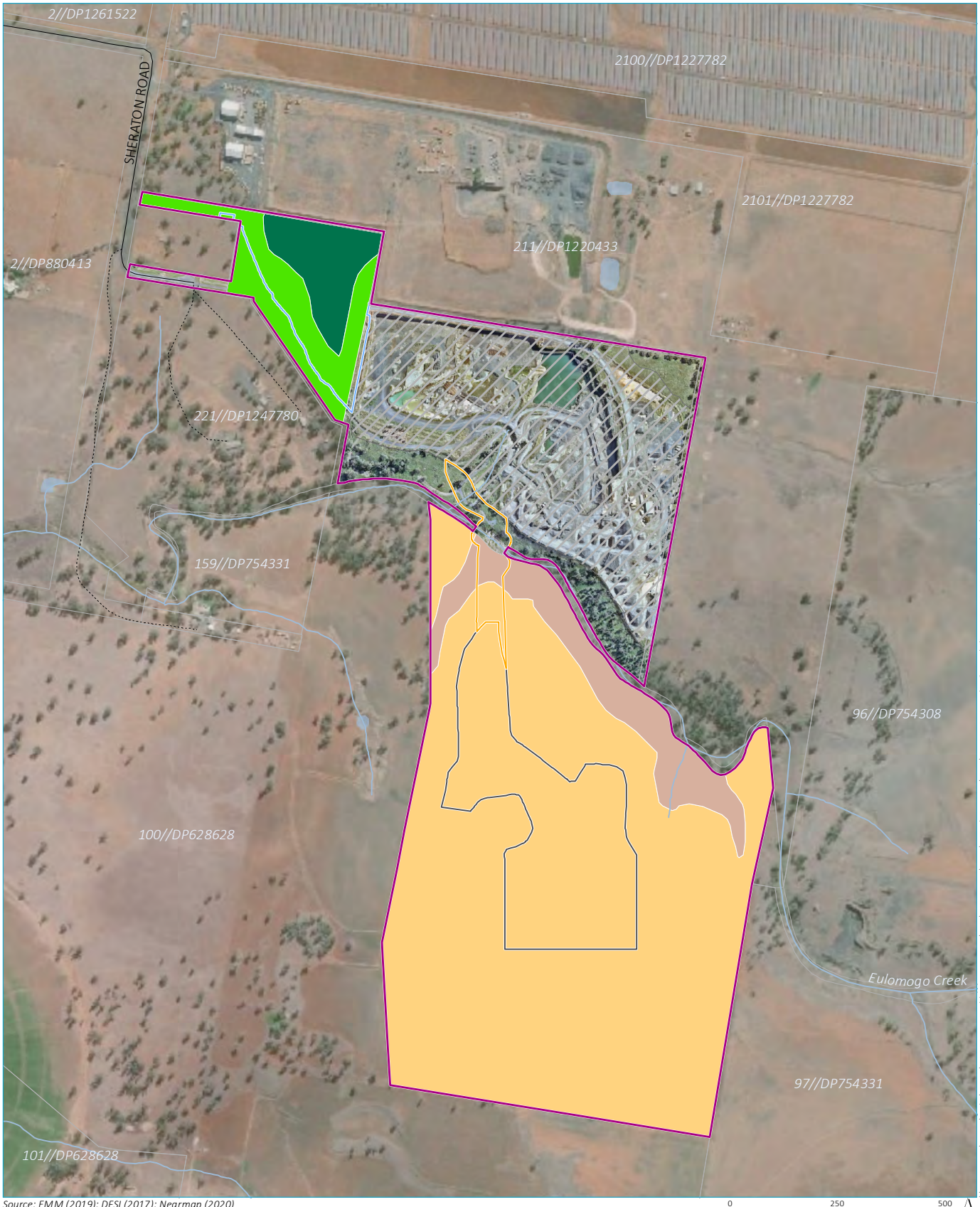
Soil mapping

- A
- B
- C

- Minor road
- Vehicular
- Watercourse/drainage
- Cadastral boundary (data does not

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.16

EMM
creating opportunities



Source: EMM (2019); DFSI (2017); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

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KEY

- Project area
- Western disturbance area
- Haul road disturbance area
- Southern disturbance area
- Indicative existing disturbance area

Land and soil capability

- Very high capability land
- High capability land
- Moderate-low capability land
- Low capability land

- Watercourse/drainage line
- Waterbody
- Minor road
- Vehicular track
- Cadastral boundary (data does not align with surveyed site boundary)

Land and soil capability class mapping of the study area

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EMM
creating opportunities

There were no identified NSW EPA records or other potential regulatory contamination issues within a minimum 500 m radius of the site for the following searches undertaken (refer to Appendix I). Additionally, there are no records for USTs or properties affected by loose-fill asbestos insulation on the site.

6.9.4 Impact assessment

i Land and soil capability

The LSCA provides information on the agricultural land uses most physically suited to a particular area. As previously noted, there are eight LSC classes ranging from extremely high capability land to extremely low capability land. Five soil mapping units (SMU's) were mapped by Landloch 2019 for the project area. The ratings for individual LSC hazards and limitations relative to each SMU are provided in Table 6.40.

Table 6.40 LSC hazard assessment

Hazard/limit	Soil mapping unit				
	Southern extension area			Western extension area	
	A	B	C	D	E
Water erosion	2	3	4	2	3
Wind erosion	1	1	2	1	1
Soil structural decline	2	2	2	2	2
Soil acidification	2	2	2	2	2
Salinity	1	1	1	1	1
Waterlogging	2	2	2	2	2
Shallow soils and rockiness	5	5	6	2	3
Mass movement	1	1	1	1	1
LSC Class	5	5	6	2	3

For SMU's A and B, Landloch 2019 determined that the LSC class for shallow rock was between class 4 and 6 and was, therefore, overall assessed as class 5.

Overall, the findings show that:

- the WEA has LSC Class 2 and Class 3 land, which is capable of most land uses including cropping with cultivation, grazing, horticulture, forestry and nature conservation; and
- the SEA has LSC Class 5 and Class 6 land, which is primarily limited to grazing, forestry, nature conservation, and very occasional cultivation for (dryland) pasture establishment. The primary limitation with the SEA is shallow soils and rockiness. The area identified as Class 6 and shown in Figure 6.17 has widespread rock outcrops that cover an estimated 30-50% if the area, with a soil depth of 0.3-0.7 m. The area identified as Class 5 and shown in Figure 6.17 has localised rocky outcrops ranging <30% in coverage, and a soil depth of 0.25-0.5 m.

ii Contamination

The construction of the project will require the use of heavy machinery and plant. Spills and leaks from machinery or fuel and chemical storage could potentially impact soil and water within the project area if not managed appropriately.

The potential contamination impacts from construction activities are:

- exposure of construction workers and immediate surrounding human receptors (via direct contact, inhalation or ingestion) to existing CoPC (eg hazardous building materials) during construction works which could adversely impact on health; and
- off-site discharge of CoPC to surface water during construction, potentially adversely impacting off-site ecological receptors.

All construction works on the site will be undertaken in accordance with responsibilities under relevant Work Health and Safety legislation and industry guidelines. Any intrusive activities which may be required will be carried out under a Construction Environmental Management Plan (CEMP) and, therefore, the potential risk of exposure to contaminants can be addressed accordingly.

During operation of the project potential sources of contamination will be from minor leaks of fuel and oil from vehicles/heavy machinery. These impacts can be managed through the installation of spill containment measures.

iii Land uses and zoning

To determine the project's compatibility with other land uses in the vicinity, an assessment of the project against the permissible uses and objectives of each zone as provided in the Dubbo LEP and also Section 12 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industry) (Mining SEPP) has been completed below.

The project is classified as 'extractive industry' under the Dubbo LEP, which is defined as:

> *Extractive industry means the winning or removal of extractive materials (otherwise than from a mine) by methods such as excavating, dredging, tunnelling or quarrying, including the storing, stockpiling or processing of extractive materials by methods such as recycling, washing, crushing, sawing or separating, but does not include turf farming.*

Extractive industries are permissible with consent within the IN3 and RU1 zones. Extractive industries are prohibited within the RE2 zone. However, Section 4.38(3) of the EP&A Act states, in relation to SSD, that:

> *(3) Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.*

An assessment of the project against each objective of the applicable land zones is provided in Table 6.41.

Table 6.41 Assessment of the project against zoning objectives

Objective	Comment
RE2 Private Recreation	
To enable land to be used for private open space or recreational purposes.	It is understood, based on anecdotal accounts, that land within the project area and to the north was originally zoned private recreation in the 1980's for the purposes of potentially establishing a golf course in this location. Subsequent zoning plans have retained the private recreation use to provide a buffer between encroaching residential land and the quarry. However, the land has since been subdivided and sold off with a second quarry (South Keswick Quarry) recently established within the RE2 zoned land. This has meant that the land no longer has significant potential as a recreational space as well as having a reduced buffer benefit. The project will retain part of this RE2 zoned land as a visual buffer. Following completion of quarrying, this land will be rehabilitated with future land uses to be determined in consideration of the land use zoning.
To provide a range of recreational settings and activities and compatible land uses.	
To protect and enhance the natural environment for recreational purposes.	

Table 6.41 Assessment of the project against zoning objectives

Objective	Comment
RU1 Primary Production	
To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.	The project will maintain the supply high quality basalt product to local and regional markets. It will maintain an extraction and processing rate of up to 500,000 tpa of basalt for up to 25 years.
To encourage diversity in primary industry enterprises and systems appropriate for the area.	The project will allow continued quarrying at an existing site that is already established as an extractive industry land use, in close proximity to another separate and private basalt quarry. Therefore, the project could be considered an appropriate land use.
To minimise the fragmentation and alienation of resource lands.	It will allow continued quarrying at an existing site that is already established as an extractive industry land use, therefore minimising the area of land disturbance and avoiding the fragmentation of surrounding agricultural land.
To minimise conflict between land uses within this zone and land uses within adjoining zones.	The project area is surrounded by agricultural land, apart from a solar farm and separate quarry to the north. There are private residences located west of the project area. The existing quarry has been operating with minimal conflict since 1980 next to these adjoining land uses. As noted above, the project will allow the continued quarrying at the existing site, and therefore will not be established in proximity to any new adjoining land uses or zones.
To enable uses of an appropriate scale to facilitate the economic sustainability of primary production.	The quarry currently provides around 350,000 tpa of basalt quarry products to local and regional markets. This includes State and local government projects, which are largely unaffected by the current economic situation. The project can be considered economically sustainable, as there is an sustained existing and forecasted demand for construction materials. In the Dubbo region alone, there are several large scale Government projects proposed in order to meet future population growth, including the new Dubbo Bridge, the Newell Highway upgrades at West Dubbo and various local road developments.
To enable function centres, restaurants and appropriate forms of tourist and visitor accommodation to be developed in conjunction with agricultural uses.	The project will not impact any established function centres, restaurants or tourist and visitor accommodation.
IN3 Heavy Industrial	
To provide suitable areas for those industries that need to be separated from other land uses.	The quarry is within an established quarry precinct which is generally separated from other land uses such as dense residential areas.
To encourage employment opportunities.	The project will ensure the continued employment of the existing quarry workforce and ancillary workers.
To minimise any adverse effect of heavy industry on other land uses.	Adverse impacts of the project on other land uses have been minimised and mitigated where reasonable and feasible.
To support and protect industrial land for industrial uses.	The project will ensure the continued use of industrial land for an industrial use.

An assessment of the project against section 12 of the Mining SEPP is provided in Table 6.42.

Table 6.42 Assessment of the project against section 12 of the Mining SEPP

Clause			Comment
a)	consider -		
	i)	the existing uses and approved uses of land in the vicinity of the development, and	Land uses in close vicinity to the project area include a separate basalt quarry, solar farm and sparse rural residential properties. A school precinct and high density residential area are also located in proximity to the project area. The existing quarry has been operating in proximity to these land uses since 1980 with minimal conflict. Considering this, the project will not significantly impact or be incompatible with, existing or approved land uses around the project area.
	ii)	whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and	Impacts to surrounding land uses are considered in Chapter 6 of this EIS. The project will generally not have significant impacts to these land uses with the exception of two neighbouring residential properties (R2 and R3). No significant impacts to land identified for future residential development are predicted. An SIA was completed for the project, which considers its impact on socio-economic trends in the local and regional area. The SIA is summarised in section 6.12 of this EIS.
	iii)	any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and	The quarry is within an established quarry precinct and currently does not receive complaints from neighbouring properties. Potential future amenity impacts to surrounding land uses have been considered in Chapter 6 of this EIS. The project will be generally compatible with surrounding land uses.
b)	evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii), and		Consideration of the social and public benefits of the project have been given in Sections 6.12 and 6.13 of this EIS.
c)	evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).		Several measures will be implemented by Holcim to mitigate adverse impacts and enhance positive impacts to surrounding land uses. By mitigating adverse impacts to surrounding land uses, this will help to achieve compatibility between the varied land uses and zones surrounding the project area. These measures are summarised in Appendix C of this EIS.

6.9.5 Mitigation measures

i Soil inventory

The details of the quality and distribution of soil materials able or unable to support plant growth will guide material handling processes (ie stripping, stockpiling, sorting and amelioration) and eventual rehabilitation of disturbed areas. The LSCA notes that effective soil management is imperative to successful rehabilitation, and post mining land use objectives.

The fertility of the topsoil materials has generally been assessed as moderate to high; however, handling and stockpiling could easily degrade the fertility of these soils.

To assist with soil management, a summary of the estimated growth media volumes is provided in Table 12 of the LSCA. It is noted that bulk earthworks and handling of materials has the potential to mix different soil layers and materials and either improve, or degrade, the quality of materials as growth media. Landloch recommends that, should growth media be salvaged from these areas, it may be useful and cost-effective to undertake more detailed survey work to delineate soils and allow the segregation of undesirable materials during stripping.

ii Contamination

To manage any potential contamination impacts associated with the construction and operation of the project, a construction environmental management plan (CEMP) should be prepared to address applicable provisions under the PoEO Act. Work, health and safety controls to prevent exposure of construction workers to contamination will be implemented in accordance with the requirements of the *Work Health and Safety Act 2011* and the *Work Health and Safety Regulation 2017*. As well as typical environmental management measures, other components of the CEMP will include:

- an unexpected finds protocol, including procedures to identify and manage contamination, if encountered;
- procedures for the handling and storage of waste including contaminated materials;
- surface water management and sediment and erosion control;
- requirements for the storage of dangerous goods and other materials; and
- decommissioning requirements, including remediation and rehabilitation if necessary.

To manage spills and leaks associated during the operation of the project, spill containment measures will be installed in permanent operational facilities where there is a risk of impact from spills. Site management activities will be documented in an OEMP prepared for the project.

6.9.6 Conclusion

A LSCA was completed for the project, which identified that the WEA is located in LSC Class 2 and 3 and the SEA in LSC Class 5 and 6. LSC Class 2 and 3 are capable of most land uses, including cropping with cultivation, grazing, horticulture, forestry and nature conservation. LSC Class 5 and 6 are capable of land uses such as grazing, forestry, nature conservation and occasional cultivation for (dryland) pasture establishment. The primary hazard identified in the LSC hazard assessment is the widespread shallow soils and rockiness of the SEA.

As described in section 6.10, rehabilitation of the project area will aim to reinstate the previous land use as much as possible. This includes reinstating the LSC classes as described above. In addition, the proposed post-operational land uses are consistent with the capabilities of the LSC classes.

The project is generally consistent with applicable land use zoning objectives and policy requirements. The project is generally compatible with surrounding land uses and will not significantly impact on future land use trends in the vicinity of the project area.

The potential for contamination risks to future human and ecological receptors can be managed given appropriate environmental management and mitigation measures are undertaken for the project.

6.10 Rehabilitation

6.10.1 Introduction

A Rehabilitation and Landscape Management Strategy (R&LMS) was prepared for the project by EMM. This chapter provides a summary of the R&LMS which is provided in Appendix J. It assesses the potential land resources, rehabilitation and closure impacts associated with the project.

A LSCA has also been prepared for the project by LandLoch and is provided Appendix A of the R&LMS. A summary of the LSCA, in particular the LSC classes present in the project area, has been provided in Section 6.9.

6.10.2 Assessment approach

i Assessment requirements

The rehabilitation SEARs requirements are listed in Table 6.43.

Table 6.43 Rehabilitation SEARs requirements

SEARs requirement
Rehabilitation –
– including the proposed rehabilitation strategy for the site having regard to the key principles in the Strategic Framework for Mine Closure, including:
– rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria;
– nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and
– the potential for integrating this strategy with any other rehabilitation and/or offset strategy in the region.

Currently there are no legislative requirements for the rehabilitation and final landform planning of extractive industry projects. The R&LMS was prepared in accordance with the following guidelines:

- *The Strategic Framework for Mine Closure* (Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia 2000);
- *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry* (NSW Department of Industry, Tourism and Resources 2006a);
- *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry* (NSW Department of Industry, Tourism and Resources 2006b);
- *Managing Urban Stormwater – Soils and Construction Volume 1* (Landcom 2004);
- *Managing Urban Stormwater – Soils and Construction Volume 2E – Mines and quarries* (DECC 2008); and
- *ESG3: Mining Operations Plan (MOP) Guidelines* (Department of Trade and Investment 2013) (the MOP Guidelines).

ii Rehabilitation and decommissioning objectives

The overriding objective of rehabilitation activities with the project area will be to return disturbed land to a condition that is stable, and supports the proposed post-mining land use, which will include pastures or woodland areas.

The rehabilitation strategy was developed in consideration of factors including opportunities (such as proximity to remnant native vegetation areas) and constraints (such as slope and soil quality), ecological and rural land use values and existing strategic land use objectives. The rehabilitation objectives for the project are summarised in Table 6.44.

Table 6.44 Rehabilitation objectives

Aspect	Objective
Quarry (as a whole)	• Safe, stable and non-polluting. • Minimise visual impact of final landforms as far as is reasonable and feasible.
Pits	• Minimise to the greatest extent practicable the safety risk to humans, stock and fauna. • Re-establish pre-quarry land and soil capability while enhancing biodiversity values.
Rehabilitation areas	• Safe, stable and non-polluting. • Establish self-sustaining native open woodland ecosystems characteristic of vegetation communities found in the project area (ie pre-mining) on the pit walls.
Agricultural land	• Reinstate targeted LSC classes as per EIS. • Rehabilitate pasture areas so that they can support sustainable grazing activities.
In pit water storage	• Engineered to be hydraulically and geomorphologically stable.
Surface infrastructure	• To be decommissioned and removed, unless agreed otherwise as part of the detailed closure planning process.
Community	• Ensure public safety. • Minimise adverse socio-economic effects associated with quarry closure.

6.10.3 Existing environment

Existing land and soil characteristics of the project area and surrounds have been previously described in Sections 1.4.1, 0, and 6.8.1 of this report.

Rehabilitation activities at the quarry has been limited to rehabilitating the southern face of the West Pit, referred as the Rehabilitation Area in Figure 1.3. This area is approximately 1 ha in size and has been fully rehabilitated with 1:3 slopes.

6.10.4 Impact assessment

i Final land use

Rehabilitation of the project will aim to reinstate the previous land use as much as possible whilst enhancing biodiversity values diminished due to past agricultural land uses.

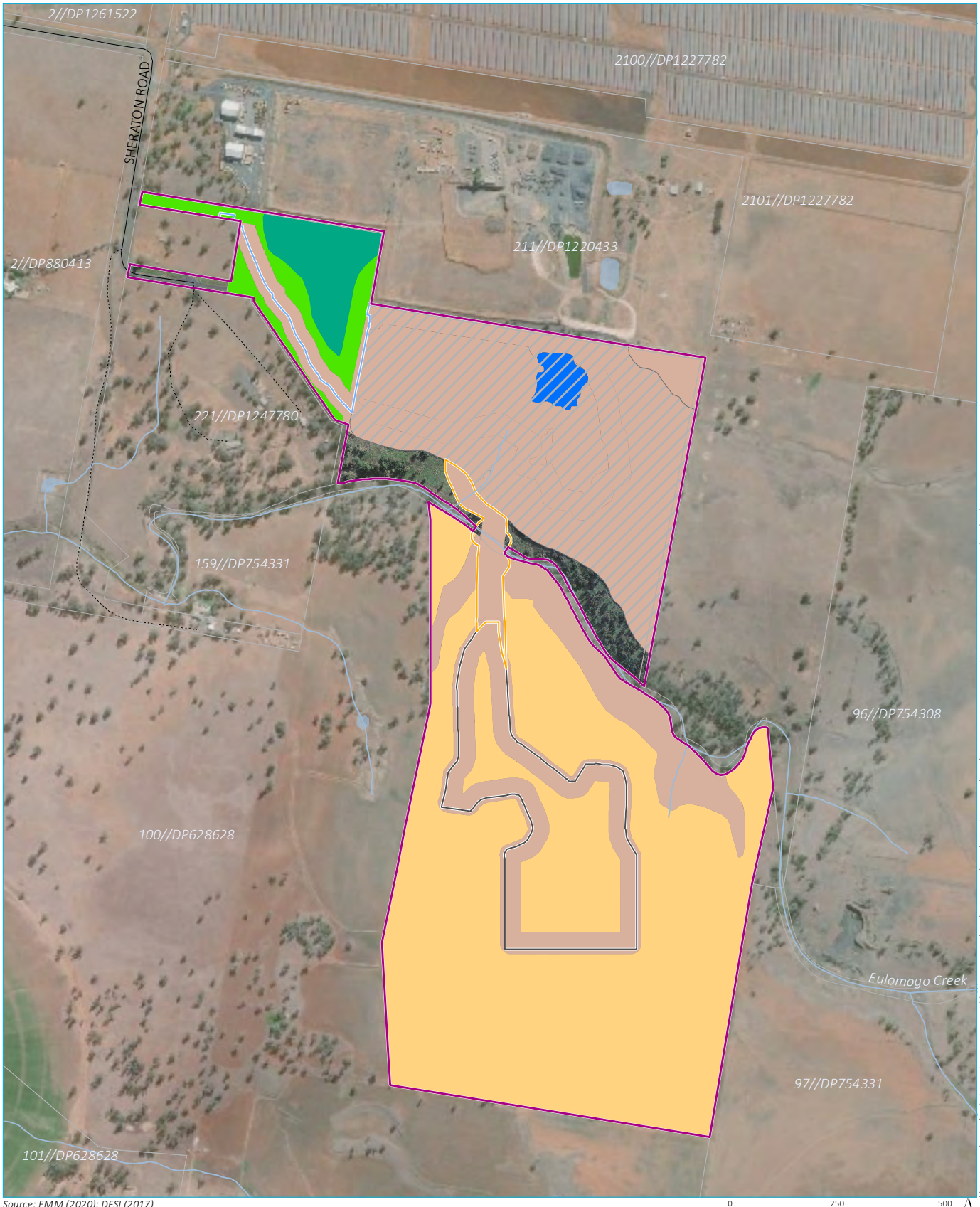
As described in Section 6.9, the SEA currently contains LSC classes 5 and 6 and the WEA currently contains classes 2 and 3. Rehabilitation activities will aim to maintain or improve the existing LSC classes (

Figure 6.18).

All stripped subsoil and topsoil will be stockpiled for future use (as bunds surrounding the WEA and SEA to act as noise attenuation and visual mitigation during operation of the quarry) in rehabilitation activities in order to maintain existing LSC classes (Section 6.10.4iii).

During the operational phase, final land use planning will be completed in consultation with relevant stakeholders such as DPIE and DRC. The proposed post-quarrying land-uses are outlined in Table 6.45 below, in addition to alternate land uses that may be considered, such as:

- the quarry infrastructure areas and the pit floors may be used for industrial purposes; and/or
- a workshop that may be suitable for storage of agricultural machinery or industrial enterprise.



Source: EMM (2020); DFSI (2017)

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GDA 1994 MGA Zone 55

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KEY

- Project area
- Western disturbance area
- Haul road disturbance area
- Southern disturbance area
- Indicative existing disturbance area

Land and soil capability

- LSC 2 - very high capability land
- LSC 3 - high capability land
- LSC 5 - moderate low capability land
- LSC 6 - low capability land
- Water storage

- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with surveyed site boundary)

Post-quarrying land and soil capability classes

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Figure 6.18

EMM creating opportunities

ii Rehabilitation domains

a Overview

The project area has been divided into a series of rehabilitation domains, with each domain having similar bio-physical characteristics and rehabilitation domains. These domains have been assigned in accordance with the MOP Guidelines.

Primary domains (as defined in the MOP Guidelines) are based on land management units within the project area, usually with a unique operational and functional purpose during operation and, therefore, have similar characteristics for managing environmental issues. The primary domains form the basis of conceptual rehabilitation and project closure planning for this strategy.

Secondary domains are the post-closure land use domains and are defined as land management units characterised by a similar post quarrying land use objective (Department of Trade and Investment 2013). Primary and secondary domains for the project area are detailed in Table 6.45 and shown in Figure 6.19.

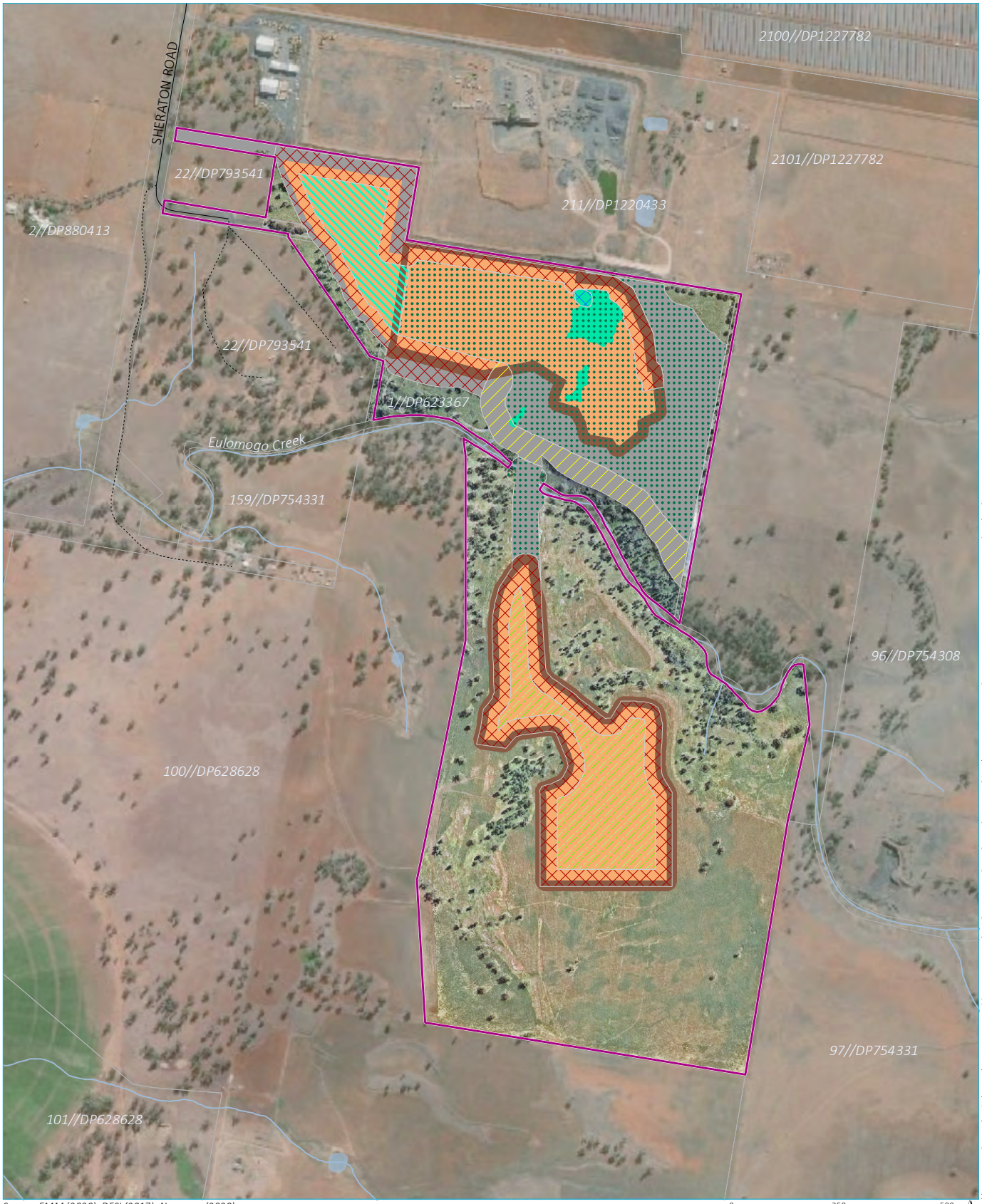
Table 6.45 Primary and secondary domains

Code	Primary domain (operational)	Quarry areas included	Code	Secondary domain (Post-mining land use)
1	Mine infrastructure areas	• Crushing and screening circuits. • Pre-coat plant. • Pug mill. • Product stockpiles. • General infrastructure. • Access roads and haul roads. • Offices, carpark, workshop, stores. • Utilities (power line and water pipelines).	B	• Rehabilitation Pasture –LSC Class 6.
			D	• Biodiversity – Blakely's Red Gum -Yellow Box grassy tall woodlands on flats and hills in the Brigalow Belt South Bioregion and Mandewar Bioregion.
			E	• Biodiversity – Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion.
2	Water management areas	• Pond 1. • Pond 2. • Settlement pond. • Haul road drive in sumps.	B	• Rehabilitation Pasture –LSC Class 6.
			C	• Water storage – LSC Class 8.
3	Soil stockpiles	• Topsoil and subsoil stockpiles.	A	• Rehabilitation Pasture – LSC Class 5.
			B	• Rehabilitation Pasture –LSC Class 6.
4	Pits	• West pit. • East pit. • WEA. • SEA.	A	• Rehabilitation Pasture – LSC Class 5.
			B	• Rehabilitation Pasture –LSC Class 6.
			D	• Biodiversity – Blakely's Red Gum -Yellow Box grassy tall woodlands on flats and hills in the Brigalow Belt South Bioregion and Mandewar Bioregion.
			F	• Rehabilitation Pasture –LSC Class 2.
			G	• Rehabilitation Pasture –LSC Class 3.

b Domain 1 – Infrastructure areas

At the end of the quarry life, land contamination assessments will be completed and any contaminated materials will be bioremediated on-site or transported to a suitable off-site waste treatment facility.

Following the completion of quarrying, all surface infrastructure will be safely decommissioned and removed unless required for an alternate post-closure land use. The diversion bank will be removed and the fill batter recontoured to blend in with the profile of Eulomogo Creek.



Source: EMM (2020); DFSI (2017); Nearmap (2020)

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KEY

- Project area

Primary domains

- 1. Infrastructure area
- 2. Water management area
- 3. Soil stockpile area
- 4. Pit

Secondary domains

- A. Rehabilitation pasture - LSC Class 5
- B. Rehabilitation pasture - LSC Class 6
- C. Water storage - LSC Class 8
- D. Biodiversity - Blakely's Red Gum - Yellow Box grassy tall woodlands on flats and hills in the Brigalow Belt South Bioregion and Mandewar Bioregion (walls)
- E. Biodiversity - Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion
- F. Rehabilitation pasture - LSC Class 2
- Cadastral boundary (data does not align with surveyed site boundary)
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody

Primary and secondary rehabilitation domains

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Figure 6.19

EMM
creating opportunities

Hardstand areas will be contour ripped and soils will be revegetated to form pastures as per rehabilitation methods outlined in Section 6.10.4iii. Native vegetation species (Blakely's Red Gum -Yellow Box grassy tall woodlands on flats and hills in the Brigalow Belt South Bioregion and Mandewar Bioregion and Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion) will be planted via hydroseeding.

c Domain 2 – Water management areas

All water management areas within Domain 2 will be rehabilitated, including the West Pit pond, Settling Pond, pit sumps and the southern haul road sediment dams (refer Figure 6.9). The East Pit water storage will remain.

The rehabilitation of water management areas will include the removal of all pumps, footvalves and pipelines. Voids will be backfilled with embankment material and soil generated from recontouring Domain 1 and then revegetated to form pastures as per rehabilitation methods outlined in Section 6.10.4iii.

d Domain 3 – Soil stockpiles

Soil stockpiles will be located alongside the pits and temporary used as bunding to reduce noise and visual impacts (refer Figure 2.1). Stockpiles will be removed as progressive rehabilitation is undertaken throughout the project phases. In-situ soils in the footprint of the stockpiles will be contoured and revegetated to form pasture species as per rehabilitation methods outlined in Section 6.10.4iii.

e Domain 4 – Pits

Prior to rehabilitation, land contamination assessments will be undertaken within the pits.

Following the completion of quarrying within a pit, the pit wall will be recontoured using blast or dozing techniques to a gradient consistent with rehabilitation completed to date on existing pit walls. The rehabilitated south-western wall has an overall gradient of 1(v):3(h) or 18°. The removed rock will be mixed with soil and used to facilitate slope stability. The pit walls will be revegetated with the native vegetation species Blakely's Red Gum -Yellow Box grassy tall woodlands on flats and hills in the Brigalow Belt South Bioregion and Mandewar Bioregion and Western Grey Box – cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion communities.

The pit floors will be contoured, re-spread with subsoil and topsoil with suitable material to pre-quarrying LSC class and revegetated to form pasture species. The pit floor of the SEA will be contoured to free drain to Eulomogo Creek. The pit floor of the WEA will be contoured to free drain to the East Pit water storage.

iii Rehabilitation methods

a Soil management

Several soil management methods will be implemented during the rehabilitation phase, as summarised in Table 6.46.

Table 6.46 Summary of soil management methods during the rehabilitation phase

Soil management measure	Summary
Soil testing	Prior to stripping, topsoil and subsoil will be sampled to: – identify the soil resource prior to stripping; – assist with the preparation of a soil balance or inventory to assist with rehabilitation planning; and – determine if the soil requires amelioration. Additional assessment of topsoil for the presence of weeds will be undertaken as part of the soil sampling.
Clearing and grubbing	Clearing and grubbing will be undertaken in a manner that minimises mixing of topsoil and subsoil during the process.
Soil amelioration	Soil testing will be undertaken to determine amelioration requirements and rates. The quarry soils will require amelioration with agricultural gypsum to treat dispersion, and improve the structure, and water holding capacity. Fertilisers will be applied following respreading to compensate for nutrients lost from the soil when stored in the extraction area bunds. Preference will be given to the use of mineral based biologically activated fertilisers over water soluble chemical fertilisers to minimise the potential for nutrient runoff into Eulomogo Creek and to encourage beneficial microbial activity in the soil. Topsoil stockpiles will require amelioration and/or good mixing of the anaerobic and aerobic layers when returned to rehabilitated areas.
Soil stripping	A soil stripping and placement plan will be developed for each area that is to be stripped as part of the Land Disturbance Permit process. All staff and contractors will be required to obtain the relevant permit prior to clearing activities. The responsible environmental personnel will advise on permits required and authorise permits prior to commencement of works. Soil stripping depths and volumes, and the steps involved in the process, are provided in Table 5.2 of Appendix J.
Soil stockpiling	All stripped topsoil and subsoil will be used to form visual amenity and acoustic bunds around the extraction areas. The topsoil will be stripped first and temporarily pushed into a windrow just beyond the outer tow of the proposed bund. Soil ameliorants (most likely gypsum) will be broadcast over the exposed subsoil and will be mixed when the subsoil is pushed up to form the bund. The bund will compacted via track rolling with a bulldozer and then the topsoil will be spread over the bund and hydro-mulched with cover crops and appropriate grass species to minimise erosion and weed infestation.
Soil respreading	Subsoil will respread prior to topsoil in order to re-establish an appropriate soil profile that approximates the pre-disturbance profile. Prior to re-spreading of stockpiled topsoil, an assessment of weed infestation will be undertaken to determine if individual stockpiles require burial due to their unsuitability as a result of weed infestation. More detail on steps to be taken during this process are outlined in Section 5.1.6 of Appendix J.
Monitoring	The soil management process will be monitored through each step to ensure that the health of the soil is maintained, and the rehabilitation and biodiversity objectives can be achieved. The Rehabilitation Management Plan will detail the testing, witness, and hold points requirements for each step of the soil management process.

b Establishment of vegetation

The revegetation of final landforms will include the following species:

- cover crop species for short term erosion protection and weed suppression;
- introduced pasture species for stabilisation of the waste rock emplacement and TSF embankments, long-term soil stockpile protection and rehabilitation for grazing purposes;
- species that comprise the vegetation communities currently present within the project area: Broad-leaved Peppermint-Brittle Gum – Red Stringybark dry open forest, Yellow Box - Blakely's Red Gum grassy woodland and Mountain Gum-Manna Gum open forest species where a woodland is to be re-established (ie on the waste rock emplacement and pit amenity bund); and
- riparian species for the clean water diversions.

Seed will be obtained from commercial suppliers and stored in appropriate conditions prior to sowing. Sowing methods for the revegetation of final landforms will vary depending on the topography and accessibility of the area and may include hand seeding, broadcast seeding or hydroseeding.

Hand seeding will be used on areas where machinery access is difficult, including such areas as topsoil or subsoil stockpiles. Broadcast seeding will be use on flat areas to establish cover crop and pasture species, such as the pit floors where significant erosion is unexpected. Hydroseeding will be used to revegetate the pit walls, recountered fill batter, and the sides of Eulomogo Creek, where higher erosion rates are expected.

c Erosion and sediment

Project elements will be progressively rehabilitated to minimise the risk of sediment erosion and re-work.

During the rehabilitation phase, erosion may result from the removal of the culvert in Eulomogo Creek and rehabilitation of the haul road either side of the culvert. Erosion may also occur along the pit walls within the WEA and SEA. Based upon observed erosion rates of the West Pit, average annual erosion rates on the pit walls in the WEA and SEA are expected to be less than 2 tonnes per hectare per year (t/ha/y) with a peak rate of 5 t/ha/y. The subsoil may be highly dispersible due to exchangeable sodium percentage (ESP) and exchangeable magnesium percentage (EMP).

iv Completion criteria

Rehabilitation completion criteria will be based upon current knowledge of practices and successes in similar environments and will be used as the basis for assessing when rehabilitation of the project is complete. Indicators are measured against the criteria, and are set for the six phases of rehabilitation, consistent with the MOP Guidelines as follows:

- Phase 1 – Decommissioning (ie removal of equipment and infrastructure);
- Phase 2 – Landform Establishment (ie land shaping);
- Phase 3 – Growth Medium Development (ie soil physical and chemical properties);
- Phase 4 – Ecosystem and Land Use Establishment (ie vegetation establishment);
- Phase 5 – Ecosystem and Land Use Sustainability (ie established vegetation is supporting post-mining land use); and
- Phase 6 – Land Relinquishment.

The completion criteria will involve a set of objectives for the ideal post-closure landform, rehabilitation criteria to achieve the objectives and methods to evidence that the criteria have been met using Landscape Function Analysis and agricultural productivity measures.

Whether rehabilitation criteria have been met depends on the trending of measurements over time (gathered through post-closure monitoring) compared to pre-quarrying site conditions. The criteria will be refined and confirmed in the Rehabilitation Management Plan (RMP) and in the detailed closure plan as the project progresses towards closure (see Section 6.10.5).

Interim rehabilitation criteria to be applied to the project prior to the preparation of the RMP is provided in Tables 6.1–6.3 of the R&LMS (refer Appendix J). The interim rehabilitation criteria will address the following outcomes:

- restoration of a safe and stable landform that is non-polluting; and
- reinstate soil profiles and function and create landforms that are compatible with surrounding topography; and
- reestablishment of landforms that permit grazing, improved pasture and biodiversity outcomes.

6.10.5 Mitigation measures

i Erosion and sediment control

The following erosion and sediment control measures will be implemented to mitigate erosion risk and predicted rates:

- implementation of progressive erosion and sediment control plans for individual areas to ensure sediment erosion risks are identified and appropriately managed and mitigated;
- rock/soil matrices and hydro mulching will be implemented to further reduce erosion rates along pit walls;
- dispersive soils will be treated with gypsum during the stripping process to improve electrochemical stability and such parameters as ESP and EMP;
- a sump will be excavated into the floor of the SEA to collect runoff during the rehabilitation phase and until 60% of soil surface has been retained; and
- implementation of sowing techniques for the revegetation of the final landforms (refer Section 6.10.4.iii).

ii Post-closure monitoring

Rehabilitation monitoring to assess rehabilitation progress will be undertaken annually during operation and every 5 years once rehabilitation has commenced (or less if the rehabilitation criteria have been met). Post-rehabilitation, review of the monitoring frequency will be undertaken based on the performance of the revegetation and an appropriate monitoring frequency determined.

Rehabilitation monitoring will identify areas requiring maintenance and identify and address deviations from the expected. Rehabilitation areas will be assessed against performance indicators and regularly inspected for the following aspects:

- evidence of any erosion or sedimentation;
- success of initial establishment cover;
- natural regeneration of improved pasture;
- weed infestation (primarily noxious weeds, but also where rehabilitation areas are dominated by other weeds);
- integrity of drainage, erosion and sediment control structures; and
- general stability of the rehabilitation areas.

Monitoring techniques will include photographic monitoring and soil sampling in established transects or quadrants within the rehabilitation areas. Specific monitoring within grazing and also native woodland and riparian rehabilitation areas will be undertaken such as indicators of grazing productivity and rapid ecological assessment techniques.

iii Post-closure maintenance

Where monitoring has identified that rehabilitation criteria has not been met, maintenance works may be undertaken and include:

- re-seeding and, where necessary, re-soiling and/or the application of specialised treatments;
- use of materials such as composted mulch to areas with poor vegetation establishment;
- replacement of drainage controls if they are found to be inadequate for their intended purpose, or compromised by vegetation or wildlife; and
- de-silting or repair of sediment control structures.

Maintenance works will also be carried out to target specific issues, like weeds management, the upkeep of access tracks and public safety.

The spreading of noxious weeds could impact the success of revegetation and will be controlled through the following measures:

- herbicide spraying or scalping weeds;
- post-closure use of rehabilitated areas as a working farm, with associated management practices; and
- rehabilitation inspections to identify potential weed infestations.

Access tracks may be required to facilitate the revegetation and ongoing maintenance of rehabilitation areas. These tracks will be kept to a practical minimum and will be designated prior to the completion of the project. Controls will be implemented to minimise the potential for impacts on public safety and may include maintenance of fencing and warning signs around areas that have the potential to cause harm and that are accessible to the public. As pit walls will be rehabilitated to a safe and stable gradient of 18°, permanent bunding is not anticipated to be required. Additionally, any large rocks within the pit walls that pose a safety risk post-rehabilitation will be removed and relocated.

iv Management and closure plans

A RMP will be developed to provide a structured and documented process for managing and improving rehabilitation activities at the quarry. The plan will serve as a process map for interdepartmental administration of rehabilitation activities within the quarry planning and implementation process.

A detailed closure plan for the quarry will be developed within five years of planned closure.

6.10.6 Conclusion

The project area will be progressively rehabilitated through all phases of the project. Leading practices will be adopted through the rehabilitation phase of the project to ensure all potential impacts are appropriately avoided, minimised or mitigated.

The rehabilitation concepts presented in the R&LMS will be reviewed over time to allow for the consideration of a number of factors, including the outcomes of future rehabilitation trials and research, as well as the outcomes of consultation with relevant stakeholders during the detailed closure planning phase. Final rehabilitation and project closure requirements will ultimately be formulated in consultation with key government agencies and other relevant stakeholders and noted in the RMP.

6.11 Traffic and transport

6.11.1 Introduction

This section provides a summary of the Traffic Impact Assessment (TIA) completed by EMM for the project. It is provided in full in Appendix K and summarised below. The TIA describes the existing local and regional traffic network surrounding the existing site and assesses the impacts of the project on that network. A road safety audit (RSA) was completed for the project by Bitzios Consulting (refer Appendix B of Appendix K).

6.11.2 Assessment approach

i Assessment requirements

The traffic and transport SEARs requirements are listed in Table 6.47.

Table 6.47 Traffic and transport SEARs requirements

SEARs requirement
Traffic and transport – including:
– accurate predictions of the road traffic generated by the construction and operation of the development, and any proposed traffic generating developments in the area, including a description of the types of vehicles likely to be used for the transportation of quarry products;
– a detailed assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road network (as identified above), including undertaking a road safety audit;
– a detailed assessment of potential traffic impacts and interactions with nearby schools, and
– a detailed assessment of potential traffic impacts and interactions with nearby schools.

The TIA was prepared with consideration of the *Guide to Traffic Generating Developments* (RTA 2002) in addition to the relevant Austroads guidelines by.

ii Methodology

a Overview

Assessment for the TIA included desktop research, a site inspection (including intersection traffic counts), intersection modelling and a road safety audit.

The existing transport route to and from the quarry primary includes Sheraton Road and Mitchell Highway, which are the focus of the TIA.

Changes in traffic generation have been assessed for the existing quarry production levels (on average 350,000 tpa over the last five years) and the proposed future maximum (up to 500,000 tpa). However, it is noted that the current quarry approval does not have a limit on production and, therefore, future maximum traffic generation could theoretically be consistent with the approved operations.

There will be no change between existing and future maximum operational traffic for light vehicles on Sheraton Road or Mitchell as the workforce will remain the same.

There will be minimal construction traffic so the TIA does not assess project-related construction traffic in detail.

b Desktop research

Desktop research provided an understanding of the existing traffic environment, including the local and regional road networks. It identified the roads network potentially affected by the project, road accident records, public transport services and known future improvement projects to upgrade the local or regional road network.

c Site inspection

A site inspection was completed on 28 April 2020 by Abdullah Uddin (Associate Traffic Engineer) from EMM. This included inspection of the relevant road network, key intersections and the quarry site access.

Traffic counts were completed at the intersection of Sheraton Road and Mitchell Highway on 4 June 2019 between 6:00 am to 9:00 am and 3:00 pm to 6:00 pm.

d Intersection modelling

Intersection modelling was completed using the SIDRA Intersection 9.0 software to predict the impact of project-related operational traffic on the intersection of Sheraton Road and Mitchell Highway. The key peak morning and night-time periods were modelled for predicted life of quarrying (to 2045).

The performance of the intersection during operation of the project in consideration of the associated traffic volumes was determined through the following parameters:

- level of service (LOS);
- degree of saturation (DOS);
- average delay per second (DEL); and
- 95th queue lengths (Q95).

The LOS standards which have been applied to the assessment of intersection performance are provided in Table 6.48.

Table 6.48 Intersection level of service standards

Level of service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Priority intersection ('Stop' or 'Give Way' signage)
A	<14	Good operation	Good operation
B	15–28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29–42	Satisfactory	Satisfactory, but accident study required
D	43–56	Operating near capacity	Near capacity and accident study required
E	57–70	At capacity. At traffic signals, incidents will cause extensive delays. Roundabouts require other control mode.	At capacity; required other control mode
F	>71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; required other control mode

e Road safety audit

The road safety audit (RSA) identified existing safety risks on Sheraton Road, south of its connection with the Mitchell Highway.

6.11.3 Existing environment

i The Mitchell Highway

The Mitchell Highway near Sheraton Road is two-way two-lane undivided road with lane widths of 3.5 m and posted speed limit of 70 kilometres per hour (km/hr). The Mitchell Highway, east of the intersection with Sheraton Road, is also referred to as Wellington Road.

ii Sheraton Road

The southern section of Sheraton Road (south of the intersection with the Mitchell Highway) is an undivided two-way 7.2-m wide sealed road with 0.5-m to 1.5-m wide unsealed shoulders (refer Photograph 6.1). The road has a general speed limit of 100 km/hr, with advisory curve warning speed limit signs of 35 km/hr at bends in the road. It is a no through road travelling south to the quarry and also providing access to rural residences, South Keswick Solar Farm and South Keswick Quarry.

Photograph 6.1 Sheraton Road (northbound)

The northern section of Sheraton Road (north of the intersection with the Mitchell Highway) is a dual carriageway providing access to several schools, business and rural residences (refer Photograph 6.2). It has a posted speed limit of 60 km/hr, 3.2-m wide traffic lanes and 3.0-m wide parking lanes on either side. It operates as a school zone for approximately 800 m with a reduced speed of 40 km/hr during 8.00 am–9.30 am and 2.30 pm–4.00 pm on school days. This section of the road has two level pedestrian crossings which are generally operated by school crossing officials during the school zone periods.

Photograph 6.2 Sheraton Road (southbound carriageway)

iii Intersection of Sheraton Road and Mitchell Highway

The intersection consists of a two-lane roundabout with an island diameter of approximately 32 m and circulating width of 10 m (refer Figure 6.20).

Source: Nearmap (2020)

Figure 6.20 Intersection of Sheraton Road and Mitchell Highway

The results of the 4 June 2019 traffic counts are displayed in Figure 6.21. The following peak time periods were identified for the intersections:

- 8.00 am to 9.00 am consisting of general and school traffic;
- 3.00 to 4.00 pm consisting of school traffic; and
- 4.30 pm to 5.30 pm consisting of general traffic.

The existing traffic volumes included a total of 21 heavy vehicle movements travelling to and from the south, which is representative of lower than average daily heavy vehicle movements.

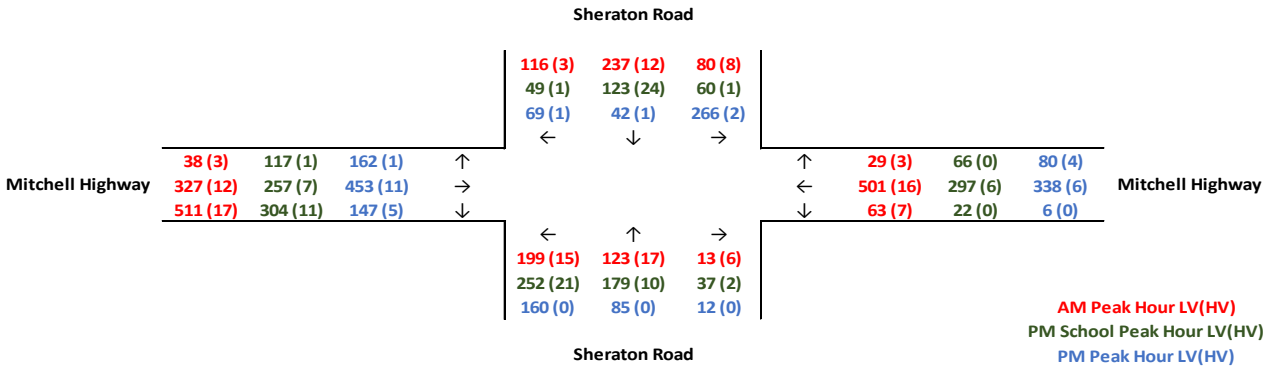


Figure 6.21 Existing traffic volumes at the intersection of Mitchell Highway and Sheraton Road

iv Road safety

Mitchell Highway (within proximity to the roundabout) and Sheraton Road have low numbers of reported crashes, and, therefore, are considered to have good local traffic safety conditions. As summarised in Table 6.49, minimal crashes have occurred along these roads in the last 5 years.

Table 6.49 Five year crash history for the Mitchell Highway and Sheraton Road

	Non-casualty	Minor/other injury	Moderate injury	Serious injury	Fatal
Mitchell Highway (within 500 m east and west of the roundabout)	3	0	1	1	0
Sheraton Road (between 500 m north of the roundabout and the quarry access)	4	0	1	0	0

v Public transport, pedestrian and cycling

There are no public bus routes which along Sheraton Road past the intersection. Hourly public bus routes travel along the Mitchell Highway.

Significant pedestrian and school bus activity on weekdays due to St Johns Primary School, St Johns College and Dubbo Christian School, located on Sheraton Road south of the intersection. Pedestrian pathways and two refuge islands are located on either side of Sheraton Road alongside the schools.

There is an off-road cycling pathway along the western side of Sheraton Road, which extends from the intersection to the schools.

6.11.4 Impact assessment

i Construction

The construction activities and subsequent expected traffic generation are listed below:

- proposed access road – approximately 9 light vehicles for contractors completing road grading, sealing and marking over a 9-week period; and
- southern haul road – approximately 20 heavy vehicles per month for 2 months for the delivery of pre-mixed concrete and pre-cast concrete in addition to 4 to 6 light vehicles for contractors.

A detailed assessment of project-related construction traffic was not prepared as it is for continuation of an existing operation and, therefore, minimal construction activities are required for the project.

ii Operations

a Traffic volumes

Project-related traffic during the operational phase will result from the quarrying of the WEA and SEA for 25 years.

Under the existing and future maximum average (or typical) daily production scenarios there will be approximately 35 daily truck loads (70 movements) and 50 daily truck loads (100 movements), respectively, operating from the quarry via Sheraton Road (Table 6.50). Under the existing and future maximum peak daily production scenarios, there will be approximately 66 daily truck loads (132 movements) and 121 daily truck loads (242 movements), respectively, operating from the quarry via Sheraton Road (Table 6.51).

Table 6.50 Daily traffic generation for an average production day

Quantity	Existing (350,000 tpa)	Future maximum (500,000 tpa)
Average daily production (tonnes)	1,167	1,667
Truck load capacity (tonnes)	33	33
Working days per year	300	300
Average daily truck loads (vehicles)	35	50
Average daily truck loads (movements)	70	100
Peak hourly truck loads (all peak hours)	3.5	5.0
Peak hourly truck movements (all peak hours)	7	10

Source: Based on information provided by Holcim

On a small number of busy days each year, the peak daily site truck traffic movements may be significantly higher than on an average (or typical) production day. The daily and peak hourly heavy vehicle loads and movements during a peak production day for existing operations (350,000 tpa) and future maximum operations (500,000 tpa) are listed in Table 6.51.

Table 6.51 Daily traffic generation for a peak production day

Quantity	Existing (350,000 tpa)	Future maximum (500,000 tpa)
Peak daily production (tonnes)	2,200	4,000
Truck load capacity (tonnes)	33	33
Peak daily truck loads (vehicles)	66	121
Peak daily truck loads (movements)	132	242
Peak hourly truck loads (AM peak hour)	8	20
Peak hourly truck loads (PM School peak hour)	10	20
Peak hourly truck loads (PM peak hour)	10	20
Peak hourly truck movements (AM peak hour)	16	40
Peak hourly truck movements (PM School peak hour)	20	40
Peak hourly truck movements (PM peak hour)	20	40

Source: Based on information provided by Holcim

During operation, there will be approximately 30 light vehicle movements per day, which will occur before and after the daily shift time of 6:00 am to 6:00 pm and, therefore, avoiding peak time periods.

iii Traffic distribution

All quarry-related traffic will exit the site via Sheraton Road, as per the existing operations, up to the intersection with the Mitchell Highway. At the intersection of Sheraton Road and Mitchell Highway, heavy vehicle traffic will be distributed approximately 50% to the west, 25% to the east and 25% to the north, in accordance with the current distribution of heavy vehicle traffic movements in the locality.

iv Road network capacity

Under the future maximum (500,000 tpa) average day production conditions (1,667 tonnes per day, Table 6.50), daily traffic increases will be very minor (less than a 0.3% daily traffic increase at any location) and will have no noticeable effect on the typical locality daily traffic conditions or road network operations.

Under the future maximum (500,000 tpa) peak day production conditions (4,000 tonnes per day, Table 6.51), daily traffic increases will also be relatively very minor and insignificant (less than a 0.6% traffic increase at any location). The exception is Sheraton Road, south of the Mitchell Highway, where the additional proportional daily traffic increases will be approximately +1.9%. In comparison to the existing daily traffic on this section of Sheraton Road; the increase will not significantly impact the road's capacity.

The additional truck traffic using Sheraton Road will result in faster road pavement degradation. This could be addressed by means of a road maintenance agreement with the DRC.

v Intersection performance

To determine the impact of project-related traffic on the intersection of Sheraton Road and Mitchell Highway, a conservative scenario of 1% linear annual growth of baseline traffic has been applied until 2045. The forecasted light and heavy vehicle traffic movements per peak hourly period are shown in Figure 6.22.

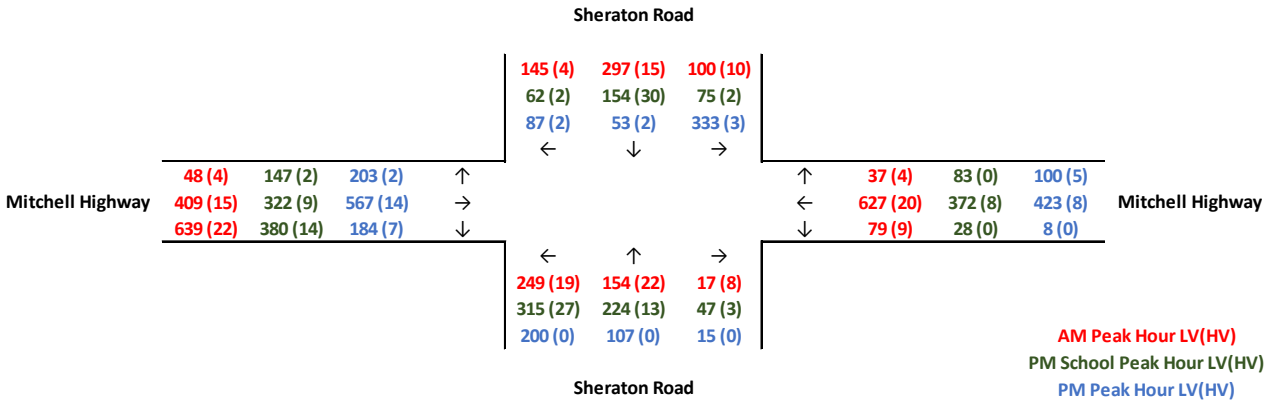


Figure 6.22 Forecasted light and heavy vehicle movements per peak hourly period in 2045

a Average daily production

The results of the intersection performance modelling for an average production day are summarised in Table 6.52.

Table 6.52 SIDRA results for 2020 and 2045 for average daily production

Year and Peak hourly period	DOS		LOS		DEL (seconds)		Q95 (metres)	
	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production
2020								
8:00 am to 9:00 am	0.416	0.417	B	B	15.7	15.7	19.5	19.6
3.00 to 4.00 pm	0.314	0.315	A	A	12.7	13.4	12.8	12.8
4.30 pm to 5.30 pm	0.315	0.315	A	A	11.9	11.9	12.1	12.2
2045								
8:00 am to 9:00 am	0.593	0.595	B	B	20.8	20.8	35.6	35.8
3.00 to 4.00 pm	0.420	0.421	A	A	13.4	13.4	19.4	19.5

Table 6.52 SIDRA results for 2020 and 2045 for average daily production

Year and Peak hourly period	DOS		LOS		DEL (seconds)		Q95 (metres)	
	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production
4.30 pm to 5.30 pm	0.409	0.409	A	A	12.4	12.4	17.6	17.7

The future maximum average day quarry operations traffic will not have any significant impact to the performance of this intersection in 2020 or 2045 peak hourly traffic periods.

b Peak daily production

The results of the intersection performance modelling for a peak production day are summarised in Table 6.53.

Table 6.53 SIDRA results for 2020 and 2045 for peak daily production

Year and Peak hourly period	DOS		LOS		DEL (seconds)		Q95 (metres)	
	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production	Existing production	Future maximum production
2020								
8:00 am to 9:00 am	0.420	0.431	B	B	15.8	16.0	19.8	20.7
3.00 to 4.00 pm	0.317	0.324	A	A	12.7	13.4	13.3	12.8
4.30 pm to 5.30 pm	0.318	0.323	A	A	12.0	11.9	12.8	12.2
2045								
8:00 am to 9:00 am	0.597	0.609	B	B	20.9	21.4	36.2	37.7
3.00 to 4.00 pm	0.425	0.432	A	A	13.4	13.4	19.7	20.2
4.30 pm to 5.30 pm	0.412	0.418	A	A	12.4	12.5	17.8	18.3

Similar to the situation for an average production day, the future maximum peak day quarry operations traffic will not have any significant impact to the performance of this intersection in 2020 or 2045 peak hourly traffic periods.

vi Road safety

The Mitchell Highway and Sheraton Road in proximity to the quarry are considered to have good local traffic safety conditions currently given the low number of reported crashes (one crash per year) (refer Table 6.49). This is expected to continue under the project given that future maximum traffic generation will increase road traffic at this location by approximately +1.9%.

The Road Safety Audit of Sheraton Road identified seven safety items. These items and the risk rating of each item are summarised in Table 6.54.

Table 6.54 Safety items on Sheraton Road

Item	Risk rating
Children crossing north of St Johns Primary School on Sheraton Road may be obscured by heavy vehicles	High
Vehicles failing to give way to school bus movements in the St Johns Primary School drop-off and pickup zone	High
Vehicles failing to give way to U-turn movements (travelling south) at the end of the medium strip on Sheraton Road	Medium
Increased risk of crashes due to queue push back from St Johns Primary School drop-off and pickup zone extending southbound on Sheraton Road	Medium
Long queues at the intersection of Sheraton Road and Mitchell Highway during afternoon peak time periods extending across the children crossing	Low
Increased risk of crashes due to cars exiting from the Bunnings car park across four lanes of Sheraton Road onto Mitchell Highway	Medium
Poor pavement conditions on the southern section of Sheraton Road	Medium

The majority of the safety items require attention regardless of the operation of the project as they primarily relate to school traffic and pedestrian movements. Holcim is currently consulting with the School's precinct stakeholders and DRC in relation to these issues.

Holcim will implement a Driver's Code of Conduct, with which all truck drivers will be required to comply (see Section 6.11.4.i).

vii Public transport, pedestrian and cycling facilities

Public transport, pedestrian and cycling facilities do not extend past the schools located on Sheraton Road. There will continue to be no impact to these facilities through construction and operation of the project.

6.11.5 Mitigation measures

i Driver's Code of Conduct

Holcim will implement a Driver's Code of Conduct to facilitate the future safe site operations for all the quarry truck traffic using Sheraton Road, in combination with all the other road users (including school buses) and pedestrian traffic.

The Code of Conduct will be required to be read and signed by all truck drivers operating to and from the quarry and will address all relevant road safety and traffic management measures such as, compliance with all rules and regulations, vehicle speeds, driver behaviour near schools, residential and shopping areas, courtesy to other road users, fatigue management, drug and alcohol testing, checking vehicles and covering loads, the appropriate use of compression braking, procedures for accidents and breakdowns, procedures for oversize vehicles accessing the site, and procedures for monitoring and compliance.

ii Road pavement maintenance

A road maintenance agreement for Sheraton Road will be discussed with DRC.

iii Stakeholder engagement

As described in Section 5.3, Holcim recently established a CCC for Dubbo Quarry. The first CCC meeting was held on 2 November 2020. Further meetings of the CCC will continue to address traffic and road safety related matters.

6.11.6 Conclusion

The project has the potential to result in an increase in heavy vehicle traffic within the local and regional road network. There will be no increase in light vehicle traffic and minimal construction traffic under the project.

Under the existing and future maximum average daily production scenarios there will be approximately 35 daily truck loads (70 movements) and 50 daily truck loads (100 movements), respectively, operating from the quarry via Sheraton Road. Under the existing and future maximum peak daily production scenarios, there will be approximately 66 daily truck loads (132 movements) and 121 daily truck loads (242 movements), respectively, operating from the quarry via Sheraton Road.

Under the future maximum average day production conditions, the additional proportional daily traffic increases will be very minor (less than a 0.3% daily traffic increase at any location) and will have no noticeable effect on the typical locality daily traffic conditions on Sheraton Road or any other road in the locality.

Under the future maximum peak day production conditions, on most of the locality road network the additional proportional daily traffic increases will also be very minor (less than a 0.6% traffic increase at any location). On Sheraton Road, south of the Mitchell Highway, the additional daily traffic increases will be +1.9% approximately which will potentially be noticeable in comparison to the existing daily traffic operations on this section of Sheraton Road; however, the increase will not significantly impact the road's capacity.

The Mitchell Highway/Sheraton Road intersection will continue to perform at either LOS A or B for all the assessed peak hours with significant spare traffic capacity (approximately 40%) remaining in 2045 when taking into account maximum future additional quarry traffic (on either an average or a peak production day) and potentially 25% additional background traffic growth by 2045.

The approved quarry haulage route operates past a number of schools on Sheraton Road where a Road Safety Audit report has identified several road safety issues. Most of the safety issues are related to school generated traffic movements. Holcim is currently consulting with the School's precinct stakeholders and DRC in relation to these issues.

6.12 Social

6.12.1 Introduction

An SIA has been prepared for the project by EMM (2020) and is provided in Appendix L. The assessment identified the potential impacts and opportunities associated with both the construction and operational phases of the project, as well as appropriate measures for managing adverse social impacts and enhancing potential benefits. It also documents the assessment methods and results, the initiatives built into the project design to avoid and minimise associated impacts to the local community, and the mitigation and management measures proposed to address any residual impacts not able to be avoided.

6.12.2 Assessment approach

i Assessment requirements

The social SEARs requirements are listed in Table 6.55.

Table 6.55 Social SEARs requirements

SEARs requirement
Social including a detailed assessment of the potential social impacts of the development that builds on the findings of the Social Impact Assessment Scoping Report, in accordance with the *Social impact assessment guideline for State significant mining, petroleum production and extractive industry development*, paying particular consideration to:
– how the development might affect people's way of life, community, access to and use of infrastructure, services and facilities, culture, health and wellbeing, surroundings, personal and property rights, decision-making systems, and fears and aspirations;
– the principles in Section 1.3 of the guideline;
– the review questions in Appendix D of the guideline

The SIA was prepared in accordance with the *Social impact assessment guideline for State significant mining, petroleum production and extractive industry development* (DPE 2017).

ii Research method

The SIA was informed by data collected as part of the social baseline, community consultation and engagement findings, findings from technical studies, previous SIA reports from the same regional area, academic research and relevant government and agency reports. The community engagement completed for the project is summarised in detail in Chapter 5.

The SIA research included two separate phases. Phase 1 involved the completion of the social impact section of the project's Scoping Report. The Scoping Report was informed by the stakeholder engagement meetings and workshops undertaken by Holcim and EMM. The project's area of social influence was also determined in Phase 1.

Phase 2 included the completion of multiple research methodologies to inform the SIA, including:

- social baseline study;
- field study;
- social impact identification;
- social risk assessment; and
- social impact mitigation and management.

A risk assessment framework has been applied to the social impacts identified for the project.

6.12.3 Existing environment

i Area of social influence

The SIA has identified two areas of social influence:

- the local area, which is the primary area of influence for the project and is the suburb of Dubbo or known as the Dubbo State Suburb (SSC) as per the Australian Bureau of Statistics (ABS) categories; and
- the regional area, which is the Dubbo Statistical Area (SA3), which includes the broader region surrounding Dubbo.

ii Social baseline

The social baseline analysis undertaken for the SIA included the following key findings for communities within the areas of social influence.

According to the 2016 Census, the local area has a population of 38, 943 (ABS 2016). From 2016, the population has experienced a growth rate of 37.6%. Overall, the local area experienced a much greater population percentage increase than the regional area (5.5%) and NSW (14.2%) (ABS 2016).

Employment in the local area is higher than the regional area or NSW with only 5.5% unemployment compared to 6.2% and 6.3%, respectively. The main occupations in the area are labourers (18.2%), managers (18.2%), and professionals (14.5%).

The main industries of employment in the local area are health care and social assistance (15.7%) followed by retail trade (11.4%) and education and training (9.4%) (ABS 2016). The higher proportion of persons working in healthcare and social services reflects the concentration of community and health services available in the local area, which services the wider Western NSW and Far West NSW regions.

The local area has a low availability of rental housing in addition to lower mortgage repayments and rent payments compared to NSW averages. The median weekly income is higher for individuals but lower for households.

Although the local area has a low level of unemployment, and adequate provision of social infrastructure and social services, there are more households with low income and fewer people in high-skill occupations compared to the rest of NSW, suggesting higher rates of socioeconomic disadvantage.

As a regional centre, the local area is well serviced by a range of schools, childcare and health care facilities including hospitals and specialist services. The local area also has a number of community services, including Aboriginal community services, child and family services, youth community services, housing and homelessness services, employment services, disability services, aged services, and domestic violence services.

The local area offers a wide range of recreational and tourist facilities, including parks, natural areas, sporting facilities, campground and caravan parks and the Taronga Western Plains Zoo. It has abundant tourist accommodation, signifying tourism as an important industry.

6.12.4 Impact assessment

The SIA considers impacts of the project identified during the community engagement (refer Chapter 5). These impacts are summarised in Table 6.56.

The risk-based framework in Table 6.56 considers the findings of technical reports as well as perceptions of the local community gathered during community engagement. Assessment of social impacts is complex and, therefore, requires the balancing of a range of factors and often competing interests. The impact assessment is reflective of this and has:

- assessed some aspects of the project as both negative and positive as they relate to different groups of people;
- included negative impacts on local communities while documenting the benefits to the broader region;

- considered the impacts on vulnerable groups and provided management strategies to ensure that any existing disadvantages are not exacerbated; and
- considered each community's access to critical resources, such as housing and health care, and how this affects their resilience.

The social impacts outlined in Table 6.56 have been assessed on a worst-case scenario initially and then the residual effect is assessed on the basis that mitigation and management strategies are successfully implemented. The assessment uses the terms unmitigated and mitigated when referring to negative impacts and un-enhanced or enhanced when referring to benefits (positive impacts).

Table 6.56 Summary of social risks attributed to the project

Impact	Description of social risk without mitigation	Affected parties	Duration	Extent	Positive or negative	Unmitigated or unenhanced	Mitigated or enhanced
Way of life	Access to adequate employing (ongoing) for local residents during operations	Current quarry employees	Operation	Local area and regional area	Positive	Significant-11	Significant-12
	Access to adequate employing (ongoing) of local residents during constructions	Residents with qualifications for work	Construction	Local area and regional area	Positive	Limited-3	Limited-5
	Noise from truck movements causing amenity issues	Local area (particularly stakeholders located along the haulage route)	Operation	Local area (particularly the haulage route)	Negative	Negligible-3	Negligible-3
	Noise from quarry operations causing amenity issues	Local area (particularly residents located near the project area)	Operation	Local area (particularly the project area)	Negative	High-12	Medium-9
	Dust causing amenity issues	Local area (particularly residents located near the project area)	Operation	Local area (particularly the project area)	Negative	Negligible-2	Negligible-2
	Land rehabilitation	Local residents and community members	Operation and post-closure	Local area (specifically the rehabilitated project area)	Positive	Significant-11	Significant-12
	Impacts to visual amenity due to voids and bunding	Rural residences #R1, #R2 and #R3	Operation	Project area (specifically on the western boundary)	Negative	Medium-8	Low-8
Culture impacts	Destruction of culturally significant indigenous artefacts or items	Local and regional indigenous communities	Operation	Local area (limited to the operation area)	Negative	Medium-10	Negligible-5

Table 6.56 Summary of social risks attributed to the project

Impact	Description of social risk without mitigation	Affected parties	Duration	Extent	Positive or negative	Unmitigated or unenhanced	Mitigated or enhanced
Health and wellbeing impacts	Public safety issues associated with truck movements through school crossings and drop-off/pick-up school bus zones	Students, parents, and school staff of St John's College, Saint John's Primary School, and Dubbo Christian School	Operation	Local area (along Sheraton Road)	Negative	Unacceptable-16	High-15
	Dust exacerbating health related issues	Local residents (particularly residents near the project area)	Operation	Local area (particularly residents near the project area)	Negative	Negligible-2	Negligible-2
Surrounding impacts	Discharge from the quarry into Eulomogo Creek affecting water quality	Users of Eulomogo Creek, both direct and indirect	Operation	Local area, (Eulomogo Creek)	Negative	High-13	Low-6
Personal and property rights	Land rehabilitation	Local residents and community members	Operation and post-closure	Local area (particularly rehabilitation area neighbours)	Negative	Medium-9	Low-6
Fears and aspirations	Contributions to continued economic growth and development of the local area and the region	Local and regional community	Operational	Local, regional and state area	Positive	Significant-11	Significant-11

The SIA considers the cumulative impacts of the project. A total of thirteen projects (operational and proposed/approved) were identified within proximity to the project area, within the LGAs of Dubbo Regional Council, Gilgandra Shire, and Mid-Western Shire, which have the potential to contribute to the cumulative impacts of the project. The cumulative population growth as a consequence of these projects is less than the Dubbo Region population increase forecast of 5,000 people between 2021–2041 (DPIE 2019). Thus, any significant concerns regarding the cumulative impacts of the project can be addressed and mitigated.

Cumulative impacts could also arise from public safety due to truck movements. Light and heavy vehicle traffic from both Holcim's quarry and the South Keswick Quarry currently travel along Sheraton Road. Without upgraded crossings and alternative turning locations provided by the schools/DRC, this could pose a cumulative risk to students, parents, and school staff of the school precinct during pick-up and drop-off times.

6.12.5 Mitigation measures

The proposed mitigation and management strategies for potential social impacts are summarised in Table 6.57.

Table 6.57 Summary of mitigation and management strategies for identified social risks

Impact	Description of social risk	Proposed mitigation and management strategies	Responsibility
Way of life	Access to adequate employment (ongoing)	Local participation strategy and plan and provision of training and upskilling opportunities for workers	Holcim Truck contractors
	Access to adequate employment (short-term)	Local participation strategy and plan	Holcim Construction contractors
	Noise from truck movements causing amenity issues	Continued maintenance of community grievance mechanism	Holcim
	Noise from quarry operations causing amenity issues	Development of community and stakeholder engagement strategy that includes provisions for residents affected by noise Continued maintenance of community grievance mechanism	Holcim Contractors
	Dust causing amenity issues	Continued maintenance of community grievance mechanism	Holcim Contractors
	Voids and bunding affecting visual amenity	Development of community and stakeholder engagement strategy that includes provisions for residents affected by visual changes from voids and bunding Continued maintenance of community grievance mechanism	Holcim
	Land rehabilitation	Inclusion of local stakeholders in the rehabilitation and closure planning and implementation process	Holcim
Culture impacts	Destruction of culturally significant Indigenous artefacts	Development and implementation of AHMP, including avoidance measures and unexpected finds and discovery protocols	Holcim Contractors
Health and community well-being	Public safety issues due to truck movements through school zones	Implementation of Driver's Code of Conduct continued engagement in the form of the CCC and a grievance mechanism	Holcim Dubbo Regional Council Representatives of schools located along Sheraton Road South Keswick Quarry
	Dust exacerbating health related issues	Include information about air quality in any updates provided to the local community as part of Holcim's community and stakeholder engagement strategy Continued maintenance of community grievance mechanism	Holcim Contractors
Surrounding	Discharge of water from the quarry into Eulomogo Creek	Implementation of water management strategy	Holcim
Personal and property rights	Land rehabilitation	Inclusion of local stakeholders in the rehabilitation and closure planning and implementation process	Holcim

Table 6.57 Summary of mitigation and management strategies for identified social risks

Impact	Description of social risk	Proposed mitigation and management strategies	Responsibility
Fears and aspirations	Contributions to continued economic growth and development of the local area and the region	Operation of the project and liaison with Dubbo Regional Council for economic opportunities	Holcim

A monitoring and management framework will be developed to ensure that the identified social impacts are monitored over time to measure the effectiveness or otherwise of the proposed mitigation and management measures, including changing conditions and trends in the local and regional areas over the same period. This will:

- track progress of mitigation and management strategies;
- assess actual project impacts against predicted impacts;
- identify how information will be captured for reporting to impacted stakeholders including landholders, communities and government on progress and achievements;
- provide key performance indicators, targets and outcomes;
- identify responsible parties; and
- describe mechanisms for ongoing adaption of management measures when and if required.

6.12.6 Conclusion

The project will result in positive social benefits to the community, including access to short- and long-term employment, land use opportunities post-rehabilitation and also contributions to continued economic growth and development of the local area and the region.

Negative social impacts of concern to the community include noise and dust impacts potentially affecting the amenity and health of the surrounding community, decreased road safety on Sheraton Road, impacts to waterways and destruction of culturally significant indigenous artefacts or items. Separate technical studies have been completed to assess these impacts.

The mitigation and management measures proposed will help to either minimise potential impacts or enhance potential benefits of the project.

6.13 Economic

6.13.1 Introduction

This economic assessment holistically considers the economic effects of continued quarrying at the existing site and extraction of two new resource areas as proposed under the project.

6.13.2 Assessment approach

The economic SEARs requirements are listed in Table 6.58.

Table 6.58 Economic SEARs requirements

SEARs requirement
Economic, including a detailed assessment of the likely economic impacts of the development paying particular attention to:
– the significance of the resource;
– the costs and benefits of the project; identifying whether the development as a whole will result in a new benefit to NSW, including consideration of fluctuation in commodity markets and exchange rates; and
– the demand on local infrastructure services;

6.13.3 Existing environment

The construction industry is the third largest industry in Australia for the number of people it employs and its share in the Gross Domestic Product (GDP) of the country.

In 2019, over a million people were employed in construction. Construction accounts for around 9% all jobs in Australia. A further 118,800 jobs are projected to be added by May 2023.

Construction generates over $360 billion in revenue and has a share of 9% in the total GDP of the country. Only the healthcare and retail sectors are higher revenue generators than the construction sector.

The construction industry sector makes the greatest contribution to economic output in the Dubbo region, which at $1.1 billion accounts for 15.27% of total output.

6.13.4 Impact assessment

i Significance of the resource

The quarry currently provides around 350,000 tpa of basalt quarry products to local and regional markets, which extends to the west of Cobar, north to the Queensland border, east to Orange and south to Parkes.

These products consist of mostly high quailty aggregates and and specialised road base products. The quarry is the only quarry in the district which provides bitumen emulsion and pugmilled blend products (blended road bases), in addition to the jetpatcher/paveline truck loading facility which is unique to the quarry.

Key customers for the quarry are DRC and TfNSW. Other shire councils that depend on the quarry for product supply include Narromine Shire Council, Gilgandra Shire Council, Mid-Western Regional Council and Warrumbungle Shire Council.

There is approximately 7.86Mt of resource estimated within the project area. The project will extend the life of the quarry for up to 25 years.

The population of Dubbo Region the Dubbo Region population increase forecast of 5,000 people between 2021–2041 (DPIE 2019). The entire West and Orana region is expected to increase by more than 300,000 people by 2036, most of whom are expected to live in regional centres such as Dubbo (DPE 2017). This will increase the demand for development in and around Dubbo well into the future.

Several key tourist, road and health focused projects are proposed to be constructed by Council or State or Federal governments within Dubbo to support the forcased population growth. The quarry is ideally located within the centre of the DubboRegion and can, therefore, continue to supply financially competitive product to support the forcasted growth of ongoing demand for materials.

The project is ideally located to enable access to major transport links which results in minimised haulage distances and subsequent decrease in costs for key projects in the Dubbo Region. Therefore, the quarried basalt can be considered a significant resource to help support forcasted growth and development across the Dubbo Region.

ii Economic benefits of the project

There are three key economic benefits relating to the project. Benefits to the regional economy, the local economy and to the construction industry. These are detailed further below.

a Key benefits to the region

The primary economic benefit will be to continue to provide high quality, competitive construction material products to the Dubbo Region. The market for the products supplied by the quarry is extensive, with products supplied to locations west of Cobar, north to the Queensland border, east to Orange and south to Parkes. The quarry's biggest customers are currently DRC and TfNSW.

Shire councils such as Narromine, Gilgandra, Mid Western and Warrumbungle also depend on the quarry for product supply. The quarry also sells construction materials to civil construction projects, engineering projects, subdivision work, industrial projects, commercial and domestic customers.

The quarry currently holds two DRC supply contracts for General Quarry Supply and for Bitumen Emulsion and Sealing Aggregate Supply. It is the only quarry in the district that supplies bitumen emulsion and its council jetpatcher / paveline truck loading facility is unique to Dubbo. This innovation was built especially to meet DRC's product requirements.

The project is required to enable the quarry to continue to operate and provide the regional and broader markets with high quality construction and road base products. It is considered that, if an extension to the quarry life and resource extraction area is not granted, this will result in a significant gap in the local and regional construction materials market and will have substantial financial implications for the quarry's existing and future customers.

The *Dubbo City Planning and Transportation Strategy 2036* (Stapleton Transportation and Planning Pty Ltd 2009) outlines the construction program for local and regional roads over the next 15+ years. The project is well placed to take advantage of the future potential supply contracts that will result from this road building program.

b Benefits to the local economy

The project will contribute to the local economy through the employment of the construction and operational workforces. The construction phase will require up to 6 contractors for construction of the Eulomogo Creek crossing and up to 9 contractors for construction of the proposed road access, in addition to the existing workforce of the quarry.

There will be no change to the existing workforce numbers with the operational phase requiring 12 FTE employees, 25 contractor truck drivers, 28 regular and 10 irregular contractors. The proejct will ensure existing employment positions at the quarry are retained which will result in positive flow-on impacts to the local economy from household expentiture as a result of wages and salaries paid. Positive flow-on impacts to the local economy will also occur through the purchasing of goods and services for construction of project elements.

Figures from the ABS show that non-residential value of work undertaken has increased in the 2nd quarter of 2020, due to the continuation of large scale Government projects in the Dubbo Region, including the new Dubbo Bridge, the Newell Highway upgrades at West Dubbo and local road development.

Therefore, the continuation of the project will position the quarry to take advantage of these upcoming developments and any future developments and provide a competitive market for quarry products.

c Net benefits to the construction industry

The project will benefit the construction industry at the national level, facilitating the development of State and national infrastructure and development of construction projects at the local level.

The construction industry has a major influence on community development as it facilitates the construction of infrastructure such as roads and highways, engineering and industrial projects and residential development.

The construction sector is closely linked to the engineering and industrial sectors and, therefore, demand for construction materials remains constant despite the current effects of the COVID-19 pandemic. The construction industry is the fourth largest contributor to GDP in the Australian economy.

The quarry mainly supplies its products to State and local government projects, which are large-planned road projects and are relatively unaffected by the current economic situation. These are long-term contracts with TfNSW and DRC and will continue to be executed during the operation of the project.

The high quality of the quarry's products, and the concrete products that it is used for, has seen increasing demand for the quarry's products in the greater Dubbo and regional markets. This demand is forecast to increase further as a result of the extensive infrastructure construction projects in NSW, that are funded by the NSW and Commonwealth governments, in part in response to the economic downturn caused by the COVID-19 pandemic.

The project will also contribute to the NSW and Commonwealth economies, through the payment of Personal Income Tax, Fringe Benefits Tax, Company Income Tax, Goods and Services Tax and Payroll Tax.

iii Costs of the project

The economic costs of the project are relatively minor, as there will not be significant capital required to be invested to continue operations of the quarry othen that the construction of additional surface infrastructure (roads, creek crossing, water management infrastructure). The project will involve the continual use of the existing site, which already contains built infrastructure including processing plant.

The CIV of the project is approximately $3.8 M. This investment will be spent mainly on civil works, including relocation of the proposed access road, surface water management modifications/additions, and construction of the Eulomogo Creek Crossing and southern haul road.

In terms of environmental costs, the quarry is unlikely to result in significant costs to the community or the environment. This is mainly due to the relatively isolated nature of the site, and that the project will generally meet amenity standards including air quality noise and vibration and will generally not be visually intrusive to the local area. Existing transport links will be used to deliver product to local and regional markets. The extension to the quarry will be developed on land in a rural area which has been the subject of quarrying activities for 40 years.

The project is designed to maximise the amount of material that can be extracted while remaining within acceptable limits set out by government policy. It limits the amount of vegetation clearing required and any clearing that cannot be avoided will be appropriately offset in accordance with applicable government policy.

The amenity impacts (ie noise, air quality, visual) and associated environmental costs will be minimised through detailed design and on-site management protocols. Overall, the environmental costs of the project will be closely managed to ensure the quarry operates in accordance with relevant government policy and environmental standards set out under law.

iv Demand on local infrastructure and services

The project will not create significant demand for local infrastructure services. It will continue to use the existing workforce at the site and will only require a small temporary construction workforce. These workers will continue to be sourced from the local area, which will ensure that wages are spent in the local economy.

Considering this, the project will not result in any additional demand on local infrastructure services or competition for labour or resourcing.

Holcim has long-standing relationships with local businesses and an established supply chain in the region for its existing activities. To maximise local benefits derived from the project, Holcim (and its engaged contractors) will continue to support local business by using established supply networks and providing sufficient opportunities and information to local business to secure new supply contracts where they are competitive in cost and meet the standards of service required.

The project does not require any public infrastructure to be upgraded in order to operate. The existing road network will be used to transport product from the site to market.

6.13.5 Conclusion

The economic benefits of the project are considered to outweigh the environmental costs and demand for local infrastructure and services. The project will result in a number of key benefits to the region, including:

- continued employment opportunity for the existing quarry workforce for the foreseeable future;
- potential additional employment opportunity for ancillary quarry workers;
- continued supply of construction materials for major developments including road development in the local and regional areas for State and local government authorities;
- contribution to the continued competition in the market for regional quarry products. and
- taxation income to the Federal and State governments.

6.14 Hazards

6.14.1 Introduction

This section provides an assessment of the likely risks to public safety, in particular the transport, handling and use of any hazardous or dangerous goods as part of the project, in accordance with the SEARs.

6.14.2 Assessment approach

i Assessment requirements

The hazard SEARs requirements are listed in Table 6.59.

Table 6.59 Hazard SEARs requirements

SEARs requirement*
Hazards – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, handling and use of any hazardous or dangerous goods.

*Refer to Section 6.15 for an assessment of the project's bushfire risks.

ii SEPP 33 screening assessment

An assessment under *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) has been applied to the project. SEPP 33 presents a systematic approach for the assessment of proposals for potentially hazardous and offensive industry or storage. To determine if a project is potentially hazardous, a screening process is applied which considers the type, volume and location of dangerous goods stored on a site, including transportation volumes and frequencies to the site.

Under SEPP 33, a 'potentially hazardous industry' includes activities like the handling, storage or processing of substances which in the absence of appropriate mitigation measures may impact the surrounding environment.

To determine whether a development is a 'potentially hazardous industry', the screening process described in Appendix 4 of *Applying SEPP 33* (DoP 2011) was applied. This involves consideration of set thresholds for the following components:

- the mode of storage and the maximum quantity stored or held on site for each material;
- the distance of the stored material from the site boundary for any of the materials in dangerous goods classes 1.1, 1.2 and 3; and
- the average number of annual and weekly road movements of material to and from a site and the typical quantity in each load.

The amounts of dangerous goods stored and transported at the existing quarry will not change under the project. The SEPP 33 screening assessment, therefore, applies to both the existing site and the project.

In addition, an assessment to determine if the project is considered a 'potentially offensive industry' under SEPP 33 is also provided.

6.14.3 Existing environment

i Dangerous goods

Holcim holds a dangerous goods licence under the NSW *Work Health and Safety Act 2011* (licence no. NDG019747) for the storage of dangerous goods at the existing site. Details of the dangerous goods stored at the existing site are summarised in Table 6.60. The class of dangerous goods stored at the existing site have been determined using *The Australian Code for the Transport of Dangerous Goods by Road and Rail* (Commonwealth of Australia 2020). Diesel is not considered a dangerous good as per *Applying SEPP 33* (DoP 2011) and, therefore, has not been considered.

Table 6.60 Dangerous goods stored at the existing site

Dangerous good	Storage type	Storage volume (kg)	Class
Acetylene	Above ground tank	250	2.1 – flammable gases
Aerosols	Within workshop in individual containers	Minor amounts such as spray paint bottles and general chemicals	2.1 – flammable gases
Oxygen	Above ground tank	300	2.2 – non-flammable, non-toxic gases
Argon	Above ground tank	300	2.2 – non-flammable, non-toxic gases
Bitumen emulsion	Above ground tank	35,800	9 – miscellaneous dangerous substances and articles, including hazardous substances
Premium precoat	Above ground tank	35,000	9 – miscellaneous dangerous substances and articles, including hazardous substances

ii Hazard procedures and plans

The existing site operates under a *Pollution Incident Response Management Plan* (Holcim 2019) (PIRMP) and an *Emergency Procedures Report* (Holcim 2019). The PIRMP was prepared in consideration of the POEO Act. It provides a risk assessment of potential environmental hazards that could occur at the existing site using Holcim's Safety, Health and Environment (SHE) Risk Assessment Tool and appropriate mitigation measures to address these risks. It includes a pollution information data sheet (PIDS) for all pollutants stored on-site, including the use, storage, safety information and clean up procedure relevant to the pollutant.

The *Emergency Procedures Report* (Holcim 2019) identifies the types and volumes of dangerous goods stored at the existing site, including the correct procedure to follow if various crisis situations occur. This could include a chemical spill or leak, fire or vehicle collision or rollover.

A dangerous goods manifest is also maintained on-site for recording the storage of premium precoat.

6.14.4 Impact assessment

i Potentially hazardous industry

a Storage volumes and location of dangerous goods

Dangerous goods in classes 2.2 and 9 are excluded from the *Applying SEPP 33* (DoP 2011) screening process for the following components:

- the mode of storage used and the maximum quantity stored or held on site of each material; and
- the distance of the stored material from the site boundary for any of the materials in dangerous goods classes 1.1, 1.2 and 3.

This is because dangerous goods in Class 2.2 are non-flammable and non-toxic. These gases are not considered to be potentially hazardous with respect to off-site risk. Dangerous goods in Class 9 pose little threat to people or property; however, could still potentially harm the environment. Therefore, only acetylene and aerosols stored at the existing site will be considered cumulatively as Class 2.1.

The thresholds for this component of the screening process are summarised in Table 1 of *Applying SEPP 33* (DoP 2011). For the storage of dangerous goods classified as Class 2.1, amounts below 100 kg are unlikely to be represent a significant risk and, therefore, are not potentially hazardous. There will be no change to the amount of acetylene or aerosols stored at the existing site, approximately 250 kg.

Therefore, the volume of acetylene or aerosols stored at the existing site and under the project do not meet the threshold for a potentially hazardous industry.

b Transportation of dangerous goods

The *Applying SEPP 33* (DoP 2011) screening process for a potentially hazardous industry also considers the average number of annual and weekly road movements of the dangerous good to and from the site and the typical quantity in each load. The thresholds for this component of the screening process are summarised in Table 2 of *Applying SEPP 33* (DoP 2011) and have been applied to the existing operations for Class 2.1 and Class 9 dangerous goods. Class 2.2 dangerous goods are excluded from the transport screening process.

There will be no change to the volume or frequency of dangerous goods transported to or from the existing site. As summarised in Table 6.61, the transportation of dangerous goods will remain below the applicable screening threshold and, therefore, does not meet the criteria for a potentially hazardous industry.

Table 6.61 Transportation screening thresholds for Class 2.1 and Class 9 dangerous goods

	Vehicle movements		Minimum quantity	
	Cumulative	Peak	Per load (tonne)	
	Annual	Weekly	Bulk	Packages
Class 2.1				
Existing amounts	1	1	0.05	0.025
Screening threshold	>500	>30	2	5
Class 9				
Existing amounts	26	1	N/A	N/A
Screening threshold	>1000	>60	N/A	N/A

c Other risk factors

SEPP 33 requires consideration of other hazards to public safety outside of the scope of the screening process, as summarised in Table 6.58 below. The project will not result in any other hazards to public safety.

Table 6.62 Other types of hazards

Type of hazard	Comment
Any incompatible materials (hazardous and non-hazardous materials)	The quarry does not store or use incompatible materials.
Any wastes that could be hazardous	The quarry does not produce hazardous wastes.
The possible existence of dusts within confined areas	Dust generated at the quarry is directly expelled to the air and does not accumulate within confined areas.
Types of activities the dangerous goods and otherwise hazardous materials are associated with (storage, processing, reaction, etc.)	The activities that dangerous goods are used in are general quarry processing activities, namely crushing and blending inert products. These activities are not expected to be hazardous to the public.
Incompatible, reactive or unstable materials and process conditions that could lead to uncontrolled reaction or decomposition.	Such materials and process conditions do not occur at the quarry.
Storage or processing operations involving high (or extremely low) temperatures and/or pressure.	No specialised storage or processing operations is undertaken at the quarry.
Details of known past incidents (and near misses) involving hazardous materials and processes in similar industries.	Quarries are not known to be commonly hazardous industries unless storage quantities of dangerous goods exceed relevant SEPP 33 screening thresholds.

Other hazards which may impact public safety include hazards from blasting and landslides onsite.

The site is not accessible to pedestrians, which could be injured during a blast event if located in proximity. To mitigate risk to the operational workforce, blasts are completed in accordance with Holcim's relevant management plans and completed by an appropriately qualified technician.

ii Potentially offensive industry

To determine whether the project is 'potentially offensive industry' under SEPP 33, the following assessment has considered:

- whether the project will produce air, noise, water or other emissions with a potential for pollution; and
- any relevant requirements for pollution control licences, permits or agreements.

Technical environmental assessments have been completed for noise, air and surface water impacts.

As described in Section 6.2, NMLs for the project will remain within the applicable criteria for daytime and night time periods for the construction and operational phase. Any exceedances will be short term and significantly decrease once usual quarry operations resume. To address residual exceedances, negotiated agreements, as per the VLAMP, may need to be considered. There will be no exceedances for sleep disturbance or noise or vibration due to blasting and road traffic noise.

As described in Section 6.3, air quality emissions from the project will remain within the applicable criteria.

As described in Section 6.7, the proposed water management system will result in decreased discharges to Eulomogo Creek. This will beneficially impact receiving water quality and natural flow regime of Eulomogo Creek. The proposed water management system will be completed in accordance with *Managing Urban Stormwater: Volume 1* (Landcom 2004) and Volume 2E (DECC 2008) in addition to several proposed management and monitoring plans to prevent any pollution to surface waterways.

Measures summarised in Appendix C of this EIS will help to mitigate or control adverse impacts, including any risk of noise, air quality or surface water pollution.

Holcim do not hold a pollution control licence, permit or agreement for the existing quarry, nor will such be required for the project.

Considering the project will not have a significant adverse impact on human health, life, property or the biophysical environment, it is not considered a potentially offensive industry under SEPP 33.

6.14.5 Mitigation measures

Hazard related procedures and plans currently implemented at the quarry will continue to operate under the project.

6.14.6 Conclusion

The volumes of dangerous goods stored and transported to the existing site, and which will be stored as part of the project, are below the SEPP 33 thresholds. Therefore, the project is not a potentially hazardous industry and a preliminary hazard assessment is not required.

6.15 Bushfire

6.15.1 Introduction

This section presents an assessment of bushfire risks and was prepared by EMM.

6.15.2 Assessment approach

i Assessment requirements

The bushfire SEARs requirements are listed in Table 6.63.

Table 6.63 Bushfire SEARs requirements

SEARs requirement*
Hazards – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, handling and use of any hazardous or dangerous goods.

*Refer to Section 6.14 for risks associated with the transport, handling and use of any hazardous or dangerous goods.

ii Legislative requirements

a Environmental Planning and Assessment Act 1979

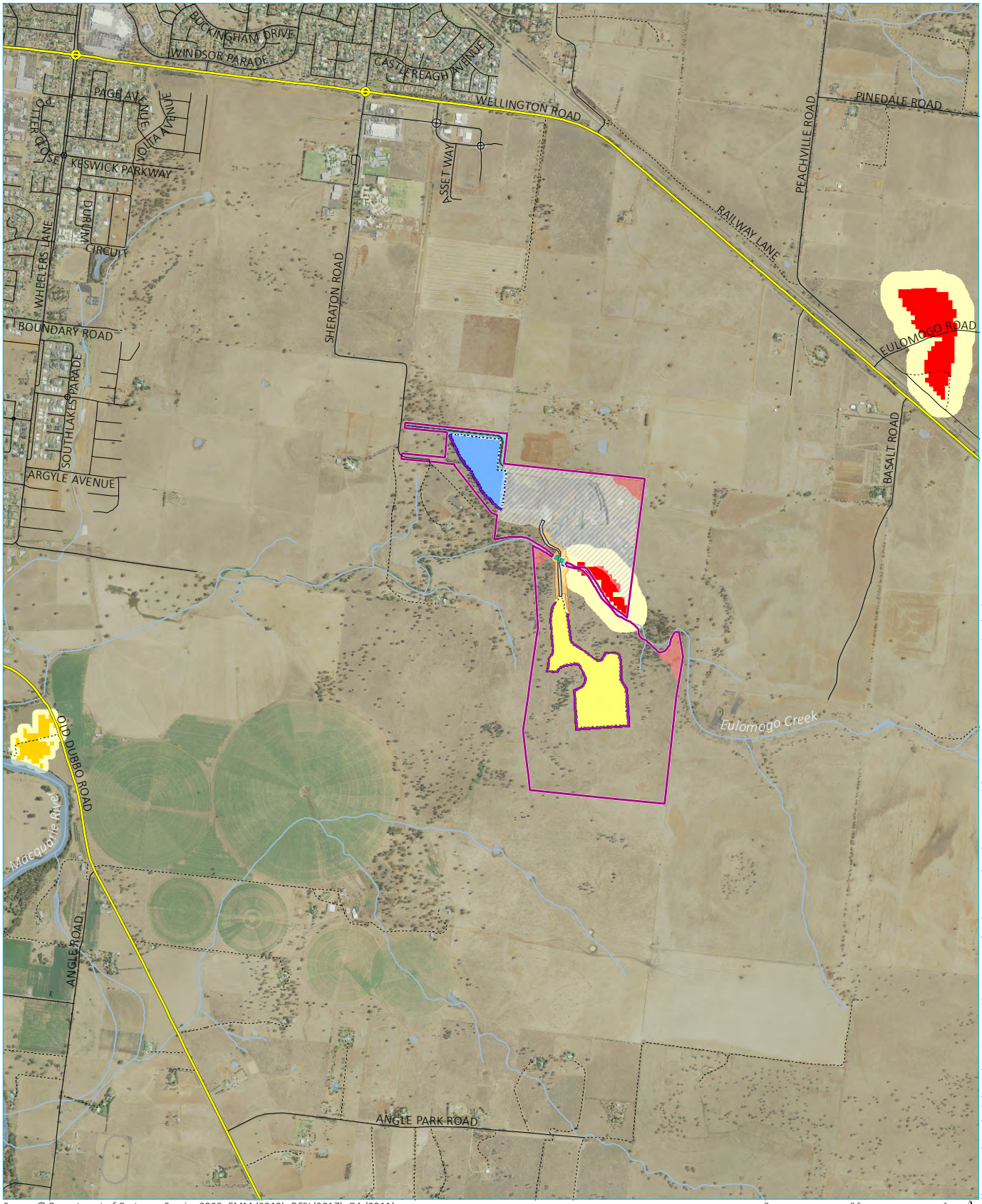
Under section 10.3 of the EP&A Act, the identification of bushfire prone land is required for all LGAs. The bushfire prone land mapping for each LGA provides the trigger for consideration of the provisions of *Planning for Bushfire Protection 2019* (NSW Rural Fire Service) (NSW RFS) (herein referred to as PBP) for new development on land which is bushfire prone.

Under section 4.14 of the EP&A Act, SSD projects are exempt from requiring a bushfire safety authority (BFSA). However, given the scale of many SSD projects, the requirements of PBP should be applied as appropriate, and consultation with NSW RFS is encouraged. Even where comments are sought at the approval stage of a project, further consultation with NSW RFS may be required at subsequent stages of project development (eg during detailed design).

b Planning for bushfire protection

The project area is partially mapped as bushfire prone (Vegetation Category 1 and buffer) on DRC's bushfire prone land map (refer Figure 6.23). Therefore, the provisions of PBP are to be considered for the project.

PBP provides an assessment framework for the potential impacts of bushfire upon the proposed new assets and establishes bushfire protection measures that are to be addressed and collectively form an effective mitigation strategy in order to reduce the bushfire impacts. For the purposes of this EIS and in keeping with PBP, the project is considered 'other development', as it is not residential subdivision, residential infill, or Special Fire Protection Purpose (SFPP). As 'other development', the proposed development is addressed through demonstrating compliance with the aim and objectives of PBP. The aim of PBP is 'to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment'.



Source:© Department of Customer Service 2020; EMM (2019); DFSI (2017); GA (2011); NSW Rural Fire Service (2020)

0 0.5 1 km

GDA 1994 MGA Zone 56

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KEY

- Project area
- Sediment pond
- Aboriginal protection zone
- Proposed haul road
- Indicative proposed water crossing
- Proposed access road
- Truck tarping area
- Bund wall
- Indicative existing disturbance area
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area

Bushfire prone land

- Vegetation category 1
- Vegetation category 2
- Vegetation buffer
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line

Bushfire prone land mapping

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.23

EMM creating opportunities

The objectives of PBP are to:

- afford buildings and their occupants protection from exposure to a bushfire;
- provide for a defendable space to be located around buildings;
- provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings;
- ensure that appropriate operational access and egress for emergency service personnel and occupants is available;
- provide for ongoing management and maintenance of bushfire protection measures; and
- ensure that utility services are adequate to meet the needs of fire fighters.

No bushfire specific performance requirements are provided in the National Construction Code 2019 (NCC) for Building Code of Australia (BCA) Class 5 to 8 buildings (which include offices, shops, factories, warehouses, public carparks and other commercial or industrial facilities). Therefore, *Australian Standard 3959 -2018 Construction of Buildings in Bushfire-prone Areas* (AS 3959-2018) or the National Association of Steel Framed Housing (2014) *Steel Framed Construction in Bush Fire Areas* (NASH Standard) does not apply as a set of 'deemed to satisfy' provisions. For buildings of Class 5 to 8 under the NCC, the general fire safety construction provisions of the NCC are taken as acceptable solutions, but the following objectives of PBP apply in relation to access, water supply and services, and emergency planning:

- to provide safe access to/from the public road system for firefighters providing property protection during a bushfire and for occupant egress for evacuation;
- to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development;
- to provide adequate services of water for the protection of buildings during and after the passage of bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and
- provide for the storage of hazardous materials away from the hazard wherever possible.

Mitigation measures as appropriate for the project are discussed in Section 6.15.5.

c NSW Rural Fires Act 1997

Bushfire suppression and management is regulated by the *Rural Fires Act 1997* (RF Act). Both the EP&A Act and the RF Act are modified by the *Rural Fires and Environmental Assessment Legislation Amendment Act 2002* to enhance bushfire protection through the development assessment process. The objectives of the RF Act are to provide for the:

- prevention, mitigation, and suppression of bush and other fires in NSW;
- co-ordination of bushfire fighting and bushfire prevention throughout the State;
- protection of people from injury or death, and property from damage, as a result of bushfires; and
- protection of the environment.

The RF Act places emphasis on cooperative fire management and wildfire suppression planning between the various organisations involved in fire management. With respect to the project area and dependent on the fire emergency, either the NSW RFS or Fire and Rescue NSW (FRNSW) will respond to fill the role of designed combat agency and/or assist as the secondary agency.

Section 63 of the RF Act states that it is the duty of the owner or occupier of land to take the notified steps and any other practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of a bushfire on or from that land.

Part 3, Division 4 of the RF Act stipulates that the Bush Fire Coordinating Committee (BFCC) must constitute a Bush Fire Management Committee (BFMC) for each area in NSW that is subject to the risk of bushfires. Each BFMC is required to prepare and submit to the BFCC a draft Bush Fire Risk Management Plan (BFRMP), a strategic document that identifies community assets at risk and sets out a five year program of coordinated multi-agency (including NSW RFS and FRNSW) treatments to reduce the risk of bushfire to the assets identified. The project occurs within the Orana BFMC area.

iii Methodology

Bushfire risks associated with the project have been assessed in accordance with PBP, with the following steps undertaken in the assessment process:

- identify the location, extent, and vegetation formation of any bushland on or within 500 m of the project, using a combination of aerial imagery and vegetation mapping;
- identify the slope and aspect of the project area and of any bushfire prone land within 500 m of the project, using a combination of aerial imagery, vegetation mapping, and site survey data from the quarry and NSW LIDAR raster data (DFSI 2017) to calculate slope;
- identify any features on or adjoining the project area that may mitigate the impact of a bushfire on the proposed development;
- identify potential bushfire impacts, including those related to bushfire impacting on the project, as well as bushfire emanating from the project and into the locality, and
- identify mitigation measures for asset protection zones (APZs), defendable space, construction standards (where relevant), access, potential ignition sources, location and adequacy of services, landscaping requirements, and emergency management procedures, in relation to the identified bushfire hazards.

6.15.3 Existing environment

i Regional fire weather

An analysis of the fire weather experienced in the region provides insight into bushfire behaviour potential within the project area and surrounds. Forest Fire Danger Index (FFDI) is based upon the LGA and Fire Weather District, as determined by the NSW RFS, where the development is to be located. The FFDI measures the degree of danger of fire in Australian vegetation and assumes a credible worst case scenario and an absence of any other mitigating factors relating to aspect or prevailing wind. The 1:50 year fire weather scenario for most of NSW is determined as FFDI 80 (NSW RFS 2017), and is the FFDI that has been used to inform bushfire behaviour on land within the project area (Lower Central West Plains Fire Weather Area). The project is within Orana BFMC area, which comprises the following regional weather characteristics:

- warm to hot summers, ranging from 17°C to 34°C with some extremes exceeding 38°C for many days;
- winter temperatures ranging from -4°C to 16°C with regular early morning frosts in the southern area of the Wellington LGA;
- mean average rainfall between 500 - 600 mm per annum. Rainfall is usually fairly evenly distributed throughout the year with a slightly greater average in the summer months. January is on average, the wettest month with 60 mm; and
- the bushfire season generally commences on 1 October and concludes 31 March (Orana BFMC 2012).

Prevailing weather conditions associated with the bushfire season in the Orana BFMC are north to westerly winds created by consecutive high pressure systems causing high daytime temperatures. Such hot winds are usually very dry with low relative humidity often going below 20 % (Orana BFMC 2012).

ii History of bushfire and existing ignition sources

Local knowledge indicates that major fires within the Orana BFMC area occur approximately every 10 to 15 years, with recent experience showing that major fires are now occurring much more frequently (Orana BFMC 2012). In 95-99% of fires in the Orana BFMC area, the normal fire suppression methods generally bring these fires under control within a few hours. With the other 1-5% of cases, that can only be described as major fires or fire storms, fires have only been brought under control with steadying or changing weather conditions combined with normal fire suppression methods including the use of water-bombing aircraft and back burning (Orana BFMC 2012).

The main sources of ignition in the Orana BFMC area are:

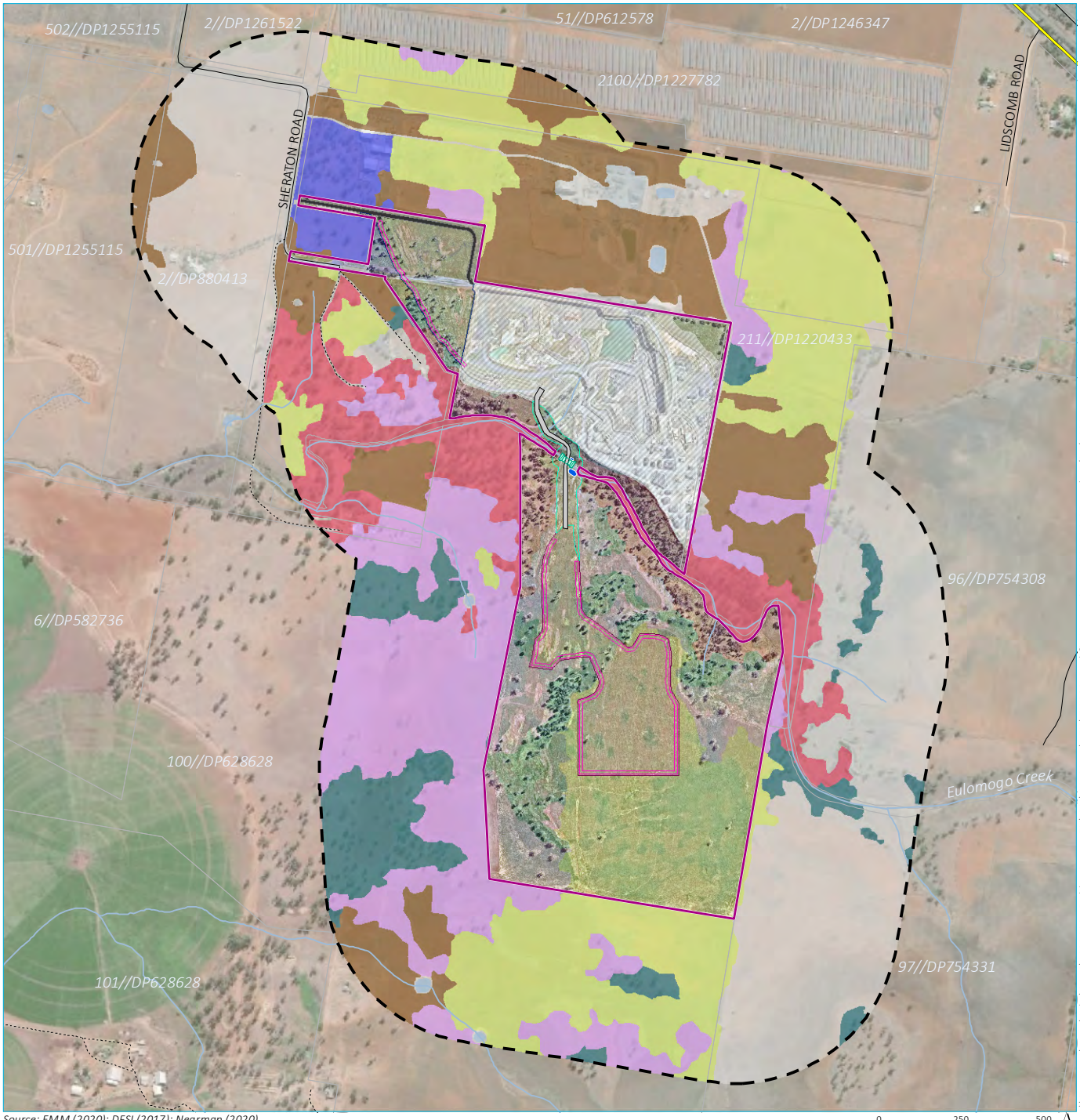
- careless acts by individuals (use of welders, angle grinders, dragging implements behind machinery or children playing with fire on days of high to extreme weather conditions);
- the use of farm machinery during dry, hot conditions;
- campfire escapes;
- lightning strikes;
- electrical power supply lines;
- burning of stolen vehicles;
- motor vehicle exhausts systems when in contact with vegetation on sides of roads;
- escaped controlled permit burns; and
- arson activity.

iii Vegetation assessment

Vegetation fuel is one of the key factors (with weather and topography) which influences how a fire behaves. Fuel attributes vary between different vegetation groups, by type, quantity, arrangement and moisture content. Based on these attributes fuels will also vary in how they ignite, spread and their intensity. Grouping vegetation types with similar fuel attributes together provides a means to generally characterise fire behaviour potential.

The project area is partially mapped as bushfire prone (Vegetation Category 1 and buffer) on the DRC bushfire prone land map (Figure 6.23). Vegetation Category 1 is considered the highest risk for bushfire, as it has the highest combustibility and likelihood of forming fully developed fires including heavy ember production (NSW RFS 2015). Vegetation Category 1 includes areas of forest, woodlands, heaths, forested wetlands and timber plantations and is given a buffer of 100 m, with the buffer also representing bushfire prone land (NSW RFS 2015).

Vegetation within 500 m of the project area was assessed to determine its formation and classification. Vegetation mapping within the project area has been undertaken by EMM (2020c) as part of the BDAR for the project (Appendix F). Previous vegetation mapping within the broader locality comprises *State Vegetation Type Map: Central West / Lachlan Region, Version 1.4. VIS_ID 4468* (DPIE 2015). Vegetation, including corresponding vegetation formation, mapped within a 500 m buffer of the project area is listed in Table 6.64 and shown in Figure 6.24.



Source: EMM (2020); DFSI (2017); Nearmap (2020)

0 250 500 m

GDA 1994 MGA Zone 55

N

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KEY

- Project area
- Project area 500 m buffer
- Sediment pond
- Proposed haul road
- Indicative proposed water crossing
- Proposed access road
- Truck tarping area
- Bund wall
- Indicative existing disturbance area
- Western disturbance area
- Haul road disturbance area
- Southern disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Waterbody
- Cadastral boundary (data does not align with survey site boundary)
- Non-native vegetation

Native vegetation Plant community type (PCT)

- 45 : Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion
- 76 : Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- 81 : Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion
- 267 : White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion
- 511 : Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion
- 796 : Derived grassland of the NSW South Western Slopes

Vegetation within proximity of the project area

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Figure 6.24

EMM creating opportunities

Table 6.64 Vegetation within and surrounding the project area

Plant community type (PCT)	Vegetation formation (Keith 2004)	PBP classification
0 – Not native	N/A	Grassland[1]
45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion	Grasslands	Grassland
76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Grassy Woodlands	Woodland
81 - Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion	Grassy Woodlands	Woodland
267 - White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion	Grassy Woodlands	Woodland
511 - Queensland Bluegrass - Redleg Grass - Rats Tail Grass - spear grass - panic grass derived grassland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Grassy Woodlands	Woodland
599 – Blakely's Red Gum – Yellow Box grassy tall woodland on flats and hills in the Brigalow Belt South and Nandewar Bioregion	Grassy Woodlands	Woodland
796 - Derived grassland of the NSW South Western Slopes	Grasslands	Grassland

Notes: 1. Exotic vegetation within proximity to the project area has been assigned to a vegetation formation as per the conversions presented within Table A1.9 of PBP and using aerial imagery interpretation and EMM (2020c) vegetation data and field observations.

The native vegetation adjacent to the project area and in the broader locality align with the grasslands and grassy woodlands vegetation formations, as classified by Keith (2004). The areas of vegetation mapped as not native have been assigned to the grassland formation as per Keith (2004), based upon the lack of woody vegetation, predicted fuel load and best fit. These areas are likely to be a mix of grassland dominated by non-native species, areas with minimal vegetation, and planted exotic trees found in disturbed roadside areas, cropland, heavily grazed pastures, parklands and residential properties. EMM (2020c) (refer Appendix F) provides detailed descriptions of the composition of each vegetation community mapped within the project area.

Photograph 6.3 shows the grassy woodland vegetation to be retained within the Eulomogo Creek corridor and within land mapped as bushfire prone (Vegetation Category 1) with the existing disturbance area (bund wall and stockpiles visible) in the background.

iv Slope assessment

Effective slope is considered to be the slope under the vegetation which will most significantly influence bushfire behaviours for each aspect and is usually the steepest slope. Slopes are classified in accordance with PBP and are combined with vegetation formation in an area to determine APZs for a development type. Slopes are classified according to the following PBP categories:

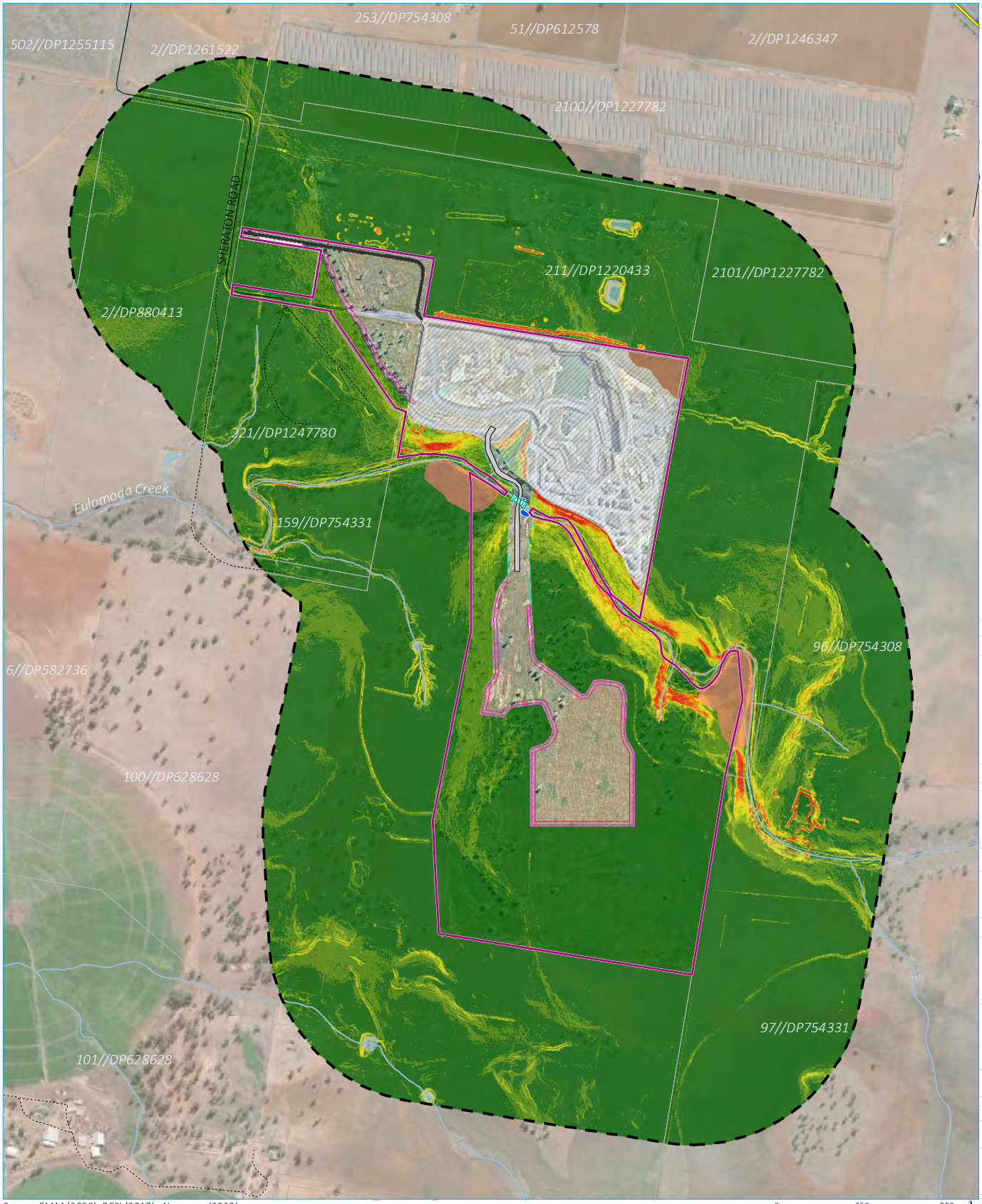
- all flat and upslope vegetation, considered 0 degrees (°);
- >0 to 5° downslope vegetation;
- >5 to 10° downslope vegetation;
- >10 to 15° downslope vegetation; and
- >15 to 18° downslope vegetation.

Photograph 6.3 **Vegetation within the Eulomogo Creek corridor and bushfire prone land mapping, south of the existing quarry boundary looking east, existing quarry bund wall and stockpile area visible**

A slope analysis that encompasses the land surrounding the disturbance area and for a 500 m buffer beyond the project area has been undertaken (Figure 6.25). This allows understanding of the slope classifications under the vegetation hazard and therefore potential fire behaviour surrounding the project area.

As shown in Figure 6.25, the land surrounding the project area is a gently undulating landscape with some areas of steeper slopes associated with low hills and various permanent and ephemeral water courses, as well as ground disturbance related to past disturbance from agriculture and other land development (including the existing quarry). Slopes immediately adjacent to the project area vary in gradient from flat land to areas that are over 35° in gradient. The very steepest slopes directly adjacent to the project area, as shown in Figure 6.25 are associated with the bund walls of the existing quarry and do not contain vegetation hazard; however, there are also steep areas associated with Eulomogo Creek where the woodland vegetation will be retained.

The effective slope has also been calculated, for those areas of vegetation directly adjacent to the existing disturbance area, where surface infrastructure occurs, as shown in Figure 6.25.



Source: EMM (2020); DFSI (2017); Nearmap (2020)

0 250 500 m

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KEY

- Project area
- Project area 500 m buffer
- Sediment pond
- Aboriginal protection zone
- Indicative existing disturbance area
- Proposed haul road
- Indicative proposed water crossing
- Bund wall
- Truck tarping area
- Proposed access road
- Western disturbance area
- Haul road disturbance area
- Southern disturbance area
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- Cadastral boundary (data does not align with survey site boundary)

Slope (degrees)

- 0 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- >35

Slopes within proximity of the project area

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Figure 6.25

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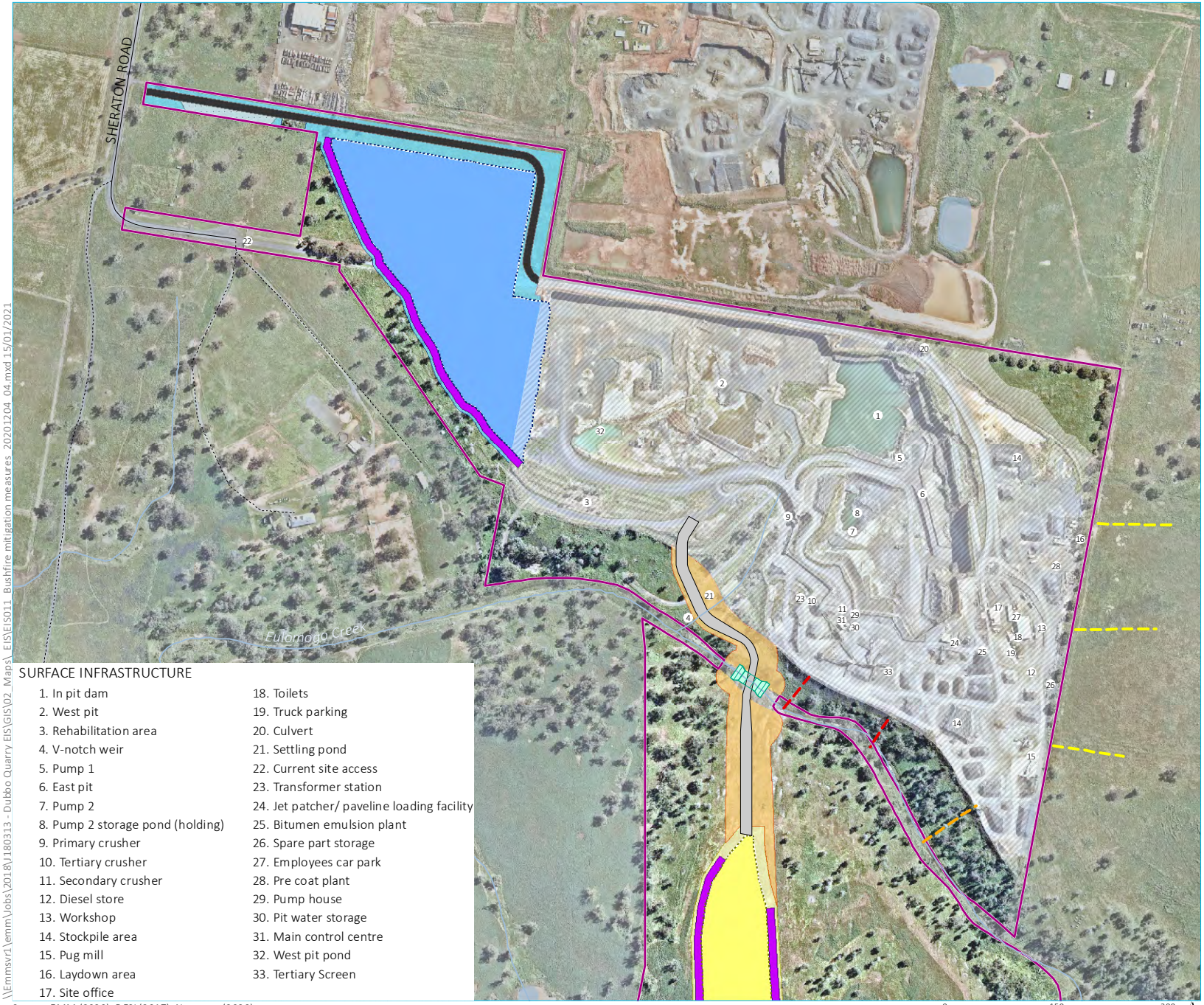

KEY

- Project area
- Proposed haul road
- Indicative proposed water crossing
- Watercourse/drainage line
- Minor road
- Vehicular track
- Proposed access road
- Truck tarping area
- Bund wall
- Indicative existing disturbance area
- Western extension area
- Western disturbance area
- Haul road disturbance area
- Southern extension area
- Southern disturbance area

Slope line

- Upslope vegetation (considered 0 degrees)
- >10 - 15 degrees downslope vegetation
- >15 - 20 degrees downslope vegetation

SURFACE INFRASTRUCTURE

1. In pit dam
2. West pit
3. Rehabilitation area
4. V-notch weir
5. Pump 1
6. East pit
7. Pump 2
8. Pump 2 storage pond (holding)
9. Primary crusher
10. Tertiary crusher
11. Secondary crusher
12. Diesel store
13. Workshop
14. Stockpile area
15. Pug mill
16. Laydown area
17. Site office
18. Toilets
19. Truck parking
20. Culvert
21. Settling pond
22. Current site access
23. Transformer station
24. Jet patcher/ paveline loading facility
25. Bitumen emulsion plant
26. Spare part storage
27. Employees car park
28. Pre coat plant
29. Pump house
30. Pit water storage
31. Main control centre
32. West pit pond
33. Tertiary Screen

Source: EMM (2020); DFSI (2017); Nearmap (2020)

0 150 300 m

GDA 1994 MGA Zone 55

N

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Surface infrastructure and effective slope

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.26

EMM creating opportunities

In accordance with PBP, APZs are recommended based on bushfire attack level (BAL) 29, to provide separation between the buildings at the site (warehouse and office) and the vegetation hazard (beyond the boundary of the existing disturbance area) so that the buildings will not be exposed to radiant heat levels exceeding 29kW/m² (based on a flame temperature of 1090 Kelvin (K)). This is consistent with the approach identified in Section 8.3.10 of PBP (commercial and industrial development) and Tables 7.4a and A1.12.3 of PBP.

The recommended APZs for the warehouse and office are provided within Table 6.65, with the actual separation distance and resulting BAL achieved, based upon the effective slope and vegetation formation present.

As shown within Table 6.65 and Figure 6.27, the warehouse and office are located so as to achieve a suitable setback from the hazard, achieving BAL-12.5 and BAL-LOW respectively. Separation distance between the tertiary crusher, pug mill and diesel store and the vegetation hazard have also been assessed within Table 6.65, as these are the closest surface infrastructure, other than buildings, to the vegetation beyond the boundary of the existing disturbance area. The achieved separation distance between the identified surface infrastructure and the hazard, and resulting indicative BAL, is also provided within Table 6.65 and shown in Figure 6.27. Further explanation around the recommended and proposed APZs for the site is provided within section 6.15.5 (mitigation measures).

Table 6.65 Vegetation, effective slope and separation distance

	Southern aspect (Tertiary crusher)	**Eastern aspect (Pug mill)**	**Eastern aspect (Warehouse)**	**Eastern aspect (Office)**	**Eastern aspect (Diesel store)**
Effective slope	>15 - 20° Downslope	Upslope/Flat	Upslope/Flat	Upslope/Flat	Upslope/Flat
Vegetation formation	Woodland (Eulomogo Creek corridor)	Grassland (Native/exotic pasture)	Grassland (Native/exotic pasture)	Grassland (Native/exotic pasture)	Grassland (Native/exotic pasture)
Recommended APZ (FDI 80, ≤29kW/m², 1090K) (for BAL–29)	27 m	10 m	10 m	10 m	10 m
Achieved separation distance from vegetation to nearest surface infrastructure (Figure 6.27)	35 m	26 m	40 m	85 m	50 m
Assessed BAL rating	BAL-29	BAL-12.5	BAL-12.5	BAL-LOW	BAL-LOW

Notes: 1. The existing disturbance area is cleared of all vegetation (apart from a few trees and shrubs) and completely developed (Figure 6.26) therefore the slope on the aspects surrounding the existing disturbance area where the vegetation hazard will remain in proximity of surface infrastructure, have been assessed.

v Features on adjoining land that may mitigate the impact of bushfire

The project area is surrounded by areas that have been highly modified through agricultural, residential, and commercial land uses. These areas contain modified vegetation or non-vegetated areas, and include:

- historically cleared agricultural land comprising cropping and livestock grazing, with fuel loads that will fluctuate depending on weather conditions and intensity of grazing and/or cropping regime;
- rural-residential properties and residential properties containing managed land within the curtilage of buildings; and
- other existing commercial operations including the South Keswick Quarry and Dubbo South Keswick Solar Farm, containing managed land, and located directly to the north of the project area.

KEY

- Project area
- Separation

Indicative bushfire attack level

- BAL 40
- BAL 29
- BAL 12.5
- BAL LOW

Source: EMM (2020); DFSI (2017); GA (2011); ASGC (2006); Nearmap (2020)

0 50 100 m

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Surface infrastructure, separation distance and indicative bushfire attack level

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Environmental Impact Statement
Figure 6.27

EMM creating opportunities

These features may mitigate the impact of high intensity bushfire on the project, particularly as the landscape has been historically substantially cleared for agriculture and the ongoing management of vegetation for these land uses. Some areas of native vegetation remain as a patchwork of disturbed woodland and derived grassland remnants within the landscape, and it is these areas that are within close proximity to the project area that remain a hazard.

6.15.4 Impact assessment

Bushfire is capable of damaging infrastructure associated with the project and consequently impacting upon the safety of staff and contractors during the construction and operation of the project. Bushfire emanating from the construction and operation of the project poses a human safety and property threat within the locality, as well as threatening native flora, fauna, and ecosystems within the locality of the project. Fire suppression operations can be made more challenging as a result of bio-physical risk factors, as discussed in the sections above. This includes weather conditions, vegetation characteristics, terrain and aspect, and existing potential ignition sources, which can contribute to the risk of bushfire originating from outside the project in surrounding areas. The addition of activities associated with the construction and operation of the project adds additional risks. The potential ignition of unplanned bushfires from the construction and operation phases of the project are likely to be from the following sources:

- diesel generators;
- storage of flammable gas, liquids (eg fuel) and other hazardous chemicals;
- vehicle and machine movement over long grass;
- sparks generated from malfunctioning surface infrastructure (eg crushers, pugmill, transformer station, bitumen emulsion plant and pre-coat plant);
- sparks generated from hot works (eg welders and grinders); and
- human error, such as non-compliance of hot works procedures or incorrect disposal of cigarette butts.

The bushfire prevention and protection measures described in section 6.15.5 will assist in mitigating the identified bushfire impacts during the construction and operation of the project.

6.15.5 Mitigation measures

As outlined within Chapter 2, there will not be a defined construction phase, as operation of the project will commence as soon as development approval is received from DPIE. Therefore, all activities associated with the project will be guided by an OEMP to be prepared by Holcim. A bushfire management plan (BFMP), in accordance with PBP and any additional requirements from the NSW RFS, will be prepared by a suitably qualified bushfire consultant, as part of the OEMP for the construction and operation of the project.

The BFMP will provide details for the ongoing management and maintenance of bushfire protection measures as well as bushfire emergency response measures. The BFMP shall encompass those mitigation measures outlined within Table 6.66 to Table 6.71.

Table 6.66 Performance criteria and acceptable solutions - asset protection zones

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• APZs are provided commensurate with the construction of the building; and • A defendable space is provided.	• An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of PBP.	✓		• APZs have been assessed against Table A.12.3 (FDI 80) in Appendix 1 of PBP (refer to section 6.15.3iv). • The recommended APZs within section 6.15.3iv of this report are based on BAL-29. This is consistent with the approach identified in Section 8.3.10 of PBP (commercial and industrial development) which states the provisions of Chapter 7 of PBP be used as a base package of measures. It is noted that non-residential Class 5 to 8 buildings require no specific level of construction in accordance with AS 3959 and the NCC. Structural fire protection measures (chapter 3 of AS 3959) are deemed adequate if located out of the flame zone. The existing disturbance area at the site provides the APZ between the hazard vegetation, and the warehouse and office will be exposed to BAL-12.5 and BAL-LOW (refer to section 6.15.3iv). The APZ between the hazard vegetation and other assessed surface infrastructure (tertiary crusher, pug mill and diesel store) will be exposed to BAL-LOW to BAL-29 (refer to section 6.15.3iv). It is noted that this surface infrastructure does not fall under the NCC and AS 3959-2018. It is also noted that the pre -coat plant is located very close to the eastern boundary and likely in the flame zone (however was not assessed). This infrastructure may have potential to cause the ignition of surrounding grassland. **Recommendation for BFMP:** • APZs shall be maintained for the buildings. • A defendable space or APZ shall be provided around all surface infrastructure. In many instances, surface infrastructure requires access, parking, hardstand and loading areas. It is prudent to place these in the most appropriate location in order to establish defendable space for firefighting purposes, as well as to mitigate the potential for ignition of surrounding vegetation from project sources. This is particularly important for the surface infrastructure located on the boundary of the site (tertiary crusher, pug mill, diesel store and pre-coat plant).
• APZs are managed and maintained to prevent the spread of a fire to the building.	• APZs are managed in accordance with the requirements of Appendix 4 of PBP.		✓	• As the APZs comprise the working quarry (roads and hardstands) there will be limited vegetation management required. However, landscaping and re-vegetation may occur in proximity to surface infrastructure. **Recommendation for BFMP:** • Any landscaped areas or revegetation in proximity to surface infrastructure will be managed to the standards of an Inner Protection Area (IPA) and in accordance with Appendix 4 of PBP. The BFMP will provide details on suitable landscaping in accordance with IPA standards within Appendix 4 of PBP.
• The APZ is provided in perpetuity.	• APZs are wholly within the boundaries of the development site.		✓	• APZs are wholly within the development footprint and will be provided for the life of the development. **Recommendation for BFMP:** • Suitable management measures for the APZs to be included within the BFMP for the construction and operation of the project.
• APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	• APZ are located on lands with a slope less than 18°.	✓		• The APZs are located on land less than 18°.

ii Property access

Property access is by way of Sheraton Road, providing access from the public road system to the quarry. The upgraded property access road, new internal haul road and existing internal access roads within the site shall comply with section 7.4 of PBP, as outlined within Table 6.67.

Table 6.67 Performance criteria and acceptable solutions – property access

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	• Property access roads are two-wheel drive, all-weather roads.	✓		• The upgraded (realigned) private property access road will be a two-wheel drive, all-weather road. It will provide two-wheel drive, all weather access from the public road system to the employee car park, workshop and site office. • The new internal haul road (the southern haul road), to connect the existing quarry to the SEA is designed to allow trucks to transport Basalt from the SEA to the primary crusher. • The existing processing infrastructure, stockpiles, maintenance and administrative facilities are proposed to remain within the area of current extraction activities, with locations of the infrastructure shown in Figure 6.26. No new surface infrastructure is proposed in the two new extraction areas (WEA and SEA). The existing surface infrastructure are all within proximity to the two-wheel drive, private property access road. • As part of the current operations, dump trucks move from the existing quarry area to the processing infrastructure and stockpiles, along a series of internal haul roads. These roads are designed for dump trucks and 4WD vehicles only, and therefore may not always provide all weather access. However, there is no surface infrastructure within the existing or proposed quarrying areas. **Recommendation for BFMP:** • The property access road is maintained to provide safe, all-weather access to structures and hazard vegetation, and • The internal access roads are maintained so as to provide firefighting vehicles with safe, all-weather access to structures and hazard vegetation (particularly the hazard vegetation along Eulomogo Creek and any future revegetation in proximity to structures).
• The capacity of access roads is adequate for firefighting vehicles.	• The capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes), bridges and causeways are to clearly indicate load rating.	✓		• The upgraded (realigned) private property access road has been designed to accommodate two-way movements of a truck and quad dog vehicle, with an average 33 tonne payload. • The new internal haul road (the southern haul road) is designed for dump trucks (Caterpillar 769C Rock Trucks) with a loaded weight over 60 tonnes. • The Eulomogo Creek crossing is designed for dump trucks with a loaded weight of up to 150 tonnes, therefore it will have capacity to carry a fully loaded firefighting vehicle. **Recommendation for BFMP:** • The Eulomogo Creek crossing shall include a load rating sign.

Table 6.67 Performance criteria and acceptable solutions – property access

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• There is appropriate access to water supply.	• Hydrants are provided in accordance with the relevant clauses of AS 2419.1-2005 *Fire hydrant installations. Part 1 System design, installation and commission.*	n/a		• There is no reticulated water supply.
	• There is suitable access for a Category 1 fire appliance to within 4 m of the static water supply where no reticulated supply is available.		✓	• In the event of a bushfire, the quarry will use the water cart (13,000 L) which is filled up from the storage pond and/or the main in pit dam (Figure 6.26). • A fire appliance could also access the water supply from the storage pond and main pit dam, as there is hardened ground within 4 m of water pumps. However, the current fittings (6 inch line) will not suit an NSW RFS tanker. **Recommendation for BFMP:** • During preparation of the BFMP, the NSW RFS shall be contacted to determine the connections required, so as the static water supplies are accessible to the NSW RFS tankers. The BFMP shall include provisions for the access of a Category 1 fire appliance to within 4 m of the static water supply. • Alternately, there are currently existing water tanks on the quarry site, comprising a 20,000 L tank at the office, a 22,500 L tank at the amenities block and a 100,000 L tank that is used for dust suppression in the crushing plant. These could potentially be used for firefighting water. In addition, there are plans to install a 100,000 L tank to capture the workshop roof runoff. During preparing of the BFMP, any new static water supply proposed for firefighting shall provide suitable access within 4 m for a Category 1 fire appliance.
• Firefighting vehicles can access and exit the property safely.	• Minimum 4 m carriageway width.	✓		• The upgraded (realigned) property access road will be widened to 10 m in order to accommodate incoming and outgoing truck movements. • The new internal haul road (southern haul road), to connect the existing quarry area to the SEA will be 15 m wide and will narrow to a width of 10 m at the Eulomogo Creek crossing. • All existing internal access roads within the quarry site are suited to approximately 6 m wide dump trucks.
	• In forest, woodland and heath situations, rural property roads have passing bays every 200 m that are 20 m long by 2m wide, making a minimum trafficable width of 6 m, at the passing bay.	✓		• The upgraded (realigned) property access road will be widened to 10 m in order to accommodate incoming and outgoing truck movements. The minimum trafficable width is larger than 6 m along the entire property access road.

Table 6.67 Performance criteria and acceptable solutions – property access

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
	• A minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches.		✓	**Recommendation for BFMP:** • The BFMP shall include provisions to ensure that a minimum vertical clearance of 4 m to any overhanging obstructions (including awnings) is provided along all access routes.
	• Property access must provide a suitable turning area in accordance with Appendix 3 of PBP.		✓	**Recommendation for BFMP:** • The BFMP shall include provisions to ensure a suitable turning area in accordance with Appendix 3 of PBP.
	• Curves have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress. • The minimum distance between inner and outer curves is 6 m. • The crossfall is not more than 10 degrees. • Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.		✓	• Development Consent D2017-640, granted by Dubbo Regional Council on 16 August 2018, allowed for the construction of a new intersection on Sheraton Road with the proposed entry/exit to Lot 222 DP 1247780 approximately 175 m north of the existing access point. Therefore, construction of the site access intersection is not included in the project. It is noted that Development Consent D2017-640 limits trucks accessing the site at the new intersection to 19 m long. The consent will be modified to allow larger trucks sizes as required for the project. • The conceptual proposed access road design for the project includes turning radius' for 20m trucks, therefore a Category 1 fire appliance can enter and exit the property. **Recommendation for BFMP** • During preparation of the BFMP, the NSW RFS shall be contacted to ensure that a Category 1 fire appliance can enter and exit the property safely.
	• A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way.	n/a		• Not relevant to the development type.

Table 6.68 Performance criteria and acceptable solutions – water supply

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• An adequate water supply is provided for firefighting purposes.	• Reticulated water is to be provided to the development, where available.	n/a		• There is no reticulated water supply.
	• A static water supply is provided where no reticulated water is available.		✓	• In the event of a bushfire, the quarry will use the water cart (13,000 L) which is filled up from the storage pond and/or the main in pit dam (Figure 6.26), via two portable water pumps. A fire appliance could also access these water supplies if connections are replaced to be suitable for fighting purposes. • Alternately, there are currently existing water tanks on the quarry site, comprising a 20,000 L tank at the office, a 22,500 L tank at the amenities block and a 100,000 L tank that is used for dust suppression in the crushing plant. These could potentially be used for firefighting water. In addition, there are plans to install a 100,000 L tank to capture the workshop roof runoff in the future. **Recommendation for BFMP:** • The BFMP shall confirm the location and capacity of static water supplies for firefighting purposes and in liaison with the NSW RFS.
• Water supplies are located at regular intervals. • The water supply is accessible and reliable for firefighting operations. • Flows and pressure are appropriate.	• Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1-2005. • Hydrants are not located within any road carriageway. • Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1-2005.	n/a		• There are no fire hydrants proposed.
• The integrity of the water supply is maintained.	• All above-ground water service pipes external to the building are metal, including and up to any taps.		✓	**Recommendation for BFMP:** • The BFMP shall include provisions to ensure that all above-ground water service pipes related to the static water supply are metal, including and up to any taps.

Table 6.68 Performance criteria and acceptable solutions – water supply

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• A static water supply is provided for firefighting purposes in areas where reticulated water is not available.	• Where no reticulated water supply is available, water for firefighting purposes is provided in accordance with Table 5.3d of PBP.		✓	• In the event of a bushfire, the quarry will use the water cart (13,000 L) which is filled up from the storage pond and/or the main in pit dam (Figure 6.26), via two portable water pumps. A fire appliance could also access these water supplies if connections are replaced to be suitable for fighting purposes. • Alternately, there are existing water tanks on the quarry site, comprising a 20,000 L tank at the office, a 22,500 L tank at the amenities block and a 100,000 L tank that is used for dust suppression in the crushing plant. In addition, there are plans to install a 100,000 L tank to capture the workshop roof runoff. These could potentially be used for firefighting water. **Recommendation for BFMP:** • Table 5.3d of PBP is aimed at providing suitable static water supplies or non-reticulated residential development, and is not necessarily relevant to commercial and industrial development. Therefore, the BFMP shall confirm the capacity of static water supplies (SWS) for firefighting purposes, as relevant to this development type, and in liaison with the local NSW RFS. An 'SWS' marker shall be obtained from the local NSW Rural Fire Service and positioned for ease of identification by brigade personnel and other users of the SWS.
	• A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65 mm Storz outlet with a ball valve is fitted to the outlet. • Ball valve and pipes are adequate for water flow and are metal. • Supply pipes from tank to ball valve have the same bore size to ensure flow volume.		✓	**Recommendation for BFMP:** • The BFMP shall provide provisions to ensure that the static water supply connection, water flow and supply pipes are suitable for firefighting purposes in liaison with the local NSW RFS.
	• Underground tanks have an access hole of 200 mm to allow tankers to refill direct from the tank.	n/a		• There are no underground tanks proposed.

Table 6.68 Performance criteria and acceptable solutions – water supply

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
	• A hardened ground surface for truck access is supplied within 4 m.		✓	• A fire appliance could access the water supply from the storage pond and main pit dam, as there is hardened ground within 4 m of water pumps. However, the current fittings (6 inch line) will not suit an NSW RFS tanker. **Recommendation for BFMP:** • During preparation of the BFMP, the NSW RFS shall be contacted to determine the connections required, so as the static water supplies are accessible to the NSW RFS tankers. The BFMP shall include provisions for the access of a Category 1 fire appliance to within 4 m of the static water supply. • Alternately, there are existing water tanks on the quarry site, comprising a 20,000 L tank at the office, a 22,500 L tank at the amenities block and a 100,000 L tank that is used for dust suppression in the crushing plant. In addition, there are plans to install a 100,000 L tank to capture the workshop roof runoff. These could potentially be used for firefighting water. During preparing of the BFMP, any new static water supply proposed for firefighting shall provide suitable access within 4 m for a Category 1 fire appliance.
	• Above-ground tanks are manufactured from concrete or metal.		✓	**Recommendation for BFMP:** • Any above-ground tanks designated for firefighting water, shall be manufactured from concrete or metal.
	• Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959).		✓	**Recommendation for BFMP:** • Any raised tanks designated for firefighting water, shall have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959).
	• Unobstructed access can be provided at all times.		✓	**Recommendation for BFMP:** • The BFMP shall provide provisions to ensure unobstructed access to dedicated firefighting static water supply.
	• Underground tanks are clearly marked.	n/a		• There are no underground tanks proposed.
	• Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters	n/a		• There are no above ground static fire water supply tanks directly near a vegetation hazard.
	• All exposed water pipes external to the building are metal, including any fittings.		✓	**Recommendation for BFMP:** • The BFMP shall include provisions to ensure that all exposed water pipes external to the building are metal, including any fittings.

Table 6.68 Performance criteria and acceptable solutions – water supply

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
	• Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19 mm internal diameter.		✓	**Recommendation for BFMP:** • The BFMP shall provide provisions to ensure pumps, if provided for firefighting purposes, meet this solution.
	• Fire hose reels are constructed in accordance with AS/NZS 1221-1997, and installed in accordance with the relevant clauses of AS 2441-2005.		✓	**Recommendation for BFMP:** • The BFMP shall provide provisions to ensure fire hose reels, if provided for firefighting purposes, meet this solution.

iv Other services

Table 6.69 Performance criteria and acceptable solutions – electricity and gas services

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	• Where practicable, electrical transmission lines are underground. • Where overhead, electrical transmission lines are proposed as follows: – lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and – no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines (Resources and Energy NSW 2016).	n/a		• The realignment of the existing power and telecommunicators lines are subject to a separate DA (Part 5 approval under the EP&A Act, with Essential Energy and NBN Australia being the determining authorities).
• Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	• Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596-2014 and the requirements of relevant authorities, and metal piping is used. • All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard side. • Connections to and from gas cylinders are metal. • Polymer-sheathed flexible gas supply lines are not used. • Above-ground gas service pipes are metal, including and up to any outlets.		✓	**Recommendation for BFMP:** • If required, gas will be installed in accordance with AS/NZS 1596 2014, as appropriate to the development.

Table 6.70 Performance criteria and acceptable solutions – construction standards

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact	• BAL is determined in accordance with Tables A1.12.5 to A1.12.7 of PBP.	✓		• APZs have been assessed against Table A.12.6 (FDI 80) in Appendix 1 of PBP. • Using the existing disturbance area as an APZ, the buildings (warehouse and office) will be exposed to BAL-12.5 and BAL-LOW respectively (Figure 6.27).
	• Construction provided in accordance with the NCC and as modified by Section 7.5 of PBP		✓	• Non-residential Class 5 to 8 buildings require no specific level of construction in accordance with AS 3959-2018. The general fire safety provisions in section 3 of AS 3959-2018 are deemed adequate if located out of the flame zone. The buildings (warehouse and office) at the site are located outside of the flame zone. • Further, commercial buildings, structures and equipment must also have fully compliant fire safety systems in accordance with AS and NCC requirements and as appropriate to the building/structure type, including some or all of the following features: – fire extinguishers; – fire hose reels; – fire hydrant systems; and – automatic sprinkler systems. **Recommendation for BFMP:** • During the preparation of the BFMP, BAL for the buildings (warehouse and office) shall be confirmed in accordance with Table A.12.6 (FDI 80) in Appendix 1 of PBP, and the buildings shall comply with the general fire safety provisions in section 3 of AS 3959-2018, as modified by section 7.5 of PBP. • It is noted that embers have been shown to travel much further than 100 m, therefore it is encouraged that all buildings are constructed to at least BAL-12.5, as section 3 of AS 3959-2018 does not provide construction requirements for buildings assessed in bushfire-prone areas as being BAL-LOW. • The buildings, structures and equipment will be routinely serviced to comply with the specific fire safety system requirements, as relevant to the structure type.
• Proposed fences and gates are designed to minimise the spread of bush fire.	• Fencing and gates are constructed in accordance with section 7.6 of PBP.		✓	**Recommendation for BFMP:** • All fences and gates shall be made of non-combustible material.

Table 6.70 Performance criteria and acceptable solutions – construction standards

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• Proposed Class 10a buildings are designed to minimise the spread of bush fire.	• Class 10a buildings are constructed in accordance with section 8.3.2 of PBP.	n/a		• There are no class 10a structures existing or proposed for the project.

Table 6.71 Performance criteria and acceptable solutions – landscaping

Performance criteria	Acceptable solutions	Complies	Detailed design	Justification/commitment
• Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	• Compliance with the NSW RFS 'Asset protection zone standards' (see Appendix 4 of PBP); • A clear area of low-cut lawn or pavement is maintained adjacent to the house; • Fencing is constructed in accordance with section 7.6 of PBP; • Trees and shrubs are located so that: – the branches will not overhang the roof; – the tree canopy is not continuous; and – any proposed windbreak is located on the elevation from which fires are likely to approach.		✓	• All APZs surrounding the surface infrastructure are created by the quarry operation itself, therefore there are very limited trees, shrubs or grass within the buffer between the vegetation hazard beyond the disturbance area boundary and the surface infrastructure. • There are some shrubs around the administrative facilities, and a small stand of trees near the toilets and truck parking area. **Recommendation for BFMP:** • Any landscaped areas (gardens) around the administrative facilities, that may contribute to flame contact upon the structures (via wind driven embers landing within the shrubs and trees, for example) shall be avoided. • Trees and shrubs are located so that: – the branches will not overhang any roof, and – the tree canopy is not continuous. • The BFMP shall provide general landscaping provisions to limit potential for wind-driven embers to cause ignitions, for example cleaning out gutters and managing vegetation within the gardens adjacent to the buildings. • All fences shall be made of non-combustible material. • Progressive rehabilitation will be undertaken concurrently with extraction of the WEA and SEA. Rehabilitation requirements will be identified during detailed design of the project and a rehabilitation management plan will be prepared for the site. The rehabilitation management plan shall consider the interaction of any progressive vegetative rehabilitation and the need to provide setback of any structures from hazard vegetation, as well as the provisions of Appendix 4 of PBP, if vegetation rehabilitation is to occur near any structures.

vii Potential ignition sources

Section 6.15.4 identifies the potential ignition sources and hazardous and flammable materials associated with the project. It is recommended that the BFMP provide provisions to mitigate the potential ignition of bushfire from project sources, including:

- hazardous materials are to be located away from the vegetation hazard;
- storage for potentially flammable materials are to be designed, housed, and maintained so as not serve as an unacceptable bushfire risk to surrounding vegetation;
- implementation of adequate storage and handling requirements for potentially flammable substances in accordance with *AS 1940 The storage and handling of flammable and combustible liquids, AS 1596 The storage and handling of LP gas* and other relevant Australian Standards;
- plant and equipment are maintained in good working order, are fitted with appropriate spark arrestors, where practical, and vehicle movement over long grass is limited;
- all vehicles and equipment are provided with portable fire extinguishers that comply with relevant Australian Standards.
- staff are informed of the site rules included designated smoking areas and putting rubbish in designated bins;
- hot work permits are required with no hot works on total fire bans and/or conditions associated with severe fire weather;
- immediate notification to emergency services of the location and nature of any accidental ignition of surrounding vegetation and/or structures, that was unable to be successfully extinguished, and
- provide assistance to NSW RFS/FRNSW in the investigation of the cause of any unplanned fires in proximity to the project, should they occur.

viii Bushfire management plan, including emergency management

The BFMP for the project will be developed by a suitably qualified bushfire consultant for the construction and operation of the project. The BFMP will provide details for the ongoing management and maintenance of bushfire protection measures and will encompass the provisions outlined within Table 6.66 to Table 6.71, including:

- APZ locations and management details;
- property access provisions such as access locations and alternative emergency access;
- water supplies and bushfire suppression systems (including drenching systems, static water supply, natural water sources etc);
- schedule of the BAL requirements and building footprints as well as any specific construction details;
- landscaping requirements including management of an APZs, as well as the interaction between future rehabilitation areas and surface infrastructure;
- details regarding bushfire emergency management and evacuation plan, and
- any other essential bushfire safety requirements.

The BFMP shall include a bushfire emergency management and evacuation plan that is consistent with *A guide to developing a bush fire emergency management and evacuation plan* (NSW RFS 2014) and *Australian Standard 3745-2010 Planning for emergencies in facilities,* as appropriate to the project. The bushfire emergency management and evacuation plan shall:

ix Environmental impact of proposed measures

A BDAR (Appendix F) has been prepared for the project in accordance with the BAM and addresses the requirements of the BC Act. 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. The clearing of native vegetation and fauna habitat is required for the project, with all impacts required to be offset in accordance with the BC Act.

x Summary of mitigation measures

The table below provides a summary of recommendations to achieve compliance with the relevant requirements of PBP for bush fire protection for asset protection zones, construction standards, access, water supply, provision of services, and emergency management.

Table 6.72 Summary of recommended management measures

Mitigation element	Objectives
Asset protection zones	• APZs are provided commensurate with the construction of the building. • A defendable space is provided. • Vegetation is managed within asset protection zones in perpetuity.
Property access	• Safe access to/from the public road system is provided for firefighters providing property protection during a bushfire and for occupant egress for evacuation; • Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation. • The capacity of access roads is adequate for firefighting vehicles. • There is appropriate access to water supply.
Water supply	• Adequate services of water for the protection of buildings during and after the passage of bushfire are provided. • Water supply requirements for firefighting are designed in accordance with the relevant Australian Standards and PBP.
Other services	• Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings. • Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.
Construction standards	• The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.
Landscaping	• Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.
Potential ignition sources	• To provide for the storage of hazardous materials away from the hazard wherever possible.
Bushfire management plan (including emergency management)	• A BFMP for the construction and operation of the project, will provide details for the ongoing management and maintenance of bushfire protection measures. • The BFMP should include a bushfire emergency management and evacuation plan to provide suitable emergency and evacuation (and relocation) arrangements for occupants of the development.

6.15.6 Conclusion

The project area is partially mapped as bushfire prone (Vegetation Category 1 and buffer). Therefore, the provisions of PBP are to be considered for the project. In accordance with the PBP, vegetation within 500 m of the project area was assessed to determine its formation and classification. Bushfire risks associated with the project include potential for damage to quarry infrastructure, safety of staff and contractors during the construction and operation of the project, human safety and property threat within the locality, as well as threatening native flora, fauna, and ecosystems within the locality of the project. Recommendations have been made to achieve compliance with the relevant requirements of PBP for bush fire protection for asset protection zones, construction standards, access, water supply, provision of services, and emergency management.

6.16 Visual

6.16.1 Introduction

A visual impact assessment (VIA) for the project is provided below.

6.16.2 Assessment approach

i Assessment requirements

The visual SEARs requirements are listed in Table 6.63.

Table 6.73 Visual SEARs requirement

SEARs requirement
Visual - including a detailed assessment of the likely visual impacts of the development (before, during and post-mining) on private landowners in the vicinity of the development and key vantage point s in the public domain, paying particular attention to any new landform.

ii Purpose

This VIA examines the effect of the project in terms of visual impact on local residences and other locations where a line of sight to the project is feasible and where people may place a value on the existing visual landscape. The assessed viewing locations include destinations such as tourist sites and vantage points, or similar settings where the view is an integral component of the experience.

The visual landscape is important because it provides:

- a public good;
- a setting for the day-to-day lives of local communities;
- habitat for flora and fauna;
- a sense of place; and
- opportunities for aesthetic enjoyment.

A visually attractive landscape can also provide economic benefits through recreation and tourism, plus indirect benefits to health and wellbeing.

Projects are also important to communities and local economies, and there is generally some visual effect arising from development because it typically generates a new element in the landscape. Not all development has a negative visual impact and not all impacts are unacceptable. There is a need to consider the extent to which a proposed development integrates or contrasts with the local landscape, and the extent to which sensitive receptors in the vicinity will be affected by the proposed development.

The purpose of this VIA is, therefore, to understand the likely interactions between the project and visual receptors in the vicinity.

iii Methodology

a Overview

This VIA is consistent with the *Guidelines for Landscape and Visual Impact Assessment* (Landscape Institute and the Institute of Environmental Management and Assessment (LI&IEMA) 2013).

The VIA establishes the existing nature of the landscape and visual environment. This includes the range of authorised uses which have modified the environment, such as roads, resource extraction, infrastructure, etc., as well as the natural environment.

Importantly, the assessment seeks to assess only the proposed project activities, not legacy issues or the impact of historical practices. All existing infrastructure, including roads and pipelines, form part of the base case.

The stages of the assessment are:

- describe the existing environment surrounding the project area and establish a visual context;
- identify and evaluate the visual effect of the project;
- identify and evaluate the visual sensitivity of receptors within the existing environment;
- integrate the consideration of visual effect and visual sensitivity findings; and
- consider feasible mitigation measures.

When assessing the visual impacts of a proposed development, there are two high-level variables to be considered:

- the visual effect; and
- the sensitivity of the receptors to the visual effect.

Visual effect is concerned with the development or activities and the extent to which they will contrast to or integrate with the existing landscape. It considers the size or scale of the change, the duration of the change, and reversibility of the change. It also considers design elements such as form, shape, texture and line relative to the host landscape.

Visual sensitivity is concerned with the people or locations likely to have visibility of the development. It considers the nature of the receptors and considers factors such as the distance between the receptor and the proposed development, relative elevations, the relationship of the receptor to the development, and any intervening or mitigating factors such as vegetation.

When combined, those two variables determine the significance of the overall visual impact.

In order to retain a level of objectivity, the method includes a series of tables which allow the impact of the development to be assessed against key factors. These tables and rationale are presented below.

b Visual effect

Three factors are considered when evaluating the visual effect:

- contrast;
- integration; and
- the magnitude of the effect.

There is an interplay between these factors. Hence a development which occupies a significant portion of a primary view, but which has high integration and low contrast within the landscape, may nevertheless have a low visual effect. On the other hand, a development occupying only a minor proportion of a primary view but which exhibits high contrast and low integration may have a higher visual effect.

Contrast and integration are the 'visual properties' of the proposed development. The effect of the two visual properties can, however, only be known once we establish how much of the landscape is occupied by the proposed development, the duration and reversibility of the change. The measurement of magnitude is concerned with the size and scale of the development relative to other landscape elements, and whether there will be a complete loss of a particular characteristic of the landscape or simply a minor change. A high contrast is less favourable than a low contrast and a high level of integration is more favourable than a low level of integration. Contrast and integration levels are described in Table 6.74 and Table 6.75, respectively.

Table 6.74 Contrast levels

Category	Meaning
High	The scale, form, line, colour or texture of the proposed development do not reflect, borrow from or complement the existing visual landscape
Moderate	The scale, form, line, colour or texture of the proposed development include some key elements which reflect, borrow from or complement the existing visual landscape
Low	The scale, form, line, colour or texture of the proposed development extensively reflect, borrow from or complement the existing visual landscape

Table 6.75 Integration levels

Category	Meaning
High	The existing visual landscape remains the dominant visual character because the design, siting, screening or filtering of the development makes it the recessive element
Moderate	The existing visual landscape remains the dominant visual character, but the design, siting, screening or filtering of the development only achieves partial integration.
Low	The existing visual landscape is dominated by the development.

The next step is to consider both the contract and integration rankings in terms of magnitude. A low level of magnitude is more favourable than a high level of magnitude. Magnitude levels are described in Table 6.76.

Table 6.76 Magnitude levels

Category	Meaning
High	A substantial change due to total loss of elements, features or characteristics of the host landscape; and represents a generally permanent and irreversible change. Size and scale are strongly inconsistent with other landscape elements.
Moderate	A discernible change due to partial loss of elements, features or characteristics of the host landscape; and represents a generally medium-term change (less than 10 years) and landscape recovery is expected. Size and scale are moderately inconsistent with other landscape elements.
Low	An insubstantial change due to alteration of elements, features or characteristics of the host landscape; and represents a generally medium-term change (less than 10 years) and landscape integrity is broadly retained. Size and scale are consistent with other landscape elements.

It is necessary to consider the two visual properties – contrast and integration – plus the magnitude of the landscape change, in order to rank the overall visual effect. Table 6.77 provides a simple matrix to consider the interplay between those factors. The grey boxes contain the visual effect classifications.

Table 6.77 Overall effect

Visual properties		Magnitude		
Contrast	**Integration**	**High**	**Moderate**	**Low**
High	Low	High Effect	High-Moderate Effect	Moderate Effect
High	Moderate	High Effect	Moderate Effect	Moderate-Low Effect
High	High	High Effect	Moderate Effect	Low Effect
Moderate	Low	High Effect	Moderate Effect	Moderate Effect
Moderate	Moderate	Moderate Effect	Moderate Effect	Moderate-Low Effect
Moderate	High	Moderate Effect	Moderate Effect	Low Effect
Low	Low	High Effect	Moderate Effect	Low Effect
Low	Moderate	High-Moderate Effect	Moderate Effect	Low Effect
Low	High	Moderate Effect	Moderate-Low Effect	Low Effect

Note that the visual effect is not the same as the visual impact. In order to understand the impact, we not only need to understand the visual effects associated with the proposed development, but also the visual sensitivity of local receptors to a landscape change as described by the visual effects. In short, visual effects describe the characteristics of the source and visual sensitivity describes the characteristics of the receivers.

c Visual sensitivity

The ranking of visual sensitivity depends on how critically the change to the landscape is likely to impact the people living at or visiting locations from which a primary view is available to the proposed development.

Not all places where a view is possible will have residents or visitors.

Those locations that do have residents or visitors also are not equal in terms of the likely duration of the view (for example from a moving vehicle vs from a living room), the number of people experiencing the view, or the importance of the amenity or view integrity to the viewpoint. In this respect, the primary view from a residential dwelling or a tourist lookout will have a higher sensitivity that a remote agricultural or forestry location.

A primary view is defined as being an arc created by sight lines from a standing human radiating out vertically and horizontally at angles of 30 degrees around the centreline of the line of sight towards the proposed development. It is recognised that views do exist beyond the 30-degree arc but this is, by convention, considered the most important part of a view.

Generally, the closer to the development, the more of the view occupied by the proposed development.

The ranks for the relevant local sensitivities is provided in Table 6.78.

Table 6.78 Visual sensitivity table

Land use	Visual sensitivity level			
	Less than 250 m from the development	**Between 250 m and 500 m from the development**	**Between 500 m and 2 km from the development**	**More than 2 km from the development**
Residential dwelling	High	High / Moderate	Moderate	Low
Community facility, major tourism site, function centre or commercial accommodation	High	High / Moderate	Moderate	Low
Designated lookout, picnic site, park or recreational destination	High	Moderate	Low	Low
Designated tourist road or scenic route	High	Moderate	Low	Low
Main (State) road or rail line	Moderate	Low	Low	Low
Minor road	Moderate	Low	Low	Low
Broadacre rural land	Low	Low	Low	Low
Forestry land	Low	Low	Low	Low

d Visual impact

Visual impact is an aggregation of the above factors (see Table 6.79). The broad categorisation is the summary of overall visual effect and visual sensitivity.

Table 6.79 Visual impact

Visual effect	Visual sensitivity		
	High	**Moderate**	**Low**
High	High Visual Impact	High/Moderate Visual Impact	Moderate/Low Visual Impact
Moderate	High/Moderate Visual Impact	Moderate Visual Impact	Moderate/Low Visual Impact
Low	Moderate/Low Visual Impact	Moderate/Low Visual Impact	Low Visual Impact

e Area of theoretical visibility

The area of theoretical visibility represents the area within which the majority of potential views of the project may be located. It can also be considered the 'study area' for this VIA.

Consideration of the views within the area of theoretical visibility are the focus of the VIA. It is acknowledged that there may be other viewpoints, at some significant distance, outside the area of theoretical visibility but the likelihood of any material impact at those locations is negligible and are therefore not investigated as part of this assessment.

The approach has been to constrain the overall limit for setting the area of theoretical visibility at a radius of 4 km from the project area.

When dealing with unobstructed sight lines and adequate lighting, human-scale objects are resolvable as objects via unaided vision to a maximum distance of approximately 3 km. This is generally the conventional limit for 'distance' views. Some additional allowance has been made with respect to this project due to the size of the disturbance footprint, particularly in relation to the SEA, and the generally flat topography.

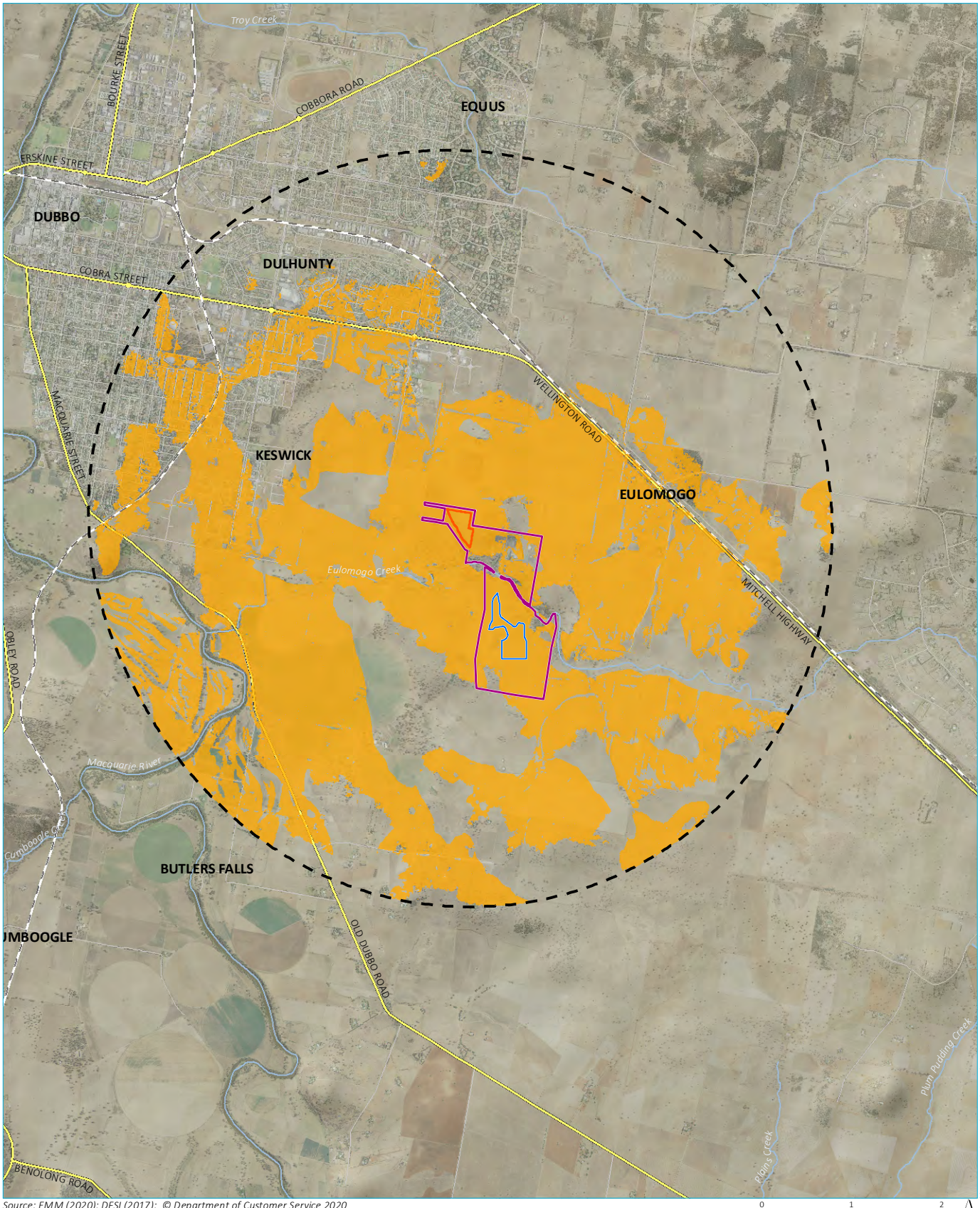
As a conservative measure, a 4 km radius for the visual catchment represents the extent of the area from which the effect of the development could conceivably be evident in any detail[3], assuming an unobstructed and unfiltered line of sight.

This VIA has also taken the approach to consider the visual effect of the SEA and the WEA separately, where appropriate.

The two extension areas are approximately 600 m apart and will have different areas of theoretical visibility. These two quarry locations also have different operational lives. The areas of theoretical visibility[4] within the visual catchment for each extension area are shown in Figure 6.28 and Figure 6.29.

[3] Tomko, M, Trautwein, F & Perves, R S (2009) Identification of practically visible spatial objects in natural environments, DOI: 10.1007/978-3-642-00318-9_1 · Source: DBLP

[4] Theoretical visibility figures are based only on topography. They do not consider any other natural or built features, such as trees or buildings, which can influence the actual line of sight. Potential receptor locations which are not within the area of theoretical visibility are not assessed further in the VIA.



Source: EMM (2020); DFSI (2017); © Department of Customer Service 2020

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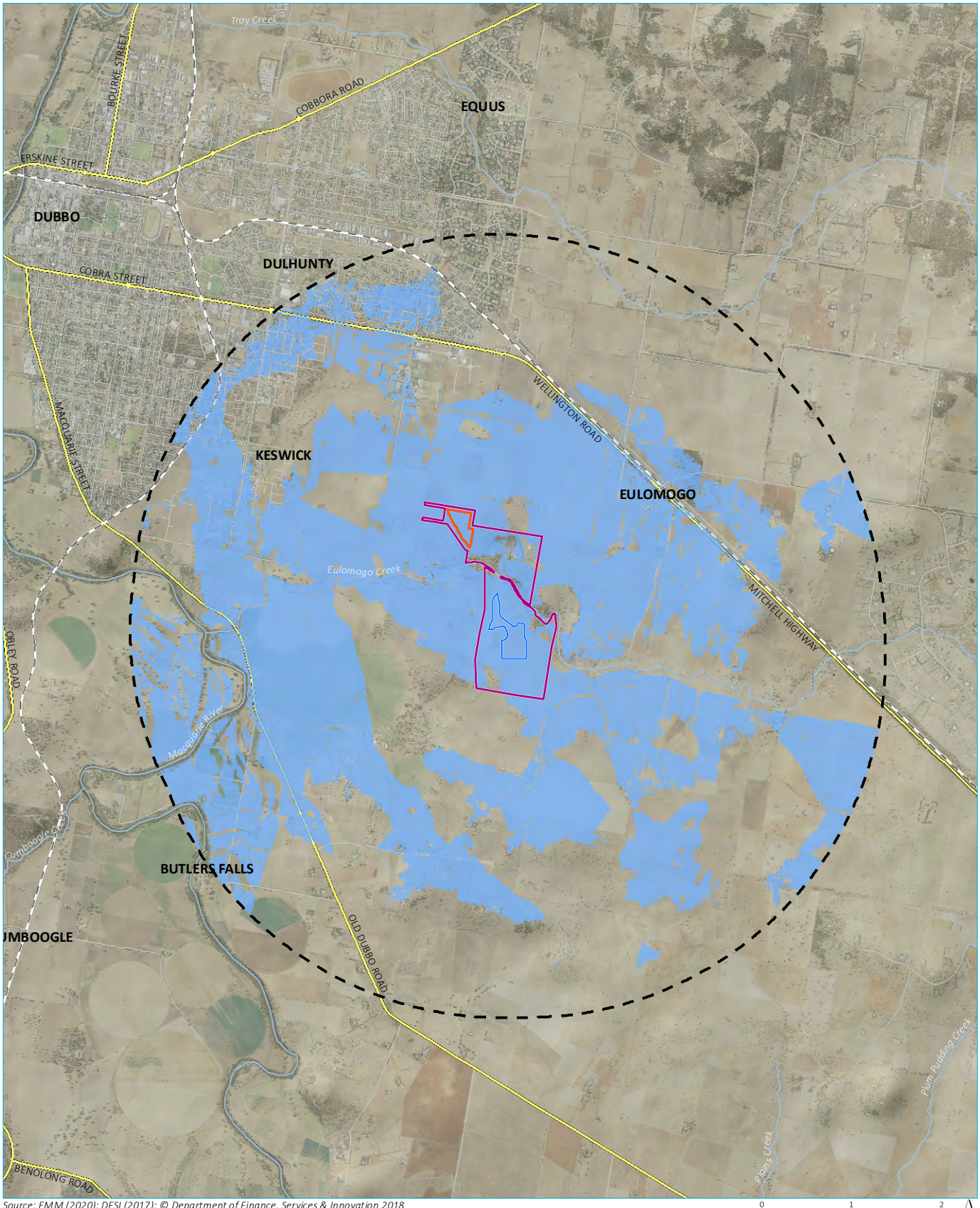
KEY

- Project area
- Rail line
- Major road
- Minor road
- Named watercourse
- Western extension viewshed area within 4km
- Western extension extent (4m bund)
- Southern extension extent (4m bund)
- Western extension viewshed analysis area (4km buffer)

Area of theoretical visibility for WEA

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.28

EMM creating opportunities



Source: EMM (2020); DFSI (2017); © Department of Finance, Services & Innovation 2018

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KEY

- Project area
- Rail line
- Major road
- Minor road
- Named watercourse
- Southern extension viewshed area within 4km
- Western extension extent (4m bund)
- Southern extension extent (4m bund)
- Southern extension viewshed analysis area (4km buffer)

Area of theoretical visibility for SEA

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.29

EMM creating opportunities

6.16.3 Existing environment

i The landscape context

The Dubbo region is characterised by low-lying alluvial plains with little variation in elevation.

The quarry site is located in a peri-urban area south-east of the main urban areas of Dubbo, and is surrounded by a mix of industrial land uses, a solar energy facility, and patchwork of farmland used for cropping and livestock production.

The most dominant visual features in the immediate vicinity are:

- the South Keswick Quarry, adjoining the project area and immediately to the north;
- the solar panel array for the South Keswick Solar Farm, immediately to the north of the South Keswick Quarry;
- Eulomogo Creek and associated riparian vegetation; and
- local rural residences and agricultural infrastructure.

The visual context is otherwise generally defined by agricultural land uses, including grazing and irrigated cropping,

The region has undergone significant clearing and the land cover is comprised of open woodlands, scattered trees amongst pasture lands and isolated remnants of native vegetation along riparian corridors and in pockets of less fertile or productive soils. The only area of significant vegetation cover is Beni State Conservation Area, approximately 6.5 km to the north-east of the quarry. Eulomogo Creek dissects the site and connects to the Macquarie River approximately 3 km west of the site.

Vegetation comprises mostly modified grasslands with pockets of isolated mature (remnant) trees or small stands of mature trees generally along roadways or drainage lines.

There is a large lot residential subdivision at Eulomogo, approximately 3.5 km to the east and beyond the Mitchell Highway.

ii Residential suburbs

The nearest residential precinct is the Southlakes Estate to the west of the existing quarry. Southlakes is comprised of predominantly detached dwellings and lots are generally in the range of 400 m^2 to 2,000 m^2.

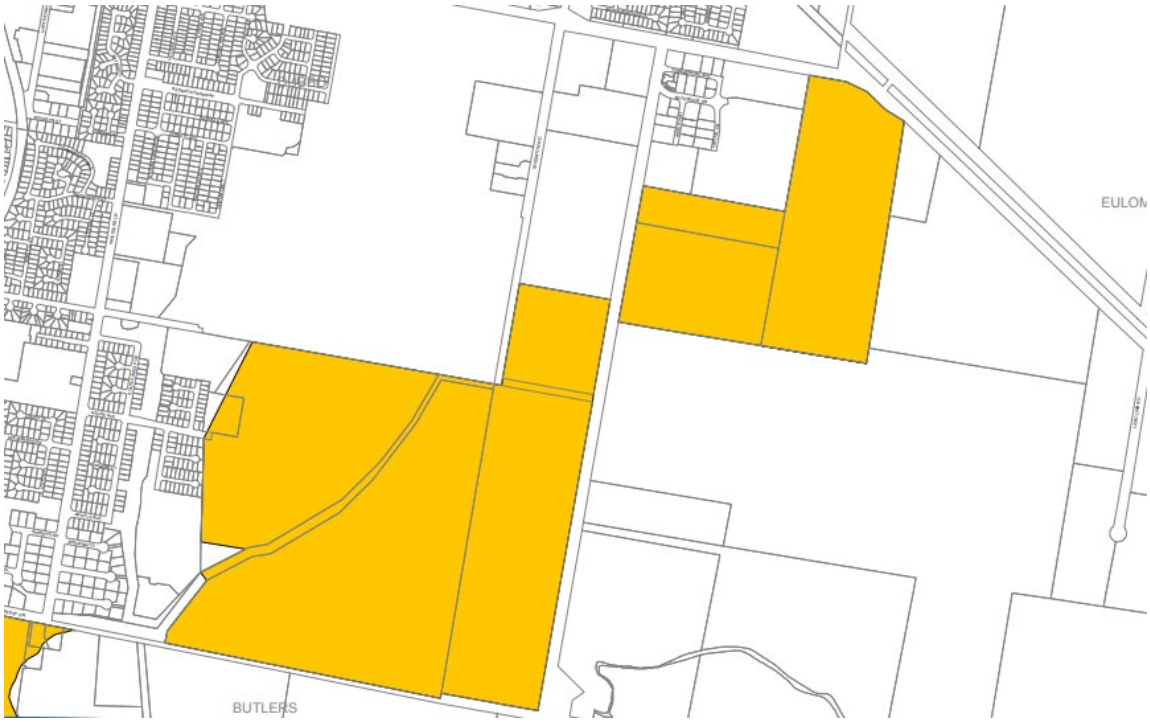
iii Urban release area

The Dubbo LEP provides for urban release areas generally east and north of the site (refer to Figure 6.28).

The Land Zoning Map under Dubbo LEP currently zones the future land release areas as R1 Primary Production or R2 Rural Landscape.

The Minimum Lot Size Map further indicated that the majority of the land within the urban release area has a minimum lot size of 600 m^2.

While noting that the subdivision and development of the urban release area lands, the Lot Size Maps under the Dubbo LEP indicate that land closest to the proposed quarry expansion area requires a minimum lot size of 1.5 hectares (shown as “Y”). Elsewhere within the Urban Release Area, lots sizes vary from 300 m^2 to 2,000 m^2.



Source: Dubbo Local Environmental Plan 2011, Urban Release Areas Map 008B (detail)

Figure 6.30 Urban release areas

These future development provisions are taken into account as part of the VIA.

As these are potential future receptors, the key consideration is the extent to which the operational life of the project, particularly extraction within the WEA, will coincide with occupied residences in the eastern section of the Urban Release Area.

There is an approved plan of subdivision for Lot 1 DP880413 – being the land approximately 550 m to the north-west of the proposed WEA and immediately west of the South Keswick Solar Farm – which proposes 51 lots of 2,000 m^2 or larger. The land does not yet have internal roads or utilities available and the earliest prospect of a dwelling being erected and occupied is at least two years.

iv Community facilities, major tourism sites, function centres and commercial accommodation

There is a cluster of schools to the north of the project site along Sheraton Road, being St Johns College, St Johns Primary School and Dubbo Christian School.

Lazy River Estate, Old Dubbo Road, provides an events facility and accommodation.

Justleigh Farm Stays is located approximately 600 m south-west of the existing quarry.

Dubbo Botanical Gardens is approximately 3.3 km to the north-west and has no line of sight to the quarry site due to intervening residential areas.

Western Plains Zoo is approximately 6 km to the west and has no line of sight to the quarry site.

Dubbo Observatory is approximately 6.5 km to the south-west and has no line of sight to the quarry site.

Dundullimal Homestead (heritage building) is approximately 5 km to the west of the site and has no line of sight to the quarry site.

v Designated lookouts, picnic sites, parks or recreational destinations

There is a travelling stock reserve (TSR) adjacent to the Mitchell Highway, on the northern side of the road and rail line, near Eulomogo (refer to Figure 6.31).

The only other reserve is Dundullimal Park immediately west of Old Dubbo Road and the Macquarie River (refer to Figure 6.31).

Brian Dickens Park is situated at the corner of Boundary Road and Wheelers Lane.

Dawson Park, Egret Park and Dubbo Greyhound Racing Club are located on Wheelers Lane.

There are un-named open space areas within Southlakes Estate nestled between residential development.

vi Designated tourist road or scenic route

There are no designated tourist roads or scenic routes within the area of theoretical visibility.

vii Main road or rail line

The closest main road and rail line are to the north-east of the existing quarry, being the Mitchell Highway and Main Western Railway Line which run co-aligned.

viii Minor roads

Minor roads in the vicinity of the existing quarry include:

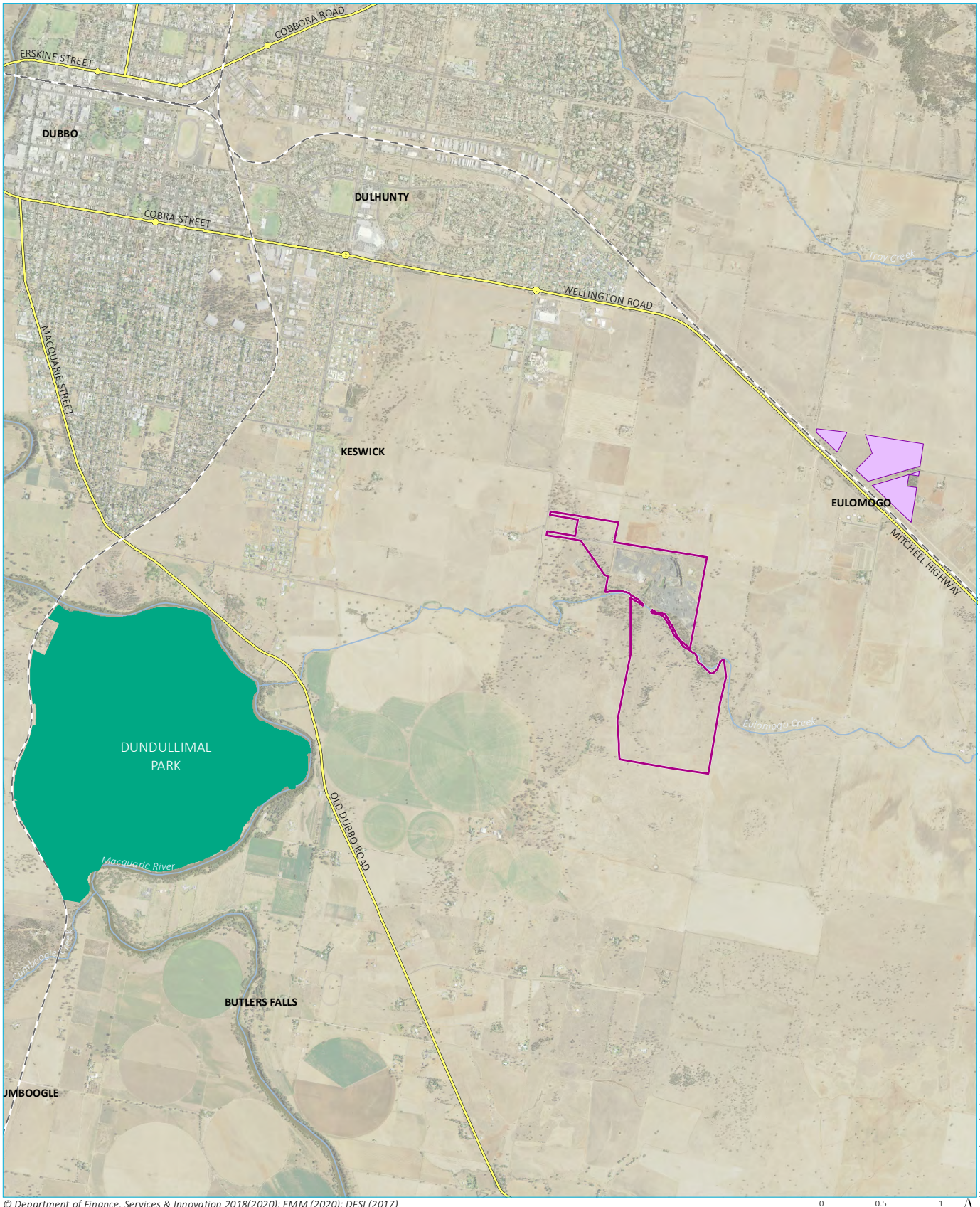
- Sheraton Road;
- Basalt Road;
- Lidscombe Road;
- Hennessy Drive;
- Argyle Avenue;
- Bayou Avenue;
- Old Dubbo Road; and
- Angle Park Road.

ix Broadacre rural land

The agricultural enterprises in the vicinity of the project area includes irrigated pastures, viniculture and livestock grazing.

x Forestry land

There is no forestry land within the primary visual catchment. The nearest is Beni State Forest which is approximately 7 km north-east of the existing quarry.



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KEY

- Project area
- Travelling stock reserve
- Dundullimal Park
- Rail line
- Major road
- Named watercourse

Travelling stock reserves and Dundullimal Park

Dubbo Quarry Continuation Project
Environmental Impact Statement
Figure 6.31

EMM creating opportunities

Figure 6.31 Travelling stock reserves and Dundullimal Park

6.16.4 Impact assessment

i Visual effect considerations

Specific elements of the project, relevant to consideration of visual impacts, are described and assessed with respect to their visual effect below.

a New quarry voids and perimeter bunding

Quarry voids are situated below the surrounding landform. For visibility of the void, this means visibility requires the observer to be at a level which is equal to or higher than the quarry surface elevation. Visibility of the voids is also limited by the proposed 4 m high perimeter bund along the surface edge of each void. The bunds will be seeded to generate low level vegetation and this will soften the appearance of the bunds.

The bunds will, therefore, be the key elevated component of the project and, noting the scarcity of any rise in local topography providing a vantage point higher than 4 m to the west (towards Dubbo urban area), the visual element most likely to create a visual effect to the west of the site is the bund surrounding the proposed quarry voids. To the east of the site, land rises approximately 20 m relative to the elevation of the development site over a distance of at least 1 km. There may, therefore, be some mid-distance visibility of the proposed quarry voids (and bunds) from the east, subject to any intervening vegetation or structures which may filter or obscure the line of sight.

Contrast

The contrast rating for the proposed bunds is moderate.

The scale, form, line, colour and texture of the project include some key elements which reflect, borrow from or complement the existing visual landscape. Notably the existing landscape includes more intrusive elements such as a solar array and the existing surface infrastructure for the subject quarry and the adjoining South Keswick quarry. The construction of the bund from spoil and the proposed seeding of the bund will facilitate some complementarity with the existing landscape.

Integration

The integration of the proposed bunds is also ranked as moderate.

The bunds will not dominate the visual character of the area. The siting of the bunds is dictated by the quarry void perimeter and cannot be located elsewhere. Some screening is achieved by existing vegetation at the site and on adjoining properties.

Magnitude

The voids and bunding are of a moderate size and scale.

The WEA and SEA will have quarrying areas of approximately 6.5 ha and 13.6 ha, respectively.

There are however other similarly scale elements in the landscape already, such as the South Keswick Solar Farm and the adjoining quarry immediately north of the subject site.

On this basis the magnitude of the effect is considered moderate.

b New surface structures

In addition to the bunding around the perimeter of the proposed quarry voids, surface works associated with the proposed quarry extensions are limited to:

- the proposed access road;
- the southern haul road; and
- the proposed water management system.

Contrast

The contrast rating for the new surface structures is low.

Internal roads, water storages and sediment ponds, are existing features of the environment. These elements will not create a contrast to the broader visual setting.

Integration

The integration of the proposed new surface structures is high.

The access road and haul road are surface level infrastructure with negligible visual intrusion on viewsheds.

The water management infrastructure is also surface level structures such as sediment ponds.

Magnitude

Similar elements are already in evidence across the local landscape and the addition of items such as access roads will not remove or substantively modify any fundamental characteristics of the host landscape.

The magnitude is considered to be low.

c Existing surface structures

There are a range of structures already in situ at the existing facility. These include items such as site office, workshop, plant and equipment.

The project will extend the life of the quarry but will utilise the existing structures, plant and equipment in their respective current locations. There is no proposal to add to or relocate those structures. The structures and plant are situated adjacent the existing quarry pit. The indicative heights for selected prominent structures are:

- Offices – 2.8 m and 3.6 m;
- Amenities building – 3.3 m;
- Workshop – 7.4 m;
- Primary bin – 9 m;
- Crushing plant – 17 m;
- Pre-coat plant conveyor – 7.4 m; and
- Pug mill silo – 10.5 m.

The project will be to extend the duration of the visual effect of these structures.

The quarry operates under development consent SPR79/22 granted by the former Talbragar Shire Council on 18 March 1980, and it is assumed that there have been surface structures, plant and equipment installed at the site generally since that time. There is no known record of any complaint regarding loss of visual amenity due to the presence of the structures, plant and equipment.

Contrast

The contrast rating for the existing surface structures is low.

These elements form part of the existing environment. The additional time for the presence of these elements does not create a contrast.

Integration

Integration is ranked as high. The persistence of the existing elements, and the absence of any radical change in the surrounding environment, maintains status quo.

Magnitude

By definition, these items are already integrated within the existing landscape. An extended period for these elements to persist does not represent an alteration of the landscape. The magnitude is, therefore, low.

d Night lighting

Night time quarrying operations are not proposed but there may be an occasional need for maintenance of plant or equipment at night. This is not expected to generate any substantive light spill as lighting will be localised and directional to the task area.

It is noted that the installation of 4 m high perimeter earth bunds will also mitigate the spill of light or night glow.

Factors of contrast, integration and magnitude are not considered further due to the inconsequential and infrequent use of night lighting.

e Duration of the effect

The project will extend the life of the quarry for approximately 25 years. Over the project life, the intensity of quarrying activities will vary within the project area. For the initial years of the project, quarry activities will primarily be contained within the WEA. Quarrying activities in the SEA will commence in Year 3 at a smaller scale. Once extraction of the fresh basalt resource in the WEA has been exhausted, nominally scheduled for Year 9, quarrying activities in the SEA will intensify and will be the primary resource extraction area until completion of the project.

The above scheduling has been considered as the duration of the visual impact, and the site will be rehabilitated at the end of the quarry life.

The staging for the WEA is important to note in relation to the urban release area at the Southlakes Estate. The timing of any residential subdivision in the urban release area and growth of any urban development towards the WEA is likely to be staged and established over several years. This means the growth of residential development and the operational life of dominant extraction activities within the WEA are inversely proportional.

f Summary

A summary of the effects of the visual elements of the project is given in Table 6.80.

Table 6.80 Summary of visual effect

Visual element	Contrast	Integration	Magnitude	Effect
Voids and bunding	Moderate	Moderate	Moderate	Moderate
New surface infrastructure	Low	High	Low	Low
Existing surface infrastructure	Low	High	Low	Low
Night lighting	N/A	N/A	N/A	N/A

On this basis, the consideration of the sensitivity of receptors (in the following section) is focussed on the relative exposure of their primary viewshed to the voids and bunding. The effect of the other elements of the project – such as the new and existing surface infrastructure – are considered in respect of their cumulative effect. These latter elements are, considered individually, forecast to have a low visual effect.

ii Sensitive receptors within the area of theoretical visibility

The categories of sensitive receptors are listed below and the extent to which those receptors are within the area of theoretical visibility is discussed.

There are both suburban residential dwellings and rural residences within the area of theoretical visibility.

iii Existing suburban residences

The primary urban area within the visual catchment is the Southlakes Estate, situated to the west of the project area.

With the generally flat terrain, and a consistent building height limit for dwellings in the Southlakes Estate, the viewlines (if any) to the project area will generally only be available to the 'front line' dwellings closest to the proposed development. Other dwellings within the Southlakes Estate will have potential views obscured by neighbouring dwellings.

The Urban Release Areas represent a staged development. There is potential for subdivision and construction of dwellings within the Urban Release Area during the 25-year life of the quarry.

The nearest existing residential dwellings in Southlakes Estate are in Bayou Avenue, approximately 1.5 km to the west of the proposed WEA. This dwelling is identified as sensitive receptor #R18 (refer Figure 6.1). Receptor R18 is considered representative of all existing residential premises on the eastern-most edge of the Southlakes Estate. Refer to Photograph 6.4.

All of the existing residential premises in Southlakes Estate have an elevation in the range of 268 m AHD (southern extent) to 290 m AHD (northern extent) and there are rises in topography between those residences and the projebct area of between 290 m AHD and 294 m AHD. There are also pockets of remnant mature vegetation in the intervening space. These factors will obscure any line of sight to the project area which will be situated at approximately 290 m AHD.

Photograph 6.4 View east from R18 Argyle Avenue, Southlakes Estate

iv Future urban residences

There is a residential lot subdivision east of Bayou Avenue in Southlakes Estate (refer to Figure 6.32).

While no residences have been constructed at the time of writing, the creation of the small lot subdivision is an indication that the construction of residential dwellings can be reasonably anticipated to occur. Therefore, it has been assigned a receptor point (#R19) at the easternmost lot within that subdivision, generally being at the junction of future roads Marine Court and Stream Avenue. Refer to Photograph 6.5.

For this 'Marine Court' subdivision, the same intervening factors of topography and vegetation, as noted for the existing residences, will apply.

Assuming that the Urban Release Area to the west of the project area is fully developed, the nearest residential dwellings in that estate will be approximately 300 m to the west of the WEA. It is noted that this precinct within the Urban Release Area is zoned R5 Large Lot Residential, and the minimum lot size is 1.5 hectares (ha). This suggests that the number of future residences in the R5 zoned land is approximately 30, of which a proportion will have potential viewlines to the WEA and SEA. The exact number will be a factor of lot configuration.

The Urban Release Area to the north-west of the proposed WEA is zoned R2 Low Density Residential and currently has subdivision approval (refer to Figure 6.33). Receptor point #R23 is positioned in anticipation of a dwelling being constructed in the future in this precinct.

Source: © Department of Finance, Services & Innovation 2018 EMM (2020); DFSI (2017)

0 100 200 m

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KEY

- Project area
- Lot boundaries
- Minor road

Subdivision within Southlakes Estate

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Figure 6.32

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Photograph 6.5 View east from the edge of urban development in Southlakes Estate R19

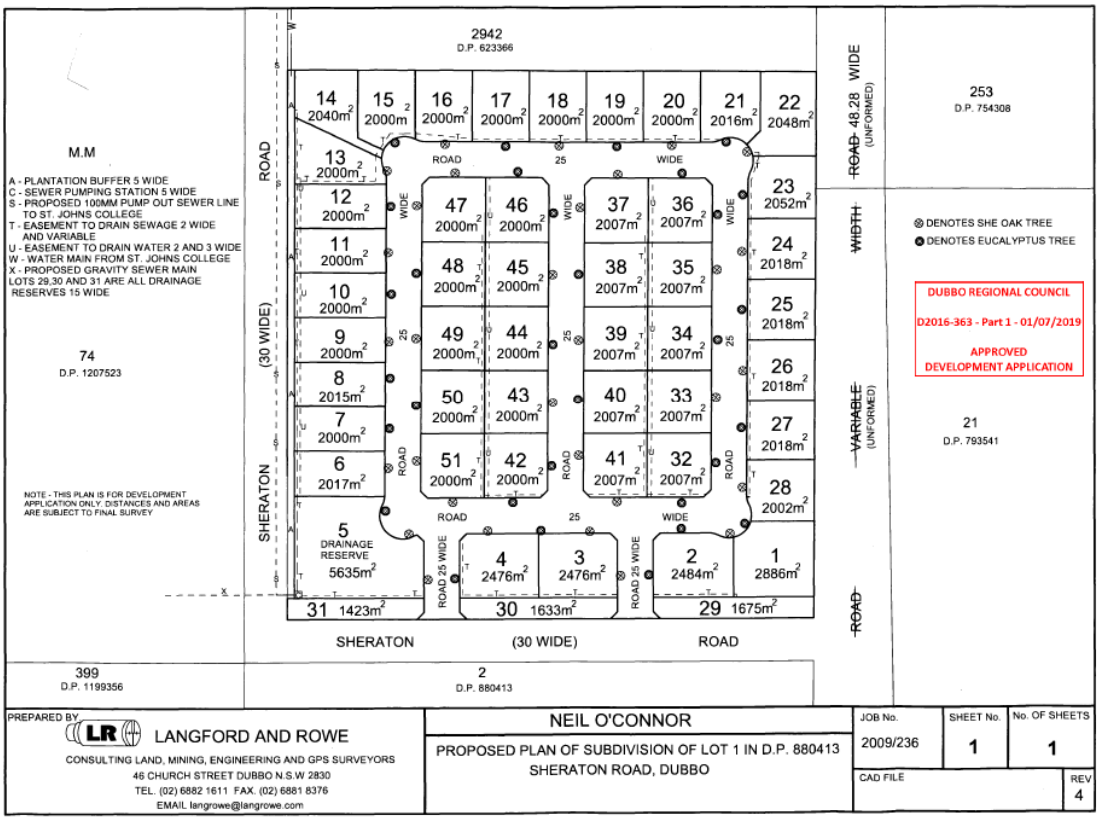

Figure 6.33 Approved subdivision plans for land to the north-west of the WEA

Source: Dubbo Regional Council

The Urban Release Area to the north of the project area is zoned B7 Business Park and will not provide for residential development, and commercial premises will be approximately 700 m away with intervening structures such as the solar farm limiting any viewlines.

Other land nearby is zoned RU2 Rural Landscape or RU1 Primary Production.

a Sensitivity of future urban residences

For the Urban Release Area to the north-west of the WEA, there is development consent for a subdivision of low-density residential lots, generally 2,000 m^2 or greater. There are 51 lots proposed (one of which is a drainage reserve) and the visual sensitivity will be limited to those four lots along the southern extent of the subdivision. The distance between the WEA and likely nearest future receptor is approximately 550 m. There is established vegetation on Lot 211 DP1220433 which will filter any view towards the WEA, and buildings associated with the South Keswick Quarry will also obscure the view partially.

It is difficult to precisely classify the sensitivity of future urban (large lot) residences in the proposed Urban Release Area to the west of the proposed WEA because the subdivision arrangement is not yet confirmed and the location of future residences with those 1.5 ha lots cannot be predicted.

We can only rely on the distance between the WEA/SEA and the land that is mapped in the LEP as an Urban Release Area. Typically, large lot dwellings are not constructed on the boundary of the lot but on the conservative assumption that a nearby large lot may have a dwelling located on the eastern boundary of the lot (ie nearest to the WEA) then the distance will be approximately 300 m.

This will rank the future urban residences immediately west of the WEA as having a high-moderate sensitivity; however, a number of factors need to be considered:

- the main resource extraction are for the quarry may have moved from the WEA to the SEA by the time the large lot subdivision is created and residences constructed on those land parcels;
- the mitigation measures such as tree plantings and groundcover vegetation at the western boundary of the WEA quarry and the bund will have had years to become established; and
- future owners of large residential lots to the west of the proposed WEA will be aware of the existence of the quarry and will, presumably, sensibly site and orientate any residential dwelling in a way that avoided a primary viewshed directed towards an existing quarry.

b Rural residences

Rural residences are identified by a unique receptor number. The location of the rural residences is shown in Figure 6.1.

For each rural residence, a sensitivity ranking is applied. Refer to Table 6.81 and Table 6.82.

Note that distances are estimated from the nearest point of the proposed development and measured in a straight line to the nearest façade of the residence.

There is a large lot residential subdivision at Eulomogo, approximately 3.5 km to the east and beyond the Mitchell Highway. Views to the proposed development will not be available from the residences in Eulomogo.

Table 6.81 WEA - Sensitive receptor locations and sensitivity ranking

No.	Nearest road	Sensitivity	Reason / Notes
R1	Sheraton Road	High	Distance is ~240 m; Some vegetation filtering
R2	Sheraton Road	Moderate	Distance is ~600 m; Some vegetation filtering
R3	Sheraton Road	Moderate	Distance is~520 m; Some vegetation filtering
R4	Wellington Road (A32)	Low	Distance is ~770 m; Solar array obscuring
R5	Lidscomb Road	Low	Distance is ~1.6 km; Vegetation obscuring
R6a	Old Dubbo Road	Low	Distance is ~2.3 km; Structures and vegetation obscuring
R6b	Old Dubbo Road	Low	Distance is ~2.4 km; Structures and vegetation obscuring
R7	Angle Park Road	Nil	Distance is~3.1 km; Outside area of theoretical visibility
R8	Angle Park Road	Nil	Distance is ~3.1 km; Outside area of theoretical visibility
R9	Sheraton Road	Low	Distance is~1.3 km; Vegetation and structures obscuring
R10	Sheraton Road	Low	Distance is~1.5 km; Other structures obscuring
R11	Sheraton Road	Low	Distance is~1.2 km; Vegetation and structures obscuring
R12	Sheraton Road	Low	Distance is ~1.5 km; Other structures obscuring
R13	Wellington Road (A32)	Nil	Distance is ~1.4 km; Outside area of theoretical visibility
R14	Lidscomb Road	Low	Distance is ~1.6 km; Predominantly obscured by solar array
R15	Lidscomb Road	Low	Distance is ~1.8 km; Partly obscured by solar array; Vegetation filtering
R16	Basalt Road	Low	Distance is ~1.7 km; Vegetation and structures obscuring
R17	Sheraton Road	Low	Distance is ~400 m (office only); Vegetation and structures obscuring
R18	Argyle Avenue	Low	Distance is ~1.5 km; Vegetation obscuring
R19	Stream Avenue (future)	Low	Distance is ~1.3 km; Vegetation obscuring
R20	Angle Park Road	Low	Distance is ~ 3.4 km; Vegetation filtering
R21	Angle Park Road	Low	Distance is ~ 3.5 km; Vegetation and structures obscuring
R22	Basalt Road	Low	Distance is ~2 km; Vegetation filtering
R23	Sheraton Road	Low	Distance is ~550 m; Vegetation and structures obscuring

Table 6.82 SEA - Sensitive receptor locations and sensitivity ranking

No.	Nearest road	Sensitivity	Reason / Notes
R1	Sheraton Road	Low	Distance is ~700 m; Vegetation filtering
R2	Sheraton Road	Moderate	Distance is ~600 m; Some vegetation filtering
R3	Sheraton Road	Low	Distance is~1.3 km; Vegetation filtering
R4	Wellington Road (A32)	Low	Distance is ~1.7 km; Solar array obscuring
R5	Lidscomb Road	Low	Distance is ~1.6 km; Vegetation obscuring
R6a	Old Dubbo Road	Low	Distance is ~1.7 km; Topography and vegetation obscuring
R6b	Old Dubbo Road	Low	Distance is ~1.7 km; Topography and vegetation obscuring
R7	Angle Park Road	Nil	Distance is ~1.9 km; Outside area of theoretical visibility
R8	Angle Park Road	Nil	Distance is ~1.9 km; Outside area of theoretical visibility
R9	Sheraton Road	Low	Distance is~2.5 km; Vegetation and structures obscuring
R10	Sheraton Road	Nil	Distance is~2.7 km; Outside area of theoretical visibility
R11	Sheraton Road	Low	Distance is~2.5 km; Vegetation and structures obscuring
R12	Sheraton Road	Nil	Distance is ~2.7 km; Outside area of theoretical visibility
R13	Wellington Road (A32)	Low	Distance is ~2.1 km; Topography and solar array obscuring
R14	Lidscomb Road	Low	Distance is ~1.9 km; Predominantly obscured by solar array
R15	Lidscomb Road	Low	Distance is ~1.9 km; Vegetation filtering
R16	Basalt Road	Low	Distance is ~1.9 km; Vegetation and structures obscuring
R17	Sheraton Road	Low	Distance is ~1.2 km (office only); Vegetation and structures obscuring
R18	Argyle Avenue	Low	Distance is ~2.2 km; Vegetation obscuring
R19	Stream Avenue (future)	Low	Distance is ~2.1 km; Vegetation obscuring
R20	Angle Park Road	Low	Distance is ~ 2 km; Vegetation filtering
R21	Angle Park Road	Low	Distance is ~ 2.1 km; Vegetation and structures obscuring
R22	Basalt Road	Low	Distance is ~1.6 km; Vegetation obscuring
R23	Sheraton Road	Low	Distance is ~1.6 km; Vegetation and structures obscuring

c Rural residence viewsheds

Images below illustrate the viewshed of various rural residences or locations close to those rural residences.

Photograph 6.6 View from Basalt Road near R22

Photograph 6.7 View from Mitchell Highway with R16 in foreground

Photograph 6.8 View from Mitchell Highway at driveway to R14 and R15

Photograph 6.9 View to the north from driveway at R7 Angle Park Road

Photograph 6.10 Looking north from driveway to R8 Angle Park Road

Photograph 6.11 View north near the driveway to R21 Angle Park Road

Photograph 6.12 View north-east from R6a off Old Dubbo Road

v Community facilities, major tourism sites, function centres and commercial accommodation

a Tourism sites

There are no major tourism sites within the area of theoretical visibility.

b Schools, sport and community centres

Within the area of theoretical visibility, Dubbo Christian School, St Johns Primary School and St Johns College are approximately 1.2 km to 1.5 km to the north of the proposed development (WEA). These are shown as R10, R12 and R11 respectively on Figure 6.1.

Views to the quarry site are not available from these premises due to intervening vegetation and structures. See, for example, the view from St Johns High School shown at Photograph 6.13.

The façade of the St Johns College is also not designed to take advantage of any views to the south (ie in the direction of the quarry) and is comprised of a carpark and utilities service rooms with little fenestration.

Visual sensitivity for these three schools is, therefore, nil to low.

Dubbo Greyhound Racing Club (Dawson Park) and Egret Park are situated approximately 2 km north-west of the project area. At this distance, the sensitivity level is low. Visitors to either location are unlikely to be provided viewlines to the project area due to vegetation around Egret Park.

The chain of ponds and open space within the Southlakes Estate will also have no visibility of the site due to its slightly lower elevation and the surrounding residential development.

Photograph 6.13 View from the south-west corner of R11 (St Johns High School) Sheraton Road

vi Major roads and rail lines

The Mitchell Highway (A32) is, at its nearest point, approximately 1.8 km north-east of the project area and the section between Dubbo and Eulomogo is partly in the area of theoretical visibility.

The nearest available traffic count suggests that approximately 1,200 vehicles travel this road each day (TfNSW). Any potential views to the quarry from the Mitchell Highway will be obscured, or heavily filtered, by intervening vegetation or structures, such as the South Keswick Solar Farm. The duration of any potential line of sight is also constrained by the speed of travel, which for the Mitchell Highway in this location is 110 km/hr.

The Sydney-Dubbo rail link has a similar alignment to the Mitchell Highway and supports daily rail services. Between Dubbo and Eulomogo the line is mostly not within the area of theoretical visibility. It is unlikely to provide views to the project area.

Old Dubbo Road is, at its closest point, approximately 2.5 km west of the project area and, between Dubbo urban areas and Angle Park Road, falls within the area of theoretical visibility. The distance between the road and the project area, combined with the scattered vegetation and the speed of travel (100 km/hr) will allow only a fleeting and distant view towards the quarry. Old Dubbo Road has a recorded traffic count (2010) of 1,386 vehicles on average per day[5].

Sheraton Road is the main access road to the site and, therefore, passes within close proximity to the WEA. The quarry is located at the southern extent of the road and the traffic volumes for this nearby section of Sheraton Road is extremely low, generally being only traffic associated with the local quarries and rural properties.

Visual sensitivity for these road and transport-based views is, therefore, negligible to low.

[5] Dubbo City Council, Traffic Count Macquarie St (Old Dubbo Rd) north of Margaret Crescent, 2010

vii Impact assessment summary

a Rural residences

There are three existing rural residences which have a ranking of high or moderate sensitivity, to the moderate visual effects associated with the proposed voids and bunding, and to a lesser extent with the new and existing surface infrastructure.

Those residences are:

- R1 Sheraton Road (high sensitivity to WEA);
- R2 Sheraton Road (moderate sensitivity to WEA; moderate sensitivity to SEA); and
- R3 Sheraton Road (moderate sensitivity to WEA).

For all other rural residences, the impact is assessed to be low or non-existent, due to both viewing distance and the presence of intervening structures and vegetation.

For rural residence R1 – which has a high sensitivity to the visual element of the proposed bunding; and the bunding is identified as having a moderate ranking in terms of visual effect – the visual impact is high/moderate. Holcim currently have a negotiated agreement from R1 for quarry related impacts which will continue under the project.

For rural residences R2 and R3, the overall moderate visual impact means that additional design solutions, mitigation measures, or interventions should be considered to reduce the level of visual impact.

b Future urban residences

The interaction between an expanded quarry and an expanded rural residential development represents an unusual situation. It is not specifically noted as a visual impact as there are currently no receptors in the area identified as a future urban release area.

There is a desired future character for the urban release area (ie R5 Large Lot Residential) as articulated thorough the zoning in the Dubbo LEP. The stated intent for a future character of the area does not, however, imply incompatibility with adjoining land subject to a different land zoning and does not, of itself, demonstrate visual impact. Land east of the large lot urban release area is zoned RE2 Private Recreation, RU1 Primary Production and IN3 Heavy Industry. From a strategic planning perspective, however, there are some matters to be considered.

There are a number of unknowns regarding the future establishment of residential dwellings in the proposed large lot subdivision, including the timing of the subdivision and any construction activity. In this respect, the key consideration in regard to the future large lot subdivision is the relative timing of (and future cessation of) the quarry expansion works and the development and occupation of rural residential dwellings to the west of the site.

The purpose of a VIA is to establish the change in the view experienced by sensitive receptors at selected locations. Just as the current development in the precinct establishes a visual status quo, so the existence of authorised development at some future date will, if it precedes the establishment of sensitive receptors such as rural residences, form part of the status quo for proponents intending to erect dwellings. Invariably, the development on those large lot subdivision parcels will sensibly take into account the presence of any surrounding visual elements in the siting and orientation and screening of the dwelling.

Nevertheless, it is appropriate to consider the potential interaction between an expanded quarry operational area and future residential dwellings which may (or may not) be constructed in the latter stages of the operational life for the WEA.

In anticipation of some future potential interaction, the early establishment of visual impact mitigation measures, such as tree plantings for visual screening, is a sensible and pragmatic risk management initiative.

The approved subdivision of 51 lots to the north-west of the proposed WEA already has the benefit of vegetation filtering views towards the proposed location of the WEA, and visual effects can also be further ameliorated through the additional plantings proposed (above) in relation to the future large lot subdivision to the west of the proposed WEA.

c Community facilities, major tourism sites and function centres

The Lazy River Estate, Old Dubbo Road is an events facility and accommodation approximately 3 km south-west of the SEA and, at this distance, any detail of the propose development will be difficult to distinguish, and the primary view in the direction of the proposed SEA is filtered by stands of trees in the mid-long distance of the viewshed. The impact for the Lazy River Estate facility is, therefore, likely to experience a low visual impact (refer to Photograph 6.14).

All other community facilities, tourism sites and function centres are beyond the area of theoretical visibility or have obstructed views in the direction of the project.

d Designated lookouts, picnic sites, parks or recreational destinations

A cluster of parks were identified within the area of theoretical visibility – being Brian Dickens Park, Dawson Park, Egret Park and Dubbo Greyhound Racing Club located on Wheelers Lane in Southlakes. Those parks have a potential view towards the proposed WEA but it is approximately 2 km distant and there are trees filtering the viewline.

The view to the south and east from these parks is also dominated by the urban development of Southlakes residential areas. The visual impact for these locations is, therefore, low.

Photograph 6.14 View to the north-east from Old Dubbo Road near Lazy River Estate
Source: Google Earth

e Designated tourist road or scenic route

There are no designated tourist roads or scenic routes within the area of theoretical visibility, and therefore no impact is registered.

f Main road or rail line

The closest main road and rail line are to the north-east of the existing quarry, being the Mitchell Highway and Main Western Railway Line which run co-aligned, and there are sections of these transport corridors where glimpses of the WEA and SEA may be possible, if fleeting. The impact on these viewing locations is low.

g Minor roads

Minor roads in the vicinity of the existing quarry, with likely impact based on low traffic volumes and distance from the proposed quarry extensions, are:

- Sheraton Road (<250 m, in part; moderate impact)
- Basalt Road (~1.8 km; low impact)
- Lidscombe Road (~1.5 km; low impact)
- Hennessy Drive (~2.3 km; low impact)
- Argyle Avenue (~1.5 km; low impact)
- Bayou Avenue (~1.5 km; low impact)
- Old Dubbo Road (~2.5 km low impact); and
- Angle Park Road (~2 km; low impact).

The moderate impact on Sheraton Road needs to be seen in context. Sheraton Road provides vehicle access from the Mitchell Highway in a southerly direction for approximately 3 km. The last 1 km of Sheraton Road (beyond the South Keswick Solar Farm) services only the existing Dubbo Quarry and two rural residences. The users of this more exposed section of Sheraton Road are extremely limited and will include staff and contractors associated with the operation of the quarry. The moderate impact will, therefore, affect a very small number of receivers and on a brief temporal basis.

h Broadacre rural land

Broadacre rural land adjoins the subject site to the south and west. Impacts for these areas are low given the infrequent viewing opportunities available under that landuse.

i Forestry land

There is no forestry land within the area of theoretical visibility, and no impact is registered.

6.16.5 Mitigation measures

Holcim are currently consulting with rural residences R2 and R3 in regard to the overall moderate visual impacts of the project and the need for additional design solutions, mitigation measures, or interventions to reduce the level of visual impact.

Further, in anticipation of some future potential interaction with future residences in urban release areas, the early establishment of visual impact mitigation measures, such as tree plantings for visual screening, is a sensible and pragmatic risk management initiative.

Within Lot 222 DP 628628 which is the location of the proposed WEA, there is approximately 2 ha of land along the south-western portion of that lot which is not proposed to be excavated. This area supports a number of remnant mature trees and there is scope to introduce additional plantings which could further filter any viewlines from sensitive receptors (including future sensitive receptors) west and south of the WEA.

Within Lot 100 DP 1247780 which is the location of the SEA, there is approximately 50 hectares of land, with currently low levels of vegetation, predominantly to the south, south-west and south-east, which is not proposed to be excavated and where there is scope to introduce additional plantings which could further filter any viewlines from sensitive receptors to the south of the SEA. This land parcel, however, is not owned by Holcim and so any additional plantings will require consultation with and approval from the landowner.

6.16.6 Conclusion

Elements of the project with visual effects include the quarry pits/void, bund walls, existing built infrastructure and proposed surface infrastructure.

There are three existing rural residences within the area of theoretical visibility that will have high or moderate visual impacts resulting from the project. At these residences moderate visual effects are associated with the proposed voids and bunding, and to a lesser extent with the proposed and existing surface infrastructure. Holcim currently have an agreement with one of the residences and are currently in consultation with the remaining two landholders.

For all other existing rural residences, the impact is assessed to be low or non-existent, due to both viewing distance and the presence of intervening structures and vegetation.

Impacts to future residences are not able to be quantified at this time. In anticipation of some future potential interaction, the early establishment of visual impact mitigation measures, such as tree plantings for visual screening, is a sensible and pragmatic risk management initiative.

The project will have low to nil visual impacts to other sensitive receptors including community facilities, major tourism sites, function centres, public vantage points, and visually sensitive lands.

7 Evaluation of merits

7.1 Introduction

This chapter provides an overall evaluation of the merits of the project, having regard to:

- demand for quarry product;
- site suitability and project design;
- strategic context;
- stakeholder engagement;
- the biophysical, economic and social costs and benefits of the project (ie impact assessment); and
- relevant matters for consideration under the EP&A Act, including how the principles of ecologically sustainable development have been incorporated in the design, construction and ongoing operations of the project, and the consistency of the project with the objects of the EP&A Act.

7.2 Demand for quarry product

The quarry services local and regional markets which extend to the west of Cobar, north to the Queensland border, east to Orange and south to Parkes. The population of Dubbo Region is projected to increase by 7,400 people between 2016 and 2041 or from a population of 51,400 to 58,800 (DPE 2019b). The entire Orana region is expected to increase by more than 300,000 people by 2036 (DPE 2017). In line with the population increase, the Federal, State and local governments have plans to deliver a number of large infrastructure and capital works projects in the region, which are outlined in Section 3.4, and which will require a secure supply of quarry product.

The projected local and regional population growth, and the resultant infrastructure and capital works required, are expected to sustain or increase demand for quarry product within the Orana and Dubbo region. As noted in Section 6.14, the applicant currently holds supply contracts with TfNSW and DRC, as the quarry's high-quality basalt is in demand for the production of concrete, asphalt, road base and other applications. These are long-term contracts that will continue to be executed during the operation of the expansion of the quarry. The quarry also sells products to civil construction projects, engineering projects, subdivision developments, industrial projects, commercial and domestic customers.

Local and affordable construction materials will aid the delivery and maintenance of affordable housing in Dubbo and the region and other development, in line with the objects of the EP&A Act.

The quarry extension is required to enable the quarry to continue to operate and provide the local and regional markets with high quality construction and road base products. If an extension of the quarry life is not granted, there will be a significant gap in the supply of local and regional construction materials market. This will have substantial implications for the quarry's existing and future customers.

Further details on the significance of the resource within the project area are provided in Section 6.13.2.

7.3 Site suitability and project design

As outlined in Chapter 3, the quarry is located in a strategic and central location, which will continue benefit both the applicant and its customers. The site is in close proximity to the city of Dubbo, major transportation routes such as the Mitchell Highway, and is compatible with adjacent land uses (ie Keswick Quarry is immediately north of the quarry).

The site is sufficiently distanced from dense residential areas, minimising environmental impacts to the closest urban environment. In addition, a staged approach has been proposed to quarrying within the WEA and SEA. Staged quarry plans were proposed in consultation with DRC to avoid/reduce potential land use conflicts (refer Section 2.3.4). For example, stripping of the SEA will occur once every two years, which will minimise disruption to landowners who could continue to use the non-active parts of the project area for grazing of cattle. The overburden, which will involve separated topsoil and subsoil, will be stripped and pushed around the perimeter of the quarry to form a bund wall. The bund walls will be compacted, mulched or grassed over, and eventually repurposed for rehabilitation of the quarry's final landform. The entire process has been outlined in Section 2.3.4, and shows the detail that has been taken into consideration to design a well-managed, orderly and economic use of land in accordance with the objects of the EP&A Act.

The site has the ability to accommodate external manoeuvring of heavy vehicles, handling and storage of materials, as well as the ability to utilise and upgrade existing road infrastructure, with additions that will improve accessibility, efficiency and management of the proposed project area.

The technical assessments prepared as part of preparing this EIS have assisted to refine the proposed disturbance area of the WEA and SEA. In particular, the BDAR report informed Holcim's decision to avoid, minimise and mitigate impacts by identifying biodiversity values within the two extension areas. As a result, the extraction footprint has been significantly refined as outlined in Section 6.4.

The alternatives considered for the project are also discussed in Chapter 3, outlining why the project design for which approval is sought is the most appropriate and feasible option for the development.

7.4 Strategic context

The project aligns with a number of directions and objectives set out in both the Regional Plan and the DRC Strategic Plan, as outlined in Section 3.4.1 and Section 3.4.2 respectively. The project will ensure the continued contribution of quarrying to the diversity of local economic development and employment in Dubbo. The project will continue to provide continued employment opportunities for the existing workforce in addition to local contractors required for maintenance and construction activities. It will continue to supply locally sourced and financially competitive quarry products that will be required to service current customers, as well as forecast growth and economic and industrial development across the region. The improvements in infrastructure will consequently enable and support various streams of service provision within the region, boosting the economy and liveability and thereby improving long-term social and economic outcomes.

7.5 Stakeholder engagement

In accordance with the objects of the EP&A Act, the SIA Guidelines and project's SEARs requirements, engagement has been an important part of the preparation of this EIS. Holcim and EMM, on behalf of Holcim, have engaged with the local community and stakeholders right from the feasibility and scoping stages of the project, and have continued to do so throughout the preparation of the EIS.

Consultation has been undertaken with the wider community including local businesses, RAPs, CCC, local and State government agencies; using a variety of communication channels including workshops, meetings, letters/emails and telephone calls, as well as social media (ie Facebook).

Given the constrained circumstances brought on by the current COVID-19 pandemic, the engagement approach had to be amended in line with Federal and State government COVID-19 recommendations and measures. As such, face to face stakeholder consultation was not possible during most of 2020 and other means of consultation were employed.

While many community members and stakeholders recognised the economic benefits of the project, some of the key concerns raised were about road safety and driver conduct specifically around Sheraton Road and close to schools. Holcim has looked at addressing these concerns, and further studies (ie road safety audit), consultation and preparation of a Driver's Code of Conduct have been undertaken to address these. Other concerns raised, such as impacts to surface water and Eulomogo Creek, amenity (noise, dust and general air quality), cumulative impacts, and impacts to Aboriginal heritage, were also considered and addressed in respective technical assessments and summaries in this EIS (refer Chapter 6 and Section 7.6).

Importantly, Holcim has significantly refined the footprint of the two proposed extraction areas to reduce the areas of native vegetation that will be disturbed by the project. Quarry staging has been incorporated into the project to avoid/reduce potential land use conflicts (refer Section3.7.2).

Overall, the findings from community engagement demonstrate that stakeholders are in support of the opportunities that arise from the project if there are prospects for local and regional economic growth and ongoing employment. However, given the high values that the local community places on maintaining the liveability of the area, Holcim has committed to ongoing engagement in community consultation to support these values.

7.6 Impact assessment

Detailed technical investigations have been conducted as part of this EIS. These assessments identified residual impacts of the project and appropriate mitigation measures to address these impacts.

Construction noise will impact closest assessment locations R2 and R3. The disturbance will be for an eight-week period and only during standard daytime hours. Construction mitigation measures will reduce these short-term impacts. During project operation, NMLs will be exceeded at several assessment locations ranging from negligible (1–2 dB) to significant (>5 and >RANL). However, the exceedances are mostly expected during stripping operations which will last for approximately 4 weeks. Once stripping operations are complete, noise levels will decrease by at least 8 dB in addition to significantly lower noise levels predicted for general quarry operations. Thus, future noise levels are predicted to be relatively unchanged compared to existing operational noise levels.

Predicted concentrations and deposition rates for incremental and cumulative particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) are below the applicable impact assessment criteria at all assessment locations for both the existing and proposed scenarios under the project.

Holcim has undertaken significant steps to avoid, minimise and mitigate impacts by identifying biodiversity values early in the assessment process, and working with multiple iterations of design footprint to achieve a feasible project with least biodiversity impact. Particular efforts were made to avoid the woodland areas with larger patch size and greater connectivity to other areas of habitat outside of the disturbance area. The majority of the community vegetation is highly degraded and of low quality. There will be 5.66 ha of native vegetation that will be cleared for the project, which will require an offset to be provided to retire 126 ecosystem credits.

One isolated Aboriginal artefact (DQ-IF1), of low archaeological significance, will be impacted by the project. The design of the project avoids impacts to all remaining identified Aboriginal sites, with three remaining sites to be protected by a semi-permanent or permanent boundary fence and/or the PAD areas.

No impacts to local groundwater users or GDEs are predicted. There will be no groundwater take or change to groundwater levels of quality as a result of the project.

Modifications to the existing surface water management system are proposed as part of the project, with the primary aim to decrease discharges to Eulomogo Creek. The water balance modelling predicts that the proposed water management system will require substantially less discharges to Eulomogo Creek during wet periods, will decrease groundwater inflows to the quarry pits and improve the water quality and natural flow regime of Eulomogo Creek.

The project has the potential to result in an increase in heavy vehicle traffic within the local and regional road network. There will be no increase in light vehicle traffic and minimal construction traffic under the project. On Sheraton Road, south of the Mitchell Highway, the additional daily traffic increases will be +1.9% approximately which will potentially be noticeable in comparison to the existing daily traffic operations on this section of Sheraton Road; however, the increase will not significantly impact the road's capacity.

The Mitchell Highway/Sheraton Road intersection will continue to perform at either LOS A or B for all the assessed peak hours with significant spare traffic capacity (approximately 40%) remaining in 2045 when taking into account maximum future additional quarry traffic (on either an average or a peak production day) and potentially 25% additional background traffic growth by 2045.

The approved quarry haulage route operates past a number of schools on Sheraton Road where a Road Safety Audit report has identified several road safety issues. Most of the safety issues are related to school generated traffic movements. Holcim is currently consulting with the School's precinct stakeholders and DRC in relation to these issues.

No additional hazards have been identified. Potential bushfire risks are considered manageable in accordance with mitigation measures outlined in Appendix C.

Visual impacts are considered to be low or non-existent for rural residences on Sheraton Road (R1, R2, R2). Potentially high-moderate visual impacts are predicted for one or two future dwellings on the proposed large lot subdivision to the west of the WEA. However, there are a number of unknowns in regard to these potential residential dwellings. Any visual impacts could be mitigated by plantings for visual screenings.

The residual impacts identified during the assessment process can all be managed and mitigated using appropriate management measures outlined in Appendix C. Despite some of the residual impacts, the SIA identified that the project will result in positive social benefits to the community, including access to short and long term employment, land use opportunities post-rehabilitation and also contributions to continued economic growth and development of the local area and the region. Furthermore, the economic assessment identified the need for construction materials, in order to service existing contracts and demand from customers such as local and state governments.

7.7 Ecologically sustainable development

7.7.1 Overview of ESD

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future. With over 100 years' experience in Australia, and a history of effective implementation of environmental management systems across its operations, Holcim understands the importance of maintaining ESD objectives on site.

The principles of ESD are defined in Clause 7(4) of Schedule 2 of the EP&A Regulation and include the following:

(a) the **precautionary principle,** namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by –

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options

(b) **inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) **improved valuation, pricing and incentive mechanisms**, namely; that environmental factors should be included in the valuation of assets and services, such as –

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanism, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to the environmental problems.

Consideration has been given to appropriately identifying, avoiding, mitigating and managing environmental risks. This demonstrates environmental due diligence and will provide for ongoing and adaptive monitoring and management of the operation in line with the principles of ESD outlined in the following sections.

7.7.2 Precautionary principle

The EIS has enabled an understanding of the potential impacts of the project on biophysical, social and economic factors. No additional management controls or mitigation strategies have been proposed. Existing management controls and mitigation strategies will be used to monitor, mitigate and/or manage the potential impacts of the project.

7.7.3 Inter-generational equity

Holcim undertakes ongoing environmental monitoring and mitigation measures to provide effective environmental management across its existing operations. This management is provided through planning, communication, documentation, review and feedback, and will continue and be updated should the project be approved. These environmental management measures will ensure that the health, diversity and productivity of the environment is maintained or enhances for future generations.

In particular, the extensive consideration relevant to ongoing rehabilitation and monitoring will ensure that the sites surrounding the quarry footprint are left rehabilitated.

7.7.4 Conservation of biological diversity and maintenance of ecological integrity

The potential impacts of the project have been described in this EIS, including the potential impact of the project on biodiversity, and identifies measures to address residual impacts. The project has been designed, where possible, to avoid sensitive biodiversity areas. Nevertheless, a total of 5.66 ha of native vegetation will be cleared for the project, which will require the offsetting of 126 ecosystem credits. These offsets will be provided to compensate the unavoidable clearing of areas of vegetation.

7.7.5 Improved valuation and pricing of environmental resources

The project will support the ongoing, efficient operation and supply of basalt quarry product within the vicinity of the existing quarry and provide an economically viable pathway for DRCC, TfNSW and other local and regional contractors to source basalt locally. The project will utilise existing infrastructure as much as possible and improve infrastructure for an efficient supply of the resource.

The existing environmental management measures will ensure that the health, diversity and productivity of the environment is maintained or enhanced, where possible, for future generations.

7.8 Conclusion

The project has been designed to avoid and minimise adverse biophysical, social and economic impacts. The project is anticipated to result in limited environmental impacts, specifically to one isolated Aboriginal object (DQ-IF1) and to 5.66 ha of vegetation. Other residual impacts have been identified and assessed and will be managed and/or mitigated as outlined in Appendix C.

Environmental management will be undertaken in accordance with the issued SSD consent, updated EPL, revised site management plans, and mitigation measures consolidated in Appendix C.

The continued operation of the quarry will provide significant immediate and long-term benefits to the local community, region and State; as the development of the region relies on locally sourced and readily available quarry product that can be used to achieve strategic objectives and plans for the region.

As the potential environmental impacts can be managed and mitigated with few residual impacts and there are a range of immediate economic and social benefits from extending the project area and life of the quarry, Holcim are confident that the project is in the public interest. The project allows the best use of the currently approved operations (existing site) and presents an opportunity to meet ongoing and future basalt demand without establishing another site in a different location. Rather, the project will enable production in a well-established and strategically located quarrying district.

References

ANZECC 1990, *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

ANZECC/ARMCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia 2000, *The Strategic Framework for Mine Closure.*

Australia ICOMOS 1999, *Australian International Council on Monuments and Sites* (ICOMOS) *Burra Charter*.

ABS 2016, *2016 Census Quick Stats for Dubbo*, accessed https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SED10026.

CCAA 2018, *Building a strong foundation for NSW: Policy Priorities for NSW*, Cement Concrete & Aggregates Australia, retrieved 16 July 2020 https://www.ccaa.com.au/imis_prod/documents/261118_NSW_Policy_Priorities_201819.pdf.

Commonwealth of Australia 2020, *The Australian Code for the Transport of Dangerous Goods by Road and Rail.*

DECCW 2006, *NSW Water Quality and River Flow Objectives,* the Department of Environment, Climate Change and Water.

DECCW 2010a, *Aboriginal Cultural Heritage Consultation Requirements for Proponents,* the Department of Environment, Climate Change and Water.

DECCW 2010b, *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW,* the Department of Environment, Climate Change and Water.

DECCW 2010c, *Guide to investigating, assessing, and reporting on Aboriginal cultural heritage in NSW*, the Department of Environment, Climate Change and Water.

DECC 2008, *Managing Urban Stormwater – Soils and Construction Volume 2E – Mines and quarries*, Department of Environment and Climate Change.

DECC 2009, *Interim Construction Noise Guideline,* Department of Environment and Climate Change.

DFSI 2017, *Dubbo 2km^2 x 2km^2 1 metre Resolution Digital Elevation Model Metadata*, DFSI Spatial Services, A Division of Department of Finance, Services and Innovation.

DoE 2013, *Matters of National Environmental Significance – Significance Impact Guidelines 1.1,* Department of Environment.

DoI 2018, *Macquarie-Castlereagh water quality management plan,* the NSW Department of Planning.

DoP 2011, *Applying SEPP 33,* the NSW Department of Planning.

DPE 2017a *Central West and Orana Regional Plan 2036*, Department of Planning and Environment.

DPE 2017b, *Social impact assessment guideline for State significant mining, petroleum production and extractive industry development.*

DPE 2019a, *Preparing an Environmental Impact Statement – Guidance for State Significant Projects*, NSW Department of Planning and Environment.

DPE 2019b, *Dubbo Regional Council 2019 NSW Population Projections,* Department of Planning and Environment, NSW Government, retrieved 16 July 2019 https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/Research-and-demography/Population-projections/2019-Dubbo.pdf

DPI 2013, *Policy and guidelines for fish habitat conservation and management*, Department of Primary Industries.

DPIE 2015, *State Vegetation Type Map: Central West / Lachlan Region, Version 1.4. VIS_ID 4468,* NSW Department of Planning, Industry and Environment, 2015.

DPIE 2019, *NSW Murray-Darling Basin Porous Rock Resource Description,* NSW Department of Planning, Industry and Environment July 2019.

DPIE 2020, Brigalow Belt South Bioregion website, accessed 6 October 2020 https://www.environment.nsw.gov.au/bioregions/BrigalowBeltSouth-Maps.htm

DRC 2018, *Dubbo Region Community Strategic Plan*, Dubbo Regional Council.

ESG3: Mining Operations Plan (MOP) Guidelines (Department of Trade and Investment 2013) (the MOP Guidelines).

EMM 2019a, *Dubbo Quarry Extension Project Scoping Report*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2019b, *Dubbo Quarry Extension Project Scoping Report – social impact assessment*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020a, *Dubbo Quarry Extension Project noise and vibration impact assessment,* prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020b, *Dubbo Quarry Extension Project air quality impact assessment,* prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020c, *Dubbo Quarry Extension Project Biodiversity development assessment report,* prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020d, *Dubbo Quarry Extension Project Aboriginal due diligence assessment*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020e, *Dubbo Quarry Extension Project surface water assessment*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020f, *Dubbo Quarry Extension Project Rehabilitation and landscape management strategy*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020g, Dubbo Quarry Extension Project Traffic impact assessment, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

EMM 2020h, *Dubbo Quarry Extension Project social impact assessment*, prepared for Holcim (Australia) Pty Limited by EMM Consulting Pty Limited.

Environmental Earth Sciences 2013 *Dubbo Zirconia Project, Groundwater Assessment* September 2013

EPA 2000, *Industrial Noise Policy*, NSW Environmental Planning Authority.

EPA 2011, *NSW Road Noise Policy*, NSW Environmental Planning Authority.

EPA 2017, *Noise Policy for Industry,* NSW Environmental Planning Authority.

Geochempet 2019, *Petrographic report on a rock sample from Holcim Dubbo Quarry*, prepared for Holcim (Australia) Pty Ltd by Geochempet Services, Petrographic, Geological and Geochemical Consultants.

Holcim 2019a, *Pollution Incident Response Management Plan*.

Holcim 2019b, *Emergency Procedures Report.*

Holcim n.d., *About us*, viewed 26 June 2020, Holcim (Australia) Pty Limited https://www.holcim.com.au/about-us/at-a-glance.

ICT Technical Services 1995, *Imperial Chemical Industries (ICI) Explosives Blasting Guide*.

Isbell 2002, *Australian Soil Classification*.

ISSC3 2016, ISSC3 *Guide for the Management of Vegetation in the Vicinity of Electricity Assets*, Industry Safety Steering Committee 3, November 2016.

Katestone 2011, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Precent and/or Minimise Emissions of Particulate Matter from Coal Mining*, prepared for the NSW Office of Environment and Heritage, Katestone Environmental Pty Ltd.

Keith 2004, *Ocean shores to desert dunes – The native vegetation of NSW and the ACT,* David Keith.

Landscape Institute and the Institute of Environmental Management and Assessment 2013, *Guidelines for Landscape and Visual Impact Assessment.*

MAC Acoustics 2016, *South Keswick Quarry Project Noise and Vibration Impact Assessment*. Prepared for R.W Corkery & Co Pty Ltd by Muller Acoustic Consulting.

McKenzie et al 2009, *Australian Soil and Land Survey; Guidelines for Surveying Soil and Land Resources*.

Murphy and Lawrie 1998, *Soil Landscapes of the Dubbo 1:250 000 Sheet.*

NSW Department of Land and Water Conservation 2000, *Soil and Landscape Issues in Environmental Impact Assessment.*

NSW Department of Industry, Tourism and Resources 2006a, *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry.*

NSW Department of Industry, Tourism and Resources 2006b, *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry*.

Landcom 2004a, *Managing Urban Stormwater – Soils and Construction Volume 1*.

Landloch 2019, *Holcim Dubbo Quarry Land and Soil Capability Assessment,* prepared for Holcim (Australia) Pty Limited by Landloch Pty Ltd.

LI&IEMA 2013, *Guidelines for Landscape and Visual Impact Assessment,* Landscape Institute and the Institute of Environmental Management and Assessment.

National Geoscience Mapping Accord 2000, *Dubbo 1:100,000 Geology Map* Sheet 8633, May 2000.

NSW RFS 2014, *A guide to developing a bush fire emergency management and evacuation plan*, NSW Rural Fire Service.

NSW RFS 2015, *Guide for bushfire prone land mapping*, Version 5b, NSW Rural Fire Service, November 2015.

NSW RFS 2017, *Fire Weather Districts and FDI for NSW Government Areas – for use with Planning for Bush Fire Protection*, May 2017.

NSW RFS 2019, *Planning for Bush Fire Protection. A guide for Councils, planners, fire authorities and developers*, NSW Rural Fire Service, November 2019.

NSW RFS 2020, *NSW RFS Fire Ground Map, NSW RFS Incident Control Online system fire ground perimeter for 15 July 2019 – 3 February 2020*, NSW Rural Fire Service, February 2020

OEH 2012, *The Land and Soil Capability Assessment Scheme,* NSW Office of Environment and Heritage.

OEH 2017, *Biodiversity Assessment Method*, NSW Office of Environment and Heritage.

Orana BFMC 2012, *Orana Bush Fire Management Committee - Bush fire risk management plan,* Orana Bush Fire Management Committee, September 2012.

Parsons Brinckerhoff 2003 *Hydrogeological Investigations for Industrial Candidate Area No.4 Dubbo* Technical report to Dubbo City Council dated February 2003

RDA Orana 2019, *Our region*, Regional Development Australia Orana NSW, viewed 16 July 2019 https://www.rdaorana.org.au/our-region/.

RTA 2002, *Guide to Traffic Generating Developments*, Road and Traffic Authority.

Standards Australia 2006, *Explosives – Storage and use – Part 2: Use of explosives* 2187.2, 2006.

Standards Australia 2004, *The storage and handling of flammable liquids,* Australian Standard 2004-1940.

Standards Australia BS 7385 Part 2-1993 *Evaluation and measurement for vibration in buildings Part 2.*

Standards Australia, AS 2187.2-2006 *Explosives - Storage and Use - Use of Explosives*

Standards Australia 2010, *Planning for emergencies in facilities*, Australian Standard 3745, 2010.

Standards Australia 2014, *The storage and handling of LP gas*, Australian Standard 1596, 2014.

Standards Australia 2017, *The storage and handling of flammable and combustible liquids*, Australian Standard 1940, 2017.

Standards Australia 2018, *Construction of buildings in bushfire-prone areas*, Australian Standard 3959, 2018.

Stapleton Transportation and Planning Pty Ltd 2009, *Dubbo City Planning and Transportation Strategy 2036.*

The National Committee on Soil and Terrain 2009, *Australian Soil Survey and Land Survey Field Handbook*.

WaterNSW real time water data base, accessed 6 October 2020: https://realtimedata.waternsw.com.au/.

WorkCover 2005, *Storage and Handling of Dangerous Goods – Code of Practice 2005.*

Abbreviations

ABS	Australian Bureau of Statistics
ACHA	Aboriginal cultural heritage assessment
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Services
AHMP	Aboriginal Heritage Management Plan
ALL.	Meters below ground level
ANZECC	Australian and New Zealand Environment and Conservation Council
AQIA	Air quality impact assessment
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
ASPAC	Australian Soil and Plant Analysis Council
AWS	Automatic Weather Station
BAM	*Biodiversity Assessment Method*
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity development assessment report
	Biosecurity Act 2015
BFMC	Bush Fire Management Committee
BFMP	Bush fire management plan
BMP	Blasting Management Plan
BoM	Bureau of Meteorology
CCC	Community Consultative Committee
CEEC	Critically endangered ecological communities
CEMP	Construction environmental management plan
CO	Carbon monoxide
COVID-19	Coronavirus disease
DA	Development application
DAWE	Commonwealth Department of Agriculture, Water and the Environment
dB	Decibel
DEL	Average delay
DGVs	Default Guideline Values
DOS	Degree of saturation
DPE	Department of Planning and Environment (former)
DPIE	Department of Planning, Industry and Environment
DRC	Dubbo Regional Council

Dubbo AC Working Party	Dubbo City Council Aboriginal Community Working Party
Dubbo LALC	Dubbo Local Aboriginal Land Council
EIS	Environmental impact statement
EMM	EMM Consulting Pty Ltd
EMP	Exchangeable magnesium percentage
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ESD	Ecologically sustainable development
ESP	Exchangeable sodium percentage
FM Act	*Fisheries Management Act 1994*
FRNSW	Fire and Rescue NSW
FTE	Full-time equivalent
GDEs	Groundwater dependent ecosystems
IBRA	Interim Biogeographic Regionalisation for Australia
ICI	Imperial Chemical Industries
ICNG	Interim Construction Noise Guideline
ICOMOS	Australian International Council on Monuments and Sites
IEMA	Institute of Environmental Management and Assessment
IPC	Independent Planning Commission
Koala SEPP	State Environmental Planning Policy Koala Habitat Protection 2019
LALC	Local Aboriginal Land Council
LEP	Local environmental plan
LGA	Local government area
LI	Landscape institute
LOS	Level of service
LSC	Land and soil capability
LSCA	Land and soil capability assessment
mADH	Meters Australian Height Datum
MDB	Murray Darling Basin
MIC	Maximum instantaneous charge
Mining SEPP	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industry)
MNES	Matters of National Environmental Significance
MOP	Mining operations plan
NATA	National Association of Testing Authorities
NMLs	Noise management levels

NMP	Noise management plan
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
NPfI	*Noise Policy for Industry*
NSW	New South Wales
NVIA	Noise and vibration impact assessment
OEH	NSW Office of Environment and Heritage
OEMP	Operational environmental management plan
PAD	Potential archaeological deposit
PBP	*Planning for Bushfire Protection 2019*
PCT	Plant community types
$PM_{2.5}$	Particulate matter less than 2.5 (µm) in aerodynamic diameter
PM_{10}	Particulate matter less than 10 micrometres (µm) in aerodynamic diameter
PNTLs	Project Noise Trigger Levels
POEO	NSW *Protection of the Environment Operations Act 1997*
PPV	Peak particle velocity
RAP	Registered Aboriginal Parties
RANL	Recommended amenity noise level
RBL	Rating background noise level
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
R&LMS	Rehabilitation & landscape management strategy
RMS	Roads and Maritime Service
RMP	Rehabilitation management plan
RNP	*NSW Road Noise Policy*
RSA	Road safety audit
RTS	Response to submissions
SEA	Southern Extension Area
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 33	State Environmental Planning Policy No 33 - Hazardous and Offensive Development
SIA	Social impact assessment
SII	Serious and irreversible impacts
SMU	Soil mapping units
SO_2	Sulphur dioxide
SSC	Dubbo State Suburb
SSD	State significant development

SWA	Surface water assessment
TEC	Threatened ecological communities
TfNSW	Transport for NSW
TIA	Traffic impact assessment
Tpa	Tonnes per annum
TSP	Total suspended particulate matter
TSR	Travelling stock reserve
VIA	Visual impact assessment
VOCs	Volatile organic compounds
VLAMP	Voluntary Land Acquisition and Mitigation Policy
WALs	water access licences
WEA	Western Extension Area
Y	Year

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