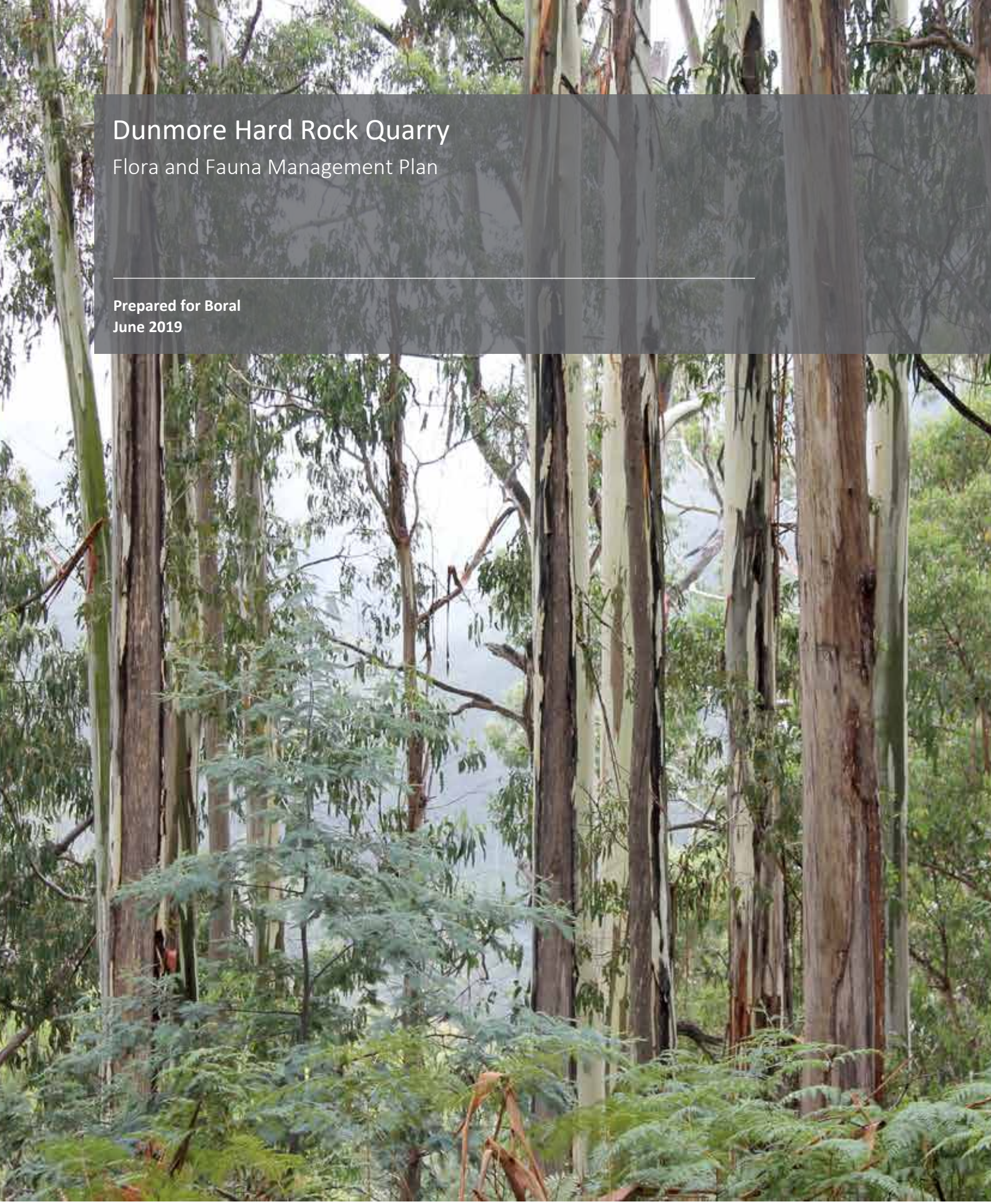
Dunmore Hard Rock Quarry

Flora and Fauna Management Plan

Prepared for Boral
June 2019



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Dunmore Hard Rock Quarry

Flora and Fauna Management Plan

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11 March 2019

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1 Introduction

1.1 Background

The Dunmore Hard Rock Quarry, owned and operated by Boral Resources (NSW) Pty Ltd, is located at Tabbita Road Dunmore, approximately 12 kilometres north-west of Kiama in the Shellharbour Local Government Area (LGA). The quarry produces hard rock which is crushed to produce coarse aggregates and road construction materials, and fines that are used as manufactured sand or bedding material. Development Consent (DA 470-11-2003), issued 19 November 2004 by the Minister for Infrastructure and Planning, allows Boral to produce up to 2.5 million tonnes of hard rock a year (Mtpa), and transport it offsite by road and rail to local and regional markets.

The Development Consent requires the preparation and implementation of a number of management plans to guide the environmental management of the development throughout its operational life. In accordance with Condition of Approval (CoA) 47, a Flora and Fauna Management Plan (FFMP) was prepared by Cumberland Ecology for Boral in 2009 and updated by Arcadis in 2016. This FFMP incorporated a Vegetation Clearing Protocol, a Compensatory Habitat Management Plan and a Remnant Vegetation Conservation Plan.

Since consent was issued in November 2004, there have been eight approved modifications (with conditions), as detailed below:

1. Modification 1 - New amenities block (approved December 2005);
2. Modification 2 - Vegetation offsets and transport route (approved June 2006);
3. Modification 3 – (approved May 2008);
4. Modifications 4 and 5 – Extension to extraction area (approved November 2008);
5. Modification 6 – Increased extraction area and road haulage (approved February 2014);
6. Modification 7 – Proposed blending plant (approved December 2015);
7. Modification 8 – Remove overburden and construct bund (approved November 2016); and
8. Modification 9 – Extension to extraction area (approved September 2017).

To reflect this progression in Dunmore Quarry's operations, Boral has updated the existing Flora and Fauna Management Plan, in accordance with the current quarry activities and approvals.

1.2 Project description

Dunmore Hard Rock Quarry (the site) covers approximately 248 hectares and is surrounded by private property, predominantly agricultural grazing land and tracts of remnant native vegetation, to the south, north and west (Figure 1.1). Dunmore Soil and Sand Quarry adjoins the site to the east.

Dunmore Hard Rock Quarry produces hard rock from Bumbo Latite Member, a fine-grained intermediate volcanic rock similar to basalt, which is crushed to produce coarse aggregates, road construction materials and fines. Extraction occurs from three discrete areas: Original Dunmore Quarry, Croome Farm Pit and Sydney Trains Land (together comprising the extraction footprint). These areas are described in further detail in Section 3.1.

The extraction method involves drilling and blasting to produce broken rock, that is transported to the primary crusher feed bin. The primary-crushed rock is further reduced in size in a series of crushers, before being conveyed to the tertiary screen house where the crushed rock is sized according to product specifications. The sized products are then stockpiled within the various stockpile areas on site, until they are transported by road and rail to local and regional markets.

1.3 Objectives of the plan

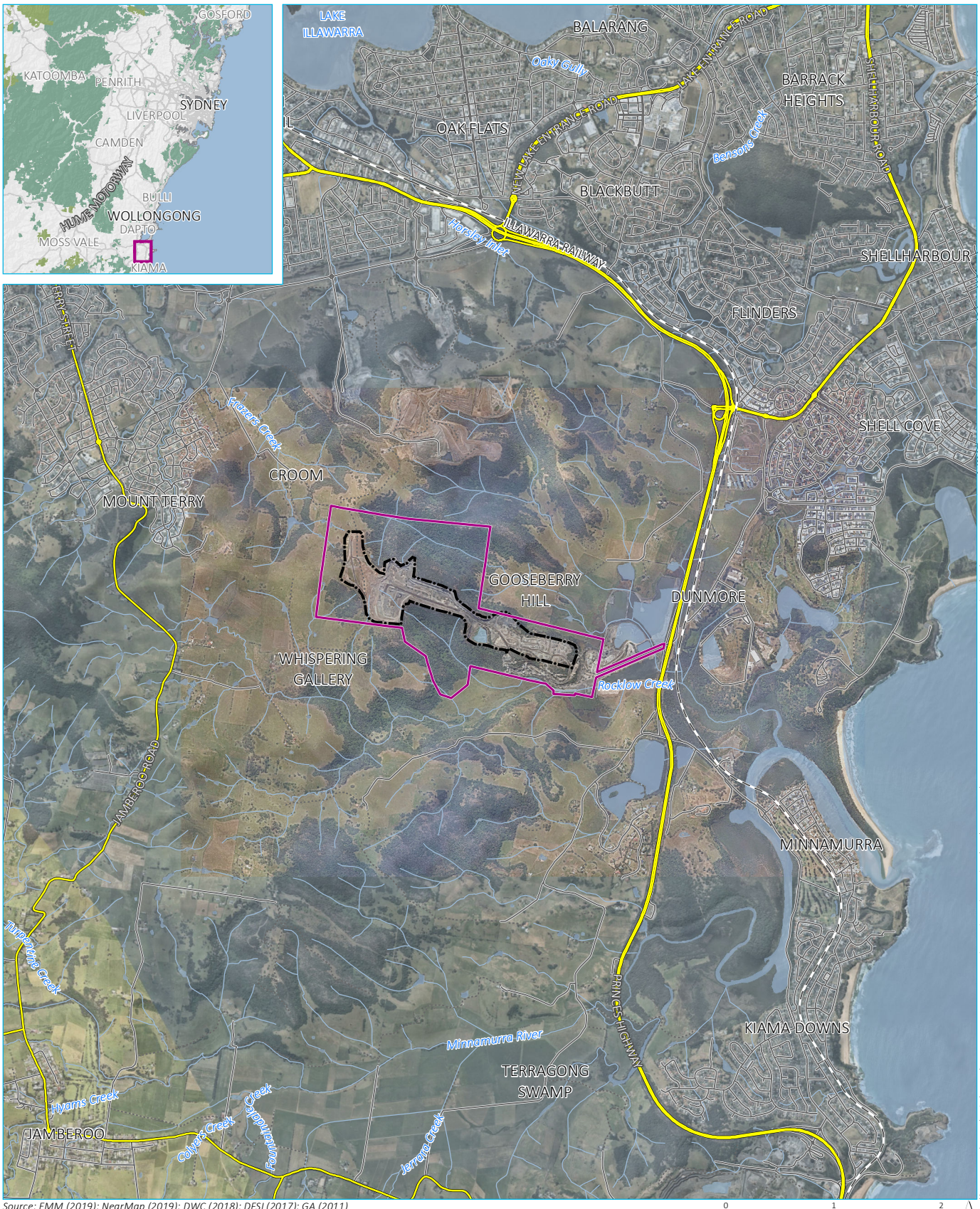
The purpose of this Flora and Fauna Management Plan (FFMP) is to provide a single operational document that clearly identifies key management issues, management objectives and actions to be implemented in accordance with development consent requirements, the proposed schedule for implementation as well as the monitoring and review of commitments included in this FFMP.

1.4 Document structure

The structure of this FFMP is outlined in Table 1.1

Table 1.1 Structure of this FFMP

Section	Content
1	Provides an overview of the project, previous environmental assessments of the Project, and the purpose and scope of this plan.
2	Details the statutory requirements for the Plan as outlined in the Conditions of Approval issued by the NSW Department of Planning and Environment, and other legislative requirements.
3	Describes the existing environment of the site, significant biodiversity values contained within the site.
4	Outlines the past and future management actions to be undertaken across the site, within Conservation Areas.
5	Outlines the monitoring, reporting and review requirements pertaining to flora and fauna management within the site.
6	Specifies the environmental induction training to delivered to all staff and subcontractors involved in the Project.
7	Outlines the requirements pertaining to contingency planning, including emergency incident reporting and management.



Source: EMM (2019); NearMap (2019); DWC (2018); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 MGA Zone 56

N

KEY

- Site boundary
- Approved extraction boundary
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse/drainage line
- Waterbody

Site locality

Boral - Dunmore Hard Rock Quarry
Flora and fauna management plan
Figure 1.1

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2 Relevant Legislation, Guidelines and Plans

2.1 Legislation

Key environmental legislation relating to flora and fauna management includes:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- NSW *Biodiversity Conservation Act 2016* (BC Act, replacing the NSW *Threatened Species Conservation Act 1995* (TSC Act);
- NSW *Fisheries Management Act 1994* (FM Act);
- NSW *Environment Planning and Assessment Act 1979* (EP&A Act);
- NSW *National Parks and Wildlife Act 1974* (NPW Act);
- NSW *Biosecurity Act 2015* (replacing the *Noxious Weeds Act 1993* (NW Act);
- NSW *Local Land Services Act 2013* (LLS Act, replacing the *Native Vegetation Act 2003*); and
- NSW *Water Management Act 2000* (WM Act).

2.2 Guidelines

Key guidelines relating to this management plan include:

- Hygiene Protocol for the control of Disease in Frogs (DECC 2008);
- Code of Practice for Injured, Sick and Orphaned Protected Fauna (0EH 2011);
- Code of Practice for injured, sick and orphaned flying foxes (OEH 2012);
- Code of Practice for injured, sick and orphaned koalas (OEH 2011);
- Guidelines for the rehabilitation of birds of prey (DECCW 2011);
- Florabank Native Seed Collection Code of Practice (Greening Australia NSW 1999); and
- Guidelines for the Translocation of Threatened Plants in Australia – Third Edition (Commander et al. 2018).

2.3 Conditions of Approval

The quarry operates under a Ministerial consent granted on 19 November 2004 issued for the Development Application DA 470-11-2003. Since the consent was issued there have been eight approved modifications (with conditions), as detailed in Section 1.1.

A number of the Ministers Conditions of Approval (MCoA) from the NSW Department of Planning and Infrastructure (February 2014) are relevant to this Plan and have been considered in its preparation. Table 2.1 outlines where each relevant condition is considered in this FFMP.

Table 2.1 Conditions of approval and where they are addressed in this FFMP (as updated by Modification 9)

Condition of Approval	Condition Requirements	Where addressed in this plan
Vegetation Offset Strategy		
Schedule 4, Condition 46	The Applicant must: (a) establish, conserve, and maintain at least: • 4.6 hectares of *Melaleuca armillaris* Tall Shrubland; and • 8.2 hectares of Blue Gum-White Box Woodland/Forest, on Boral-owned land adjacent to the development;	Section 4.1.1
	(b) conserve, maintain, and enhance the vegetation in the area to the south of the development marked on the map in Appendix 3 as Remnant Vegetation Conservation Area;	Section 4.1.2
	(c) conserve, maintain, enhance and establish the vegetation in the area to the south of the development marked on the map in Appendix 3 as Offset Area, in accordance with the letter from Boral to the Department dated 22 September 2008 titled *Dunmore Quarry – Revised Offset for Quarry Extension;*	Section 4.1.3
	(d) within 12 months of the date of Modification 8, the Applicant must provide a biodiversity offset strategy outlining the measures to offset 48 Illawarra Zieria individuals and 1.94 ha of native vegetation clearing (including 0.05 ha of Illawarra Subtropical Rainforest EEC), to the satisfaction of OEH and the Secretary. The offset must demonstrate that the biodiversity values in the general vicinity of the site have been maintained or improved; and	Appendix A
	(e) within 12 months of the date of approval of Modification 9, the Applicant must provide a biodiversity offset strategy outlining measures to offset 162 Illawarra Zieria individuals by no less than 2,268 Illawarra Zieria credits, to the satisfaction of OEH and the Secretary. The offset must demonstrate that the biodiversity values in the general vicinity of the site have been maintained or improved.	Appendix A
Schedule 4, Condition 46A	Within 12 months of the date of Modification Application 470-11-2003 Mod 4, the Applicant must make suitable arrangements in consultation with the OEH to provide appropriate long term security for the biodiversity offset referred to in condition 46 (c), to the satisfaction of the Secretary.	Section 4.1.3
Schedule 4, Condition 46B	Within 12 months of the date of providing the biodiversity offset strategy required under condition 46(d), the Applicant must make suitable arrangements to provide long term security for this strategy, to the satisfaction of the Secretary.	Not required – see Appendix A
Schedule 4, Condition 46C	Within 12 months of the date of providing the biodiversity offset strategy required under condition 46(e), the Applicant must make suitable arrangements to provide long term security for this strategy, to the satisfaction of the Secretary.	Not required – see Appendix A
Flora and Fauna Management Plan		
Schedule 4, Condition 47	Within 12 months of the date of this consent, the Applicant must prepare, and subsequently implement, a Flora and Fauna Management Plan for the development to the satisfaction of the Director-General. This plan must include: (a) a Vegetation Clearing Protocol;	Appendix B
	(b) a Compensatory Habitat Management Plan;	Section 4.1.1
	(c) a Remnant Vegetation Conservation Plan; and	Section 4.1.2

Table 2.1 Conditions of approval and where they are addressed in this FFMP (as updated by Modification 9)

Condition of Approval	Condition Requirements	Where addressed in this plan
	(d) a Biodiversity Offset Management Plan.	Not required – see Appendix A
Schedule 4, Condition 48	The Vegetation Clearing Protocol must: (a) delineate the areas of remnant vegetation to be cleared; and (b) describe the procedures that would be implemented for: • pre-clearance surveys; • progressive clearing; • fauna management; • conserving and reusing topsoil; • collecting seed from the site; • salvaging and reusing material from the site; and • controlling weeds.	Section 4.2 and Appendix B
Schedule 4, Condition 49	The Compensatory Habit Management Plan must: (a) describe the compensatory habitat proposal to satisfy condition 46(a); (b) justify why this area(s) is suitable for the compensatory habitat proposal; (c) establish baseline data for the existing habitat in the proposed compensatory habitat area(s); (d) describe how the compensatory habitat proposal would be implemented; (e) set completion criteria for the compensatory habitat proposal; and (f) describe how the performance of the compensatory habitat management proposal would be monitored over time.	Section 4.1.1
Schedule 4, Condition 50	The Remnant Vegetation Conservation Plan must: (a) describe what measures would be implemented to satisfy condition 46(b); (b) establish baseline data for the existing vegetation in the area; (c) set completion criteria for the Remnant Vegetation Conservation Area; and (d) describe how the performance of the Remnant Vegetation Conservation Area would be monitored over time.	Section 4.1.2
Schedule 4, Condition 50A	The Biodiversity Offset Management Plan must: (a) describe what measures would be implemented to satisfy condition 46(c); (b) describe the biodiversity offset strategies in conditions 46(d)-(e); (c) include a timetable for providing long term security of the offset areas; (d) set performance and completion criteria for the offset areas; and (e) include a program to monitor and report on the effectiveness of the implementation measures, and progress against the performance and completion criteria.	Section 4.1.3 and Appendix A
Schedule 4, Condition 51	The Applicant must include a progress report on the implementation of the Flora and Fauna Management Plan in the Annual Review.	Section 5.2
Rehabilitation		
Schedule 4, Condition 53	The Applicant must progressively rehabilitate the site to the satisfaction of the Secretary.	Section 4.3 and Appendix C

Table 2.1 Conditions of approval and where they are addressed in this FFMP (as updated by Modification 9)

Condition of Approval	Condition Requirements	Where addressed in this plan
Schedule 4, Condition 54	Within 6 months of the date of this consent, the Applicant must prepare a Rehabilitation Management Plan for the site to the satisfaction of the Secretary. This plan must: (a) identify the disturbed area at the site; (b) describe in general the short, medium, and long-term measures that would be implemented to rehabilitate the site; (c) describe in detail the measures that would be implemented over the next 3 years to rehabilitate the site; and (d) describe how the performance of these measures would be monitored over time. The Applicant must implement the approved management plan as approved from time to time by the Secretary.	Appendix C

2.4 Licences and permits

2.4.1 Environmental Protection Licence

The Environment Protection Authority (EPA) issues environment protection licences to the owners or operators of various industrial premises under the *Protection of the Environment Operations Act 1997* (POEO Act). Licence conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice. All licence holders must:

- comply with the conditions of their licence;
- prepare pollution incident response management plans; and
- publish and/or make pollution monitoring data available

Dunmore Quarry operates in accordance with Environment Protection Licence No. 77 (anniversary date is 31 August) and nominates specific criteria that need to be satisfied with respect to blasting and nominates noise, blasting, dust and water monitoring requirements.

2.4.2 Activities requiring Director-General consent (specific to Offset Area)

In accordance with Item 2 of Annexure C of the Conservation Agreement (Appendix E), the following activities must not be undertaken, consented to or permitted in the Offset Area without prior written consent of the Director-General:

a) the sowing or planting of trees, grasses or other plants in the conservation area

b) the introduction of any non-indigenous plants or non-indigenous fauna into the conservation area

c) the entry of domestic animals including pets and domestic livestock in the conservation area

d) the use or application of fertiliser or pesticides in the conservation area

e) the use of trail bikes, four-wheel-drive vehicles or any other vehicle in the conservation area off any formed road

f) any works in the conservation area, especially any revegetation work and developments, which have the potential to impact on any cultural features. (Seek advice from the Department if any are identified, prior to any work commencing)

g) the removal of any biological or inorganic component of the conservation area

h) any works which will adversely affect the natural flows and bodies of water.

2.5 Alignment with other plans relevant to the project

This document supersedes the *Vegetation Offset Strategy (Development Consent Conditions 46-58) Flora and Fauna Management and Rehabilitation Plan 2009 Revision* (Cumberland Ecology 2009) and the *Dunmore Hard Rock Quarry Flora and Fauna Management Plan* (Arcadis 2016).

A number of other management plans contain relevant information relating to this Flora and Fauna Management Plan including a Water Management Plan, Rehabilitation Management Plan (Appendix C), Pollution Incident Response Management Plan, Site Emergency Response Plan and Bushfire Management Plan (Appendix D). The management actions in this plan complement these other plans and should be considered holistically.

3 Existing environment

3.1 Site description

The site covers approximately 245 hectares (ha) and includes the existing disturbance footprint (73 ha, as modified in Modification 9), processing plant, stockpiles of sized products, a workshop and maintenance area, the rail siding and product loading area, administration buildings, carpark and weighbridge (Figure 3.1). The site also contains a concrete batching plant, which operates under a separate development consent granted by Shellharbour City Council on 4 December 1997. The site is accessed from the Princes Highway via Tabbita Road, a road used solely for access to the quarry.

The extraction footprint is surrounded by remnants of native vegetation, separated by expanses of cleared and disturbed grassland. The condition of native vegetation varies between and within remnants, with some areas consisting largely of native plant species and others supporting dense infestations of weeds.

Historically, extraction has occurred in an area known as Original Dunmore Quarry, in the east of the site. Extraction operations are currently centred on the Croome Farm Pit and Sydney Trains Land extraction areas (Figure 3.1). Development Consent DA 470-11-2003 allows an extraction rate of 2.5 Mtpa.

3.1.1 Original Dunmore Quarry

Extraction from the original Dunmore Quarry, located on Boral-owned land, commenced in 1921. The original quarry contains approximately 2.5 million cubic metres (m^3) of breccia- agglomerate above approximately 12 million tonnes (Mt) of latite in the lower flow. Extraction involves the progressive removal of a breccia-agglomerate (likely to be suitable for production of road pavement materials) and the eventual recovery of high quality latite from the lower flow. There is no limit on the extraction rate from the original quarry.

The existing extraction floor in the original Dunmore Quarry slopes gradually to the east. Elevations of the floor vary from 30 m Australian Height Datum (AHD) to 60 m AHD and there are localised faces where some of the agglomerate has been extracted. The outer faces of the original Dunmore Quarry have been retained to assist in screening exposed extraction faces and stockpiled by-products on the quarry floor.

3.1.2 Croome Farm Pit

The western area, referred to as Croome Farm Pit extraction area (including the Croome Farm West Pit), is owned by Boral. Extraction commenced in this area in 2000, and following Modification 9 approximately 30 Mt remains in the Croome Farm Pit extraction area. The resource within the Croome Farm Pit extraction area is calculated to the current approved depth of extraction of 107 m AHD.

Extraction within Croome Farm Pit will continue to target the upper and middle latite flows. The design of the approved extraction area provides for the creation of three benches in the upper and middle flows in the Croome Farm Pit extraction area.

3.1.3 Sydney Trains Land

The central extraction area, referred to as Sydney Trains Land, is located on land leased to Boral for which a production royalty is applied to any material extracted from this area. Extraction within this area commenced in 1986 with the intent to provide an internal low-level access to the Croome Farm Pit extraction area. Extraction within Sydney Trains Land will continue to target the upper and middle latite flows.

The extraction floor levels within the Sydney Trains Land rise gradually in a westerly direction at about 3% to 4% to meet the horizontal floor (and bench) levels in the Croome Farm Pit extraction area. The extraction faces in the Sydney Trains Land are typically 15 to 17 m high.

3.1.4 Land use

The Dunmore Quarry has been operating since 1921, initially by Blue Metal & Gravel Pty Ltd (BMG) and then by Boral from 1982 when BMG's parent company, BMI Limited, became a subsidiary of Boral Limited.

The majority of land surrounding the site is owned by Boral and two other quarry companies: Readymix and Dunmore Sand & Soil Pty Ltd. A number of rural properties also adjoin the site. Land use in the surrounding locality includes:

- agricultural land to the north and south, dairying is the major current agricultural enterprise in the locality (DECCW 2011);
- commercial and industrial development, including Dunmore Sand and Soil Quarry immediately to the east, Holcim Australia's Albion Park Quarry to the north and the Dunmore Recycling and Waste Disposal Depot to the east;
- residential development, including Albion Park to the north Shell Cove and Shellharbour to the north-east, residential development adjacent to the Shellharbour Junction train station to the east, and Dunmore Lakes Estate to the south;
- education facilities, including Shelharbour Anglican College, to the east;
- infrastructure development, including the Princes Highway and the South Coast Rail Line to the east; and
- coastal wetlands located on the eastern side of the Princes Highway.

3.1.5 Topography

The site is located amongst the undulating topography of the lower slopes of the Illawarra escarpment, on two hills known locally as Locking Hill and Gooseberry Hill. The northern and southern boundaries of extraction activities align with the crests of steep slopes, which have been retained to reduce impacts on visual amenity into the site.

The majority of the site has a maximum elevation of approximately 164 m AHD, which gradually reduces via a series of quarried landforms to approximately 10 m AHD at the eastern margin of the extraction and stockpiling area, and 2 m AHD at the weighbridge and office complex.

3.1.6 Hydrology

Drainage within the site is essentially subdivided into clean runoff from outside the extraction footprint and potentially sediment-laden runoff from within the extraction and infrastructure areas.

The catchment area for potentially sediment laden runoff for the site is defined by the area of disturbance, bund walls and topographic watershed lines. All dirty runoff from site components, such as the product stockpile areas, workshop and maintenance area, processing area as well as the extraction area, flows into one of three dams: the Croome Sumps, Middle Dam and Lower Dam. A bio-filtration swale is located down gradient of the Lower Dam to aid water quality management when discharging from the Lower Dam. An overview of these dams and the bio-filtration swale is provided in the Water Management Plan. All clean runoff from the site flows into the tributaries of Rocklow Creek which is predominantly dry for most of the year.

3.2 Significant biodiversity values

The Illawarra region within the Sydney Basin Bioregion is one of the most biologically diverse in NSW, and the site and surrounding locality contains the largest remaining patches of native vegetation on the Illawarra foothills and coastal plain (DECCW 2011).

3.2.1 Endangered ecological communities

The site supports three Endangered Ecological Communities (EECs) listed under the TSC Act. These EECs are known to exist only in the Illawarra region (DECCW 2011, Figure 3.2). The approximate area of each EEC described below has been calculated following the completion of vegetation clearing for all extensions to the extraction footprint to date.

i Illawarra Subtropical Rainforest

Approximately 47 ha of Illawarra Subtropical Rainforest occurs within the site, including a large patch that adjoins the southern margin of the extraction footprint and a large patch that is located in close proximity to the northern boundary of the extraction footprint. This EEC occurs most commonly in sheltered gullies generally with a southerly aspect.

Illawarra Subtropical Rainforest of the site is characterised by dense canopy dominated by Coachwood (*Ceratopetalum apetalum*), Sassafras (*Doryphora sassafras*), Grey Myrtle (*Backhousia myrtifolia*) and a diversity of figs. The abundance of weeds is generally low, with the exception of localised infestations of Lantana (*Lantana camara*).

ii *Melaleuca armillaris* Tall Shrubland

Approximately 21 ha of *Melaleuca armillaris* Tall Shrubland occurs within the site, generally associated with very shallow to skeletal soils, mainly on the ridges and upper slopes. Patches of this EEC adjoin the northern and southern boundary of the extraction footprint.

Melaleuca armillaris Tall Shrubland on the site supports a low canopy dominated by *M.armillaris*, a shrub stratum is dominated by Lantana, Narrow-leaved Mint-bush (*Prostanthera linearis*), Illawarra Zieria (*Zieria granulata*), Prickly Beard-heath (*Leucopogon juniperinus*) and *Phyllanthus gasstroemii* and a groundcover dominated by Tussock Grass (*Poa labillardieri*), Weeping Grass (*Microlaena stipoides*), Golden Everlasting (*Xerochrysum bracteatum*), *Rytidosperma* spp. and Pale Fan-flower (*Scaevola albida*). Dense Lantana infestations are common along the margins of *Melaleuca armillaris* Tall Shrubland.

iii Illawarra Lowlands Grassy Woodland

Approximately 37 ha of Illawarra Lowlands Grassy Woodland occurs within the site, generally associated with lower slopes and some ridges. Patches of this EEC occur to the west and north of the extraction footprint.

Illawarra Lowlands Grassy Woodland of the site is characterised by a canopy dominated by Forest Red Gum (*Eucalyptus tereticornis*) and White-topped Box (*E. quadrangulata*), a sparse understorey dominated by Black Wattle (*Acacia mearnsii*), Sweet Pittosporum (*Pittosporum undulatum*), Veined Mock-olive (*Notelaea venosa*) and Red Ash (*Alphitonia excelsa*), a shrub layer dominated by Lantana, Green Native Cascarilla (*Croton verreauxii*), *Phyllanthus gasstroemii*, Coffee Bush (*Breynia oblongifolia*) and Illawarra Zieria and a groundlayer dominated by Creeping Beard Grass (*Oplismenus imbecillis*), Weeping Grass, Tussock Grass and Cape Ivy (*Delairea odorata*).

3.2.2 Threatened flora species

i Illawarra Zieria

Illawarra Zieria is a tall shrub or small tree listed as Endangered under both the BC Act and EPBC Act. This species is known to occur within both *Melaleuca armillaris* Tall Shrubland and Illawarra Lowlands Grassy Woodland EECs within the site. In proximity to the extraction footprint, approximately 40 plants were identified within *Melaleuca armillaris* Tall Shrubland EEC to the north of the extraction while several plants were recorded in the lower part of the Original Dunmore Quarry (R.W. Corkery and Co., 2003). During the ecological assessments for Modification 8 (EMM 2016a) and Modification 9 (EMM 2016b) a further 48 individuals (Modification 8) and a further 162 individuals (Modification 9) located in planted Eucalypt woodland that formed a part of the previous revegetation works. Additional plants were identified to the west of the extract footprint during a site visit undertaken by Arcadis in February 2016. This species likely occurs in other locations throughout the site in associated with Illawarra Subtropical Rainforest, *Melaleuca armillaris* Tall Shrubland and Illawarra Lowlands Grassy Woodland EECs.

3.2.3 Threatened fauna species

A fauna assessment undertaken by Kevin Mills and Associates in 2003 identified eight mammal species, 73 bird species and three frog species (R.W. Corkery and Co., 2003). No threatened species were identified within the site. Recent surveys by EMM (2016a, 2016b) did not identify any threatened fauna species, but considered that the site had potential to support a number of threatened avifauna.

Strategy for the Conservation and Management of Biodiversity in the Dunmore - Shellharbour Hills Area (DECCW 2011) describes the results of several fauna surveys undertaken within the surrounding locality, that are of relevance to the site, and these results are described below.

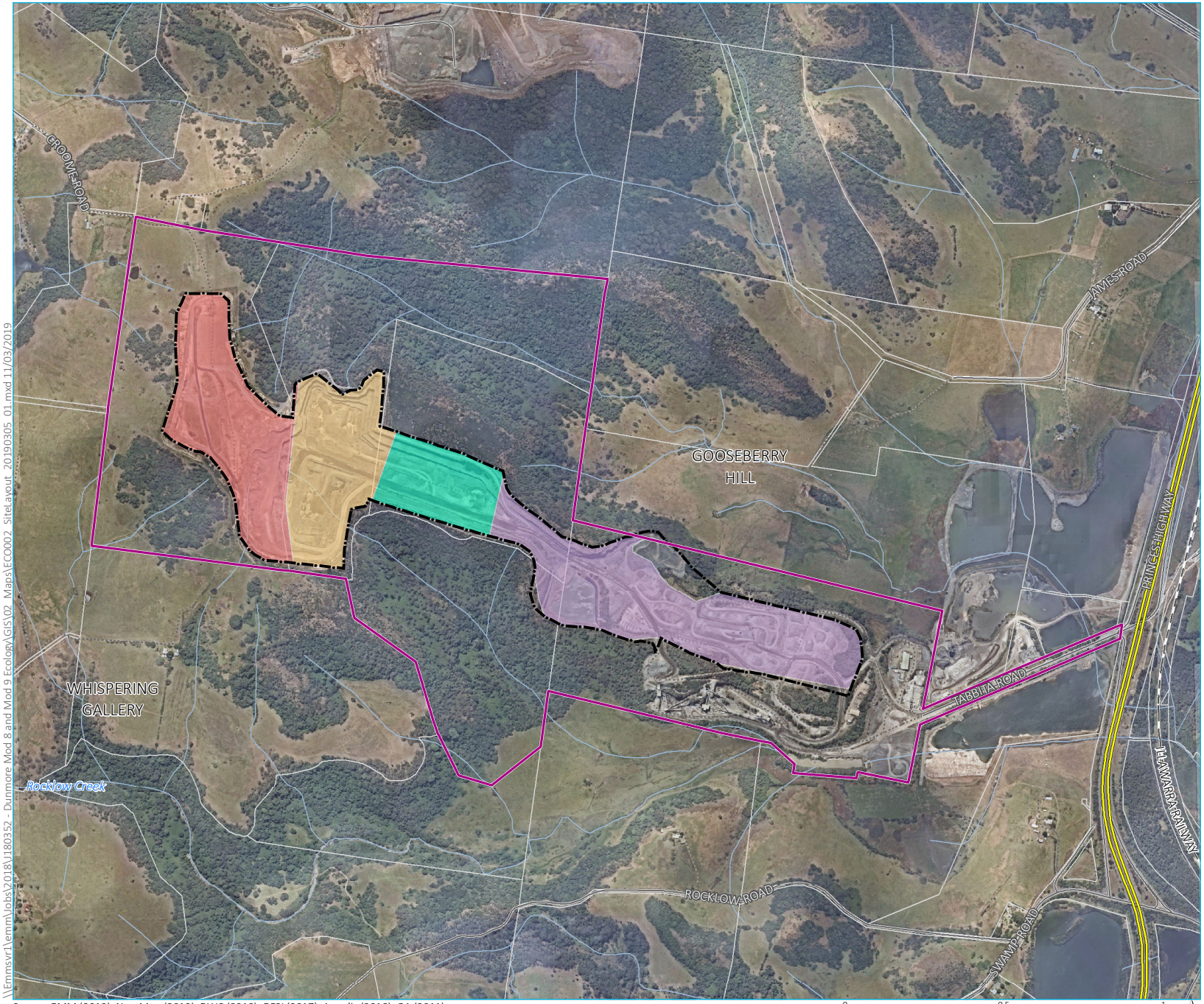
i Grey-headed Flying-fox

A camp for the vulnerable Grey-headed Flying-fox, listed as vulnerable under both the BC Act and the EPBC Act, is located in remnant vegetation south of the site, known as Flying Fox Gully (Figure 3.2). Flying Fox Gully is a rainforest gully that is used as a summer camp for the species, and as a maternity camp during the spring and summer, where annual breeding and rearing of young take place. This is one of three maternity camps known in the Illawarra region and the only roost not protected within a conservation reserve (DECCW 2011).

A Grey-headed Flying-fox release cage is located in proximity to this camp (Figure 3.2), which has previously been used to reintroduce injured and/or orphaned flying foxes to the wild, following their care and rehabilitation. Dunmore Hard Rock Quarry provides assistance to wildlife groups WIRES (Wildlife Information and Rescue Service) and NANA (Native Animal Network Association) that care for the flying foxes.

ii Microbats

Five microbat species listed as vulnerable under the BC Act have been recorded in the locality surrounding the site (DECCW 2011). Surveys undertaken by Gaia Research in 2009 recorded the presence of Large-footed Myotis (*Myotis macropus*), Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). Eco Logical Australia (2007) previously recorded the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*).



KEY

- Site boundary
- Approved extraction boundary
- Rail line
- Main
- Local road
- Vehicular track
- Watercourse/drainage
- Cadastral boundary

Extraction areas

- Croome Farm West
- Croome Farm
- Sydney Trains Land
- Original Quarry

Source: EMM (2019); NearMap (2019); DWC (2018); DFSI (2017); Arcadis (2016); GA (2011)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

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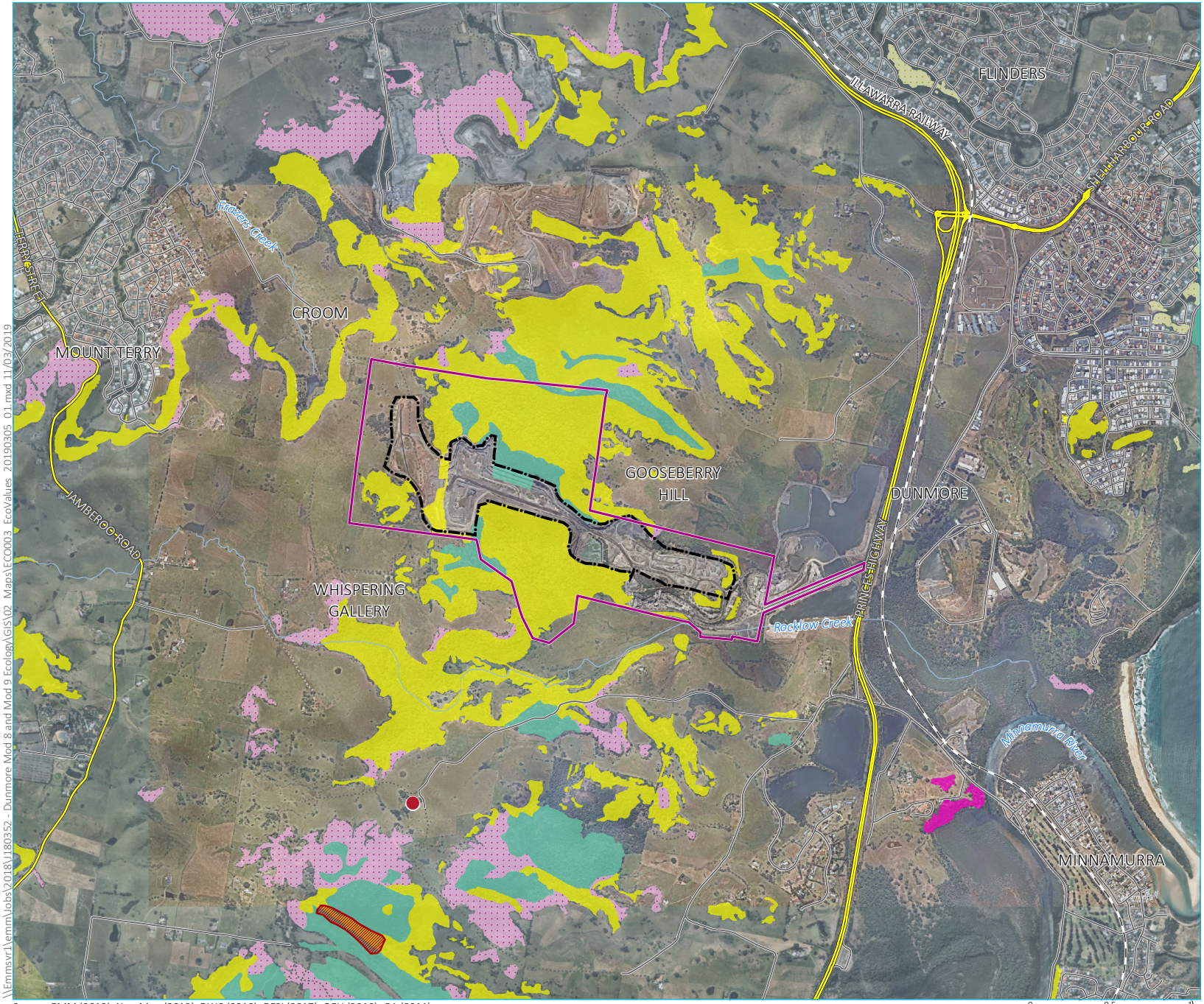
Dunmore Hard Rock Quarry site layout

Boral - Dunmore Hard Rock Quarry
Flora and fauna management plan
Figure 3.1

EMM
creating opportunities



KEY

- Site boundary
- Approved extraction boundary
- Rail line
- Main road
- Local road
- Vehicular track
- Named watercourse
- Grey-headed Flying-fox release area
- Grey-headed Flying-fox camp

Illawarra PCT mapping (VIS_ID4678) - EECs

- Illawarra Lowlands Grassy Woodland
- Illawarra Lowlands Grassy Woodland/ Riverflat Eucalypt Forest on Coastal Floodplains
- Illawarra Subtropical Rainforest
- Illawarra Subtropical Rainforest/ Lowland Rainforest
- *Melaleuca armillaris* Tall Shrubland

Source: EMM (2019); NearMap (2019); DWC (2018); DFSI (2017); OEH (2016); GA (2011)

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Ecological values

Boral - Dunmore Hard Rock Quarry
Flora and fauna management plan
Figure 3.2

EMM
creating opportunities

4 Management actions

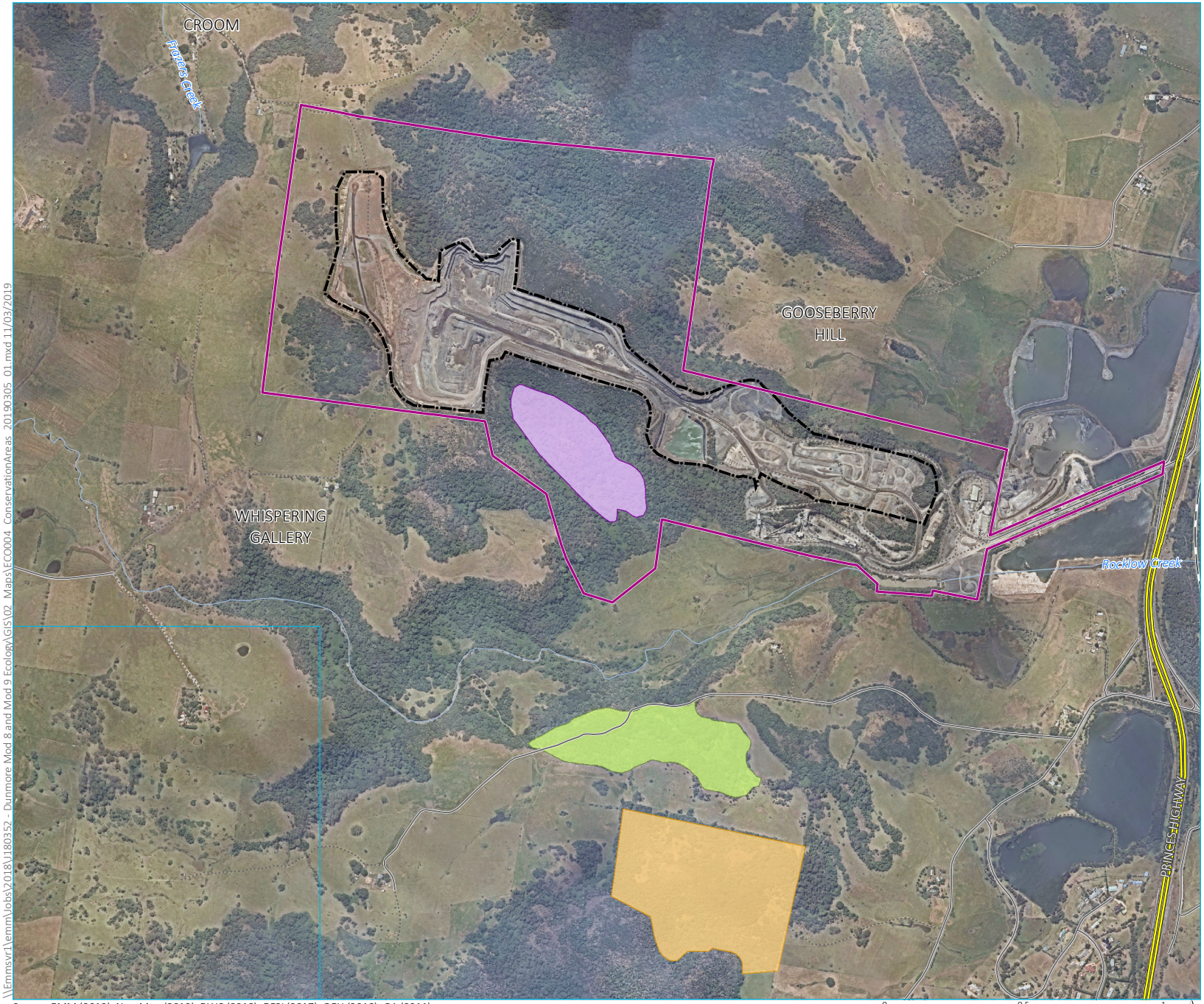
4.1 Conservation areas

In accordance with Schedule 4 Condition 46 of Development Consent (DA 470-11-2003), the Dunmore Quarry was required to conserve, maintain and enhance several discrete areas of native vegetation, including a compensatory habitat area and a remnant vegetation conservation area. A subsequent modification to DA 470-11-2003 in 2008 required additional vegetation to be conserved, maintained and enhanced within an offset area.

Table 4.1 provides a summary of how the various conservation areas meet the conditions of approval, while all conservation areas shown on Figure 4.1.

Table 4.1 Conditions of consent pertaining to conservation areas

Development application	Approval date	Condition of consent (CoA)	Conservation area name
DA 470-11- 2003	November 2004	CoA 46(a): establish, conserve, and maintain at least: • 4.6 hectares of *Melaleuca armillaris* Tall Shrubland; and • 8.2 hectares of Blue Gum-White Box Woodland/Forest, on Boral-owned land adjacent to the development.	Compensatory Habitat Area
		CoA 46(b): conserve, maintain, and enhance the vegetation in the area to the south of the development marked on the map in Appendix 3 (of the consent) as Remnant Conservation Area.	Remnant Vegetation Conservation Area
Modifications 4 and 5	November 2008	CoA 46(c): conserve, maintain, enhance and establish the vegetation in the area to the south of the development marked on the map in Appendix 3 (of the consent) as Offset Area, in accordance with the letter from Boral to the Department dated 22 September 2008 titled *Dunmore Quarry – Revised Offset for Quarry Extension*.	Offset Area



KEY

- Site boundary
- Approved extraction boundary
- Rail line
- Main
- Local road
- Vehicular track
- Named

Conservation areas

- Remnant vegetation conservation
- Offset area
- Compensatory habitat

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Source: EMM (2019); NearMap (2019); DWC (2018); DFSI (2017); OEH (2016); GA (2011)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

Conservation areas

Boral - Dunmore Hard Rock Quarry
Flora and fauna management plan
Figure 4.1

EMM
creating opportunities

4.1.1 Compensatory habitat

i Existing environment

Prior to commencement of management of the Compensatory Habitat area in 2007/2008, the Compensatory Habitat Area contained four vegetation communities (Cumberland 2009):

- degraded Illawarra Lowlands Grassy Woodland EEC;
- degraded and moderate quality Illawarra Subtropical Rainforest EEC; and
- degraded and higher quality *Melaleuca armillaris* Tall Shrubland EEC.

The site selected for *Melaleuca armillaris* Tall Shrubland compensatory habitat originally included portions of Kikuyu and native pasture on a hilltop with dry rainforest and woodland around the lower slopes. The sites selected for Illawarra Lowlands Grassy Woodland compensatory habitat originally included Kikuyu pasture on an area of alluvial soil between the *Melaleuca armillaris* Tall Shrubland compensatory habitat site to the north and a hill to the south, with Illawarra Lowlands Grassy Woodland on the lower slope. Ongoing management has resulted in significant improvements in these areas since 2007/2008.

ii Management objectives

The primary management objectives of the Compensatory Habitat Area are:

- to establish at least twice the area of EECs cleared for the quarry extension in nearby areas of modified vegetation, that support similar geology/soil type and landform; and
- to improve the connectivity of native vegetation communities by establishing vegetation on land that has previously been cleared for grazing activities. Isolated patches of remnant vegetation will be linked by revegetating areas of cleared grazing (predominantly exotic grassland) land between remnant patches.

iii Past management actions

A summary of management actions undertaken within compensatory habitat area (see Figure 4.1) is provided in Table 4.2.

Table 4.2 Management actions already undertaken in Compensatory Habitat Area

Date	Action
December 2006 and January 2007	Seed collection and propagation of provenance native plants was undertaken by Southern Bushland Repair.
August 2007	The area of the former 'Rocklow' property set aside for regeneration consisted of partially cleared grazing land centred on a rocky 'knoll'. Following fencing, this area was planted with shrubs and trees, grown from provenance seed collected on or near the site and grown as tube stock at Jamberoo Native Nursery. Soil was translocated from the area to be quarried prior to December 2007. This soil was repositioned on top of the hill in the compensatory area.
December 2007	Tubestock propagated from collected seed were planted by Jamberoo Native Nursery.

Table 4.2 Management actions already undertaken in Compensatory Habitat Area

Date	Action
February 2008	A preliminary assessment of the high weed growth which had emerged from the translocated soil was undertaken. Growth and diversity of plant species was measured in 20 x 50 metre quadrats. It was determined that: • A greater diversity of native plant species (27) than weeds (20) was recorded. These currently cover less than 5% of the area measured. They include numerous ground covers. Three significant colonizing species were recorded. These are: Peach-leaf Poison Bush (*Trema aspera*), Wattle (*Acacia* spp.) and Brush Kurrajong (*Commersonia fraseri*). • Planted tubestock are showing vigorous growth and have already attained height dominance (Table 4.2). At present, they cover less than 5% of the area. Some grazing of eucalypts was observed, but the majority were unaffected. Herbivores present, as indicated by scats, are wallabies and rabbits.
April 2008	An assessment was carried out at the end of the growing season, to assess the progress of regeneration of native species in the area designated for *Melaleuca armillaris* tall shrubland regeneration, in the four to five months since planting of tubestock. It was determined that: • weeds dominated in the soil translocation area when it was first assessed in February 2008. Twenty weed species were recorded. By late April, although still dominant, weeds were almost all dead or dying; • on both occasions, a greater diversity of native species (27-30) than weeds (20-21) was recorded. In February, all native species had less than 5% coverage of the area measured. By the end of April, Dusky Coral Pea (*Kennedia rubicunda*) was covering up to 25% of the area (cover/abundance category 3). Three significant colonizing species present (Peach-leaf Poison Bush, Brush Kurrajong and *Acacia* spp.) had increased in abundance of individuals and in height; • natural regeneration, although presently outstripped by weed growth, is occurring in the area treated with soil translocated from the cleared area of *Melaleuca armillaris* tall shrubland. Steady growth of native colonizing species, especially Brush Kurrajong, was evident in April; • natural regeneration is being prevented by the lush growth of pasture in areas surrounding the *Melaleuca armillaris* Tall Shrubland regeneration area at the top of the hill. The extent of native grassland is less, and the extent of pasture is greater than was originally mapped by Cumberland Ecology in 2005; and • complete regeneration of native vegetation is unlikely to be achieved in areas where there is a lush growth of pasture grasses, especially Kikuyu (*Pennisetum clandestinum*).
November 2009	Monitoring determined that coverage of tube stock did not exceed 25% across the regeneration area. Height and coverage of natural regeneration had increased. Healthy growth of tubestock which survived initial grazing was continuing. Bracelet Honey-myrtle (*Melaleuca armillaris*) dominated, with smaller numbers of surviving eucalypts, wattles and other species. Weeds and Kikuyu continued to dominate the ground layer, although in the area of translocated soil there was an increasing, but still small, coverage and diversity of native species.
April 2017	A Vegetation Assessment was undertaken by Goodbush. Observations included: • Maintenance of these plantings has been minimal and evidence of this can be observed by trees that have been constricted by the plant guards that should have been removed once the tree had exceeded the requirements of the guards. Many plant guards have been broken from the trees and have been wind-blown throughout the gully. • Regeneration of weed species within the planted areas. Weeds such as Lantana, Blackberry and Thistles have colonised the planted areas due to the sparse planting of canopy species. • Use of inappropriate tree species in the planting program. • Future management actions were recommended which have been incorporated into the future actions described in Table 4.3.

Table 4.2 Management actions already undertaken in Compensatory Habitat Area

Date	Action
October 2018	Works have been scheduled for the year which are based on the prior Vegetation Assessment undertaken in 2017 by Goodbush. Works include: • Removal of all old core flute guards constricting trees and disposal of materials. • Weed control within the planted areas to reduce competition and assist plant establishment. • Treatment of woody weeds such as Lantana and Cassia using the cut and paint method and mulching materials on site. • Treatment invasive vines such as Moth Vine and Cape Ivy using cut and paint and scrape and paint methods after careful removal and bagging of any viable propagules. • Target weeding of listed noxious weeds such as Blackberry using manual methods.

iv Future management actions

Management actions to be undertaken to conserve and maintain EECs within the Compensatory Habitat Management Area are provided in Table 4.3. These management actions have been developed in accordance with Condition of Approval 46(a).

Table 4.3 Future management actions for the Compensatory Habitat Area

Management action ref. ID	Performance measure	Management action	Timing	Responsibility	Source (this can provide link to relevant CoA)
Weed management					
CHA01	No new noxious weed species become established within the Compensatory Habitat Area.	All vehicles, trucks, and plant to have been cleaned (to remove vegetative material and soil), including tyre treads, prior to entry into the Compensatory Habitat Area.	During clearing and soil removal prior.	Environmental Manger Contractors	Schedule 4, CoA46(a)
CHA02		Clean equipment used for weed treatment prior to moving between discrete management locations within the Compensatory Habitat Area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Schedule 4, CoA46(a)
CHA03		Induct all site personnel on the existence of noxious weeds and the controls they are required to implement to minimise weed spread within the Compensatory Habitat Area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Schedule 4, CoA46(a)
CHA04	Reduce biomass of noxious and woody weeds within the Compensatory Habitat Area.	Undertake weed survey across the Compensatory Habitat Area, to identify any remaining infestations of noxious and woody weeds.	Annually in summer.	Contractors Contractor for bush regeneration/weed management/suitably qualified ecologist	Schedule 4, CoA46(a)
CHA05		Treat any remaining weed infestation with hand removal or herbicide application.	Annually, subsequent to survey undertaken in summer.	Contractor for bush regeneration/weed management	Schedule 4, CoA46(a)
Monitoring of revegetated areas					
CHA06	Increase condition and extent of *Melaleuca armillaris* Tall Shrubland and Illawarra Lowlands Grassy Woodland EECs within	Undertake survey of revegetated areas, to identify current extent and condition of revegetated areas (including diversity and abundance of native and exotic plant species)	Annually in summer.	Contractor for bush regeneration/weed management/suitably qualified ecologist	Schedule 4, CoA46(a)

Table 4.3 Future management actions for the Compensatory Habitat Area

Management action ref. ID	Performance measure	Management action	Timing	Responsibility	Source (this can provide link to relevant CoA)
CHA07	Compensatory Habitat Area.	Undertake supplementary tubestock planting, if annual monitoring indicates current extent and condition of revegetated areas is not meeting the required objectives. Planting to be undertaken in location specified by a suitably qualified and experienced bush regenerator.	Annually, subsequent to survey undertaken in summer.	Contractor for bush regeneration/weed management	Schedule 4, CoA46(a)

v Monitoring

Monitoring will include:

- annual weed surveys to identify any remaining infestations of noxious and woody weeds;
- annual surveys of revegetated areas, to identify current extent and condition of revegetated areas (including diversity and abundance of native and exotic plant species); and
- photopoint monitoring at locations identified by the bush regeneration contractor.

vi Completion criteria

The following completion criteria are outlined for the Compensatory Habitat Area:

- establishment of a dominant native canopy cover across the Compensatory Habitat Area, as per below:
  - midstorey canopy cover of 50% for areas of *Melaleuca armillaris* Tall Shrubland; and
  - overstorey canopy cover of 15% for areas of Illawarra Lowlands Grassy Woodland;
- removal of woody weeds across the Compensatory Habitat Area; and
- reduction in exotic groundcover to less than 30% over five consecutive monitoring periods.

Once these completion criteria have been met, no further management of this area is required under this FFMP, and Conditions 46(a) and 49 are deemed to have been satisfied.

4.1.2 Remnant Vegetation Conservation Area

i Existing environment

The Remnant Vegetation Conservation Area (RVCA) contains areas of Illawarra Subtropical Rainforest EEC. Cumberland Ecology (2009) described this EEC as being dominated by Fig Trees (*Ficus* spp.), Giant Stinging Tree (*Dendrocnide excelsa*), Narrow-leaved Red Olive Plum (*Cassine australis*) in more mesic locations, and Grey Myrtle in drier locations with shallower soil.

Good Bush (2017) has identified that the majority of the Remnant Vegetation Conservation Area supports a largely intact remnant of the Illawarra Subtropical Rainforest EEC at the top (north-west), with planted woodland vegetation in the lower (south-east portion). Cumberland Ecology (2009) identified weed invasion and degradation of native vegetation resulting from edge effects as potential risks to Illawarra Subtropical Rainforest EEC within the remnant vegetation conservation area, particularly in the south-eastern section.

ii Management objectives

The primary management objectives of the Remnant Vegetation Conservation Area are:

- to remove dense infestations of noxious and environmental weeds, including Lantana), Moth Vine (*Araujia sericifera*), Cape Ivey (*Delairea odoratam*) and White Passionfuit (*Passiflora subpeltata*); and
- to reconstruct the Illawarra Subtropical Rainforest EEC in the Kikuyu pasture adjoining the south-east of Remnant Vegetation Conservation Area, to protect the existing extent of Illawarra Subtropical Rainforest EEC from edge effects and weed incursions.

iii Past management actions

A summary of management actions undertaken within the remnant vegetation conservation area to date is provided in Table 4.4.

Table 4.4 Management actions already undertaken in Remnant Vegetation Conservation Area

Date	Management Action
Summer 2005	Seed was collected from rainforest and Eucalypt species on the Rocklow property and in nearby areas of the Illawarra. Tubestock were grown from these seeds at the Jamberoo Native Nursery at nearby Curramore.
March 2008	Tubestock were planted into the kikuyu pasture on the slopes above the gully.
Late summer 2008	The heavily weed-infested gully was sprayed with glyphosate.
August 2008	Three 20 x 20 metre quadrats were placed across the profile of gully and adjoining slopes. The site was initially monitored in August 2008, approximately 5 months after planting. Results showed good growth of tubestock, but extensive grazing damage, probably by native macropods (wallabies and possibly kangaroos).
June 2009	The following species (both planted and naturally regenerating) were establishing well across the site: Falcate wattles (*Acacia maideni, A. melanoxylon, A. implexa*), Native Hibiscus (*Hibiscus heterophyllus*), and Cedars (*Toona ciliata, Melia azederach*). Grazing by wallabies was limiting the diversity of other native plant species surviving, both tubestock and natural regeneration, over most of the site. Rapid weed growth was impacting on the survival of tube stock and jeopardizing natural regeneration in the gully area. Significant natural regeneration was occurring in the gully area.
November 2009	Grazing of tubestock had occurred across most of the site. Maiden's Wattle (*Acacia maideni*), Blackwood (*Acacia melanoxylon*), Hickory (*Acacia implexa*), Native Hibiscus (*Hibiscus heterophyllus*) and Bracelet Honey-myrtle (*Melaleuca armillaris*) were surviving well. Rainforest and other species planted had all been heavily grazed across most of the site. These include Hopbush (*Dodonaea viscosa*), *Ficus* spp. (especially Sandpaper fig (*Ficus coronata*)), Lilly pilly (*Acmena smithii*), Red Ash (*Alphitonia excelsa*), Flame Tree (*Brachychiton acerifolius*), Black Wattle (*Acacia mearnsii*), Eucalypts (*Eucalyptus tereticornis* and *E. quadrangulata*), Cheese tree (*Glochidion ferdinandi*), Native Bleeding Heart *(Homalanthus populifolius*), Flintwood (*Scolopia braunii*) and Tea tree (*Leptospermum polygalifolium*) These were all planted as healthy, vigorous tubestock in top condition.
April 2017	Vegetation and weed surveys undertaken by Good Bush Pty Ltd, documenting the vast majority of the RVCA consists of diverse Illawarra Subtropical Rainforest EEC, while areas where canopy has been cleared have been invaded by Lantana. The south-eastern section of the RVCA has been revegetated within the last ten years using a range of local native tree species, some of which are not entirely appropriate to this site.

iv Future management actions

Management actions to be undertaken to conserve, maintain and enhance existing vegetation within the Remnant Vegetation Management Area are provided in Table 4.5. These management actions have been developed in accordance within Condition of Approval 46(b).

Table 4.5 Future management actions to be undertaken in the Remnant Vegetation Conservation Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
Weed Management					
RVCA01	No new noxious weed species become established within the Remnant Vegetation Conservation Area.	All vehicles, trucks, and plant to have been cleaned (to remove vegetative material and soil), including tyre treads, prior to entry into the Remnant Vegetation Conservation Area.	During clearing and soil removal prior to sand excavation activities.	Environmental Manger Contractors	Schedule 4, CoA 46(b)
RVCA0**2**		Clean equipment used for weed treatment prior to moving between discrete management locations within the Remnant Vegetation Conservation Area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Schedule 4, CoA 46(b)
RVCA03		Induct all site personnel on the existence of noxious weeds and the controls they are required to implement to minimise weed spread within the Remnant Vegetation Conservation Area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Schedule 4, CoA 46(b)
RVCA04	Reduce biomass of Lantana within the Remnant Vegetation Conservation Area.	Undertake weed survey across the Remnant Vegetation Conservation Area, to identify any remaining infestations of weeds, including Lantana.	Annually in summer.	Contractors Contractor for bush regeneration/weed management/suitably qualified ecologist	Schedule 4, CoA 46(b)
RVCA05		Treat any remaining weed infestation with hand removal or herbicide application.	Annually, subsequent to survey undertaken in summer.	Contractor for bush regeneration/weed management/suitably qualified ecologist	Schedule 4, CoA 46(b)
Monitoring of Revegetated Areas					
RVCA06	Increase condition and extent of Illawarra Subtropical Rainforest EEC within Remnant Vegetation Conservation Area.	Undertake survey of revegetated areas across the profile of gully and adjoining slopes, to identify current extent and condition of revegetated areas (including diversity and abundance of native and exotic plant species)	Annually in summer.	Contractor for bush regeneration/weed management/suitably qualified ecologist	Schedule 4, CoA 46(b)

Table 4.5 Future management actions to be undertaken in the Remnant Vegetation Conservation Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
RVCA06		Undertake supplementary tubestock planting, if annual monitoring indicates current extent and condition of revegetated areas is not meeting the required objectives. Planting to be undertaken in located specified by a suitably qualified and experienced bush regenerator.	Annually, subsequent to monitoring undertaken in summer.	Contractor for bush regeneration/weed management	Schedule 4, CoA 46(b)

v Monitoring

Monitoring will include:

- annual weed to identify any remaining infestations of noxious and woody weeds;
- annual surveys of revegetated areas, to identify current extent and condition of revegetated areas (including diversity and abundance of native and exotic plant species);
- photopoint monitoring at locations identified by the bush regeneration contractor.

vi Completion criteria

The following completion criteria are outlined for the Remnant Vegetation Conservation Area:

- maintenance of high-quality intact remnants, with no significant change in cover of native species;
- establishment of a dominant native canopy cover of 15% in the lower (south-eastern) portion of the Remnant Vegetation Conservation Area; and
- establishment of a predominantly native (>50%) groundcover, with maintenance of this native groundcover over five consecutive monitoring periods.

Once these completion criteria have been met, no further management of this area is required under this FFMP, and Conditions 46(b) and 50 are deemed to have been satisfied.

4.1.3 Offset Area

A Conservation Agreement between the Minister administering the National Parks and Wildlife Act (1974) and Boral Resources for Dunmore Quarry was signed by NSW Minister for the Environment on February 2011 (Appendix E)

NSW Minister for the Environment confirmed signing the Dunmore Quarry Conservation Agreement, and acknowledged that the Conservation Agreement satisfied condition 46A of DA 470-11-2003, for the long term security of the Offset Area.

i Existing environment

Four vegetation communities were identified within the offset area during ground-truthing surveys undertaken by EMM (2017):

- Illawarra Subtropical Rainforest EEC;
- Illawarra Lowlands Grassy Woodland EEC;
- *Melaleuca armillaris* Tall Shrubland EEC; and
- some areas of Exotic Grassland.

Other significant ecological values identified in the Offset Area include:

- populations of Illawarra Zieria, at least 1,400 individuals growing in the Offset Area (EMM 2017); and
- habitat suitable two threatened mammal species: Grey-headed Flying-fox and the Eastern Bentwing-bat.

ii Long term security

The Offset Area is subject to a Conservation Agreement between Boral and the Minister for the Environment, under the NSW *National Parks and Wildlife Act 1979*.

iii Management objectives

In accordance with the Conservation Agreement signed on February 2011, the primary management objectives of the Offset Area are:

- to protect and promote the recovery of threatened species, populations and ecological communities;
- to protect the critical habitat of those threatened species, populations and ecological communities that are endangered;
- to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities; and
- to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed.

iv Past management actions

A summary of management actions undertaken within the offset area is provided in Table 4.6.

Table 4.6 Management actions already undertaken in the Offset Area

Date	Action
May 2009	Vegetation of offset area ground-truthed by Cumberland Ecology.
2011	The Offset Area was fenced to exclude cattle, and facilitate natural regeneration outside of the active management zone.
April 2017	A Vegetation Assessment was undertaken by Goodbush. A restoration plan was formulated to address weed management and encourage the regeneration of natural vegetation communities within the site. The objectives of the bushland restoration plan are as follows: • Protect existing natural vegetation using weed management methods and revegetation where necessary • Treat Noxious Weeds and WoNS as per legal requirements • Intervention weeding of highly invasive weed species to limit further spread • Regeneration of natural vegetation communities working from areas of highest resilience toward areas of least natural resilience • Undertake a staged weeding program over a number of years to assist natural regeneration while ensuring minimal disturbance to habitat. • Maintain worked areas to assist regeneration before clearing of additional unworked areas
August 2017-Ongoing	Work is being maintained within the area as per the objectives and recommendation of the Vegetation Assessment in 2017.

v Future management actions

Management actions to be undertaken in the Offset Area is provided in Table 4.7. These management actions have been developed in accordance within Condition of Approval 46(c), and generally pertain to Item 1 of Annexure C of the Conservation Agreement for the Offset Area, which outlines principles and activities to manage conservation values of the Offset Area.

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
Weed Management					
OA01	No new noxious weed species become established within the offset area.	All vehicles, trucks, and plant to have been cleaned (to remove vegetative material and soil), including tyre treads, prior to entry into the offset area.	Clean equipment used for weed treatment prior to moving between discrete management locations within the offset area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA02		All vehicles, trucks, and plant used within the offset to remove weeds is to be thoroughly cleaned to remove all plant material and soil potentially containing weed seeds and propagules.	Clean equipment used for weed treatment prior to moving between discrete management locations within the offset area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA03		Clean equipment used for weed treatment prior to moving between discrete management locations within the offset area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA04		Induct all site personnel on the existence of noxious weeds and the controls they are required to implement to minimise weed spread within the offset area.	When management is required in weed infested area.	Boral Environmental Manager Contractors Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA05	Develop a plan for the timely and effective management of weeds	Undertake an initial weed survey across the Offset Area, focusing within EECs.	Completed April 2017 (Good Bush 2017).	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
OA06	within the Offset Area.	Record location and species of weed required to be treated, focusing within EECs of the offset area.	Completed April 2017 (Good Bush 2017).	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA07		Develop a plan for the strategic and continued treatment of weeds within the offset area, once the locations and densities of weed infestations have been identified.	A strategy for treatment of weeds was developed by Good Bush (2017). This strategy is updated annually based on the result of bush regeneration/weed management works across the site.	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA08	Treatment of existing weeds within the offset area.	Treat weed infestation with hand removal or herbicide application. Note that the Conservation Agreement specifies that a glyphosate-based herbicide by direct application to cut surfaces (cut and paint or scrape and paint method) and targeted spraying must be used to reduce damage to nontarget vegetation. Other weed control methods may be undertaken with prior written permission of the Director-General.	In accordance with Offset Area Weed Management Plan (developed as per OA07).	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA09		Removal of Lantana is not undertaken during nesting periods for small birds which nest in Lantana thickets.	During weed control, and in accordance with Offset Area Weed Management Plan (developed as per OA07).	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)
OA10	Reduce percent cover of woody noxious weeds across the offset area	Undertake weed monitoring in accordance with Offset Area Weed Management Plan (to be developed as per OA07).	As specified in the Offset Area Weed Management Plan (developed as per OA07).	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1 (a)

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
Feral animal control					
OA11		Identify the presence and/or abundance of pest animals (primarily pigs and foxes) within the Offset Area, by means of: • Visual or aural observations, and/or • Implementation of sand plot monitoring stations (to identify tracks), and/or • Implementation of non-poisoned "bait stations", and/or • Undertaking scat counts, and/or • Other quantitative techniques which can be designed in discussion with the Department or the Livestock Health and Pest Authority.	Annually during summer.	Suitably qualified, experienced and licence pest-controller	Conservation Agreement Annexure C Item 1(b)
OA12	Reduce presence and/or abundance of pest animals (primarily pigs and foxes) within the Offset Area.	Undertake control of pest species by means of shooting, trapping and use of poisonous baits consistent with advice from the Department and the Livestock Health and Pest Authority.	Annually, subsequent to identification of presence and/or abundance of pest animals, as required.	Suitably qualified, experienced and licence pest-controller	Conservation Agreement Annexure C Item 1(b)
OA13		Participate in community pest animal control programs, and encourage neighbours to implement pest animal control programs.	As requested by Local Land Services and subject to community consultation.	Boral Environmental Manager	Conservation Agreement Annexure C Item 1(b)
Bushfire					
OA14	Minimise areas affected by bushfire.	Suppress all bushfires occurring in Offset Area as quickly as possible.	As required.	Quarry Manager	Conservation Agreement Annexure C Item 1(c)

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
OA15	Protect the natural assets of the offset area.	Undertake fire hazard reduction with any required approvals and/or permits using: • raking and hand clearing; or • pile burning; or • fuel reduction burns.	As required.	Quarry Manager	Conservation Agreement Annexure C Item 1(d)
OA16	At least 50 per cent of each of the vegetation types within the Offset Area must exist in a state that has been burnt less frequently than the minimum fire interval.	Using fire hazard reduction bums and controlled burning which take into account the recommended fire intervals given in the Bush Fire Environmental Assessment Code for New South Wales (Rural Fire Service February 2006) and the guidelines contained in the Threatened Species Hazard Reduction Lists for the Bush Fire Environmental Assessment Code or equivalent replacements	In *Melaleuca armillaris* Tall Shrubland EEC: no fire more than once every 10 years. In Illawarra Lowlands Grassy Woodland EEC: no fire more than once every 5 years. In Illawarra Subtropical Rainforest EEC: no fire.	Boral Environmental Manager Quarry Manager	Conservation Agreement Annexure C Item 1(e)
Vehicle access					
OA17	Protect the natural assets of the Offset Area.	Vehicle access is to be limited to formed trails for management purposes as approved by the Department, firefighting or any emergency requirements.	Whenever vehicular access into and through the Offset Area is required.	Boral Environmental Manager Quarry Manager Contractors Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1(f)
Threatened species					
OA18	To manage threatened species and communities in accordance with	Undertake a targeted survey to identify locations and number of individuals of *Ziera granulata* within the offset area	Completed May 2017 (EMM 2017 – Appendix F).	Suitably qualified ecologist	Conservation Agreement Annexure C

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
OA19	recovery plans and/or specific management advice from the Department.	Undertake a survey to update the boundaries of vegetation communities, including EECs, within the offset area.	Completed May 2017 (EMM 2017 – Appendix F).	Suitably qualified ecologist	Item 1(g)
OA20		Develop an Offset Area Threatened Species Plan, that details the location and extent of threatened flora species and EECs, and outlines any management actions required to be implemented for their protection	Completed May 2017 (EMM 2017 – Appendix F).	Suitably qualified ecologist	
Restoration of indigenous (native) vegetation					
OA21	Establish indigenous plants to maintain the vegetation structure in keeping with the identified vegetation community.	Undertake a baseline survey to identify areas that require restoration of indigenous (native) vegetation).	Completed April 2017 (Good Bush 2017).	Contractor for bush regeneration/weed management, or suitably qualified ecologist	Conservation Agreement Annexure C Item 1(h)
OA22		Develop an Offset Area Vegetation Restoration Plan, which specifies which locations will be restored, the species to be used (appropriate to existing vegetation community) using planting, brush mulching or direct seeding. The plan may also include details to thin existing native vegetation that is altering a vegetation community structure in an adverse way.	A strategy for restoration of native species was developed by Good Bush (2017). This strategy is updated annually based on the result of bush regeneration/weed management works across the site.	Contractor for bush regeneration/weed management, or suitably qualified ecologist	Conservation Agreement Annexure C Item 1(i)
OA23	Use plant species produced from material sourced locally in restored areas.	Collect seed in the offset area for seedlings that will be planted within or adjacent to the offset area. Seeds may not be collected from species individually listed on Schedules 1, 1A or 2 of the Threatened Species Conservation Act without prior written approval from the Director General, or under a licence granted under S132c of the National Parks and Wildlife Act, 197 or S91 of the Threatened Species Conservation Act 1995 (now BC Act).	Prior to restoration using direct seeding.	Contractor for bush regeneration/weed management	Conservation Agreement Annexure C Item 1(i)

Table 4.7 Future management actions to be undertaken in the Offset Area

Management Action Ref ID	Performance Measure	Management Action	Timing	Responsibility	Source (this can provide link to relevant CoA)
Provision of fauna habitat					
OA24	Provide supplementary habitat to locally occurring fauna species (including threatened species).	Undertake a survey to identify the number and type of hollow-bearing trees within the offset area.	Completed May 2017 (EMM 2017).	Suitably qualified ecologist	Conservation Agreement Annexure C Item 1(l)
OA25		Install habitat (nest) boxes for native fauna in strategic locations where suitable hollows for native fauna are limited or absent. Locations and number to be determined in consultation with the Department.	Twenty (20) nest boxes were installed in May 2011.	Suitably qualified ecologist	Conservation Agreement Annexure C Item 1(l)
Visitation and research					
OA26		Facilitate visitation, research and community use of the offset area in a way that does not adversely impact on the conservation values of the offset area. Research projects should be discussed with the Department.	As required.	Boral Environmental Manager	Conservation Agreement Annexure C Item 1(n)

vi Completion criteria

Given Boral the Offset Area is subject to a Conservation Agreement, completion criteria are not required.

4.2 Vegetation clearing

A Vegetation Clearing Protocol was required to describe the measures to be implemented prior to the commencement of vegetation clearing in the site. This protocol was originally prepared by Cumberland Ecology (2009) and vegetation clearing associated with the approved quarry extension and all subsequent modifications has been completed under this protocol. No additional vegetation clearing has been undertaken or is proposed for the current operation of Dunmore Hard Rock Quarry. However, an updated Vegetation Clearing Protocol has been prepared and is provided in Appendix B.1.

If vegetation clearing is required it will be conducted generally in accordance with the Vegetation Clearing Protocol (Appendix B.1) and a Vegetation Clearing / Ground Disturbance Form (Appendix B.2) will be completed prior to clearing.

4.3 Rehabilitation

Extraction of hard rock from Dunmore Hard Rock Quarry will substantially modify the existing landform within the site. Following the completion of quarrying activities (or progressively once activities have ceased in particular sections), the quarry will be recontoured and revegetated.

Recontouring and revegetation is outlined in the Rehabilitation Plan (Appendix C). The Rehabilitation Plan has been developed in accordance with Schedule 4, Condition of Approval 54.

5 Monitoring, reporting and review

5.1 Monitoring

Flora and fauna management actions will be measured through regular environmental performance reviews. These will be based on the future management actions outlined in:

- Section 4.1.1iv: Compensatory Habitat Area (Table 4.3);
- Section 4.1.2iv: Remnant Vegetation Conservation Area (Table 4.5); and
- Section 0: Offset Area (Table 4.7).

The reviews will be used to assess progress in meeting project environmental objectives and targets and will be undertaken by the Environmental Manager.

Boral environmental performance is measured through compliance with the plans listed above, in addition to other environmental plans such as the Water Management Plan.

Should an environmental non-conformance be identified as a result of a monitoring result, Boral will immediately notify the Secretary of Planning and any other relevant agencies of the non-conformance. Within 7 days of the date of the incident, Boral will provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested

5.2 Reporting

Reporting on the implementation of this Plan would include the following:

- the results of all environmental surveys and monitoring, including adequacy of site-specific environmental safeguards and management measures;
- any community/stakeholder complaints or non-conformances with licences/criteria, including any responses provided or actions undertaken in response to the complaint or non-conformance; and
- any remediation actions or changes to management and mitigation measures.

This information will be provided as a part of Boral's Dunmore Quarry Annual Review (AR).

5.2.1 Annual Review

The results of the monitoring program will be presented in the AR. This will include detailed assessment of monitoring results collected over the course of the annual monitoring program, an evaluation of any trends occurring across the site, and recommendations for management action. Through the AR management actions may include:

- refinement of flora and fauna management objectives and initiation of remedial action; and/or
- alteration to monitoring frequency, parameters or locations.

5.3 Review

5.3.1 Review of monitoring actions

Any non-compliance identified during monitoring actions, of management and mitigation measures, will be highlighted and an environmental incident report will be completed. The non-conformance will be considered unresolved until:

- the non-compliance issue has been resolved;
- a new or revised procedure has been established and implemented;
- training has been provided to relevant personnel/ sub-contractors; or
- additional specific environmental management inspections are detailed in this flora and fauna management plan.

5.3.2 Review of Management Plan

Within 3 months of the submission of an:

a) incident report under schedule 5 condition 7 of the consent;

b) Annual Review under schedule 5 condition 9 of the consent;

c) audit report under schedule 5 condition 10 of the consent; and

d) any modifications to this consent,

the Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent, to the satisfaction of the Secretary.

This Plan will be reviewed within 3 months of the submission of any of the following:

- an incident report or non-conformance as per Section 5.1;
- any annual review as per Section 5.2.1;
- an audit report;
- any modification to the consent; or
- as otherwise determined by the Environmental manager.

A review of the adequacy of site-specific environmental safeguards and management measures will be carried out by the Environmental Manager on a monthly basis. This review will encompass site inspection and auditing reports as well as root cause assessments undertaken for any incidents reported.

6 Training

6.1 Environmental induction

Environmental induction training will be delivered to any staff and subcontractors who will interact with biodiversity values outlined in this FFMP. This does not include staff and subcontractors accessing operational areas that do not support any biodiversity values.

The induction will be delivered by the relevant Boral personnel (eg Environmental Manager or Quarry Manager). This will include a component on environmental issues, what this Plan is for, and management and the associated controls and mitigation measures that will be implemented for the Project. All personnel will be required to sign an induction sheet, a copy of which will be maintained on site and appropriate records maintained.

Appropriate training and induction should include, but not be limited to:

- raising awareness of on-site environmental management issues;
- providing information on the location and importance of EECs, threatened flora and fauna species (and habitat) known to occur within the site;
- providing information on the current and proposed management practices within all Conservation Areas;
- providing information on any relevant management measures, such as weed control measures;
- providing information on the boundaries for any proposed vegetation clearing;
- training on procedures on encountering fauna (eg snakes); and
- training on weed identification and the appropriate guidelines for removing weeds, driving vehicles in weed infested locations and the disposal of weed infested topsoil.

6.2 Site-specific environmental training

Where identified by the Environmental Manager, additional site-specific training may be developed and implemented by the Project Manager, delivered to relevant personnel/contractors as required regarding sensitive environmental issues. Specific training may include:

- training in the use and location of spill kits; and
- management, and environmental incident response training.

6.3 Environmental incident register

All environmental incidents are documented in the Site Incident Management System (SIMS), will be maintained by the Environmental Manager and will include any outcomes from incidents. These will feed into the inductions, toolbox meetings and pre-start meetings as necessary and appropriate.

7 Contingency planning

7.1 Emergency incident plans

A number of plans have been developed by the site in response to both environmental and emergency incidents. These are:

- Pollution Incident Response Management Plan (PIRMP);
- Site Emergency Response Plan; and
- Bushfire Management Plan.

Relevant details for the management action in response to these incidents are located within the associated plans.

All reporting will be in accordance with Boral's Site Incident Management System (SIMS). Similar complaints will be addressed through the site complaints register. Compliance with statutory requirements will be assessed through implementation of Boral's site audit program that is aligned to ISO 19011:2003. Results of the abovementioned aspects will be used to ensure appropriate corrective actions are in place and to verify appropriate close out actions, follow up and reporting has occurred.

8 References

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