Russell Vale Colliery Underground Expansion Project

Surface Operations Biodiversity Management Plan

RVC ENV PLN 032

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1 INTRODUCTION

1.1 Overview

This Surface Operations Biodiversity Management Plan (SoBMP) has been prepared by Wollongong Coal Pty Limited (WCL) to the existing remnant vegetation and habitat at the locations described as the surface facilities, a program to develop measures that could improve biodiversity outcomes onsite, and in Bellambi Gully Creek for the underground expansion of the Russell Vale Colliery (the Colliery) in accordance with relevant conditions of consent. This plan has been prepared by Paul Price (Restoration Ecologist) and Rebecca Dwyer (Team Leader – NSW Ecology).

1.2 Project Background

Wollongong Coal Limited (WCL) operates the Russell Vale Colliery (formerly the NRE No.1 Colliery) in the Southern Coalfield of New South Wales (NSW) The mine is located at Russell Vale approximately 8 kilometres (km) north of Wollongong and 70 km south of Sydney, within the local government areas (LGAs) of Wollongong and Wollondilly in the Illawarra region of NSW (**Figure 1**). The Colliery which has been on 'care and maintenance' since 2015. WCL successfully sought Approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to expand the mining operations at the Colliery; this ongoing application is referred to as the Underground Expansion Project (UEP). The UEP has recently been approved under the EP&A Act by the Independent Planning Commission (IPC).

Mining as has been undertaken at Russell Vale Colliery since the 1880s. Continuous mining has been a feature of the Project Application Area (PAA) since 1887 and surface facilities have operated at the Russell Vale site since this time. With the advent of more sophisticated mining methods in the 1960s, workings progressed further west of the Illawarra Escarpment. Subsequently, four ventilation shafts (Shaft Numbers 1, 2, 3 and 5) and a shaft to provide personnel and materials access to the workings (No. 4 Shaft) were sunk to the west of the escarpment.

Mining has occurred in three seams, the Bulli Seam, Balgownie Seam and the Wongawilli Seam. The Balgownie seam is located approximately 10 metres (m) below the Bulli Seam and the Wongawilli Seam is located approximately 20 m below the Balgownie Seam. All three seams outcrop along the Illawarra Escarpment and the seams are accessed by adits1 directly into the seams. There are two main mining areas within the Russell Vale Colliery lease area, which are referred to as Wonga East and Wonga West. In the Wonga East area, the Bulli Seam and Balgownie Seam have largely been fully extracted. The existing and proposed workings are contained within Consolidated Coal Lease 745 (CCL745) and Mining Lease 1575 (ML1575)

The Colliery Pit Top is located at the base of the Illawarra Escarpment above the suburb of Russell Vale (refer to **Figure 1**). The Pit Top facilities occupy an area of approximately 100 hectares (ha) at the eastern extent of the Colliery holdings. The site is accessed via a private driveway from the Princes Highway at a signalised intersection with Bellambi Lane. Coal has historically been hauled from Russell Vale Colliery to Port Kembla Coal Terminal (PKCT) by truck, via Bellambi Lane and Memorial Drive.

The Russell Vale Emplacement Area (RVEA) is located immediately north of the Colliery Pit Top and is largely located outside the Colliery Holding and not covered by this plan or a part of this

project as it operates under a development consent issued by Wollongong City Council (WCC) on the 11 April 1990.

The original UEP application submitted by Gujarat NRE Coking Coal Ltd in 2009 involved a substantial expansion of longwall mining in the Wongawilli Seam across the Wonga East area (a total of 11 longwall panels) and Wonga West area (a total of seven longwall panels) to extract 31 million tonnes (Mt) of run-of-mine (ROM) coal over a project life of 18. In response to concerns from the public and government agencies, the original UEP application has been substantially revised over time to reduce the potential adverse impacts of the mine.

In order to address residual uncertainty regarding the impacts of longwall mining raised by the PAC Second Review Report, a revised mine design has been developed based on a non-caving first workings mining system. The revised mine plan has been designed to be long term stable with negligible risk of pillar failure to address potential subsidence-related mining impacts on groundwater, surface water and biodiversity within the Cataract Reservoir catchment. Changes to the Russell Vale Pit Top are also proposed to address concerns regarding potential amenity impacts to surrounding residential areas. This revised plan is referred to in this document as the Revised Preferred Project Report (RPPR).

Key elements of the Revised Preferred Project are:

- Mining by means of first working mining techniques only, with the workings designed to be long term stable with minimal subsidence impacts. No longwall mining is proposed;
- Extraction of approximately 3.7 Mt of ROM coal over 5 years at a production rate that will not exceed 1 Mt of product coal per year;
- Construction and use of a coal processing plant to improve the quality of product coal;
- Redesign of the Pit Top layout to strategically relocate (select key) infrastructure to more shielded locations;
- Reduced hours of operation for surface facilities relative to the Preferred Project mine plan; and
- Additional noise mitigation works at the Russell Vale Pit Top including a new noise barrier, extension to the height of existing bunds and acoustic treatment of coal processing (select) infrastructure.

1.3 Purpose and Scope

This Surface Operations Biodiversity Management Plan (SoBMP) has been prepared to satisfy **Condition B21 of Project Approval (PA) MP09_0013** which specifies that WCL are to prepare and implement a BMP for the purposes of managing biodiversity impacts associated within the surface infrastructure areas within the site described in **section 1.4**, and within the footprint shown in **Figure 2, Figure 3** and **Figure 5.**

The purpose and scope of this SoBMP as required by Condition B21 and B22 of the Consent is to:

- Establish baseline data for existing remnant vegetation and habitat on site.
- Describe the short, medium, and long-term measures to be undertaken to manage the remnant vegetation and habitat on the site.
- Include detailed description of the measures that would be implemented to:

- Minimise impacts to biodiversity on the site, including BC species and or communities listed under the NSW *Biodiversity Conservation Act 2016* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Protect vegetation and fauna habitat outside of the approved disturbance areas.
- Control weeds (including noxious weeds), feral pests, erosion, and manage bushfire hazards.
- control access to vegetated or revegetated areas.

- Substantially integrate the Biodiversity Management Plan and Rehabilitation Management Plan to achieve biodiversity objectives for the rehabilitated site.
- Detail a program to monitor and report on effectiveness of the above measures and identify measures that could be implemented to improve biodiversity outcome.
- Outline reporting structures regarding responsibility for monitoring, reviewing, and implementing the plan.
- Outline statutory requirements, including any performance measures to be achieved.
- Describe management measures that will be implemented to ensure compliance with any statutory requirements or performance measures.
- Develop Contingency plans to prevent exceedance of performance measures.

In accordance with **Condition B22** WCL will ensure implementation of this Management Plan as approved by the Secretary.

This BMP covers the proposed alterations to the study area within the footprint shown in **Figure 2, Figure 3** and **Figure 5** and covers a duration of 5 years from the acceptance of the plan.

1.4 Surface Facilities

1.4.1 RV Pit Top facilities

The RVC Pit Top (study area) is located on the lower slopes of the Illawarra Escarpment, adjacent to the suburbs of Russell Vale and Corrimal (**Figure 1**). The existing Russell Vale Colliery Pit Top is shown in **Figure 5.** The Russell Vale study area occupies an area of approximately 100 hectares including the surface facilities sites and surface infrastructure, fire trails, emplacement area (not part of this project) with vegetated areas that are remnant, planted and recovered from previous historical clearing, in addition to areas that have been grazed.

The following surface facilities at the Russell Vale Pit Top site includes the coal conveyor, truck load out facilities, ventilation shaft sites, the mine water management system, Bellambi Gully Creek, coal handling and processing infrastructure, coal stockpiles and stockpile area, storage and transport facilities, mine entry adits, workshops and administration buildings (**Figure 2, Figure 3,** and **Figure 5** to **Figure 8**).

1.4.2 Ventilation shaft sites

There are five shafts within the RVC UEP surface facilities area. Four are exclusively ventilation shafts (vent shaft sites 1-3, 5) and one a shaft for personnel, materials and ventilation (vent shaft 4), The Ventilation Shafts 1 to 5 and their sites are located within the WaterNSW Metropolitan Special Area. The site is surrounded by natural bushland accessed via unsealed roads. Each vent shaft site is detailed below and shown in **Figure 2** and **Figure 3**.

1.4.2.1 No.1 Shaft

No.1 Shaft is located on a surface lease approximately 5 km northeast of the Russell Vale site. It is surrounded by native bushland within the WNSW Special Catchment Area and is accessed via one of the SCA owned fire trails leading off Mount Ousley Road. No.1 Shaft is an upcast ventilation shaft, which allows waste air to be removed from underground workings. The fan at No.1 Shaft has a capacity air flow rate of 90 cubic metres per second. It provides effective ventilation for selected sections of the mine and complements the other upcast No.5 Shaft located on the lease further to the west.

An NRE owned substation is located about 50 m north of No.1 Shaft. At this location, the 33kV power supply from Russell Vale (now decommissioned) enters the switchyard to the transformer and the power is reduced to 6.6kV. This 6.6kV supply is then cabled to a transformer at No. 1 Shaft where the power was previously used to drive one of two 185kW motors. These motors are used to drive the fan with one of the motors available on standby.

This Vent shaft is not part of the current underground mining program as detailed in the UEP Extraction plan and the activities onsite consist of property and APZ maintenance only.

1.4.2.2 No.2 Shaft

No.2 Shaft is located on a surface lease approximately 70m from the currently operating upcast No.1 Shaft. The site consists of an empty brick building and an old vent fan. Also in the area, located between the two shafts is the remains of a building, parts of a now disused belt driven air compressor and compressed air vessel. Parts of the shaft evase and fan are also present, along with a disused electrical switch yard and concrete block building.

No.2 Shaft is an old ventilation shaft, which has been, decommissioned. The shaft has not been used for ventilation purposes for over 40 years. This Vent shaft is not part of the current underground mining program as detailed in the UEP Extraction plan and the activities onsite consist of property and APZ maintenance only.

1.4.2.3 No.3 Shaft

No.3 Shaft was for previous mining used as a downcast ventilation shaft providing clean air to the underground workings. It is surrounded by native bushland within the WNSW Metropolitan Special Area and is accessed via fire trails.

The site consists of a 33kV power supply corridor with some lines and poles and a concrete slab that previously was the base for a disused switch yard, and associated buildings. The actual shaft has a steel mesh sheet across the top of it and is surrounded by a chain wire fence and low vegetation regrowth. This Vent shaft is not part of the current underground mining program as detailed in the UEP Extraction plan and the activities onsite consist of property and APZ maintenance only.

1.4.2.4 No.5 Shaft

No.5 Shaft is an upcast ventilation shaft allowing waste air to be removed from the underground workings as was a component of previous workings. The No.5 Shaft site includes a compressed air facility, and power and water delivery pipeline to underground.

The site is accessed via a fire trail leading from No.4 Shaft and is located on a part of CCL 745 that includes the surface land, approximately 11km north-west of the Russell Vale site. It is surrounded by native bushland within the WNSW Metropolitan Special Area.

This Vent shaft is not part of the current underground mining program as detailed in the UEP Extraction plan and the activities onsite consist of property and APZ maintenance only.

1.4.2.5 No. 4 shaft

The Number 4 Shaft (No. 4 shaft) and associated facilities, located approximately 10km north-west of the Russell Vale site, is accessed by Fire Trail No.8 north of Picton Road. The No.4 shaft is surrounded by native bushland within the WaterNSW Metropolitan Special Area. No 4 Shaft site is a cleared site with rehabilitated areas predominantly grassed bordering naturally vegetated areas (**Figure 3**).

The No.4 Shaft has previously been used for moving men and materials between the underground workings and surface facilities. Site facilities include a winder, offices, bathhouse, stores, workshop, a car parking area, water management facility, sewage treatment plant, electrical sub-station and explosives magazine. No power is currently supplied by the decommissioned electrical substation, rather the site is powered by a solar array and Tesla Battery.

This Vent shaft is not part of the current underground mining program as detailed in the UEP Extraction plan and the activities onsite consist of property maintenance inclusive of the solar array and battery, the sewerage treatment ponds, and APZ maintenance only.

Figure 1 location of the Russell Vale Colliery, New South Wales

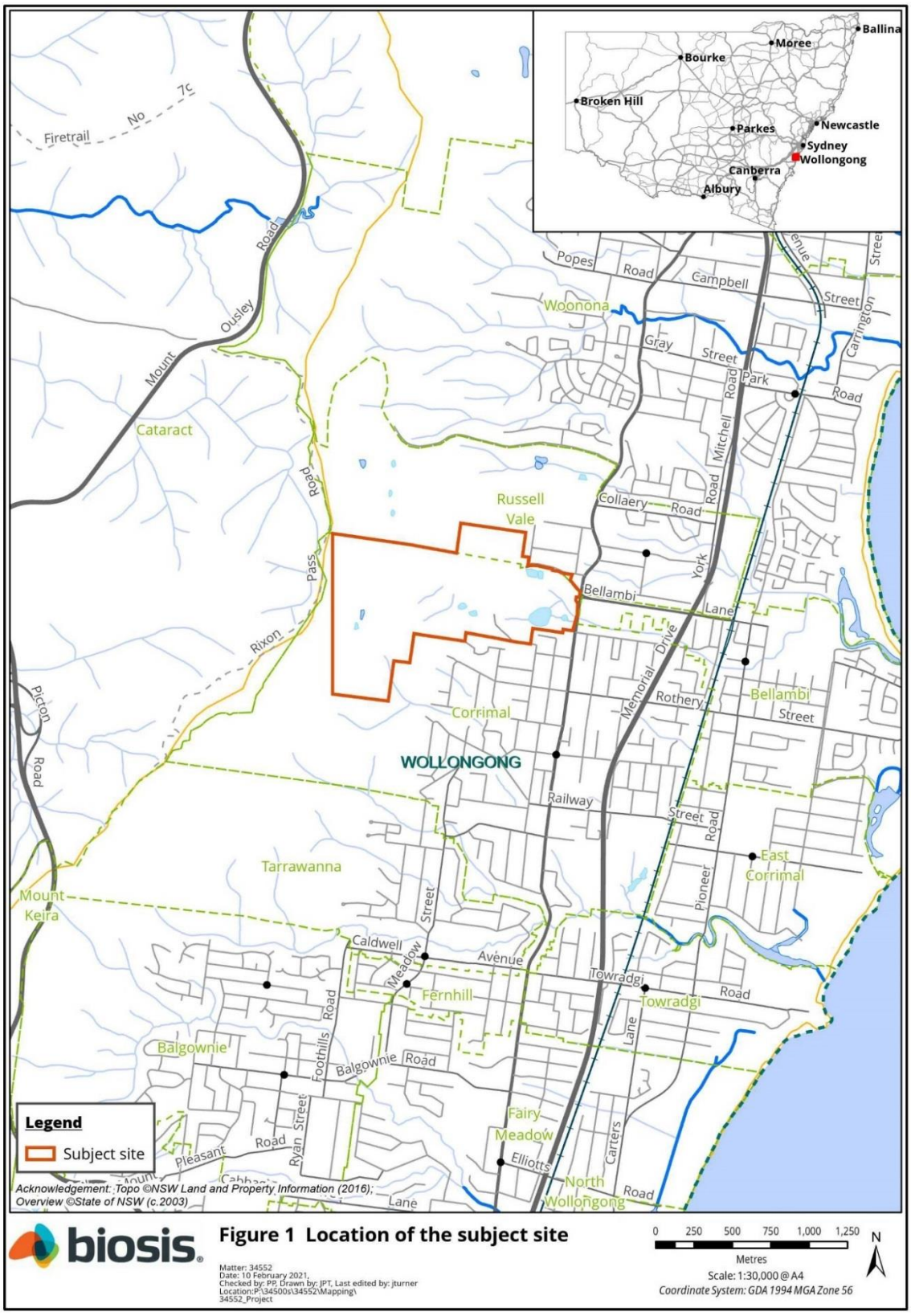


Figure 2 Russell Vale Colliery ventilation shaft study areas (Vent shaft 1,2,3)

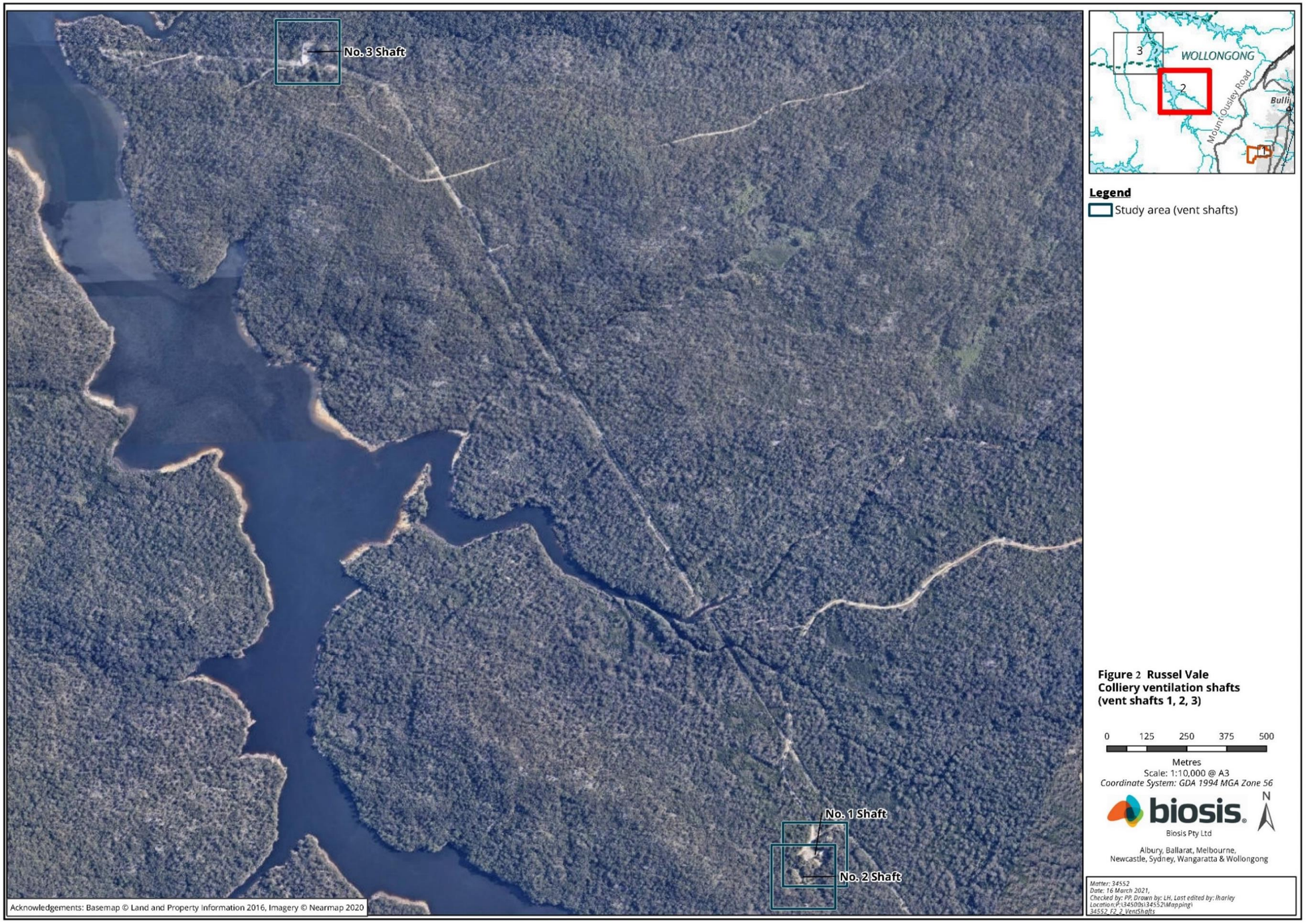
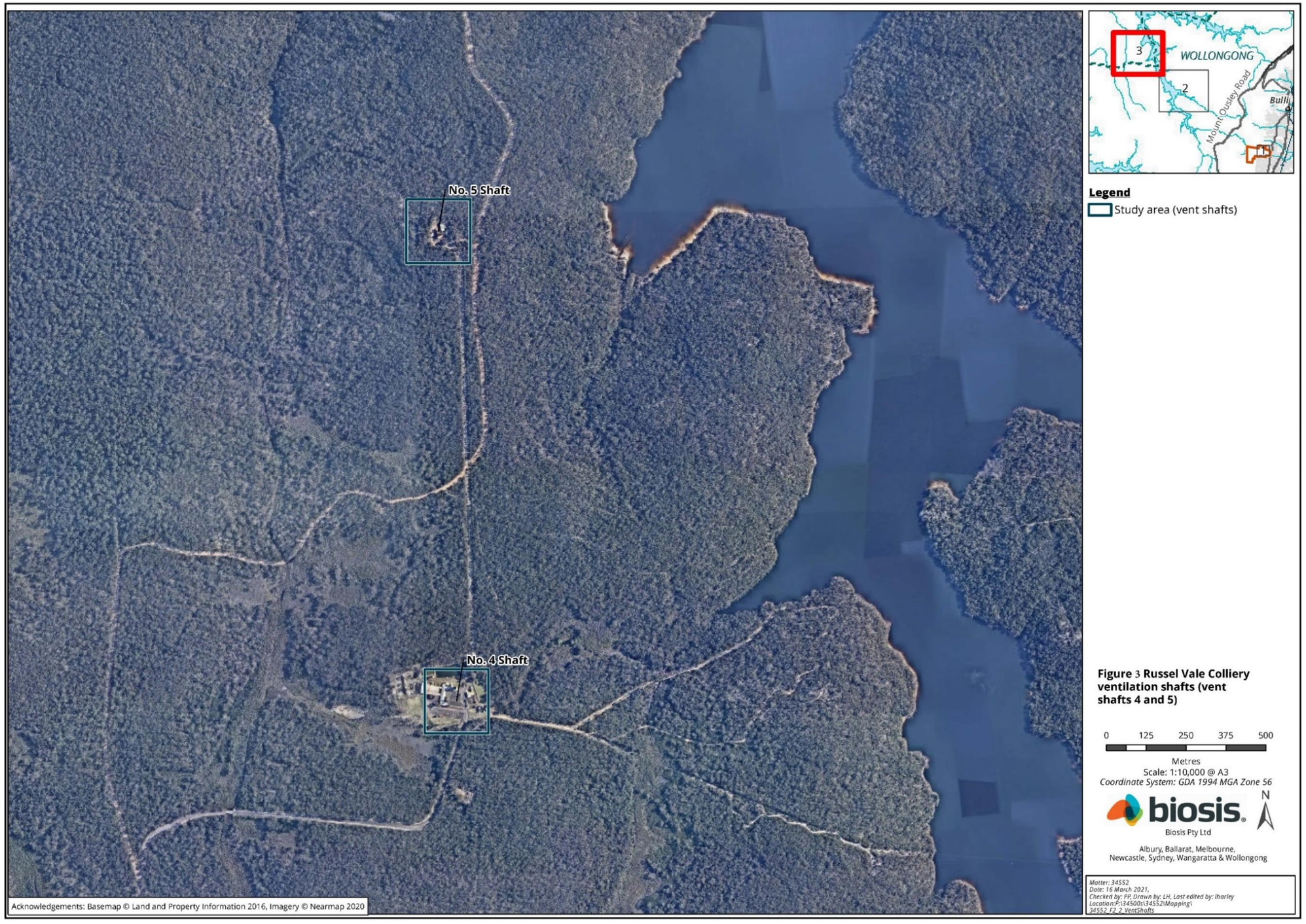


Figure 3 Russell Vale Colliery ventilation shaft study areas (Vent shaft 4 and 5)



1.5 Report Structure

The remainder of this SoBMP is structured as follows:

Section 1 - Provides the background, purpose and structure of this Management Plan, outlines the conditions of consent, document scope, as well as consultation requirements and outcomes.

Section 2 - Outlines the statutory requirements applicable to the BMP.

Section 3 - Outlines the consultation and details where this consultation has been addressed in this plan.

Section 4 - Details the required statutory conditions from the Consent, the RPPR, and legislation.

Section 5 - Outlines the baseline data and impact assessments undertaken which support this BMP.

Section 6 - Describes the potential impacts of the proposal.

Section 7 - Details the performance measures and indicators that will be used to assess the UEP.

Section 8 - Describes the monitoring program and its associated reporting.

Chapter 9 - Describes the management, remediation and mitigation measures that will be implemented to reduce potential impacts as well as the Contingency Plan to manage any unpredicted impacts and their consequences.

Chapter 10 - Describes the protocols for the handling of incidents, complaints and non-conformances.

Chapter 11 - Details how the BMP will be implemented, managed, reviewed and updated.

Chapter 12 - Audit and Review

Chapter 13 - Record Keeping and Document Control

Chapter 14 -Plan References

Chapter 15 - Plan Glossary of terms and abbreviations

Appendix A - Records of Agency consultation

Appendix B - Flora and Fauna likelihood of presence within the study area

Appendix C - Green and Golden Bell Frog survey data

Appendix D - Provides an inventory of the biodiversity altering exotic flora and recorded weed species within the study area with recommended control methods

Appendix E - Provides a native flora species list for the proposed revegetation of the visual bund wall and screens, and other general areas onsite.

1.6 Environmental Management System Overview

WCL has a formalised environmental management system (EMS) for the Colliery (Wollongong Coal 2021a). The EMS provides a framework to ensure that activities at the Colliery are undertaken in an environmentally responsible manner, and are in general accordance with the following:

- NSW State Development consent MP09_0013;

- Revised Preferred Project Report
- EPBC Approval (2020/8702)[1]
- ISO14001 Environmental Management Standard; and
- legislative and other requirements such as the site EPL.

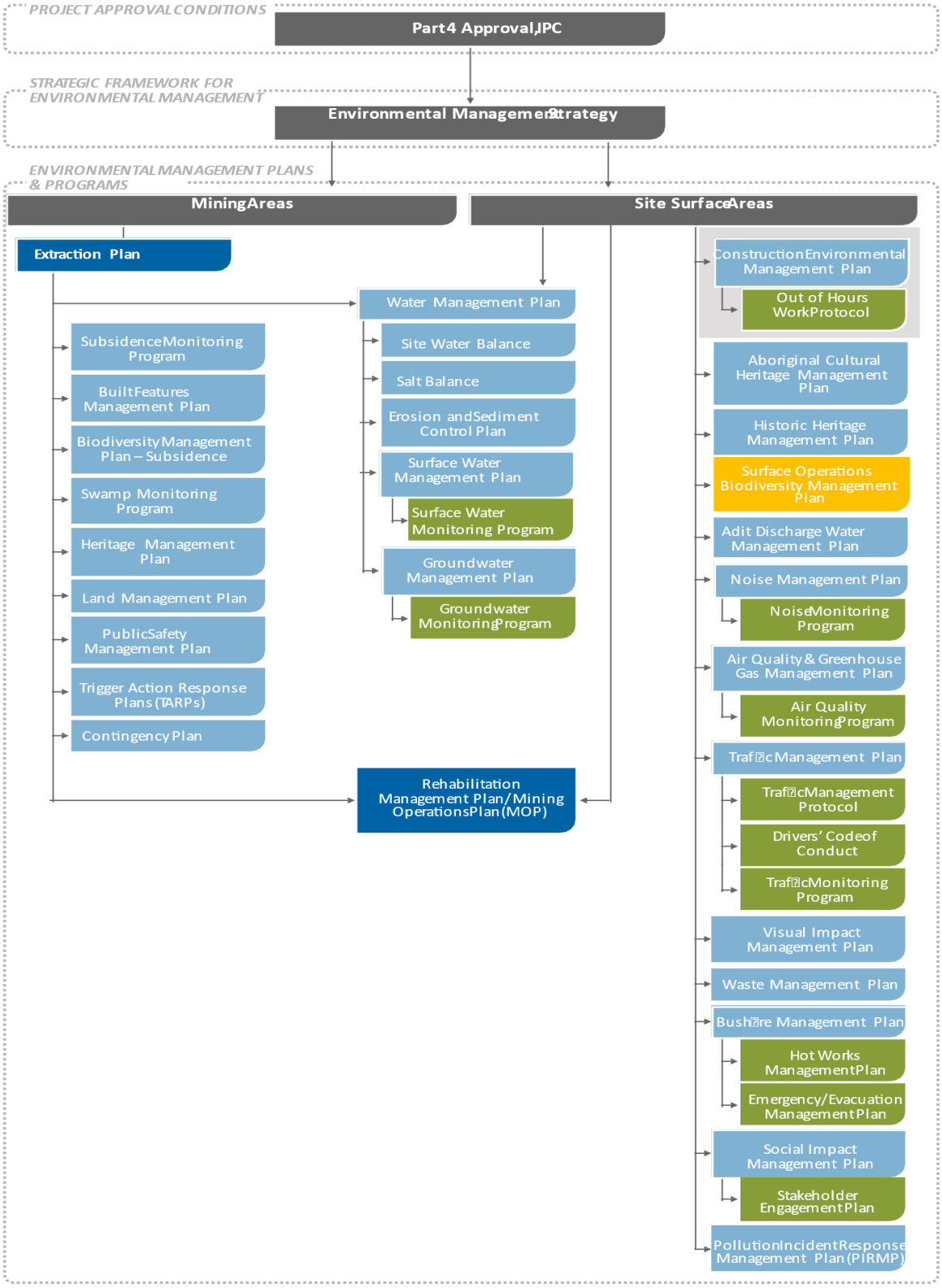
The structure of the EMS is summarised in **Figure 4.** The EMS is implemented, managed and updated as required in accordance with the Russell Vale Underground Expansion Project major project approval MP09_0013 ('the Consent').

This plan should be read in conjunction with the:

- RVC Surface Operations Water Management Plan (see **Figure 4** for illustration of where this plan sits in the EMS) for specific details of those aspects relating to water quality sampling and monitoring in accordance with the EPL. Details of the RVC Pit Top water management system is included in section 5.1 of the Surface Operations Water Management Plan (WCL 2021) and section 3 of the Pit top Surface Water Management Plan (SWMP, WCL 2021).
- The Russell Vale Bushfire Management Plan (***RVC EC PLN 026***, WCL 2021) for specific details on the measures available for management of bushfire at site and address of those specific conditions as outlined in **Condition B39** and **B40**.

[1] Noted as being in final draft form pending approval at the completion of this management plan.

Figure 4 WCL Environmental Management Structure



2 PROJECT DESCRIPTION

2.1 Project Overview - Surface Infrastructure

The project involves a revised mine plan that has been designed to have negligible subsidence to address potential subsidence-related mining impacts on groundwater, surface water and biodiversity within the Cataract Reservoir catchment.

The project also involves changes to the Russell Vale Pit Top (the Pit Top), which includes key project components (i.e. surface infrastructure) requiring construction.

The current and proposed surface infrastructure are presented in **Figure 5** and **Figure 6** to **Figure 8** respectively.

The key elements of the project are:

- mining by bord and pillar mining techniques only with the workings designed to be long-term stable with minimal subsidence impacts.
- extraction of approximately 3.7 million tonnes of Run-of-Mine (ROM) coal at a reduced production rate of up to 1 million tonnes of product coal per year (equivalent to approximately 1.2 million tonnes of ROM coal per year).
- redesign of the Pit Top layout to relocate infrastructure to more shielded locations to reduce amenity impacts.
- operation of surface facilities and product transport, typically limited to daytime hours (7.00am to 6.00pm Mondays to Friday, 8.00am to 6.00pm Saturday, no Sundays and Public Holidays), with provision for occasional operation until 10.00pm Monday to Friday to cater for unexpected port closures or interruptions.
- reduced product trucking rates relative to the previous UEP mine plan with a maximum of 17 trucks permitted per hour.
- extension to the height of existing bunds, construction of new bunds and noise walls within the existing surface infrastructure area for improved noise mitigation.
- construction of a new truck loading facility and associated conveyors.
- construction of a suitable dry coal processing plant to improve the quality of product coal removing reject rock material via use of dry separation methods will also be evaluated at this stage and if required to be installed, will be commissioned to align with the ramp up of production to 1.2Mtpa ROM.

2.2 Project Staging

The project will be implemented in stages as per below with the scope of this Plan covering all stages:

Stage 1

Installation of environmental monitoring controls and mitigation measures, truck access roads, construction of new noise walls, noise bunds and new primary sizer.

Commencement of mining operations ramping up to approximately 0.5 Mtpa with crushed coal transferred to ROM stockpile and coal loading via front-end loader to trucks to be transported to PKCT.

Evaluation of the feasibility of a coal processing plant (CPP) to be installed as part of the new Stage 2 surface infrastructure.

Key elements included in Stage 1 Works include (See **Figure 6**):

- Development and mining by bord and pillar mining
- Up to 500,000 tonnes of product coal per year
- Installation of new primary sizer inline
- Front end loading ROM coal onto trucks
- ROM Stockpile 30,000 tonnes
- Construction of surface infrastructure works, including construction of new noise walls, noise bunds, truck access roads, and commissioning the design and construction of the truck loading bin and associated conveyers.

A copy of the Stage 1 surface infrastructure is provided in **Figure 6**.

Stage 2

Finalise the construction and commissioning of new surface infrastructure, comprising truck loading bins and associated conveyors.

The coal will be transferred from the ROM stockpile through a series of conveyors to the truck loading bin to be loaded onto the trucks for transportation to PKCT or transferred to a new stockpile area for temporary stockpiling.

Coal from temporary stockpile will be loaded onto trucks by front-end loader for transportation to PKCT (Stage 2A – see **Figure 7**).

If the outcome of the evaluation in Stage 1 is to construct a CPP, the coal from the ROM stockpile will transferred by a series of conveyors to the CPP (Stage 2B – see **Figure 8**).

The product from the CPP will transferred to the truck loading bin to be loaded onto the trucks for transportation to PKCT or transferred to a new stockpile area for temporary stockpiling.

Coal from temporary stockpile will be loaded onto trucks by front-end loader for transportation to PKCT. The rejects conveyor will transfer the rejects from the CPP to the rejects stockpile (Stage 2B).

Commencement of full mining operations ramping up to 1.2 Mtpa to align when the new coal handling facilities and associated infrastructure is fully operational.

Key elements included in Stage 2 Works include:

- Mining by bord and pillar mining
- Up to 1 Million tonnes of product coal per year
- Up to 1.2 Million tonnes ROM coal per year
- Loading product coal onto trucks via bins
- Construction of new CPP
- Construction new surge bin
- ROM Stockpile 30,000 tonnes
- Product Stockpile 14,000 tonnes

- Emergency Stockpile
- Rejects stockpile 1,500 tonnes
- Waste rock from CPP used in rehabilitation
- Waste Rock from CPP emplaced underground

2.2.1 Coal Handling and Processing

The proposed coal handling facilities and surface infrastructure upgrades proposed as part of the Revised Preferred Project will be undertaken in accordance with the UEP Project Consent under the NSW EP&A Act to improve the quality of ROM coal in order to meet market demands and to minimise impacts on the environment and local community.

Works associated with the planned upgrade are all located within the existing disturbance footprint of the study area. The planned upgrades to the existing surface infrastructure within the study area (**Figure 5**) are shown on **Figure 6** to **Figure 8**.

2.2.2 Reject Material Handling

Following commissioning of a suitable CPP, it is anticipated that approximately 0.2 Mtpa of reject material will be produced at full production. Reject material consisting of rock material from the CPP will be transferred via the rejects conveyor to the reject stockpile (see **Figure 8**).

Beneficial reuse would be dependent on further application and or approval, whilst Underground emplacement would only be carried out if testing determines the material to be suitable – see RVC Waste Management Plan.

Reject material that after suitable testing meets the specifications (see Waste Management Plan *RVC ENV PLN 033*) are hauled back to the mine portal via the internal haul road (see **Figure 5**) for emplacement underground.

2.2.3 Coal Stockpiling

Three main coal stockpiles will operate within the Pit Top operational area, these being the main ROM stockpile (30,000 tonne (t) capacity), product stockpile (14,000 t capacity) and proposed temporary rejects stockpile (1,500 t capacity).

2.3 Bellambi Gully Creek

The RPPR describes proposed Bellambi Gully Creek realignment works as being a part of a modification to the previous project consent MP10_0046, i.e., MOD 4. The Modification was subsequently withdrawn, and the project was included in the UEP major project application. Subsequent to the issue of the RPPR in July 2019, and the UEP Additional Information Response Report in June 2020, on 23 July 2020 WCL was issued with an enforcement order by DPIE in relation to the replacement of the underground section of Bellambi Gully pipe. Generally the order requires WCL to engage a suitably qualified independent licensed engineer to develop detailed plans for the replacement of the underground pipe section of Bellambi Gully Creek with a suitably designed and engineered open channel, generally in accordance with the design parameters outlined in *Cardno 2020 Phase 1 and 2 Bellambi Gully Flood Assessment Proposed Stormwater Diversion Drain*.

As a result of and in compliance with this order the detailed design for Bellambi Gully Diversion and associated site water management system improvements was completed in late 2020 with works commencing onsite post approval of the Construction Management Plan (CMP) by DPIE in

April 2021. The construction works associated with the construction of the new diversion channel and associated site water management system improvements are reasonably expected to be completed by November 2021 are addressed in the Bellambi Gully Creek Diversion CMP. The operation of this new channel once completed in accordance with the DPIE order will be detailed in a specific maintenance plan inclusive of an implementation plan which would be included as appropriate in the RV Surface Operations Water Management Plan. This is shown in the context of the site EMS in **Figure 4**.

2.4 Rehabilitation

WCL intends to continue use of the site post the 5-year term of this MP09_0013 Consent. As a result, decommissioning and closure of the Russell Vale Colliery Pit Top facilities are not proposed following the completion of the UEP project.

Rather, if required pending the completion of the 5-year term of the current approval if there are delays to expected future planning assessment process such that mining operations are required to cease the site would be maintained until such time as a planning consent for mining operations is obtained. If consent for continuing use of the site is at the times not anticipated to be forthcoming, WCL will prepare and implement a detailed mine closure and rehabilitation plan in consultation with the Resources Regulator and other relevant government agencies and stakeholders.

For this project term of 5 years from the date of commencement of mining operations, the existing rehabilitation and mine closure strategy outlined in the current Russell Vale Colliery Rehabilitation Management Plan or its equivalent Mine Operations Plan, and generally in accordance with the Rehabilitation Objectives detailed in Table 5 of the Development Consent.

WCL will continue to progressively rehabilitate and decommission non-critical infrastructure as they are phased out of operations or become non-critical to potential future land use options at the Colliery. This will be further detailed in the Rehabilitation Management Plan or combined with the Mining Operations Plan as detailed in the RVC EMS (see **Figure 4**) and in accordance with **Condition B44.**

2.5 Environmental Duty of Care

WCL will implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under the consent.

WCL will conduct all approved activities consistent with the approval and any other legislation that is applicable.

Figure 5 Existing Russell Vale Colliery Pit Top

Figure 6 Proposed Stage 1 without surface infrastructure

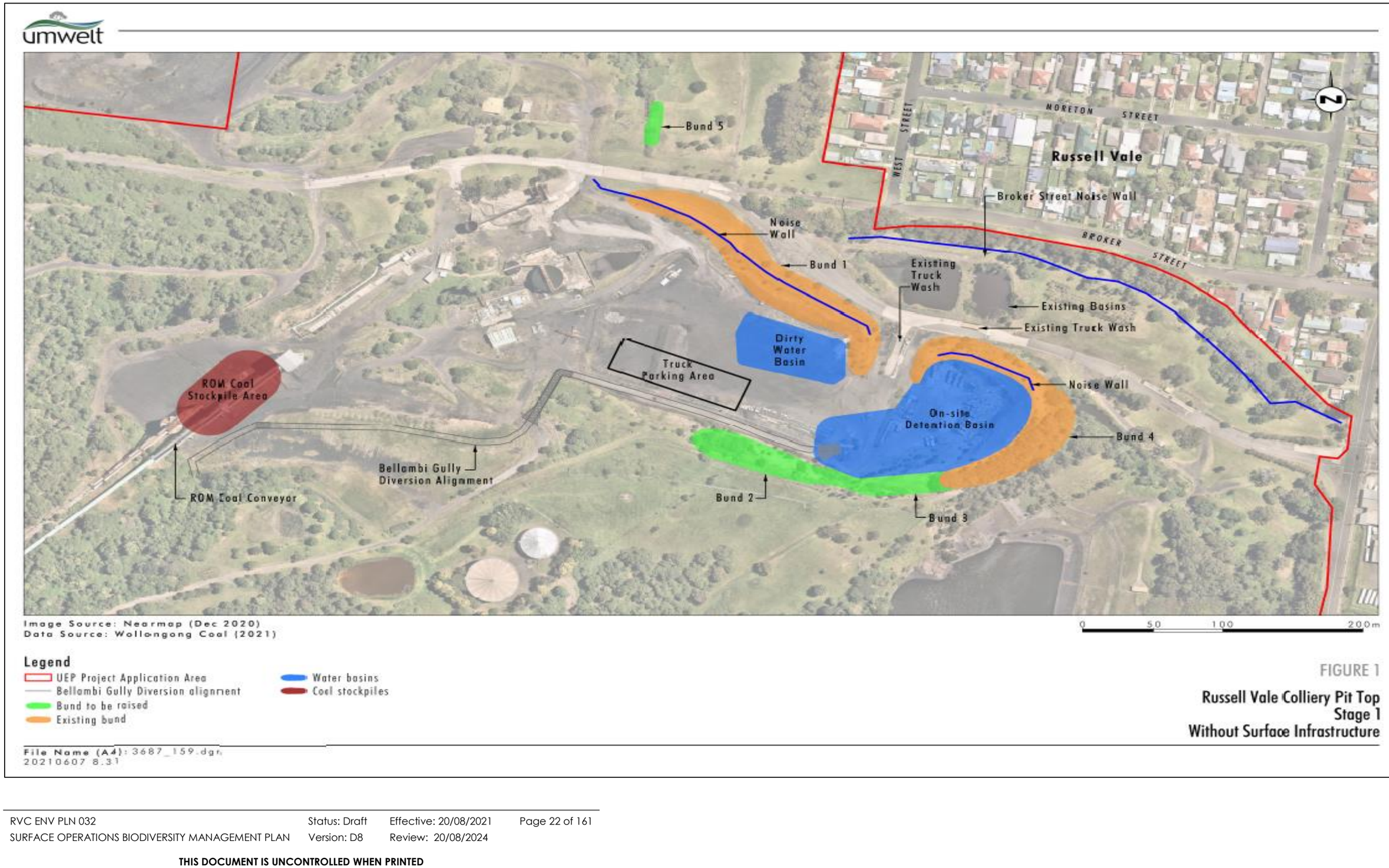


Figure 7 Proposed Stage 2A surface infrastructure components without coal processing plant

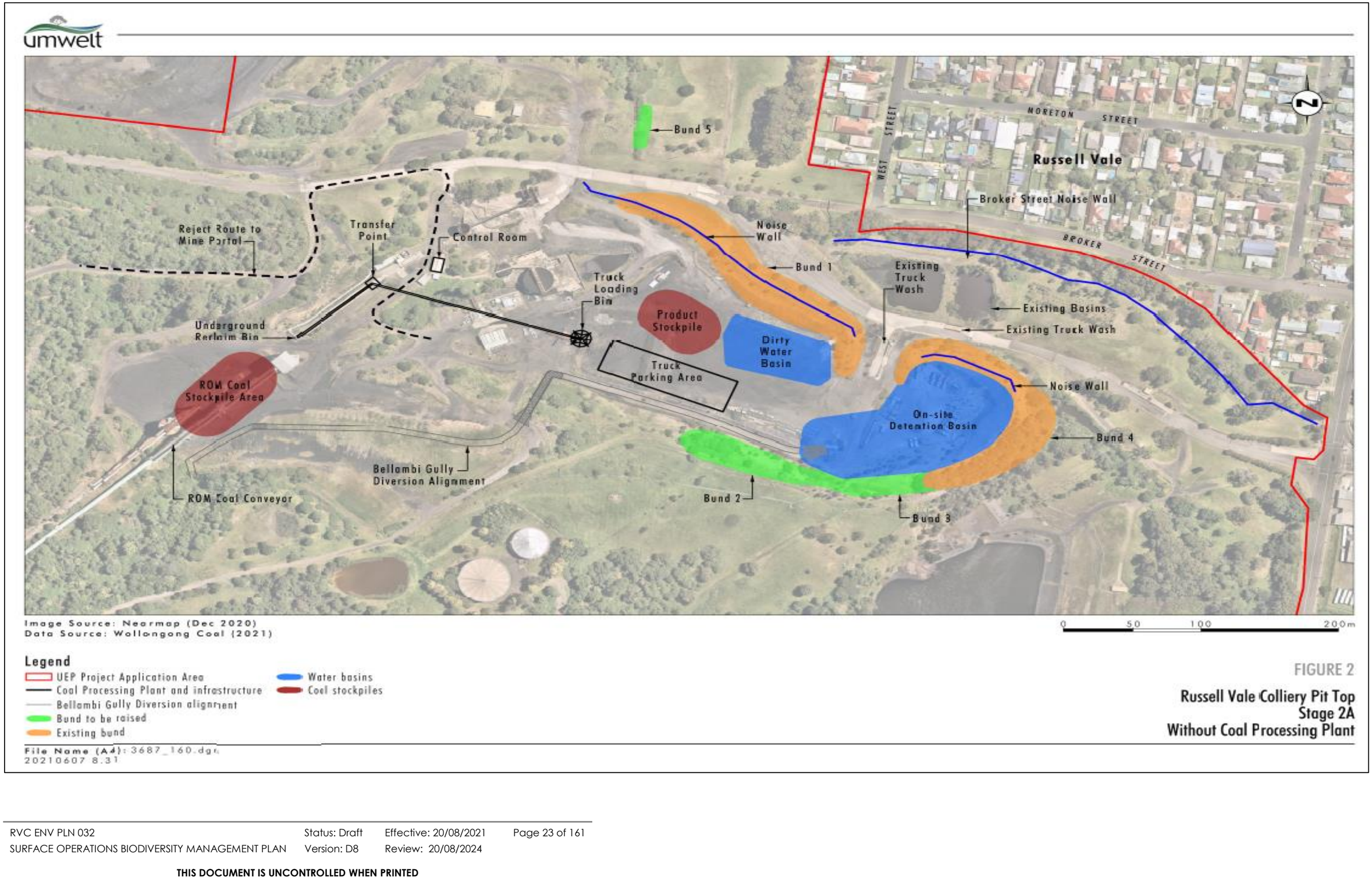
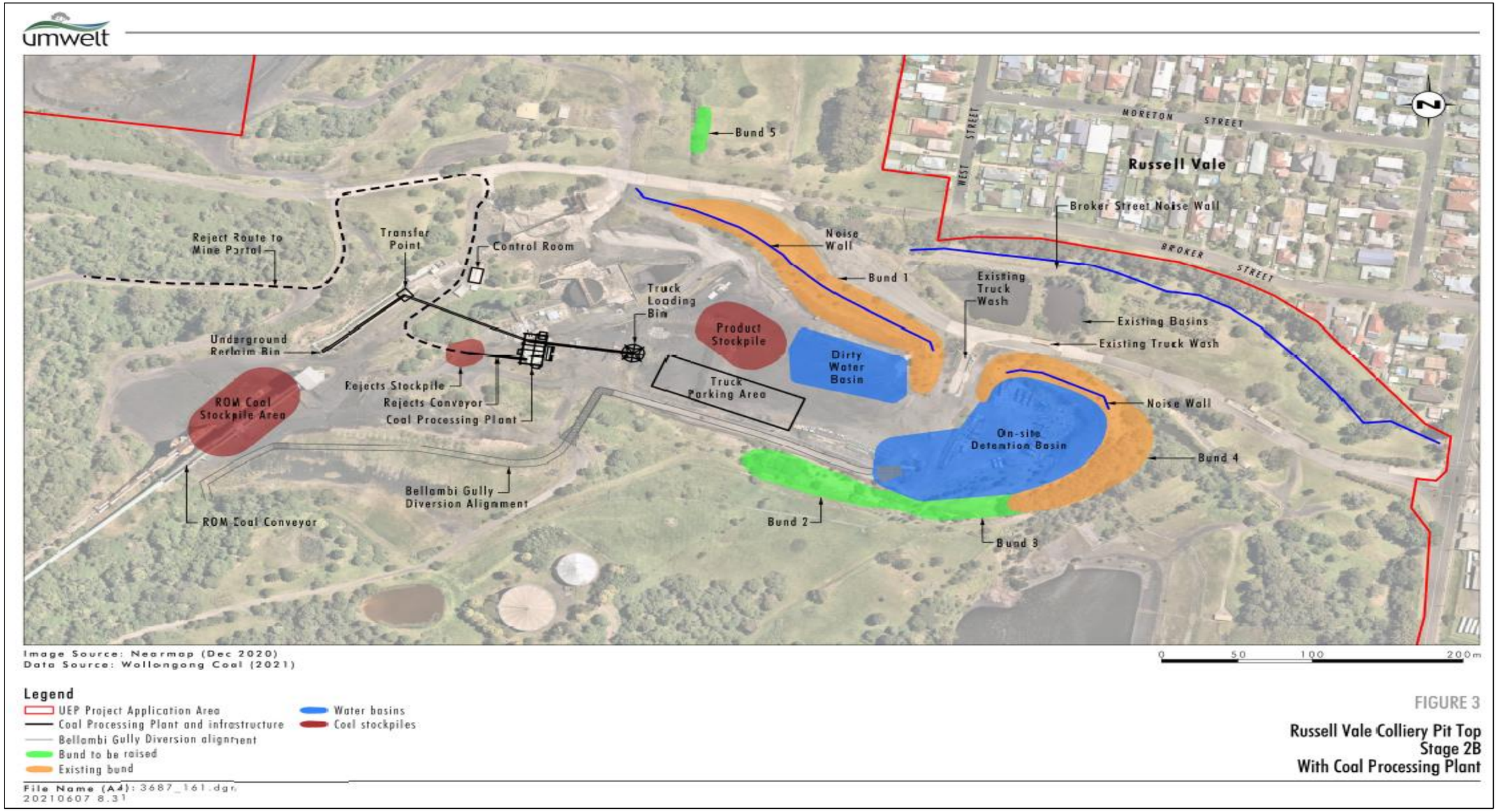


Figure 8 Proposed Stage 2B surface infrastructure components with coal processing plant



3 CONSULTATION

3.1 Consultation during the Environmental Assessment

Extensive community and government consultation has been carried out prior to and during the preparation of the original environmental assessment, the Revised Project Report, the Submissions Report and other project-related assessment documentation. The primary objective of consultation was to keep the community, government agencies and other stakeholders informed and involved during project development process.

Community engagement was carried out in two phases and is summarised in section 4.1.2 and section 4.1.3 of the RPPR.

A complete summary of previous and ongoing government agency and stakeholder consultation is provided in Table 4.5 of the RPPR. Consulted parties of relevance to this SoBMP included:

- The Department of Planning, Industry and Environment (DPIE); and
- DPIE – Biodiversity Conservation Department (includes EES and BCD).

3.2 Consultation during the preparation of the Management Plan

This Plan has been prepared in consultation with:

- NSW DPIE (Planning);
- NSW Biodiversity Conservation Department (includes EES and BCD);
- Commonwealth Department of Agriculture, Water and the Environment (DAWE); and

Details of the consultation including information on how the maters raised have been resolved in this plan, or with details of how the matter has been addressed otherwise including any disagreement remaining, provided in **Table 1** below.

Table 1 - Project consultation

Agency	Feedback from Consultation	Where addressed in this Plan
DPIE (BCD) 1 April 2021.	▪ Further detail and clarity is required on rehabilitation (e.g. species, number of plants, protection of plants from herbivores, timing etc.)	**Resolved - Section 9.4, 9.5 and APPENDIX E** – Revegetation species list
	▪ Further detail and clarity is required on weed management, including a list of all weeds on site, mapping of these weeds, control measures, timing and targets.	**Resolved - Section 9.3, Table 15 and Table 24.**
	▪ Deer are not mentioned in the BMP. Given the site's location, the BMP should address deer impacts and measures to mitigate these impacts.	**Resolved - Section 6, 8.4 and 9.6.**
	▪ Threatened species such as Powerful Owl, microbats and Grey-headed Flying Fox might use the site. We recommend the BMP address what to do if these or other animals are encountered.	**Resolved - Section 6, 9.6.3 and 9.6.4.**

Agency	Feedback from Consultation	Where addressed in this Plan
	▪ Indirect impacts on surrounding areas could also be elaborated, for example showing areas to be fenced on a map, monitoring of surrounding areas to ensure weeds are not spreading etc. ▪ The duration of the BMP should be specified. As much of the Plan relates to aquatic ecology, we suggest DPI Fisheries be consulted (if they have not been consulted already).	**Resolved - Section 6.** **Resolved – Section 1.3.** **Resolved - Section 5.1.6 outlines that there is no aquatic habitat within the study area and hence no trigger of a requirement to contact DPI Fisheries regarding fish habitat.** **Section 8.4.1 also describes an Aquatic ecological monitoring program addressing water Quality to ensure adherence with ANZECC and to support the development of site specific guidelines.**
DPIE	DPIE Feedback received 23/05/21	**Addressed as required in this plan in accordance with the feedback table.**
DAWE	The relationship of the consultation with DAWE/OWS/IESC in relation to this plan is in relation to the downstream environment of Bellambi Gully Creek and the associated testing program.	**Section 8.4.1 also describes an Aquatic ecological monitoring program addressing water Quality to ensure adherence with ANZECC and to support the development of site specific guidelines to EPBC Act approval.**

4 STATUTORY REQUIREMENTS

4.1 Overview

A number of approvals, licences and consents apply to the project, with associated conditions and requirements. The following sections summarise those that are most relevant in relation to this Management Plan. WCL will conduct all activities in accordance with the project approval and any other relevant legislation.

With regard to Biodiversity and Surface operations WCL will ensure that all plant and equipment used at the site is maintained in a proper and efficient condition; and operated in a proper and efficient manner in accordance with **Condition A27**.

In accordance with **Condition B22** WCL will ensure implementation of this Management Plan as is required prior to the commencement of mining operations, once approved by the Secretary.

4.2 State UEP Approval

Schedule 2, Part B, Condition B21 of the Consent requires the preparation of a BMP addressing the management of the surface infrastructure areas within the site to the satisfaction of the Planning Secretary. This condition further states that the plan must (relevant sections to the study area shown):

a) Be prepared by a suitably qualified and experienced person/s;

b) Be prepared in consultation with BCD;

c) Be approved by the Secretary prior to the commencement of mining operations under this consent.

d) Establish baseline data for existing remnant vegetation and habitat on site.

e) Describe the short, medium, and long-term measures to be undertaken to manage the remnant vegetation and habitat on the site,

f) Include a detailed description of the measures that would be implemented to:

(i) minimise impacts to biodiversity on the site, including any species and communities listed under the BC Act and EPBC Act;

(ii) protect vegetation and fauna habitat outside of the approved disturbance areas

(iii) control weeds, including measures to avoid and mitigate the spread of noxious (NSW priority) weeds;

(iv) control feral pests;

(v) control erosion;

(vi) control access to vegetated or revegetated areas; and

(vii) manage bushfire hazards;

g) Include a program to monitor and report on the effectiveness of the above measures and identify measures that could be implemented to improve biodiversity outcomes; and

h) Include details of who would be responsible for monitoring, reviewing, and implementing the plan.

Table 2 indicates where each component of the relevant Condition is addressed within this SoBMP.

Table 2 - State Biodiversity Management Plan Requirements

Development consent	Plan Section
Condition A1 – Obligation to Minimize Harm to the Environment *In addition to meeting the specific performance measures and criteria established under this approval, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this consent."*	**Section 9**
Condition A2 – Terms of the Consent *The development may only be carried out:* *(a) in compliance with the conditions of this consent;* *(b) in accordance with all written directions of the Planning Secretary; and* (c) *generally in accordance with the RPPR and the Development Layout.*	**This Plan**
***Condition A20* – Evidence of Consultation** Where conditions of this consent require consultation with an identified party, the Applicant must: *(a) consult with the relevant party prior to submitting the subject document; and* *(b) provide details of the consultation undertaken including:* *i. the outcome of that consultation, matters resolved and unresolved; and* *ii. details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.*	**Table 1 and Appendix A – Agency Consultation**

Development consent	Plan Section
Condition A21 – Staging, Combining, and Updating strategies, plans, or programs. With the approval of the Planning Secretary, the Applicant may: a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program); b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); and c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this approval are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development).	**Section 2.2** **Section 12 and 13**
Condition A27 Operation of Plan and Equipment. The Applicant must ensure that all plant and equipment used at the site is:" (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	**Section 4.1**
Condition A28 – Compliance The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development."	**Section 11**
Schedule 2 Part B – specific environmental conditions **Condition B21:** a) be prepared by a suitably qualified and experienced person/s; b) be prepared in consultation with BCD; c) be approved by the Secretary prior to the commencement of mining operations under this consent.	**Section 1.1** **Section 3** **Section 4.1**
Condition B21: d) establish baseline data for existing remnant vegetation and habitat on site. e) describe the short, medium, and long-term measures to be undertaken to manage the remnant vegetation and habitat on the site,	**Section 5** **Section 7**

Development consent	Plan Section
Condition B21: f) include detailed description of the measures that would be implemented to: (i) minimise impacts to biodiversity on the site, including any species and communities listed under the BC Act and EPBC Act; (ii) protect vegetation and fauna habitat outside of the approved disturbance areas (iii) control weeds, including measures to avoid and mitigate the spread of noxious (NSW priority) weeds; (iv) control feral pests; (v) control erosion; (vi) control access to vegetated or revegetated areas; and (vii) manage bushfire hazards.	**(i) Section 6 and Section 9** **(ii) Section 9.1 and 9.6.2** **(iii) Section 9.3** **(iv) Section 9.5** **(v) Section 9.2** **(vi) Section 9.1 and 9.4** **(vii) Section 9.8**
Condition B21: g) Include a program to monitor and report on the effectiveness of the above measures and identify measures that could be implemented to improve biodiversity outcomes.	**Section 8**
Condition B21: h) Include details of who would be responsible for monitoring, reviewing, and implementing the plan.	**Table 12 and Section 12**
Condition B22: The Applicant must implement the Biodiversity Management Plan as approved by the Planning Secretary.	**Section 4.1**

4.3 Management Plan Conditions

Table 3 identifies where the specific management plan commitment from Part F of the Project Approval is addressed in this plan.

Table 3 - Management Plan Requirements

Development consent	Plan Section
Condition F4 – Adaptive Management *The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in this consent. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding offsetting actions taken.* *Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:* *(a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not reoccur;* *(b) consider all reasonable and feasible options for remediation (where*	**Section 9.9, 9.10 and 10**

Development consent	Plan Section
relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; *(c) within 14 days of the exceedance occurring, submit a report to the Secretary describing these remediation options and any preferred remediation measures or other course of action; and* *(d) implement remediation measures as directed by the Planning Secretary;* *to the satisfaction of the Secretary.*	
Condition F5 – Management Plan Requirements *Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:* *(a) a summary of relevant background or baseline data;* *(b) details of:* *(i) the relevant statutory requirements (including any relevant consent, licence or lease conditions);* *(ii) any relevant limits or performance measures and criteria; and* *(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;* *(c) any relevant commitments or recommendations identified in the document/s listed in condition A2;* *(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;* *(e) a program to monitor and report on the:* *(i) impacts and environmental performance of the development; and* *(ii) effectiveness of the management measures set out pursuant to condition F5(c);* *(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;* *(g) a program to investigate and implement ways to improve the environmental performance of the development over time;* *(h) a protocol for managing and reporting any:* *(i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;* *(ii) complaint; or* *(iii) failure to comply with other statutory requirements;* *(i) public sources of information and data to assist stakeholders in*	**Section 5** **Section 4** **Section 7** **Section 9.3, 11.3 and 12** **Section 7** **Section 7 and 8** **Section 9.10** **Section 7** **Section 10** **Section 13.1.1**

Development consent	Plan Section
understanding environmental impacts of the development; and *(j) a protocol for periodic review of the plan.* ***Note**: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	**Section 12**
Condition F6 – Management Plan Requirements *The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.*	**Section 1 and 4**
Condition F7– Revision of Strategies, Plans and Programs *Within three months of:* *(a) the submission of an incident report under condition F9;* *(b) the submission of an Annual Review under condition F11;* *(c) the submission of an Independent Environmental Audit under condition F13; or* *(d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise);* *the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.*	**Section 12**
Condition F8– Revision of Strategies, Plans and Programs *If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within 6 weeks of the review.* ***Note**: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.*	**Section 12**
Condition F9– Incident Notification *The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must identify the development (including the development application number and name) and set out the location and nature of the incident.*	**Section 10**
Condition F10 – Non-Compliance Notification *Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must set out the condition of this consent that the development is non- compliant with, why it does*	**Section 10.1.2**

Development consent	Plan Section
not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. ***Note**: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	
Condition F11 – Annual Review *By the end of March each year after the commencement of the development under this consent, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:* *(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year;* *(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:* *(i) relevant statutory requirements, limits or performance measures/criteria;* *(ii) requirements of any plan or program required under this consent;* *(iii) monitoring results of previous years; and* *(iv) relevant predictions in the document/s listed in condition A2(c);* *(c) Identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;* *(d) evaluate and report on:* *(i) the effectiveness of the noise and air quality management systems; and* *(ii) compliance with the performance measures, criteria and operating conditions of this consent;* *(e) identify any trends in the monitoring data over the life of the development;* *(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and* *(g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.*	**Section 12**
Condition F12 – Annual Review *Copies of the Annual Review must be submitted to WCC, WSC, and made available to the CCC and any interested person upon request.*	**Section 12.1**

Development consent	Plan Section
Condition F13 – Independent Environmental Audit *Within one year of commencement of development under this consent, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must:* *(a) be prepared in accordance with the Independent Audit Post Approval Requirements (Department 2020 or as updated);* *(b) be led and conducted by a suitably qualified, experienced and independent by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Planning Secretary;* *(c) be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Planning Secretary) whose appointment has been endorsed by the Planning Secretary;* *(d) be carried out in consultation with the relevant agencies and the CCC;* *(e) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licenses and mining leases for the development (including any assessment, strategy, plan or program required under these approvals);* *(f) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;* *(g) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and* *(h) be conducted and reported to the satisfaction of the Planning Secretary.*	**Section 12 and 13.1**
Condition F14 – Independent Environmental Audit *Within three months of commencing an Independent Environmental Audit, or other timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations.* *The recommendations must be implemented to the satisfaction of the Planning Secretary.*	**Section 12**
Condition F15 – Monitoring and Environmental Audits *Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.*	**Section 8, 10 and 12**

Development consent	Plan Section
For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.	
Condition F17– Access to Information *Before the commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must:* • *make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website:* *(i) the documents referred to in condition A2(c) of this consent;* *(ii) all current statutory approvals for the development;* *(iii) all approved strategies, plans and programs required under the conditions of this consent;* *(iv) the proposed staging plans for the development if the construction, operation or decommissioning of the development is to be staged;* *(v) minutes of CCC meetings;* *(vi) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;* *(vii) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;* *(viii) a summary of the current phase and progress of the development;* *(ix) contact details to enquire about the development or to make a complaint;* *(x) a complaints register, updated monthly;* *(xi) the Annual Reviews of the development;* *(xii) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report;* *(xiii) any other matter required by the Planning Secretary; and* • *keep such information up to date, to the satisfaction of the Planning Secretary.*	**Section 13**

4.4 Statements of Commitment

Table 4 - Statement of Commitment

Statement	Timing	Where addressed in this plan
WCL will implement the following measures to improve the visual amenity of the site and minimise the visual impact of the RPPR. • Bunds surrounding the Pit Top will be progressively rehabilitated, spread with topsoil and planted with a selection of native species as soon as practical once final bund height is achieved. • Existing vegetation outside the Pit Top disturbance area will be regularly maintained and supplemented or replaced if necessary to maintain visual screening. • Areas of disturbance will be kept to the minimum practicable and rehabilitated as soon as practical. ***Note: amended to include only relevant commitments to Biodiversity, Visual management plan requirements have been removed as being not relevant and addressed in RVC ViMP.***	Ongoing	**Section 9.4, 9.5.4 and 9.9**
WCL will develop and implement a site-specific Fire Management Plan for the Revised Preferred Project in consultation with the RFS to manage bushfire threat and to document emergency response procedures.	*Within 3 months of approval and ongoing*	**Section 5.3**
Rehabilitation and Mine Closure		
WCL will progressively rehabilitate the site as soon as reasonably practicable following disturbance to the satisfaction of the Executive Director Mineral Resources.	Ongoing and upon mine closure	**Section 9.5.4**
As part of the mine closure process, WCL will undertake a program to investigate sealing of the mine adit at the mine closure stage. Any investigation will be undertaken with consideration of the advice of the Independent Expert Panel for Mining in the Catchment and in consultation with relevant agencies, including the EPA, WaterNSW and DPIE. If sealing of the adit is found to be unsuitable or not the preferred option (based on advice and/or consultation), a suitable funding arrangement will be negotiated with the relevant stakeholders to fund the ongoing monitoring and treatment of future water outflows from the adit, if required. The funding arrangement will consider appropriate water quality targets based on an agreed potential end use at the	*Prior to mine closure*	**Section 9.5.4**

time of closure and will be sufficient for 10 years of monitoring and treatment.		
Management Plans		
WCL will prepare a Construction Environmental Management Plan, prior to the commencement of construction, that identifies the environmental and social management controls to be implemented during the construction phase.	Prior to the commencement of construction	**Section 6 and 9.2**
All existing operational environmental management plans and monitoring networks will be reviewed and revised (where necessary) to reflect the Revised Preferred Project approval requirements, should the project be approved. Each environmental management plan will include (where relevant): • detailed baseline data; • a description of: - the relevant statutory requirements (including any relevant approval, licence or lease conditions); any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; • a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; • a program to monitor and report on the: - impacts and environmental performance of the project; - effectiveness of any management measures; • a contingency plan to manage any unpredicted impacts and their consequences; • a program to investigate and implement ways to improve the environmental performance of the project over time; • a protocol for managing and reporting any: - incidents; - complaints; - non-compliances with statutory requirements; and - exceedances of the impact assessment criteria and/or performance criteria; and • a protocol for periodic review of the plan	Within 3 months of approval	**Section 1.6 and 12**

4.5 Licences and Leases

In addition to the development consent (MP09_0013), all activities at or in association with the study area will be undertaken in accordance with the following licences, permits and leases which have been issued (**Table 5**).

Table 5 - Licences, Permits and Leases

Licence/Approval	Document No	Issue Date	Expiry Date
Mining Operations Plan (MOP)	RVC MIN PLN 015	01 Sept 2020	01 Sept 2022
Bush Fire Hazard Reduction Certificate	HR20070188810-2, HR20070188810-3, HR20070188810-4 HR20070188810-5	02 July 2020	01 July 2023

4.6 Relevant Legislation and Guidelines

A summary of the legal requirements applicable to the project will be in the Compliance Register, which will be updated and will consider relevant legislation, conditions of consent and licence requirements. The Compliance Register will include both Federal and State legislation, as well as State Environmental Planning Policies (SEPPs) and any Codes of Practice to which the WCL is required to comply.

A copy of the Compliance Register is maintained on the Wollongong Coal Server.

Specifically the Biosecurity Act 2015 introduced the General Biosecurity Duty on 1 July 2017, which reinforces the concept of invasive species management as a shared responsibility for all community members. The General Biosecurity Duty provides that any person who deals with biosecurity matter (such as feral deer) and who knows (or ought to know) of the biosecurity risk posed (or likely to be posed), has a biosecurity duty to ensure that the risk is prevented, eliminated or minimised — as far as is reasonably practicable.

WCL will conduct approved mining operations consistent with the Consent MP09_0013 conditions and any other legislation that is applicable including the key legislation as below:

- *Biosecurity Act 2015;*
- *Biodiversity Conservation Act 2016;*
- *Coal Mine Health and Safety Act 2002;*
- *Dams Safety Act 2015;*
- *Environmental Planning and Assessment Act 1979;*
- *Environment Protection and Biodiversity Conservation Act 1999(Commonwealth);*
- *Fisheries Management Act 1994;*
- *Local Land Services Act 2013;*
- *Mining Act 1992;*
- *Protection of the Environment Operations Act 1997;*

- *WNSW Act Act 2014;*
- *Water Act 1912; and*
- *Water Management Act 2000*.

5 BASELINE DATA

5.1 Surface Facilities study area

The Russell Vale Mine Pit surface infrastructure area is predominantly cleared of natural vegetation with some remnant stands of trees remaining on site (See Figure 5). The site is surrounded by dense bushland in proximity to Russell Vale communities. The site property boundary is characterised by steep slopes and is densely wooded in areas. A relatively large proportion of the Pit Top working and storage area is cleared and or comprised of hard sealed surfaces.

The vegetation of the study area is predominantly represented by four broad types (**Figure 9**):

- Cleared/disturbed vegetation (in the form of exotic grasslands).
- Urban/native/ exotic vegetation (dominated by aggressive woody weed species).
- Revegetated vegetation.
- Native vegetation in a range of conditions.

The dominant geology consists of a Quaternary talus in the form of large sandstone blocks supported by deep colluvial detritus and soil classifying the soil landscape as Illawarra Escarpment (9029ie) (Chapman & Murphy 1989), with soils characteristically shallow, loose and sandy as a result of the predominately sandstone derived subgrade.

The study area is directly linked to bushland in a southerly and westerly directions, which includes the Illawarra Escarpment Conservation Area. As such, the study area provides connectivity to bushland facilitating the movement of fauna throughout the landscape.

5.1.1 Terrestrial vegetation

Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over four person hours.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is Plant Community Type (PCT) as defined by the Biodiversity Assessment Method (BAM) (OEH 2017), and has been the standard used across NSW since 2016.

The vegetation types, within the study area, were stratified into PCTs broadly based on previous vegetation mapping, and the vegetation boundaries marked with a hand-held GPS in the field. Appropriate PCTs were selected on the basis of species composition and structure, known geographical distribution, landscape position, underlying geology, soil type, and any other diagnostic features.

Previous assessments undertaken (ERM 2010) identified that native vegetation and fauna habitat within the study area is limited in extent and was observed to be in poor condition. With scope to undertake a comparative analysis of previously documented Keith (1994) derived vegetation types to current plant community types (PCT) (OEH 2020), an additional field survey was undertaken 5 February 2021.

As such, the study area contained one PCT and two vegetation types that did not equate to a describable PCT, were confirmed with the study area. These were:

- *PCT 694: Blackbutt - Turpentine - Bangalay moist open forest on sheltered slopes and gullies, southern Sydney Basin* (Illawarra Escarpment Blackbutt forest).
- *Revegetation areas.*
- *Urban native exotic.*

5.1.1.1 Illawarra Escarpment Blackbutt forest

Illawarra Escarpment Blackbutt Forest was observed to be in three conditional types within the study area; low, medium and high.

Low conditioned Illawarra Escarpment Blackbutt Forest was primarily low in native floristic diversity amongst all stratums. This is due to a large presence of weed species within the mid and ground storey stratums. The conditional type was either represented by an intact canopy layer of Blackbutt *Eucalyptus pilularis* and Turpentine *Syncarpia glomulifera* dominated by a midstorey stratum of exotic species such a Lantana *Lantana camara*, Large Leaf Privet *Ligustrum lucidum* and Cassia *Senna pendula* var *glabrata.* This condition class was also represented by a community lacking a distinguishable canopy layer stratum primarily dominated by both a native and exotic mid storey represented by species such Maiden's wattle *Acacia maidenii and Lantana.* The ground stratum was highly disturbed with a diverse range of exotic species including, Wandering Jew *Tradescantia fluminensis* and with scattered native species such as Basket Grass *Oplismenus imbecillis* and *Geranium homeanum.*

Moderate and high condition vegetation types were characterised by a canopy of Blackbutt *Eucalyptus botryoides X saligna* Turpentine and Grey Ironbark *Eucalyptus paniculata* subsp. *paniculata.* The native mid-storey was represented by Maiden's Wattle and Sweet Pittosporum *Pittosprum undulatum*. The distinction between the two condition types was the cover and abundance of weed species within the mid and ground layer stratums. Exotic species observed within vegetation types included Broad-leaved Privet, Lantana and Cassia.

This PCT is not consistent with and listed Endangered Ecological Community (EEC) under either the BC Act or EPBC Act.

5.1.1.2 Revegetation

Revegetation areas were located on the northern and eastern sections of the study area, primarily utilised as visual or privacy screens for WCL and neighbouring residential areas. Flora species observed within the vegetation type included a variety of both native and exotic species such as Swamp oak Casuarina glauca, Prickly-leaved Tea Tree Melaleuca styphelioides, Woollybutt Eucalyptus longifolia and Monterey cypress Cupressus macrocarpa.

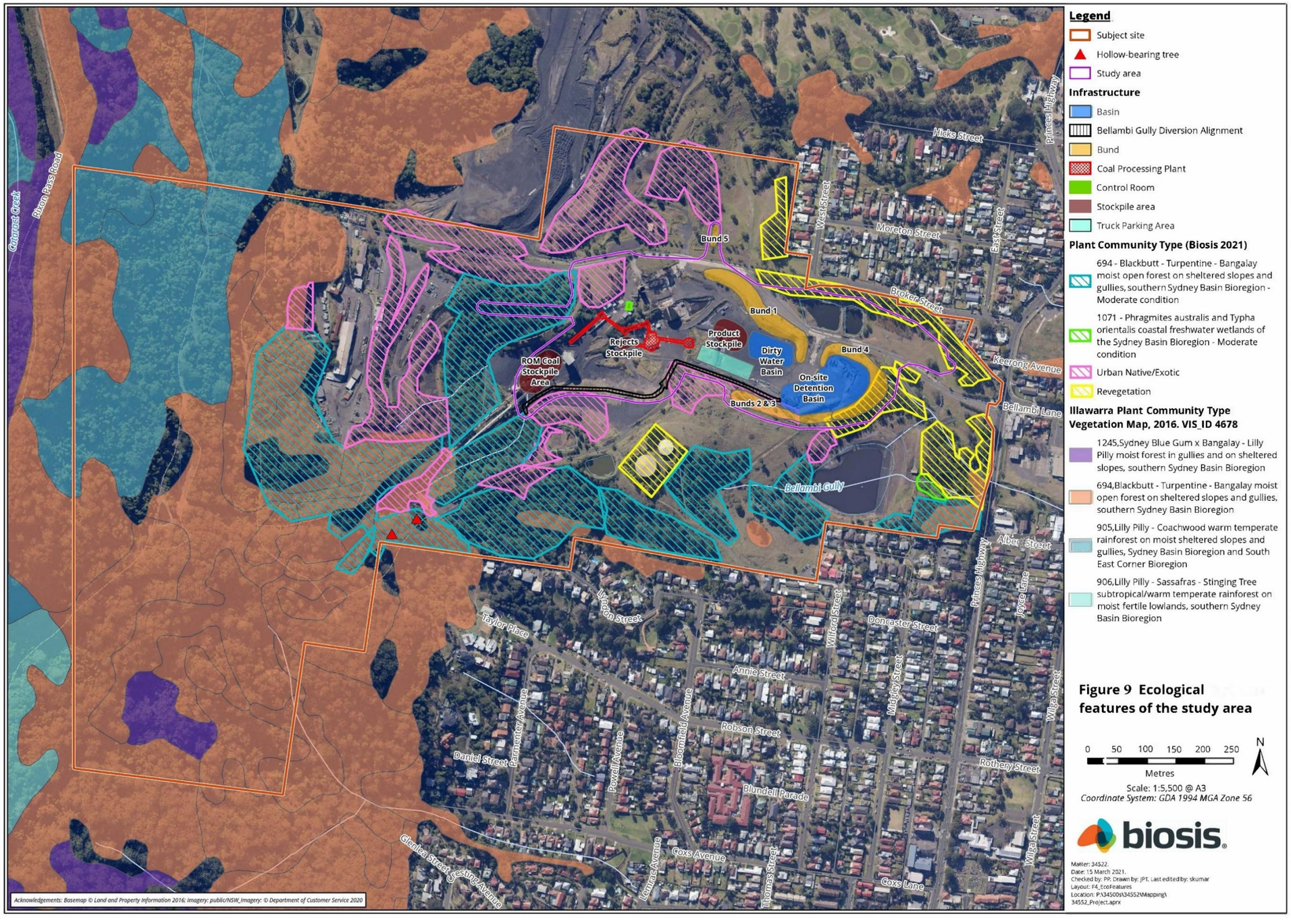
5.1.1.3 Urban/native/ exotic

This community was in a highly degraded condition with a high abundance of weed species throughout all stratums. Areas of cleared vegetation were dominated by exotic herb and grass species such as Paspalum *Paspalum dilatatum*, Kikuyu *Cenchrus clandestinus*, Veldt Grass *Ehrharta erecta*, Fleabane *Conyza bonariensis* and Cobbler's Pegs *Bidens pilosa*. The mid storey stratum, where evident, was primarily represented by Lantana with occasional Maidens Wattle and exotic species such as *Celtis australis* and African Olive, *Olea europaea* subsp. *cuspidata.*

It is to be noted, that whilst outside of the immediate study area, the PCT *Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion* was recorded in an eastern portion of the subject site (**Figure 9**). The community was considered to be in a high to moderate condition as a result of the low weed densities and typical monoculture of Broadleaf Cumbungi *Typha orientalis* within the presumably man made drainage structure. Other species recorded within the vegetation type included *Bolboschoenus caldwellii* and Lesser Joyweed *Alternanthera denticulata.*

This vegetation type is considered to be associated with the BC Act listed EEC *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.*

Figure 9 Ecological features of the study area



5.1.2 Fauna habitats

A range of fauna habitat features are present throughout the study area. Habitat within the study area provides potential foraging, breeding and nesting resources for a range of fauna. No hollow-bearing trees were recorded within the study area during field surveys. The habitat features relevant to each fauna group are identified in **Table 6** below.

Table 6 - Key fauna habitat features present across the study area.

Habitat features	Fauna species
Infrastructure	Microchiropteran bats and birds.
Watercourse	Habitat for amphibians; foraging for birds, microbats, reptiles and marsupials.
Leaf litter/woody debris	Foraging resources for birds, mammals, frogs and reptiles.

5.1.3 Threatened species

Vegetation within the study area was surveyed using the random meander technique (Cropper 1993) over four person hours.

General classification of native vegetation in NSW used in this report is based on the classification system in Keith (2004) which uses three groupings of vegetation: vegetation formation, vegetation class and vegetation type, with vegetation type the finest grouping. The grouping referred to in this report is Plant Community Type (PCT) as defined by the Biodiversity Assessment Method (BAM) (OEH 2017), and has been the standard used across NSW since 2016.

The vegetation types, within the study area, were stratified into PCTs broadly based on previous vegetation mapping, and the vegetation boundaries marked with a hand-held GPS in the field. Appropriate PCTs were selected on the basis of species composition and structure, known geographical distribution, landscape position, underlying geology, soil type, and any other diagnostic features.

The field investigation of the study area was surveyed using the random meander technique (Cropper 1993). A habitat-based assessment was completed to determine the presence of suitable habitat for threatened species previously recorded (EES 2020) or predicted to occur (Commonwealth of Australia 2020) within 5 km. This list was filtered according to species descriptions, life history, habitat preference and soil preference to determine those species most likely to be present within the study area.

Threatened species habitat within the study area is considered to be highly limited due to the past disturbance factors such as vegetation clearance, exotic species invasion and the close proximity to residential dwellings. However, the vegetation directly west of the study area has the potential to support a number of locally occurring threatened species.

Review of the EES BioNet Atlas (EES 2021) and the Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool (DAWE 2021) found records of 19 threatened flora species and 30 threatened fauna species as previously recorded, or predicted to occur, within a five kilometre radius of the study area (see **Figure 10, Figure 11,** and **Figure 12**).

Of these locally occurring threatened species, Grey-headed Flying-fox *Pteropus poliocephalus* (Vulnerable, BC Act and EPBC Act) is considered the most likely to occur within the study area.

No significant habitat features in the form of hollow-bearing trees, myrtaceous feed trees and Koala feed trees, camps (Grey-headed Flying-fox), canopy stick nests, dreys or ground nests were identified during the filed assessment. Additionally, no threatened species were observed during field assessment.

An assessment of habitat for threatened fauna species is provided as **Table 7.**

Table 7 - Assessment of habitat for threatened fauna species

Habitat features	Threatened fauna associations	Likelihood of occurrence or impact
Feed trees	Black wattle *Acacia mearnsii* *Acacia longifolia* and some sparse Sweet Pittosporum *Pittosporum undulatum* were identified within the study area may provide opportunistic nectar resources suitable for Grey-headed Flying-fox and other nectivorous bird species.	The closest Grey-headed Flying-Fox camp is located approximately 3 km to the north of Russell Vale in Woonona (Department of the Environment 2015). As such, the study area and immediately locality is not considered roosting habitat for the Grey-headed Flying-fox. Grey-headed Flying-fox are transient species that may utilises these foraging resources on occasion, however, the surrounding resources within the Escarpment Area provide higher quality habitat.
Hollow-bearing trees	None present.	Not applicable.
Rocky outcrops	None present.	Not applicable.
Waterways (creek, river or dam)	Bellambi Creek Gully, Dams and soak.	No habitat in the form of dense reedy habitat Low quality habitat for Green and Golden Bell Frog was identified. Given the quality of habitat present in the study area, the potential of occurrence is low. Therefore, no further consideration is required.
Caves and shelters	None present.	Not applicable.
Man-made structures	Former coal conveyor and associated infrastructure.	Provides no habitat value for listed MNES species.

Previous assessments undertaken by Biosis (2020) discounted the likelihood Green and Golden Bell Frog *Litoria aurea* (Vulnerable, NSW BC Act and EPBC Act) from occurring within the study area. It was concluded that the habitat was unfavourable due to limited reedy habitat for

refuge and foraging (*Typha* sp.) and a lack of emergent floating vegetation required for floating/broadcasting during breeding season (less than 5% cover).

To support of these findings, targeted surveys for Green and Golden Bell Frog were undertaken annually between 2010 and 2013, as a condition of the BMP (NRE 2012) and federal approval. The survey effort was considered comprehensive (21 days in total of diurnal and nocturnal surveys, and specifically, 57.8 hours undertaken at Dam No.6), undertaken annually at seven locations within the colliery. No Green and Golden Bell Frog individuals were identified during these surveys.

During the current assessment, Dam No. 6, Dam No. 5 and the broader surrounds were documented as being situated on coal wash and disturbed ground (Photo 3). Coal and associated by-products of processing works (i.e. Mercury, Arsenic, Aluminium and Copper) are documented as having deleterious effects on freshwater ecosystems (Evans 1987, Kennedy et al. 2003, Ali et al. 2017). Furthermore, mineral salts in coal oxidise in water, which means that run-off or pooling habitat within the study area may be impacted from increased salinity and in turn have deleterious impacts on amphibians within the locality.

Upon review of water quality results, from the previous rainfall event in May 2020, concentrations of Aluminium (0.53 mg/L) and Copper (0.002 mg/L) were well above trigger values for 90% protection level, with 50% confidence for freshwater ecosystems (ANZECC and ARMCANZ 2000 vol. 1) at the data logger LDP11 (Russell Vale Outflow; data supplied by WCL).

Based on current research, previous survey results (Biosis 2011, 2013), the absence of critical habitat components during the current assessment and the physico-chemical nature of surface water within the study area (i.e., elevated levels of Aluminium and Copper), it is unlikely that Green and Golden Bell Frog would utilise the study area. It is highly unlikely if they were present that the species would be able to breed successfully due to the presence of copper and aluminium in high concentrations within Dam No. 6.

Results of the surveys are provided as **Appendix C.**

Table 8 - Survey and Desktop assessment of habitat for threatened fauna species

Fauna	Habitat features	Threatened fauna associations	Likelihood of occurrence or impact
Koala	**Feed trees**	None present.	No significant habitat features in the form of hollow-bearing trees, myrtaceous feed trees and Koala feed trees
Grey-headed Flying-Fox	**Feed trees**	Black wattle *Acacia mearnsii Acacia longifolia* and some sparse Sweet Pittosporum *Pittosporum undulatum* were identified within the study area may provide opportunistic nectar resources suitable for Grey-headed Flying-fox and other	Grey-headed Flying-fox are transient species that may utilises these foraging resources on occasion, however, the surrounding resources within the Escarpment Area provide higher quality habitat. The closest **Grey-headed Flying-Fox** camp is located approximately 3 km to the north of Russell Vale in Woonona (DoE 2015). As such, the study area and immediately locality is not

Fauna	Habitat features	Threatened fauna associations	Likelihood of occurrence or impact
		nectivorous bird species.	considered roosting habitat for the Grey-headed Flying-fox.
Bats and Owls	**Hollow-bearing trees Caves and shelters**	None present.	Not applicable.
Reptiles	**Rocky outcrops**	None present.	Not applicable.
Amphibian Fish	**Waterways (creek, river or dam)**	Bellambi Creek Gully, Dams and soak.	No habitat in the form of dense reedy habitat was identified for threatened fish. No habitat in the form of dense reedy habitat was identified. Low quality habitat for Green and Golden Bell Frog was identified. Given the quality of habitat present in the study area, the potential of occurrence is low. Therefore, no further consideration is required.
Bats	**Man-made structures**	Former coal conveyor and associated infrastructure.	Provides no habitat value for listed MNES species.

5.1.4 Surface water management system

The existing approved study area Water Management System (WMS) catchment is approximately 43 hectares in area and consists of the following sub catchments:

- Rehabilitated and undisturbed natural catchments.
- Disturbed catchments including the pit top area and coal handling infrastructure.
- Hardstand areas including the maintenance workshop area, administration offices, access roads and car parking.

The existing WMS allows for two categories of water:

- Clean water, comprising runoff from undisturbed and fully rehabilitated areas, and
- Dirty water, comprising runoff from any area disturbed by mining operations, runoff from areas where coal is stockpiled and handled, and groundwater extracted from the underground workings.

Details pertaining to the WMS and monitoring locations and frequencies are provided in **Section 5.1.6** below.

5.1.5 Bellambi Gully Creek

Bellambi Gully Creek is at the current time an ephemeral waterway originating on the escarpment behind the site, running through the site via an 1800 diameter stormwater diversion pipe under the stockpile area before exiting into a weir structure.

The Bellambi Gully Creek upstream of the 1800 millimetres (mm) diameter pipe culvert is a steep sided vegetated gully with trees and large submerged boulders being evident.

From this weir structure the water returns to a highly disturbed environment and creek bed before leaving site via a culvert under the Princess Highway/ Beyond the Russell Vale site boundary, Bellambi Gully Creek flows east through past several industrial premises, under the northern distributer, through residential streets, under the northern railway line, through the Holy Spirit High School's grounds, and then flows out into the ocean at Bellambi Beach, which is several km north of and not connected to Bellambi Lagoon.

The creek is mainly comprised of culverts under main transport structures and roads, or disturbed creek beds through urban areas. According to the WBM Oceanics Australia report completed for Wollongong City Council in June 2005, the Bellambi Creek catchment area is approximately 427ha and the total creek length is 4.3km (Beca, 2011).

The Bellambi Gully pipe is currently subject to a program of works to replace it with a new open channel to the South.

5.1.6 Aquatic habitats

Aquatic habitats including Bellambi gully creek within the study area are considered to be in a poor state, due to large scale weed incursions, and a highly disturbed soil profile, a channel bed and being mainly comprised of isolated dams and as such are of limited value to aquatic species. The first order stream (Bellambi Gully) within the study area is typically characterised by a low stream flow, is largely a reconstructed channel before entering a pipe for a substantial part of the site, and is considered to be a seasonal waterway dominated by in line dams. As such aquatic habitats, insofar as providing habitat for aquatic flora and fauna are non-existent with the exception of a small area of native aquatic vegetation within the area mapped as *Phragmites australis* and *Typha orientalis* coastal freshwater wetland (**Figure 9**).

Aquatic environments are identified as being situated on coal rejects and disturbed ground. Coal and associated by-products of processing works are documented as having deleterious effects on freshwater ecosystems. Furthermore, mineral salts in coal oxidise in water, which means that run-off or pooling habitat within the study area may be impacted from increased salinity and in turn have deleterious impacts on amphibians within the locality. However it is noted that this environment has been subject to the influence of mining since the 1880's.

Aquatic habitats within the subject site are components of the surface water management system, with their design and purpose being to prevent pollutants from exiting the site. As such these areas are design to retain substances considered to be harmful to aquatic species and are not intended to provide for the function of aquatic ecological communities.

Water quality results from May 2020 recorded results above trigger values for 90% protection level, with 50% confidence for freshwater ecosystems (ANZECC and ARMCANZ 2000 vol. 1) at the data logger LDP11 (Russell Vale Outflow; data supplied by WCL). The objectives for water quality exiting the subject site are specified in **section 8.2**.

Table 9 - Water Storages

NAME	CAPACITY (ML)	FUNCTION	MANAGEMENT	HABITAT
Dirty water system				
Dam 1	5	Flow through sediment basin. Excess water draining from the truck wash and pumped transfers from the underground mine.	Discharges under gravity to Dam 2. Management of sediment levels in Dams 1, and 2 to less than 20% dam volume.	Nil
Dam 2	2	Sediment Basin Excess water draining from the adjacent truck wheel wash and gravity fed drainage from Dam 1.	Discharges under gravity to the Stormwater Control Dam. Management of sediment levels in Dams 1, and 2 to less than 20% dam volume.	Nil
Dam 5	< 10	Redundant dam draining to SWCD.	-	Nil
Pit Top Dam	8	Recycled water storage for day to day mining operation. Dam does not to act as a catchment dam	Capacity maintained to allow for prescribed use. Overflow back to the WTP.	Nil
Fire Dam	2	Recycled water storage for day to day mining operation. Dam does not to act as a catchment dam	The Fire Dam is located to the south of the Pit Top Dam and is elevated approximately 2m above the Pit Top Dam with a small spillway and overflow pipe to the Pit Top Dam.	Nil
Highway Dam	0.3	Pumped back to the SWCD	Maintenance of pump and spillway	Nil
Stormwater control dam	62	Pumped transfers from the Highway Dam Runoff from about 7.5 ha of mostly undisturbed catchment (including Dam 5).	Registered with Dam Safety NSW (DS NSW). Maintenance of the spillway area Monitor seepage (see LDP 3) Monitor spillway overflow (LDP 9)	Nil

NAME	CAPACITY (ML)	FUNCTION	MANAGEMENT	HABITAT
Dry Detention Basin (under construction)	2.1	Stockpile and coal handling area. Maintenance and laydown areas.	Discharges under gravity to Dam 1. An emergency overflow pipe allows for discharges to the Clean Water Detention Basin to occur during extreme storm events.	No. New basin will capture flows off the coal stockpile area in wet weather and is otherwise intended to be dry.
Clean Water System				
Clean Water Detention Basin (under Construction)	Approximately 26 (under construction)	Serves to reduce the magnitude of the peak discharge entering Bellambi Gully from the clean water diversion.	Dry detention basin, that includes a low-flow path that connects to the existing Bellambi Gully pipeline via a stormwater pit. An emergency overflow weir is located at the north-eastern corner, which directs flows during extreme storm events into the existing channel system.	To be established with a low flow structure such that the basin does not hold water.
BG Clean water Channel (under construction)	n/a	Convey flows from LDP 2 and BG upstream inclusive of 1:100 yr flood event.	Ongoing maintenance of debris control structures	n/a New flood channel to covey flows from u/s ephemeral waterway inclusive of debris structures.
Dam 6	n/a	Redundant dam draining to Dam 5.	-	Reviewed for GGBF. See App C

5.1.7 Environmental and NSW Priority weed species.

5.1.7.1 Environmental weed species

As a result of the modified nature of the study area, a wide range of environmental weed species and garden escapees were recorded throughout the study area. A concise inventory of the exotic flora that was recorded is provided as **Table 24.** Core locations and densities of exotic species are provided as **Figure 15**.

5.1.7.2 NSW Priority Weed Species/ WONS

Three weeds listed as NSW priority weed species in the Wollongong Local Government Area (LGA) under the NSW *Biosecurity Act 2015* (Biosecurity Act) were recorded within the study area, and landowners and occupiers are under legal obligations to manage such species in line with the General Biosecurity Duty which states:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Two of the observed priority weed species are also considered to be Weeds of National Significance (WoNS) (**Table 10**).

Table 10 - Priority weeds and WoNS recorded within the study area

Scientific name	Common name	General Biosecurity Duty	WoNS
Asparagus aethiopicus	Ground Asparagus Fern	Must not be imported into the State or sold	Yes
Eragrostis curvula	African Lovegrass	Land managers reduce impacts from the plant on priority assets	No
Lantana camara	Lantana	Land managers should mitigate the risk of new weeds being introduced to their land. The plant should not be bought, sold, grown, carried or released into the environment. Exclusion zone: The plant should be eradicated from the land and the land kept free of the plant.	Yes

5.2 Vent Shafts

5.2.1 Vent Shaft No.1 and No. 2

Vegetation found at No.1 and No. 2 shafts is consistent with PCT 1083: Red Bloodwood - scribbly gum heathy woodland in low to moderate condition. No hollow bearing trees were found in the study area for m Forest Oak *Allocasuarina littoralis*, an important feed tree for Glossy Black-Cockatoo *Calyptorhynchus lathami* listed as Vulnerable under the BC ACT is present north and east of shaft two. Coastal Upland Swamp Endangered Ecological Community (EEC) under the EPBC and BC Acts lies 30 m west of the access track outside the impact area.

Cleared areas around the vent shaft are typically rocky and open with a grassy understory of Blady Grass *Imperata cylindrica*, sedges, and exotic grasses. Weed density is low but includes Crofton Weed *Ageratina adenophora*, considered a High Threat Exotic (HTE) under the BC Act.

5.2.2 No.3 Shaft

No. 3 Shaft vegetation is also consistent with PCT 1083: Red Bloodwood - scribbly gum heathy woodland in moderate to high condition. Weeds are dominant at the site and two hollow-bearing trees are within the Asset Protection Zone (APZ) north of the shaft. No EECs or specific

threatened species habitat is mapped in the study area. Forest Oak, an important Glossy Black-Cockatoo feed tree is common in the APZ, as is Crofton Weed.

5.2.3 No.4 shaft

The No.4 shaft is larger than the other study areas with infrastructure including buildings, a helipad and water management dams with multiple access points on the eastern side. Vegetation is largely cleared and mapped as Urban Native / Exotic or PCT 1083: Red Bloodwood - scribbly gum heathy woodland in moderate condition.

The southeast corner is consistent with PCT 1803 - Banksia - Needlebush - Tea-tree damp heath swamp in moderate condition and equivalent to Coastal Upland Swamp EEC and habitat for Giant Dragonfly *Petalura gigantea* listed and Endangered under the BC Act. Thirteen hollow-bearing trees are found in or adjoining the study area, seven of which are in the APZ.

5.2.4 No.5 shaft

Vegetation around the No. 5 shaft is consistent with PCT 1083: Red Bloodwood - scribbly gum heathy woodland in moderate condition and one hollow-bearing tree is found in the northeast corner. Managed understory vegetation is typically low native shrubs and Bracken *Pteridium esculentum*.

PCT 1083: Red Bloodwood - scribbly gum heathy woodland vegetation in moderate condition occurs along the power line easement between No. 4 and No. 5 shafts. The open native grass and sedge land present in the APZ provides good potential habitat for orchid species. Three hollow bearing trees are found outside the easement and APZ disturbance area. An active Common Wombat *Vombatus ursinus* burrow is found north of the No.4 shaft. Weeds are generally absent.

The explosives shed is surrounded by PCT 1083: Red Bloodwood - scribbly gum heathy woodland in low condition. Condition improves to moderate outside of the inner management area. A single hollow-bearing tree is north of the access track within the study area. Whisky Grass *Andropogon virginicus* an invasive exotic species is dominant within the fenced compound.

5.3 Bushfire Risk

The remote areas, steep slopes and dense bushland areas of the escarpment are difficult to readily access to manage uncontrolled bushfire. The locality of bushfire, available fuel load and the prevailing weather conditions are key factors influencing the significance of bushfire risk.

The Russell vale mine site locality, escarpment and WaterNSW special areas have been subject to significant bushfires in the past. Significant fires occurred in September 1939, October 1968, November 1980,

These fires coincided with extended dry periods, hot, dry and windy conditions leading to extreme fire weather. All the above fires burnt extensive areas of bushland.

The start of a typical fire season coincides with fresh to strong south west to northwest winds, which prevail during August and September. The majority of bush fires can occur from this period until the onset of summer rains or coastal showers. Longer fire seasons are experienced when rainfall is lower than average extending the bush fire season through summer to early autumn (Illawarra BFMC, 2008).

Fires generally travel in an easterly direction under the influence of westerly winds. Southerly and/or easterly winds also have the potential to intensify wildfire burning on or along the escarpment (Illawarra BFMC, 2008).

6 POTENTIAL IMPACTS

The proposed upgrades to Pit Top will occur within existing disturbed areas, and no direct or indirect impact on biodiversity is anticipated as a result of these works. A summary of potential implications of development of the study area and recommendations to minimise impacts during the implementation of the project is provided in **Table 11.**

Table 11 - Potential impacts and recommendation for avoidance and minimising impacts

Ecological value	Impacts	Recommendations	
		Avoid	Minimise and mitigate
Native vegetation including trees – includes areas associated with the asset protection zone (APZ) creation and maintenance. Vegetation in a low condition the form of Illawarra Escarpment Blackbutt Forest, and Urban/native/exotic occurs within the study area which may be affected by Asset Protection Zone maintenance. No BC Act or EPBC Act communities or threatened species were recorded within the study area.	Indirect impacts to native vegetation include weed incursion and impacts from grazing as a result of feral pests such as deer and rabbits. Clearing of native revegetated areas	Design has previously considered location of native plant communities and the development footprint and the associated APZ will not require the removal of high or moderate quality Illawarra Escarpment Blackbutt Forest.	▪ Identifying the locations of Illawarra Escarpment Blackbutt Forest (**Figure 15**) as **No Go zones** in the Project Construction Environmental Management plan (CEMP) or similar for construction activities and this plan for operational use including site inductions. ▪ Install appropriate barriers to the boundary of the Illawarra Escarpment Blackbutt Forest for any construction areas/ activities or operational activities where there is no other restriction that acts to remove potential for accidental encroachment. ▪ Ensure any modification to the project during further concept planning or during construction that has some potential to impact on the native vegetation is assessed and measures implemented to

Ecological value	Impacts	Recommendations	
		Avoid	**Minimise and mitigate**
			avoid impacts to vegetation are undertaken. All residual impacts must be recorded and provided in annual reporting. ▪ Ensure appropriate sediment control measures are put in place to ensure run-off during construction does not result in indirect impacts to native plant communities. ▪ APZ is to be maintained in accordance with Bushfire Management Plan (WCL 2020).
Native species including threatened species	Low potential for Grey-headed Flying Fox and Powerful Owl which have the potential to utilise the study area occasionally only for opportunistic foraging. No powerful owls have been detected on site during previous monitoring. The likelihood of the powerful owl being recorded on site is low. Direct impact via clearing and maintenance of APZ	▪ No hollow-bearing trees were observed within the proposed footprint, leading to no potential for the species to be nesting on site.	▪ APZ is to be maintained in accordance with Bushfire Management Plan (WCL 2020). Pre-APZ maintenance inspections are to be undertaken with scope to locate any potential nesting fauna or newly established threatened species/populations. ▪ Carryout program of vertebrate pest control or removal. ▪ The speed limit on site is capped at 40km/h to reduce the potential impact to the powerful owl of collisions with vehicles.

Ecological value	Impacts	Recommendations	
		Avoid	**Minimise and mitigate**
	Loss of habitat such as Hollow-bearing trees, screening vegetation Vertebrate pests		▪ No coal haulage trucks are allowed to access site after 6pm, and vehicle traffic is also reduced after 6pm. ▪ Threatened species unexpected find protocol in **Table 16**.
Surface water	Runoff from the following: ▪ Disturbed catchments including the pit top area and coal handling infrastructure. ▪ Hardstand areas including the maintenance workshop area, administration offices, access roads and car parking.	Recommendations provided within the Surface Operations Water management plan (WCL 2021)	▪ Dirty water runoff generated within disturbed areas the site is intercepted and managed by a series of dirty water drains, pipelines, and dams to allow for treatment and reuse on site. Further details of the RVC Pit Top water management system is included in section 5.1 of the Water Management Plan (WCL 2021). ▪ Ongoing water quality monitoring is undertaken at discharge locations, allowing for exceedances to be identified and corrective actions implemented in accordance with the Water Management Plan (WCL 2021).
NSW priority and environmental weeds/ WoNS	Weed spread leading to degradation of adjacent bushland and community	Appropriate hygiene methods are implemented to stop weed spread throughout community to avoid degradation within retained native vegetation.	▪ Treat all weeds prior to undertaking works to minimise weed spread. ▪ Implement the weed management program, outlined in **Section 9.3.1**, within the study area including reporting.

Ecological value	Impacts	Recommendations	
		Avoid	Minimise and mitigate
Bushfire	Increased risk of Bushfire	Hazard reduction activities including the establishment and maintenance of 'Asset Protection Zones' (APZ) around RVC infrastructure, and between RVC site and neighbouring land and properties.	Implementation of a number of key risk control measures: • Establishment and or maintenance of APZ • Bushfire fighting resources available onsite • Vegetation maintenance onsite
Vertebrate Pest Species	Predation by introduced herbivores (rabbits, hares and wild deer) can have an adverse effect on the natural ecosystems and the establishment of plantings by defoliating, damaging, removing or killing both young and established plants.	Management to ultimately remove pest species via targeted programs as per **section 9.5**.	▪ Protection measures around new plantings. ▪ Maintain existing site fencing ▪ Reduction in vegetation that allows for such pests to not be observed

Figure 10 Threatened flora records within 5km of the study area

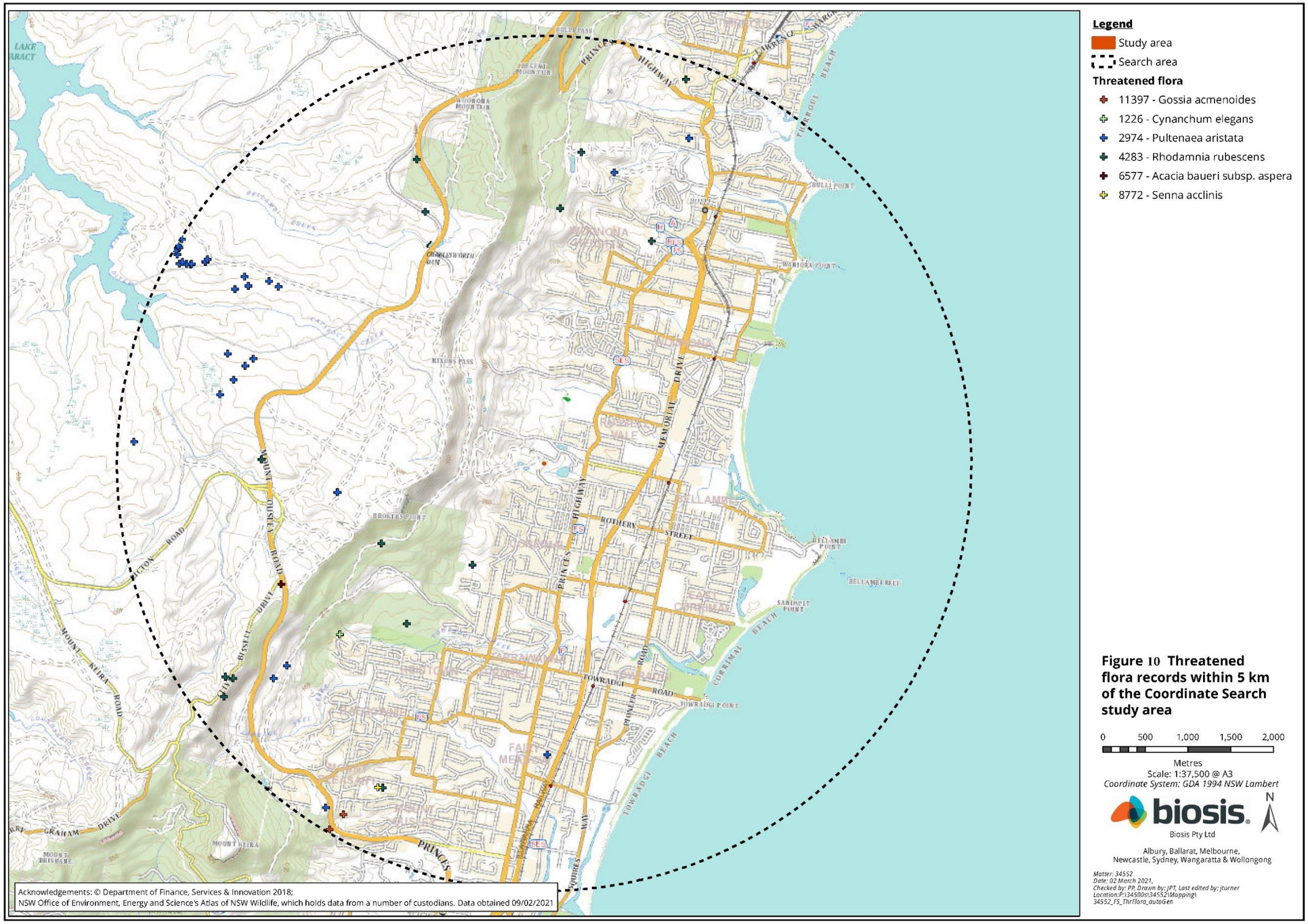


Figure 11 Threatened Fauna records within 5km of the study area

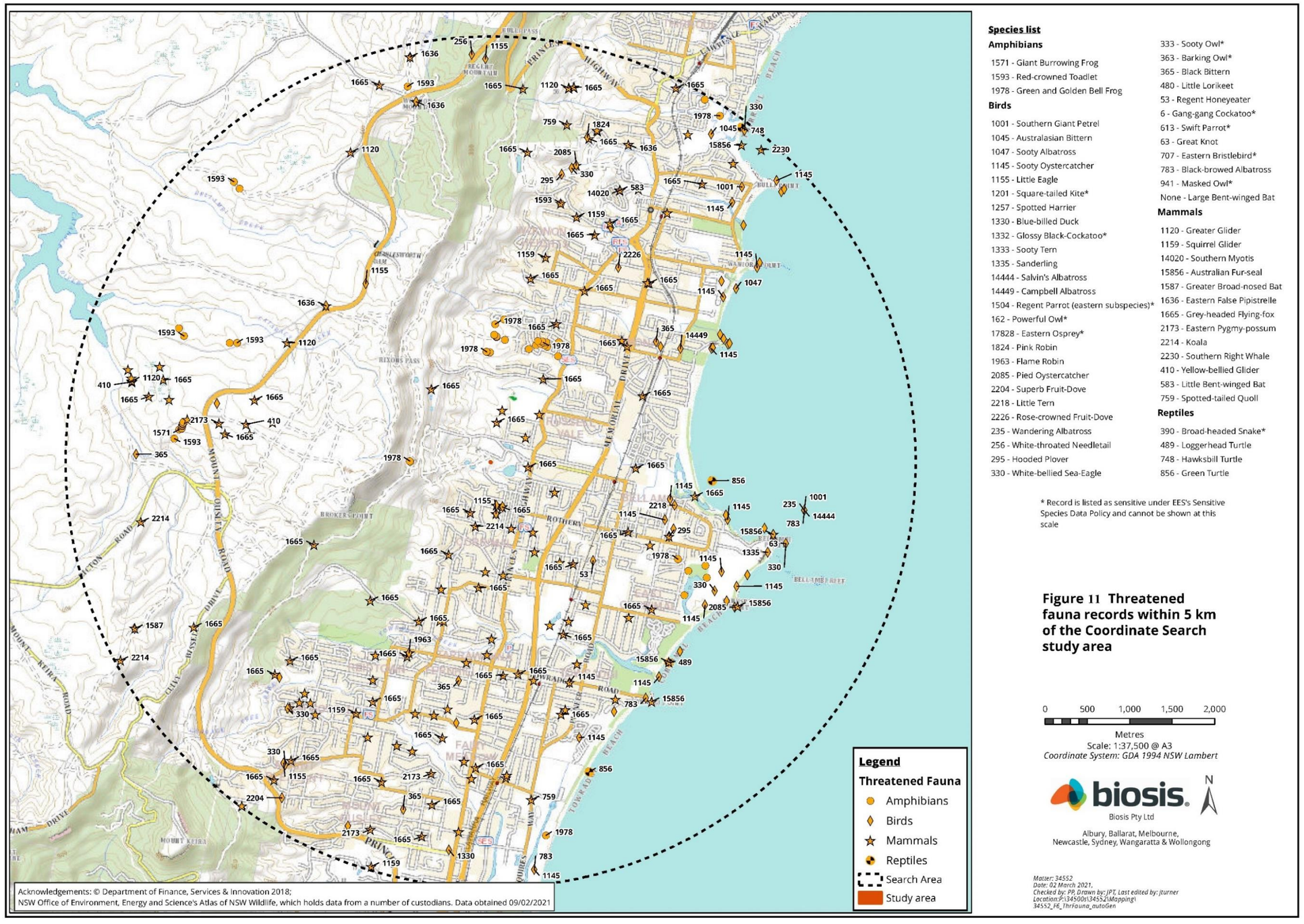
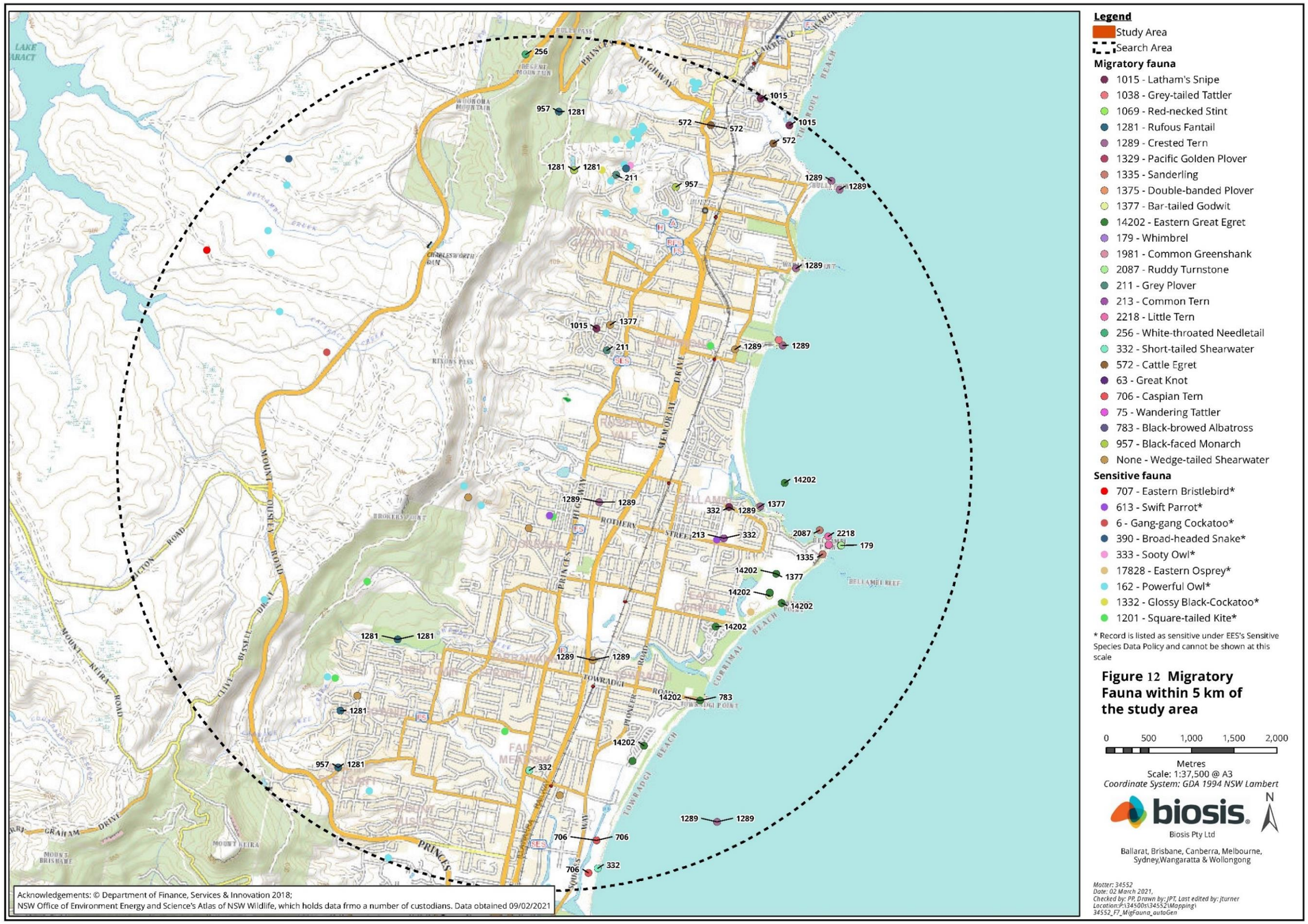


Figure 12 Migratory species recorded within 5km of the study area



7 PERFORMANCE CRITERIA

7.1 Performance measures

Performance measures for the study area in coordination with **Condition B21** of the DC MP09_0013 are provided as **Table 12.**

Table 12 - Biodiversity management actions and performance criteria

Management action	Responsibility	Task / performance criteria	Timing
Remnant vegetation and habitat	Environment and Approvals Manger Facilities/ Land Manager	**Short term management measures:** ▪ Installation of informative signage or protective fencing/bunting on borders of moderate or high vegetation types i.e. No Go Zones. ▪ Construction area boundaries delineated and demarcated established to prevent access to areas of remnant vegetation/ habitat. ▪ WCL staff and their associated sub/contractors are informed during the induction process of the locations of areas of remnant vegetation. ▪ Weed monitoring program (see below) baseline established. ▪ Implementation of weed management plan that incorporates NSW priority and aggressive woody weed species, and WoNS (see **section 5.1.7** of this plan). ▪ No increase in the projected foliage cover (PFC) of weed species within the disturbance area.	▪ Prior to the commencement of the surface facility construction works. ▪ Prior to commencement of activities involving removal of weeds. ▪ Where construction or operational activities are likely to impact or are adjacent.

Management action	Responsibility	Task / performance criteria	Timing
		Medium term management measures: ▪ Continued implementation of the weed management plan that incorporates NSW priority and aggressive woody weed species, and WoNS (see **section 5.1.7** of this plan). ▪ 5 – 10% reduction in the projected foliage cover (PFC) of weed species within the disturbance area. ▪ Weed control and monitoring program continues. ▪ Support of weed removal with replating where possible. ▪ Continued maintenance of the informative signage and/or protective fencing/bunting for revegetation as required borders of moderate or high vegetation types i.e. No Go Zones ▪ Assessment for and replacement of failed vegetation where required.	▪ Over the duration of construction phase of the project. ▪ 6 monthly inspection of revegetation areas to identify the success of the revegetation based on the relevant performance criteria.

Management action	Responsibility	Task / performance criteria	Timing
		Long term management measures: • Continued implementation of the weed management plan that incorporates NSW priority and aggressive woody weed species, and WoNS (see **section 5.1.7** of this plan). • 20% reduction in the projected foliage cover (PFC) of weed species within the disturbance area. • Maintenance of restored areas to support vegetation restoration. • Continued maintenance of the informative signage and/or protective fencing/bunting on borders of moderate or high vegetation types i.e. No Go Zones. • Final Restoration for areas	▪ To commence at the completion of the construction phase of the surface facility upgrades and continue for the life of UEP project.
Surface water	Environment and Approvals Manger	Treated water discharged from the RVC Pit Top WMS is currently undertaken in accordance with EPL12040 and discharged via LDP 2 In addition the EPL defines three other licenced discharge points (LDPs 1, 3 and 9) and two ambient water quality monitoring points (EPLs 11 and 12) for the RVC site. Dirty water runoff generated within disturbed areas around the site is intercepted and managed by a series of dirty water management system of drains, pipelines, and dams to allow for treatment and reuse on site. Dams and drains would be subject to a vegetation maintenance routine to prevent establishment of trees or woody weeds in critical areas such as spillways, dam	▪ Monthly during discharge. ▪ Regular inspections of the dams and drainage lines in accordance with the WCL RVC Surface Operations Water Management Plan.

Management action	Responsibility	Task / performance criteria	Timing
		embankments. Further details of the RVC Pit Top water management system is included in section 5.1 of the RV Surface Operations Water Management Plan (WCL 2021). The downstream water monitoring program outlined in **section 8.2** of this Plan will be monitored and has been detailed in the RVC Surface Operations Water Management Plan and has been included for context only in terms of the aquatic macroinvertebrate sampling program.	
NSW priority weed and aggressive environmental weed control	Environment and Approvals Manger Facilities/ Land Manager	Primary and secondary NSW priority weed control works are to include the following actions over the 5-year period: **Short Term** Development of weed control program in accordance with **Table 24** to identify areas and approximate timing, and proposed treatment. **Medium Term** ▪ Reduction in the projected foliage cover of mature exotic species within the disturbance area to 30-40%, with the aim to reduce to 10% in the long term. ▪ Continued weed management program with NSW priority vine and woody weeds in identified areas and strategy to undergo primary treatment within the first months. ▪ Following weed control, revegetation is to be undertaken to prevent soil erosion and prevent weed encroachment/ return. **Long Term**	• From the outset of vegetation management program. ▪ 6 monthly weed monitoring to direct the medium term weed control program.

Management action	Responsibility	Task / performance criteria	Timing
		• Repeat treatments where required are to be ongoing as required over the duration of the SoBMP. • Commencement of maintenance of NSW priority woody weeds works will occur once mature exotic species have been reduced to 10% Projected Foliage Cover (PFC).	
Revegetation – general	Environment and Approvals Manger Facilities/ Land Manager	General site revegetation to assist in revegetation of key locations as per would be guided by **Figure 14** and the Visual Impact Management Plan (VIMP) (WCL2 021e). Species selected for revegetation are to be wherever practicable selected from that provided from the Visual Impact Management Plan as **Table 25** and **Table 26.** **Performance Criteria** • Maximum loss of 20% of the original planting numbers for an individual species, will trigger replanting of the lost species. • A minimum of 85% survivorship for each species is to be maintained. • Replacement planting is to be carried out throughout the maintenance period to sustain the 85% survival rate at the completion of the maintenance period. • Losses of greater than 15% of originally installed plantings may have the maintenance period extended until survival rates have been achieved.	6 monthly inspection of revegetation areas to identify the success of the revegetation based on the relevant performance criteria. Watering visits to continue as required to plant establishment. Weed removal as required to the completion of the maintenance period.
Revegetation - construction/	Environment and Approvals	Species selected for revegetation are to be selected as per Table 4 of the *Visual Impact Management Plan VIMP* (WCL	▪ Commences immediately following final installation of all plants.

Management action	Responsibility	Task / performance criteria	Timing
vegetation disturbance	Manger Facilities/ Land Manager Construction Contract Manager	2021e) with Suggested species for revegetation activities is provided as **Table 25** and **Table 26.** **Performance Criteria** • There will be a maximum loss of 20% of the original planting numbers for an individual species. • A minimum of 85% survivorship for each species is to be maintained. • Replacement planting is to be carried out throughout the maintenance period to sustain the 85% survival rate at the completion of the maintenance period. ▪ Losses of greater than 15% of originally installed plantings may have the maintenance period extended until survival rates have been achieved. Additional activities to ensure successful plant establishment and maintenance is provided as **section 9.4.**	▪ Watering visits to continue as required to plant establishment. ▪ Weed removal as required to the completion of the maintenance period.
Rehabilitation	Environment and Approvals Manger. Facilities/ Land Manager,	Key milestones for progressive rehabilitation milestones from commencement of operations to decommissioning and mine closure incorporating the measures in Table 5 of the Consent has been prepared in the form of a Mine Operations Plan, (MOP WCL 2021). WCL will continue to progressively rehabilitate the site in accordance with the milestones in the MOP in a manner generally consistent with Table 5 of the Consent as they apply to the described surface facilities. Specifically, as per Table 5 WCL will ensure rehabilitation:	Progressive and as required.

Management action	Responsibility	Task / performance criteria	Timing
		For all areas of the site affected by the development is:, • Safe, stable and non-polluting landforms. • Fit for the intended post mining land user/s. • Establish the final landform and post mining land use/s as soon as practicable after cessation of mining operations. • Minimise post mining environmental impacts. For areas prosed for native ecosystem re-establishment: • Self-sustaining native ecosystems. • Established noting local plant communities. • Includes riparian habitat within any disturbed and or revegetated creek lines and retained water features. • Habitat, feed, and foraging resources for threatened fauna species. • Vegetation connectivity and wildlife corridor, as far as is reasonable and feasible. Final landforms: • Stable and sustainable for intended post mining land use/s. • Consistent with surrounding topography to minimise visual impacts. Surface infrastructure: • Revegetated with suitable land local native plant species to a landform consistent with the surrounding environment. Portals and Vents: ▪ Decommissioning and made safe and stable.	

Management action	Responsibility	Task / performance criteria	Timing
		▪ Retain habitat for threatened species (e.g. bats) where practicable.	
Vertebrate pest management	Environment and Approvals Manger Facilities/ Land Manager	▪ Contribute to the regional reduction in numbers as required over the duration of the BMP in coordination with LLS as per **section 9.5** of this BMP.	▪ Annually.
Clearing of vegetation	Environment and Approvals Manger Facilities/ Land Manager	▪ No clearing of vegetation in areas of remnant vegetation. ▪ Clearing of vegetation for the creation of approved APZ, maintenance of existing, and maintenance of fire trails and access roads onsite only.	▪ Ongoing.

8 MONITORING AND REPORTING

8.1 Site inspections

The Environmental team will undertake regular inspections of the Colliery at least monthly or as required upon identification of works or activities with the potential to impact upon remnant biodiversity values as per **Table 11** and identify any remediation/rectification work required, and areas of actual or potential noncompliance.

The results of the inspections will be recorded in the Site Environmental Inspection Checklist Non-compliances identified (e.g. vegetation management, storage/disposal, bin capacity) are to be reported with appropriate actions identified, managed and implemented in accordance with the EMS.

Records will include the nature of the deficiency, any actions required and an implementation priority. The completion of the actions will be monitored to ensure they are implemented within specified timeframes of the EMS.

8.2 Water Quality Monitoring

8.2.1 Surface water monitoring

The RVC Pit Top water management system includes separate management systems for clean and dirty water generated on site. The clean water management system consists of a series of diversion drains and dams that, combined, are intended to intercept runoff from clean catchment areas prior to flowing into operational or disturbed areas, thereby minimising the volume of water removed from the surrounding environment. Dirty water runoff generated within disturbed areas the site is intercepted and managed by a series of dirty water diversion drains, pipelines, and dams to allow for treatment and reuse on site. Further details of the RVC Pit Top water management system is included in section 5.1 of the Surface Operations Water Management Plan (WCL 2021).

8.2.2 Licenced discharge points and ambient monitoring locations

Wollongong Coal currently holds an Environment Protection Licence (EPL) (12040) for operations at RVC, issued under section 55 of the NSW Protection of the Environment Operations Act 1997 (POEO Act). Treated water discharged from the RVC Pit Top WMS is currently undertaken in accordance with EPL12040, which defines four licenced discharge points (LDPs 1, 2, 3 and 9) and two ambient water quality monitoring points (EPLs 11 and 12) for the RVC site, as well as the applicable discharge limits at these locations.

Further details of the RVC Pit Top water management system is included in section 5.1 of the Water Management Plan (WCL 2021) and section 3 of the Pit top Surface Water Management Plan (SWMP, WCL 2021).

Details of water monitoring requirements and locations provided in **Table 13** and **Figure 13** are subject to potential future EPL modification discussions with the EPA, and are not expected to change at this time. Should a future EPL update be required this table would be updated at this time.

Table 13 - Environment Protection Licence Monitoring Locations

Point	Description	Monitoring Requirements	Frequency	EPL Limit Conditions	Site Specific Triggers
LDP1	Licensed Discharge Point: Underground drainage from coal stockpile and forested area in Rath's Gully.	pH Total Suspended Solids Turbidity Electrical Conductivity	Monthly during discharge	-	-
LDP2	Licensed Discharge Point: Treated water outlet discharging to Bellambi Gully.	pH Total Suspended Solids Turbidity Electrical Conductivity	Monthly during discharge	pH: 6.5 – 9.2 TSS: 50 mg/L	pH: 8.5 – 9.1 (20th/80th percentile) EC: 2,434 µS/cm (80th percentile) TSS: 26 mg/L (80th percentile)
		Volume	Continuous -	Discharge: 2,500 kL/day (EPL)	Discharge: 2,500 kL/day (EPL)
LDP3	Licensed Discharge Point: Seepage through the SWCD wall into Bellambi Gully.	-		-	-
LDP9	Licensed Discharge Point: The SWCD gabion spillway discharging to Bellambi Gully.	-	-	-	-
LDP11	Ambient Monitoring Point: Bellambi Gully ambient water quality west of Princes Highway.	Turbidity Electrical Conductivity Volume	Continuous	-	pH: 8.0 – 8.9 (20th/80th percentile) EC: 1,508 µS/cm (80th percentile) TSS: 224 mg/L (80th percentile)

Point	Description	Monitoring Requirements	Frequency	EPL Limit Conditions	Site Specific Triggers
LDP12	Ambient Monitoring Point: Bellambi Gully upstream. ambient water quality.	Turbidity Electrical Conductivity Volume	Continuous	-	-

8.2.3 Aquatic ecological monitoring of Bellambi Gully Creek

Aquatic and ecological monitoring of Bellambi Gully will be undertaken during operations to inform closure planning and address EPBC conditions regarding the development of appropriate downstream site specific ANZECC criteria and monitoring to determine compliance with the ANZECC. Aquatic ecology monitoring will also be required prior to post closure Adit discharge that is anticipated to occur circa 2050.

8.2.3.1 Operational discharge monitoring

Aquatic ecological monitoring will be undertaken at Bellambi Gully in order to identify any impacts to aquatic biota associated with the ongoing Adit discharge and discharge of treated water from Russell Vale Colliery included as part of the approved project in accordance with the EPBC Approval and Table 4 of the Consent. The aquatic ecological monitoring will enable the identification of any impacts to aquatic environments within Bellambi Gully and provide baseline data to inform relevant management measures to protect downstream aquatic biota or receiving waterbodies. This data will also assist in the development and application of site specific physico-chemical trigger values.

A minimum of two downstream aquatic ecological monitoring sites will be established along Bellambi Gully, with a minimum of two control sites also established to provide reference conditions. These control sites will be located such that any impacts associated with the Adit operational discharges can be differentiated from past and existing diffuse impacts to local waterbodies associated with residential, industrial and infrastructure development in the locality and provide a characterisation of the current pollution status of waterways. The results will provide a suitable basis for the interpretation of monitoring results from Bellambi Gully in the context of current waterway conditions and likely effect on aquatic ecosystems.

The impact and control sites will be established during an initial site assessment to be completed before second working commence. This will ensure the most appropriate and representative locations for monitoring are utilised.

The aquatic ecological monitoring at Bellambi Gully will be undertaken bi-annually in spring and autumn within freshwater environments during operational discharge. The aquatic ecological monitoring methods will include the collection of 'edge' macroinvertebrate samples according to the NSW AUSRIVAS protocols. The biological sampling will be augmented by the following supplementary methods to build a comprehensive understanding of aquatic conditions at each site:

- Visual aquatic habitat assessments (HABSCORE), following Barbour et al. (1999).

- Supplementary on-site water quality measurements for a basic suite of parameters including pH, dissolved oxygen, electrical conductivity, turbidity and alkalinity at a minimum.
- Photo point monitoring.
- Consideration of the results of discharge water and sediment monitoring undertaken by Wollongong Coal as relevant to the aquatic ecological monitoring program.

The collective data will be used to compare ecological condition between the impact and control monitoring sites. The multiple methods of analysis will be used to characterise the steam health condition and water quality status of each site and also enable the detection of any impacts to aquatic ecosystems within Bellambi Gully. These data will also provide an indication of any potential impacts to downstream receiving environments beyond Bellambi Gully.

These data will provide a longer term and more sensitive understanding of stream health conditions of Bellambi Gully and reference waterways than physicochemical water quality sampling alone. In addition, these data will also identify how any impacts associated with discharge may manifest within the aquatic environment. The data will provide a biological input into the development of site-specific water quality monitoring trigger values for operational discharges in order to inform ongoing monitoring works, impact assessments and management or mitigation measures.

8.2.3.2 Closure planning Adit discharge aquatic ecological monitoring

As closure is anticipated to occur around 2050, it is likely that specific aquatic ecological monitoring sampling methods will have progressed in that time. However, the framework of monitoring described above for operational monitoring provides a suitable basis to inform the closure planning monitoring approach. A review of monitoring methods included in this section and the suitability of control sites should be completed and updated as relevant prior to the monitoring commencing.

The aquatic ecological monitoring at Bellambi Gully will be undertaken bi-annually in spring and autumn within freshwater environments. Aquatic monitoring will be undertaken at least two years year prior to anticipated Adit discharge (informed through groundwater monitoring and modelling), and for at least two years following the commencement of any discharge of Adit water into Bellambi Gully (should discharge occur). The survey methods will include:

- Macroinvertebrate sampling according to the NSW AUSRIVAS protocols, along with benthic macroinvertebrate sample collection.
- Visual aquatic habitat assessments (HABSCORE), following Barbour et al. (1999).
- Supplementary on-site water quality measurements for a basic suite of parameters including pH, dissolved oxygen, electrical conductivity, turbidity and alkalinity at a minimum.
- Photo point monitoring.
- Analysis of the results of discharge water and sediment monitoring undertaken by Wollongong Coal as relevant to the aquatic ecological monitoring program.

The collective data will be used to compare ecological condition between the impact and control monitoring sites, as well as post-discharge monitoring data to pre-discharge monitoring data. Benthic macroinvertebrate samples analysed to ascertain the pollution sensitivity of the benthic macroinvertebrate community at each site and infer the pollution status of sediments.

These multiple lines of evidence will be used in partnership with the before-after-control-impact (BACI) approach to enable the detection of any impacts to aquatic ecosystems within Bellambi Gully and provide an indication of any potential impacts to downstream receiving environments. The data will provide biological input into the development of site-specific water quality monitoring trigger values for the Adit discharge in order to inform ongoing monitoring works, impact assessments and management or mitigation measures.

8.3 Bellambi Gully diversion Works

The Bellambi Gully Diversion project includes works to further separate clean and dirty water systems onsite.

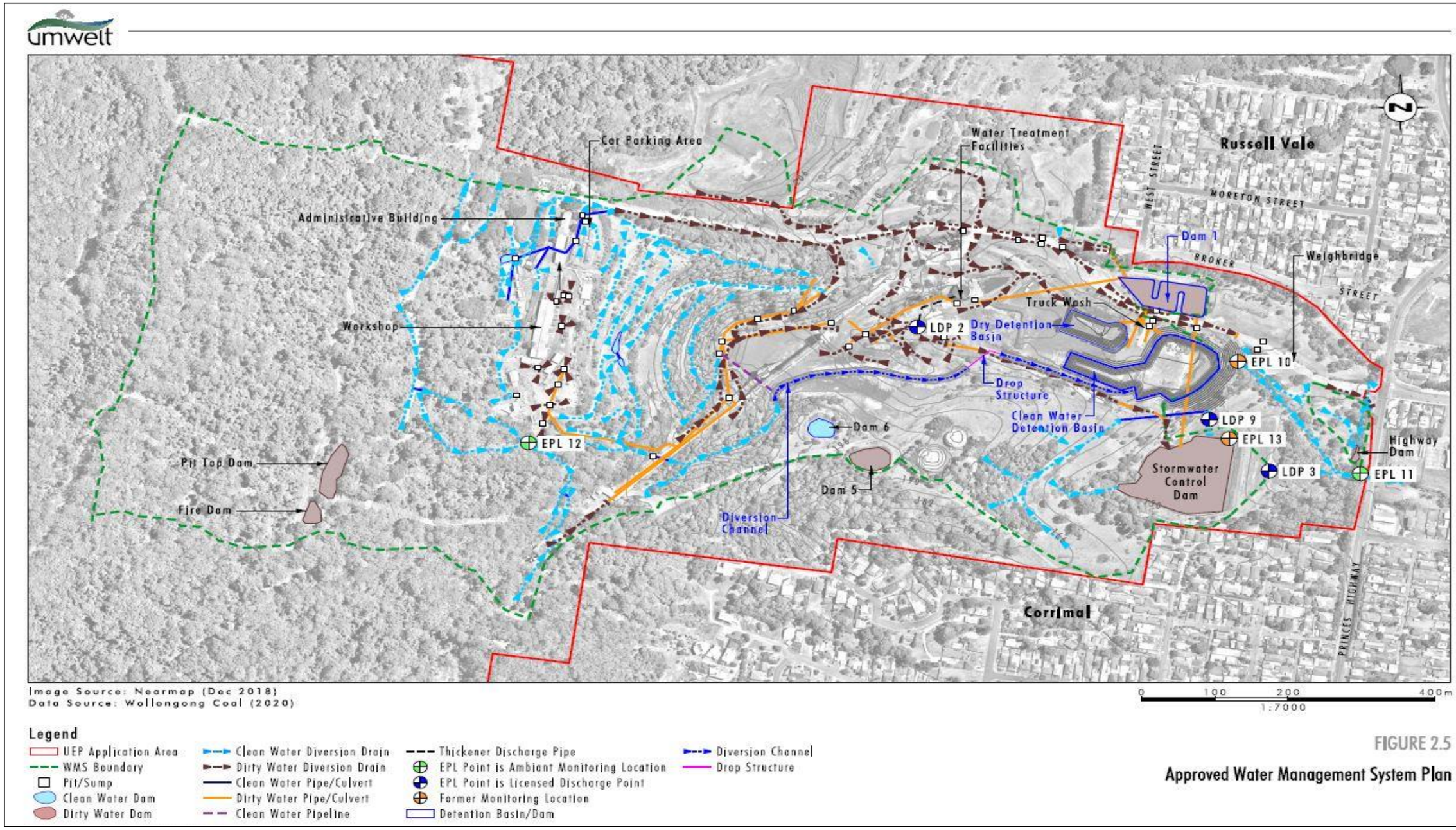
The project includes the replacement of existing 'trash racks' with self-cleaning debris control structures at the inlets at the top of the site and at the entry of adjacent catchments, control of flows through dirty water areas and establishment of a new dry dirty water basin, a new channel to direct Bellambi Gully flows around the operational stockpile area to the new clean water basin.

The future operation of these structures and any monitoring relevant to this plan will be addressed upon completion.

8.4 Biodiversity Monitoring

All monitoring is to be undertaken in accordance with **Table 14** of this SoBMP. The monitoring programs are detailed below.

Figure 13 Existing surface water monitoring locations (UMWELT 2020)



8.4.1 Biodiversity monitoring framework

The biodiversity monitoring framework for the surface facilities is provided as **Table 14.**

Table 14 - Biodiversity monitoring framework

Management action	Specification / Requirement
Weed management	Weed Monitoring works are to be undertaken by the Vegetation Management Consultant or similarly qualified professional. Monitoring surveys will assess the success of weed removal, plant growth and natural regeneration, and will be undertaken as follows: ▪ Prior to commencement of mining operations to gather baseline data and map. ▪ Establishing a photo-points in representative locations. ▪ Compile initial and on-going weed density maps. ▪ Assessment of weed control works including priority and woody weed control, and weed density surrounding plantings, via monitoring techniques such as weed density mapping. ▪ Assessment of the success rate of plantings and assessment of plant replacement requirements and convey any need to Bush regeneration contractor. ▪ Assessment of the site for evidence of herbivory and erosion. ▪ Survey every six (6) months to gather ecological monitoring data on the progress of the project. Each six-month survey should be accompanied by a brief report from with the consultant/ contractor and the manager regarding the progress of the works against the performance criteria and highlight any areas of concern / merit. This would be reported on in the annual environmental management report for the duration of this Plan being 5 years. ▪ Progress and success of the weed management works will be reported and updated in each preceding report as milestones are achieved.

Management action	Specification / Requirement
Surface water	Treated water discharged from the RVC Pit Top WMS is currently undertaken in accordance with EPL12040, which defines four licenced discharge points (LDPs 1, 2, 3 and 9) and two ambient water quality monitoring points (EPLs 11 and 12) for the RVC site. Dirty water runoff generated within disturbed areas the site is intercepted and managed by a series of dirty water drains, pipelines, and dams to allow for treatment and reuse on site. Further details of the RVC Pit Top water management system is included in Section 5.1 of the Water Management Plan (WCL 2021). The downstream monitoring would be carried out as described in **section 8.4** above.
Remnant/planted vegetation	Monitoring of remnant planted vegetation works are to be undertaken by the Vegetation Management Consultant or similarly qualified professional. Monitoring surveys will assess the success of plant growth and natural regeneration by reviewing the vegetation condition in addition to any weed management, and will be undertaken as follows: ▪ Prior to commencement of mining operations to gather baseline data and map. ▪ Establishing a photo-points in representative locations. ▪ Assessment of weed control works including priority and woody weed control, and weed density surrounding plantings, via monitoring techniques such as weed density mapping. ▪ Assessment of the success rate of plantings and assessment of plant replacement requirements and convey any need to Bush regeneration contractor. ▪ Assessment of the site for evidence of herbivory and erosion. ▪ Survey every six (6) months to gather ecological monitoring data on the progress of the project. Each six-month survey will be updated form the preceding report as milestones are achieved accompanied in a brief report from the consultant/ contractor regarding the progress of the works against the performance criteria highlighting any areas of concern / merit. This would be reported on in the annual environmental management report for the duration of this Plan being 5 years.

Management action	Specification / Requirement
Vertebrate pest	All pest vertebrate pest control activities are to undertaken in consultation with LLS and if required Wollongong City Council. Suggested control methodologies as would be applied in accordance with best practice guidance such as the South East Regional Strategic Pest Animal Plan 2018-2023. The pest management program is detailed below with specific mitigation measure for those pest species identified onsite with the program likely to include the following: • Ground shooting -. • Cage trapping – for Rabbit, hare or Fox. • Baiting or Poisoning - 1080 baiting, such as Foxoff ® for Fox and wild dogs). • Habitat removal - Warren/den ripping and or fumigation for rabbits/ hares • Biological control - Hemorrhagic Disease Virus (RHDV) release (rabbit). Monitoring of vertebrate pest species to be undertaken in association with a suitably trained and qualified professional. Monitoring surveys will assess the success of measures to reduce pest numbers and will be undertaken as follows: ▪ Prior to commencement of mining operations to gather baseline data. ▪ Establishing a photo-points in representative locations. ▪ Assessment of any pest control efforts to date ▪ Assessment of the site for evidence of herbivory and erosion. Survey as outlined below with the result to be detailed in a brief report from the consultant/ contractor regarding the progress of the works against the performance criteria highlighting any areas of concern / merit. This would be reported on in the annual environmental management report described in **section 12** of this plan for the duration of this Plan being 5 years. **Rabbits/ Hares** • Monitoring of Rabbit abundance will be undertaken in accordance with the South East Regional Pest Animal\ Plan 2018 – 2023 (State of New South Wales through local land services, 2020). Monitoring will include visual observation of sightings, scratching and scats. Density will be assigned based on the following criteria: - (nil): No rabbit sightings or sign.

Management action	Specification / Requirement
	- 1 (low): Few or no sightings and/or little active sign. - 2 (medium): Some rabbits seen at any time and/or much active sign. 3 (high): Rabbits seen at any time much sign of activity active warrens, dung hills, scratching's. **Foxes** Monitoring of Fox abundance will be undertaken using baited remote cameras. Five baited cameras will be placed out across the stewardship site for four nights during late summer, when independent young are expected to be disperse and adults will be active (State of New South Wales through local land services, 2020). Should monitoring identify the presence of Foxes additional controls will be reviewed for implementation in consultation with LLS. **Deer** The results of Feral Deer monitoring, and any culling as would be carried out in accordance with LLS and DPI guidelines will be included within the annual report.
Bushfire	All bushfire mitigation measures in association with the study area are to be undertaken in accordance with the WCL Bushfire Management Plan (WCL 2021) for which has been prepared in compliance with **Condition B40** of the Project Approval (MP09_0013) for the RVC UEP.

9 MITIGATION AND MANAGEMENT STRATEGIES

Environmental management will be undertaken in accordance with the process described in **Figure 17.**

9.1 Exclusion fencing

Prior to the commencement of earthworks where those works are adjacent to, or have the potential to impact on, remnant vegetation or areas of weeds, exclusion fencing is to be installed along the boundaries of the works. Exclusion fencing or bunting will also be installed around revegetation area's to prevent access and exclude further impacts for the duration of the revegetation program (or until revegetation objectives have been achieved). If any works are to be conducted outside of the approved surface infrastructure areas, or in the vicinity of sensitive areas; the sensitive areas will be identified and delineated prior to any works being conducted to protect vegetation and fauna.

Where these works have the potential to impact on mature trees, i.e. the drip zone the alignment of this fencing is to be in accordance with the Australian Standard Protection of Trees on Development Sites (AS4970-2009).

The fencing should be constructed of, as a minimum, capped star pickets and high visibility para webbing and have appropriate signage stating that it is an environmentally sensitive No-Go area to inform and educate construction personnel. Exclusion zones are to be clearly marked and labelled on design drawings issued for construction and should be displayed in prominent places and provided in site inductions.

No storage of materials or machinery is to be undertaken within exclusion zones or retained vegetation, no preparation of chemicals or ancillary construction activities such as the mixing of concrete to be carried out in these areas, and care to avoid the compaction of soils to be observed.

9.2 Erosion and sediment controls

Earthworks are not to commence until sediment and erosion controls have been installed as per the UEP project CEMP and as required the Bellambi Gully CMP and Surface Operations Water Management Plan SoWMP (2021) for which includes an Erosion and Sediment Control Plan. Erosion and sediment control is to be observed and monitored for the entire construction phase of the development, and as required during construction/ earth disturbance and or where identified as required vegetation removal works onsite.

Where an APZ is required to be created the Hazard Reduction Certificates (HRC) require the APZ's to be cleared using the specified method. The Colliery HRC specifies no mechanical hand clearing, mowing or brush cutting as a result of the slope of the land and the risk of machinery creating erosion issues when tracking up sloped areas. However, due to the area of APZ's that are to be cleared and managed at RVC, mechanical land clearing determined to only be feasible option in combination with mulching of vegetation following a risk assessment of the associated erosion risks.

9.3 Weed Management Measures

This proposed construction and operational works have the potential to introduce and or promote environmental weeds inclusive of WoNS and pathogens. The weed management and

mitigiation applies to those areas that described as comprising the Russell Vale Surface facilities in S1.4 of this plan.

There are described as exotic species considered either a high risk of dispersing and becoming established in adjacent native vegetation or have the potential to cause significant ecological harm.

Weed management measures to be undertaken over the duration of this plan are to include:

- Development of a weed management program (see **section 9.3.1**)
- The use a range of weed management methods such as slashing or mowing (physical and mechanical control) as well as a range of herbicides (to avoid herbicide resistance).
- Mow/slash grasses areas infested with weeds before they seed (avoiding native vegetation).
- Dispose of weed contaminated soil at an appropriate waste management facility.
- Remove weeds immediately and dispose of without stockpiling wherever practicable.
- Separate weeds from native vegetation to be mulched – do not use weeds for mulch.
- Minimise soil disturbance in weed infested areas.
- all plant and equipment used at the site is will employ appropriate vehicle hygiene measures such as:
    - Clean machinery, vehicles and footwear where they have been in contact with an area of weed infestation before moving to a new location onsite.
    - Securely cover loads, waste skips/ containers, or stockpiles of weed-contaminated material.

9.3.1 Weed Management Program

This weed management program will be undertaken in consultation with the Illawarra Weeds District Authority. The weed management program has been developed in accordance with the outcomes and performance criteria in the *Southeast Regional Strategic Weed Management Plan 2017 – 2022* (Local Land Services, 2017), and follows section 6.2 "The guiding principles for implementation". The following principles will be used to guide weed management planning and implementation and are consistent with the weed reforms and leading practice:

- Prevention and early intervention are the most effective weed management actions.
- Causes of weed invasion and spread are managed wherever possible, not just the symptoms.
- The biology and ecology of weeds, including dispersal mechanisms, vectors and pathways for spread are considered in weed management.
- Innovation which results in more effective and efficient weed management is encouraged.
- Regular monitoring, evaluation and improvement are incorporated in weed management programs.
- Weeds are managed in a strategic and coordinated manner across the landscape. Assessing and managing weed risk at a landscape and multi species scale (where appropriate) can lead to significant efficiencies in use of resources and achievement of strategic outcomes.

- The best available science, expertise and tools are utilised in weed management decision making and practice.

The program will include:

- The current baseline (April 2021) overall weed densities of recorded environmental weeds priority species woody weeds, WonS recorded on site, and the development of a figure showing their current distribution. Species specific control for priority and environmental weeds recorded within the subject site are provided in **Table 24** and shown in **Figure 15.**
- Primary and secondary treatment of all environmental weeds, priority weeds and WoNS recorded on site, as described in **section 7.1.**
- Development of a targeted hierarchical approach to be monitored and reported against.
- Application of the recommended control techniques as outlined in **Appendix D.**
- Establishment and maintenance of no-go zones as detailed on site maps.
- Establishment of a program with short, medium, and long-term objectives and actions as below.

Table 15 - Weed management program.

Timing	Action
Short Term	Development of weed control program in accordance with **Table 10** to identify areas and approximate timing, and proposed treatment.
Medium Term	▪ Continued weed management program with NSW priority vine and woody weeds in identified areas and strategy to undergo primary treatment within the first months. ▪ Exotic species to be treated include Lantana, African Love Grass and Asparagus Fern. ▪ Treatment of aggressive woody weed species such as Cassia, African Olive and Large-leaved Privet. ▪ Following weed control, revegetation is to be undertaken to prevent soil erosion and prevent weed encroachment/ return.
Long Term	▪ Repeat treatments where required are to be ongoing as required over the duration of the BMP. ▪ Commencement of maintenance of NSW priority woody weeds works will occur once mature exotic species have been reduced to 10% Projected Foliage Cover (PFC).

9.4 Revegetation

The study area currently contains a series of five landscaped bunds which act as acoustic and visual bunds. Three of the bunds are vegetated with screen planting. As a part of the proposed activity the existing vegetation on these bunds will be revegetated where disturbed and supplemented where necessary to maintain visual screening (see **Figure 14**). Additionally, where identified in the Visual Impact assessment screen plantings will be undertaken to effectively mitigate visual impacts from the approved infrastructure and mining operations.

The tree and screen planting also allows the opportunity to further improve the biodiversity conditions with the planting of a variety of native species indigenous to the Illawarra Region as recommended in *Section 12 Chapter B06 – Development in the Illawarra Escarpment of the Wollongong City Council DCP 2009*. The recommended species planting list for two distinct portions of the study area as provided in **APPENDIX E** is based on species that are characteristic of the vegetation types of Illawarra Escarpment Blackbutt Forest and Illawarra Lowlands Grassy Woodland. Additionally, they are species that are easily propagated and established from readily available local provenance seed.

To ensure a successful survival rate of all planted specimens the following aspects are to be considered:

- Revegetation where practicable is to occur during the months of March to April to ensure optional climatic conditions are available for plant establishment and growth.
- Pest control measures as described in **section 9.5** below.
- Watering visits to continue as required to plant establishment.
- Weed removal as required to the completion of the maintenance period.
- Control of access to areas via establishment of such as area as "*No_Go zones*" and updates to operational figures with appropriate delineation and protection such as:
    - Install fencing or bunting around revegetation area to prevent access and exclude further impacts for the duration of the revegetation program (or until revegetation objective have been met).

9.5 Vertebrate pest management

Predation by introduced herbivores (rabbits, hares and wild deer) can have an adverse effect on the natural ecosystems and the establishment of plantings by defoliating, damaging, removing or killing both young and established plants. To minimise the loss of regenerating and planted specimens through predation, all new plantings and revegetation areas will be subject to suitable protection measures as above in addition to pest management activities. All pest vertebrate pest control activities are to undertaken in consultation with LLS and if required Wollongong City Council. Suggested control methodologies as would be applied in accordance with best practice guidance such as the South East Regional Strategic Pest Animal Plan 2018-2023.

The pest management program is detailed below with specific mitigation measure for those pest species identified onsite with the program likely to include the following:

- Ground shooting -.
- Cage trapping – for Rabbit, hare or Fox.
- Baiting or Poisoning - 1080 baiting, such as Foxoff ® for Fox and wild dogs).
- Habitat removal - Warren/den ripping and or fumigation for rabbits/ hares
- Biological control - Hemorrhagic Disease Virus (RHDV) release (rabbit).

The application of any baiting program would be in accordance with any NSW EPA Pesticide control order in place for the specific material EPA issued pesticide control orders (PCOs) in accordance with Section 38 of the NSW Pesticides Act 1999 to ensure restricted pesticides are used safely, by appropriately qualified and trained personnel, and disposed of appropriately.

9.5.1 Deer

Deer are declared as a game animal in NSW under Schedule 3, Part 1 of the Game and Feral Animal Control Act 2002. Hunters need to acquire a licence to hunt deer on public or private land. NSW Police and NSW DPI retain regulatory oversight of hunting activities. Currently parts of the Game and Feral Animal Control Act 2002 are suspended for Wollongong Local Government Area (LGA), the change removes the requirement to hold a NSW Game Hunting Licence before hunting feral deer on private land, allowing them to be managed in the same way that rabbits, foxes, pigs and goats are controlled.

Primary control methods include:

- exclusion fencing
- shooting (aerial).

Supplementary control methods include:

- shooting (ground)
- trapping and euthanise.

Objectives of the management program include:

- Provide a coordinated wild deer control programs in the management areas and key locations and assets.
- Prevent / minimise wild deer spread offsite.

The control program will include:

- A population density investigation.
- A review of timing of deer control events to minimise issues related to carcass management.
- Report sightings onsite, monitor and control onsite.
- Respond to wild deer hazard reports and control wild deer in response to public complaints for site.
- Monitor distribution change and numbers and monitor extent of environmental impacts with reporting in the annual report.

9.5.2 Rabbits

Australian native vegetation is very sensitive to rabbit damage with as few as 0.5 rabbits per ha noted in NSW Local land services (Rev 2, June 2020) as being enough to prevent the regeneration of a number of threatened or endangered plant species.

Erosion caused by denuded vegetation from rabbit grazing has a major impact on dam catchments, water supplies and maintaining topsoil. The burrowing behaviour of rabbits can undermine roads, culverts, buildings and sites of cultural significance.

Best management pest control supports an integrated, cross tenure approach using a range of primary and supplementary control measures.

Primary control methods include:

- ground baiting
- Warren/den ripping and or fumigation (rabbits/ hares)
- Biological control including Hemorrhagic Disease Virus (RHDV)

- fumigation methods.

Supplementary control methods include:

- shooting.

9.5.3 Red Fox

No foxes have been observed or previously reported on site however the foxes are reasonably suspected to occur in the area.

The primary focus for management for the site is reducing the impact of foxes on threatened species. As control strategies and techniques for foxes are challenging in relation to their capacity to disperse and recolonise. The best management pest control supports an integrated, cross tenure approach using a range of primary and supplementary control measures as below.

Primary control methods include:

- coordinated Ground baiting.

Supplementary control methods include:

- shooting (ground)
- trapping and euthanise.

9.5.4 Baiting programs

In the instance that any baiting program is required, that program would be carried out in accordance with any NSW EPA Pesticide control order (PCOs), as may be in place for the specific material to ensure compliance with Section 38 of the NSW Pesticides Act 1999 to ensure restricted pesticides are used safely, by appropriately qualified and trained personnel, and disposed of appropriately.

Specifically, the methodology of controlling rabbits or hares through the use of Pindone® should not be undertaken due to the potential, threat of secondary poisoning to local populations of threatened species, Powerful Owl *Ninox strenua* (Vulnerable, BC Act).

9.6 Threatened Species

9.6.1 Flora

The project design has previously considered the location of native plant communities in the development footprint, along with the associated APZ, and will not require the removal of high or moderate quality Illawarra Escarpment Blackbutt Forest. This plan has also identified the locations of Illawarra Escarpment Blackbutt Forest (**Figure 9**) as **No Go zones.** This is reflected in the Project Construction Environmental Management plan (CEMP), Bellambi Gully CMP or similar for construction activities and this plan for operational use including site inductions.

Appropriate barriers such as fencing would be placed along the boundary of the Illawarra Escarpment Blackbutt Forest for any construction or operational activities where there is no other restriction that acts to remove potential for accidental encroachment.

9.6.2 Sensitive Area Mapping/ No-Go Areas

Sensitive area, or No-Go area, maps have been developed clearly identifying the ecological values to be avoided during the planning and undertaking of construction and operational

activities (**Figure 9**). A register of sensitive area maps will be maintained with changes captured by the document control process outlined in **section 13.2.**

Any disturbance to areas not already covered by this SoBMP will be assessed through the REF process to ensure that potential impacts to biodiversity are adequately identified and mitigated. Where construction works or operational activities are expected to occur near or around sensitive areas; the sensitive areas will be identified and delineated prior to any works being conducted in the area.

9.6.3 Fauna

The project is not expected to have any direct impact on any threatened species of fauna. However grey headed flying foxes and powerful owls are noted to have the potential to use the site for foraging.

9.6.4 Unexpected Threatened Species Finds Protocol

If during the implementation of the Proposed Action threaded species such as Powerful Owls or Grey Headed Flying fox are encountered within the study area, the unexpected threatened species finds procedure should be followed. This procedure has been developed to satisfy these requirements and details the actions to be taken when a threatened species is unexpectedly encountered during project activities.

This unexpected finds protocol procedure is applicable to all activities conducted by personnel that have the potential to come into contact with terrestrial threatened species. Specifically, surface operations personnel and contractors will be inducted via a specific induction/training program. This will include information on the identification of potential threatened species occurring on site and relevant mitigation measures such, as caution where driving onsite at night.

In the instance that a threatened species is located onsite targeted training would be carried out via specific toolbox meetings and or SWMS to capture any specific identified mitigation measures.

Table 16 - Unexpected finds protocol

Step 1: Threatened species unexpectedly encountered during project activities
If a threatened species is unexpectedly encountered during project activities: ▪ STOP ALL WORK in the vicinity of the find. ▪ Immediately notify the shift supervisor, project manager, and or Environmental Coordinator who will notify the Environmental Manager (EM), ▪ Environmental Manager to contact Ecologist to carry out review of the find.
Step 2: Assessment of Impact
▪ An assessment is to be undertaken by the EM and the Ecologist to determine the likely impact to the threatened species and appropriate management options will be developed in consultation with WCL. ▪ If a significant impact is likely to occur, consultation will be undertaken with the BCD and DPIE as appropriate.
Step 3: Approvals

▪ Obtain any relevant licences, permits or approvals required if the species is likely to be significantly impacted. ▪ Update any relevant ecological monitoring programs and/or biodiversity offset requirements. ▪ Update CEMP and Sub Plans as required.
Step 4: Recommencement of works
▪ Works will recommence once necessary advice has been sought and approval obtained if required. ▪ Include relevant threatened species and/or TEC's in subsequent project inductions and toolbox talks.

9.7 Site Rehabilitation

In accordance with **Condition B44** of the Project Approval, a Rehabilitation Management Plan (RMP) (WCL 2019) as has been addressed via the development of an Operational MOP has been prepared to address the RPPR commitment to progressive rehabilitation over project life, with rehabilitation of all surface facilities following the completion of mining.

WCL will rehabilitate the site in accordance with the conditions imposed on the mining leases(s) associated with the project under the *Mining Act 1992* in a manner generally consistent with the proposed rehabilitation strategy described in the RPPR and the objectives in Table 5 of the Development Consent as they apply to all surface infrastructure components of the development.

As part of the mine closure process, WCL will undertake a program to investigate sealing of the mine adit at the mine closure stage. Any investigation will be undertaken with consideration of the advice of the Independent Expert Panel for Mining in the Catchment and in consultation with relevant agencies, including the EPA, WaterNSW and DPIE. If sealing of the adit is found to be unsuitable or not the preferred option (based on advice and/or consultation), a suitable funding arrangement will be negotiated with the relevant stakeholders to fund the ongoing monitoring and treatment of future water outflows from the adit, if required. The funding arrangement will consider appropriate water quality targets based on an agreed potential end use at the time of closure and will be sufficient for 10 years of monitoring and treatment.

The following Conceptual Completion Criteria detailed in **Table 17** to **Table 19** for the Domains 1 and 2 for the RVC Surface facilities and Domain 3 for the vent shafts will be applied progressively with the mitigation measures in this SoBMP to inform the detailed Closure Plans and progressive restoration.

Table 17 - Domain 1 - Long Term Rehabilitation Indicators

Rehabilitation Phase	Completion Criteria
Decommissioning	▪ Infrastructure removed; ▪ Mine entries sealed to Resource Regulator standards and DSC satisfaction with regard to water egress and adit discharges, threatened species such as bats; ▪ Mine dams and associated drainage lines removed unless required for future residential development;

	▪ Contamination investigated and remediated where required relative to the final landforms.
Landform Establishment	▪ Slopes geotechnically stable; ▪ Substrate characterised across Pit Top; and ▪ Drainage system established.
Growth Medium Development	▪ Growth medium types and depths suitable for grass cover establishment.
Ecosystem Establishment	▪ Rapid growth grasses; ▪ Weed management activities as and where required ▪ Sterile grasses used to establish ground cover; and ▪ Non-invasive residential grasses for permanent ground cover.
Ecosystem Development	▪ Non-invasive ground covers maintained in healthy state.

Table 18 - Domain 2 - Long Term Rehabilitation Indicators

Rehabilitation Phase	Completion Criteria
Decommissioning	▪ Infrastructure removed; ▪ Mine dams and associated drainage lines removed unless required for future residential development. ▪ Contamination investigated and remediated where required relative to the final landforms; ▪ Roads remain serviceable.
Landform Establishment	▪ Slopes geotechnically stable; ▪ Substrate characterised in disturbed areas; and ▪ Drainage system established.
Growth Medium Development	▪ Growth medium types and depths suitable for local native species regeneration.
Ecosystem Establishment	▪ Rapid growing sterile native grasses used to establish initial ground cover; ▪ Local native groundcover for substrate stabilisation; ▪ Weed management activities as and where required. ▪ Rapid growing local native colonisers for initial native community structure establishment; and ▪ Local native species used for mature canopy development.
Ecosystem Development	▪ Groundcovers established; ▪ Ecosystem Development; ▪ Colonisers established; ▪ Mature canopy species established;

Rehabilitation Phase	Completion Criteria
	▪ Recruitment of local native flora species evident; ▪ Out-competition of noxious weeds by native flora species evident; and ▪ Utilisation of site by local native fauna species evident.

Table 19 - Domain 3 - Long Term Rehabilitation Indicators

Rehabilitation Phase	Completion Criteria
Decommissioning	▪ Infrastructure removed; ▪ Dams and reticulation systems removed; ▪ Shafts sealed to regulatory standards; ▪ Boreholes sealed to regulatory standards; ▪ Environmental monitoring equipment removed; and ▪ Contamination remediated; ▪ Roads serviceable.
Landform Establishment	▪ Slopes geotechnically stable; ▪ Substrate characterised in disturbed areas; ▪ Drainage system established; ▪ Subsidence impacted waterways remediated where possible or offset to Regulator satisfaction; and ▪ Subsidence impacted swamps offset to regulator satisfaction.
Growth Medium Development	▪ Growth medium types and depths suitable for local native species regeneration.
Ecosystem Establishment	▪ WaterNSW approved revegetation methods used in rehabilitation of all catchment disturbance areas.
Ecosystem Development	▪ Native species naturally re-established; ▪ Out-competition of noxious weeds by native flora species evident; ▪ Utilisation of site by local native fauna species evident; and ▪ WaterNSW satisfied with rehabilitation.

9.8 Bushfire Management

The risk and potential impact of bushfires on RVC facilities and infrastructure is minimised through the implementation of a number of key risk control measures.

These control measures include:

- Hazard reduction activities including the establishment and maintenance of 'Asset Protection Zones' (APZ) around RVC infrastructure, and between RVC site and neighbouring land and properties. APZ's provide the following benefits in the event of a Bushfire:
  - A buffer zone between a bush fire hazard and an asset;
  - An area of reduced bush fire fuel that allows suppression of fire;
  - An area from which back-burning may be conducted; and
  - An area which allows emergency services access and provides a relatively safe area for firefighters to defend the assets and property.
- Management of vegetation, primarily done through routine lawn mowing and vegetation clearing around site.
- Maintenance of Fire Trails to a standard for Category 1 Fire Trail access where possible i.e., 4m wide clearing.

APZs as are managed in accordance with the NSW RFS Standards for Asset Protection Zones (RFS 2019) are inspected annually, for vegetation regrowth, and any clearing of vegetation within the APZs required to maintain compliance is conducted by WCL as required prior to the commencement of the annual bushfire season. This clearing is managed via an approved Hazard Reduction Certificates (HRC) and its associated conditions.

The main hazard reduction activity conducted onsite is the management of vegetation. This is primarily done through routine lawn mowing and vegetation clearing around site in association with the creation and ongoing maintenance of APZ's as a physical control method to reduce the vegetation density around the company's assets and property boundaries. Several APZs have been identified and developed with the NSW Rural Fire Service (RFS) during an inspection of RVC site. These APZ's are in place at the site as shown in **Figure 16.**

Specifically in relation to the clearing of the HRC's, the certificates require the APZs to be cleared using the method of mechanical hand clearing, mowing or brush cutting except in the case of specific exemption. For the WCL RV site RFS approved an exemption to allow mechanical clearing using machinery and mulching of vegetation pending a risk assessment of the associated erosion risks.

Upon completion of vegetation clearing conducted under a HRC, HRC Return Form for the relevant HRC must be filled out, signed off and returned to the RFS District Officer.

The clearing of vegetation within the APZ's, around ventilation shafts, located in drinking water catchment areas managed by Water NSW, is conducted under, and in accordance with, the Water NSW Activity Approval and Environmental Management Plan for this activity.

Any hazard reduction burns conducted on RVC Site will be completed by RFS staff in conjunction with any other relevant authorities and in consultation with WCL representatives.

Further detail regarding bushfire management is outlined in the Bushfire Management Plan (WCL 2020).

Figure 14 Revegetation locations within the study area

Figure 15 Location and densities of keystone weed species within the study area

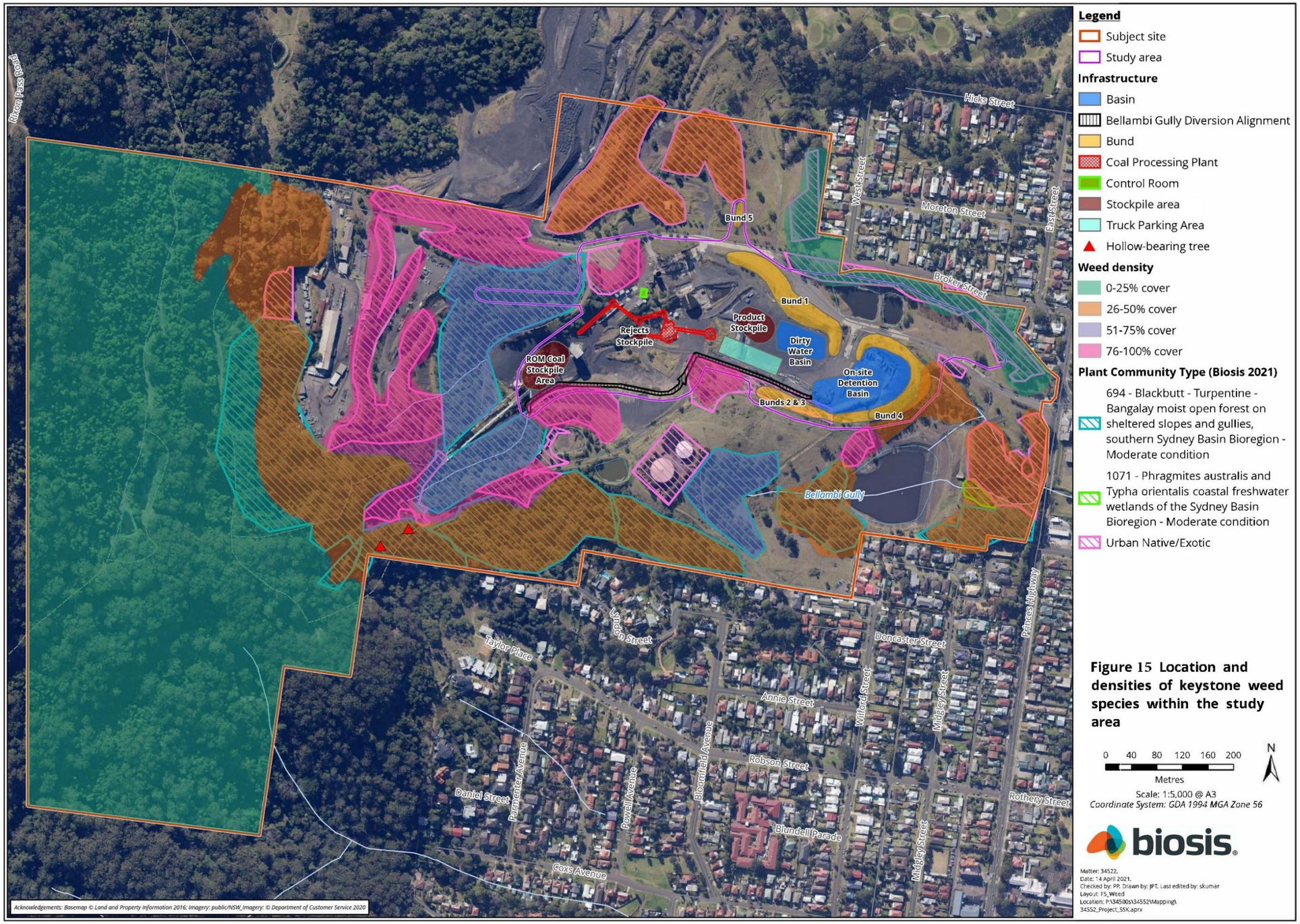


Figure 16 Bushfire Asset Protection Zones

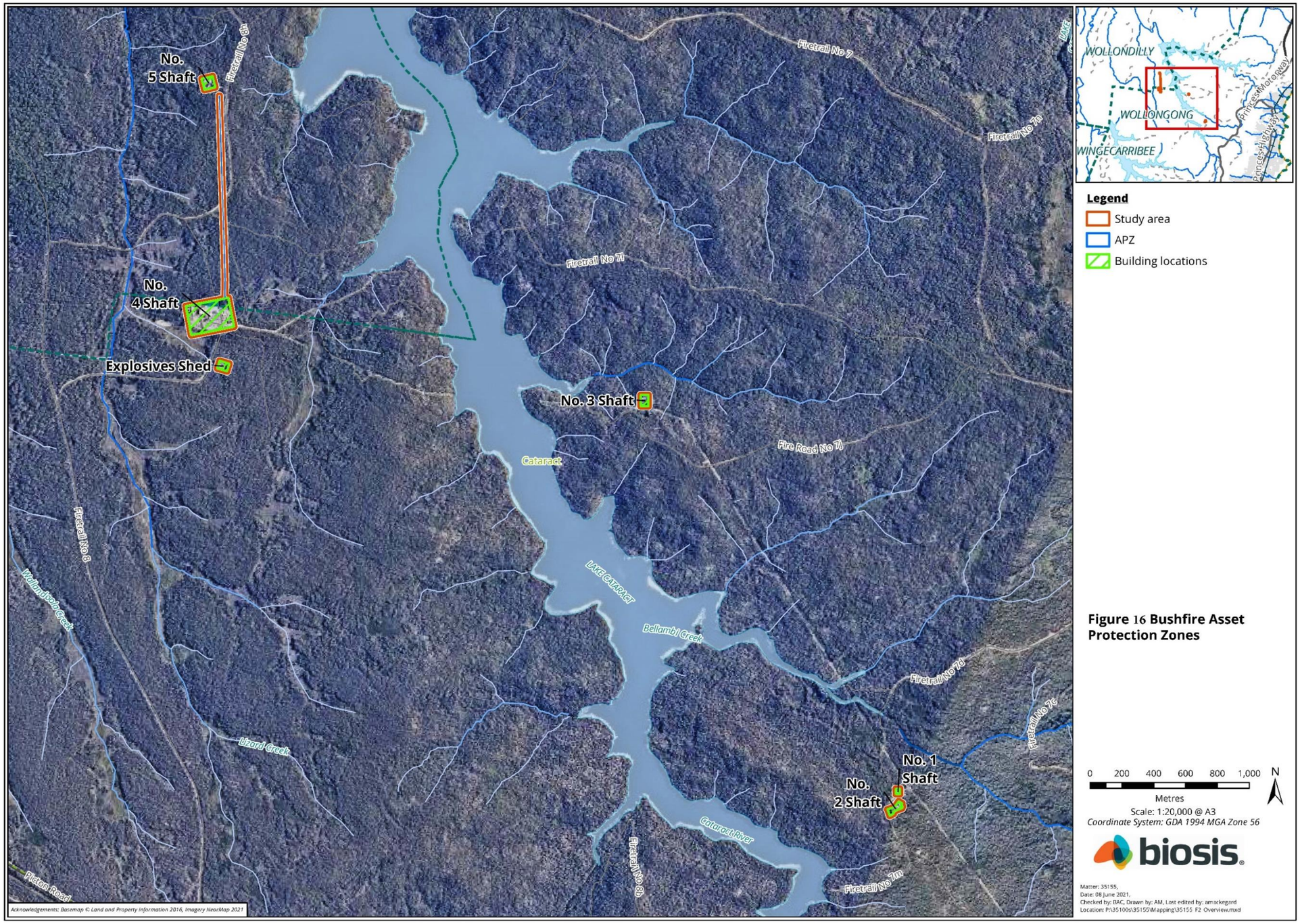


Figure 16 Bushfire Asset Protection Zones

9.9 Adaptive management

In accordance with Condition F4, where exceedances of the identified criteria or performance measures in **Section 7** of this plan has occurred, WCL will at the earliest opportunity:

- Take all reasonable and feasible steps to ensure that the exceedance ceases and does not re-occur such as contingency planning.
- Consider all reasonable and feasible options for remedial treatment (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action.
- Within 14 days of the exceedance occurring, submit a report to DPIE describing the remedial options and any preferred remedial measures or other course of action, and
- Implement remediation measures as directed by the Planning Secretary.

Contingency measures if exceedances occur are provided in **section 7.1**.

9.10 Contingency Plan

Condition F5(f) requires WCL to establish a contingency plan to manage any unpredicted impacts and their consequences, and to ensure that ongoing impacts reduce to levels below relevant performance measures or criteria as quickly as possible.

This takes the form of a contingency plan and provides a simple, transparent and useable reference for the management of aspects or issues at the Colliery, and the implementation of appropriate management measures.

The regular prescribed audits would act to identify contingency measures specific to the issue (e.g. weeds, revegetation, water quality) and refer to the specific RVC Operational management Plan TARP as required (e.g. RVC Surface Operations Water Quality re Water Quality, RVC Visual Impact Management Plan re revegetation) that will be considered as address potential non-conformances with the performance measures detailed in **Section 7** and **Table 12**, including associated consequences and opportunities to improve environmental performance of the development over time. The contingency process of review will include:

- The observation will be reported to the Group Environmental Manager as soon as possible.
- The observation will be recorded.
- The Group Environmental Manager will investigate any potential contributing factors and identify an appropriate action plan to manage the identified impact(s), in consultation with specialists and/or relevant agencies if necessary.
- WCL will identify an appropriate action plan to manage the identified impact(s), in consultation with other specialists and/or key stakeholders.
- WCL will continue to monitor performance with the new action plan in place and, if successful will formalise these actions as part of the Management Plan. Contingency measures will be developed in consideration of the specific circumstances of the issue and the assessment of consequences.
- Application of the Unexpected Threatened species find protocol.

10 INCIDENTS, AND NON CONFORMANCE REPORTING

10.1 Handling incidents and non-compliance

The Development Consent defines:

• An **'incident'** to be "an occurrence or a set of circumstances that causes or threatens to cause material harm and which may or nor cause a non-compliance".

• '**Non-compliance** as "an occurrence, set of circumstances or development that is a breach of this consent".

In accordance with Condition F1(d)(iv), any incidents, exceedance or non-compliance will be managed through established WCL procedures as detailed in the EMS (Wollongong Coal 2021a).

10.1.1 Incidents

The DC MP09_0013 defines an 'incident' to be "*An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance*".

Incidents will be managed through established WCL procedures and in accordance with **Condition 9** WCL must "*immediately notify the DPIE and any other relevant agencies immediately after it becomes aware of an incident*". The notification must identify the following items:

- The development application number and name.
- The location and nature of the incident.

A detailed report of the incident shall be provided to DPIE within 7 days of the incident occurring.

10.1.2 Non-Conformance Protocol

As required by **Condition F10**, WCL will notify DPIE of any non-compliance within seven days of becoming aware of it in accordance with established protocol developed as a component of the Environmental Management System (EMS).

The notification will set out the condition of the consent that the project is non-compliant with, why it does not comply, the reasons for the non-compliance (if known), and what actions have been, or will be, undertaken to address the non-compliance.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with WCL Russell Vale Colliery, and will be promoted through direct consultation and direction of the mines' Operations Manager. A Compliance Register will be established to monitor compliance against development consent criteria, mining leases and licenses through the Compliance Register.

For the purpose of this Management Plan, an exceedance of the criteria specified Table 4.1, or that is deemed to be the direct result of operational emissions from the site, will be classified as a Biodiversity incident.

The notification will set out the condition of the consent that the project is noncompliant with, why it does not comply, the reasons for the non-compliance (if known), and what actions have been, or will be, undertaken to address the non-compliance.

In addition, as required by **Condition E1**, where there is an exceedance of any of the criteria in the Consent, WCL will notify:

- Affected landowners in writing. Affected landowners will be notified of an exceedance as soon as practicable, and no longer than 7 days after the monitoring results have been obtained.

WCL will also provide regular monitoring results to these landowners until the project is again complying with the relevant criteria.

10.2 Inspections and compliance

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with WCL Russell Vale Colliery, and will be promoted via direct consultation and through the direction of the Operations Manager.

Regular targeted inspections and/or internal audits will be undertaken as required by suitably qualified personnel under the direction of the E&C Manager, to identify any remediation/rectification work required, and areas of actual or potential non-compliance.

A Compliance Register will be established to monitor compliance against Development Consent criteria, mining leases etc. Non-compliances identified through the Compliance Register are to be reported, with corrective actions implemented.

A review of WCL's compliance with all conditions of the Development Consent, mining leases and all other approvals and licences will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on WCL's website.

10.3 Complaints Handling

Complaints will be managed through established WCL procedures and as required by **Condition F5 (h)(iii).** The Colliery will ensure the telephone number and email address in which environmental and pollution complaints can be made is easily accessible to the community, via both signage at the operation and advertised by the Wollongong Coal website.

The Environmental Manager is responsible for ensuring that the currency and effectiveness of the telephone service is maintained. Notifications of complaints received are to be provided as quickly as practicable to Environmental Manager, or delegate.

The complaints register will include the following details:

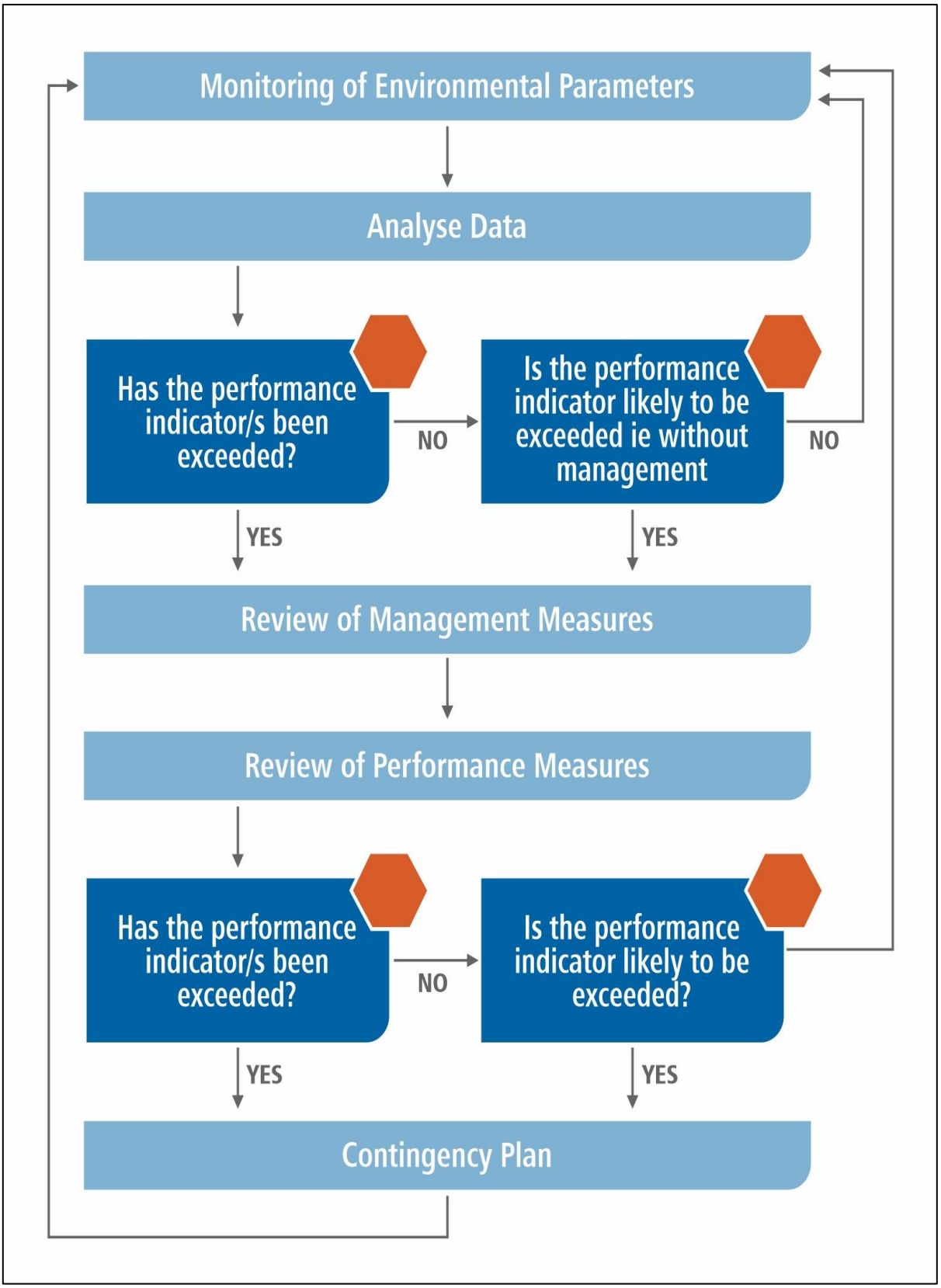
- Date and time of the complaint.
- The method by which the complaint was made.
- Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect.
- The nature of the complaint.
- The action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant.
- If no action was taken by the licensee, the reasons why no action was taken.

Where possible tools such as site video footage would be used in addition to any monitoring, auditing, site or compliant location, inspection records would be used response to potential complaints.

In accordance with **Condition F17(a)(x)** of the Consent, a Complaints Register will be made publicly available on the website and updated on a monthly basis. A summary of complaints received, and actions taken will be presented to the CCC as part of the operational performance review as per **Condition F17(a)(v**), in addition to internal review at the regular SMT meetings, and or daily operating meeting.

A summary of complaints received, and actions taken will also be included in the Annual Review and the Annual Environmental Management Reports (AEMRs). The record of a complaint will be kept for a minimum four-year period after the complaint was made.

Figure 17 Environmental management process



11 PLAN ADMINISTRATION

11.1 Roles and Responsibilities

Environment and community management is regarded as part of the responsibilities of all Colliery personnel. The roles and function of the main personnel responsible for the implementation of environmental and community management including the plans, procedures and action plans contained in this BMP are outlined in the Environmental Management System (EMS).

Specifically in accordance with Condition B21(h) the WLC Group Management team including the Group Environment and approvals manager are responsible for ensuring that the monitoring, reviewing, and implementation of this plan is facilitated, resources and implemented.

11.2 Resources Required

In accordance with the WCL SYS POL 003 Environmental Policy, Management shall ensure that the appropriate resources are made available to achieve the implementation of this Plan including the monitoring, reviewing as outlined in **section 12** Audit and Review.

It is the role of the Group Environment Manager to ensure that these requirements are communicated to WCL Management.

11.3 Training and Awareness

In accordance with **Condition A28**, all WCL employees, contractors (and their sub-contractors) are to be made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.

All training and inductions conducted are to be undertaken as per the WCL Training procedures.

11.3.1 Staff Training

Staff training will be undertaken as detailed in the Environmental Management Strategy (EMS). This consists of three levels of training applicable to different types of staff:

- Level 1 – High level training regarding environmental requirements – Management staff.
- Level 2 – Operational level training – Project Managers, Supervisors, Surface Personnel.
- Level 3 – Basic environmental awareness – All staff and contractors.

In the event that there are specific environmental management requirements relating to a contractor's work activities, details of these requirements are to be issued to the contractor in writing as a part of the induction.

Records, which detail the attendees, content of the induction/training will be maintained.

Additional targeted training will be provided as deemed necessary via toolbox talks or specific briefings to individuals or groups of workers with a specific authority or responsibility for operational environmental management, or those undertaking an activity to provide them with the knowledge, skills and awareness to minimize the potential for and extent of any impacts to Biodiversity onsite.

This may occur via the following forums:

- Delivery of Toolbox Talks highlighting waste minimisation and management issues;
- Incorporation of relevant safeguards update into crew training days; and

- Refresher training where required.

At a minimum this will include:

- Contractors whose activities are not directly supervised by Colliery personnel; and
- Contractors whose activities are ongoing and have the potential to result in an impacts to Biodiversity in the areas identified or otherwise result in an incident (e.g. stockpile contractors, vegetation maintenance contractors).

Notices may also be posted on the notice boards in crib rooms and elsewhere around the site to advise of waste minimisation and management measures.

11.3.2 Inductions

All personnel, including contractors, sub-contractors and staff, are required to attend a compulsory site induction that includes an environmental component prior to commencement of works on site. This The Environment Manager/Site Environment Representative, or delegate, will conduct the environmental component of the site induction.

The environmental component will include an overview of:

- Mandatory HSECQ Rules, Environment Policy and EMS requirements.
- General environmental duty of care;
- Relevant details of this Management Plan, including purpose and objectives;
- Key environmental matters of relevance i.e. aspects and impacts relevant to site biodiversity values;
- Specific requirements and responsibilities with regard to implementation of mitigation measures; and
- Incident response and reporting requirements.

A record of all environment inductions will be maintained and kept on site. The Site Environment Representative may authorise amendments to the induction where required to address project modifications, legislative changes or amendments to this Management Plan or related documentation. The Environment Manager/Site Environment Representative will review and endorse the induction program and monitor its implementation.

12 AUDIT AND REVIEW

12.1 Annual Review

In accordance with **Condition F11,** WCL will prepare an annual review of the environmental performance of the project. The timeframe and scope of the annual review are defined in Section 5.1 of the EMS.

The items that are directly relevant to this Management Plan include:

- A comprehensive review of the monitoring results and complaints records of the Project over the past year, including a comparison of these results against the:
    - Relevant statutory requirements, limits or performance measures/criteria;
    - Requirements of any plan or program required under the Development Consent;
    - Monitoring results of previous year/s; and
    - Relevant predictions in the document/s listed in Condition A2(c).
- Any non-compliance or incident which occurred in the previous calendar year, and what actions were (or are being) taken to rectify the non-compliance and avoid recurrence;
- Any complaints, non-compliance or incident which occurred in the previous calendar year, and what actions were (or are being) taken to rectify the non-compliance and avoid recurrence; and
- What measures will be implemented over the next year to improve the environmental performance of the Project.
- Evaluation and reporting on:

  o The effectiveness of the air quality management system; and

  o Compliance with the performance measures, criteria and operating conditions of the approval.
- Trends in the monitoring data over the life of the project;
- Any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- What measures will be implemented over the next calendar year to improve the environmental performance of the project.

A copy of the Annual Review will be submitted to WCC, WSC and made available to the CCC and any interested person upon request, in accordance with **Condition F12**.

12.2 Auditing

In accordance with **Condition F13**, an Independent Environmental Audit will be undertaken by a suitably qualified auditor and include experts in any field specified by the Secretary. The timeframe and scope of the audit are defined in Section 5.2 of the EMS.

It is further noted that any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, it is taken to be monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This further

includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.

12.3 Plan Revision

In accordance with **Condition F7**, this WMP will be reviewed within three months of:

- The submission of an incident report under Condition F9;
- The submission of an annual review under Condition F11;
- The submission of an independent environmental audit under Condition F13; or
- The approval of any modification of the conditions of the development consent (unless the conditions require otherwise).

The suitability of existing strategies, plans and programs required under the development consent will be reviewed by WCL.

In accordance with **Condition F8**, if necessary, to either improve the environmental performance of the project, cater for a modification or comply with a direction, the strategies, plans and programs required under the Development Consent will be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document will be submitted to the Planning Secretary for approval within 6 weeks of the review.

12.4 Reporting and Continual improvement

Progress against the performance requirements of this plan will be assessed during annual reporting cycles where WCL will continue to investigate and implement ways to improve the environmental performance of the development with respect to the objectives of this plan over time which will be reported in Wollongong Coal's Annual Review.

This will be in the form off annual ecological monitoring reporting noting outcomes of the biodiversity monitoring framework in April each year for incorporation into the annual reporting as required under **Condition F11**, distributed in accordance with **Condition F12** as outlined above. This review is to include a comprehensive assessment of monitoring results to date and analyses of data collected to date.

13 RECORD KEEPING AND CONTROL

13.1 Information and Records

All environmental management documents including this SoBMP are maintained on the WCL website so that they are always current at the point of use.

Types of records required to be kept and or made available on the website as they are obtained in accordance with **Condition F17** include:

- The documents as listed in condition A2(c) of this consent.
- All current statutory approvals required for the development.
- All approved strategies, plans, programs required under the conditions of this consent.
- Information on the proposed staging of all the development where relevant and a summary of the current phase and progress of the development.
- Minutes of CCC meetings.
- Regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent.
- A comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs.
- Contact details to enquire about the development or to make a complaint.
- A complaints register, updated monthly.
- The Annual Reviews of the development.
- Audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report.
- Any other matter required by the Planning Secretary.
- Minutes of environmental management system review meetings and evidence of any action taken.

All documents described in this plan are subject to ongoing review and continual improvement. This includes times of change to scheduled activities or to legislative or licensing requirements.

Only the EM or delegate, has the authority to change any of the EMS documentation.

13.1.1 Public sources of data

To assist the public and other stakeholders understand the impacts from the development, including monitoring results, newsletters and updates, and in accordance with Condition F5(i), WCL will:

- publish information on the company website;
- notify the local community through the Russell Vale CCC; and
- contact individuals by direct notification (email subject to registration of interest) where relevant.

This information will be updated as required.

13.2 Document Control

Environmental records are to be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

All records of the EMS will be stored so that they are readily retrievable and suitably protected from deterioration or loss. Archiving will be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

The revision status of this plan is indicated in the title section of each copy. Revisions to any documents listed within this Plan will not necessarily constitute a revision of this document.

Controlled copies of this plan are addressed as below:

- A master copy of each EMS document including all appendices and supporting information is to be held in the office of the E&C Department.
- On the WCL website.

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Wollongong Coal 2021b. Russell Vale Colliery – Russel Vale East Pit Top – Revised Underground Expansion Project - Biodiversity Management Plan.

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Wollongong Coal 2021d. Russell Vale Colliery Russell Vale East – Revised Underground Expansion Project – Surface Water Management Plan.

15 GLOSSARY OF TERMS AND ABBREVIATIONS

Abbreviations	
BCD	Biodiversity Conservation Division within the DPIE
BMP	Biodiversity Management Plan
DAWE	Department of Agriculture, Water and the Environment
DPIE	Department of Planning, Industry and Environment
DRE	Division of Resources and Energy within DTIRIS
EEC	Endangered Ecological Community
EES	NSW Environment, Energy and Science
E&C	Environment and Community
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environmental Protection Authority
EPL	Environmental Protection Licences
LGA	Local Government Area
LLS	Local Land Services
Mtpa	Million tonnes per annum
NRAR	Natural Resources Access Regulator
NRE	Gujarat NRE Coking Coal Limited
OEH	Office of Environment and Heritage
PA	Project Approval
PCT	Plant Community Type
ROM	Run of Mine
RPPR	Revised Preferred Project Report
TARP	Trigger Action Response Plan
WCC	Wollongong City Council
WSC	Wollondilly Shire Council
WCL	Wollongong Coal Limited

Terms	
Annual Review	The review as required by condition F11 of the approval.

Terms	
Construction	The construction works for the project as described in the RPPR. Construction work does not include surveys, acquisitions, fencing, investigative drilling or excavation, minor clearing, minor access roads, minor adjustments to services/utilities, works which allow isolation of the site so that access for construction can be provided (including service relocations) and establishing temporary facilities for construction (including for example an office and amenities compounds, temporary water and communications, construction compounds, materials storage compounds, maintenance workshops, testing laboratory or material stockpile areas).
CCC	The Russell Vale Community consultative committee
Conditions of this consent	Conditions contained in Schedule 2
Construction	The construction works for the project as described in the RPPR. Construction work does not include surveys, acquisitions, fencing, investigative drilling or excavation, minor clearing, minor access roads, minor adjustments to services/utilities, works which allow isolation of the site so that access for construction can be provided (including service relocations) and establishing temporary facilities for construction (including for example an office and amenities compounds, temporary water and communications, construction compounds, materials storage compounds, maintenance workshops, testing laboratory or material stockpile areas).
Department	Department of Planning, Industry & Environment
Feasible	Means what is feasible and practical in the circumstances
Incident	A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the Project Approval and which may or may not be a non-conformance. See "Unintended Event" – the Russell Vale Colliery Logistics Manager and the Group Environmental Manager are responsible for determining if a report of an "unintended event" represents an "incident" as defined.
Material Harm	Material harm is harm to the environment that: • involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or • results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment). This definition excludes "harm" that is authorised under either this approval or any other statutory approval'.

Terms	
Mining operations	The carrying out of mining, including the extraction, processing, stockpiling and transportation of coal on the site and the associated removal storage and/or emplacement of vegetation, topsoil, overburden and reject material. Mining operations include both phase-in and full operations.
Mine closure	Decommissioning and final rehabilitation of the site following the cessation of mining activities.
Mitigation	Activities associated with reducing the impacts of the development
Monitoring	For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.
Negligible	Small or unimportant, not worth considering.
Non-Compliance	An occurrence or set of circumstances or development that is a breach of the project consent.
Reasonable	Means applying judgement in arriving at a decision, taking into account mitigation benefits, cost of mitigation versus benefits provided, community views, and the nature and extent of potential improvements.
Secretary	The Secretary of the Department of Planning, Industry & Environment
Second Workings	The extraction of coal from board and pillar workings
Surface Facilities Site	Russell Vale Pit Top site, coal conveyor, truck load out facilities, ventilation shaft sites, and any other site subject to proposed surface disturbance (excluding subsidence impacts) associated with the development.

16 CONTROL AND REVISION HISTORY

Revision History

PROPERTY	VALUE
Approved by	Group Environment and Approvals Manager
Document Owner	Richard Sheehan
Effective Date	20/08/2021

Revisions

VERSION	DATE REVIEWED	REVIEW TEAM (CONSULTATION)	NATURE OF THE AMENDMENT
D1	23/01/2021	Biosis Pty Limited	Draft SoBMP
D2	19/03/2021	Biosis Pty Limited	Draft SoBMP
D3	14/04/2021	Biosis Pty Limited	Draft SoBMP
D4	20/04/2021	Biosis Pty Limited	Draft SoBMP Update to address DPIE feedback
D5	12/06/2021	Biosis Pty Limited	Draft SoBMP Update to address DPIE feedback
D6	16/07/2021	Robert Faddy-Vrouwe Tony Cable Warwick Lidbury	Update Project Description to be consistent with all other management plans and incorporate DPIE feedback dated 9 July 2021.
D7	10/08/2021	Robert Faddy-Vrouwe Devendra Vyas Warwick Lidbury	Update to incorporate DPIE feedback dated 10 August 2021.
D8	20/08/2021	Robert Faddy-Vrouwe	Update to incorporate DPIE feedback dated 19 August 2021.

APPENDIX A – AGENCY CONSULTATION

The relationship of the consultation with DAWE/OWS/IESC in relation to this plan is in relation to the downstream environment of Bellambi Gully Creek and the associated testing program.

Consultation	Date
Draft Public Environment Report Submitted – outlined approach to surface water monitoring	December 2020
IESC Advice received on Draft PER – includes recommendations regarding water monitoring and management	February 2021
Meeting with DAWE/OWS regarding response to IESC advice and preparation of final PER (including management plans)	2 March 2021
Submission of Draft Final PER and draft management plans (including draft Water Management Plan) for DAWE/OWS comment	16 March 2021
Submission of FINAL PER for assessment (including draft Water Management Plan). Final PER included additional commitments around proposed monitoring of downstream catchment and reference site and approach to setting discharge limits for future discharge of adit flows from the portal (post closure) should these be discharged to Bellambi Gully.	14 April 2021
Receipt of Proposed Decision for EPBC Act approval with draft monitoring and water limit conditions.	12 May 2021
Response to draft conditions including proposed changes to discharge conditions	17 May 2021
Meeting with DAWE/OWS to discuss issues around operational discharges to Bellambi Gully	19 May 2021
Receipt of revised draft conditions and provision of additional monitoring data regarding operational discharges	26-27 May 2021
Receipt of revised draft conditions with proposed approach to monitoring and setting of discharge limits for operational discharges.	8 June 2021

APPENDIX B – FLORA AND FAUNA

The following table includes a list of the threatened flora species and ecological communities that have potential to occur within the study area. The list of species is sourced from the NSW BioNet Wildlife Atlas and the Protected Matters Search Tool (DPIE; accessed on 9/02/2021). Examples of criteria (**Table 20**) for determining the likelihood of occurrence for threatened biota as a guide for writing the rationale for likelihood have been listed in **Table 21** and **Table 22.**

Table 20 - Criteria for determining the likelihood of occurrence for threatened biota

Likelihood of occurrence	Potential criteria
High	▪ Species/ecological communities recorded in study area during current or previous assessment/s. ▪ Aquatic species recorded from connected waterbodies in close proximity to the study area during current or previous assessment/s. ▪ Sufficient good quality habitat is present in study area or in connected waterbodies in close proximity to the study area (aquatic species). ▪ Study area is within species natural distributional range (if known). ▪ Species has been recorded within 5 km or from the relevant catchment/basin.
Medium	▪ Records of terrestrial biota within 5 km of the study area or of aquatic species in the relevant basin/neighbouring basin. ▪ Habitat limited in its capacity to support the species due to extent, quality, or isolation.
Low	▪ No records within 5 km of the study area or for aquatic species, the relevant basin/neighbouring basin. ▪ Marginal habitat present (low quality & extent). ▪ Substantial loss of habitat since any previous record(s).
Negligible	▪ Habitat not present in study area ▪ Habitat for aquatic species not present in connected waterbodies in close proximity to the study area. ▪ Habitat present but sufficient targeted survey has been conducted at an optimal time of year and species wasn't recorded.

Table 21 - Threatened flora species recorded / predicted to occur within 5 km of the study area

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Acacia baueri subsp. *aspera*			VU	1999		Negligible	Habitat not present within study area, prefers sandstone heath in exposed conditions.	Low, well branched shrub occurring on the Kings Tableland, the Woronora Plateau, Mt Kiera district and in Wedderburn. Grows in low heath, primarily on exposed sandstone ridges in Sydney Coastal Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths and Wallum Sand Heaths. Grows in open, exposed conditions on infertile sandy loams.
Acacia bynoeana	Bynoe's Wattle	VU	EN	#	PMST	Negligible	Habitat not present within study area.	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Prefers open, slightly disturbed sites on sandy soils.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Caladenia tessellata	Thick Lip Spider Orchid	VU	EN	#	PMST	Negligible	Habitat not present within study area.	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Subalpine Woodlands. Grows on clay loam or sandy soils.
Cryptostylis hunteriana	Leafless Tongue Orchid	VU	VU	#	PMST	Negligible	Habitat not present within study area.	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths. Grows in sandy soils.
Cynanchum elegans	White-flowered Wax Plant	EN	EN	1991#	PMST	Low	Habitat not present within study area.	Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Genoplesium baueri	Bauer's Midge Orchid	EN	EN	#	PMST	Negligible	Habitat not present within study area.	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests. Grows on sandstone substrates
Gossia acmenoides	Scrub Ironwood		EN	2017		Low	Habitat not present within study area. No records within 5 km of study area.	Found in subtropical and dry rainforest on the ranges and coastal plain of eastern Australia. Known from Shellharbour, Wollongong and Kiama LGAs and encompasses all occurrences south of the Georges River. The population in the Sydney Basin Bioregion south of the Georges River is the southernmost occurrence of the species and is approximately 175 km from the nearest population to the north in the Hunter region of NSW. Estimated less than 100 mature plants, through approximately 30 sites. Occurring often as a single individual or small group.
Haloragis exalata subsp. *exalata*	Square Raspwort	VU	VU	#	PMST	Negligible	Habitat not present within study area.	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Melaleuca biconvexa	Biconvex Paperbark	VU	VU	#	PMST	Negligible	Habitat not present within study area.	Large shrub or small tree confined to NSW with scattered, widely dispersed populations around the Jervis Bay area in the south and the Gosford-Wyong area to the north. Grows in damp places, often near streams or low lying areas on low slopes or sheltered aspects in a variety of communities including Hunter-Macleay Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Floodplain Wetlands, Coastal Freshwater Lagoon and North Coast Wet Sclerophyll Forests. Grows in alluvial soils.
Persicaria elatior	Tall Knotweed	VU	VU	#	PMST	Negligible	Habitat not present within study area.	Erect herb found growing in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.
Persoonia hirsuta	Hairy Geebung	EN	EN	#	PMST	Negligible	Habitat not present within study area.	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 m in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests. Grows in sandy soils on sandstone substrates.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Pimelea spicata	Spiked Rice-flower	EN	EN	#	PMST	Negligible	Habitat not present within study area.	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Landsdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open Woodland Coastal Grasslands in the Illawarra region. Grows on well-structured clay soils.
Pterostylis gibbosa	Illawarra Greenhood	EN	EN	#	PMST	Negligible	Habitat not present within study area.	Deciduous terrestrial orchid with a disjunct distribution from the Milbrodale in the Hunter Region, Albion Park and Yallah in the Illawarra Region and Nowra in the Shoalhaven Region. Found growing amongst grasses on flat or gently sloping land with poor drainage in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Woolybutt *E. longifolia*, and White Feather Honey-myrtle *Melaleuca decora*. In Nowra, the orchid can be found growing in association with Spotted Gum Corymbia maculata, Forest Red Gum and Grey Ironbark E. paniculata. In the Hunter Region, the orchid is associated with Narrow-leaved Ironbark E. crebra, Forest Red Gum and Black Cypress Pine Callitris endlicheri. Grows in red brown loam soils.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Pterostylis saxicola	Sydney Plains Greenhood	EN	EN	#	PMST	Negligible	Habitat not present within study area.	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests. Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.
Pultenaea aristata	Prickly Bush-pea	VU	VU	2016#	PMST	Negligible	Habitat not present within study area.	Small shrub restricted to the Woronora Plateau between Helensburgh and Mount Kiera. Found growing in Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, Southern Lowland Wet Sclerophyll Forests and Coastal Swamp Forests. Grows on sandstone substrates.
Rhodamnia rubescens	Scrub Turpentine	CR		2020		Low	Habitat not present within study area	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.
Senna acclinis	Rainforest Cassia		EN	2018	PMST	Negligible	Habitat not present within study area.	Tall shrub with populations occurring in the coastal districts and adjacent tablelands from the Illawarra to Queensland. Found growing on rainforest margins, often fulfilling the role of a gap phase shrub in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Dry Rainforests, Subtropical Rainforests, Western Vine Thickets, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests.

Scientific name	Common name	Conservation status		Most recent record	Other sources	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		BC	EPBC					
Syzygium paniculatum	Magenta Lilly Pilly	VU	EN	#	PMST	Negligible	Habitat not present within study area.	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests. Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.
Thelymitra kangaloonica	Kangaloon Sun Orchid	CR	CR	#	PMST	Negligible	Habitat not present within study area.	Terrestrial orchid confined to the southern tablelands in the Moss Vale, Kangaloon, Fitzroy Falls area with the majority growing on land managed by the Sydney Catchment Authority. Found growing in swamps and Sedgelands at elevations between 550 and 700 m in Temperate Highland Peat Swamps on Sandstone, Coastal Heath Swamps and Montane Bogs and Fens. A cryptic species which is most visible when flowering between late October and early November. Grows in grey silty or grey loam soils.
Thesium australe	Austral Toadflax	VU	VU	#	PMST	Negligible	Habitat not present within study area.	Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands often in association with Kangaroo Grass *Themeda triandra* in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.

Table 22 - Threatened fauna species recorded, or predicted to occur, within 5 km of the study area

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Mammals								
Cercartetus nanus	Eastern Pygmy-possum		VU		2016	Negligible	Habitat not present within study area	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.
Chalinolobus dwyeri	Large-eared Pied Bat	VU	VU		#	Transient	No records within locality. Species may potentially use study area for foraging, but lack of suitable roosting habitat and recorded	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							sighting it is unlikely to rely on study area.	on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.
Dasyurus maculatus	Spotted-tailed Quoll	EN	VU		2019	Low	No records within locality. Highly degraded nature of study area, with lack of suitable den sites makes it unlikely species will occur within study area.	Occurs along the east coast of Australia and the Great Dividing Range. Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.
Falsistrellus tasmaniensis	Eastern False Pipistrelle		VU		2010	Low	No records within locality. Species may potentially use study area for foraging, but lack of suitable roosting habitat and recorded sighting it is unlikely to rely on study area.	Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	EN	EN		#	Low	No records within locality. The study area does not support post fire vegetation and is highly degraded.	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Miniopterus australis	Little Bent-winged Bat		VU		2015	Low	No records within locality. Species may potentially use study area for foraging, but lack of suitable roosting habitat and recorded sighting it is unlikely to rely on study area	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bentwing bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.
Miniopterus orianae oceanensis	Large Bent-winged Bat		VU		2017	Low	Species may potentially use study area for foraging, but lack of suitable roosting habitat and recorded sighting it is unlikely to rely on study area	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred km to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								moths) above the tree canopy and along waterways.
Myotis macropus	Southern Myotis		VU		2012	Low	Species may potentially use study area for foraging, but lack of suitable roosting habitat and recorded sighting it is unlikely to rely on study area	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and also catch flying insects.
Petauroides volans	Greater Glider	VU			2016#	Negligible	Habitat not present within study area	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe.
Petaurus australis	Yellow-bellied Glider		VU		2015	Negligible	Habitat not present within study area	Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.
Petaurus norfolcensis	Squirrel Glider		VU		2016	Negligible	Habitat not present within study area	Generally occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.
Petrogale penicillata	Brush-tailed Rock-wallaby	VU	EN		#	Negligible	Habitat not present within study area	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungles and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.
Phascolarctos cinereus	Koala	VU	VU		2015	Negligible	Habitat not present within study area	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemastoma* and *E. signata*. They are solitary with varying home ranges.
*Phascolarctos cinereus (*combined populations of Qld, NSW and the ACT*)*	None	VU			#	Negligible	Habitat not present within study area	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus robusta, E. tereticornis, E. punctata, E. haemastoma* and *E. signata*. They are solitary with varying home ranges.
Pseudomys novaehollandiae	New Holland Mouse	VU			#	Negligible	Habitat not present within study area	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January, but can extend into autumn.
Pteropus poliocephalus	Grey-headed Flying-fox	VU	VU		2019#	Transient	Species may utilise study area occasionally for foraging yet due to highly degraded nature, availability of higher quality resources it is unlikely the species relies on the study area for resources. No roosting habitat present within study area due to degraded nature.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.
Scoteanax rueppellii	Greater Broad-nosed Bat		VU		1999	Low	Species may potentially use study area for foraging, but lack of	Occurs along the Great Dividing Range and in coastal areas. Occurs in woodland and rainforest, preferring open habitats or

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							suitable roosting habitat and recorded sighting it is unlikely to rely on study area	openings in wetter forests. Often hunts along creeks or river corridors. Preys upon beetles and other large, flying insects, other bats and spiders. Roosts in hollow tree trunks and branches.
Birds								
Anthochaera phrygia	Regent Honeyeater	CR	CR		1995#	Negligible	Habitat not present within study area.	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nest in tall mature eucalypts and sheoaks.
Botaurus poiciloptilus	Australasian Bittern	EN	EN		2001#	Low	Habitat not present within study area	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including *Typha* spp. and *Eleoacharis* spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								dense vegetation on a flattened platform of reeds.
Calidris alba	Sanderling		VU		2013	Negligible	Habitat not present within study area.	Occurs on the coast mostly on open sand beaches exposed to open sea-swells.
Calidris canutus	Red Knot	EN			#	Negligible	Habitat not present within study area.	Typically located within intertidal mudflats, sandflats and sandy beaches of sheltered coasts. Occasionally found on sandy open beaches or shallow pools, or in saline wetlands close to the coast.
Calidris ferruginea	Curlew Sandpiper	CR	EN		#	Negligible	Habitat not present within study area.	Inhabits sheltered intertidal mudflats. Also non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.
Calidris tenuirostris	Great Knot	CR	VU		1999	Negligible	Habitat not present within study area.	Mainly found on intertidal mudflats, sandflats and sandy beaches.
Callocephalon fimbriatum	Gang-gang Cockatoo		VU		2016	Low	Habitat not present within study area	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								coastal areas. It requires tree hollows in which to breed.
Calyptorhynchus lathami	Glossy Black-Cockatoo		VU		2009	Low	Habitat not present within study area	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.
Circus assimilis	Spotted Harrier		VU		2014	Low	Habitat not present within study area	The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Dasyornis brachypterus	Eastern Bristlebird	EN	EN		2017#	Low	Habitat not present within study area	Found in coastal woodlands, dense scrub and heathlands, particularly where it borders taller woodlands.
Glossopsitta pusilla	Little Lorikeet		VU		2013	Low	Habitat not present within study area	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.
Haematopus fuliginosus	Sooty Oystercatcher		VU		2019	Low	Habitat not present within study area	The Sooty Oystercatcher is found on undisturbed tidal rocks on ocean shores and islands. Occasionally it is observed on sandspits and mudflats. It forages on exposed rock or coral at low tide for limpets and mussels. The Sooty Oystercatcher breeds in spring and summer almost exclusively offshore or on isolated promontories

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Haematopus longirostris	Pied Oystercatcher		EN		2019	Low	Habitat not present within study area	An intertidal forager found on undisturbed sandy beaches and spits, tidal mudflats and estuaries. Its food supply (beach macroinvertebrates) have been negatively affected by human impacts. The Pied Oystercatcher is restricted to the littoral zone of beaches and estuaries, nesting on the ground above the tideline. A pair will re-nest in the same spot each year, rarely shifting their territory. Occasionally the Pied Oystercatcher is found in paddocks near the coast.
Haliaeetus leucogaster	White-bellied Sea-Eagle		VU		2014	Low	Habitat not present within study area	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.
Hieraaetus morphnoides	Little Eagle		VU		2018	Low	Habitat not present within study area	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.
Hirundapus caudacutus	White-throated Needletail	VU			2010#	Low	Habitat not present within study area	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.
Ixobrychus flavicollis	Black Bittern		VU		2015	Low	Habitat not present within study area	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Lathamus discolor	Swift Parrot	CR	EN		2017#	Low	Habitat not present within study area	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.
Limosa lapponica baueri	Bar-tailed Godwit (baueri)	VU			#	Low	Habitat not present within study area	The bar-tailed godwit (western Alaskan) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								coasts, sandy ocean beaches, rock platforms, and coral reef-flats.
Limosa lapponica menzbieri	None	CR			#	Low	Habitat not present within study area	The bar-tailed godwit (northern Siberian) occurs mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats.
Lophoictinia isura	Square-tailed Kite		VU		2018	Low	Habitat not present within study area	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia*, *Corymbia maculata, E. elata,* or *E. smithii*. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Neophema chrysogaster	Orange-bellied Parrot	CR	CR		#	Low	Habitat not present within study area	Critical winter habitat for the species includes natural saltmarshes dominated by Sarcocornia quinqueflora (Beaded Glasswort) and Sclerostegia arbuscula (Shrubby Glasswort), as well as the associated grassy or weedy pastures. Historical records indicate that the Orange-bellied Parrot was formerly more abundant and widespread in NSW than it is now, however the species' distribution continues to extend into south-eastern NSW where suitable habitat is still available.
Ninox connivens	Barking Owl		VU		2003	Low	Habitat not present within study area	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.
Ninox strenua	Powerful Owl		VU		2019	Low	Breeding habitat not present within study area. May utilise study	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
							area for incidental foraging only.	it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.
Numenius madagascariensis	Eastern Curlew	CR			#	Low	Habitat not present within study area	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sand flats often with beds of seagrass.
Onychoprion fuscata	Sooty Tern		VU		2013	Low	Habitat not present within study area	The Sooty Tern is a pelagic species found over tropical waters were it feeds offshore far away from land. It breeds off the coast of WA and QLD rarely venturing to the south-east of Australia.
Oxyura australis	Blue-billed Duck		VU		1996	Low	Habitat not present within study area	The Blue-billed Duck is widespread in NSW. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only seen in coastal areas during

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								summer. Prefers large permanent wetlands, feeding on the bottom of swaps.
Pandion cristatus	Eastern Osprey		VU		2013	Low	Habitat not present within study area	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.
Petroica phoenicea	Flame Robin		VU		1967	Low	Habitat not present within study area	Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.
Petroica rodinogaster	Pink Robin		VU		2015	Low	Habitat not present within study area	The Pink Robin is found in dense, dank forests and treefern gullies. During the winter months the Pink Robin disperses

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								north (as far up as the central coast of NSW) and west (as far as the ACT area) into more open forests, woodlands and scrublands. The diet consists mainly of spiders and insects.
Polytelis anthopeplus monarchoides	Regent Parrot (eastern subspecies)	VU	EN		1990	Low	Habitat not present within study area	In southeast Australia they are found in riparian or littoral River Red Gum forests, adjacent Black Box woodlands, and in nearby open mallee woodland or shrubland, as well as Belah, Buloke or Slender Cypress Pine. Moves between the riverine nesting habitat and foraging sites along corridors of natural vegetation.
Ptilinopus regina	Rose-crowned Fruit-Dove		VU		2019	Low	Habitat not present within study area	Occurs in tall tropical and subtropical, evergreen or semi-deciduous rainforest, especially with dense growth of vines. Prefers large patches of rainforest, but sometimes occurs in remnant patches surrounded by suboptimal habitat including farmlands.
Ptilinopus superbus	Superb Fruit-Dove		VU		1992	Low	Habitat not present within study area	The Superb Fruit Dove ranges from northern NSW to as far south as Moruya. It is found in rainforests, closed forests (including mesophyll vine forests) and sometimes in eucalypt and acacia woodlands with fruit-

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								bearing trees. It forages in the canopy of fruiting trees such as figs and palms.
Rostratula australis	Australian Painted Snipe	EN	EN		#	Low	Habitat not present within study area	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.
Thinornis rubricollis	Hooded Plover	VU	CR		2012	Low	Habitat not present within study area	In south-eastern Australia Hooded Plovers prefer broad sandy beaches, with a wide wave-wash zone for feeding, beach cast seaweed, and sparsely vegetated sand-dunes for shelter and nesting. Hooded Plovers are also found on tidal bays and estuaries, rock platforms, rocky or sand-covered reefs, near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.
Tyto novaehollandiae	Masked Owl		VU		2014	Low	Habitat not present within study area	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.
Tyto tenebricosa	Sooty Owl		VU		2016	Low	Breeding habitat not present within study area. May utilise study area for incidental foraging only	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees, mainly eucalypts often located in gullies.
Frogs								
Heleioporus australiacus	Giant Burrowing Frog	VU	VU		2016#	Low	Habitat not present within study area	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations. Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends the majority of its time in non-breeding habitat 20-250m from breeding sites.

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
Litoria aurea	Green and Golden Bell Frog	VU	EN		2016#	Low	Habitat not present within study area	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of Grafton and northern VIC. The species is found in marshes, dams and stream sides, particularly those containing bulrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks , although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop , feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.
Litoria littlejohni	Littlejohn's Tree Frog	VU	VU		#	Low	Habitat not present within study area	The species is distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern VIC. It is not known from coastal habitats. Occurs in wet

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								and dry sclerophyll forests and heath communities associated with sandstone outcrops between 280 and 1000 m. Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground, and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has been recorded calling in all seasons with variously reported peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.
Mixophyes balbus	Stuttering Frog	VU	EN		#	Low	Habitat not present within study area	This species is usually associated with mountain streams, wet mountain forests and rainforests. It rarely moves very far from the banks of permanent forest streams, although it will forage on nearby forest floors. Eggs are deposited in leaf litter on

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								the banks of streams and are washed into the water during heavy rains.
Pseudophryne australis	Red-crowned Toadlet		VU		2019	Low	Habitat not present within study area	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.
Fish								
Macquaria australasica	Macquarie Perch	EN		EN	#	Low	Habitat not present within study area	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries
Prototroctes maraena	Australian Grayling	VU		EN	#	Low	Habitat not present within study area	The Australian Grayling occurs in streams and rivers on the eastern and southern flanks of the Great Dividing Range from Sydney southwards to the Otway Ranges in

Scientific name	Common name	Conservation status			Most recent record	Likely occurrence in study area	Rationale for likelihood ranking	Habitat description*
		EPBC	BC	FM				
								Victoria, and Tasmania. Australian grayling do not occur in the inland Murray–Darling Basin system. Grayling is a diadromous species; migrating between freshwater streams and the ocean. This species has been found in clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops, and also in muddy-bottomed, heavily silted habitats.
Reptiles								
Hoplocephalus bungaroides	Broad-headed Snake	VU	EN		2015#	Low	Habitat not present within study area	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.

APPEDNIX C – GREEN AND GOLDEN BELL FROG SURVEY DATA

Table 23 - Weather conditions and survey effort, Green and Golden Bell Frog survey, NRE No. 1 Colliery (Russelll Vale Colliery)

Date	Temperature (°C)		Rainfall (mm)	Relative Humidity at 3 pm	Cumulative Rainfall (past 7 days)	Survey effort		Number of People	Total Survey Effort Dam No. 6 (hrs)	Total Survey Effort All Sites (hrs)	Sites surveyed
	Min	Max				Diurnal	Nocturnal				
4 May 2010	17	24.1	0	76	0	1.5	1.5	1	3	3	Dam No. 6
5 May 2010	16.7	21.3	0	73	0	1.5	1.5	1	3	3	Dam No. 6
6 May 2010	11.4	20.8	0.2	42	0.2	1.5	1.5	1	3	3	Dam No. 6
7 September 2010	10.6	14.8	0	62	28.6	1.5	1.5	2	3	3	Dam No. 6
8 September 2010	7.3	15.6	0	53	28.6	1.5	1.5	2	3	3	Dam No. 6
9 September 2010	10	20.6	0	66	28.6	1.5	1.5	2	3	3	Dam No. 6
16 November 2010	17	19.8	16.8	88	24	-	1.1	1	1	1	Dam No. 6
17 November 2010	15.2	20.1	0.4	90	18.6	-	1.1	1	1.1	1.1	Dam No. 6
18 November 2010	15.4	21.5	3	13	21.6	-	1.1	1	1.1	1.1	Dam No. 6
17 January 2011	20.4	23.1	0	82	44.8	-	1.2	2	1.2	1.2	Dam No. 6

Date	Temperature (°C)		Rainfall (mm)	Relative Humidity at 3 pm	Cumulative Rainfall (past 7 days)	Survey effort		Number of People	Total Survey Effort Dam No. 6 (hrs)	Total Survey Effort All Sites (hrs)	Sites surveyed
	Min	Max				Diurnal	Nocturnal				
18 January 2011	18	22.9	0	73	23	-	1.2	1	1.2	1.2	Dam No. 6
19 January 2011	17.7	23.4	0	83	8.8	-	2.2	2	2.2	2.2	Dam No. 6
20 January 2011	19.7	26.1	0	84	1.8	-	1.2	1	1.2	1.2	Dam No. 6
14 March 2011	21.6	25.2	0	72	0.2	-	1.4	2	1.4	1.4	Dam No. 6
17 March 2011	19	22.5	9	84	11	-	1.2	2	1.2	1.2	Dam No. 6
28 March 2011	15.7	23.1	4.4	75	102.2	-	1.1	1	1.1	1.1	Dam No. 6
30 March 2011	19.1	26.1	0	68	11	-	1.1	2	1.1	1.1	Dam No. 6
20 October 2011	14.5	22	0	71	101.6	-	7.2	2	1.2	6	Dam No. 6 Pit Top Dam RV Emplacement Dam Basin No. 2 Don's Dam Roadside Dam Storm Water Control Dam
24 January 2012	20.2	23.7	0.2	72	4.8	-	7.2	2	1.2	6	Dam No. 6 Pit Top Dam RV Emplacement Dam Basin No. 2 Don's Dam Roadside Dam

Date	Temperature (°C)		Rainfall (mm)	Relative Humidity at 3 pm	Cumulative Rainfall (past 7 days)	Survey effort		Number of People	Total Survey Effort Dam No. 6 (hrs)	Total Survey Effort All Sites (hrs)	Sites surveyed
	Min	Max				Diurnal	Nocturnal				
											Storm Water Control Dam
30 January 2013	18.3	24.2	0.8	72	221.4	-	8.1	2	1.1	7	Dam No. 6 Pit Top Dam RV Emplacement Dam Basin No. 2 Don's Dam Roadside Dam Storm Water Control Dam
26 February 2013	19.4	23.7	0	83	119.4	-	8.1	2	1.1	7	Dam No. 6 Pit Top Dam RV Emplacement Dam Basin No. 2 Don's Dam Roadside Dam Storm Water Control Dam
Total Survey Effort									**36.4**	**57.8**	
Total Survey									**27.4**	**48.8**	

Date	Temperature (°C)		Rainfall (mm)	Relative Humidity at 3 pm	Cumulative Rainfall (past 7 days)	Survey effort		Number of People	Total Survey Effort Dam No. 6 (hrs)	Total Survey Effort All Sites (hrs)	Sites surveyed
	Min	Max				Diurnal	Nocturnal				
Effort (Active season)											

APPENDIX D - RECORDED WEED SPECIES AND CONTROL TECHNIQUES

Table 24 - Recorded weed species and control techniques.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
Annual weed species	Various	Hand remove or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100)	Monitor for seedlings. Hand remove and/or remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Acetosa sagittata	Turkey Rhubarb	Seeds to be bagged and removed from site. Hand removal all underground tubers. Chemically treat (spray) using a 333g/L Fluroxypyr based product at a dilution rate of 300 to 600 ml per 100 L water Or with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Ageratina adenophora	Crofton Weed	Cut and paint stems with 'neat' 360g/L Glyphosate based herbicide to reduce collateral damage to natives and riparian areas Or Chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100)	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water prior to flowering. A DPI approved biocontrol (Rust) may be applied to assist in control of large and remote locations.
Ageratina riparia	Mistflower	Cut and paint stems with 'neat' 360g/L Glyphosate based herbicide to reduce collateral damage to natives and riparian areas Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100)	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
Andropogon virginicus	Whiskey Grass	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100). May require brushcutting or slashing to promote new growth prior to application.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Anredera cordifolia	Mederia Vine	Hand removal all aerial and underground tubers. Biomass to be removed from site. Chemically treat (spray) using a Fluroxypyr 200 g/L based product at a dilution rate of 300 to 500 ml per 100 L water Or with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Araujia sericifera	Moth Plant	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100). May require the use of a penetrant for effective kill rate. Fruits to be disposed off-site	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Asparagus aethiopicus	Ground Asparagus Fern	Hand remove in area of high regeneration potential ensure that all fruiting bodies and central 'rhizome' has been removed and disposed offsite. Aerial tubers do not require removal and can act as a preventative measure against soil erosion. Large infestions to be chemically treated (spray) with a	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water. All seeds and biomass are to be disposed offsite.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
		Metsulfuron-methyl 600 g/kg based herbicide at a diluted rate of 1 –2 g per 10 L of water plus a non-ionicsurfactant. As per APVMA approved Offlabel permit PER9907.	
Asparagus asparagoides	Bridal Creeper	Hand remove in area of high regeneration potential ensure that all fruiting bodies and central 'rhizomes' has been removed and disposed offsite Or Chemically treat during peak growing season (Aug - Sept) using either a Metsulfuron-methyl 600 g/kg based herbicide at a diluted rate 10 g metsulfuron-methyl to 100 L water, or a 360g/L Glyphosate based herbicide at a diluted rate of 1 part glyphosate to 50 parts water. As per APVMA approved Off label permit PER9907. Introduction of a bio-control (rust) will assist in areas of heavy infestation.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water. All seeds and biomass are to be disposed offsite.
Bidens pilosa	Cobblers Pegs	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100)	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
***Bryophyllum* spp.**	Mother of Millions	Hand remove in area of high regeneration potential ensuring that all propagules and fruiting bodies been removed and disposed offsite Or chemically whilst flowering using either a Fluroxypyr 200 g/L based herbicide at a diluted rate 600 mL per 100 L of water, or a a Triclopyr 300 g/L + Picloram 100 g/L based herbicide e.g Grazon® DS, at a diluted rate of 500 mL per 100 L of water. Both chemical application will require the addition of a surfactant.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water. All biomass is to be disposed offsite.
Cardiospermum grandiflorum	Balloon Vine	Cut and paint stems with 'neat' 360g/L Glyphosate based herbicide. Treatment of large infestations will require preparation prior to chemical application. Firstly 'skirt' vines on trees and vines, then apply a 360g/L Glyphosate based herbicide at a diluted rate of 1 part glyphosate to 50 parts water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Cestrum parqui	Green Poisonberry, Green Cestrum	Small specimens may be 'scraped and painted' using a 'neat' 360g/L Glyphosate based herbicide in areas of high regeneration potential. Larger stands chemically treat using a Triclopyr 300 g/L + Picloram 100 g/L based product Grazon® DS late spring to early autumn.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Cirsium vulgare	Spear Thistle	Flowering and fruiting bodies to be removed to reduce seed dispersal. Hand remove Or Chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate	Germination is promoted via disturbance e.g soil movement, fire. Monitor for seedlings. Treat prior to flower and seed set

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
		based herbicide at a diluted rate of 10ml/L of water (1:100)	
Chloris gayana	Rhodes Grass	Hand remove Or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100). May require brushcutting or slashing to promote new growth prior to application.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Cinnamomum camphora	Camphor Laurel	Cut/paint, Fill/drill and apply 'neat' 360g/L Glyphosate based herbicide.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Conyza bonariensis	Fleabane	Hand remove in area of high regeneration potential. Flowers and seeds to be removed and disposed of site. Remaining biomass can be composted on site on. Larger infestations can be chemically treated using a a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water. Treatment prior to flowering to reduce seed set is recommended.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
***Cortaderia* spp.**	Pampass Grass	Small individual specimens can be grubbed out and composted on site. De-seed/flower all mature specimens (Late summer early Autumn) and chemically treat using a 360g/L Glyphosate based herbicide at a dlution rate of 1.0 or 1.3 L per 100 L of water. An APVMP approved surfactant or penetrant may be used for increased kill rates on larger	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
		specimens/infestations.	
***Cotoneaster* spp.**	Broad-leaved Cotoneaster	Cut and paint/frill and drill stems with 'neat' 360g/L Glyphosate based herbicide.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Eragrostis curvula	African Lovegrass	Hand remove or chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100). May require brushcutting or slashing to promote new growth prior to application.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water
Ipomoea cairica	Coastal Morning-Glory	Manually remove all biomass from smothered vegetation and ground or 'skirt' vines from trees and shrubs in prep for chemical application. Spot (Foliar) spray with either a Triclopyr 300 g/L + Picloram 100 g/L based product e.g. Grazon® DS at a dilution rate of 50 mL/10 L water	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Ipomoea indica	Purple Morning Glory	Manually remove all biomass from smothered vegetation and ground or 'skirt' vines from trees and shrubs in prep for chemical application. Spot (Foliar) spray with either a Triclopyr 300 g/L + Picloram 100 g/L based product e.g. Grazon® DS at a dilution rate of 50 mL/10 L water	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
Lantana camara	Lantana	Small or isolated infestations: Hand remove or Cut and paint stems with 'neat' 360g/L Glyphosate based herbicide in areas of high regeneration potential. Large infestations: can be cleared/treated in a mosaic pattern to reduce impacts to wildlife and the incidence of mass germination of secondary weed species. Can be chemically treated (foliage spray) via the use of a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water or a broadleaf selective herbicide such as a Metsulfuron-methyl 600 g/kg based herbicide.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Ligustrum lucidum	Broad-leaved Privet	Cut/paint, Fill/drill and apply 'neat' 360g/L Glyphosate based herbicide during growing season.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Ligustrum sinense	Small Leaf privet	Cut/paint, Fill/drill and apply 'neat' 360g/L Glyphosate based herbicide during growing season. Larger specimens may produce vegetative suckers in response treatments.	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Lilium formosanum	Taiwan Lily	Hand remove flowered/seeded specimens in areas of high regeneration potential, bulb and bulblets must be removed during the process. Where applicable, chemically treat using a 360g/L Glyphosate and Metsulfuron-methyl 600g/kg based mixture at a dilution rate of 2L glyphosate plus 15g metsulfuronmethyl per 100L of water (off label permit:	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
		PER9907).	
Lonicera japonica	Japanese Honeysuckle	Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential. Larger infestations can be chemically treated by the use of a using a Metsulfuron-methyl 600 g/kg based product at a dilution rate of 10–20g in 100L of water. A surfactant may be required (off label permit: PER9907).	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Nephrolepis cordifolia	Fishbone Fern	Hand remove where applicable ensuring bulk of the root system and the associated water tubers are removed. Can be chemically treated via the application of a mixture of a Glyphosate 360g/L and Metsulfuron-methyl 600g/kg based herbicides at a dilution rate of 200mL glyphosate plus 1.5g metsulfuron methyl per 10L of water	Hand remove seedlings/shooting nodes or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Ochna serrulata	Ochna, Mickey Mouse Bush	Small specimens may be manually removed. Established specimens can be either scaped/ painted using a 'neat' Glyphosate 360g/L based product or foliage spray using of a Glyphosate 360g/L and Metsulfuron-methyl 600g/kg based herbicides at a dilution rate of 200mL glyphosate plus 1.5g metsulfuron methyl per 10L of water (off label permit: PER9907).	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
Olea europaea* subsp. *cuspidata	African Olive	Seedlings can be manually removed. Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (off label permit: PER9907).	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water. Monitor for secondary weed incursions post removal of large monoculture infestations.
***Onopordum* spp.**	Scotch Thistle	Flowering and fruiting bodies to be removed to reduce seed dispersal. Hand remove or Chemically treat (spray) deseeded mature specimens with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water (1:100)	Germination is promoted via disturbance e.g. soil movement, fire. Monitor for seedlings. Treat prior to flower and seed set
***Rubus fruticosus* aggregate**	Blackberry	Dig out single plants (biomass to remain on site) or scape and paint using a 'neat' 360g/L Glyphosate based herbicide (off label permit: PER9907). Chemically treat larger infestations using either a 360g/L Glyphosate based herbicide at a diluted rate of 10–13mL per 1L of water or a APVMA approved broad leaf selective herbicide applied at the registered rate. Slashing may be require to gain access and stimulate new growth.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Senna pendula* var *glabrata		Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (off label permit : PER9907).	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

Botanical name	Common name	Initial primary treatment (70% kill)	Secondary and maintenance treatments (90% kill)
Sida rhombifolia	Paddy's Lucerne, Common Sida	Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (off label permit : PER9907). Spot spray with a with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Solanum sisymbriifolium		Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (off label permit : PER9907). Spot spray with a with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.
Solanum mauritianum	Wild tobacco	Cut/paint, scrape/paint and apply 'neat' 360g/L Glyphosate based herbicide to actively growing stems in areas of in areas of high regeneration potential (off label permit : PER9907). Spot spray with a with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.	Hand remove seedlings or spot spray with a 360g/L Glyphosate based herbicide at a diluted rate of 10ml/L of water.

APPENDIX E – REVEGETATION SPECIES LIST

Table 25 - Illawarra escarpment blackbutt forest

Scientific Name	Common Name	Planting density
Ground cover/grasses		
Carex longebrachiata	Australian Sedge	1 plant per 2 square metres
Imperata cylindrica	Blady Grass	1 plant per 2 square metres
Lomandra longifolia	Spiny-headed Mat Rush	1 plant per 2 square metres
Shrubs/small trees		
Acacia implexa	Hickory Wattle	1 plant per 3 square metres
Acacia maidenii	Maiden's Wattle	1 plant per 3 square metres
Acacia mearnsii	Black Wattle	1 plant per 3 square metres
Acmena smithii	Lilly Pilly	1 plant per 3 square metres
Banksia integrifolia	Coastal Banksia	1 plant per 3 square metres
Breynia oblongifolia	Coffee Bush	1 plant per 3 square metres
Melaleuca styphelioides	Prickly-leafed Paperbark	1 plant per 5 square metres
Trees		
Eucalyptus botryoides/saligna	Wollongong Woolybutt	1 plant per 5 square metres
Eucalyptus paniculata subsp. *paniculata*	Grey Ironbark	1 plant per 5 square metres
Syncarpia glomulifera	Turpentine	1 plant per 5 square metres

Table 26 - Illawarra lowland grassy woodland

Scientific Name	Common Name	Planting density
Ground cover/grasses		
Carex longebrachiata	Australian Sedge	1 plant per 2 square metres
Imperata cylindrica	Blady Grass	1 plant per 2 square metres
Lomandra longifolia	Spiny-headed Mat Rush	1 plant per 2 square metres
Shrubs/small trees		
Acacia maidenii	Maiden's Wattle	1 plant per 3 square metres

Acacia mearnsii	Black Wattle	1 plant per 3 square metres
Brachychiton populneus	Kurrajong	1 plant per 3 square metres
Dodonaea viscosa var. *angustifolia*	Sand Olive	1 plant per 3 square metres
Melaleuca decora	White-feather Honeymyrtle	1 plant per 3 square metres
Melaleuca styphelioides	Prickly-leafed Paperbark	1 plant per 3 square metres
Trees		
Eucalyptus amplifolia	Cabbage Gum	1 plant per 5 square metres
Eucalyptus bosistoana	Coast Grey Box	1 plant per 5 square metres
Eucalyptus botryoides	Bangalay	1 plant per 5 square metres
Eucalyptus longifolia	Woollybutt	1 plant per 5 square metres
Eucalyptus tereticornis	Forest Red Gum	1 plant per 5 square metres