

# Response to Submissions Report

Origin Eraring Power Station - Ash Dam Augmentation MOD 1



## Response to Submissions Report

Origin Eraring Power Station - Ash Dam Augmentation MOD 1

Client: Origin Energy Resources Limited

ABN: 66 007 845 338

Prepared by

**AECOM Australia Pty Ltd**

17 Warabrook Boulevard, Warabrook NSW 2304, PO Box 73, Hunter Region MC NSW 2310, Australia

T +61 2 4911 4900 F +61 2 4911 4999 [www.aecom.com](http://www.aecom.com)

ABN 20 093 846 925

03-Dec-2018

Job No.: 60521040

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

## Quality Information

Document      Response to Submissions Report


Ref             60521040

Date            03-Dec-2018

Prepared by   Gabriel Wardenburg, Zoe Cox, Angela Stewart

Reviewed by   Michael England

### Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	2-Nov-2018	DRAFT	Gabriel Wardenburg Project Manager	
1	03-Dec-2018	FINAL	Gabriel Wardenburg Project Manager	

This page has been left blank  
intentionally.

## Table of Contents

Glossary	i
Executive Summary	i
1.0 Introduction	1
1.1 Background	1
1.2 The Project	1
1.3 Assessment, Approval Process and Exhibition	1
1.4 Purpose of this Report	2
1.5 Structure of this Report	2
2.0 Overview of Exhibited Project	3
2.1 Project Summary	3
2.1.1 Amended ash deposition strategy	3
2.1.2 Establishment of Western emplacement area for ash deposition	5
2.1.3 Water management systems	5
2.1.4 Upgrades to ancillary infrastructure	6
2.1.5 Decommissioning of ancillary infrastructure	6
2.2 Summary of Project Need	6
2.3 Summary of Key Potential Impacts	7
3.0 Actions Taken During and After Environmental Assessment Exhibition	11
3.1 Engagement Activities	11
4.0 Analysis of Submissions Received	13
4.1 Overview	13
4.2 Analysis	13
4.2.1 Public submissions received during the exhibition period	13
4.2.2 Special interest groups	14
4.2.3 Government agencies	14
4.3 Categorisation of Public Submission Issues	14
5.0 Response to Community Submissions	17
5.1 Overview	17
5.2 Air Quality	17
5.3 Alternatives and Design Changes	18
5.4 Climate Change	19
5.5 Consultation	19
5.6 Contamination	20
5.7 Dam Integrity and Disaster Risk Management	21
5.8 Project Timeline / Sequencing	22
5.9 Environmental Risk	22
5.10 Biodiversity	23
5.11 Health	24
5.12 Sustainability	26
5.13 Other	28
6.0 Response to Special Interest Group Submissions	29
6.1 Overview	29
6.2 Nature Conservation Council of NSW	29
6.2.1 Need for the project	29
6.2.2 Groundwater	30
6.2.3 Underground coal mine connectivity and remediation	30
6.2.4 Closure and rehabilitation	30
6.2.5 Seepage and receiving water	30
6.2.6 Air pollution	31
6.2.7 Impacts on threatened species	31
6.3 Environmental Justice Australia	32
6.3.1 CCP chemical composition	33
6.3.2 Lining of EAD	33
6.3.3 Dam safety	33
6.3.4 Rehabilitation	34

	6.3.5	Financial assurance	34
	6.3.6	Best practice management and rehabilitation	34
6.4		Northern Lakes Disability Tourism Precinct Committee Inc.	35
	6.4.1	The precautionary principle	35
	6.4.2	Biodiversity	35
	6.4.3	Options	36
	6.4.4	Stakeholder consultation	37
	6.4.5	Prescribed impacts and the precautionary principle	37
	6.4.6	Environmental safeguards and bond	37
	6.4.7	Traffic and noise	38
6.5		Hunter Community Environment Centre	38
	6.5.1	CCP reuse targets	38
	6.5.2	CCP dam failure	39
	6.5.3	Elements of EPS CCP	39
	6.5.4	Contamination of Lake Macquarie and wetlands	40
	6.5.5	Groundwater pollution	40
	6.5.6	Air pollution	40
6.6		Greenpeace Australia	41
	6.6.1	Do nothing option	41
	6.6.2	Environmental and health impacts	42
	6.6.3	Closure and remediation	43
	6.6.4	Contamination and pollution	43
	6.6.5	Subsidence risks	43
	6.6.6	CCP re-use	44
	6.6.7	Environmental record	44
6.7		Community Environment Network	45
	6.7.1	Option 3	45
	6.7.2	Additional loading of EAD	46
	6.7.3	Mine void remediation	46
	6.7.4	Dust deposition impacts	46
	6.7.5	Biodiversity offsets	47
7.0		Response to Government Agency submissions	49
	7.1	NSW Environment Protection Authority	49
	7.2	NSW Department of Planning and Environment – Division of Resources and Geoscience	49
	7.3	Lake Macquarie City Council	50
	7.4	NSW Office of Sport	56
	7.5	NSW Office of Environment and Heritage	58
	7.6	NSW Dam Safety Committee	63
	7.7	NSW Department of Industry	63
8.0		Updated Mitigation Measures	65
9.0		Project Evaluation	73
Appendix A			
		EPBC Assessment of Significance	A
Appendix B			
		Stakeholder Submissions – Table of Issues	B
Appendix C			
		Updated Threatened Species Figure	C



## Glossary

The terms and acronyms used in this report are provided below.

Term / acronym	Description
AEP	Annual Exceedance Probability
AHIP	Aboriginal Heritage Impact Permit
ATIC	Australian Technical Infrastructure Committee
ANCOLD	Australian National Committee on Large Dams
BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BDAR	Biodiversity Development Assessment Report
CCP	Coal Combustion Product
CEMP	Construction Environmental Management Plan
Coastal Management SEPP	<i>State Environmental Planning Policy (Coastal Management) 2018 (NSW)</i>
DPE	NSW Department of Planning and Environment
DoEE	Commonwealth Department of Environment and Energy
DSC	NSW Dams Safety Committee
EA	Environmental Assessment
EAD	Eraring Ash Dam
EEC	Endangered Ecological Community
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
EPL	Environment Protection Licence
EPS	Eraring Power Station
HDD	Horizontal Directional Drilling
GHG	Greenhouse gas
ICNG	Interim Construction Noise Guidelines
LGA	Local Government Area
LMCC	Lake Macquarie City Council
LTMS	Long Term Management Strategy
MNES	Matters of National Environmental Significance
MW	Megawatt
OEH	Office of Environment and Heritage
Origin	Origin Energy Eraring Pty Limited, the operator of EPS
PCT	Plant Community Type
PIRMP	Pollution Incident Management Response Plan

Term / acronym	Description
PMF	Probable Maximum Flood
PM	Particulate Matter
RL	Road Level
RTS	Response to Submissions
TSP	Total Suspended Particulate



## Executive Summary

Origin Energy Eraring Pty Limited (Origin) owns and operates Eraring Power Station (EPS) and the associated Eraring Ash Dam (EAD) on Rocky Point Road, in the Lake Macquarie Local Government Area (LGA). EPS has been operating since 1982 and comprises four 720 MW coal fired units. Origin is seeking to augment the EAD using an alternate placement strategy and landform design (Project) to maintain operational flexibility and extend the storage life of the EAD in the short to mid-term whilst continuing to support the development of long term Coal Combustion Product (CCP) placement strategies towards 2032.

Currently, CCP generated during the production of electricity is either reclaimed for beneficial reuse or deposited hydraulically via pipelines into the EAD. The EAD provides CCP storage capacity and there is an expected increased reliance on EPS following recent and future closures of large generation assets in NSW, Victoria (Hazelwood) and South Australia (Northern Power Station). Following higher than planned output electricity output rates at the EPS to meet market demands, the volume of CCP recently deposited at the EAD has been higher than previously planned. Therefore, alternative ash placement strategies are proposed to extend the storage capacity of the EAD in the short to mid-term.

The total construction period for the Project is expected to be approximately three months.

EPS currently operates under a number of Project Approvals and authorisations, including Project Approval 07\_0084 for the management of CCP. Project Approval (07\_0084) was issued under Part 3A (repealed) of the Environmental Planning & Assessment Act (EP&A Act). As this modification request was submitted prior to the cut-off date of 1 March 2018, the provisions of the former Part 3A continue to apply to this modification request. The current Project would therefore be undertaken as a modification to the existing Project Approval (07\_0084) under section 75W of the EP&A Act. The approval authority is the Minister for Planning.

### Environmental Assessment

An Environmental Assessment (EA) was prepared for Origin to accompany an application under Section 75W of the EP&A Act to modify the existing Project Approval (07\_0084). The modification is seeking approval for the augmentation of the EAD. The EA considered all the potential environmental issues identified during the planning and assessment including the preparation of specialist and technical studies to support the EA.

The EA was placed on public exhibition between 13 September 2018 and 27 September 2018 and was made available on the DPE web site. Throughout this period, stakeholders including the community, special interest groups local council and relevant government agencies were invited to comment on the EA.

### Response to submissions report

This Response to Submissions report (RTS) provides Origin's response to submissions received on the EA during the public exhibition period. Origin has reviewed all the submissions received and has prepared clarifications and responses to the items raised.

### Issues raised in submissions

A total of 29 submissions were received by the NSW Department of Planning and Environment (DPE) and each submission was registered as 'Objects' or 'Comments'. Of the 29 submissions received, 7 were neutral and 22 objected to the project modification. One submission was received after the exhibition period closed but has been included in the list of submissions and the responses.

The key issue categories included the following (in alphabetical order):

- Air quality
- Alternatives
- Approvals process
- Climate change
- Consultation
- Contamination
- Dam integrity
- Energy sources
- Environmental risk
- Flora and fauna
- Health
- Other.

### **Benefits of the Project**

The EAD provides CCP storage capacity for EPS and therefore the EAD is an essential part of EPS. It is expected that there will continue to be an increasing reliance on EPS following the recent and planned closures of large generation assets in NSW (e.g. Munmorah Power Station which closed in 2012 and Liddell Power Station which is due to be closed in 2022) and in Victoria and South Australia. The continued operation of the EPS is required to ensure future power system security within the broader National Electricity Market.

Other key benefits of the Project include:

- Improvements to existing stormwater infrastructure beside the EAD would reduce runoff currently entering the EAD via overland flows, and therefore reduce the potential for surface water and groundwater impacts.
- The receiving water pond would provide storage capacity to manage flows from the EPS site.
- The CCP placement strategy would secure operation for the coming years and facilitate the development of a strategy to enable operations to continue until the presently anticipated EPS closure date of 2032.

The Project generally maintains the existing scale of EPS operations as it would be located primarily within the existing operational footprint of the EAD.

Origin has commenced an extensive program of rehabilitation and revegetation of areas affected by the operations of the EPS. Progressive rehabilitation of completed surfaces of the EAD would be undertaken where possible, which would minimise the potential for generation of dust emissions.

### **Mitigation measures**

A comprehensive list of mitigation measures was provided in Section 9.0 of the EA to mitigate potential impacts associated within the Project as described in the EA. These mitigation measures have been revised following issues raised during submissions received on the EA and are provided in Section 8.0 of this RTS.

### **Ongoing consultation with community and stakeholders**

Origin would continue to consult with community members and affected stakeholders as outlined in responses throughout Chapters 5 to 7 of this RTS. Consultation would also occur with relevant government agencies throughout the planning and construction of the Project, as required.

### **Conclusion**

All submissions received on the EA have been reviewed and responses have been provided within this RTS. These responses include revising some of the mitigation measures for the Project.

It is considered that whilst the Project may have some residual impacts, the management measures identified would effectively ensure that the environmental consequences associated with the Project are minimised and likely to remain substantially the same as those currently approved.

The benefits of the Project would outweigh its potential impacts with the implementation of the proposed management and mitigation measures as identified in this EA. It is therefore considered that it is appropriate and in the public interest to approve the Project.

## 1.0 Introduction

### 1.1 Background

Origin owns and operates EPS and the associated EAD on Rocky Point Road, in the Lake Macquarie Local Government Area. EPS has been operating since 1982 and comprises four 720 MW coal fired units. EPS is Australia's largest power station with a generation capacity of 2,880 MW, accounting for approximately 25 per cent of New South Wales' power requirements. EPS is presently anticipated to reach the end of its operational life by 2032.

Currently, CCP generated during the production of electricity is either reclaimed for beneficial reuse or deposited hydraulically via pipelines into the EAD. The EAD has been an essential part of EPS since it began operations in 1981.

### 1.2 The Project

Origin is seeking to augment the EAD using a placement strategy and landform design to maintain operational flexibility and extends the storage life of the EAD in the short to mid-term whilst continuing to support long term CCP placement strategies towards the anticipated closure date of 2032.

This is part of a broader approach to the operation of EPS, to enable it to adapt to the dynamics of energy supply and demand, power station operations and EAD management practices throughout its working life.

### 1.3 Assessment, Approval Process and Exhibition

EPS currently operates under a number of Project Approvals, including Project Approval 05\_0138, Concept Approval 05\_0138, Project Approval 06\_238 and Project Approval 07\_0084 for the management of CCP at the EPS site, as well as the original authorisations for EPS which are supported by the *Eraring Power Station Act 1981* (which commenced on 15 December 1981).

The Concept Approval and various Project Approvals described above were issued under Part 3A (now repealed) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Part 3A of the EP&A Act was repealed in 2011, however transitional arrangements were set out in Schedule 6A of the EP&A Act which provided that Part 3A continued to apply to the approved Part 3A project, including modifications to Project Approvals under section 75W of the EP&A Act.

On 1 March 2018, amendments to the EP&A Act were enacted to remove these Part 3A transitional arrangements. The transitional arrangements that were previously contained within Schedule 6A of the EP&A Act were transferred to Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, with additional provisions inserted regarding the removal of these transitional Part 3A arrangements.

Origin briefed the Department of Planning & Environment (DPE) regarding the proposed Project on 22 February 2018 and submitted documentation describing the proposal on 28 February 2018. Advice received from DPE (dated 28 February 2018) confirmed that a modification to Project Approval (07\_0084) under Section 75W of the EP&A Act would be the appropriate approval pathway for the Project.

As this modification request was submitted prior to the cut-off date of 1 March 2018, the provisions of the former Part 3A continue to apply to this modification request. The current Project would therefore be undertaken as a modification to the existing Project Approval (07\_0084) under section 75W of the EP&A Act. The approval authority is the Minister for Planning.

Separately, given the repeal of Part 3A (which provided for concept approvals) and as Concept Approval 05\_0138 is now largely redundant, Origin proposes to surrender the Concept Approval.

Exhibition of the Environmental Assessment (EA) for the Project commenced on 13 September 2018 and was completed on 27 September 2018. The EA was made available on the DPE web site (<http://majorprojects.planning.nsw.gov.au/>).

## 1.4 Purpose of this Report

The public exhibition of the EA provided a formal opportunity for the community and other stakeholders and agencies to share their knowledge and opinions, and provide input into the assessment by making written submissions on the Project.

This Response to Submissions report (RTS) highlights the value of this public involvement and provides responses to the submissions received during the public exhibition of the EA. Correspondence was received by Origin from DPE providing copies of submissions received during the exhibition of the EA and requesting responses to the matters raised in those submissions.

The purpose of this RTS report is to:

- Detail and provide responses to issues raised in the submissions received during the EA exhibition period;
- Note any changes to the Project or additional management measures that have been recommended as a result of those submissions; and
- Enable the Minister for Planning or his delegate to determine the application.

## 1.5 Structure of this Report

This RTS Report addresses issues raised in the submissions received during the exhibition period and is structured as follows:

- **Section 1.0** and **Section 2.0** provides an overview of the project, the EA process and the RTS purpose and structure
- **Section 3.0** provides a summary of the actions undertaken during and after exhibition of the EA
- **Section 4.0** provides an analysis of the submissions received
- **Section 5.0** and **Section 6.0** provides an analysis of the special interest group and community member submissions received and responses
- **Section 7.0** provides a summary of the agency submissions received and responses
- **Section 8.0** describes updated mitigation measures for the project
- **Section 9.0** Conclusion and summary of the proposed project
- **Appendices** containing information referenced in the RTS.

## 2.0 Overview of Exhibited Project

### 2.1 Project Summary

The Project would involve the amendment of the current CCP deposition strategy to achieve the landform shown in **Figure 1**. There are four main elements to the Project which are described below.

- Amendment of the ash deposition strategy, including:
  - The continued deposition of CCP within the EAD using a combination of techniques as appropriate based on observed CCP characteristics and ongoing ash dam surveillance. Deposition techniques would be adjusted as required to achieve the design landform.
- Establishment of the Western Emplacement Area to enable CCP deposition to RL140 within existing areas of the EAD, requiring:
  - Construction of a western saddle embankment
  - Reconfiguration of the existing RL140 Access Road
  - Filling of Mine Voids underlying the EAD.
- Upgrades to ancillary infrastructure including:
  - Stormwater diversion systems
  - Ash delivery line re-configuration.
- Decommissioning and relocation of CCP recycling infrastructure.

The Project Approval 07\_0084 for the staged expansion of the Eraring Ash Dam in 2008 envisaged that CCP placement would be limited to relative level (RL) 140 metres. The Project would not involve CCP storage above RL 140 metres and retains broadly similar landform characteristics to the original design. However, establishment of an improved stormwater diversion system and western saddle embankment are new design elements which require earthworks and clearing of additional vegetation.

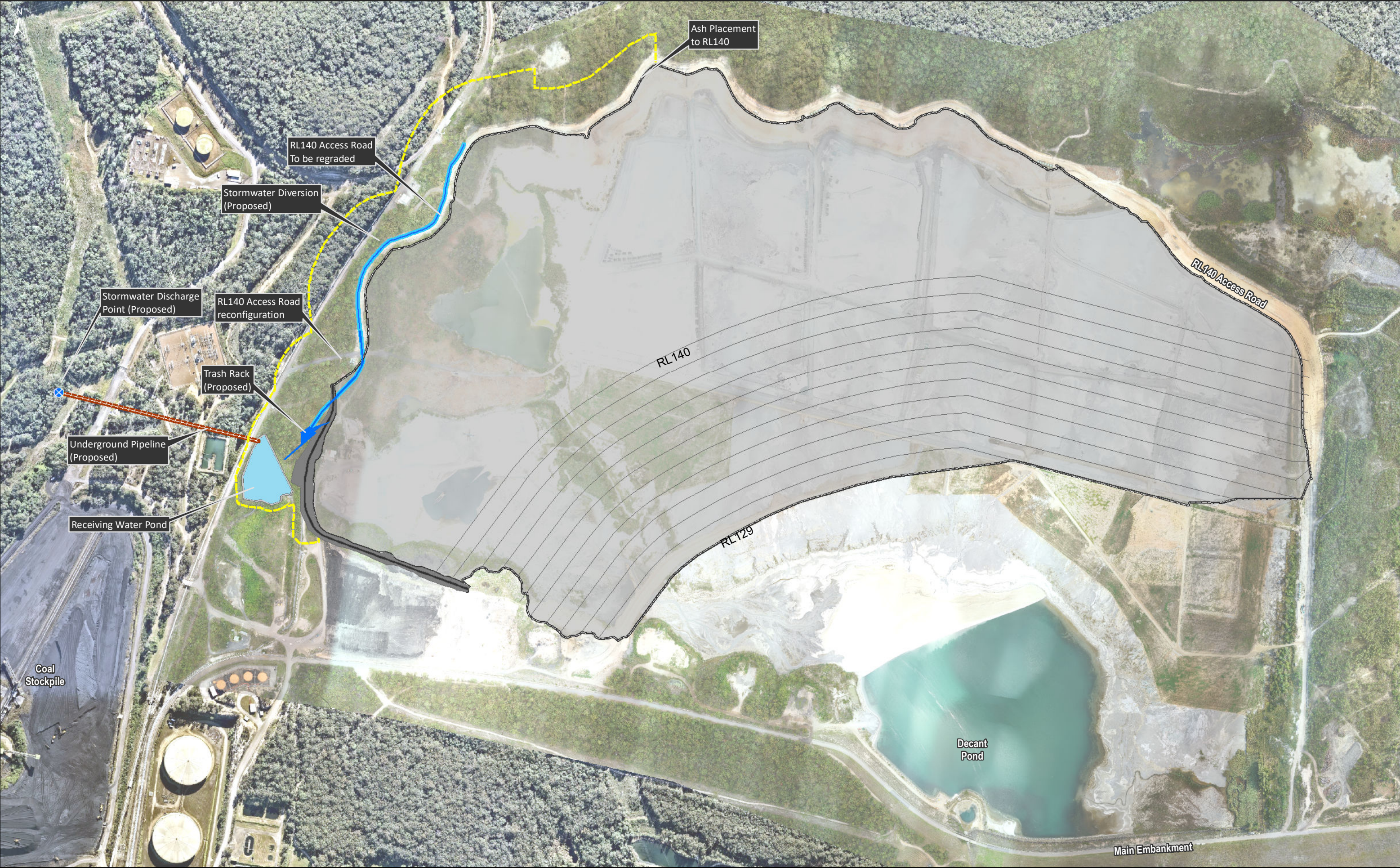
The Project generally maintains the existing scale of EPS operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support activities such as ash reuse, water management and ongoing temporary and long term rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and ash placement strategies. The proposed augmentation would see ash placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active ash placement. The proposed modification would increase the ash surface area potentially exposed during operation of the Project by between 4% and 7%.

While some changes to mitigation measures have been proposed in response to submissions, the Project remains as described in Section 4.1 of the EA.

#### 2.1.1 Amended ash deposition strategy

The Project would include ash deposition to RL 140m within the western operational footprint of the EAD. As part of the Project, a western saddle embankment would be constructed, the RL 140 Access Road would be reconfigured and some mine voids within the inactive workings of the former Awaba coal mine would be filled.





**Project Design Elements (Proposed)**

- Ash Placement to RL140
- Limit of additional surface disturbance to facilitate filling of mine voids

- Ash Placement Contours
- Roadway
- Bored Tunnel

- Western Saddle Embankment
- Stormwater Discharge Point
- Stormwater Diversion Alignment

- Stormwater Detention Basin

**Design Landform - Ash placement to RL140**  
Ash Dam Augmentation Project  
Source: Origin 2018  
0 50 100 200 Meters



### 2.1.2 Establishment of Western emplacement area for ash deposition

The Project would include CCP deposition to RL 140m within the western operational footprint of the EAD. As part of the Project a western saddle embankment would be constructed, the existing RL 140 Access Road would be reconfigured and some mine voids within the inactive workings of the former Awaba coal mine would be filled.

#### Western saddle embankment

A western saddle embankment is required along the perimeter of the Western Emplacement Area to enable safe placement of CCP to RL 140m. The concept design of the new western saddle embankment incorporates an earth fill embankment approximately 600m in length, constructed to a maximum height of 10m.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. The design of the western saddle embankment has been undertaken in consultation with the NSW Dam Safety Committee (DSC), relevant DSC guidelines, Australian National Committee on Large Dams (ANCOLD) guidelines and the requirements of the *Dams Safety Act 1978*.

#### Reconfiguration of RL140 access road

The EAD is bounded on the west and north by an access road nominally established at RL140 m. Establishment of the western saddle embankment would require re-alignment of the existing access road to connect with the crest of the embankment (which would form an extension of the existing access road).

Actual road level is variable along the alignment and to support stormwater diversion works it would be necessary to adjust gradients in both directions to design levels. It is anticipated that up to 500m of existing roadway may require regrading.

#### Filling of mine voids

As the Western Emplacement Area is located above inactive mine workings, remedial action is required to address the potential for:

- subsidence causing fractures and ground movements potentially impacting works associated with the Project
- direct water connectivity between the EAD and mine workings.

A range of remedial approaches would be employed to effectively mitigate subsidence risks identified for the site which would include the following techniques:

- Filling of mine voids with stabilised fill material; and/or
- Excavating and controlled collapsing of shallow mine workings; and/or
- Installing an impervious barrier using clays or suitable stabilised fill materials.

The preferred strategy may employ all or a combination of the above techniques. The effectiveness of these remedial actions would be confirmed prior to CCP placement above RL130 within the emplacement area.

### 2.1.3 Water management systems

Improved controls would be implemented and structures would be constructed to effectively manage both stormwater and process flows in and around the EAD. This would include new stormwater works intercepting potential surface flows to the Western Emplacement Area, and diverting these water flows to water storages within the broader Eraring catchment before they interact with the EAD.

#### Stormwater diversion works

New stormwater diversion works are required along the RL 140m access road for a length of approximately 1 kilometre to the north-west of the EAD. The stormwater diversion works would substantially reduce surface water flows currently entering the EAD by diverting run-off from an estimated catchment area located to the north of the EAD approximately 8.6ha in size.



Diverted stormwater flows would enter an existing receiving pond which would be reshaped (within the same general footprint as currently exists) to accommodate design storage volumes. The receiving pond would provide an estimated 10,000m<sup>3</sup> of storage volume, and substantial additional buffer storage and overtopping storage totalling approximately 39,342m<sup>3</sup> based on the surrounding terrain.

Works associated with the receiving pond are described in Section 4.1 of the EA.

The Project would provide an improvement to surface water management, by diverting stormwater that would otherwise flow into the EAD. Furthermore, the water management system would improve climate change resilience as described in **Sections 5.4** and **5.7** below.

#### **2.1.4 Upgrades to ancillary infrastructure**

New CCP deposition pipelines would be required to transport and deposit dense phase CCP slurry within the EAD. Pipelines would be constructed with multiple discharge points and connect to the existing CCP pipeline network. Discharge spigots may be located strategically within the EAD to enable staggered deposition. Deposition pipelines may be relocated as required throughout the course of the Project to enable the most efficient deposition of CCP material.

#### **2.1.5 Decommissioning of ancillary infrastructure**

Establishment of the Western Emplacement Area would require relocation of CPP recycling infrastructure currently operated by Boral<sup>1</sup>. Infrastructure in this area primarily consists of mobile plant which is readily relocatable. Existing culverts acting to drain process water from the clean water detention pond to the EAD would be decommissioned either by removal or filling with a suitable grout material.

### **2.2 Summary of Project Need**

The EAD provides CCP storage capacity for EPS and so the EAD is an essential part of EPS.

It is expected that there would continue to be an increasing reliance on EPS following the recent and planned closures of large generation assets in NSW (e.g. Munmorah Power Station which closed in 2012 and Liddell Power Station which is due to be closed in 2022) and in Victoria and South Australia. The continued operation of the EAD is required to ensure future power system security within the broader National Electricity Market.

To meet market demand and ensure system security (as a result of recent power station closures) EPS has operated at higher than previously planned output rates. This has resulted in an increase in CCP disposal rates to the EAD in recent years than previously anticipated.

An assessment of EAD storage capacity has been undertaken and has determined that alternate CCP placement strategies are important for maximising the efficient application of CCP in the short to mid-term.

The benefits of the Project include:

- Improvements to existing stormwater infrastructure north of the EAD would reduce runoff currently entering the EAD via overland flows, thereby reducing the potential for surface water and groundwater impacts
- The receiving water pond would provide storage capacity to manage flows from the EPS site.
- The CCP placement strategy would secure operation for the coming years and facilitate the development of a strategy to enable operations to continue until the presently anticipated closure date of 2032.

The primary benefit of the Project is ensuring future power system security within the broader National Electricity Market.

---

<sup>1</sup> It is clarified that the recycling infrastructure operated by Boral processes 'bottom ash', a sub-component of CCP.

## 2.3 Summary of Key Potential Impacts

An assessment of potential environmental impacts associated with the Project based on existing data and knowledge of the site was carried out. A risk analysis was undertaken to rank these issues according to the level of environmental risk. Based on the risk analysis, the key issues and potential impacts as a result of the Project were considered to be as follows.

### Biodiversity

The Project would result in direct impacts on biodiversity values through the loss of vegetation and fauna habitats as a result of clearing works and subsequent facility operations. A Biodiversity Development Assessment Report has been prepared in accordance with the *Biodiversity Conservation Act 2016* (BC Act).

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places, which are further described and defined as matters of national environmental significance (MNES). Potential impacts to MNES are considered in Section 5.1 of the exhibited EA and are further described in the Biodiversity Development Assessment Report (which forms Appendix C of the EA).

The EA concluded that the Project is not expected to have a significant impact on relevant MNES and accordingly, the Project would not need to be referred to the Department of Environment and Energy (DoEE). A report (Umwelt, 2018) has been prepared to confirm these findings (see **Appendix A**) and confirms that the project is unlikely to result in a significant impact to MNES.

Approximately 8.95 hectares of native vegetation would be directly impacted by the Project. Three ecosystem-credit species were recorded during field surveys or were considered likely to occur within the Project area, including:

- Black-eyed Susan (*Tetradlea juncea*)
- Squirrel glider (*Petaurus norfolcensis*)
- Stephen's banded snake (*Hoplocephalus stephensii*).

Following the application of avoidance and mitigation measures, assessment in accordance with the Biodiversity Assessment Method identified that the following biodiversity credits would be required to offset the impacts of the Project:

- 22 ecosystem credits for PCT1627 Smooth-barked Apple – Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast
- 261 ecosystem credits for PCT1636 Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast
- 327 species credits each for Black-Eyed Susan – (*Tetradlea juncea*), Squirrel Glider (*Petaurus norfolcensis*) and Stephen's Banded Snake – (*Hoplocephalus stephensii*).

Offset requirements under the *BC Act* would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of stewardship sites and the retirement of relevant credits from that site (or those sites)
- In-perpetuity conservation through securing required credits through the open credit market and/or
- Payments to the Biodiversity Conservation Fund, which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

In-perpetuity conservation would form the preferred method of offsetting under the BC Act where practicable. Origin has undertaken preliminary investigations of land-based offset opportunities and identified approximately 60ha of potentially suitable land. An additional 500ha of potential offset sites have also been identified within 10km of the Project Area.

## Hydrology

During operation of the proposed stormwater diversion system for the Project, additional run-off from an estimated catchment area of approximately 8.6ha would be diverted to a proposed receiving pond (which has an existing catchment of approximately 12.1ha). This accounts for an increase in just over 70% of the existing catchment area which would otherwise flow to the EAD. Sustained heavy rain events would utilise overtopping storages which extend beyond the constructed limits of the receiving pond based on local topography and be diverted to a new discharge point via pipeline, some 360m to the west.

Diverted water would only be discharged during times of sustained rainfall events when it is anticipated that the estimated 10,000m<sup>3</sup> storage capacity of the receiving pond may be exceeded (Aurecon, 2018). Flows discharged from the receiving pond would be limited to a rate of 240m<sup>3</sup>/hour (by pipeline diameter) and therefore water received during peak storm inflows would be discharged over a prolonged period.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The construction of new stormwater works along a length of approximately 1 kilometre to the north-west of the EAD would divert stormwater flows from local catchments (which would otherwise enter the EAD) into an existing receiving pond. The volume of surface flows currently entering the EAD would therefore be substantially reduced, further minimising the potential for surface water to enter the EAD and infiltrate groundwater. A depression approximately 3ha in extent located within the current western extent of the EAD currently collects some stormwater drainage from the immediate catchment area. This water storage would be made redundant by the proposed stormwater diversion works. CCP placed within this area during the Project would displace water, reducing the volume of standing water available to infiltrate as groundwater in this area. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

The Western Emplacement Area would be located over the mine workings of the former Awaba Mine and is discussed further below. The proposed final ash placement level at this location is approximately RL 140 whereas the existing extent of the EAD sits at approximately RL 130. Water within the deposited CCP slurry would drain towards the water collection point at the lowest part of the EAD. Therefore, due to the gradient and existing groundwater flow regime there is expected to be minimal available water to infiltrate into groundwater surrounding the western emplacement area. Filling of mine voids (as described in Section 4.1.2 and 8.3 of the EA) would further reduce the potential for seepage or groundwater migration from the site.

Potential impacts to coastal wetlands and the coastal environment were considered based on the existing flow path of stormwater from the site. The diverted catchment (approximately 20.7ha) would be much smaller than the area of wetland it is flowing into (estimated to be an area of around 90ha to 100ha). The flow pathway approximately 3.5 km from the receiving pond and also collects a larger catchment associated with the existing EPS and surrounds. Consequently, the volume of water diverted as a result of the Project is likely to comprise a relatively small proportion of total flows entering the wetland. Further, diverted flows would be limited to a maximum rate of 240m<sup>3</sup> per hour and would be temporary in nature (less than 40 minutes during a 1% AEP storm event and 5.4 hours during a Probable Maximum Flood). Therefore the volume, duration and frequency of diverted flows are likely to be inconsequential in comparison to the current flows reaching the wetland under existing conditions.

## Geotechnical

Disused mine workings (the former Awaba Mine, operated by Centennial Coal) have previously been identified beneath the north western portion of the EAD. An assessment of potential mine subsidence impacts was prepared to review and assess potential geotechnical risks of the Project relating to the proximity of the underground mine workings.

The assessment identified two potential risks associated with the Project:

- Potential for subsidence in the form of either pillar collapse or roof failures leading to sinkhole formation and impacting on the EAD and the western saddle embankment.
- Mining induced fractures resulting in connectivity and the potential for surface water to flow from the EAD into the mine workings.

Both subsidence and surface water connectivity risks can be effectively controlled through the application of mine void filling technologies (SCT, 2018<sup>2</sup>).

Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Rehabilitation Plan is provided in Section 8.0.

The area that would be required to be remediated would depend on a range of factors including the hydraulic conductivity of the fill material and the effectiveness of the filling strategy used. The design would be further developed relying on further testing and the available engineering approaches.

### Aboriginal heritage

In 2006, HLA-Envirosciences Pty Ltd (HLA, now AECOM) undertook an archaeological survey for proposed alterations and additions to the existing EPS, specifically the expansion of the EAD and the installation of a black start/peaking generator. The survey did not identify evidence of surface Aboriginal sites and assessed the potential for subsurface archaeological sites to be low on the basis of a lack of a developed or *in situ* soil profile within the study area.

An Aboriginal heritage assessment was undertaken in accordance with the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation 2005* (which were developed for all Part 3A projects) and the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. This included a visual inspection of the Project area by a heritage specialist. The Due Diligence Code provides a process whereby a reasonable determination can be made as to whether or not Aboriginal objects would be harmed by an activity, whether further investigation is warranted and whether the activity requires an Aboriginal Heritage Impact Permit (AHIP) application. The Aboriginal heritage assessment did not identify any areas of Aboriginal archaeological or cultural sensitivity and found that Aboriginal sites or objects are unlikely to be discovered or impacted as a result of the Project. In the unlikely event that Aboriginal objects are identified during the construction of the project, works would cease and relevant agencies would be contacted.

### Air quality

The Project area is surrounded predominantly by undeveloped bushland, which serves as a buffer zone between EPS and surrounding residential areas. Residential receivers closest to the EAD are located in Eraring, approximately 1km to the south. The Myuna Bay Sport and Recreation Centre is located approximately 500m to the south.

The Project would continue to utilise dense phase CCP placement as per existing operations and is not expected to generate a significant increase in air emissions. Potential emissions from construction works would be minor and temporary and would be managed in accordance with standard construction management measures. Progressive rehabilitation of completed surfaces of the EAD would be undertaken in a staged manner where possible, minimising the potential for dust emissions. Targeted treatment of localised dusting events would continue to be undertaken using active measures including:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition

---

<sup>2</sup> SCT, 2018, Assessment of Potential Mine Subsidence Impacts for Proposed Eraring Ash dam Augmentation Project. Report dated 14 July 2018

- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks.

**Traffic**

The transport of up to some 48,000m<sup>3</sup> of fill material and cement to site would require up to 600 trucks, (or about 50 trucks per week) during the materials delivery phase, expected to occur over a three month period. Other construction vehicle movements would include the transport of minor quantities of construction materials / wastes to and from the EPS site and construction employees travelling to the EPS site. These vehicle movements are expected to be minimal.

Vehicle traffic counts were undertaken on 5 April 2018 during the morning period (7.00am to 10.00am) and afternoon period (4.00pm to 7.00pm) at the intersection of Dora Street and Short Street, Morisset and at the intersection of Rocky Point Road and Construction Road to inform the EA. During the twelve hour monitoring period 9,059 vehicles utilised the Dora Street / Short Street intersection, of which there were 327 heavy vehicles (approximately 4%).

When compared to existing traffic levels utilising the intersections of Wangi Road / Rocky Point Road (Eraring) and Dora Street / Short Street (Morisset), these additional temporary truck movements would not significantly impact the capacity of the existing traffic network. No alterations or new connections to the public road network are proposed as part of the modification. Traffic entering and exiting EPS in connection with the Project would be managed in the following ways:

- Access arrangements would be communicated with all truck drivers (e.g. using route maps) to ensure that they access the site from the proposed route (being via the Pacific Highway (M1), Mandalong Road and through Morisset onto Wangi Road, Rocky Point Road and Construction Road)
- Heavy vehicle truck movements would be staged in order to minimise impacts on the surrounding traffic network
- All additional car and truck parking would be managed wholly within the EPS site.

**Other environmental issues**

Other environmental issues were considered to have very low or no anticipated impact, including waste, noise, visual, traffic and transport, GHG emissions, Non-Aboriginal heritage, social and economic and cumulative impacts. These environmental issues were addressed in Table 15 of the EA and standard safeguards as outlined in Section 9 of the EA would be used to mitigate potential impacts associated with these environmental issues.

## 3.0 Actions Taken During and After Environmental Assessment Exhibition

### 3.1 Engagement Activities

A number of activities were undertaken with key stakeholders both during and after the exhibition period of the EA. These activities are outlined below in **Table 1**.

**Table 1 Engagement activities carried out during and after EA exhibition**

Stakeholder	Activity	Date	Outcomes
Office of Environment and Heritage	<ul style="list-style-type: none"><li>Site visit to EPS to review Biodiversity Assessment Methodology</li></ul>	8/10/2018	It was confirmed that ecological assessments were undertaken in general accordance with the Biodiversity Assessment Method.
Department of Planning and Environment	<ul style="list-style-type: none"><li>Site visit to EPS</li></ul>	8/10/2018	The proposed modifications were discussed to clarify particulars of the project.

This page has been left blank  
intentionally.



## 4.0 Analysis of Submissions Received

### 4.1 Overview

The EA was placed on exhibition between 13 September 2018 and 27 September 2018.

During the display period of the EA, submissions were invited from the community and other stakeholders. The receipt of submissions was coordinated and managed by DPE. Submissions were received by the Department, and uploaded onto the Department's website. Submissions were accepted by electronic online submission or post.

A total of 30 submissions were received by DPE and each submission was registered as 'Objects' or 'Comments'. Each submission has been assigned a unique submission number.

A listing of all submissions received is provided in **Appendix B**, together with the unique number of each submission, the submitter's position (Objects or Comments), and the section in this report that responds to the issue(s) raised by the submitter.

Community submissions are discussed further in **Section 5.0**. Special interest group submissions are discussed further in **Section 6.0**. Government agency submissions are discussed further in **Section 7.0**.

### 4.2 Analysis

Of the 31 submissions received, 18 were from members of the public, 6 from special interest groups and 7 from government agencies. Of these 8 were neutral and 22 objected to the project modification. Two submissions were received after the exhibition period closed (NSW Dam Safety Committee and NSW Department of Industry) but have been included in the analysis of submissions and the responses. An analysis of the submissions is provided below.

#### 4.2.1 Public submissions received during the exhibition period

Eighteen submissions were received from members of the community including:

- 17 objections
- 1 neutral.

The submissions received were from the areas shown in **Table 2**:

**Table 2 Location of Submissions Received**

LGA	Suburbs	No. of Submissions
Lake Macquarie	Morisset, Rathmines, Valentine and Murrays Beach	6
Newcastle	Cooks Hill, Maryland, Hamilton East, Islington and Tighes Hill.	7
Central Coast	Lake Munmorah and Jiliby.	3
Cessnock	Quorrobolong.	1
Ku-ring-gai	Killara	1
Total		18

These 18 submissions included two form letters (with some variation among those form letters) which were received from a total of 9 individuals.

#### 4.2.2 Special interest groups

Six submissions were received from special interest groups, including:

- Nature Conservation Council of NSW
- Environmental Justice Australia
- Northern Lakes Disability Tourism Precinct Committee Inc
- Hunter Community Environment Centre;
- Greenpeace Australia Pacific; and
- Community Environment Network.

Of the 6 submissions received from special interest groups, 5 submissions were objections and 1 submission was neutral.

#### 4.2.3 Government agencies

Seven submissions were received from State and Local Government agencies including:

- NSW Dam Safety Committee (DSC)
- NSW Department of Planning and Environment - Division of Resources and Geoscience (DRG)
- Lake Macquarie City Council (LMCC)
- NSW Office of Sport
- NSW Environment Protection Authority (EPA)
- NSW Office of Environment and Heritage (OEH)
- NSW Department of Industry (DoI).

All 7 government agency submissions were neutral. No objections were received from any of the government agencies.

### 4.3 Categorisation of Public Submission Issues

The analysis of public submissions involved identifying the issues raised and coding the issues into key issue categories with sub-issue categories. Twelve key issue categories were identified and coded during the initial phase of the submission review process. Key issue and sub-issue categories are shown in **Table 3**.

**Table 3 Issue categories**

Issue Categories	Issues raised
Air quality	<ul style="list-style-type: none"> <li>• The potential for the EAD modification to generate dust, therefore impacting on local air quality</li> <li>• Discussion regarding previous dusting events that occurred in the last 2 years.</li> </ul>
Alternatives	<ul style="list-style-type: none"> <li>• Renewable energies should be invested in, avoiding coal fired power plants</li> <li>• Option 3 (<u>RL 138 Embankment Raise</u>) in a 2014 ash disposal options assessment should be the preferred option due to its reduced impacts on natural habitat</li> <li>• Alternative uses of CCP: Consideration should be given to returning CCP to the voids in the Valley, away from waterways to the disused mines or it should be reused, such as in buildings.</li> </ul>
Climate change	<ul style="list-style-type: none"> <li>• The potential for future intensified weather conditions and natural destruction events to impact on the Project.</li> </ul>

Issue Categories	Issues raised
Consultation	<ul style="list-style-type: none"> <li>The effectiveness of stakeholder consultation, community consultation groups and committees.</li> </ul>
Contamination	<ul style="list-style-type: none"> <li>Increasing total quantities of stored CCP may pose an increased risk to the environment</li> <li>The potential for the modification to increase rates of leaching and run off into Lake Macquarie</li> <li>The potential impact of contaminants on natural resources within the locality including wetlands and Lake Macquarie.</li> </ul>
Dam Integrity	<ul style="list-style-type: none"> <li>The structural integrity of the dam and the chosen design should be confirmed with scientific research. Public should be given the opportunity to comment on any improvements</li> <li>The potential for extreme weather events to cause impounded material to be released into Lake Macquarie</li> <li>The potential for climate change and storm event impacts on the EAD.</li> </ul>
Energy sources	<ul style="list-style-type: none"> <li>Should the Project be approved, construction should not begin until current EAD capacity is almost reached</li> <li>No mention made in the EA of what is proposed for CCP generated post 2024</li> <li>Conflict between the expected EPS shut down date and the expected life of the Project.</li> </ul>
Environmental risk	<ul style="list-style-type: none"> <li>Potential for contaminant leakages that could impact upon groundwater and surface water that could enter Lake Macquarie</li> <li>The potential for the Project to impact water quality of Lake Macquarie, surrounding wetlands and Myuna Bay due to increased rates of leachate</li> <li>The potential for the Project to generate stormwater overflow issues.</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>The potential for the Project to impact fauna and flora and on the breeding ability of species</li> <li>The potential for the EAD to impact upon marine and aquatic fauna and their habitat (including endangered species) and fish stocks.</li> </ul>
Health	<ul style="list-style-type: none"> <li>The potential for the Project to impact on human health and safety in the nearby area due to coal ash dust and contaminants</li> <li>The EAD poses an unacceptable hazard to the health and safety of the residents and environment of Lake Macquarie and increasing the volume of coal ash stored indefinitely on the shores of Australia's largest saltwater coastal lake is irresponsible.</li> </ul>
Other	<ul style="list-style-type: none"> <li>Origin has failed to meet its CCP reuse target of 80%, with only 37% of the CCP generated currently used</li> <li>The modification should be used as an opportunity to bring the facility up to best practice</li> <li>The Precautionary Principle must be followed.</li> </ul>

This page has been left blank  
intentionally.

## 5.0 Response to Community Submissions

### 5.1 Overview

Out of the 18 community submissions received, seven submissions were form letters, some with slight variations in the text. Together, the community submissions raise a variety of concerns in addition to those raised within the form letters.

### 5.2 Air Quality

A total of seven submitters identified concern over the Project's impact on air quality, including submissions 007, 009, 012, 013, 014, 017 and 018. The issues raised from these submissions related to the following:

- The potential for the EAD modification to generate dust, therefore impacting on local air quality
- Discussion regarding previous dusting events that occurred in the last 2 years.

#### Response

The Project generally maintains the existing scale of operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support CCP reuse activities, water management and ongoing rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and CCP placement strategies. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. The proposed modification would increase the CCP surface area potentially exposed during operation of the Project by between 4% and 7%.

A Construction Environmental Management Plan (CEMP) would be prepared and implemented during construction of the Project. The CEMP would consider potential sources of dust and would include mitigation measures to be implemented during construction to minimise potential air quality impacts.

A review of the operational environmental management procedures was undertaken in response to the previous dusting events that occurred in late 2016. The following measures are currently employed to mitigate the potential for dust generation on the EAD and are addressed within the EPS environmental management procedures:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment
  - Airborne Total Suspended Particulate (TSP) and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
  - Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

Should a dusting event occur with the potential for offsite impacts, the procedure set out in the Pollution Incident Management Response Plan (PIRMP) would be followed including, where required, notification of relevant government agencies.

It is noted that within the EAD an area of approximately 20 hectares (ha) has been temporarily capped since 2016 to mitigate the potential of a dusting event. Whilst capping in some areas of the EAD is necessarily temporary, Origin would continue to implement environmental management procedures (including temporary capping of new areas where appropriate) to mitigate the potential for dust generation from the EAD.

### 5.3 Alternatives and Design Changes

A total of eight submitters commented on, raised concerns or identified alternative options to the preferred option and outcomes presented in the EA. This included submissions 003, 006, 007, 008, 009, 011, 014 and 018. The issues raised in these submissions related to the following:

- Renewable energies should be invested in, avoiding coal fired power plants
- Option 3 (RL 138 Embankment Raise) in a 2014 ash disposal options assessment should be the preferred option due to its reduced impacts on natural habitat
- Alternative uses of ash: Consideration should be given to returning fly ash to the voids in the Valley, away from waterways to the disused mines or it should be reused, such as in buildings.

#### Response

Origin is an integrated energy company, and has a 5 pillar approach to drive decarbonisation of its business, including an aim to exit coal fire generation by 2032.

Origin is committed to ensuring it can provide a reliable and secure energy supply to its customers and the community. EPS is a critical generation asset, as it provides approximately 25% of NSW's power requirements. The EAD is an essential component of EPS, which enables the operation of EPS. The Project is one of the steps that Origin is taking to ensure EPS continues to have operational flexibility to respond to market demands as the national energy generation mix changes over time, including with the increasing use of solar and other renewables.

CCP generated at EPS is managed in accordance with the specific environmental management procedures related to the site and continues to be a viable resource for the building and construction industries. The environmental management procedures provide a detailed program for the investigation and development of possible reuse and recycling options. Origin is currently active in the CCP reuse market, and has agreements in place for CCP to be used in the production of cement and concrete used by the building and construction industries. Origin is currently exploring further initiatives to increase the percentage of CCP that would be recycled. Origin has recently commenced a testing process with an innovative organisation that has successfully developed processes to utilise CCP in the production of a variety of building and construction industry applications.

However, the rates of reuse and recycling of CCP remain heavily influenced by building and construction industries demand, and current recycling opportunities are not sufficient to allow the current EAD CCP placement strategy to accommodate all of the CCP for the remaining life of EPS. Therefore, the Project is required in order to support the ongoing operation of EPS. Further detail regarding CCP reuse is provided in **Section 5.13**.

Removal of CCP from the EAD is not a feasible alternative to the Project due to the lack of other suitable purpose built storages and logistical and environmental challenges encountered when transferring CCP over substantial distances. Transportation of CCP for offsite disposal would require dedicated infrastructure with an associated environmental footprint. Progression of an offsite storage solution would also forego the existing functionality provided by facilities and substantial infrastructure which supports the current and continued operation of the EAD. It is considered the preferred option presents substantial advantages when considering potential disturbance and potential environmental impacts which may be required to facilitate offsite disposal (whether via pipeline, road, rail or conveyor).

An Ash Disposal Options Assessment undertaken in 2014 considered alternative on-site CCP disposal options at EPS. *Option 3 – RL 138 Embankment Raise* consisted of an 8m downstream raise to the existing main embankment to provide additional storage capacity of approximately 20.5 Mm<sup>3</sup>. The preliminary design of this option was configured to exclude encroachment into existing habitat offset areas and a constructed wetland. Constraints associated with this option included placement of CCP over approximately 59.6 hectares of land undergoing progressive rehabilitation and significant capital expenditure to raise the main embankment.

Investigation of a number of options, including Option 3, are being undertaken to identify a long-term CCP disposal solution to enable operations until the presently anticipated EPS closure date of 2032. However the augmentation of the EAD deposition strategy is considered to be the preferred option given the ability of the option to support the continued operation of the EAD consistent with the Project's objectives which include minimising potential impacts to the environment. The Project is designed to allow for CCP placement up to 2024, in a way which maintains flexibility for the development of strategies for further CCP placement up to the anticipated EPS closure date of 2032.

## 5.4 Climate Change

Four submitters (010, 015, 016 and 018) raised issues regarding the resilience of the EAD and the Project to climate change. The issues raised in these submissions related to the following:

- The potential for future intensified weather conditions and natural destruction events to impact on the Project.

### Response

The proposed modification does not change the risk profile or climate change resilience associated with the ongoing operation and use of EPS and the EAD. The stormwater improvements as described in Section 4.1.3 of the EA would reduce water inflows by diverting flows from local catchments to an existing receiving pond that would otherwise enter the EAD.

The EAD is managed in accordance with the *Dams Safety Act 1978*. The EAD and the proposed modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from Catchments 1, 2 and 3 would be diverted to the stormwater receiving pond, outside of the CCP impoundment. If sustained heavy rainfall was experienced and the capacity of the receiving pond is reached, flows would be diverted which ultimately lead to Lake Macquarie. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland (and ultimately Lake Macquarie) from the surrounding environment. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site EPL.

## 5.5 Consultation

One submitter (018) identified concern over the stakeholder consultation as outlined in the EA. The issue raised in this submission related to the following:

- The effectiveness of stakeholder consultation, community consultation groups and committees.

### Response

Stakeholders were identified during preparation of the EA based upon legislative requirements, assessment methodologies and a prioritisation of environmental issues. A summary of stakeholder consultation undertaken in relation to the Project was provided in Section 6 of the EA.

Origin holds regular Community Consultative Committee meetings regarding ongoing operation of the EPS. The Project was identified and discussed during the CCC meeting on 28 August 2018. The EA was also placed on public exhibition to provide the wider community with the opportunity to review and comment on the Project.



## 5.6 Contamination

11 submitters raised concerns about the perceived contamination risk associated with the Project. This included submitters 001, 002, 005, 006, 008, 009, 010, 012, 016, 017 and 018. The issues raised in these submissions related to the following points:

- Increasing total quantities of stored ash may pose an increased risk to the environment
- The potential for the modification to increase rates of leaching and run off into Lake Macquarie
- The potential impact of contaminants on natural resources within the locality including wetlands and Lake Macquarie
- The chemical composition of the CCP is not detailed.

### Response

The operational footprint of EPS site and EAD would not be substantially altered by the Project. The modification represents a small proportion of the currently stored CCP volume and the quantity of stored CCP alone does not materially change the risk profile of the EAD. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. The proposed modification would increase the CCP surface area potentially exposed during Operation of the Project by between 4% and 7%. There is no proposed change to the existing use of the premises, the coal chemical composition or existing practice of depositing CCP as a dense phase slurry. Existing environmental procedures and controls would continue to be implemented for the site.

The stormwater improvements as described in Section 4.1.3 of the EA would reduce water inflows to the EAD by diverting flows from local catchments which would otherwise enter the EAD to an existing receiving pond. A depression approximately 3ha in extent located within the current western extent of the EAD currently collects some stormwater drainage from the immediate catchment area. This water storage would be made redundant by the proposed stormwater diversion works. CCP placed within this area during the Project would displace water, reducing the volume of standing water available to infiltrate as groundwater in this area.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007). Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Rehabilitation Plan is provided in Section 8.0.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). The CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular quality testing.

EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA. A discharge from the EAD into Lake Macquarie would only occur in accordance with EPL 1429 or as an emergency discharge.

Potential impacts to coastal wetlands under *State Environmental Planning Policy (Coastal Management) 2018* are described in Section 8.2.2 of the EA. As discussed in Section 5.2.8 of the EA, clause 13(1) of the Coastal Management SEPP provides for the consideration of whether a development proposal is likely to cause an adverse impact on matters which include:

*(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*

*(b) coastal environmental values and natural coastal processes,*

*(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*

*(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*

Although clause 13 applies to development which needs development consent (which is not the case for the Project), these matters have been addressed in the environmental assessment for the Project.

Impacts to water quality and sedimentation were identified as potential risks that may arise from the stormwater diversion system. The water being diverted from Catchments 1, 2 and 3 into the receiving pond and potentially the wetlands would be comprised entirely of surface water flows. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment. The Project would provide additional opportunities for water management, ensuring existing controls at licensed water discharges to Lake Macquarie are maintained.

The 2007 EA identifies that CCP is generally comprised of fly ash and furnace bottom ash and has properties and characteristics that reflect the local source coal geology. In Australia, CCP mainly consists of silica and alumina oxides (accounting for 80 – 85%).

## **5.7 Dam Integrity and Disaster Risk Management**

Four submitters (002, 010, 015 and 018) raised concerns regarding the structural integrity of the dam. The concerns related to the following:

- The structural integrity of the dam and suggest backing the chosen design with scientific research. Public should be given the opportunity to comment on any improvements
- The dam being an unlined facility and the potential problems this may cause
- The potential for extreme weather events to cause impounded material to be released into Lake Macquarie
- The potential for climate change and storm event impacts on the EAD.

### **Response**

The Western Emplacement Area design and process was developed in consultation with the Dam Safety Committee and in accordance with the *Dams Safety Act 1978*. There would be no change required to the main embankment (located to the south) of the EAD as a result of the modification.

The EAD and modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from Catchments 1, 2 and 3 would be diverted to the stormwater receiving pond, outside of the CCP impoundment. If sustained heavy rainfall was experienced and capacity of the receiving pond is reached, flows would be diverted which ultimately lead to Lake Macquarie. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment.

The proposed modification does not adversely affect the risk profile or climate change resilience associated with the ongoing operation and use of EPS and the EAD. The stormwater improvements as described in Section 4.1.3 of the EA would reduce water inflows to the EAD by diverting flows from local catchments to an existing receiving pond that would otherwise enter the EAD.

## 5.8 Project Timeline / Sequencing

Eleven submitters raised concerns over the timeline of the Project and the ongoing operation of the EPS. This included submissions 001, 003, 004, 005, 006, 007, 008, 012, 013, 016, 017 and 018. The issues related to the following:

- Should the Project be approved, construction should not begin until current EAD capacity is almost reached
- No mention made in the EA of what is proposed for ash generated post 2024
- Conflict between the expected EPS shut down date and the expected life of the Project.

### Response

EPS is presently anticipated to reach the end of its operational life by 2032. There would be no benefit to delaying construction commencement until the EAD is close to reaching capacity. Sufficient capacity of the EAD is required to support the on-going use and contingency of EPS, particularly in a time where other power stations are being decommissioned, placing additional short-term reliance on EPS.

CCP generated at EPS is managed in accordance with the specific environmental management procedures related to the site and continues to be a viable resource for the building and construction industries. The environmental management procedures provide a detailed program for the investigation and development of possible reuse and recycling options. Origin is currently active in the CCP reuse market, and has agreements in place for CCP to be used in the production of cement and concrete used by the building and construction industries. Origin is currently exploring further initiatives to increase the percentage of CCP that would be recycled. Origin has recently commenced a testing process with an innovative organisation that have successfully developed processes to utilise CCP in the production of a variety of building and construction industry applications.

However, the rates of reuse and recycling of CCP remain heavily influenced by demand generated by the building and construction industry demand, and current recycling opportunities are not sufficient to allow the current EAD CCP placement strategy to accommodate all of the CCP for the remaining life of EPS. Therefore, the Project is required in order to support the ongoing operation of EPS. Further detail regarding CCP reuse is provided in **Section 5.13**.

The augmentation of the EAD deposition strategy is considered to be the preferred option given the ability of the option to support the continued operation of the EAD consistent with the Project's objectives which include minimising potential impacts to the environment. The Project is designed to allow for CCP placement up to 2024, in a way which maintains flexibility for the development of strategies for further CCP placement up to the anticipated EPS closure date of 2032. This is part of a broader approach to the operation of EPS, to enable it to adapt to the dynamics of energy supply and demand, power station operations and ash dam management practices throughout its working life.

## 5.9 Environmental Risk

Four submitters raised issues regarding the risk of impacts and damage to the surrounding environment and natural resources. This included submissions 006, 007, 008, 013.

The issues related to the following:

- Potential for contaminant leakages that could impact upon groundwater and surface water that could enter Lake Macquarie
- The potential for the modification to impact water quality of Lake Macquarie, surrounding wetlands and Myuna Bay due to increased rates of leachate
- The potential for the Project to generate stormwater overflow issues

## Response

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Management Plan is provided in Section 8.0.

The EAD and the proposed modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from catchments north of the EAD would be diverted to the stormwater receiving pond, located outside of the EAD. If sustained heavy rainfall was experienced and the capacity of the receiving pond is reached, flows would be diverted from the receiving pond to the existing stormwater network which leads to the wetlands and ultimately, Lake Macquarie. These would be comprised entirely of surface water flows, which would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment. The Project would provide additional opportunities for water management, ensuring existing controls at licenced water discharges to Lake Macquarie are maintained.

The Project would provide an improvement to surface water management, by diverting stormwater that would have otherwise reached the EAD into the receiving pond. Stormwater diversions away from the receiving pond would only occur following sustained heavy rainfall where the capacity of the receiving pond has been filled.

The EAD is managed in accordance with the *Dams Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site EPL.

## 5.10 Biodiversity

Three submitters (007, 013 and 018) raised issues regarding the Project's impact on ecological values. The issues related to the following:

- The potential for the expansion to impact fauna and flora and on the breeding ability of species
- The potential for the EAD to impact upon marine and aquatic fauna and their habitat (including endangered species) and fish stocks
- Whether the project should require referral to the DoEE under the EPBC Act
- Biodiversity offsets should be a confirmed requirement.

## Response

The BC Act, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. A BDAR was undertaken in accordance with the BAM to address potential impacts to threatened species, populations or ecological communities within the Project area (Umwelt, 2018).

Section 8.1.2 of the EA identifies impacts that approximately 8.95 hectares of native vegetation would be directly impacted by the Project (including two PCTs). Three threatened species have been identified as occurring within the Project area and the site contains a range of habitat features (such as hollow-bearing trees, fallen logs and threatened flora species habitat).

Origin has sought to avoid and minimise potential impacts on the ecological values of the Project, primarily through minimisation and careful selection of the location of potential disturbance. The

Project has been designed to occur in areas surrounding existing disturbed areas that are likely to be subject to edge effects and indirect impacts from current EPS operations.

As discussed in Section 8.1.3 of the EA, Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the BC Act would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of relevant credits from that site (or those sites)
- In-perpetuity conservation through securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

Identification and selection of a suitable stewardship site or sites would be informed by further detailed field based assessment. Offsets would be established through appropriate legal mechanisms or agreements to ensure the conservation of a stewardship site (or sites) in perpetuity prior to the commencement of vegetation clearing activities within the project area.

The BDAR included an assessment of biodiversity credits required to offset impacts on biodiversity values within the Project area. Two PCTs and three species-credit species would require offsetting in accordance with the BAM. Origin has undertaken preliminary investigations of land-based offset opportunities in the vicinity of the Project area both within and outside of Origin's existing landholdings. Approximately 60ha of land likely containing target PCTs and suitable habitat for target threatened species have been identified within the broader Project area.

As described in Section 8.2 of the EA, Origin has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor any potential changes in groundwater quality.

The EAD is managed in accordance with the *Dams Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance within the site's operational EPL. The project incorporates a number of stormwater improvements and it is considered that any potential impacts to aquatic fauna or their environments would remain substantially the same during operation of the Project (in the proposed modified form).

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places, which are further described and defined as matters of national environmental significance (MNES). Potential impacts to MNES are considered in Section 5.1 of the exhibited EA and are further described in the BDAR (which forms Appendix C of the EA).

The EA concluded that the Project is not expected to have a significant impact on relevant MNES and accordingly, the Project would not need to be referred to the Department of Environment and Energy (DoEE). A report (Umwelt, 2018) has been prepared to confirm these findings (see **Appendix A**) and confirms that the project is unlikely to result in a significant impact to MNES.

## 5.11 Health

14 submitters (001, 003, 004, 005, 006, 007, 008, 010, 011, 012, 014, 016, 017 and 018) raised concerns regarding potential health and safety impacts as a result of the Project. The issues related to the following:

- The potential for the Project to impact on human health and safety in the nearby area due to coal ash dust and contaminants

- The EAD poses an unacceptable hazard to the health and safety of the residents and environment of Lake Macquarie and increasing the volume of coal ash stored indefinitely on the shores of Australia's largest saltwater coastal lake is irresponsible.

## Response

The Project generally maintains the existing scale of EPS operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support activities such as CCP reuse, water management and ongoing temporary and long term rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and CCP placement strategies. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. The proposed modification would increase the CCP surface area potentially exposed during operation of the Project by between 4% and 7%.

There is no proposed change to the existing use of the premises, the coal chemical composition or existing practice of depositing CCP as a dense phase slurry. As a result, there would be no substantial change in the risk profile on human health and safety in the nearby area due to CCP and contaminants.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.2.1 of the EA identifies that the design of the western saddle embankment has been undertaken in consultation with the NSW DSC, relevant DSC guidelines, ANCOLD guidelines and the requirements of the *Dams Safety Act 1978*.

The EAD is managed in accordance with the *Dam Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site's operational EPL.

A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Rehabilitation Plan is provided in Section 8.0.

Impacts to water quality and sedimentation were identified as potential risks that may arise from the stormwater diversion system. The water being diverted from Catchments 1, 2 and 3 into the receiving pond and potentially the wetlands would be comprised entirely of surface water flows. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment. The Project would provide additional opportunities for water management, ensuring existing controls at licenced water discharges to Lake Macquarie are maintained.

The Project would provide an improvement to surface water management, by diverting stormwater that would have otherwise reached the EAD into the receiving pond. Stormwater diversions away from the receiving pond would only occur following sustained heavy rainfall where the capacity of the receiving pond has been filled.

Key findings of a Dust Emission Dispersion Study (AECOM, 2016) are provided in the EA to provide context to the Project area. The study considered the distribution and potential impact of dust emissions from the EAD under modelled scenarios to assist in the development of effective dust control strategies.

Origin maintains four depositional dust gauges in accordance with EPL 1429. The gauges are located within proximity of the development footprint (see **Table 5**).

Time series data recording concentrations of deposited matter collected within the four depositional dust gauges maintained under EPL 1429 each month is shown in **Figure 2**. A comparison against the impact assessment criteria for deposited dust identified in Table 7.1 of the *Approved Methods for the*

*Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016) is provided. The impact assessment criteria for deposited dust is expressed as an annual average concentration of 4g/m<sup>2</sup>/month and is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

The monitoring results show that depositional dust has remained substantially below the relevant assessment criteria<sup>3</sup> of 4g/m<sup>2</sup> per month. Ambient air quality monitoring is undertaken in accordance with EPL 1429 and data is made publicly available via monthly summary report<sup>4</sup>.

EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of EPL 1429. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA.

Groundwater monitoring results are publicly reported on a quarterly basis and include assessments for Arsenic, Lead, Cadmium, Copper, Zinc and Selenium. CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular testing to confirm product characteristics. Existing monitoring practices would continue and it is considered that the proposed modifications would not substantially impact on human health or safety.

## 5.12 Sustainability

11 submissions raised concerns regarding the general sustainability of the EPS and the use of coal fired power stations. This included submitters 001, 002, 004, 005, 006, 008, 012, 013, 016, 017 and 018.

The concerns related to the following:

- Origin has failed to meet its coal ash reuse target of 80%, with only 37% of the ash generated currently used
- The modification should be used as an opportunity to bring the facility up to best practice
- The Precautionary Principle must be followed.

### Response

CCP generated at EPS is managed in accordance with operational environmental management procedures and continues to be a viable resource for the building and construction industries. The EPS environmental management procedures provide a program for the investigation and development of possible reuse and recycling options. The following provides an overview of the key initiatives within these environmental management procedures:

- Ensuring continued supply of CCP to industry vendors - Origin is currently active in the CCP reuse market, and has multiple sales agreements in place for CCP to be used in the production of cement and concrete which is supplied to building and construction industries.
- On-site aggregate manufacturing of CCP based products - Origin is currently in various stages of negotiation with a number of organisations for the construction and operation of an aggregate manufacturing plant, which would bind CCPs together to produce blocks, sands and other aggregates.
- New products and technologies - Origin has recently commenced testing processes utilising samples of CCP sourced from EPS with a number of innovative organisations who have successfully developed processes or technology to utilise CCP in the production of a variety of building and construction industry applications.
- Government and regulatory advocacy - Government and regulator advocacy continues to play a key role in driving demand for CCP and has a direct impact on Origin's ability to supply CCP as a reuse material. Origin is continuing to undertake discussions through organisations such as the Australian Technical Infrastructure Committee (ATIC) (formerly the Cement and Concrete Users

---

<sup>3</sup> Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016)

<sup>4</sup> <https://www.originenergy.com.au/about/who-we-are/what-we-do/generation.html>



Research Group). ATIC has prepared a specification to increase the percentage of CCP used in cement or concrete for projects with government agencies (including major infrastructure projects). This is a positive outcome for the use of CCP nationally. Origin continues to pursue opportunities with various Council's to supply CCP for use in future infrastructure projects. Origin is also an active member of the Ash Development Association of Australia (ADAA), an industry group focussed on increasing the application of CCP within new and existing Australian markets.

As identified by the initiatives above, Origin is committed to progress towards a recycling goal of 80% however progress towards achieving that goal is determined by demand generated by the building and construction industries, and current recycling opportunities are not sufficient to allow the current EAD ash placement strategy to accommodate all of the CCP for the remaining life of EPS.

The proposed modification represents a minor increase (approximately 10ha) in the current area of exposed (uncapped or unvegetated) CCP material. Origin presently anticipates that EPS will be closed in 2032, which is indicative of the timeframe for the placement and storage of CCP. As described above, Origin would continue to actively investigate and implement a wide range of opportunities to increase its CCP recycling activities from within the dam.

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.2.1 of the EA identifies that the design of the western saddle embankment has been undertaken in consultation with the NSW DSC, relevant DSC guidelines, ANCOLD guidelines and the requirements of the *Dams Safety Act 1978*.

The DSC has established guidelines for dam owners relating to the design, safety management and surveillance of dams. In particular, the guidelines require compliance in the areas of flood capacity, seismic stability, emergency planning, inspection and monitoring activities, safety management, surveillance reporting and hydrological analysis.

The ongoing use and operation of the EAD is guided by the EPS operational and environmental management procedures which incorporate best practice and provide environmental safeguards to minimise impacts to the environment. Best practice measures currently employed at the EAD include:

- Regular dam surveillance using trained personnel including:
  - Tri-weekly (Routine) Inspections
  - Annual (Intermediate) Inspections
  - 5-Year (Comprehensive) Inspections
- The Intermediate and Comprehensive Inspection Reports are required to be submitted to the DSC
- Documented Dam Safety Management Practices and Procedures
- Documented operations and maintenance manuals
- Regular compliance audit reports
- A documented Dam Safety Emergency Plan.

All dam surveillance related activities consider relevant DSC Guidelines and guidelines established in the ANCOLD publication "Guidelines for Dam Safety Management", August 2003.

The EPS site is also operated in accordance with the requirements of EPL 1429, issued by the NSW EPA. EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements.

The Project would provide an improvement to surface water management, by diverting stormwater that would have otherwise reached the EAD into the receiving pond. Stormwater diversions away from the receiving pond would only occur following sustained heavy rainfall where the capacity of the receiving pond has been filled.

The proposed modification does not propose alteration of the EAD's main embankment. An extensive system of relief wells, chimney drains, drainage blankets and collector drains was incorporated in the design of the main embankment to relieve any hydrostatic pressure in the downstream section of the dam. Water from these drains flows to a series of toe drains located at the base of the main embankment. The toe drains incorporate a return water system allowing flows to be returned to the EAD. This system allows for the capture and retention of leachate. The Project does not propose to modify these existing controls which are considered adequate.

As described in Section 8.2 of the EA, Eraring has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor any potential changes in groundwater quality.

The Precautionary Principle is one of the elements that form the concept of ecologically sustainable development, and one of the objects of the EP&A Act is to facilitate ecologically sustainable development. The Precautionary Principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

The EA for the Project followed the Precautionary Principle by undertaking an environmental risk analysis to identify key environmental issues, undertaking detailed environmental studies for those issues identified, and identifying recognised environmental mitigation measures that would avoid, minimise or mitigate potential environmental impacts associated with the Project.

### 5.13 Other

Two submitters (007 and 018) identified concerns considered to be beyond the general scope of other submissions. The concerns related to the following:

- The possible impacts on the Myuna Bay Sport and Recreation Club
- The potential for boats to stir up sludge in the wetlands which could impact its water quality.

#### Response

Potential impacts the Myuna Bay Sport and Recreation Club are discussed in **Section 7.4** of this report, in response to the NSW Office of Sport submission.

The public use of nearby waterbodies such as Lake Macquarie, Bonnell's Bay, Lake Eraring and Myuna Bay is not considered to be substantially influenced by the Project. Discharges from the EPS site are subject to concentration and volume limits as well as relevant monitoring requirements, in accordance with the onsite EPL.

## 6.0 Response to Special Interest Group Submissions

### 6.1 Overview

Six submissions were received from non-Government organisations and business (refer **Appendix B**) including:

- Nature Conservation Council of NSW
- Environmental Justice Australia
- Northern Lakes Disability Tourism Precinct Committee Inc
- Hunter Community Environment Centre
- Greenpeace Australia Pacific
- Community Environment Network.

### 6.2 Nature Conservation Council of NSW

The Nature Conservation Council (NCC) opposes the expansion of the EAD for the following key reasons:

- Need for the project
- Concerns about groundwater impacts and retrofitting of a membrane
- Risks associated with underground coal mine connectivity and remediation
- Concerns about EAD closure and rehabilitation
- Concerns about seepage and receiving water
- Air pollution
- Impacts on threatened species.

#### Response

##### 6.2.1 Need for the project

The EAD provides CCP storage capacity for EPS and so the EAD is an essential part of EPS.

It is expected that there would continue to be an increasing reliance on EPS following the recent and planned closures of large generation assets in NSW (e.g. Munmorah Power Station which closed in 2012 and Liddell Power Station which is due to be closed in 2022) and in Victoria (Hazelwood) and South Australia (Northern Power Station). The continued operation of the EAD is required to ensure future power system security within the broader National Electricity Market as it provides approximately 25% of NSW's power requirements.

To meet market demand and ensure system security (as a result of recent power station closures) EPS has operated at higher than previously planned output rates. This has resulted in an increase in CCP disposal rates to the EAD in recent years than previously anticipated.

An assessment of EAD storage capacity has been undertaken and has determined that alternate CCP placement strategies are important for maximising the efficient application of CCP in the short to mid-term.

The Project is one of the steps that Origin is taking, in the ordinary course of the life of the EPS, to ensure EPS continues to have operational flexibility to respond to market demands as the national energy generation mix changes over time, including with the increasing use of solar and other renewables.

### 6.2.2 Groundwater

The EAD is an existing facility and currently occupies an area of approximately 250 ha. Placement of a membrane under the existing facility is not feasible and placing a liner atop the existing landform is not considered viable from an operational perspective as CCP placement activities are required to occur uninterrupted on a continual basis. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. Installing an impervious barrier using clays or suitable stabilised fill materials may form part of the preferred mine void remediation strategy which would be informed by additional geotechnical or environmental investigations.

As described in Section 8.2 of the EA, EPS has a series of groundwater monitoring bores and an associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor the potential for changes in groundwater quality.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

An extensive system of relief wells, chimney drains, drainage blankets and collector drains was incorporated in the design of the main embankment to relieve any hydrostatic pressure in the downstream section of the dam. Water from these drains flows to a series of toe drains located at the base of the main embankment. The toe drains incorporate a return water system allowing flows to be returned to the EAD. This system allows for the capture and retention of leachate. The Project does not propose to modify these existing controls which are considered adequate.

### 6.2.3 Underground coal mine connectivity and remediation

Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. As described in Section 8.3.3 of the EA, grouting technology is proposed to mitigate the potential for water to transfer into the mine workings.

A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Rehabilitation Plan is provided in Section 8.0.

### 6.2.4 Closure and rehabilitation

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. As discussed in Section 8.1.3 of the EA, on-going, progressive rehabilitation of the EAD would be carried out in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). Further, areas disturbed as a result of construction activities from the Project which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance (in accordance with the Biodiversity and Land Management Plan (AECOM, 2017)).

Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated EPS closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

### 6.2.5 Seepage and receiving water

Impacts to water quality and sedimentation were identified as potential risks that may arise from the stormwater diversion system. The water being diverted from Catchments 1, 2 and 3 into the receiving pond and potentially the wetlands would be comprised entirely of surface water flows. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment. The Project would provide additional opportunities for water management, ensuring existing controls at licensed water discharges to Lake Macquarie are maintained.

The Project would provide an improvement to surface water management, by diverting stormwater that would have otherwise reached the EAD into the receiving pond. Stormwater diversions away from the receiving pond would only occur following sustained heavy rainfall where the capacity of the receiving pond has been filled. Even then, the surface water flows would not come into contact with the EAD or be mixed with process water.

#### **6.2.6 Air pollution**

The Project generally maintains the existing scale of operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support CCP reuse activities, water management and ongoing rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and CCP placement strategies. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. The proposed modification would increase the CCP surface area potentially exposed during operation of the Project by between 4% and 7%.

The operational environmental management procedures for EPS were reviewed in response to the previous dusting events that had occurred in late 2016, and the following measures are currently employed to mitigate the potential for dust generation on the EAD and are addressed within the current EPS environmental management procedures:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment
  - Airborne TSP and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
  - Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

Should a dusting event occur with the potential for offsite impacts, the procedure set out in the Pollution Incident Management Response Plan (PIRMP) would be followed including, where required, notification of relevant government agencies. It is noted that within the EAD an area of approximately 20 hectares (ha) has been temporarily capped since 2016 to mitigate the potential of a dusting event.

#### **6.2.7 Impacts on threatened species**

The BC Act, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. A BDAR was undertaken in accordance with the BAM to address potential impacts to threatened species, populations or ecological communities within the Project area (Umwelt, 2018).

Section 8.1.2 of the EA identifies that approximately 8.95 hectares of native vegetation would be directly impacted by the Project (including two PCTs). Three threatened species have been identified as occurring within the Project area and the site contains a range of habitat features (such as hollow-bearing trees, fallen logs and threatened flora species habitat).

Origin has sought to avoid and minimise potential impacts on the ecological values of the Project, primarily through minimisation and careful selection of the location of potential disturbance. The Project has been designed to occur in areas surrounding existing disturbed areas that are likely to be subject to edge effects and indirect impacts from current EPS operations.

As discussed in Section 8.1.3 of the EA, Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the BC Act would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of relevant credits from that site (or those sites)
- In-perpetuity conservation through securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

Identification and selection of a suitable stewardship site or sites would be informed by further detailed field based assessment. Offsets would be established through appropriate legal mechanisms or agreements to ensure the conservation of a stewardship site (or sites) in perpetuity prior to the commencement of vegetation clearing activities within the project area.

The BDAR included an assessment of biodiversity credits required to offset impacts on biodiversity values within the Project area. Two PCTs and three species-credit species would require offsetting in accordance with the BAM. Origin has undertaken preliminary investigations of land-based offset opportunities in the vicinity of the Project area both within and outside of Origin's existing landholdings. Approximately 60ha of land likely containing target PCTs and suitable habitat for target threatened species have been identified within the broader Project area.

In relation to aquatic environments, as described in Section 8.2 of the EA, Origin has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor any potential changes in water quality. The project incorporates a number of stormwater improvements and it is considered that the aquatic environment would remain substantially the same during operation of the Project (in the proposed modified form).

The EPBC Act is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places, which are further described and defined as matters of national environmental significance (MNES). Potential impacts to MNES are considered in Section 5.1 of the exhibited EA and are further described in the BDAR (which forms Appendix C of the EA).

The EA concluded that the Project is not expected to have a significant impact on relevant MNES and accordingly, the Project would not need to be referred to the Department of Environment and Energy (DoEE). A report (Umwelt, 2018) has been prepared to confirm these findings (see **Appendix A**) and confirms that the project is unlikely to result in a significant impact to MNES.

## 6.3 Environmental Justice Australia

Environmental Justice Australia (EJA) objects to the proposal for the following key reasons:

- Coal ash is a highly toxic substance
- The EAD is not adequately lined
- Concerns about dam safety
- There is no rehabilitation and closure plan

- There is no financial assurance for the EAD
- The decision is being made in the absence of best practice management and rehabilitation guidelines for ash dams.

## Response

### 6.3.1 CCP chemical composition

CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular quality testing. The *Coal Ash Exemption 2014* made under the *Protection of the Environment Operations Act 1997*, specifies chemical and other material requirements for coal ash or blended coal ash which must be met prior to the supply of ash materials under the order. Origin undertakes regular characterisation tests of its CCP as required by the *Coal Ash Exemption 2014*.

### 6.3.2 Lining of EAD

The EAD is an existing facility. Placement of a membrane under the existing facility is not feasible. This is discussed in section 6.2.2.

As described in Section 8.2 of the EA, EPS has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor the potential for changes in groundwater quality.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

### 6.3.3 Dam safety

The Western Emplacement Area design and process was developed in consultation with the Dam Safety Committee and in accordance with the *Dams Safety Act 1978*. There would be no change to the main embankment of the EAD.

The proposed modification does not adversely affect the risk profile or climate change resilience associated with the ongoing operation and use of EPS and the EAD. The stormwater improvements as described in Section 4.1.3 of the EA would reduce water inflows by diverting flows from local catchments to an existing receiving pond that would otherwise enter the EAD.

The EAD and the proposed modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from Catchments 1, 2 and 3 would be diverted to the stormwater receiving pond, outside of the CCP impoundment. If sustained heavy rainfall was experienced and the capacity of the receiving pond is reached, flows would be diverted which ultimately lead to Lake Macquarie. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.0 of the EA specifies that the Project would be constructed in accordance with DSC guidance, ANCOLD guidelines and current codes of practice. No alterations to the main dam embankment are proposed as part of the Project. Design of the western saddle embankment has been undertaken in consultation with the NSW DSC, relevant DSC guidelines and the requirements of the two Acts.

The EAD is managed in accordance with the *Dams Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site EPL.

#### 6.3.4 Rehabilitation

It is noted that the submission refers to consultation with the Port Macquarie community and the Port Macquarie-Hastings Local Environmental Plan 2011. This response is provided in respect of rehabilitation issues generally and a response in relation to the applicable local government submission (Lake Macquarie City Council) is provided below at Section 7.3.

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. As discussed in Section 8.1.3 of the EA, on-going, progressive rehabilitation of the EAD would be carried out in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). Further, areas disturbed as a result of construction activities from the Project which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance (in accordance with the Biodiversity and Land Management Plan (AECOM, 2017).

Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated EPS closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

#### 6.3.5 Financial assurance

Section 4.4 of the EA identifies that following decommissioning of EPS, it is anticipated that the site would be rehabilitated to a point that would allow further uses, for example industrial and/or community uses. Origin would rehabilitate the final footprint of the CCP management facility in a manner generally consistent with the final landform.

Origin maintains allocations across its energy portfolio to provide assurance for long term rehabilitation objectives associated with its assets. A bond is not considered necessary as part of the Project as appropriate environmental safeguards are currently in place for the existing EAD and would continue to be applied to the Project in its modified form.

#### 6.3.6 Best practice management and rehabilitation

##### Environmental management

Operational environmental management procedures for EPS are currently employed and reported in accordance with EPL 1429. EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken as part of the EPS environmental management procedures and in accordance with the requirements of EPL 1429. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA. Groundwater monitoring results are publicly reported on a quarterly basis.

The following air quality management measures are also addressed within the EPS environmental management procedures and are currently employed to mitigate the potential for dust generation on the EAD:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment



- Airborne TSP and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
- Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

### Rehabilitation

As noted previously, rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. As discussed in Section 8.1.3 of the EA, on-going, progressive rehabilitation of the EAD would be carried out in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). Further, areas disturbed as a result of construction activities from the Project which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance (in accordance with the Biodiversity and Land Management Plan (AECOM, 2017)).

Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated EPS closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

## **6.4 Northern Lakes Disability Tourism Precinct Committee Inc.**

The Northern Lakes Disability Tourism Precinct Committee objects to the proposal and raises the following key issues:

- The Project does not adequately address the Precautionary Principle
- Concerns about the environmental assessment of biodiversity under the EPBC Act
- Alternative options and rehabilitation have not been examined adequately;
- Concerns about the adequacy of stakeholder consultation
- Prescribed impacts
- Concerns about the adequacy of the environmental safeguards
- Traffic and noise.

### **Response**

#### **6.4.1 The precautionary principle**

The Precautionary Principle is one of the elements that form the concept of ecologically sustainable development, and one of the objects of the EP&A Act is to facilitate ecologically sustainable development. The Precautionary Principle holds that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

The EA for the Project followed the Precautionary Principle by undertaking an environmental risk analysis to identify key environmental issues, undertaking detailed environmental studies for those issues identified, and identifying recognised environmental mitigation measures that would avoid, minimise or mitigate potential environmental impacts associated with the Project.

#### **6.4.2 Biodiversity**

##### Commonwealth legislation

The EPBC Act is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places, which are further described and defined as MNES. Potential impacts to MNES are considered in Section 5.1 of the exhibited EA and are further described in the Biodiversity Development Assessment Report (which forms Appendix C of the EA).

The EA concluded that the Project is not expected to have a significant impact on relevant MNES and accordingly, the Project would not need to be referred to the Department of Environment and Energy (DoEE). A report (Umwelt, 2018) has been prepared to confirm these findings (see **Appendix A**) and confirms that the project is unlikely to result in a significant impact to MNES.

#### NSW legislation

It is noted that the submission refers to the TSC Act, or the *Threatened Species Conservation Act 1995*, which has been replaced by the BC Act. This response is provided in respect of the current applicable NSW legislation.

The BC Act, together with the *Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. A BDAR was undertaken in accordance with the BAM to address potential impacts to threatened species, populations or ecological communities within the

Section 8.1.2 of the EA identifies impacts that approximately 8.95 hectares of native vegetation would be directly impacted by the Project (including two PCTs). Three threatened species have been identified as occurring within the Project area and the site contains a range of habitat features (such as hollow-bearing trees, fallen logs and threatened flora species habitat).

Origin has sought to avoid and minimise potential impacts on the ecological values of the Project, primarily through minimisation and careful selection of the location of potential disturbance. The Project has been designed to occur in areas surrounding existing disturbed areas that are likely to be subject to edge effects and indirect impacts from current EPS operations.

As discussed in Section 8.1.3 of the EA, Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the BC Act would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of relevant credits from that site (or those sites)
- In-perpetuity conservation through securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

Identification and selection of a suitable stewardship site or sites would be informed by further detailed field-based assessment. Offsets would be established through appropriate legal mechanisms or agreements to ensure the conservation of a stewardship site (or sites) in perpetuity prior to the commencement of vegetation clearing activities within the project area.

The BDAR included an assessment of biodiversity credits required to offset impacts on biodiversity values within the Project area. Two PCTs and three species-credit species would require offsetting in accordance with the BAM. Origin has undertaken preliminary investigations of land-based offset opportunities in the vicinity of the Project area both within and outside of Origin's existing landholdings. Approximately 60ha of land likely containing target PCTs and suitable habitat for target threatened species have been identified within the broader Project area.

### **6.4.3 Options**

#### Project alternatives

The EA describes a range of project alternatives which have been evaluated with consideration of the Project objective which is to extend the storage life of the EAD in a manner that:

- Maintains operational flexibility in terms of future CCP deposition strategies and engineering design
- Supports the continued operation of EPS to 2032 and deposition of CCP towards a final landform that is both safe and stable in the long term

- Is technically feasible
- Remains consistent with NSW DSC guidance and ANCOLD guidelines
- Minimises potential impacts to the environment.

The augmentation of the EAD deposition strategy is considered to be the preferred option given the ability of the option to support the continued operation of the EAD consistent with Project's objectives which include minimising potential impacts to the environment. The Project is designed to allow for CCP placement up to 2024, in a way which maintains flexibility for the development of strategies for further CCP placement to the anticipated EPS closure date of 2032.

Origin has sought to avoid and minimise potential impacts of the Project on biodiversity, primarily through the careful selection of the location of the disturbance area. The Project has been designed to occur in areas surrounding existing disturbed areas that are likely to be subject to edge effects and indirect impacts from current EPS operations. Selection of the preferred option minimises the potential area of clearing required when compared with the project alternatives described in Section 3.3 of the EA.

#### Rehabilitation strategy

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. As discussed in Section 8.1.3 of the EA, on-going, progressive rehabilitation of the EAD would be carried out in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). Further, areas disturbed as a result of construction activities from the Project which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance (in accordance with the Biodiversity and Land Management Plan (AECOM, 2017).

Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated EPS closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

#### Financial assurance

Section 4.4 of the EA identifies that following decommissioning of EPS, it is anticipated that the site would be rehabilitated to a point that would allow further uses, for example industrial and/or community uses. Origin would rehabilitate the final footprint of the CCP management facility in a manner generally consistent with the final landform.

#### **6.4.4 Stakeholder consultation**

Stakeholders were identified during preparation of the EA based upon legislative requirements, assessment methodologies and a prioritisation of environmental issues. A summary of stakeholder consultation undertaken in relation to the Project was provided in Section 6 of the EA.

Origin holds regular Community Consultative Committee meetings regarding ongoing operation of the EPS. The Project was identified and discussed during the CCC meeting on 28 August 2018.

The EA was also placed on public exhibition to provide the wider community with the opportunity to review and comment on the Project.

#### **6.4.5 Prescribed impacts and the precautionary principle**

This issue is addressed at **Section 6.4.1** above.

#### **6.4.6 Environmental safeguards and bond**

Environmental safeguards aimed at avoiding, mitigating or managing potential impacts identified by the environmental assessment presented in the EA are listed throughout Section 8 of the EA in respect of each environmental matter and presented as a single compiled list in Section 9 of the EA.

Origin maintains allocations across its energy portfolio to provide assurance for long term rehabilitation objectives associated with its assets. A bond is not considered necessary as part of the Project as appropriate environmental safeguards are currently in place for the existing EAD and would continue to be applied to the Project in its modified form.

Additional mitigation measures are detailed in Section 8 and include progressive rehabilitation, ongoing land management practices including ween and pest control, bushfire management and maintenance of biodiversity conservation offsets in perpetuity.

During preparation of this Response to Submissions Report, some minor clarifications were identified and an updated compilation of environmental mitigation measures is presented in Section 8 of this report.

#### **6.4.7 Traffic and noise**

Traffic impacts were assessed in Section 8.6 of the EA. The assessment involved traffic counts during morning and afternoon periods at key intersections and the identification of the heavy vehicle split.

The assessment found that access arrangements to the EPS site and internal access to the EAD would remain unchanged compared to existing conditions.

The findings predicted that transport of fill material and cement to the EPS site would generate additional construction traffic of up to 600 trucks, based on a typical B-double capacity of 80m<sup>3</sup>, equating to some of 50 trucks per week, or approximately 10 truck movements per day, over a construction period of approximately 3 months.

Mitigation measures were identified in relation to traffic and are listed in Section 8 of this report.

Based on the implementation of these measures, the EA concluded that the mitigation measures identified would effectively ensure that the environmental consequences associated with increased temporary truck movements are minimised and are likely to remain substantially the same as those currently approved.

An assessment of noise impacts was presented in Table 15 in Section 8.7 of the EA. The assessment found that there are sufficient areas of buffer land located between the EAD and nearby sensitive receivers to minimise temporary potential construction noise impacts, and that operation of the Project is not expected to significantly alter noise emissions compared to those presently occurring.

### **6.5 Hunter Community Environment Centre**

The Hunter Community Environment Centre objects to the Project for the following key reasons:

- Coal ash reuse targets have not been met
- Risks of catastrophic failure of the ash containment structure
- EA does not set out the elements or toxicity of the EPS coal ash
- The EAD will be allowed to continue to contaminate Lake Macquarie and coastal wetlands
- The EAD will be allowed to continue to pollute groundwater
- The EAD will continue to cause air pollution.

#### **Response**

##### **6.5.1 CCP reuse targets**

CCP generated at EPS is managed in accordance with the specific environmental management procedures related to the site and continues to be a viable resource for the building and construction industries. The environmental management procedures provide a program for the investigation and development of possible reuse and recycling options.

As discussed above in Section 5.3 and Section 5.13, key initiatives within these environmental management procedures include:

- Ensuring continued supply of CCP to industry vendors - Origin is currently active in the CCP reuse market, and has agreements in place for CCP to be used in the production of cement and concrete which is supplied to building and construction industries.

- On-site aggregate manufacturing - Origin is currently in various stages of negotiation with a number of organisations for the construction and operation of an aggregate manufacturing plant, which would bind CCPs together to produce blocks, sands and other aggregates.
- New products and technologies - Origin has recently commenced a partnership to test processes that involved greater utilisation of CCP in the production of a variety of building and construction industry applications.
- Government and regulatory advocacy - Government and regulator advocacy continues to play a key role in driving demand for CCP and has a direct impact on Origin's ability to supply CCP as a reuse material. Origin is continuing to undertake discussions through organisations such as the ATIC (formerly the Cement and Concrete Users Research Group). ATIC has prepared a specification to increase the percentage of CCP used in cement or concrete for projects with government agencies (including major infrastructure projects). This is a positive outcome for the use of CCP nationally. Origin continues to pursue opportunities with various Council's to supply CCP for use in future infrastructure projects.

As identified by the initiatives above, Origin is committed to progress towards a recycling goal of 80% however, the rates of reuse and recycling of CCP remain heavily influenced by demand generated by the building and construction industries, and current recycling opportunities are not sufficient to allow the current EAD CCP placement strategy to accommodate all of the CCP for the remaining life of EPS.

#### **6.5.2 CCP dam failure**

The Western Emplacement Area design and process was developed in consultation with the Dam Safety Committee and in accordance with the *Dams Safety Act 1978*. There would be no change to the main embankment of the EAD.

The proposed modification does not adversely affect the risk profile or climate change resilience associated with the ongoing operation and use of EPS and the EAD. The stormwater improvements as described in Section 4.1.3 of the EA would reduce water inflows by diverting flows from local catchments to an existing receiving pond that would otherwise enter the EAD.

The EAD and the proposed modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from Catchments 1, 2 and 3 would be diverted to the stormwater receiving pond, outside of the CCP impoundment. If sustained heavy rainfall was experienced and the capacity of the receiving pond is reached, flows would be diverted which ultimately lead to Lake Macquarie. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.0 of the EA specifies that the Project would be constructed in accordance with DSC guidance, ANCOLD guidelines and current codes of practice. No alterations to the main dam embankment are proposed as part of the Project. Design of the western saddle embankment has been undertaken in consultation with the NSW DSC, relevant DSC guidelines and the requirements of the two Acts.

The EAD is managed in accordance with the *Dams Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site EPL.

#### **6.5.3 Elements of EPS CCP**

CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular quality testing. The *Coal Ash Exemption 2014* specifies chemical and other material requirements for coal ash or blended coal ash which must be met prior to the supply of ash materials under the order. Origin undertakes regular characterisation tests of its CCP as required by the *Coal Ash Exemption 2014*.

The input coal used for electricity generation would not change under the Project. Providing the chemical analysis of the input coal, which is inherently variable by nature, would not change the outcome of the Project or the potential environmental impacts.

#### **6.5.4 Contamination of Lake Macquarie and wetlands**

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA. A discharge from the EAD into Lake Macquarie would only occur in accordance with EPL 1429 or as an emergency discharge.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

Impacts to water quality and sedimentation were identified as potential risks that may arise from the stormwater diversion system. The water being diverted from Catchments 1, 2 and 3 into the receiving pond and potentially the wetlands would be comprised entirely of surface water flows. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment. The Project would provide additional opportunities for water management, ensuring existing controls at licensed water discharges to Lake Macquarie are maintained.

The Project would provide an improvement to surface water management, by diverting stormwater that would have otherwise reached the EAD into the receiving pond. Stormwater diversions away from the receiving pond would only occur following sustained heavy rainfall where the capacity of the receiving pond has been filled. Even then, the surface water flows would not come into contact with the EAD or be mixed with process water.

#### **6.5.5 Groundwater pollution**

Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. As described in Section 8.3.3 of the EA, grouting technology is proposed to mitigate the potential for water to transfer into the mine workings.

A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Rehabilitation Plan is provided in Section 8.0.

As described in Section 8.2 of the EA, EPS has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor the potential for changes in groundwater quality.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

#### **6.5.6 Air pollution**

The Project generally maintains the existing scale of operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support CCP reuse activities, water management and

ongoing rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and CCP placement strategies. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement. The proposed modification would increase the CCP surface area potentially exposed during operation of the Project by between 4% and 7%.

The operational environmental management procedures for EPS were reviewed in response to the previous dusting events that had occurred, and the following measures are currently employed to mitigate the potential for dust generation on the EAD. These measures are addressed within the current EPS environmental management procedures:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment
  - Airborne TSP and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
  - Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

Should a dusting event occur with the potential for offsite impacts, the procedure set out in the PIRMP would be followed including, where required, notification of relevant government agencies. It is noted that within the EAD an area of approximately 20 hectares (ha) has been temporarily capped since 2016 to mitigate the potential of a dusting event.

## 6.6 Greenpeace Australia

Greenpeace Australia Pacific objects to the proposal for the following key reasons:

- The “Do Nothing” option has not been adequately identified
- Impacts to the environment and the health of the local community
- No long-term plan for closure and remediation
- Heavy metal contamination and air and water pollution not identified
- Deficiencies in subsidence risks from the abandoned underground colliery
- Failure to meet ash reuse targets
- Environmental history of the proponent.

### Response

#### 6.6.1 Do nothing option

The ‘Do nothing’ option was presented and discussed in Section 3.3.1 of the EA. It represents the currently approved project without the proposed modification.

As discussed in the EA, the 'do nothing' option would require that electricity generation operations at EPS be curtailed ahead of the anticipated closure date of 2032, due to the reduced range of options to deposit CCP without significant risks to safety and the environment.

Origin is committed to ensuring it can provide a reliable and secure energy supply to its customers and the community. EPS is a critical generation asset, as it provides approximately 25% of NSW's power requirements, and the EAD is an essential component of EPS. The Project is one of the steps that Origin is taking, in the ordinary course of the life of EPS, to ensure that EPS continues to have operational flexibility to respond to market demands as the national energy generation mix changes over time, including with the increasing use of solar and other renewables.

The proposed modification represents a minor increase (approximately 10ha) in the current area of exposed (uncapped, or unvegetated) CCP material. Origin presently anticipates that EPS will be closed in 2032, which is indicative of the timeframe for the placement and storage of CCP.

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

The 'Do nothing' option was considered unacceptable given the increased reliance on EPS to meet national electricity demands following the recent and proposed closures of large generation assets in NSW, Victoria and South Australia.

#### 6.6.2 Environmental and health impacts

Key findings of a Dust Emission Dispersion Study (AECOM, 2016) are provided in the EA to provide context to the project area. The study considered the distribution and potential impact of dust emissions from the EAD under modelled scenarios to assist in the development of effective dust control strategies.

Origin maintains four depositional dust gauges in accordance with EPL 1429. The gauges are located within proximity of the development footprint (see **Table 5**).

Time series data recording concentrations of deposited matter collected within the four depositional dust gauges maintained under EPL 1429 each month is shown in **Figure 2**. A comparison against the impact assessment criteria for deposited dust identified in Table 7.1 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016) is provided. The impact assessment criteria for deposited dust is expressed as an annual average concentration of 4g/m<sup>2</sup>/month and is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

The monitoring results show that depositional dust has remained substantially below the relevant assessment criteria<sup>5</sup> of 4g/m<sup>2</sup> per month. Ambient air quality monitoring is undertaken in accordance with EPL 1429 and data is made publicly available via a monthly summary report<sup>6</sup>.

EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of EPL 1429. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA. Groundwater monitoring results are publicly reported on a quarterly basis and include Arsenic, Lead, Cadmium, Copper, Zinc and Selenium.

There is no proposed change to the existing use of the premises and the coal chemical composition or existing practice of depositing a dense phase slurry. The CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular testing to confirm product characteristics. Existing monitoring practices would continue, and it is considered that the proposed modifications would not substantially impact on human health or safety.

There would be no substantial change in the risk profile on human health and safety in the nearby area due to CCP and contaminants.

---

<sup>5</sup> Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016)

<sup>6</sup> <https://www.originenergy.com.au/about/who-we-are/what-we-do/generation.html>



### 6.6.3 Closure and remediation

As noted previously, rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. As discussed in Section 8.1.3 of the EA, on-going, progressive rehabilitation of the EAD would be carried out in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). Further, areas disturbed as a result of construction activities from the Project which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance (in accordance with the Biodiversity and Land Management Plan (AECOM, 2017)).

Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until the anticipated EPS closure date of 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure once a final landform for the EAD has been developed.

### 6.6.4 Contamination and pollution

Coal combustion product (CCP) is a re-use product (where suitable to meet industry and market needs) and undergoes regular quality testing. The *Coal Ash Exemption 2014* specifies chemical and other material requirements for coal ash or blended coal ash which must be met prior to the supply of ash materials under the order. Origin undertakes regular characterisation tests of its CCP as required by the *Coal Ash Exemption 2014*.

Origin is focused on minimising potential impacts from CCP placements in the vicinity of the former Awaba underground mine. As described in Section 8.3.3 of the EA, grouting technology is proposed to mitigate the potential for water to transfer into the mine workings.

As described in Section 8.2 of the EA, EPS has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor the potential for changes in groundwater quality.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA.

### 6.6.5 Subsidence risks

The EA identifies that both subsidence and surface water connectivity risks can be effectively controlled through the application of mine void filling technologies. A range of remedial approaches would be employed to effectively mitigate mine subsidence and water interconnectivity risks identified for the site, including:

- Filling of mine voids with stabilised fill material, and/or
- Excavating and collapsing mine workings, and/or
- Installing an impervious barrier using clays or suitable stabilised fill materials.

The EA states that the preferred strategy may employ all or a combination of the above techniques.

A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment.

As described in Section 8.2 of the EA, EPS has a series of groundwater monitoring bores and associated groundwater monitoring program. This monitoring program would continue to be implemented in accordance with the requirements of EPL 1429, to monitor the potential for changes in groundwater quality.

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of the EPS Environment Protection Licence (EPL 1429). EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA.

The Project is not expected to significantly impact the groundwater quality beneath or downgradient of the EAD. The cementitious nature of the dense phase placement is considered likely to reduce the potential for groundwater seepage when compared to previous lean phase placement methods (i.e. using slurry containing a higher proportion of water) (HLA, 2007).

#### **6.6.6 CCP re-use**

CCP generated at EPS is managed in accordance with the specific environmental management procedures related to the site and continues to be a viable resource for the building and construction industries. The environmental management procedures provide a program for the investigation and development of possible reuse and recycling options.

As discussed above in Section 5.3 and Section 5.13, key initiatives within these environmental management procedures include:

- Ensuring continued supply of CCP to industry vendors - Origin is currently active in the CCP reuse market, and has agreements in place for CCP to be used in the production of cement and concrete which is supplied to building and construction industries.
- On-site aggregate manufacturing - Origin is currently in various stages of negotiation with a number of organisations for the construction and operation of an aggregate manufacturing plant, which would bind CCPs together to produce blocks, sands and other aggregates.
- New products and technologies - Origin has recently commenced a partnership to test processes that involved greater utilisation of CCP in the production of a variety of building and construction industry applications.
- Government and regulatory advocacy - Government and regulator advocacy continues to play a key role in driving demand for CCP and has a direct impact on Origin's ability to supply CCP as a reuse material. Origin is continuing to undertake discussions through organisations such as the Australian Technical Infrastructure Committee (ATIC) (formerly the Cement and Concrete Users Research Group). ATIC has prepared a specification to increase the percentage of CCP used in cement or concrete for projects with government agencies (including major infrastructure projects). This is a positive outcome for the use of CCP nationally. Origin continues to pursue opportunities with various Council's to supply CCP for use in future infrastructure projects.

As identified by the initiatives above, Origin is committed to progress towards a recycling goal of 80% however, the rates of reuse and recycling of CCP remain heavily influenced by demand generated by the building and construction industries, and current recycling opportunities are not sufficient to allow the current EAD CCP placement strategy to accommodate all of the CCP for the remaining life of EPS.

#### **6.6.7 Environmental record**

A review of the operational environmental management procedures was undertaken in response to the previous dusting events that had occurred in 2016. The following measures are currently employed to mitigate the potential for dust generation on the EAD and are addressed within the EPS environmental management procedures:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon

- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment
  - Airborne TSP and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
  - Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

Should a dusting event occur with the potential for offsite impacts, the procedure set out in the Pollution Incident Management Response Plan (PIRMP) would be followed including, where required, notification of relevant government agencies. It is noted that within the EAD an area of approximately 20 hectares (ha) has been temporarily capped since 2016 to mitigate the potential of a dusting event.

## 6.7 Community Environment Network

The Community Environment Network provided the following comments:

- Option 3 (RL 138 Embankment Raise) is the only option available
- Concerns about additional loading of the EAD
- Mine void remediation risks
- Effect of extreme dust depositions on adjoining communities
- Confirmation of biodiversity offsets should be provided.

### Response

#### 6.7.1 Option 3

Section 3.3 of the EA describes a range of project alternatives which have been evaluated with consideration of the project objective which is to extend the storage life of the EAD in a manner that:

- Maintains operational flexibility in terms of future CCP deposition strategies and engineering design
- Supports the continued operation of EPS to 2032 and deposition of CCP towards a final landform that is both safe and stable in the long term
- Is technically feasible
- Remains consistent with Dams Safety Committee of NSW (DSC) guidance and Australian National Committee on Large Dams (ANCOLD) guidelines
- Minimises potential impacts to the environment.

Option 3 is identified in Section 3.3.3 of the EA as part of an Ash Disposal Options Assessment undertaken in 2014 which considered a variety of deposition strategies. It is different to, and does not form part of the preferred option which is the augmentation of the existing EAD deposition strategy, as described in Section 3.3.4 and Section 4 of the EA.

The augmentation of the EAD is considered to be the preferred option given the ability of the option to support the continued operation of the EAD consistent with project objectives which includes minimising potential impacts to the environment. The Project is designed to allow for CCP placement up to 2024, in a way which maintains flexibility for further CCP placement up to the anticipated EPS closure date of 2032.

### 6.7.2 Additional loading of EAD

The Western Emplacement Area design and process was developed in consultation with the Dam Safety Committee and in accordance with the *Dams Safety Act 1978*. There would be no change to the main embankment of the EAD.

The EAD and modification have been designed with adequate freeboard to cater for heavy rainfall events. Under the Project, flows from Catchments 1, 2 and 3 would be diverted to the stormwater receiving pond, outside of the CCP impoundment. If sustained heavy rainfall was experienced and capacity of the receiving pond is reached, flows would be diverted which ultimately lead to Lake Macquarie. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment.

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.0 of the EA specifies that the Project would be constructed in accordance with DSC guidance, ANCOLD guidelines and current codes of practice. No alterations to the main dam embankment are proposed as part of the Project. Design of the western saddle embankment has been undertaken in consultation with the NSW Dam Safety Committee (DSC), relevant DSC guidelines and the requirements of the two Acts.

The EAD is managed in accordance with the *Dams Safety Act 1978*. Adequate freeboard is maintained to cater for heavy rainfall events. In the unlikely occurrence of an emergency spillway discharge, it would be carried out in accordance with the site EPL.

The proposed modification does not adversely affect the risk profile or climate change resilience associated with the ongoing operation and use of EPS and the EAD.

### 6.7.3 Mine void remediation

A range of remedial approaches would be employed to effectively mitigate mine subsidence and water interconnectivity risks identified for the site, including:

- Filling of mine voids with stabilised fill material, and/or
- Excavating and collapsing mine workings, and/or
- Installing an impervious barrier using clays or suitable stabilised fill materials.

The EA states that the preferred strategy may employ all or a combination of the above techniques.

A Mine Void Rehabilitation Plan would be prepared prior to mine void remediation activities commencing. The Mine Void Rehabilitation Plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Further detail on the proposed structure of the Mine Void Management Plan is provided in Section 8.0.

### 6.7.4 Dust deposition impacts

Key findings of a Dust Emission Dispersion Study (AECOM, 2016) are provided in the EA to provide context to the project area. The study considered the distribution and potential impact of dust emissions from the EAD under modelled scenarios to assist in the development of effective dust control strategies.

Origin maintains four depositional dust gauges in accordance with EPL 1429. The gauges are located within proximity of the development footprint (see **Table 5**).

Time series data recording concentrations of deposited matter collected within the four depositional dust gauges maintained under EPL 1429 each month is shown in **Figure 2**. A comparison against the impact assessment criteria for deposited dust identified in Table 7.1 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016) is provided. The impact assessment criteria for deposited dust is expressed as an annual average concentration of  $4\text{g/m}^2/\text{month}$  and is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

The monitoring results show that depositional dust has remained substantially below the relevant assessment criteria<sup>7</sup> of 4g/m<sup>2</sup> per month. Ambient air quality monitoring is undertaken in accordance with EPL 1429 and data is made publicly available via a monthly summary report<sup>8</sup>.

EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points as well as relevant monitoring requirements. As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of EPL 1429. Surface water and groundwater monitoring locations are shown in Figure 5 of the EA. Groundwater monitoring results are publicly reported on a quarterly basis and include assessments for Arsenic, Lead, Cadmium, Copper, Zinc and Selenium.

There is no proposed change to the existing use of the premises and the coal chemical composition or existing practice of depositing a dense phase slurry. The CCP is a re-use product (where suitable to meet industry and market needs) and undergoes regular testing to confirm product characteristics.

#### **6.7.5 Biodiversity offsets**

As discussed in Section 8.1.3 of the EA, Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the BC Act would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of relevant credits from that site (or those sites)
- In-perpetuity conservation through securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

Identification and selection of a suitable stewardship site or sites would be informed by further detailed field based assessment. Offsets would be established through appropriate legal mechanisms or agreements to ensure the conservation of a stewardship site (or sites) in perpetuity prior to the commencement of vegetation clearing activities within the project area.

---

<sup>7</sup> Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016)

<sup>8</sup> <https://www.originenergy.com.au/about/who-we-are/what-we-do/generation.html>

This page has been left blank  
intentionally.



## 7.0 Response to Government Agency submissions

Seven submissions were received from Government Agencies (refer Appendix B) including:

- NSW Dam Safety Committee (DSC)
- NSW Department of Planning and Environment - Division of Resources and Geoscience (DRG)
- Lake Macquarie City Council (LMCC)
- NSW Office of Sport
- NSW Environment Protection Authority (EPA)
- NSW Office of Environment and Heritage (OEH)
- NSW Department of Industry (DoI).

### 7.1 NSW Environment Protection Authority

#### Comments

The NSW EPA has reviewed the information supplied in relation to the Project and is satisfied that the EPA's areas of responsibility have been adequately addressed.

The EPA recommends that the following conditions be included as conditions of approval:

- The proponent must undertake the augmentation of the EAD in accordance with the proposal as detailed in the document titled "Ash Dam Augmentation Project, Environmental Assessment" (AECOM, 15/08/2018) unless superseded by any conditions of a project approval or an environment protection licence issued by the EPA
- Where there are any variations to the predictions contained in the environmental assessment, the proponent must immediately notify relevant authorities of the variation, the cause of the variation, and the action being taken to address the variation.

The EPA notes that environment protection licence 1429 applies to the Eraring Power Station and is currently under review.

#### Response

EPS currently operates under a number of Project Approvals, including Project Approval 05\_0138, Concept Approval 05\_0138, Project Approval 06\_238 and Project Approval 07\_0084 for the management of CCP at the EPS site, as well as the original authorisations for EPS which are supported by the *Eraring Power Station Act 1981* (which commenced on 15 December 1981). Operation of EPS is currently managed in accordance with EPL 1429 and the requirements of the POEO Act.

Should the EAD augmentation be approved, the proposal would be undertaken in accordance with the updated mitigation measures outlined in Section 8, conditions of the project approval (as modified) and the environment protection licence issued by the EPA.

### 7.2 NSW Department of Planning and Environment – Division of Resources and Geoscience

#### Comments

The DRG has reviewed the information supplied in relation to the Project including *Appendix C - Biodiversity Development Assessment Report* of the EA. DRG acknowledges that the proponent has engaged in project briefing with Centennial Coal and that consultation with Subsidence Advisory NSW has been undertaken during the EA process.

With regards to biodiversity, DRG understands that *in-perpetuity conservation* would form the preferred method of offsetting where practicable and that the proponent has undertaken preliminary investigations of offset opportunities, included within Appendix C and displayed within Figure 8.1 of the EA.

Should any changes occur to the proposed biodiversity offset areas as displayed within Figure 8.1 of the EA, DRG requests to be consulted. This includes any supplementary biodiversity offset measures to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral resources.

### Response

The need for access to prospective land for mineral exploration and the potential for sterilisation of mineral resources through incompatible land use is noted. Origin would consult with the DRG during development of the Biodiversity Offset Strategy if biodiversity offset areas are proposed outside of areas displayed within Figure 8.1<sup>9</sup>.

## 7.3 Lake Macquarie City Council

### Comments

LMCC has reviewed the information supplied in relation to the Project and raised no objection to the proposed augmentation of the EAD, however has raised issues relating to biodiversity and air quality that require further consideration to ensure that impacts to the environment are acceptable.

### Biodiversity considerations

- Requests that **Figure 3.2** is updated to change its symbols for Koala and *Acacia bynoeana* as they are similar.
- The number of *Tetratheca juncea* within the Project area be discussed in the EA
- Biodiversity offsets for *Tetratheca juncea* should be based on the number of *Tetratheca juncea* plants to be cleared, as this method more accurately reflects the impact on the species and required biodiversity offsets to compensate for this loss. The use of areas of habitat rather than number of plants to calculate *Tetratheca juncea* offsets as currently included in the EA does not adequately reflect the dense areas of *Tetratheca juncea* and underestimates the biodiversity offsets.
- Requests that as part of the minimisation measures in Section 4.3 of *Appendix C - Biodiversity Development Assessment Report* of the EA, on-site compensatory measures (such as revegetation works) be undertaken within other areas of the Native Vegetation Corridor onsite which are in need of rehabilitation, to strengthen and consolidate the corridor across the site. The proposed mitigation measures shown in Table 4.1 of Appendix C should form part of a condition any approval granted, through a Vegetation and Fauna Management Plan or similar.
- An assessment of impacts of diverted surface water flow into the Coastal Wetlands and of the proposed mitigation measures should be undertaken as per Clause 10 of the Coastal Management SEPP to demonstrate if sufficient measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland.
- Potential Onsite and Potential Offsite Locations; based on available mapping and database records, require further investigation to ensure the identified Onsite Offset lands provide suitable habitat for the required biodiversity offset requirements to be met, and confirmation of Offsite Offset lands be provided. The provision of local biodiversity offset sites is encouraged.

### Air quality considerations

- LMCC is concerned that the air quality impact assessment provides limited detail to authenticate the statements made in Section 8.5.1 regarding the potential impact of dust emissions from the EAD. The assessment relies on a Dust Emission Dispersion Study (AECOM, 2016) which has not been provided. LMCC requests that this report be supplied and considered in whole to support statements made regarding peak dispersion impacts over Rathmines, Balmoral, Buttaba, Arcadia Vale and Wangi Wangi.

---

<sup>9</sup> Figure 8.1 contained within the Biodiversity Development Assessment Report prepared by Umwelt, July 2018 (ref. 4145/R04/Final) and included as Appendix C of the Environmental Assessment prepared by AECOM dated 15<sup>th</sup> August 2018.

- Suggests that time series data from the four depositional dust gauges maintained under EPL 1429 including information on the proportion of dust attributable to the EAD be considered. By doing so the maximum total increase in the area of un-rehabilitated ash dam exposed to air at any one time as a result of the Project should be clarified.
- Should the document titled 2017 Ash Dam Management Strategy (Origin, 2017) (as referred to in Section 8.5.2 of the EA) be in draft form, LLMC recommends to ensure controls outlined are being, or able to be, implemented in accordance with the strategy.
- The mitigation measures for air quality impact put forward in Section 8.5.3 include a commitment to 'progressive rehabilitation of completed surfaces'. It is requested that a rehabilitation plan for the augmented ash dam be made available for review by Council.

## Response

### Biodiversity considerations

The BC Act, together with *the Biodiversity Conservation Regulation 2017*, outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. A BDAR was undertaken in accordance with the BAM to address potential impacts to threatened species, populations or ecological communities within the Project area (Umwelt, 2018).

As discussed in Section 8.1.3 of the EA, Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the BC Act would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of relevant credits from that site (or those sites);
- In-perpetuity conservation through securing required credits through the open credit market; and/or
- Payments to the Biodiversity Conservation Fund which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

Identification and selection of a suitable stewardship site or sites would be informed by further detailed field based assessment. Offsets would be established through appropriate legal mechanisms or agreements to ensure the conservation of a stewardship site (or sites) in perpetuity prior to the commencement of vegetation clearing activities within the project area.

Ecosystem credit values have been established in accordance with the BAM (OEH, 2017<sup>10</sup>). It is anticipated that the proposal would directly impact on 260 individual occurrences (clumps) of *Tetratheca juncea* known to occur within the development footprint (based on field survey, Umwelt 2018). The Threatened Biodiversity Data Collection (OEH database) prescribes how each species is assessed (area or individual) for all species. *Tetratheca juncea* is assessed as an area in accordance with requirements of the BAM. There is no option for the method of calculation (individuals vs area) to be changed in the calculator.

Figure 3.2 has been updated (refer **Appendix C**) with alternate symbology to better distinguish between Koala and *Acacia bynoeana* records.

A Construction Environmental Management Plan (CEMP) would be prepared and implemented during construction of the Project and would consider avoidance and minimisation measures identified within Table 4.1 of Appendix C of the EA. It is noted that existing vegetation clearing procedures are outlined in the Land and Biodiversity Management Plan (AECOM, 2017) and that these would be implemented for the duration of the project (see Section X).

Lake Macquarie City Council corridor mapping indicates that vegetation on the Development Footprint contains native vegetation that contributes significantly to movement and viability of flora and fauna in

---

<sup>10</sup> Office of Environment and Heritage (OEH) (2017a) Biodiversity Assessment Method, August 2017

the LGA (LMCC 2015). The Project proposes to impact areas surrounding existing cleared areas and will not result in severing any major fauna movement habitat. The BDAR (Appendix C of the EA) identifies that important connectivity and movement habitat is unlikely to be substantially impacted by the Project. Rehabilitation activities would continue to be undertaken in accordance with the Biodiversity and Land Management Plan (AECOM, 2017). This Biodiversity and Land Management Plan incorporates measures to support the establishment of safe and stable landforms with self-sustaining vegetation communities, comprising a diversity of local native species and providing a variety of habitat for native fauna. Rehabilitation activities would include revegetation of native vegetation corridors to enhance connectivity where reasonable and feasible based on operational requirements and proposed final land use.

Clause 10(4) of the provides for consideration of whether "measures have been, or will be, taken to protect, and where possible enhance, the biophysical, hydrological and ecological integrity of the coastal wetland". An assessment of the diverted surface water flow into the coastal wetland is provided in Section 8.2.2 of the EA. It is considered that the assessment adequately addresses clause 10 of the Coastal Management SEPP. Measures to protect the coastal wetlands include provision of a receiving pond providing substantial storage capacities (see **Table 4**) to effectively manage the flow of diverted waters which eventually drain towards wetlands located some 3.5km to the south west.

**Table 4 Receiving pond storage capacities**

Storage element	Details	Capacity (m <sup>3</sup> )
Receiving pond	Below RL 129 (estimated)	10,000
Buffer storage	Between RL 129 and RL 131	21,346
Overtopping storage	Between 131 and RL 132	17,996

A CEMP would be prepared and implemented during construction of the Project. The CEMP would include an Erosion and Sediment Control Plan which would describe the safeguards to be implemented during construction to minimise potential impacts to surface water and groundwater resources. The Erosion and Sediment Control Plan would incorporate principles and relevant procedures identified within the site Water Management Plan (Umwelt, 2013). Further mitigation measures are detailed in **Section 8.0**.

As described in Section 8.2.2 of the EA, the volume, duration and frequency of diverted flows are likely to be inconsequential in comparison to the existing flows reaching the wetland under existing conditions. No further assessment of potential impacts associated with the diversion of surface water towards coastal wetlands is considered necessary.

Additional due diligence surface water monitoring is undertaken in accordance with the Water Management Plan (Umwelt, 2013). The Water Management Plan includes a Trigger Action Response Plan which provides appropriate response protocols for events that may result in adverse impacts to surrounding surface waters.

Three preliminary offset investigation sites are identified in Figure 8.1 of the BDAR. These sites are considered local, being within 10 km of the Project and are within Origin's existing landholdings. Further assessment of the suitability of these sites for offsetting would be carried out in accordance with requirements of the *Biodiversity Conservation Act 2016* and the BAM if the Project is approved and, if approval is granted, before clearing work is carried out.

### Air quality considerations

The Project generally maintains the existing scale of EPS operations as it would be located primarily within the existing operational footprint of the EAD. The EAD currently occupies an area of approximately 250 ha. Within the EAD an area of approximately 150ha is currently reserved for active CCP placement with the remainder maintained to support activities such as CCP reuse, water management and ongoing temporary and long term rehabilitation objectives. Land use practices within the EAD fluctuate according to operational needs and CCP placement strategies. The proposed augmentation would see CCP placed within an area of the EAD approximately 10ha in size which comprises both previously operational areas and areas not currently utilised for active CCP placement.

The proposed modification would increase the CCP surface area potentially exposed during operation of the Project by between 4% and 7%.

A review of operational environmental management procedures was undertaken in response to prevent dusting events that had occurred in late 2016. The following measures are currently employed to mitigate the potential for dust generation on the EAD and are addressed within the EPS environmental management procedures:

- Temporary capping and vegetation
- Strategic placement of CCP to maintain the EAD surface in a moist condition
- Progressive rehabilitation of completed surfaces
- Strategic application of crusting agents
- Use of vegetative screens and bunds around areas of active CCP placement
- Direct water application through sprays or water cannon
- Temporary mobile or longer term fixed wind breaks
- Monitoring measures including:
  - Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment
  - Airborne Total Suspended Particulate (TSP) and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response
  - Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.

Should a dusting event occur with the potential for offsite impacts, the procedure set out in the Pollution Incident Management Response Plan (PIRMP) would be followed including, where required, notification of relevant government agencies.

The proposed modification represents a minor increase (approximately 10ha) in the current area of exposed (uncapped, or unvegetated) CCP material. It is considered that existing controls designed to mitigate dust generation would effectively manage the increase in exposed surface area and that potential impacts to air quality would remain substantially the same during operation of the Project (as modified). It is noted that within the EAD an area of approximately 20ha has been temporarily capped since 2016 to mitigate the potential of a dusting event, and that an area approximately 45ha in size is currently maintained in a rehabilitated state pending the development of further CCP deposition planning. Temporary capping activities with light vegetation cover will continue to be implemented where required in response to visual inspection of the EAD surface material and continued environmental monitoring.

Key findings of a Dust Emission Dispersion Study (AECOM, 2016) are provided in the EA to provide context to the project area. The study considered the distribution and potential impact of dust emissions from the EAD under modelled scenarios to assist in the development of effective dust control strategies. As noted in the EA, the study was used to assist in the development of the EAD Management Strategy (Origin, 2017), which defines the overarching management philosophy and guides the operation of the EAD and related infrastructure. The EA notes that, given the nature and low scale of the proposed modification, the operation of the augmented EAD is not expected to generate a significant increase in air emissions compared to the existing operations, and so continued management in accordance with the EAD Management Strategy is considered appropriate.

Origin maintains four depositional dust gauges in accordance with EPL 1429. The gauges are located within proximity of the Development Footprint (see **Table 5**).

**Table 5 Depositional Dust Gauges maintained in accordance with EPL 1429**

Depositional Dust Gauge	Distance^ (km)
ER2	0.8
ER4	0
ER6	1.9
U6	0.6

^ - Approximate distance as measured from the Development Footprint

Time series data recording concentrations of deposited matter collected within the four depositional dust gauges maintained under EPL 1429 each month is shown in **Figure 2**. A comparison against the impact assessment criteria for deposited dust identified in Table 7.1 of the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016) is provided. The impact assessment criteria for deposited dust is expressed as an annual average concentration of  $4\text{g/m}^2/\text{month}$  and is assessed as insoluble solids as defined by AS 3580.10.1-1991 (AM-19).

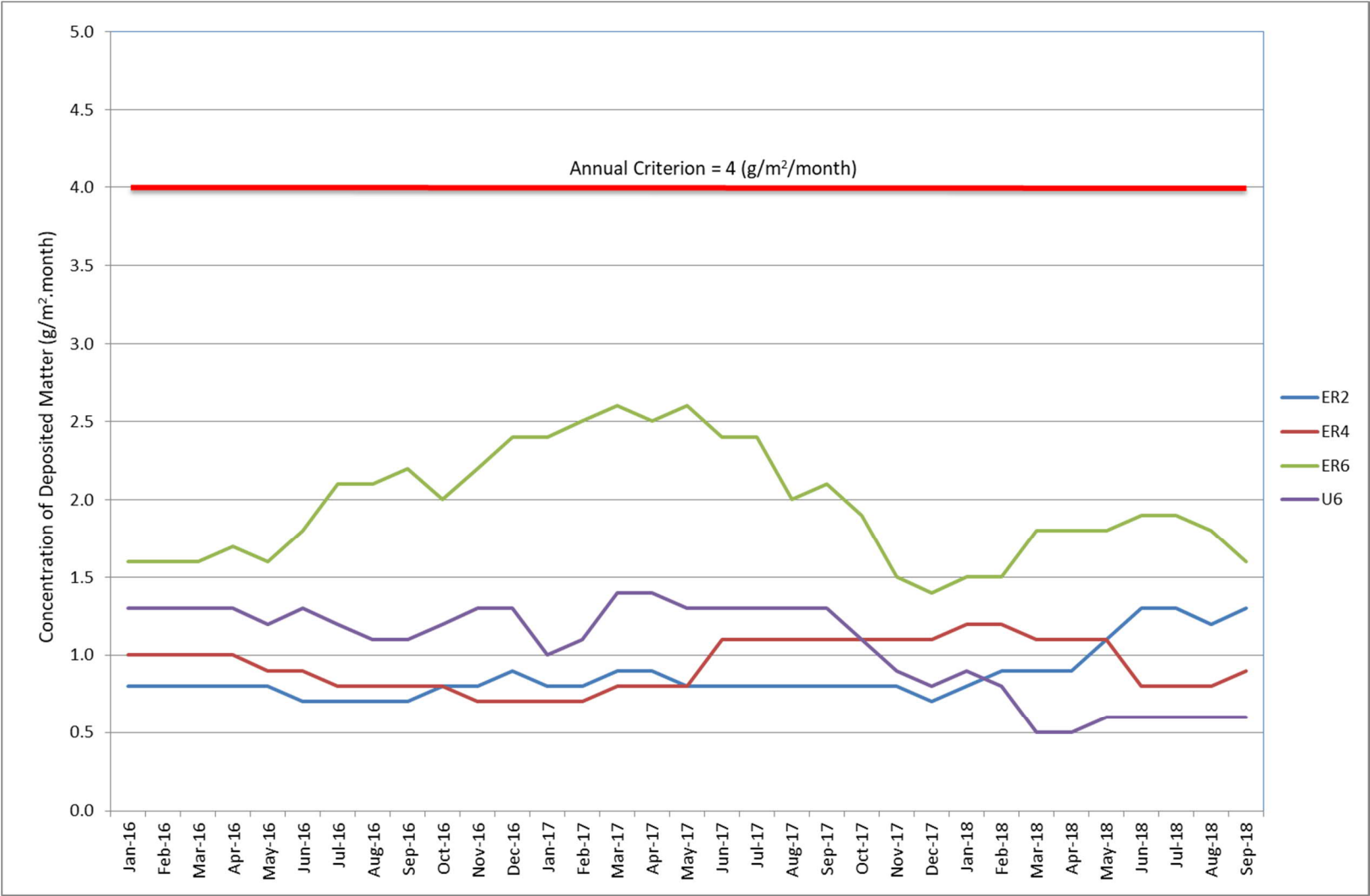


Figure 2 Eraring Power Station Depositional Dust Gauges Annual Rolling Average Comparison



It is noted that insoluble solids are typically comprised of combustible material and non-combustible materials. Dust generated from the EA is considered a non-combustible material (though is not the only non-combustible material to be collected in dust gauges and reported). The maximum annual rolling averages recorded between January 2016 and September 2018 for non-combustible material are provided in Table 6.

**Table 6 Maximum annual rolling averages recorded for Non-Combustible Material (g/m<sup>2</sup>/month) - January 2016 to September 2018**

Year	ER2	ER4	ER6	U6
December 2016	0.5	0.5	1.2	0.9
December 2017	0.5	0.7	0.6	0.7
September 2018	0.8	0.5	0.7	0.4

The monitoring results show that depositional dust has remained substantially below the relevant assessment criteria<sup>11</sup> of 4g/m<sup>2</sup> per month. Ambient air quality monitoring is undertaken in accordance with EPL 1429 and data is made publicly available via a monthly summary report<sup>12</sup>.

Mitigation measures as provided in Section 8.5.3 of the EA would be implemented in accordance with the EAD Management Strategy (Origin, 2017). It is expected that the strategy would be refined in consultation with the DPE following construction of the Western Emplacement Area. The strategy would then be reviewed on an annual basis to reflect the requirement for operational flexibility inherent in CCP placement activities.

Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. Long term rehabilitation of the EAD is dependent on further engineering design to enable operation until 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure, once a final landform for the EAD has been developed. A rehabilitation plan for the augmented EAD would be made available for review by LMCC once it has been prepared.

## 7.4 NSW Office of Sport

### Comments

The Office of Sport has raised the following comments:

- Construction phase - Traffic congestion
  - Concerned with increased traffic and how it will impact free access to the facility
  - Requests to be kept informed and consulted on any change.
- Construction phase – Noise
  - Requests the proposed hours of construction be modified to no discernible noise from 4pm Friday to Monday morning and consideration of respite periods to interrupt long periods of noise impacts. Eraring Sport and Recreation Centre is only 400m from the dam wall and comfort of customers is of utmost importance and any noise impact may have negative consequences for their business. The centre provides overnight residential accommodation to 18,044 guests ranging from 2 to 4 nights and was occupied for 87% of the year
  - Requests, as a minimum, the proposed hours of construction be modified to no discernible noise from 4pm Friday to Monday morning and consideration of respite periods to interrupt long periods of noise impact.

<sup>11</sup> Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA 2016)

<sup>12</sup> <https://www.originenergy.com.au/about/who-we-are/what-we-do/generation.html>

- On-going - Air quality
  - Requests that stringent conditions be placed on any planning approval to prevent reoccurrences of dust pollution from the power station at their centre. This should also include the proposed works and requirements for air quality monitoring with publicly available data. Several dust pollution incidents have previously occurred during dry and medium wind events.
- On-going - Crooked Creek siltation
  - Crooked Creek is partially fed by spillway from the EAD and is silted up and no longer effective environmentally or for any water based activities. Request that there be an environmental assessment of the current status of the creek and the creek be rehabilitated by the proponent prior to the commencement of any works associated with the proposed modification
  - Rehabilitation should consider the potential impact of the EAD post the works associated with the modification.
- Proposal - Embankment increased by eight metres
  - The preferred option to raise the existing embankment by eight metres poses an increased risk of flooding downstream to the facility. Requests the conditions of consent include a requirement to mitigate this risk through changing the design or reinforcing the relevant structures
  - Should provide an alternative overland flow away from Crooked Creek and the Sport and Recreation Centre.

## Response

### Traffic

As stated in Section 8.6.2 of the EA, the Project is anticipated to generate additional traffic movements of up to 50 heavy vehicles per week, or approximately 10 heavy vehicle movements per day for a period of approximately 3 months. Up to 10 additional heavy vehicle movements per day on Wangi Road is unlikely to substantially impact upon access to the Myuna Bay Sport and Recreation Centre.

### Noise

Construction works which are potentially audible at residential premises<sup>13</sup> would only be undertaken during hours currently specified in Condition 2.3 to Project Approval 07\_0084:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturdays
- At no time on Sundays and Public Holidays.

The proposed construction hours are in accordance with recommended standard construction hours as defined in the Interim Construction Noise Guidelines (ICNG) (DECC, 2009) which is the current document used to guide noise and vibration impact assessment in NSW. If required due to potential noise impacts at sensitive receptors, construction activities for the proposed modification would cease by 6pm each day and would be carried out in a way which minimises impact on customers at the Myuna Bay Sport and Recreation Centre in either the evening or night period. The Office of Sport would be notified prior to initial construction activities directly associated with the proposed modification commencing.

### Air quality

Key findings of a Dust Emission Dispersion Study (AECOM, 2016) are provided in the EA to provide context to the project area. The study considered the distribution and potential impact of dust emissions from the EAD under modelled scenarios to assist in the development of effective dust control strategies. As noted in the EA, the study was used to assist in the development of the EAD

---

<sup>13</sup> Residential premises is interpreted to include the Myuna Bay Sport and Recreation Centre.

Management Strategy (Origin, 2017), which defines the overarching management philosophy and guides the operation of the EAD and related infrastructure. The EA notes that, given the nature and low scale of the proposed modification, the operation of the augmented EAD is not expected to generate a significant increase in air emissions compared to the existing operations, and so continued management in accordance with the EAD Management Strategy is considered appropriate. The assessment pre-dates the proposed modification.

Ambient air quality monitoring is undertaken in accordance with EPL 1429. Air quality monitoring data is made publicly available via a monthly summary report<sup>14</sup>.

#### Crooked Creek

No substantial changes in emergency overflow regimes are proposed or predicted as a result of the modification. Therefore an assessment of the hydrological parameters of Crooked Creek is outside the scope of the Project. Land management activities including weed control and progressive rehabilitation would continue to be undertaken in accordance with the Land and Biodiversity Management Plan prepared for the site (AECOM, 2017). Rehabilitation of the EAD occurs on a progressive basis and is subject to operational requirements. Rehabilitation of the EAD and its immediate surrounds (including potentially, areas of Crooked Creek) is dependent on further engineering design to enable operation until 2032. It is anticipated that a detailed rehabilitation plan would be developed closer to closure, once a final landform for the EAD has been developed. It is anticipated that the rehabilitation plan would consider the potential rehabilitation of some sections of Crooked Creek.

#### Embankment

The western emplacement area is located approximately 1.8km north west of the Myuna Bay Sport and Recreation Centre. The proposed modification does not propose an increase in height of the EAD main embankment. Construction of a western saddle embankment is required to enable CCP placement within the western emplacement area (this is an existing operational area). The western embankment would be approximately 600 m in length and constructed to a maximum height of 10 m depending on topography (also acting as an access road).

The EAD is identified as a prescribed dam under Schedule 1 of the *Dams Safety Act 1978*. Section 4.2.1 of the EA identifies that the design of the western saddle embankment has been undertaken in consultation with the DSC, relevant DSC guidelines, ANCOLD guidelines and the requirements of the *Dams Safety Act 1978*. As such, the Project is not expected to pose additional flooding risks downstream or require alteration of the existing spillway (incorporating Crooked Creek).

As described in Section 8.2.1 of the EA, surface water and groundwater monitoring activities are currently undertaken in accordance with the requirements of EPL 1429. EPL 1429 sets out the concentration and volume limits for discharges from the licensed discharge points (including Crooked Creek) as well as relevant monitoring requirements. Discharges will continue to be managed and monitoring in accordance with EPL 1429. No alterations to current discharge practices are proposed as part of the Project.

## **7.5 NSW Office of Environment and Heritage**

### **Comments**

The Office of Environment and Heritage provided the following recommendations:

#### Biodiversity

- OEH recommends that the proponent clarifies the area of the development footprint and corrects it in the Biodiversity Development Assessment Report.
- OEH recommends that the proponent correct Section 5.1.1 - Direct Impacts in the Biodiversity Development Assessment Report to show the correct area of direct impact on native vegetation.
- OEH is satisfied with the biodiversity assessment provided and no further assessment is required.

---

<sup>14</sup> <https://www.originenergy.com.au/about/who-we-are/what-we-do/generation.html>

- OEH recommends that a condition of consent is included that requires the proponent to retire all ecosystem and species credits, in accordance with the offset rules of the Biodiversity Assessment Method.

#### Aboriginal cultural heritage

- OEH recommends that an Aboriginal cultural heritage assessment be undertaken in consultation with relevant Aboriginal parties to adequately determine if there are any Aboriginal cultural heritage items or cultural values present within the modification footprint.

#### Water, flood and coast

- All details for the hydrological and hydraulic calculations need to be submitted, including, but not limited to, assumptions made, and methodology used, to achieve water mitigation measures such as receiving pond storage, outlet structures and scour protection works.
- OEH recommends consideration should be given to redesigning the receiving pond so that it has a capacity to store all appropriate floodwaters.
- To satisfy conditions under the Coastal Management SEPP for development on land in proximity to coastal wetlands, the Environmental Assessment should include consideration of clause 11 (1) (a) & (b) of Coastal Management SEPP.

### **Response**

#### Biodiversity

The development footprint for the project is clarified to cover 15.1 hectares and is accurately identified in the Executive Summary and Introduction of the Biodiversity Development Assessment Report (Appendix C of the EA). Table 1.1 of the EA should be taken to describe the size of the development footprint as 15.1 hectares.

The total area of impact on native vegetation is clarified as 8.95 hectares and is correctly shown in Table 5.1 of the BDAR (Appendix C of the EA). Paragraph 2 of section 5.1 should be taken to read *"Table 5.1 below outlines the direct impacts on native vegetation, which totals approximately 8.95 hectares."*

Origin notes that OEH is satisfied with the biodiversity development assessment report included as Appendix C of the EA and that no further assessment is required. Origin supports the recommendation stated by OEH that a condition of consent is included that requires the proponent (Origin) to retire all ecosystem and species credits, in accordance with the offset rules of the Biodiversity Assessment Method.

Origin is committed to delivering a Biodiversity Offset Strategy that appropriately compensates for the unavoidable loss of biodiversity values as a result of the Project. Offset requirements under the *Biodiversity Conservation Act 2016* would be fulfilled using one or a combination of the following offset strategies:

- In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of credits from that site (or those sites)
- In-perpetuity conservation securing required credits through the open credit market, and/or
- Payments to the Biodiversity Conservation Fund, which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).

In-perpetuity conservation would form the preferred method of offsetting where practicable.

### Aboriginal cultural heritage

The project proposes modification of Project Approval (07\_0084), which was issued under Part 3A (repealed) of the EP&A Act. As this modification request was submitted prior to the cut-off date of 1 March 2018, the provisions of the former Part 3A continue to apply to this modification request. Advice received from DP&E (dated 28 February 2018) confirmed that a modification to Project Approval (07\_0084) under the former section 75W of the EP&A Act would be the appropriate approval pathway for the Project.

The *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation 2005* were developed for all Part 3A projects (Part 3A Guidelines). Step 1 of the Part 3A Guidelines states that for all projects, a preliminary assessment should be undertaken that identifies:

- a description of the location and nature of the proposed development
- a description of any social and cultural values including the spiritual, traditional, historical or contemporary associations and attachments which the place or area has for the present-day Aboriginal community
- an assessment of which of the Aboriginal cultural heritage values that are known or likely to occur.

The Part 3A Guidelines also identify when an Aboriginal cultural heritage assessment would not be necessary:

- redevelopment of a site where objects are not previously found or have been removed or damaged
- excavation of a site has previously occurred and there is little likelihood of objects remaining.

The Part 3A Guidelines conclude by stating that:

“If following a preliminary assessment, it is determined that Aboriginal cultural heritage values are not likely to occur on the proposed development site, no further assessment is required. This conclusion, and the rationale for this finding, must be documented in the preliminary information and subsequent application submitted for determination.”

Section 8.4 of the EA provides a detailed overview of previous Aboriginal heritage investigations undertaken within the project area and surrounds. Based on these previous investigations and in the context of historical disturbances and land use, a preliminary prediction of archaeological potential within the project area was considered low. However a visual inspection of the project area was completed by AECOM's Heritage Specialist on 7 May 2018 to further consider the potential for areas of Aboriginal archaeological or cultural sensitivity.

The Aboriginal assessment included in Section 8.4 of the EA has identified that the development of the EPS site and associated excavation works over several decades since work on EPS began have significantly impacted the development footprint and that the likelihood for Aboriginal objects to be present is considered low. The visual inspection of the project area by AECOM's Heritage Specialist on 7 May 2018 did not identify any areas of Aboriginal archaeological or cultural sensitivity within areas potentially disturbed by the Project. It was concluded that the potential presence of Aboriginal sites or objects within the project area is unlikely.

The assessment process presented within the EA for undertaking the preliminary assessment utilised the principles of the current Due Diligence guidelines, and for the purposes of this project may be considered a preliminary assessment under the Part 3A Guidelines.

It is noted that the project forms a continuation of an existing Part 3A project in accordance with Project Approval (07\_0084), which relates to relevant parts of the EAD. Initial enquiries in late 2005 and early 2006 identified three Aboriginal groups that wished to be involved in the project consultation process – the Koombahtoo LALC, Wonnarua Nation Aboriginal Corporation (WNAC) and Yarrowalk Enterprises Pty Limited (Yarrowalk). The Koombahtoo LALC is the relevant statutory land council for the area, while the latter two were invited due to their involvement in an Indigenous Land Use Agreement (ILUA) with Power Coal Pty Limited covering an area of some 87km<sup>2</sup> ending just north of EPS. While that project was not directly related to the activities outlined in the ILUA, the two groups were considered interested parties by HLA ENSR and therefore included.

Subsequent enquiries in relation to that project in August 2007 identified three additional Aboriginal organisations: Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC), Awabakal Traditional Owners Aboriginal Corporation (ATOAC) and Guringai Tribal Link Aboriginal Corporation (GTLAC). Therefore the Aboriginal organisations which have previously registered an interest in the Project are identified below:

- Koompahtoo LALC
- Wonnarua Nation Aboriginal Corporation (WNAC)
- Yarrawalk Enterprises Pty Limited (Yarrawalk) (now Tocumwall)
- Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC),
- Awabakal Traditional Owners Aboriginal Corporation (ATOAC)
- Guringai Tribal Link Aboriginal Corporation (GTLAC).

Notwithstanding that the Project is a continuation of an existing Part 3A project in accordance with Project Approval (07\_0084), and so the Part 3A Guidelines apply, Origin proposes to commit to the following additional indigenous engagement strategy:

- Prior to construction, consultation by written correspondence would be undertaken with the following previously identified Aboriginal Parties:
  - Koompahtoo LALC
  - Wonnarua Nation Aboriginal Corporation (WNAC)
  - Yarrawalk Enterprises Pty Limited (Yarrawalk) (now Tocumwall)
  - Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC),
  - Awabakal Traditional Owners Aboriginal Corporation (ATOAC)
  - Guringai Tribal Link Aboriginal Corporation (GTLAC).
- Prior to construction, an updated Native Title Search for the Project area would be undertaken and if a relevant registered Native Title Party and/or Applicant is identified, consultation by written correspondence would be undertaken.
- Prior to construction, a one day site visit would be held with any of the previously identified Aboriginal Parties (and any additional parties identified in the process described in the previous point) who confirm they wish to participate, to document and confirm the existing disturbed landscape and provide the opportunity to identify extant Indigenous or non-Indigenous sites or areas of archaeological sensitivity.
- Prior to construction, Origin would prepare an update of the previously completed Heritage Assessment report with supplementary findings from the site inspection with Aboriginal Parties. The supplementary assessment would comprise a short letter report containing the following information:
  - Updated desktop review of relevant available indigenous heritage assessment reports for the Project area.
  - Updated search of heritage registers as well as Commonwealth registers for indigenous heritage sites within the Project area.
  - A summary of the outcomes and findings of the one day site visit with those Aboriginal Parties.
  - Management advice for any identified or potential indigenous heritage constraints.

### Water, flood and coast

The hydrological and hydraulic calculations presented within the EA have drawn directly from the contents of a Draft Design Report (Aurecon, 2018<sup>15</sup>) which is subject to change as the detailed design phase of the project progresses. Calculations derived based on the Probable Maximum Precipitation event have been undertaken with consideration of the Generalised Short-Duration Method (BoM, 2003<sup>16</sup>) in accordance with accepted industry practice.

The proposed design evaluated four high level concept options with the principal intent of conveying stormwater away from the catchment in order to prevent potentially damaging flooding. The design intent would remain the same as outlined in the EA. For clarity, the EA proposed that the final design of the stormwater diversion works and receiving pond would consider the following design criteria:

- Capacity of major culverts, open channels and storages would be designed to contain the 1% AEP runoff event, plus freeboard. Minor pipe culverts would be sized to provide a minimum capacity to safely convey flows in a 20% AEP event with safe provision for overland flows
- Hydrologic and hydraulic calculations would be undertaken with consideration of the Australian Rainfall & Runoff (AR&R) guideline document<sup>17</sup>
- Scour protection would be designed consistent with accepted industry guidelines (i.e. Landcom (2004) Managing Urban Stormwater: Soils and Construction or equivalent).

The proposed receiving pond has sufficient storage to provide detention for events up to and in excess of the 1% AEP event (the “1 in 100 year” flood) and this is typically considered an appropriate design standard for stormwater retention or detention storage.

The Potential Maximum Flood (PMF) is the largest flood that could conceivably occur at a particular location, estimated based on Probable Maximum Precipitation (PMP), coupled with the worst flood producing catchment conditions. The EA notes that overflow storage would only be utilised in an extreme event (i.e. the PMP) which for a catchment of that size, equates to a recurrence probability exceeding well beyond 1 in 1 million years (AR&R Book 6, Figure 6) (noting that at this extent of extrapolation there is a high degree of uncertainty).

Generally, it is not physically or economically appropriate to provide complete protection against the PMF event and it is not standard practice to provide containment or flood protection in the PMF for drainage or stormwater management infrastructure. The potential for a short term, temporary interaction with Ulan Road (which is a private access road) and the coal conveyor during this rare event has been considered within the context of the EA and engineering design and is considered acceptable and appropriate.

An assessment of the diverted surface water flow into the coastal wetland is provided in Section 8.2.2 of the EA. This assessment considered clause 11(1) of the Coastal Management SEPP. The potential that the proposed stormwater diversion works may indirectly impact upon areas in the coastal wetland environments has been assessed. It is considered that the assessment adequately addresses Clause 11 of the Coastal Management SEPP.

The assessment found that, given that additional surface flows resulting from the project would only be generated during periods of sustained high rainfall, the additional inflows from the stormwater diversion works are not anticipated to significantly impact upon the integrity or resilience of the coastal wetlands environment. Key findings are summarised below:

- The water being diverted from Catchments 1, 2 and 3 into the receiving pond and potentially the wetlands would be comprised entirely of surface water flows. These surface water flows would not come into contact with the EAD or be mixed with process water. The water would be considered to be of comparable quality to other surface run-off that drains into the wetland from the surrounding environment.

---

<sup>15</sup> Aurecon, 2018. Clean Water Design, Stormwater Drainage Design Report (Draft). Prepared for Origin Energy Pty Ltd Revision B dated 6 March 2018.

<sup>16</sup> Bureau of Meteorology (2003) The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method, Bureau of Meteorology, Melbourne, Australia, June 2003, (39pp).

<sup>17</sup> Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2016, Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia



- The quantity of diverted flows (in terms of volume, duration and frequency) are likely to be inconsequential in comparison to the existing flows reaching the wetland under existing conditions. Existing flood regimes within the coastal environments would not be substantially affected.
- Additional surface flows resulting from the project (as quantified in Table 12 of the EA) would only be generated during periods of sustained high rainfall, the additional inflows from the stormwater diversion works are not anticipated to significantly impact upon the integrity or resilience of the coastal wetlands environment.

For clarity it is considered that the EA adequately demonstrates that the project, implemented with the proposed mitigation measures as proposed in **Section 8.0**) would not significantly impact on:

- the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

The quantity or quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest within the meaning of clause 11(1) of the Coastal Management SEPP.

## 7.6 NSW Dam Safety Committee

### Comments

The Committee thanked Origin Energy for providing preliminary concept drawings, notification letter and consequence category assessment of the proposed saddle dam.

The Committee noted the proposed works to Eraring Ash Dam at its November 2018 meeting.

The Committee has no objections against the proposed works provided that:

- Although the proposed new saddle dam is assessed with Low Consequence Category, and does not deem a prescription in its own right; the DSC will treat the new saddle dam in conjunction with the existing Eraring Ash Dam Embankment, which has a High B Consequence Category.
- The new saddle dam should be included in future surveillance inspections, monitoring and reports pertaining to Eraring Ash Dam.

A Design Report for the new saddle dam needs to be prepared and submitted to the DSC for its consideration prior to the construction of the saddle dam.

### Response

The western saddle embankment would be included in routine surveillance inspections, monitoring and reports pertaining to the EAD embankment in accordance with ANCOLD guidelines and the *Dams Safety Act 1978*.

A Design Report for the new saddle dam would be prepared and submitted to the DSC prior to the construction of the saddle dam.

## 7.7 NSW Department of Industry

### Comments

The NSW Department of Industry (DoI) has reviewed the information supplied in relation to the Project and has sought internal comments from the relevant branches of DoI – Lands, DoI – Water and the Department of Primary Industries (DPI).

The NSW DoI has indicated that the branches of DoI – Water and the Natural Resources Access Regulator raised the following issue for consideration:

- The Surface Water and Groundwater Monitoring and Management Plans should be revised in consultation with DoI – Water.

### Response

Following approval of the Project, the site Water Management Plan (which addresses Surface Water and Groundwater Monitoring and Management) would be revised in consultation with DoI – Water.

This page has been left blank  
intentionally.

## 8.0 Updated Mitigation Measures

The Project EA included a summary of the management measures that would be incorporated into the construction and operation of the Project. Following the receipt and consideration of submissions these management measures were reviewed. The final summary of Project management measures is provided in **Table 7**.

**Table 7 Summary of management measures**

Issue	Mitigation Measures
General	<p>Construction works which are potentially audible at residential premises would only be undertaken during hours specified in Condition 2.3 to Project Approval 07_0084:</p> <ul style="list-style-type: none"> <li>• 7am to 6pm Monday to Friday</li> <li>• 8am to 1pm Saturdays</li> <li>• At no time on Sundays and Public Holidays.</li> </ul> <p>Operations would be undertaken 24 hours a day, seven days a week.</p> <p>A Construction Environmental Management Plan (CEMP) would be prepared before commencement of construction and implemented during construction of the Project.</p> <p>The western saddle embankment would be included in routine surveillance inspections, monitoring and reports pertaining to the EAD embankment in accordance with ANCOLD guidelines and the <i>Dams Safety Act 1978</i>.</p> <p>A Design Report for the new saddle dam would be prepared and submitted to the DSC prior to the construction of the saddle dam.</p>
Biodiversity	<p><b>Construction</b></p> <p>The CEMP would identify mitigation measures and procedures including:</p> <ul style="list-style-type: none"> <li>• Vegetation clearing activities would be undertaken in accordance with existing procedures outlined in the Land and Biodiversity Management Plan (AECOM, 2017). The procedures would incorporate: <ul style="list-style-type: none"> <li>- A documented risk assessment prior to clearing commencing</li> <li>- Establishment of exclusion zones</li> <li>- Identification of habitat trees and inspections pre and post felling</li> <li>- Staged clearing activities</li> </ul> </li> <li>• Ground disturbance and soil handling activities would be undertaken in accordance with existing procedures outlined in the Land and Biodiversity Management Plan (AECOM, 2017). The procedures would incorporate: <ul style="list-style-type: none"> <li>- Weed management activities</li> <li>- Soil handling protocols including stockpiling procedures.</li> </ul> </li> <li>• Areas disturbed as a result of construction activities which are not required for future operational use would be progressively stabilised and rehabilitated as soon as practical following disturbance. Rehabilitation activities would be undertaken in accordance with the Land and Biodiversity Management Plan (AECOM, 2017).</li> </ul>

Issue	Mitigation Measures
	<p><b>Operation</b></p> <p>The following control measures would be implemented on an ongoing basis in accordance with the existing Land and Biodiversity Management Plan (AECOM, 2017):</p> <ul style="list-style-type: none"> <li>• weed management</li> <li>• vertebrate pest control</li> <li>• fencing and access control</li> <li>• bushfire management</li> <li>• progressive rehabilitation.</li> </ul> <p><b>Offset strategy</b></p> <p>Offset requirements set out in the Biodiversity Development Assessment Report which is Appendix C to the EA (Umwelt, 2018) would be fulfilled in accordance with the BC Act using one or a combination of the following offset strategies:</p> <ul style="list-style-type: none"> <li>• In-perpetuity conservation through the establishment of one or more biodiversity stewardship site(s) and the retirement of credits from that site (or those sites)</li> <li>• In-perpetuity conservation through securing required credits through the open credit market, and/or</li> <li>• Payments to the Biodiversity Conservation Fund, which would enable the Biodiversity Conservation Trust to finance its initiatives for long term biodiversity conservation (e.g. biodiversity corridors in priority areas).</li> </ul> <p>In-perpetuity conservation would form the preferred method of offsetting under the BC Act where practicable.</p>
Hydrology	<p><b>Construction</b></p> <ul style="list-style-type: none"> <li>• A Construction Environmental Management Plan (CEMP) would be prepared before commencement of construction and implemented during construction of the Project. The CEMP would include an Erosion and Sediment Control Plan which would describe the safeguards to be implemented during construction to minimise potential impacts to surface water and groundwater resources. The Erosion and Sediment Control Plan would incorporate principles and relevant procedures identified within the site Water Management Plan (Umwelt, 2013).</li> <li>• Erosion and sediment control activities would be undertaken in accordance with guidelines from Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) and Volumes 2A, 2C, 2D and 2E (DECC 2008a-d) (the Blue Book).</li> <li>• All drilling fluid would be captured and disposed of appropriately and in accordance with the NSW Waste Classification Guidelines (EPA, 2014) and the <i>Waste Avoidance &amp; Resource Recovery Act 2001</i>.</li> <li>• All drilling fluid irrigated to land would have the bulk sediment removed. Land irrigation would not be undertaken within 50 metres of a drainage line or watercourse, existing habitat offset areas or within areas of identified Endangered Ecological Community (EEC) or identified Aboriginal heritage sites. All land irrigation would be</li> </ul>

Issue	Mitigation Measures
	<p>undertaken in a manner to prevent runoff and erosion.</p> <ul style="list-style-type: none"> <li>All excess excavated material that cannot be returned to excavations or reused in construction activities would be stockpiled or temporarily placed in skip bins held on site prior to being assessed in accordance with NSW Waste Classification Guidelines (EPA, 2014). Excess material would be reused in rehabilitation activities where appropriate or appropriately disposed of in accordance with the <i>Waste Avoidance &amp; Resource Recovery Act 2001</i>.</li> <li>Ground disturbance would be minimised where possible and stabilised by progressive rehabilitation as soon as practicable.</li> <li>Ground disturbance and soil handling activities would be undertaken in accordance with existing procedures outlined in the Land and Biodiversity Management Plan (AECOM, 2017). The procedures would incorporate: <ul style="list-style-type: none"> <li>Weed management activities</li> <li>Soil handling protocols including stockpiling procedures.</li> </ul> </li> </ul> <p><b>Operation</b></p> <ul style="list-style-type: none"> <li>Following approval of the Project the site Water Management Plan (which addresses Surface Water and Groundwater Monitoring and Management) would be revised in consultation with DoI – Water.</li> <li>Existing surface water and groundwater monitoring activities would continue to be implemented for the Project in accordance with Project Approval 07_0084 (dated 29 April 2008) as modified from time to time and other planning approvals to the extent they relate to EAD operations and applicable EPL conditions.</li> </ul>
Geotechnical	<p>The following mitigation measures would be applied to the Project:</p> <ul style="list-style-type: none"> <li>A range of remedial approaches would be employed to effectively mitigate subsidence risks identified for the site and include the following techniques: <ul style="list-style-type: none"> <li>Filling of mine voids with stabilised fill material; and/or</li> <li>Excavating and collapsing of shallow mine workings, and/or</li> <li>Installing an impervious barrier using clays or suitable stabilised fill materials.</li> </ul> <p>The preferred strategy may employ some, all or a combination of the above techniques and would be informed by additional geotechnical or environmental investigations.</p> </li> <li>A Mine Void Rehabilitation Plan (MVRP) would be prepared in consultation with Subsidence Advisory NSW and Centennial Coal Company Limited prior to mine void treatment activities commencing.</li> <li>The MVRP would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria. The plan would also identify bulk material handling practices, water management procedures and appropriate environmental safeguards to minimise risks to the environment. Preparation of the MVRP would be informed by and contain: <ul style="list-style-type: none"> <li>Geotechnical mine void investigations including drilling and geotechnical core logging and/or borehole camera inspection.</li> <li>Geotechnical and Hydrologic Models to assist in identifying</li> </ul> </li> </ul>

Issue	Mitigation Measures
	<p>potential groundwater flow paths, discharge locations, and water quality parameters.</p> <ul style="list-style-type: none"> <li>- An assessment of potential hydraulic connectivity to determine the potential impact of subsidence and resulting hydraulic connectivity for preferred design scenarios.</li> <li>- Construction Quality Control Measures to be implemented describing monitoring and verification of works and quality control of grouting materials.</li> <li>- Design drawings, specifications and performance measures.</li> <li>- If required, long-term performance monitoring requirements.</li> <li>• The requirement to remediate areas where CCP is retained and the required extent of mine void rehabilitation activities would consider the hydraulic conductivity of the fill material, the height to which the voids are filled, and the expected effectiveness of the filling strategy used.</li> <li>• Pressure grouting would be employed where appropriate to fill voids from seam level through to the surface but would be limited and controlled so as not to induce hydraulic fractures of the overburden strata.</li> <li>• Mine void rehabilitation activities (and associated disturbance) would extend no further than 100m from the proposed limit of CCP placement.</li> <li>• A Mine Void Rehabilitation Verification Report would be prepared to determine the effectiveness of the applied rehabilitation action works. The verification report would be informed by and contain: <ul style="list-style-type: none"> <li>- A summary of geotechnical and/or groundwater investigations undertaken to verify performance measures identified in the MVRP are met.</li> <li>- If necessary, any further monitoring or geotechnical work required to manage residual risk associated with subsidence and surface water connectivity risks prior to CCP disposition above RL 130 within the western emplacement area.</li> </ul> </li> </ul>
Aboriginal heritage	<p>The following management measures would be implemented during construction of the Project:</p> <ul style="list-style-type: none"> <li>• In the unlikely event that Aboriginal objects, including possible human skeletal remains, are identified at any point during construction of the Project, the following procedure would be followed: <u>Aboriginal sites</u> <ol style="list-style-type: none"> <li>1. All works must cease immediately in the area to prevent any further impacts to the site</li> <li>2. Engage a suitably qualified heritage consultant to determine the nature, extent and significance of the find and provide appropriate management advice. Management action(s) would vary according to the type of evidence identified, its significance (both scientific and cultural) and the nature of potential impacts</li> <li>3. Prepare and submit an AHIMS site card for the site.</li> </ol> </li> </ul>

Issue	Mitigation Measures
	<p><u><i>Human skeletal remains</i></u></p> <p>In the event that potential human skeletal remains are identified at any point during the life of the Project, the following standard procedure (New South Wales Police Force, 2015; NSW Health, 2013) should be followed.</p> <ol style="list-style-type: none"> <li>1. All work in the vicinity of the remains should cease immediately</li> <li>2. The location should be cordoned off and the NSW Police notified</li> <li>3. If the Police suspect the remains are Aboriginal, they would contact the Office of Environment and Heritage and arrange for a forensic anthropologist or archaeological expert to examine the site.</li> </ol> <p>Subsequent management actions would be dependent on the findings of the inspection undertaken (at Point 3).</p> <ul style="list-style-type: none"> <li>• If the remains are identified as modern and human, the area would become a crime scene under the jurisdiction of the NSW Police</li> <li>• If the remains are identified as pre-contact or historic Aboriginal, OEH and the local aboriginal land council is to be formally notified in writing. Where impacts to exposed Aboriginal skeletal remains cannot be avoided an appropriate management mitigation strategy would be developed in consultation with OEH and the local aboriginal land council.</li> <li>• If the remains are identified as historic non-Aboriginal, the site is to be secured and the NSW Heritage Division contacted</li> <li>• If the remains are identified as non-human, work can recommence immediately.</li> </ul> <p>Origin commits to the following additional indigenous engagement strategy, while noting that this is a continuation of an existing Part 3A project in accordance with Project Approval (07_0084):</p> <ul style="list-style-type: none"> <li>• Prior to construction, consultation by written correspondence would be undertaken with the following previously identified Aboriginal Parties: <ul style="list-style-type: none"> <li>- Koompahtoo LALC</li> <li>- Wonnarua Nation Aboriginal Corporation (WNAC)</li> <li>- Yarrawalk Enterprises Pty Limited (Yarrawalk) (now Tocumwall)</li> <li>- Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC),</li> <li>- Awabakal Traditional Owners Aboriginal Corporation (ATOAC)</li> <li>- Guringai Tribal Link Aboriginal Corporation (GTLAC).</li> </ul> </li> <li>• Prior to construction, an updated Native Title Search for the Project area would be undertaken and if a relevant registered Native Title Party and/or Applicant is identified, consultation by written correspondence would be undertaken.</li> <li>• Prior to construction, a one day site visit would be held with any of the previously identified Aboriginal Parties (and any additional parties identified in the process described in the previous point) who confirm</li> </ul>



Issue	Mitigation Measures
	<p>they wish to participate, to document and confirm the existing disturbed landscape and provide the opportunity to identify extant Indigenous or non-Indigenous sites or areas of archaeological sensitivity.</p> <ul style="list-style-type: none"> <li>Prior to construction, Origin would prepare an update of the previously completed Heritage Assessment report with supplementary findings from the site inspection with Aboriginal Parties. The supplementary assessment would comprise a short letter report containing the following information: <ul style="list-style-type: none"> <li>Updated desktop review of relevant available indigenous heritage assessment reports for the Project area.</li> <li>Updated search of heritage registers as well as Commonwealth registers for indigenous heritage sites within the Project area.</li> <li>A summary of the outcomes and findings of the one day site visit with those Aboriginal Parties.</li> <li>Management advice for any identified or potential indigenous heritage constraints.</li> </ul> </li> </ul>
Air Quality	<p><b>Construction</b></p> <p>A CEMP would be prepared and implemented during construction of the Project. The CEMP would consider potential sources of dust and would include mitigation measures to be implemented during construction to minimise potential air quality impacts.</p> <p><b>Operation</b></p> <p>The Ash Dam Management Strategy (Origin, 2017) would be reviewed and updated if required to incorporate the Project. Existing management measures would continue to be implemented for the Project, including the following general measures for mitigating dust generation:</p> <ul style="list-style-type: none"> <li>Temporary capping and vegetation</li> <li>Strategic placement of CCP to maintain the EAD surface in a moist condition</li> <li>Progressive rehabilitation of completed surfaces</li> <li>Strategic application of crusting agents</li> <li>Use of vegetative screens and bunds around areas of active CCP placement</li> <li>Direct water application through sprays or water cannon</li> <li>Temporary mobile or longer term fixed wind breaks</li> <li>Monitoring measures including: <ul style="list-style-type: none"> <li>Surface condition monitoring to confirm crusting process and identify areas potentially requiring treatment</li> <li>Airborne Total Suspended Particulate (TSP) and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) monitors stationed around the EAD. Real time monitors provide alarms via SMS when dusting is detected to enable an immediate response</li> <li>Proactive weather monitoring providing real time data on rainfall, wind direction and speed, humidity and temperature for the site. Where inclement weather conditions are predicted or observed,</li> </ul> </li> </ul>

Issue	Mitigation Measures
	<p>mitigation measures would be implemented in accordance with an established Trigger Action Response Plan.</p> <p>Should a dusting event occur with the potential for offsite impacts, the procedure set out in the Pollution Incident Management Response Plan (PIRMP) would be followed including, where required, notification of relevant government agencies.</p>
Traffic	<p>The following measures would be implemented during construction and operation as part of the CEMP to minimise potential traffic impacts:</p> <ul style="list-style-type: none"> <li>• Access arrangements would be communicated with all truck drivers (e.g. using route maps) to ensure that they access the site from the proposed route (being via the Pacific Highway (M1), Mandalong Road and through Morisset onto Wangi Road, Rocky Point Road and Construction Road)</li> <li>• Heavy vehicle truck movements would be staged in order to minimise impacts on the surrounding traffic network</li> <li>• All additional car and truck parking would be managed wholly within the EPS site.</li> </ul>
Waste	<p>All waste would be classified in accordance to the Waste Classification Guidelines (EPA, 2014) prior to disposal and transported to a licensed waste disposal facility.</p> <p>Where possible, materials would be reused or recycled to minimise the quantities of waste disposed in landfill.</p>
Noise	<p>A CEMP would be prepared and implemented during construction of the Project. The CEMP would consider potential sources of noise and would include mitigation measures to be implemented during construction to minimise potential noise impacts.</p>

This page has been left blank  
intentionally.

## 9.0 Project Evaluation

Having fully considered the comments and issues raised in all submissions, responses have been prepared to address matters raised by submissions.

The potential environmental impacts of the project have been assessed and it is considered that whilst the project may have some residual impacts, the mitigation measures identified would effectively ensure that the environmental consequences associated with the proposed modifications are minimised and likely to remain substantially the same as those currently approved.

Offset requirements under the BC Act would be fulfilled in accordance with a Biodiversity Offset Strategy which would ensure that the unavoidable loss of biodiversity values as a result of the Project is appropriately compensated. In-perpetuity conservation would form the preferred method of offsetting under the BC Act where practicable with a number of potential offset opportunities identified in the vicinity of the Project area both within and outside of Origin's existing landholdings.

Subsidence risks would be effectively controlled through remedial action with works verified to determine their effectiveness.

The benefits of the Project would outweigh its potential impacts with the implementation of the proposed management and mitigation measures as identified in this EA. It is therefore considered that it is appropriate and in the public interest to approve the Project.

This page has been left blank  
intentionally.

# Appendix A

## EPBC Assessment of Significance

## Appendix A    EPBC Assessment of Significance





Our Ref: 4145/R05/AR/SC/30102018

30 October 2018

Gabriel Wardenburg  
Principal Environmental Scientist  
AECOM  
PO Box 73  
Hunter Region MC NSW 2310

Dear Gabriel

**Re: Commonwealth Threatened Species Assessment for the Eraring Ash Dam Augmentation Project, Eraring Power Station**

Umwelt Environmental and Social Consultants (Umwelt) has been engaged by AECOM on behalf of Origin Energy to provide an assessment of the likelihood of occurrence and, where appropriate, undertake an assessment of significance for biodiversity related Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the Eraring Power Station Ash Dam Augmentation Project.

This report has been prepared to confirm the assessment which was undertaken in connection with the Biodiversity Development Assessment Report (BDAR) prepared for the Project (Umwelt 2018) with respect to identifying and assessing potential impacts on Commonwealth Matters using the Department of Environment and Energy (DoEE) Significant Impact Guidelines 1.1.

**1.0 Project Area**

Origin proposes to expand the Eraring Ash Dam and make modifications to existing ancillary infrastructure. The Development Footprint for the Project is shown in **Figure 1** and includes the following areas of native vegetation:

- 0.95 hectares of PCT1627 Smooth-barked Apple - Turpentine - Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast - Good Condition; and
- 8.00 hectares of PCT1636 Scribbly Gum - Red Bloodwood - *Angophora inopina* heathy woodland on lowlands of the Central Coast - Good Condition.

The Development Footprint comprises an area of about 15.36 ha comprising mainly remnant vegetation within the Eraring Power Station (EPS) site adjacent to existing disturbances including an ash dam, access tracks and roads and power line easements. Intact vegetation is generally in good condition whereas the vegetation associated with the access tracks and easements is typically dominated by exotic plant species.

Inspired People.  
Dedicated Team.  
Quality Outcomes.

Newcastle

75 York Street  
Teralba NSW 2284

Ph. 02 4950 5322

Perth

PO Box 783  
West Perth WA 6872  
First Floor  
7 Havelock Street  
West Perth WA 6005

Ph. 1300 793 267

Canberra

PO Box 6135  
56 Bluebell Street  
O'Connor ACT 2602

Ph. 02 6262 9484

Sydney

Level 3  
50 York Street  
Sydney NSW 2000

Ph. 1300 793 267

Brisbane

Level 11  
500 Queen Street  
Brisbane QLD 4000

Ph. 1300 793 267

[www.umwelt.com.au](http://www.umwelt.com.au)





Image Source: Nearmap (Apr 2018), Origin (2018)  
 Data Source: AECOM (2018), Department of Finance, Services & Innovation (2018)

#### Legend

- ▬ Development Footprint (EPBC Act Assessment Area)
- ▬ Cadastre

FIGURE 1

EPBC Act Assessment Area

## **2.0 Identification of Threatened Matters**

### **2.1 Legislative Context**

The EPBC Act is the Commonwealth Government's key piece of environmental legislation. It provides the legal framework for the protection and management of nationally and internationally important flora, fauna, ecological communities, and heritage places; defined as matters of national environmental significance (MNES).

There are nine categories of MNES, being:

- World Heritage Properties
- National Heritage Places
- wetlands of international importance (ie Ramsar wetlands)
- nationally threatened species and ecological communities
- migratory species
- Commonwealth Marine Areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining) or
- a water resource, in relation to coal seam gas development and large coal mining development.

If a proposed development is likely to result in a significant impact with respect to an MNES, it must be referred to the Minister for the Environment and Energy to determine whether the development is a 'controlled action' under the EPBC Act. If it is determined to be a 'controlled action', approval for the development from the Commonwealth Environment Minister will be required.

To assist with the assessment to determine whether a development may be a controlled action, the Commonwealth Government has developed the 'Significant Impact Guidelines 1.1' (DoE 2013), which outline criteria to be considered for each MNES assessment. In addition to these, guidelines targeting particular MNES have been released; where these exist they have also been considered in this assessment.

These Assessments of Significance for the Project are provided in **Appendix A** and summarised in **Section 3** of this report.

### **2.2 Method**

MNES as listed under the EPBC Act that may occur or potential habitat for MNES that may occur in the Development Footprint have been identified through a desktop review of available literature and databases and ecological surveys undertaken to inform the Biodiversity Development Assessment Report for the Project (Umwelt 2018).



The desktop review included:

- A search of the Office of Environment and Heritage (OEH) Atlas of NSW Wildlife within a 10 kilometre (km) radius of the Development Footprint to identify EPBC Act listed threatened and migratory species, endangered populations and TECs previously recorded within the locality
- A search of Department of the Environment Protected Matters Search Tool within a 10 km radius of the Development Footprint to identify MNES (**Appendix B**)
- A review of the publication entitled "The Vegetation of Lake Macquarie City Council" (Bell and Driscoll 2015)
- A review of the publication entitled "The Vegetation of Eraring Power Station" (Bell 2007)
- A review of previous flora and fauna surveys undertaken to inform the EPS Habitat Offset Plan (AECOM 2008) and Threatened Species Management Plan (AECOM 2010).

A desktop assessment of the likelihood of occurrence of biodiversity-related MNES in the Development Footprint has been undertaken (refer to **Table 3**). This assessment has been prepared on the basis of the definitions as provided in **Table 1** and, for the proposed Development Footprint, it includes consideration of the results from the ecological surveys described above. It should be noted that for mobile matters, occurrence in the context of **Tables 1** and **3** refers to the utilisation of the habitats of the Development Footprint for foraging, breeding, roosting or nesting and does not include movement activities where the specific habitats of the Development Footprint are not utilised such as flyovers for birds or bats.

**Table 1 - Definitions of Likelihood of Occurrence**

Likelihood of Occurrence	Definition
Known	Recent and reliable records of this matter exist within the Development Footprint.
High	Despite a lack of records, it is probable that the matter occurs in the Development Footprint.
Medium	Suitable habitat is present for this matter however records of the matter are not known to occur in the immediate locality.
Low	There are no records for this matter, the matter is conspicuous all year and not recorded during targeted searches, habitat requirements are not met or its normal distribution range does not coincide with the locality. Despite this, the matter may be present in rare circumstances.
No	There is no potential for the species to occur within the locality.

Those species identified as medium or higher likelihood of occurrence in the Development Footprint are assessed further in **Appendix A**.

## 2.3 Results

The desktop assessment identified 102 threatened and/or migratory entities have been recorded and/or are predicted to occur within the locality. This includes 8 ecological communities, 24 plants, 5 frogs, 6 reptiles, 49 birds and 10 mammals. The potential for each biodiversity-related matter to occur within the EPS entire land holding and the current Development Footprint (approximately 15.36 ha) is provided in **Table 2**.

**Table 2 – Assessment of Likelihood of Occurrence of Threatened and Migratory Species and Threatened Ecological Communities**

Scientific Name		Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)		Likelihood of Occurrence	
				PMST	BioNet Records	in EPS	in Development Footprint
Ecological Communities							
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions			V	-	-	Known from near inlet canal	No
Coastal Upland Swamp in the Sydney Basin Bioregion			E	-	-	No	No
Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions			CE	-	-	No	No
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions			PD	-	-	Known	No
Coast Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community			E	likely to occur	-	Known	No
Central Hunter Valley eucalypt forest and woodland			CE	may occur	-	No	No
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion			E	likely to occur	Lake Macquarie near Swansea	No	No
Subtropical and Temperate Coastal Saltmarsh			V	likely to occur	-	No	No
Birds							
Actitis hypoleucos	common sandpiper	C, J, K	Predicted	3	Known at ash dam	No	No
Anthochaera phrygia	regent honeyeater	CE	Predicted	25	Medium	Medium	Medium
Apus pacificus	fork-tailed swift	C, J, K	Predicted	2	Low	Low	Low
Ardea ibis	cattle egret	C, J	Predicted	32	Medium, ash dam	No	No
Ardenna grisea	sooty shearwater	C, J	-	1	No	No	No
Arenaria interpres	ruddy turnstone	B, C, J, K	Predicted	-	No	No	No
Botaurus poiciloptilus	Australasian bittern	E	Predicted	-	Low	No	No

Scientific Name	Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)		Likelihood of Occurrence	
			PMST	BioNet Records	in EPS	in Development Footprint
<i>Calidris acuminata</i>	sharp-tailed sandpiper	B, C, J, K	Predicted	2	Medium, ash dam	No
<i>Calidris canutus</i>	red knot	E, C, J, K	Predicted	1	Medium, ash dam	No
<i>Calidris ferruginea</i>	curlew sandpiper	CE, B, C, J, K	Predicted	-	Medium, ash dam	No
<i>Calidris melanotos</i>	pectoral sandpiper	B, J, K	Predicted	-	No	No
<i>Calidris ruficollis</i>	red-necked stint	C, J, K	Predicted	3	Low	No
<i>Calonectris leucomelas</i>	streaked shearwater	C, J, K	Predicted	-	No	No
<i>Charadrius bicinctus</i>	double-banded plover	B	Predicted	-	No	No
<i>Charadrius leschenaultii</i>	greater sand plover	V, B, C, J, K	Predicted	-	No	No
<i>Charadrius mongolus</i>	lesser sand plover	E, B, C, J, K	Predicted	-	No	No
<i>Charadrius veredus</i>	oriental plover	J, K	-	1	No	No
<i>Cuculus optatus</i>	oriental cuckoo	C	Predicted	-	No	No
<i>Dasyornis brachypterus</i>	eastern bristlebird	E	Predicted	-	No	No
<i>Erythrorhynchus radiatus</i>	red goshawk	V	Predicted	-	No	No
<i>Egretta sacra</i>	eastern egret	C	-	1	Medium, ash dam	No
<i>Gallinago hardwickii</i>	Latham's snipe	B, C, J, K	Predicted	4	Medium, ash dam	No
<i>Grantiella picta</i>	painted honeyeater	V	Predicted	Known from PCT	Low	Low
<i>Hirundapus caudacutus</i>	white-throated needletail	C, J, K	Predicted	18	Low	Low
<i>Hydroprogne caspia</i>	Caspian tern	C, J	-	5	No	No
<i>Lathamus discolor</i>	swift parrot	CE	Predicted	25, known from PCT	<b>Known,</b> near EPS outlet	Medium
<i>Limicola falcinellus</i>	broad-billed sandpiper	B, C, J, K	Predicted	-	No	No

Scientific Name	Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)		Likelihood of Occurrence	
			PMST	BioNet Records	in EPS	in Development Footprint
<i>Limosa lapponica</i>	bar-tailed godwit	V, C, J, K	Predicted	9	No	No
<i>Merops ornatus</i>	rainbow bee-eater	J	Predicted	7	Low	Low
<i>Monarcha melanopsis</i>	black-faced monarch	B	Predicted	4	Medium	Medium
<i>Monarcha trivirgatus</i>	spectacled monarch	B	Predicted	-	No	No
<i>Motacilla flava</i>	yellow wagtail	C, J, K	Predicted	-	Low	Low
<i>Myiagra cyanoleuca</i>	satin flycatcher	B	Predicted	-	Low	Low
<i>Numenius madagascariensis</i>	eastern curlew	CE, C, J, K	Predicted	4	No	No
<i>Numenius phaeopus</i>	whimbrel	C, J, K	Predicted	2	No	No
<i>Onychoprion anaethetus</i>	bridled tern	C, J	-	1	No	No
<i>Pachyptila turtur subantarctica</i>	fairy prion (southern)	V	Predicted	-	No	No
<i>Pandion haliaetus</i>	osprey	B	Predicted	-	Low	Low
<i>Plegadis falcinellus</i>	glossy ibis	C	-	1	Low ash dam	No
<i>Pluvialis fulva</i>	Pacific gull	C, J, K	Predicted	1	No	No
<i>Pluvialis squatarola</i>	grey plover	C, J, K	-	1	No	No
<i>Rhipidura rufifrons</i>	rufous fantail	B	Predicted	2	Low	Low
<i>Rostratula australis</i>	Australian painted snipe	E	Predicted	-	Low	No
<i>Rostratula benghalensis</i>	painted snipe	E	Predicted	-	Low	No
<i>Stercorarius parasiticus</i>	Arctic jaeger	J, K	-	1	No	No
<i>Sternula albifrons</i>	little tern	C, J, K	-	1	No	No
<i>Tringa brevipes</i>	grey-tailed tattler	C, J, K	Predicted	1	No	No

Scientific Name	Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)		Likelihood of Occurrence	
			PMST	BioNet Records	in EPS	in Development Footprint
<i>Tringa nebularia</i>	common greenshank	C, J, K	Predicted	2	No	No
<i>Tringa stagnatilis</i>	marsh sandpiper	C, J, K	Predicted	1	Low	No
<b>Amphibians</b>						
<i>Heleioporus australiacus</i>	giant burrowing frog	V	Predicted	Known from PCT	Unlikely	No
<i>Litoria aurea</i>	green and golden bell frog	V	Predicted	2, known from PCT	<b>Known</b> Dora Creek – Adjacent to Inlet Canal	Low
<i>Litoria littlejohni</i>	Littlejohn's tree frog	V	Predicted	-	No	No
<i>Mixophyes balbus</i>	stuttering frog	V	Predicted	26	No	No
<i>Mixophyes iteratus</i>	giant barred frog	E	Predicted	-	No	No
<b>Mammals</b>						
<i>Chalinolobus dwyeri</i>	large-eared pied bat	V	Predicted	10, known from PCT	Medium	Medium
<i>Dasyurus maculatus</i>	spotted-tailed quoll	E	Predicted	14, known from PCT	Medium	Medium
<i>Dugong dugon</i>	dugong	B	Predicted	-	No	No
<i>Nyctophilus corbeni</i>	Corben's long-eared bat	V	-	Known from PCT	Low	Low
<i>Petauroides volans</i>	greater glider	V	Predicted	8	Low	Low
<i>Petrogale penicillata</i>	brush-tailed rock-wallaby	E	Predicted	Known from PCT	No	No
<i>Phascogale cinereus</i>	koala	V	Predicted	31, known from PCT	Medium	Medium
<i>Potorous tridactylus</i>	long-nosed potoroo	V	Predicted	Known from PCT	Low	Low
<i>Pseudomys novaehollandiae</i>	New Holland mouse	V	Predicted	1	Low	Low
<i>Pteropus poliocephalus</i>	grey-headed flying-fox	V	Predicted	42, known from PCT	<b>Known</b>	High



Scientific Name	Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)		Likelihood of Occurrence	
			PMST	BioNet Records	in EPS	in Development Footprint
Reptiles						
<i>Caretta caretta</i>	loggerhead turtle	E, B	Predicted	2, 1 from EPS	Known, EPS inlet canal	No
<i>Chelonia mydas</i>	green turtle	V, B	Predicted	119, 59 from EPS	Known, EPS inlet canal	No
<i>Dermochelys coriacea</i>	leatherback turtle	E, B	Predicted	-	No	No
<i>Eretmochelys imbricata</i>	hawksbill turtle	V, B	Predicted	-	No	No
<i>Hoplocephalus bungaroides</i>	broad-headed snake	V	Predicted	-	No	No
<i>Natator depressus</i>	flatback turtle	V, B	Predicted	1	No	No
Flora						
<i>Acacia bynoeana</i>	Bynoe's wattle	V	Predicted	61, known from PCT	Known	High
<i>Angophora inopina</i>	Charmhaven apple	V	Predicted	485, known from PCT	Known in east of operational land	Low
<i>Asperula asthenes</i>	trailing woodruff	V	-	Known from PCT	No	No
<i>Asterolasia elegans</i>	-	E	Predicted	-	No	No
<i>Astrotricha crassifolia</i>	thick-leaf hair-star	V	-	Known from PCT	No	No
<i>Caladenia tessellata</i>	thick-lipped spider orchid	V	Predicted	-	Medium	Low
<i>Cryptostylis hunteriana</i>	leafless tongue orchid	V	Predicted	4, known from PCT	Medium	Medium
<i>Cynanchum elegans</i>	white-flowered wax plant	E	Predicted	1	No	No
<i>Diuris praecox</i>	rough doubletail	V	Predicted	Known from PCT	Low	Low
<i>Eucalyptus camfieldii</i>	Camfield's stringybark	V	-	Known from PCT	No	No

Scientific Name	Common Name	Conservation Status EPBC Act	Recorded in Locality (within 10km)			Likelihood of Occurrence	
			PMST	BioNet Records	in EPS	in Development Footprint	
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Earp's gum	V	Predicted	-	Low	Low	
<i>Genoplesium insigne</i>	Variable midge orchid	CE	Predicted	1, known from PCT	Medium	Medium	
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	small-flower grevillea	V	Predicted	151, known from PCT	<b>Known</b>	Medium	
<i>Melaleuca biconvexa</i>	biconvex paperbark	V	Predicted	21	Low	Low	
<i>Pelargonium</i> sp. <i>Striatellum</i>	Omeo stork's-bill	E	Predicted	-	No	No	
<i>Persoonia hirsuta</i>	hairy geebung	E	Predicted	Known from PCT	Low	Low	
<i>Prostanthera askania</i>	tranquillity mintbush	E	-	Known from PCT	Low	Low	
<i>Prostanthera cineolifera</i>	Singleton mintbush	V	-	Known from PCT	Low	Low	
<i>Pterostylis gibbosa</i>	Illawarra greenhood	E	Predicted	-	No	No	
<i>Rhizanthella slateri</i>	eastern underground orchid	E	Predicted	-	No	No	
<i>Rutidosia heterogama</i>	heath wrinklewort	V	Predicted	5, known from PCT	Medium	Medium	
<i>Syzygium paniculatum</i>	magenta lilly pilly	V	Predicted	2	No	No	
<i>Tetradlea juncea</i>	black-eyed Susan	V	Predicted	2399, known from PCT	<b>Known</b>	Known	
<i>Thesium australe</i>	Austral toadflax	V	Predicted	-	No	No	

Note: FM Act = Fisheries Management Act 1994; CE = critically endangered; E = endangered; V = vulnerable; M = Migratory, Ma = Marine, C = CAMBA, J = JAMBA, K = ROKAMBA, B = Bonn; EPS = Eraring Power Station

Of the 102 threatened and migratory entities identified in the database searches and literature review, 11 are categorised as having a medium or greater likelihood of utilising the terrestrial habitats in the Development Footprint (see **Table 2**) and require further consideration in this report (see **Table 3**).

**Table 3 Threatened and Migratory Entities Known or Likely to occur in the Development Footprint**

Species	EPBC Act
<i>Anthochaera phrygia</i>	CE
<i>Chalinolobus dwyeri</i>	V
<i>Dasyurus maculatus</i>	E
<i>Lathamus discolor</i>	CE
<i>Pteropus poliocephalus</i>	V
<i>Acacia bynoeana</i>	V
<i>Genoplesium insigne</i>	CE
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V
<i>Rutidosis heterogama</i>	V
<i>Tetratheca juncea</i>	V
<i>Monarcha melanopsis</i>	B

Note: CE = critically endangered; E = endangered; V = vulnerable; M = Migratory, B = Bonn

### 3.0 MNES Impact Assessment

The results of the database searches, review of existing information and field investigations completed by Umwelt (2018) have identified that the Project may or will impact upon the MNES identified in **Table 3** above.

Assessments of the significance of impact of the Project against the 'Significant Impact Guidelines 1.1' for MNES as listed under the EPBC Act are provided in **Appendix A**. These Assessments of Significance consider the direct and indirect impacts associated with the Project.

In terms of threatened entities, the assessment has concluded that the Project is unlikely to result in a significant impact on an *important population* of the migratory black-faced monarch or vulnerable grey-headed flying-fox, large-eared pied bat, *Acacia bynoeana*, *Grevillea parviflora* subsp. *parviflora*, *Rutidosis heterogama*, or *Tetratheca juncea*, and unlikely to result in a significant impact on a *population* of the endangered spotted-tailed quoll or critically endangered regent honeyeater, swift parrot or *Genoplesium insigne*.

Based on the findings of this assessment, the Eraring Power Station Ash Dam Augmentation Project is unlikely to have a significant impact on biodiversity related MNES and, as such, referral to the Commonwealth Environment Minister should not be required.

Yours sincerely



Allison Riley  
NSW Ecology Manager

## REFERENCES

AECOM (2006) Baseline Data Biodiversity Native Vegetation Community and Records. In Land Management Plan Version 3. Extracts only.

AECOM (2008) Habitat Offset Plan- Eraring Power Station. Final Ver 3 5 June 2008. Extracts only.

AECOM (2010) Threatened Species Management Plan Eraring Energy Lands, Eraring NSW. Final Rev 2 13 December 2010. Extracts only.

Benson, D., and McDougall, L. (1996) Ecology of Sydney Plant Species Part 4: Dicotyledon family Fabaceae. Cunninghamia Vol 4(4):553-747.

Commonwealth of Australia (CoA) (2011) Environment Protection and Biodiversity Conservation Act 1999 referral guidelines for the vulnerable black-eyed Susan, *Tetratheca juncea*.

Commonwealth of Australia (CoA) (2017) Threat Abatement Plan for diseases in natural ecosystems caused by *Phytophthora cinnamomi*. Draft Report for Comment.

Department of Environment, Climate Change and Water (DECCW) (2009) National Recovery Plan for the Grey-Headed Flying-Fox *Pteropus poliocephalus*. Prepared by Dr Peggy Eby

Department of Environment and Energy (2017) National Flying-fox Monitoring Viewer.  
<http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>

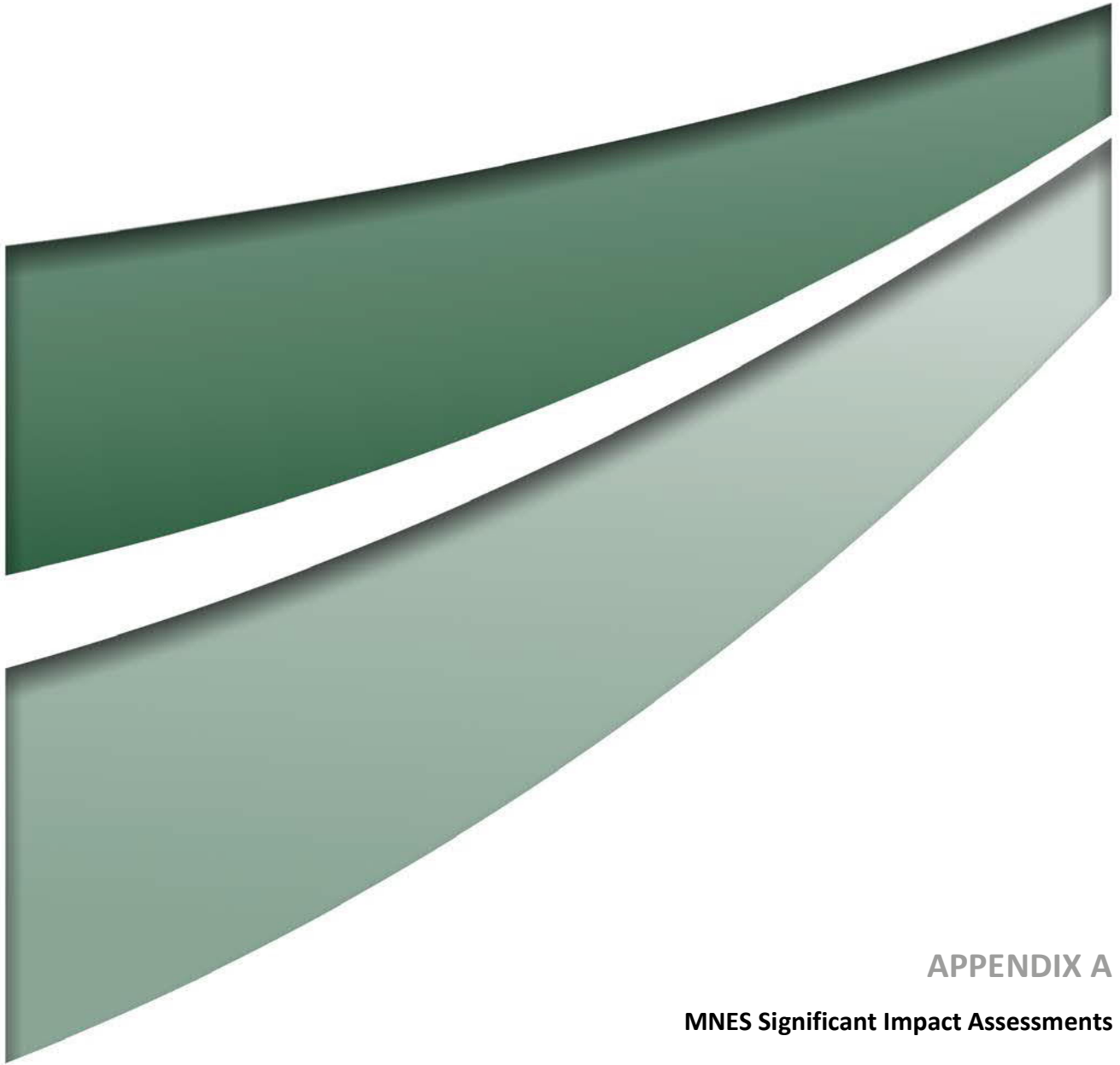
Office of Environment and Heritage (OEH) (2017) Bynoe's Wattle – profile  
<http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10006>

NSW Scientific Committee (2011) Final determination: *Acacia bynoeana* (a shrub) endangered species listing.  
<http://www.environment.nsw.gov.au/determinations/AcaciaBynoeanaEndSpListing.htm>

Species Profile and Threats Database (SPRAT) (2017a) Profile *Acacia bynoeana*  
[http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=8575](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=8575)

Species Profile and Threats Database (SPRAT) (2017b) Profile *Tetratheca juncea*  
[http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=21407](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=21407)

TSSC 2013 Approved Conservation Advice for *Acacia bynoeana* (Bynoe's Wattle).  
<http://environment.gov.au/biodiversity/threatened/species/pubs/8575-conservation-advice.pdf>



## APPENDIX A

### **MNES Significant Impact Assessments**

The 'Significant Impact Guidelines 1.1' (DoE 2013) define a significant impact as '*an impact which is important, notable, or of consequence, having regard to its context or intensity*' (DoE 2013 p. 2). When determining whether a project (proposed action) may result in a significant impact, consideration is given to the sensitivity, value, and quality of the environment which is impacted; and upon the intensity, duration, magnitude, and geographic extend of the impacts. The '*Significant Impact Guidelines 1.1*' outlines specific criteria to use when making such an assessment, based on the MNES that are being considered; which are to be complemented by additional guidelines that have been prepared for specific MNES (as available). These criteria are used as relevant in the following sections.

#### **A.1     *Pteropus poliocephalus***

The grey-headed flying-fox (*Pteropus poliocephalus*) is listed as vulnerable under the EPBC Act.

**In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:**

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The grey-headed flying-fox has been recorded in the EPS land holding and is likely to forage on seasonal flowering and/or fruiting resources across the EPS including in the Development Footprint. Camp sites (breeding habitat) have not been identified within the Development Footprint and are not expected to occur.

The National Flying-Fox Monitoring Viewer (DoEE) identifies 24 known roost camp sites within a 50 kilometre (km) radius of EPS including 5 nationally important sites. Not all of these sites have been identified as supporting a population in surveys conducted between February 2013 and February 2017. The nearest roost camp sites are at:

- Martinsville, approximately 12 km to the north-west from the Development Footprint however surveys conducted since 2013 have not identified any grey-headed flying-foxes.
- Mandalong, approximately 12 km to the south-west from the Development Footprint and had a population estimate of 16,000 to 49,999 individuals in February 2016 up from 500 to 2,499 individuals in 2015 (DoE 2017).
- Blackalls Park near Toronto, approximately 12 km to the north-west from the Development Footprint where the population estimate is generally 500 to 2,499 individuals (2015, 2016 and 2017) or 2,500 to 9,999 individuals (2013, 2015 and 2016) with a peak of 16,000 to 49,999 individuals in May 2016 (DoEE 2017).

None of these three camp sites are identified as nationally important (DoEE 2017). Foraging individuals in EPS are likely to be from any of the camp sites located within the maximum foraging distance of an adult (ie 50km) of the Development Footprint.

The Development Footprint is considered to comprise areas of potentially suitable foraging habitat for this species but is unlikely to contain significant breeding and roosting habitat necessary for maintaining genetic diversity. The Development Footprint is also not near the limit of the known range of this species. Therefore the Development Footprint is unlikely to contain an *important population* of the grey-headed flying-fox.

***An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:***

- **lead to a long-term decrease in the size of an important population of a species;**

Given that the Development Footprint does not support an *important population* of the grey-headed flying-fox, the project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population, or;**

The project will result in the loss of approximately 10 hectares (ha) of potential foraging habitat for grey-headed flying-fox. However, since the Development Footprint does not contain an *important population* of the grey-headed flying-fox, the project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing important population into two or more populations, or;**

The habitat within the Development Footprint is already highly fragmented and does not contain an *important population* of the grey-headed flying-fox. Therefore the project will not result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species, or;**

According to the draft *National Recovery Plan for the Grey-Headed Flying-Fox* (DECCW 2009), foraging habitat that meets one of the following criteria is considered critical or essential to the survival of the species:

- productive during winter and spring, when food bottlenecks have been identified
- known to support populations of >30,000 individuals within an area of 50 km radius (the maximum foraging distance of an adult)
- productive during the final weeks of gestation, and during the weeks of birth, lactation and conception (September to May)
- productive during the final stages of fruit development and ripening in commercial crops affected by grey-headed flying-foxes, and/or
- known to support a continuously occupied camp.

The Development Footprint is considered to comprise up to 8.95 ha of potentially suitable foraging habitat for this species as it may be productive over the summer months and occurs within the foraging range from roost sites known to support populations of >30,000 individuals at some time over the last four years. However given that this species has not been recorded in the Development Footprint, the relatively small area of suitable habitat when compared to the local area, the project is unlikely to significantly reduce the availability of foraging habitat critical to the survival of the species.

The National Recovery Plan for the grey-headed flying-fox (DECCW 2009) also includes criteria for roosting habitat critical to the survival of the species. Since the Development Footprint does not contain a grey-headed flying-fox camp it will not impact roosting habitat critical to the survival of the species.

Therefore the project is unlikely to substantially adversely affect habitat that is critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

No grey-headed flying-fox breeding populations or camps have been identified in the Development Footprint. The project is not expected to disrupt the breeding cycle of an *important population* of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The project will result in the loss of approximately 8.95 ha of potential foraging habitat for grey-headed flying-fox. Given the small area of potential foraging habitat to be removed and the substantial area of high quality remnant vegetation in adjoining areas, the Development Footprint is unlikely to be depended on by local grey-headed flying-fox colonies.

It is considered unlikely that the project will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the grey-headed flying-fox would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

The project is not expected to result in invasive species that are harmful to the grey-headed flying-fox becoming established in the species habitat.

- **introduce disease that may cause the species to decline; or**

No diseases that may cause the grey-headed flying-fox to decline are likely to be introduced as a result of the Project.

- **interfere substantially with the recovery of the species.**

There is currently no approved recovery plan for the grey-headed flying-fox. The overall objectives of the draft *National Recovery Plan for the Grey-headed Flying Fox* (DECCW 2009) are to:

- reduce the impact of threatening processes on grey-headed flying-foxes and arrest decline throughout the species' range
- conserve the functional roles of grey-headed flying-foxes in seed dispersal and pollination and
- improve the standard of information available to guide recovery of the grey-headed flying-fox, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species.

No significant effect on the recovery of the grey-headed flying-fox is expected to occur as a result of the project as the potential areas of foraging habitat that will be impacted as a result of the project are not expected to impact an *important population* of this species.

The project is unlikely to result in a significant impact on an *important population* of grey-headed flying-fox as the Development Footprint is not considered to support an *important population* of this species.



## A.2 *Acacia bynoeana*

The shrub *Acacia bynoeana* is listed as vulnerable under the EPBC Act.

***In the case of a vulnerable species, an important population is a population that is necessary for a species' long-term survival and recovery.***

*Acacia bynoeana* has been recorded in the EPS land holding at four locations in 2006 and 2007 (OEH Bionet) including to the north east of ash dam (AECOM 2008), south and west of the operational land (AECOM 2006). *Acacia bynoeana* is known from Lake Macquarie State Recreation Area (1600 individuals) (SPRAT Profile 2017a) and is known to occur in PCT 1636.

The species is currently known at about 30 locations between Morisset and the Southern Highlands. The locations are generally very small populations of one to five plants with only a few sites with 30 to 50 individuals (NSW Scientific Committee 2011; OEH 2017, TSSC 2013). The species prefers open, sometimes slightly disturbed sites and in recently burnt patches (NSW Scientific Committee 2011).

While surveys completed in spring 2017 have not identified any individuals of this species it has been assessed as likely to occur in the Development Footprint as due to its small size and prostrate habit it may not have been observed.

While the Development Footprint provides potential habitat for this species it is not likely to contain an *important population* of *Acacia bynoeana* as there are no records of this species in the Development Footprint during recent surveys in spring 2017 or past surveys including annual biodiversity monitoring events.

***An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:***

- **lead to a long-term decrease in the size of an important population of a species;**

Given that the Development Footprint does not support an *important population* of *Acacia bynoeana* the project will not lead to a long-term decrease in the size of an *important population* of this species.

- **reduce the area of occupancy of an important population, or;**

The project will result in the loss of approximately 8.95 ha of potential habitat for *Acacia bynoeana*. However, since the Development Footprint does not contain an *important population* of the *Acacia bynoeana*, the project will not reduce the area of occupancy of an *important population* of this species.

- **fragment an existing important population into two or more populations, or;**

The habitat within the Development Footprint has been disturbed and is already fragmented and it is noted that this habitat appears to be favoured by the plant. In the absence of records it is unlikely that the project will result in the fragmentation of an *important population* of this species.

- **adversely affect habitat critical to the survival of a species, or;**

*Acacia bynoeana* has not been identified in the Development Footprint and given the level of disturbance in the EPS land holding over an extended period, habitat in the Development Footprint is unlikely to be habitat critical to the survival of the species. Therefore the project is unlikely to substantially adversely affect habitat that is critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

*Acacia bynoeana* flowers between September and March with seed pods maturing from November to January following likely pollination by small native bees and wasps. Seed shed is localised with little dispersal of seeds. The seeds are presumed to survive long term in the soil stored seedbank and plants may appear periodically in response to disturbance (Benson and McDougall 1996). The species is clonal and capable of spreading vegetatively via underground stems (SPRAT Profile 2017a)

While the project will clear potential habitat it is not expected to disrupt the breeding cycle of an *important population* of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The project will result in the loss of less than 8.95 ha of potential habitat for *Acacia bynoeana*. Large areas of potential habitat will not be removed within EPS and this PCT is widely distributed within the Wyong sub-region IBRA.

It is unlikely that the project will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that *Acacia bynoeana* would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

*Acacia bynoeana* is threatened by weed invasion. Implementation of weed management measures during clearing and construction works would reduce risk of establishment of weeds such that the project is not expected to result in invasive species becoming established in potential habitat for *Acacia bynoeana*.

- **introduce disease that may cause the species to decline; or**

It is not known whether *Acacia bynoeana* is susceptible to any diseases. A number of species are susceptible to *Phytophthora cinnamomi* however the *Threat Abatement Plan for diseases in natural ecosystems caused by Phytophthora cinnamomi* (CoA 2017) does not recognise any *Acacia* species as being susceptible to disease from *Phytophthora cinnamomi* infection..

- **interfere substantially with the recovery of the species.**

There is currently no approved recovery plan for *Acacia bynoeana*.

The project is unlikely to result in a significant impact on an *important population* of *Acacia bynoeana* as the Development Footprint is not considered to support an *important population* of this species.

### A.3 *Tetratheca juncea*

*Tetratheca juncea* is listed as vulnerable under the EPBC Act.

**In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery.**

*Tetratheca juncea* is a low sprawling shrub growing as a single stem or clumps of stems arising from a single rootstock, as such an individual plant may have numerous stems (CoA 2011). The species is known to occur in dry sclerophyll forest, woodlands and moist heath, from 0 - 200 metres (m) in altitude with an annual rainfall of 1000 – 1200 millimetres (mm) and restricted to open forest of *Angophora costata*, *Eucalyptus haemastoma*, *E. globoidea*, *Corymbia gummifera*, and *E. capitellata* (SPRAT Profile 2017). Soils are generally sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral.

It is endemic to NSW between Wyong and Bulahdelah with the current distribution divided into two metapopulations: the central coast metapopulation (from Wyong to Beresfield) and the northern metapopulation (from Karuah to Bulahdelah) (CoA 2011). Most populations occur in the Wyong and Lake Macquarie local government areas.

There are 156 records of *Tetratheca juncea* in the EPS landholding in the OEH Atlas of NSW Wildlife including numerous records to the north and east of the ash dam (AECOM 2008). *Tetratheca juncea* was recorded at 260 locations within the Development Footprint (Umwelt 2018).

Important populations of *Tetratheca juncea* are defined in the referral guidelines as meeting any of the criteria outlined in Table A.

**Table A Important Population Definition for *Tetratheca juncea* (CoA)**

Important Population Criteria	Application to the Development Footprint
Has greater than 1000 plant clumps	No. Recorded at 260 locations.
An area of habitat has an average estimated plant clump density of 20 clumps/ha or greater	Yes. Overall density of 29 clumps/ha.
Occurs in rare habitat	Habitats in Development Footprint are not considered rare
Occurs in an area of "important habitat" as defined in Maps 4a and 4b (of the referral guidelines (CoA, 2011)) and has greater than 500 plant clumps	Area of important habitat (see <b>Appendix C</b> ) is to the north and west of the EPS operational area
Occurs at or near the distributional limits of black-eyed Susan	No
Occurs in close proximity to a protected area (e.g. National Park) where <i>Tetratheca juncea</i> is known to occur. Where close proximity is: (a) within 500m if connected by a suitable habitat corridor such as native vegetation, or (b) within 100m over disturbed habitat or non-native vegetation	Further than 500m from any protected area where <i>Tetratheca juncea</i> is known to occur
<b>Conclusion:</b>	<b>The Development Footprint is determined an important population as defined by the referral guidelines</b>

*Tetratheca juncea* within the Development Footprint is not considered to represent a key source population for breeding or dispersal or necessary for maintaining genetic diversity and is not on or near the limit of its range. However, *Tetratheca juncea* in the Development Footprint occurs in densities greater than 20 clumps per hectare. As such, the *Tetratheca juncea* population within the Development Footprint is deemed an *important population*. It is noted that important habitat for *Tetratheca juncea* as mapped in the central coast metapopulation is contiguous with the north-western portion of the site and the northern shores of the ash dam extending to the west of the Development Footprint (see **Appendix C**).

**An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:**

- **lead to a long-term decrease in the size of an important population of a species;**

The Development Footprint is deemed an important population of *Tetratheca juncea* due to its density of clumps. The project will result the removal of approximately 8.95 ha of potential habitat for *Tetratheca juncea* and up to 260 clumps, leading to decrease in the size of an important population of the species.

- **reduce the area of occupancy of an important population, or;**

The project will result in the loss of approximately 8.95 ha of potential habitat for *Tetratheca juncea* and 260 clumps. The project will reduce the area of occupancy of an important population of this species.

- **fragment an existing important population into two or more populations, or;**

The project will result in the loss of approximately 8.95 ha of habitat and 260 clumps of *Tetratheca juncea*. The Development Footprint adjoins a large, contiguous area of important habitat to the west of Lake Macquarie (see **Appendix C**) and will not fragment this existing population.

- **adversely affect habitat critical to the survival of a species, or;**

*Tetratheca juncea* is commonly recorded in remnant bushland around Lake Macquarie and is known to occur in conservation reserves in the region. The project will directly affect an important population of *Tetratheca juncea* within the Development Footprint, however this habitat is not considered critical to the survival of the species. A large tract of important habitat occurs to the west and north of the Development Footprint (see **Appendix C**). The project is unlikely to adversely affect this area of important habitat that is considered critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

Reproduction in *Tetratheca juncea* is through asexual rhizomal spread and sexual pollination (possibly by native bees capable of buzz pollination), seed development and germination (SPRAT Profile 2017). *Tetratheca juncea* has a short-lived seed bank and very low seed viability after soil storage. The project will directly disrupt the breeding cycle of individuals within the Development Footprint, which is deemed an important population. However, the project is unlikely to disrupt the breeding cycle of the much larger important population to the west and north of the Development Footprint.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The project will result in the loss of less than 9 ha of potential habitat for *Tetratheca juncea* and remove up to 260 clumps. Large areas of potential habitat will not be removed within EPS and this PCT is widely distributed within the Wyong sub-region IBRA.

It is unlikely that the project will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that *Tetratheca juncea* would decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

*Tetratheca juncea* is threatened by weed invasion. Implementation of weed management measures during clearing and construction works would reduce risk of establishment of weeds such that the project is not expected to result in invasive species becoming established in potential habitat for *Tetratheca juncea*.

- **introduce disease that may cause the species to decline; or**

The NSW key threatened process listing for the plant pathogen *Phytophthora cinnamomi* identifies that *Tetratheca juncea* may be adversely affected by direct infestation or habitat degradation. However the draft *Threat Abatement Plan for diseases in natural ecosystems caused by Phytophthora cinnamomi* (CoA 2017) does not recognise *Tetratheca juncea* as being susceptible to disease from *Phytophthora cinnamomi* infection. Notwithstanding that, the risk of introducing *Phytophthora cinnamomi* may be managed during clearing and construction works.

- **interfere substantially with the recovery of the species.**

There is currently no approved recovery plan for *Tetratheca juncea*.

Although the population of *Tetratheca juncea* within the Development Footprint is considered to represent an important population based on clump density, the plants within the Development Footprint represent a very small proportion of the known or anticipated population of this species in the wider Lake Macquarie area. Whilst the project will have an incremental impact on an important population of *Tetratheca juncea*, the project is unlikely to cause a significant impact on the species as a whole.

#### **A.4 Swift Parrot**

The swift parrot is listed as critically endangered under the EPBC Act.

The species breeds in Tasmania and moves to mainland Australia for the non-breeding season (usually arriving between February and March) (Saunders and Tzaros 2011). Most of the population winters in Victoria and NSW where it disperses across broad landscapes foraging on nectar and lerps in eucalypts. Until recently it was believed that in NSW, swift parrots forage mostly in the coastal and western slopes region along the inland slopes of the Great Dividing Range but are patchily distributed along the north and south coasts including the Sydney region (Saunders and Tzaros 2011). However, evidence is gathering that the forests on the coastal plains from southern to northern NSW are also important. They return to Tasmania in spring (September-October). The movements of this species on the mainland are poorly understood, but it is considered to be nomadic and irruptive, moving in response to food supply.

Upon reaching their core non-breeding range there is no known geographical pattern of movement. During the non-breeding season, the home-range varies tremendously between individuals and between years.

Priority sites for the swift parrot have been identified within the National Recovery Plan for the species (Saunders and Tzaros 2011). This species is likely to utilise coastal forest and river-flat vegetation associations within the coastal natural resource management region (which includes the Hunter-Central Rivers), in communities dominated by swamp mahogany (*Eucalyptus robusta*), blackbutt (*Eucalyptus pilularis*), forest red gum (*Eucalyptus tereticornis*) and spotted gum (*Corymbia maculata*) (Saunders and Tzaros 2011).

**In this case, a *population* means:**

- **a geographically distinct regional population, or collection of local populations; or**
- **a regional population, or collection of local populations, that occurs within a particular bioregion.**

The swift parrot occurs as a single population that migrates annually from breeding grounds in Tasmania to the winter foraging grounds on the coastal plains and slope woodlands of mainland eastern Australia (Saunders et al. 2011). Approximately 200 mature birds (10% of the total estimated population) are known to over-winter in the Lower Hunter Region of New South Wales (Roderick et al. 2013).

As the species occurs as a single population in Australia, any record of the species would constitute a part of a population as described above. This species has the potential to make use of the open forest and woodland habitats of the Development Footprint, particularly where there are prolific flowering eucalypts and this migratory species is likely to move throughout the area in response to mass flowering events. This species does not breed on mainland Australia, and as such the Development Footprint only represents potential foraging habitat for this species.

The Development Footprint contains low to moderate quality potential foraging habitat for this species, as the priority feed tree species that are nominated in the National Recovery Plan (Saunders and Tzaros 2011) as key foraging resources for the swift parrot in the Hunter Valley were not recorded in the PCTs identified during surveys. It is considered that the swift parrot may occupy the habitats within the Development Footprint occasionally when foraging resources are available however the Development Footprint is not expected to provide important habitat for the species based on the lack of priority feed tree species.

***An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:***

- **lead to a long-term decrease in the size of a *population*; or**

The population of the swift parrot has not been recorded within the Development Footprint, however it is known to occur in the EPS land holding near the outlet canal in lowland vegetation dominated by swamp mahogany/forest red gum.

The project may result in the loss of approximately 8.95 ha of open forest and woodland of potential foraging habitat that does not contain key feed trees as identified in the National recovery Plan (Saunders et al. 2011). The Development Footprint is not known as a historical or important foraging site for this species.

It is considered unlikely that the proposed project will lead to a decrease in the size of the population of swift parrot.

- **reduce the area of occupancy of the species; or**

The swift parrot has not been recorded within the Development Footprint, however it is known to occur in the EPS land holding near the outlet canal in lowland vegetation dominated by swamp mahogany/forest red gum.

The proposed project may result in the loss of approximately 8.95 ha of potential foraging habitat that does not contain key feed trees as identified in the National recovery Plan (Saunders et al. 2011). The Development Footprint is not known as a historical or important foraging site for this species. While the proposed project will remove potential moderate quality foraging habitat for the swift parrot, it is not likely to lead to a significant reduction in foraging habitat in the local area or region.

The proposed project may result in a reduction of the potential area of occupancy for the swift parrot in the Development Footprint, however this is unlikely to substantially reduce the area of known occupancy in the wider locality or region for a population of the swift parrot.

- **fragment an existing *population* into two or more populations; or**

A *population* of the swift parrot has not been recorded within the Development Footprint however it is known to occur in the EPS land holding near the outlet canal in lowland vegetation dominated by swamp mahogany/forest red gum. The swift parrot is highly dispersive and it is unlikely that the proposed project would create a significant change to the species' dispersal capacity or create a significant barrier the movement of the species.

It is unlikely that the proposed project would result in the fragmentation of the existing *population* into two or more populations.

- **adversely affect habitat critical to the survival of a species; or**

Habitat critical to the survival of the swift parrot includes those areas of priority habitat for which the species has a level of site fidelity or possess phenological characteristics likely to be of importance to the swift parrot (Saunders et al. 2011). The swift parrot has not been recorded within the Development Footprint, however it is known to occur in the EPS land holding near the outlet canal in lowland vegetation dominated by swamp mahogany/forest red gum. The Development Footprint does not include vegetation containing key feed tree species for the swift parrot in the Hunter-Central Rivers (Saunders et al. 2011). The project will result in the loss approximately 8.95 ha of this potential habitat.

Breeding habitat, which is restricted to Tasmania, will not be affected by the project.

The project is unlikely to adversely affect habitat that is critical to the survival of the species.

- **disrupt the breeding cycle of a *population*; or**

The swift parrot breeds and nests exclusively in Tasmania and migrates to mainland Australia during the non-breeding season. There is no potential for breeding habitat to occur in the Development Footprint.

The proposed project will not disrupt the breeding cycle of the *population* of swift parrot.



- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

The swift parrot has been recorded in the region, with records are concentrated in the lower Hunter Valley. The closest record is located at the EPS outlet canal, in vegetation dominated by swamp mahogany/red gum.

The project will involve the removal of approximately 8.95 ha of open forest and woodland that contains potential foraging habitat, however key feed tree species for the swift parrot were not identified during surveys.

It is considered unlikely that the project would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that a *population* of the swift parrot would decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

The project is not expected to result in invasive species that are harmful to a population of the swift parrot becoming established in this species habitat.

- **introduce disease that may cause the species to decline; or**

Psittacine beak and feather disease is a common and potentially deadly disease of parrots caused by a circovirus named beak and feather disease virus. The disease appears to have originated in Australia and is widespread and continuously present in wild populations of Australian parrots. Beak and feather disease affecting endangered psittacine species (parrots and related species) was listed in April 2001 as a key threatening process under the EPBC Act.

It is considered highly unlikely that the project will introduce beak and feather disease or any other disease that may cause the swift parrot to decline.

- **interfere with the recovery of the species.**

The following recovery plan has been prepared:

- National Recovery Plan for the Swift Parrot (*Lathamus discolor*) (Saunders et al. 2011)

Known or priority swift parrot habitat will not be impacted by the project and therefore objectives of the National Recovery Plan are not likely to be contravened. It is considered unlikely that the project will interfere with the recovery of a *population* of the swift parrot throughout Australia.

The project is unlikely to result in a significant impact on the population of the swift parrot. Although the Development Footprint provides potential foraging habitat for this species, the swift parrot (*Lathamus discolor*) has not been recorded within the Development Footprint and key priority feed trees will not be impacted.



## **A.5 Regent Honeyeater**

The regent honeyeater is listed as critically endangered under the EPBC Act.

The species has a patchy distribution extending from south-east Queensland, into NSW and the Australian Capital Territory, to central Victoria (CoA, 2016). The species is highly mobile, capable of travelling large distances and occurs only irregularly at most sites in varying numbers. Adding further difficulty to the survey and study of this species is its ability to often go long periods without being observed anywhere (CoA 2016). Its primary habitat is box-ironbark eucalypt woodland and dry sclerophyll forest, however it does utilise riparian vegetation and lowland coastal forest. Habitat critical to the survival of the regent honeyeater includes any breeding or foraging areas where the species is likely to occur and any newly discovered breeding or foraging locations.

The proposal area does not occur within the four known breeding areas for the species where it is regularly recorded, namely Bundarra-Barraba area of NSW, the Capertee Valley in NSW, the lower Hunter Valley in NSW and the Chiltern area of north-east Victoria.

The regent honeyeater is not known to occur within the Development Footprint, however the species has been recorded on 25 occasions within 10km of the Development Footprint, with records concentrated in coastal lowland forests. This species may occur within the woodland and open forest habitats within the Development Footprint however the lack of priority feed trees, as nominated by the National Recovery Plan for the lower Hunter, indicates that the Development Footprint is not important habitat for the species in the local area.

**In this case, a *population* means:**

- **a geographically distinct regional population, or collection of local populations; or**
- **a regional population, or collection of local populations, that occurs within a particular bioregion.**

The regent honeyeater is endemic to mainland south-eastern Australia and mostly inhabits inland slopes of the Great Dividing Range (TSSC, 2015b). The regent honeyeater comprises a single population, with some exchange of individuals between regularly used areas (CoA, 2016b). As at 2010, the total population size is estimated at 350 - 400 mature individuals (CoA, 2016b).

As the species occurs as a single population in Australia, any record of the species would constitute part of a population as described above.

***An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:***

- **lead to a long-term decrease in the size of a population; or**

The population of the regent honeyeater has not been recorded within the Development Footprint however potential habitat was identified. The project may result in the loss of approximately 8.95 ha of vegetation containing potential moderate quality foraging habitat for the regent honeyeater as their diet primarily consists of nectar from eucalypts and mistletoe (CoA, 2016b). The Development Footprint is not known as a historical or important foraging site for this species.

It is considered unlikely that the project will lead to a decrease in the size of the population of regent honeyeater.

- **reduce the area of occupancy of the species; or**

The regent honeyeater has not been recorded within the Development Footprint, however it is known to occur within 10km of the Development Footprint in coastal lowland forest. The proposed project may result in the loss of approximately 8.95 ha of potential habitat, however key feed tree species were not identified during field surveys (CoA, 2016b). While the Project will remove potential moderate quality habitat for this species, it is not likely to lead to a significant reduction in known habitat in the region.

The proposed project may result in a reduction of the potential area of occupancy for the regent honeyeater in the Development Footprint, however this is unlikely to substantially reduce the area of known occupancy in the wider locality or region.

- **fragment an existing *population* into two or more populations; or**

The decline of the population of the regent honeyeater is attributed to clearing, fragmentation and degradation of its habitat (TSSC, 2015b).

The *population* of regent honeyeater has not been recorded within the Development Footprint. The regent honeyeater is highly dispersive and it is unlikely that the Project would create a significant change to the species' dispersal capacity or create a significant barrier the movement of the species.

It is unlikely that the Proposed Action would result in the fragmentation of the existing *population* into two or more populations.

- **adversely affect habitat critical to the survival of a species; or**

Habitat critical to the survival of the regent honeyeater includes any breeding or foraging areas where the species is likely to occur and any newly discovered breeding or foraging locations (CoA, 2016b). The species has not been recorded breeding in the Development Footprint. The Development Footprint does not include vegetation containing key feed tree species for the regent honeyeater (CoA, 2016b & OEH, 2017) in the Hunter Valley, as described in the National Recovery Plan for the species. The project may result in the loss of approximately 8.95 ha of potential moderate quality habitat.

The proposed project is unlikely to substantially adversely affect habitat that is critical to the survival of a *population* of the regent honeyeater.

- **disrupt the breeding cycle of a population; or**

The regent honeyeater mainly breeds in three key sites in NSW being the Bundarra-Barraba area, the Capertee Valley, and the Lower Hunter Valley (CoA, 2016b & OEH, 2017). Other breeding areas are known in the Pilliga woodlands and the Mudgee-Wollar areas of NSW. The regent honeyeater has not been recorded in the Development Footprint and it is unlikely to contain breeding or nesting habitat for the species.

The project is not expected to disrupt the breeding cycle of the *population* of regent honeyeater.

- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

The regent honeyeater has been recorded in the region however this species has not been recorded within the Development Footprint. The regent honeyeater is considered to have potential to occur in areas of eucalypt habitat.

The project will involve the removal of approximately 8.95 ha of vegetation of potential habitat that does not contain areas of key feed tree species, as described by the National recovery Plan for the species.

It is considered unlikely that the Proposed would modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that a *population* of the regent honeyeater would decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

The project is not expected to result in invasive species that are harmful to the regent honeyeater becoming established in the species habitat.

- **introduce disease that may cause the species to decline; or**

The project is not expected to introduce any disease that may cause the regent honeyeater to decline.

- **interfere with the recovery of the species.**

The following recovery plan has been prepared:

- National Recovery Plan for the Regent Honeyeater (*Anthochaera phrygia*) (CoA, 2016b)

Any impacts to known habitat for the regent honeyeater will likely contravene the objectives of the recovery plan. The regent honeyeater has not been recorded within the Development Footprint, however approximately 8.95 ha of potential moderate quality foraging habitat has been identified. It is considered unlikely that the proposed project will interfere with the recovery of the regent honeyeater (*Anthochaera phrygia*) throughout Australia.

The project is unlikely to result in a significant impact on the population of the regent honeyeater. Although the Development Footprint provides potential foraging habitat for this species, the area proposed to be disturbed is small relative to the area of occupancy of the species and the regent honeyeater has not been recorded utilising the potential habitat within the Development Footprint or in the immediate surrounds.

#### **A.6 Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)**

The spotted-tailed quoll (*Dasyurus maculatus maculatus*) occurs in a variety of habitats including forests, woodlands, coastal heathlands and rainforest. The distribution of this species is on both the inland and coastal sides of the Great Dividing Range from the Victorian to the Queensland borders, with a number of unconfirmed records also being reported in scattered occurrences of western of NSW (OEH, 2017b).

The spotted-tailed quoll is a highly mobile marsupial capable of moving several kilometres in one night and occupying large territories ranging from 750 to 3,500 ha (OEH, 2017b).

**In this case, a *population* means:**

- **a geographically distinct regional population, or collection of local populations; or**
- **a regional population, or collection of local populations, that occurs within a particular bioregion.**

There is very little research-based literature that allows confident definition of population size or population boundaries of the spotted-tailed quoll. Spotted-tailed quoll records are generally confined to within 200km of the NSW coast and ranges from the Queensland border to Kosciuszko National Park. The species is known to occur in Lake Macquarie. According to the National Recovery Plan for the species (DELWP, 2016) it is considered likely that the total number of mature adult spotted-tailed quolls is probably greater than 2,000 but fewer than 10,000 individuals in Australia. Home range estimates vary considerably according to location and habitat quality, however females can occupy home ranges up to 750 ha and males up to 3,500 ha and both sexes usually traverse their ranges along densely vegetated creeklines. Extant populations are highly fragmented and declining. The geographic distribution of the species is contracting and its subpopulations are becoming increasingly fragmented.

The spotted-tailed quoll typically occurs at low densities, as adults are solitary and occupy large home ranges. As the species occurs as a single population, any record of the species would constitute a population as described above. A population of spotted-tail quoll has not been recorded within the Development Footprint and a search of the Atlas of NSW Wildlife has identified 14 spotted-tailed quoll records within 10km of the Development Footprint.

***An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:***

- **lead to a long-term decrease in the size of a population; or**

The spotted-tailed quoll has not been recorded within the Development Footprint, however potential habitat was identified. No evidence of the quoll was recorded during surveys, including latrines or dens. The loss of approximately 8.95 ha of potential woodland foraging habitat is not considered likely to result in a long-term decrease the *population* of the spotted-tailed quoll.

- **reduce the area of occupancy of the species; or**

While not recorded within the Development Footprint, the spotted-tailed quoll has the potential to occur on an occasional or rare basis, due to the presence of contiguous potential habitat surrounding the EPS land holding. If present, the proposed project would result in a reduction of the potential area of occupancy of the spotted-tailed quoll, however given the small area of impact relative to the size of an average spotted-tailed quoll home range area the potential reduction in the area of occupancy of the species is considered negligible.

- **fragment an existing *population* into two or more populations; or**

The spotted-tailed quoll has not been recorded within the Development Footprint, however the spotted-tailed quoll has the potential to occur on an occasional or rare basis. If the species occurs within the Development Footprint, the proposed area of disturbance relative to the mobility of the species is considered unlikely to result in the fragmentation of an existing population of the spotted-tailed quoll into two or more populations.

- **adversely affect habitat critical to the survival of a species; or**

Habitat critical to the survival of the spotted-tailed quoll includes large patches of forest with denning resources and relatively high densities of prey (medium-sized mammals). However the National Recovery Plan notes it is not possible to define or map habitat critical to populations of the spotted-tail quoll, therefore all habitats within its current distribution are considered important habitat for this species (DELWP, 2016).

The project will not adversely affect habitat critical to the survival of the *population* of the spotted-tail quoll due to the small area of impact relative to the size of an average spotted-tailed quoll home range area and the lack of denning resources (breeding habitat) within the Development Footprint.

- **disrupt the breeding cycle of a population; or**

The spotted-tailed quoll generally dens in rock shelters, small caves, hollow logs or tree hollows and utilises numerous dens within its home range (OEH, 2017b). No potential den sites were recorded during surveys and the spotted-tailed quoll has not been recorded within the Referral Area.

While not recorded within the Development Footprint, the spotted-tailed quoll has the potential to occur on an occasional or rare basis. If the species occurs within the Development Footprint, the proposed area of disturbance relative to the mobility of the species is considered unlikely to disrupt the breeding cycle of any population of the spotted-tailed quoll.

- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

It is considered likely that the total number of mature adult spotted-tailed quolls is probably greater than 2,000 but fewer than 10,000 individuals in Australia (DELWP, 2016). Extant populations are highly fragmented and declining. The Project will involve the removal of approximately 8.95 ha of potential woodland habitat for the species.

The area of habitat to be removed is not important, notable, or of consequence, in accordance with the significant impact guidelines (DEWHA, 2009).

The project will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the population of this species is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

The project is not expected to result in invasive species that are harmful to the spotted-tailed quoll becoming established in the species habitat.

- **introduce disease that may cause the species to decline; or**

The spotted-tailed quoll is not known to be affected by diseases that are causing the population of the spotted-tailed quoll to decline. Therefore, the Project is not likely to result in the introduction of disease.

- **interfere with the recovery of the species.**

The following recovery plan has been prepared:

- National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus* (DELWP, 2016).

Any impacts to known habitat for the spotted-tailed quoll will likely contravene the objectives of the recovery plan. The spotted-tailed quoll has not been recorded within the Development Footprint, however potential habitat has been identified. It is considered unlikely that the proposed project will interfere with the recovery of the spotted-tailed quoll throughout Australia.

The proposed project is unlikely to result in a significant impact on the *population* of the spotted-tailed quoll. Although the Development Footprint provides potential habitat for this species, the area proposed to be removed is not considered high quality habitat and is relatively small considering the home ranges of the species. The spotted-tailed quoll (*Dasyurus maculatus maculatus*) has not been recorded utilising the potential habitat within the Development Footprint or in the immediate surrounds.

#### **A.7 Variable midge orchid (*Genoplesium insigne*)**

*Genoplesium insigne* occurs within the Wyong Local Government Area on the NSW Central Coast. The species occurs within the Sydney Basin Bioregion and the Hunter-Central Rivers Catchment Management Authority. The species has been recorded from Chain Valley Bay (found at two localities), Charmhaven (found at three localities) and Lakehaven (no flowering plants recorded in the past 10 years). The Conservation Advice for the species identifies twenty plants occurring across all known localities (CoA 2014).

*Genoplesium insigne* occurs in patches of *Themeda australis* (kangaroo grass) amongst shrubs and sedges in heathland and forest. The species is known from three locations: at Chain Valley Bay, the vegetation associated with the species has been described as 'Dry sclerophyll woodland dominated by *Eucalyptus haemastoma* (scribbly gum), *Corymbia gummifera* (red bloodwood), *Angophora costata* (smooth-barked apple) and *Allocasuarina littoralis* (black she-oak)' (NSW OEH, 2001). The flowering period of the species is from August to November.

The species was not recorded during targeted surveys undertaken within the species known flowering period.

**In this case, a *population* means:**

- a geographically distinct regional population, or collection of local populations; or
- a regional population, or collection of local populations, that occurs within a particular bioregion.

The species is considered to occur as a single population, restricted to an area of occupancy of approximately 40km<sup>2</sup>.

***An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:***

- lead to a long-term decrease in the size of a population; or

*Genoplesium insigne* has not been recorded within the Development Footprint, despite targeted surveys undertaken within the known flowering period of the species. The loss of approximately 8.95 ha of potential habitat is not considered likely to result in a long-term decrease the *population* of *Genoplesium insigne*.

- reduce the area of occupancy of the species; or

*Genoplesium insigne* has not been recorded within the Development Footprint, despite targeted surveys undertaken within the known flowering period of the species. The loss of approximately 8.95 ha of potential habitat is not considered likely to result in a reduction in the area of occupancy of the species.

- **fragment an existing *population* into two or more populations; or**

*Genoplesium insigne* has not been recorded within the Development Footprint, however potential habitat was identified. If the species occurs within the Development Footprint, the proposed area of disturbance relative to the known extent of the species is considered unlikely to result in the fragmentation of an existing population of the species into two or more populations.

- **adversely affect habitat critical to the survival of a species; or**

All known occurrences of *Genoplesium insigne* are considered to comprise habitat critical to the survival of the species. Known habitat will not be impacted either directly or indirectly as a result of the project and therefore habitat critical to the survival of the species will not be adversely affected.

- **disrupt the breeding cycle of a population; or**

The species' lifecycle is believed to be similar to other *Corunastylis* species in that it is believed to be a seasonal perennial, which shoots from a dormant underground tuber following winter rain. The species is likely to be pollinated by small flies (midges), usually in the Chloropidae family. Seed dispersal is by wind and water (CoA 2014).

It is considered unlikely that the proposed project would disrupt the breeding cycle of any population of *Genoplesium insigne*.

- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

*Genoplesium insigne* has not been recorded within the Development Footprint, however potential habitat was identified. Approximately 8.95 ha of potential habitat is proposed to be removed, however as the species is not known to occur, this loss of potential habitat is not considered important, notable, or of consequence, in accordance with the significant impact guidelines (DEWHA, 2009).

The proposed project will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the population of this species is likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;**

The proposed project is not expected to result in invasive species that are harmful to the *Genoplesium insigne* becoming established in the species habitat.

- **introduce disease that may cause the species to decline; or**

*Genoplesium insigne* is not known to be affected by diseases that are causing the population of the species to decline. The Project is not likely to result in the introduction of disease.

- **interfere with the recovery of the species.**

A recovery plan has not been prepared for the species, however recovery actions are being identified as part of the NSW Saving Our Species program.

*Genoplesium insigne* has not been recorded within the Development Footprint, however potential habitat has been identified. It is considered unlikely that the proposed project will interfere with the recovery of *Genoplesium insigne* throughout its range.



The proposed project is unlikely to result in a significant impact on the *population* of *Genoplesium insigne*. Although the Development Footprint provides potential habitat for this species, the species has not been recorded in the Development Footprint during targeted surveys and the area small area of potential habitat that is proposed to be removed as a result of the project is not considered significant.

#### **A.8 Small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)**

Small-flower grevillea is known to occur in sporadic populations throughout the Sydney Basin on ridge crests, upper slopes and flat plains. The species inhabits a range of vegetation types from heath and shrubby woodland to open forest. Targeted surveys were undertaken in the Development Footprint for this species, however it was not recorded. Approximately 8.95 ha of potential habitat was identified within the Development Footprint identified for the species.

**In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:**

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

While small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) was not recorded in the Development Footprint, potential habitat was identified and the species is known to occur in the wider EPS land holding and the local area. Potential habitat within the Development Footprint is not considered to provide a key source of breeding or dispersal habitat and is not necessary for the maintenance of genetic diversity. The species is not at the limit of its range in the local area, being known to occur in the Prospect–Camden and Appin areas, with other disjunct populations occurring in the Lower Hunter Valley, on the Central Coast and in the Port Stephens area. A far southern population may also occur at Moss Vale, NSW. This species occurs within the Hawkesbury–Nepean, Hunter–Central Rivers and Sydney Metro (NSW) Natural Resource Management Regions.

The Development Footprint is not considered to contain an *important population* of small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*).

**An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:**

- lead to a long-term decrease in the size of an important population of a species;

Approximately 8.95 ha of potential habitat for small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) will be impacted by the proposed project.

Due to the small area of vegetation that could potentially be removed, relative to the known and predicted occurrence of the species within the local area (approximately 4900 ha of potential habitat within Lake Macquarie LGA) the proposed project is unlikely to result in a long term decrease in the size of an important population of this species.

- reduce the area of occupancy of an important population, or;

The Development Footprint does not support an important population of this species and the proposed project will not result in a significant reduction in the area of occupancy of this species.



- **fragment an existing important population into two or more populations, or;**

The Development Footprint does not support an important population of this species and the proposed project will not lead to the fragmentation of existing important population of small-flower grevillea into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The habitats occurring in and around the Development Footprint is not considered to form critical habitat for the survival of small-flower grevillea.

- **disrupt the breeding cycle of an important population, or;**

The proposed project is not expected to disrupt the breeding cycle of an important population of small-flower grevillea.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

It is unlikely that the removal of approximately 8.95 ha of potential habitat for the species would modify, destroy, remove or isolate or decrease the availability or quality of habitat for small-flower grevillea such that the species is likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

It is unlikely that the removal of approximately 8.95 ha of potential habitat for the species would result in the establishment of an invasive species that is harmful to small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*).

- **introduce disease that may cause the species to decline; or**

The proposed project involves the clearing of approximately 8.95 ha of potential habitat for the species. It is considered unlikely that the activities associated with the proposed project could introduce disease that may cause the decline of any potentially occurring population of small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*).

- **interferes substantially with the recovery of the species.**

The proposed project will not result in the loss of important habitat for small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) and it is not expected to substantially interfere with the recovery of this species.

The Development Footprint is not likely to contain an important population of the small-flowered grevillea (*Grevillea parviflora* subsp. *parviflora*) and the project will not result in a significant impact on the species.

#### **A.9 Heath wrinklewort (*Rutidosia heterogama*)**

Heath Wrinklewort (*Rutidosia heterogama*) is confined to the North Coast and Northern Tablelands regions of NSW. It is known from the Hunter Valley to Maclean, Woolli to Evans Head, and Torrington; occurring within the Border Rivers–Gwydir, Hunter–Central Rivers and Northern Rivers (NSW) Natural Resource Management Regions. The species mostly inhabits heath, and is often found along disturbed roadsides (Harden, 1992). The coastal populations from Woolli to Evans Head occur on clay soil in grassland, heath, open forest and woodland.

**In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:**

- key source populations either for breeding or dispersal; or
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

Heath wrinklewort (*Rutidosia heterogama*) was not recorded in the Development Footprint, however it is known from five locations within 10km of the Development Footprint. The species has not previously been recorded within the EPS land holding. The records of heath wrinklewort (*Rutidosia heterogama*) in the local area are not considered to form parts of important population of this species as they do not represent a key source population for breeding or dispersal; are not necessary for the maintenance of genetic diversity and are not at the limit of the species range. Key populations of the species are known from the Cessnock – Kurri Kurri area, the north coast populations between Woolli and Evans Head (in Yuraygir and Bundjalung National Parks) and also in the New England Tablelands from Torrington and Ashford south to Wandsworth south-west of Glen Innes.

The Development Footprint is not considered to provide an area of potential habitat for an important population of heath wrinklewort (*Rutidosia heterogama*).

**An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:**

- **lead to a long-term decrease in the size of an important population of a species;**

Approximately 8.95 ha of potential habitat for heath wrinklewort (*Rutidosia heterogama*) will be impacted by the proposed project.

Due to the small area of vegetation that could potentially be removed, relative to the known and predicted occurrence of the species within the local area, the proposed project is unlikely to result in a long term decrease in the size of an important population of this species.

- **reduce the area of occupancy of an important population, or;**

The Development Footprint does not support an important population of this species and the proposed project will not result in a significant reduction in the area of occupancy of this species.

- **fragment an existing important population into two or more populations, or;**

The Development Footprint does not support an important population of this species and the proposed project will not lead to the fragmentation of existing important population of heath wrinklewort (*Rutidosia heterogama*) into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The habitats occurring in and around the Development Footprint is not considered to form critical habitat for the survival of heath wrinklewort (*Rutidosia heterogama*).

- **disrupt the breeding cycle of an important population, or;**

The proposed project is not expected to disrupt the breeding cycle of an important population of heath wrinklewort (*Rutidosia heterogama*).

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

It is unlikely that the removal of approximately 8.95 ha of potential habitat for the species would modify, destroy, remove or isolate or decrease the availability or quality of habitat for heath wrinklewort (*Rutidosia heterogama*) such that the species is likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

It is unlikely that the removal of approximately 8.95 ha of potential habitat for the species would result in the establishment of an invasive species that is harmful to heath wrinklewort (*Rutidosia heterogama*).

- **introduce disease that may cause the species to decline; or**

The proposed project involves the clearing of approximately 8.95 ha of potential habitat for the species. It is considered unlikely that the activities associated with the proposed project could introduce disease that may cause the decline of any potentially occurring population of heath wrinklewort (*Rutidosia heterogama*).

- **interferes substantially with the recovery of the species.**

The proposed project will not result in the loss of important habitat for heath wrinklewort (*Rutidosia heterogama*) and it is not expected to substantially interfere with the recovery of this species.

The proposed project is not expected to result in a significant impact on an important population of heath wrinklewort (*Rutidosia heterogama*).

#### **A.10 Large-eared Pied Bat (*Chalinolobus dwyeri*)**

In the case of a vulnerable species, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The large-eared pied-bat (*Chalinolobus dwyeri*) has a range from Rockhampton in Queensland to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. The majority of records of the species occur within several kilometres of clifflines or caves, in which it is known to roost.

There is limited available information regarding what constitutes a population of the large-eared pied bat. However the National Recovery Plan identifies one record of this species at Shoalwater Bay, NSW and recognises this record as an important population (DERM, 2011). Given the paucity of records within the Development Footprint and the lack of roosting habitat, the Development Footprint or the locality is unlikely to support key source large-eared pied bat populations for breeding or dispersal. The Development Footprint is unlikely to comprise populations necessary for maintaining genetic diversity given the lack of potential breeding habitat and the Development Footprint is not near the limit of the known range of this species. Therefore the Development Footprint is unlikely to contain an *important population* of the large-eared pied bat.

***An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:***

- **lead to a long-term decrease in the size of an important population of a species;**

Despite the large range of the large-eared pied-bat, it is assumed that the species is far more restricted within the species' range than previously understood (DoE, 2017b). The largest group of populations of this species in NSW is the sandstone escarpments of the Sydney basin and the north-west slopes.

Records of the large-eared pied-bat within the Hunter Valley generally occur near the escarpment habitat associated with Yengo and Wollemi National Parks. A search of the Atlas of NSW Wildlife reveals 10 records of the large-eared pied bat within a 10 km radius of the Development Footprint.

The proposed project is not considered likely to lead to a long-term decreased in the size of an *important population* of this species as the area of foraging habitat proposed to be removed is minimal compared to its known range and potential roost sites were not identified during targeted survey.

- **reduce the area of occupancy of an important population, or;**

The proposed project will result in the loss of approximately 8.95 ha of potential foraging habitat for the species.

The proposed project is not considered likely to reduce the area of occupancy of an *important population* of this species as the area of foraging habitat proposed to be removed is minimal compared to its known range and potential roost sites have not been identified in the Development Footprint during targeted survey.

- **fragment an existing important population into two or more populations, or;**

Roosting sites of the large-eared pied-bat are unevenly distributed with populations occurring in north-east NSW and south-east Queensland, Shoalwater Bay and Blackdown Tablelands. Due to the distance between these populations are likely to be isolated with little interaction with their nearest populations (DERM, 2011).

The proposed project is therefore unlikely to result in an important population of the species becoming fragmented into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The National Recovery Plan for the large-eared pied bat (DERM, 2011) states that habitat critical for the survival of the species requires the presence of diurnal roosts and shelter habitat, usually in the form of sandstone cliffs and adjacent fertile woodland valley foraging habitat. The Development Footprint is not considered to provide habitat critical to the survival of an *important population* of this species.

- **disrupt the breeding cycle of an important population, or;**

Over most of its range, the large-eared pied bat appears to roost predominantly in caves and overhangs in sandstone cliffs and forage in nearby high-fertility forest or woodland near watercourses.

The Development Footprint does not provide any suitable breeding habitat for this species, therefore the proposed project is not expected to disrupt the breeding cycle of an important population of this species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the absence of suitable cliffline or cave roosting habitat within the Development Footprint and the infrequency of foraging records of the species within the wider Development Footprint, the Development Footprint is not considered to contain important habitat for the species. However, woodland habitat within the Development Footprint is considered to provide potential foraging habitat for the species. The proposed project is not expected to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

The proposed project is not expected to result in invasive species that are harmful to large-eared-pied bat becoming established in the species habitat.

- **introduce disease that may cause the species to decline; or**

The large-eared pied-bat is not known to be affected by diseases that are causing the species to decline. Therefore, the proposed project is not likely to result in the introduction of disease.

- **interfere substantially with the recovery of the species.**

The following recovery plan has been prepared:

- National Recovery Plan for the Large-eared Pied-Bat *Chalinolobus dwyeri* (DERM, 2011).

Any impacts to known habitat for the large-eared pied-bat will likely contravene the objectives of the recovery plan. Roosting habitat for the large-eared pied-bat has not been recorded within the Development Footprint during targeted surveys, however potential woodland foraging habitat has been identified. It is considered unlikely that the project will interfere with the recovery of an *important population* of the large-eared pied-bat.

The proposed project is unlikely to result in a significant impact on an *important population* of the large-eared pied-bat. Roosting habitat for the large-eared pied-bat has not been recorded within the Development Footprint during targeted surveys, however potential foraging habitat has been identified.

#### **A.11 Migratory Species under International Conventions**

The black-faced monarch (*Monarcha melanopsis*) is considered to potentially occur in the Development Footprint and is considered in the following assessment of impacts on migratory species.

***An area of important habitat is:***

- **habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; or**
- **habitat utilised by a migratory species which is at the limit of the species range; or**
- **habitat within an area where the species is declining.**

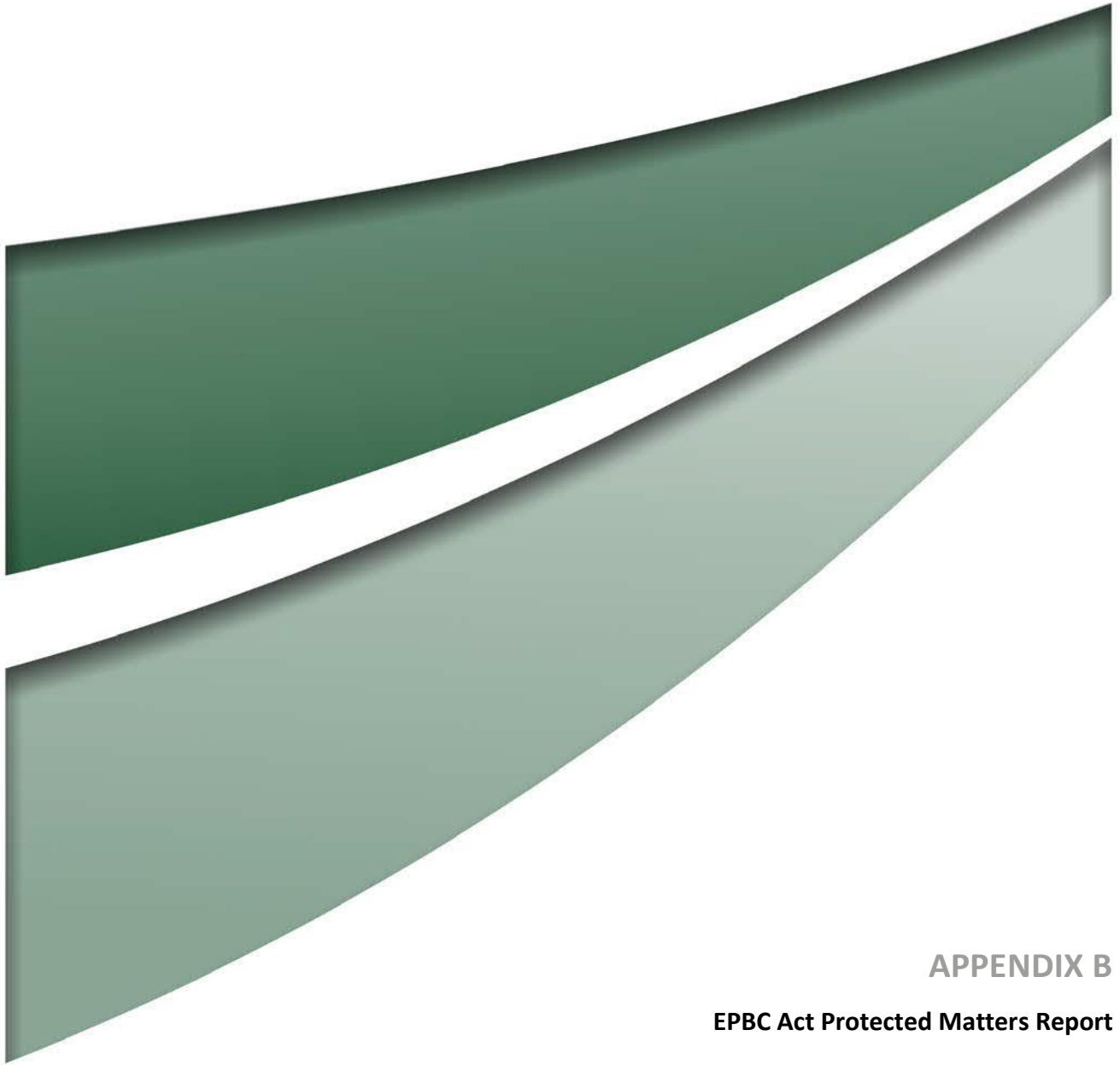
The Draft Referral Guideline for 14 birds listed as Migratory Species under the EPBC Act (DoE, 2015b) defines important habitat for the black-faced monarch which includes rainforests and wet sclerophyll forests (DoE, 2015b). The habitats within the Development Footprint for migratory species listed under international conventions is not considered to meet the criteria listed above, and where individual species may occur, *important habitat* is not likely to occur.

**The Proposed Action is considered likely to result in a significant impact on migratory species if there is a real chance or possibility that it will:**

- **substantially modify and/or destroy an area of important habitat for a migratory species;**
- **seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species; and/or**
- **result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.**

The Development Footprint is not considered to comprise *important habitat* for the black-faced monarch, and therefore the proposed project is not likely to substantially modify or destroy important migratory species habitat. Similarly, the proposed project will not seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species; or result in an invasive species that is harmful to migratory species becoming established within the Development Footprint.

The proposed project is not likely to result in a significant impact on any migratory species listed under the EPBC Act or international conventions.



## APPENDIX B

### EPBC Act Protected Matters Report



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/10/18 09:30:54

[Summary](#)

[Details](#)

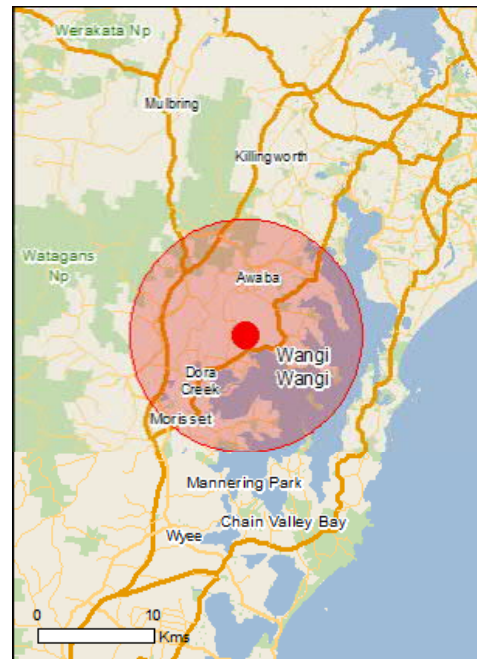
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

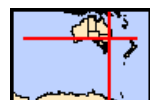
[Acknowledgements](#)



This map may contain data which are  
©Commonwealth of Australia  
(Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 10.0Km





# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	None
<a href="#">Wetlands of International Importance:</a>	1
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	4
<a href="#">Listed Threatened Species:</a>	69
<a href="#">Listed Migratory Species:</a>	55

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	3
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	62
<a href="#">Whales and Other Cetaceans:</a>	1
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	6
<a href="#">Regional Forest Agreements:</a>	1
<a href="#">Invasive Species:</a>	49
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[ Resource Information ]
Name		Proximity
<a href="#">Hunter estuary wetlands</a>		10 - 20km upstream

## Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
<a href="#">Central Hunter Valley eucalypt forest and woodland</a>	Critically Endangered	Community may occur within area
<a href="#">Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community</a>	Endangered	Community likely to occur within area
<a href="#">Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion</a>	Endangered	Community likely to occur within area
<a href="#">Subtropical and Temperate Coastal Saltmarsh</a>	Vulnerable	Community likely to occur within area

## Listed Threatened Species [ Resource Information ]

Name	Status	Type of Presence
Birds		
<a href="#">Anthochaera phrygia</a> Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Botaurus poiciloptilus</a> Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Dasyornis brachypterus</a> Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea antipodensis gibsoni</a> Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or

Name	Status	Type of Presence
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Erythroriorchis radiatus</a> Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Grantiella picta</a> Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Limosa lapponica baueri</a> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Limosa lapponica menzbieri</a> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pachyptila turtur subantarctica</a> Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche bulleri platei</a> Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta cauta</a> Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche cauta steadi</a> White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely

Name	Status	Type of Presence to occur within area
<a href="#">Thalassarche impavida</a>		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a>		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche salvini</a>		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
<a href="#">Epinephelus daemeli</a>		
Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Frogs		
<a href="#">Heleioporus australiacus</a>		
Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat may occur within area
<a href="#">Litoria aurea</a>		
Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Litoria littlejohni</a>		
Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Mixophyes balbus</a>		
Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Mixophyes iteratus</a>		
Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat likely to occur within area
Mammals		
<a href="#">Chalinolobus dwyeri</a>		
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Dasyurus maculatus maculatus (SE mainland population)</a>		
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
<a href="#">Petauroides volans</a>		
Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Petrogale penicillata</a>		
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)</a>		
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Potorous tridactylus tridactylus</a>		
Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Pseudomys novaehollandiae</a>		
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pteropus poliocephalus</a>		
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		

Name	Status	Type of Presence
<a href="#">Acacia bynoeana</a> Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Angophora inopina</a> Charmhaven Apple [64832]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Asterolasia elegans</a> [56780]	Endangered	Species or species habitat may occur within area
<a href="#">Caladenia tessellata</a> Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Corunastylis insignis</a> Wyong Midge Orchid 1, Variable Midge Orchid 1 [84692]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Cryptostylis hunteriana</a> Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Cynanchum elegans</a> White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area
<a href="#">Diuris praecox</a> Newcastle Doubletail [55086]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Eucalyptus parramattensis subsp. decadens</a> Earp's Gum, Earp's Dirty Gum [56148]	Vulnerable	Species or species habitat may occur within area
<a href="#">Grevillea parviflora subsp. parviflora</a> Small-flower Grevillea [64910]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Melaleuca biconvexa</a> Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pelargonium sp. Striatellum (G.W.Carr 10345)</a> Omeo Stork's-bill [84065]	Endangered	Species or species habitat likely to occur within area
<a href="#">Persoonia hirsuta</a> Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area
<a href="#">Pterostylis gibbosa</a> Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
<a href="#">Rhizanthella slateri</a> Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area
<a href="#">Rutidosia heterogama</a> Heath Wrinklewort [13132]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Syzygium paniculatum</a> Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Tetralathea juncea</a> Black-eyed Susan [21407]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
<a href="#">Thesium australe</a> Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

#### Reptiles

<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Hoplocephalus bungaroides</a> Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

#### Listed Migratory Species

#### [ Resource Information ]

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta</a> Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophris</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat may occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Lamna nasus</a> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
<a href="#">Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Cuculus optatus</a> Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Monarcha trivirgatus</a> Spectacled Monarch [610]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Species or species habitat known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		Species or species



Name	Threatened	Type of Presence
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		habitat may occur within area  Species or species habitat known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Species or species habitat known to occur within area
<a href="#">Tringa brevipes</a> Grey-tailed Tattler [851]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Defence Service Homes Corporation

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Breeding known to occur within area

Name	Threatened	Type of Presence
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Breeding likely to occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat known to occur within area
<a href="#">Charadrius bicinctus</a> Double-banded Plover [895]		Species or species habitat known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Diomedea antipodensis</a> Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea epomophora</a> Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea exulans</a> Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea gibsoni</a> Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Diomedea sanfordi</a> Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species

Name	Threatened	Type of Presence
<a href="#">Gallinago hardwickii</a> Latham's Snipe, Japanese Snipe [863]		habitat likely to occur within area  Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Heteroscelus brevipes</a> Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
<a href="#">Himantopus himantopus</a> Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Hirundapus caudacutus</a> White-throated Needletail [682]		Species or species habitat known to occur within area
<a href="#">Lathamus discolor</a> Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Macronectes halli</a> Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Monarcha melanopsis</a> Black-faced Monarch [609]		Species or species habitat known to occur within area
<a href="#">Monarcha trivirgatus</a> Spectacled Monarch [610]		Species or species habitat known to occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat likely to occur within area
<a href="#">Myiagra cyanoleuca</a> Satin Flycatcher [612]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat known to occur within area
<a href="#">Pachyptila turtur</a> Fairy Prion [1066]		Species or species habitat known to occur

Name	Threatened	Type of Presence
<a href="#">Pandion haliaetus</a> Osprey [952]		within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Breeding known to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rhipidura rufifrons</a> Rufous Fantail [592]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
<a href="#">Thalassarche bulleri</a> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche cauta</a> Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche eremita</a> Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche impavida</a> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche melanophrys</a> Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<a href="#">Thalassarche salvini</a> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Thalassarche sp. nov.</a> Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
<a href="#">Thalassarche steadi</a> White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
<b>Mammals</b>		
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
<a href="#">Dermochelys coriacea</a>		to occur within area
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a>		
Hawksbill Turtle [1766]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Natator depressus</a>		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans		[ Resource Information ]
Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Sousa chinensis</a>		
Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area

## Extra Information

State and Territory Reserves		[ Resource Information ]
Name		State
Forestry Management Areas in Morisset		NSW
LNE Special Management Zone No1		NSW
Lake Macquarie		NSW
Pulbah Island		NSW
Sugarloaf		NSW
The Hunter Lakes		NSW

Regional Forest Agreements		[ Resource Information ]
Note that all areas with completed RFAs have been included.		
Name		State
<a href="#">North East NSW RFA</a>		New South Wales

Invasive Species		[ Resource Information ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.		

Name	Status	Type of Presence
<b>Birds</b>		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species

Name	Status	Type of Presence
Lonchura punctulata Nutmeg Mannikin [399]		habitat likely to occur within area  Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
<b>Frogs</b>		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
<b>Mammals</b>		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Asparagus scandens Asparagus Fern, Climbing Asparagus Fern [23255]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur

Name	Status	Type of Presence
Nassella neesiana Chilean Needle grass [67699]		within area  Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area



# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

## Coordinates

-33.05218 151.5389

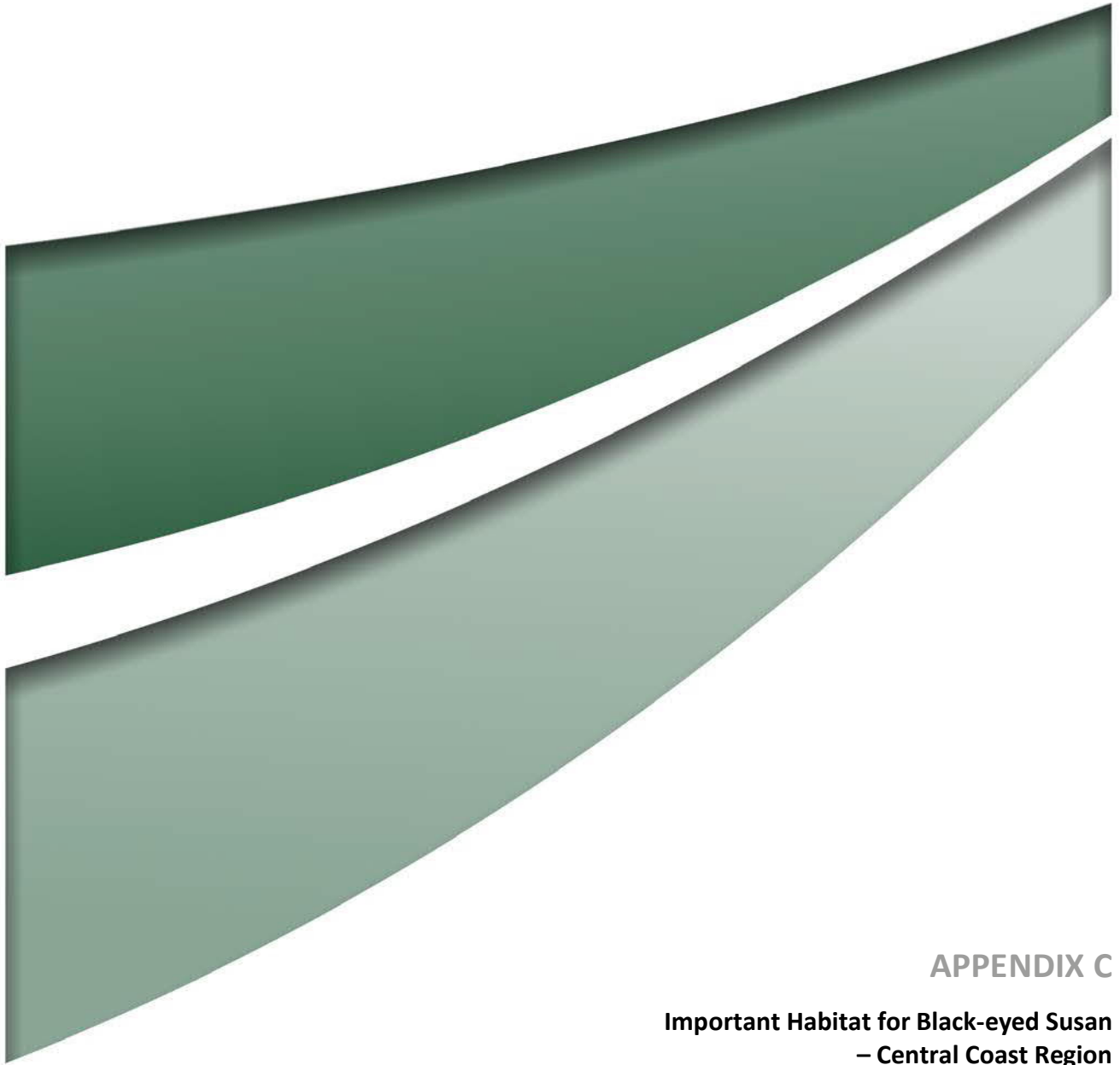
# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

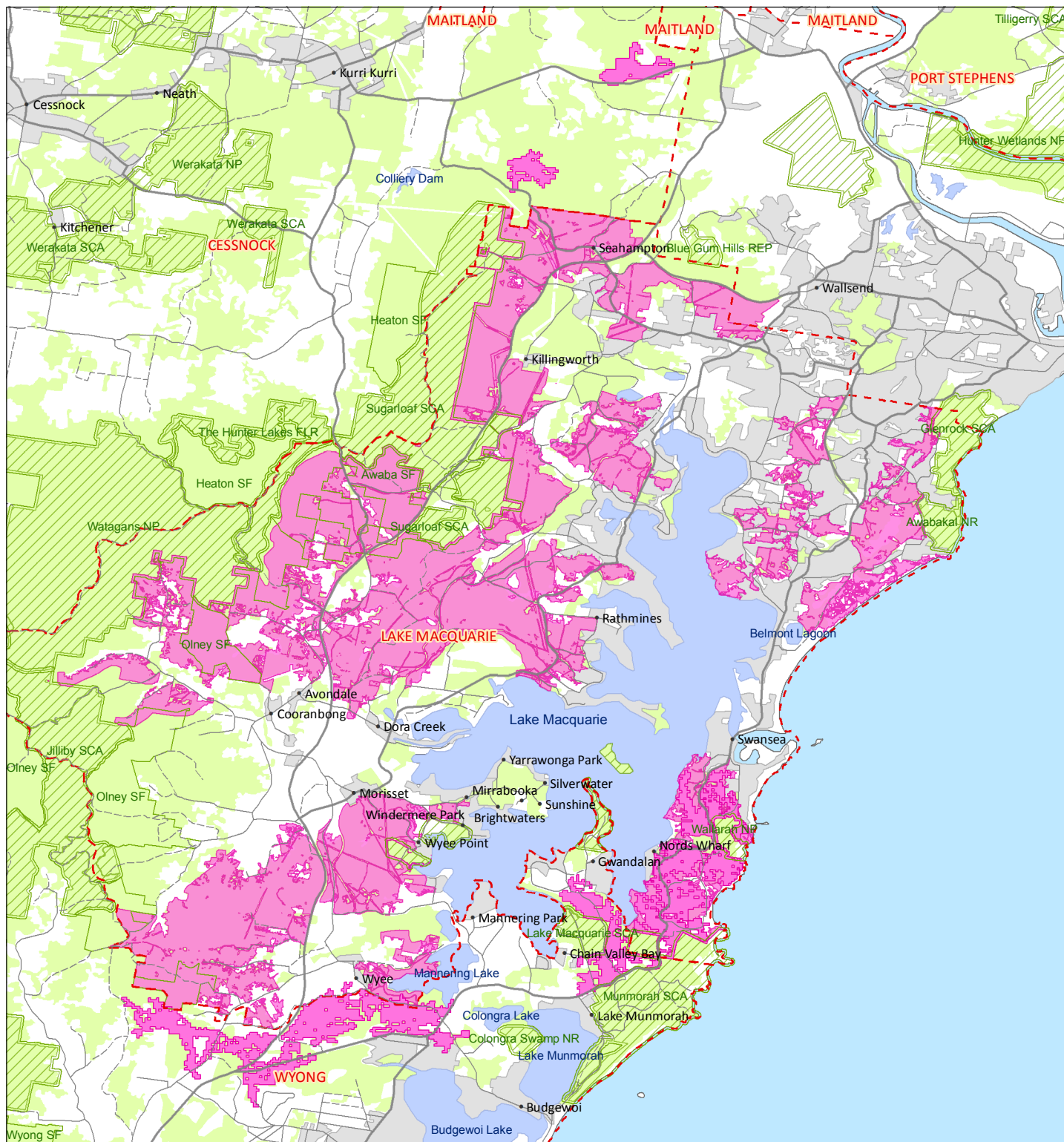
Please feel free to provide feedback via the [Contact Us](#) page.



## APPENDIX C

**Important Habitat for Black-eyed Susan  
– Central Coast Region**

Map 4a: Important habitat for black-eyed susan - central coast region



INDICATIVE MAP ONLY: For the latest departmental information, please refer to the Protected Matters Search Tool at [www.environment.gov.au/epbc/index.html](http://www.environment.gov.au/epbc/index.html)

0 1 2 3 4 5 km



Australian Government

Department of Sustainability, Environment,  
Water, Population and Communities

Produced by:  
Environmental Resources Information Network (ERIN)  
COPYRIGHT Commonwealth of Australia, 2011

Contextual data sources:  
DEWHA (2006), Collaborative Australian Protected Areas Database  
Geoscience Australia (2006), Geodata Topo 250K Topographic Data

## Legend

- Important Areas for *T. juncea*\*
- Local Govt Area Boundaries
- Cities & Towns
- Roads
- Conservation Areas
- Forestry & Indigenous Lands
- Native Forest & Woodland
- Lakes & Watercourses

\*Please note: Important areas for *T. juncea* compiled by Lake Macquarie City Council and species experts from the following sources:  
- Driscoll, C. (2009). *Tetratheca juncea* modelled habitat suitability & fragment size  
- Driscoll, C. (2011). *Tetratheca juncea* habitat suitability modelling. Unpublished PhD research. University of Newcastle  
- LMCC (2009). Native vegetation & corridors mapping  
- Payne, R. (2000). *Tetratheca juncea* conservation management plan



**CAVEAT:** The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.  
**INDICATIVE MAP ONLY:** This map has been compiled from datasets with a range of geographic scales and quality. Species or ecological community distributions are indicative only and not to be used for local assessment. Local knowledge and information should be sought to confirm the presence of the species, or species habitat, at the location of interest.

# Appendix B

## Stakeholder Submissions – Table of Issues

## Appendix B Stakeholder Submissions – Table of Issues

Submitter	ID	Response
Allan Chawner, Cooks Hill NSW	001	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.6</li> <li>Section 5.12</li> <li>Section 5.8</li> <li>Section 5.11</li> </ul>
Ben Awald, Cooks Hill NSW	002	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.6</li> <li>Section 5.7</li> <li>Section 5.12</li> </ul>
Callen Newby, of Maryland NSW	003	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.3</li> <li>Section 5.11</li> </ul>
Damien Linnane, of Hamilton East NSW	004	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.8</li> <li>Section 5.11</li> <li>Section 5.12</li> </ul>
Helen Gould, of Morisset NSW	005	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.8</li> <li>Section 5.11</li> <li>Section 5.12</li> <li>Section 5.6</li> </ul>
Jai Capewell, of Lake Munmorah NSW	006	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.12</li> <li>Section 5.3</li> <li>Section 5.9</li> </ul>
Lynette Campbell, of Jilliby NSW	007	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.3</li> <li>Section 5.2</li> <li>Section 5.8</li> <li>Section 5.9</li> <li>Section 5.10</li> <li>Section 5.13</li> </ul>
Micah Weekes, of Lake Munmorah NSW	008	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.9</li> <li>Section 5.12</li> <li>Section 5.6</li> <li>Section 5.3</li> <li>Section 5.8</li> </ul>
Paivi Rusanen, of Murrays Beach NSW	009	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.2</li> <li>Section 5.6</li> <li>Section 5.3</li> </ul>
Paul Moors, of None NSW	010	Issues raised addressed in:

Submitter	ID	Response
		<ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.7</li> <li>Section 5.4</li> <li>Section 5.6</li> </ul>
Peggy Fisher, of Killara NSW	011	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.3</li> <li>Section 5.11</li> </ul>
Peter Morris, of Valentine NSW	012	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.2</li> <li>Section 5.12</li> <li>Section 5.6</li> <li>Section 5.8</li> </ul>
Peter Orre, of Rathmines NSW	013	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.2</li> <li>Section 5.10</li> <li>Section 5.9</li> <li>Section 5.12</li> </ul>
Seppo Rusanen, of Murrays Beach NSW	014	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.2</li> <li>Section 5.11</li> <li>Section 5.3</li> </ul>
Don Owers, of Newcastle NSW	015	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.4</li> <li>Section 5.7</li> </ul>
Name withheld), of Islington NSW	016	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.12</li> <li>Section 5.6</li> <li>Section 5.4</li> <li>Section 5.8</li> </ul>
(Name withheld), of Tighes Hill NSW	017	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.11</li> <li>Section 5.12</li> <li>Section 5.6</li> <li>Section 5.2</li> <li>Section 5.8</li> </ul>
(Name withheld), of Quorrobolong NSW	018	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 5.5</li> <li>Section 5.11</li> <li>Section 5.13</li> <li>Section 5.10</li> <li>Section 5.7</li> <li>Section 5.6</li> <li>Section 5.2</li> <li>Section 5.12</li> <li>Section 5.3</li> <li>Section 5.13</li> <li>Section 5.4</li> <li>Section 5.8</li> </ul>

Submitter	ID	Response
<b>Special interest groups</b>		
Nature Conservation Council of Australia	020	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.2</li> </ul>
Environmental Justice Australia	021	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.3</li> </ul>
Northern Lakes Disability Tourism Precinct Committee Inc.	022	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.4</li> </ul>
Hunter Community Environment Centre	023	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.5</li> </ul>
Greenpeace Australia Pacific	024	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.6</li> </ul>
Community Environment Network	025	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 6.7</li> </ul>
<b>Government Agencies</b>		
NSW Dam Safety Committee (DSC)	030	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.1</li> </ul>
NSW Department of Planning and Environment - Division of Resources and Geoscience (DRG)	031	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.2</li> </ul>
Lake Macquarie City Council (LMCC)	032	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.3</li> </ul>
NSW Office of Sport	033	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.4</li> </ul>
NSW Environment Protection Authority (EPA)	034	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.5</li> </ul>
NSW Office of Environment and Heritage (OEH)	035	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.6</li> </ul>
NSW Department of Industry (DoI).	036	Issues raised addressed in: <ul style="list-style-type: none"> <li>Section 7.7</li> </ul>



# Appendix C

## Updated Threatened Species Figure

## Appendix C Updated Threatened Species Figure



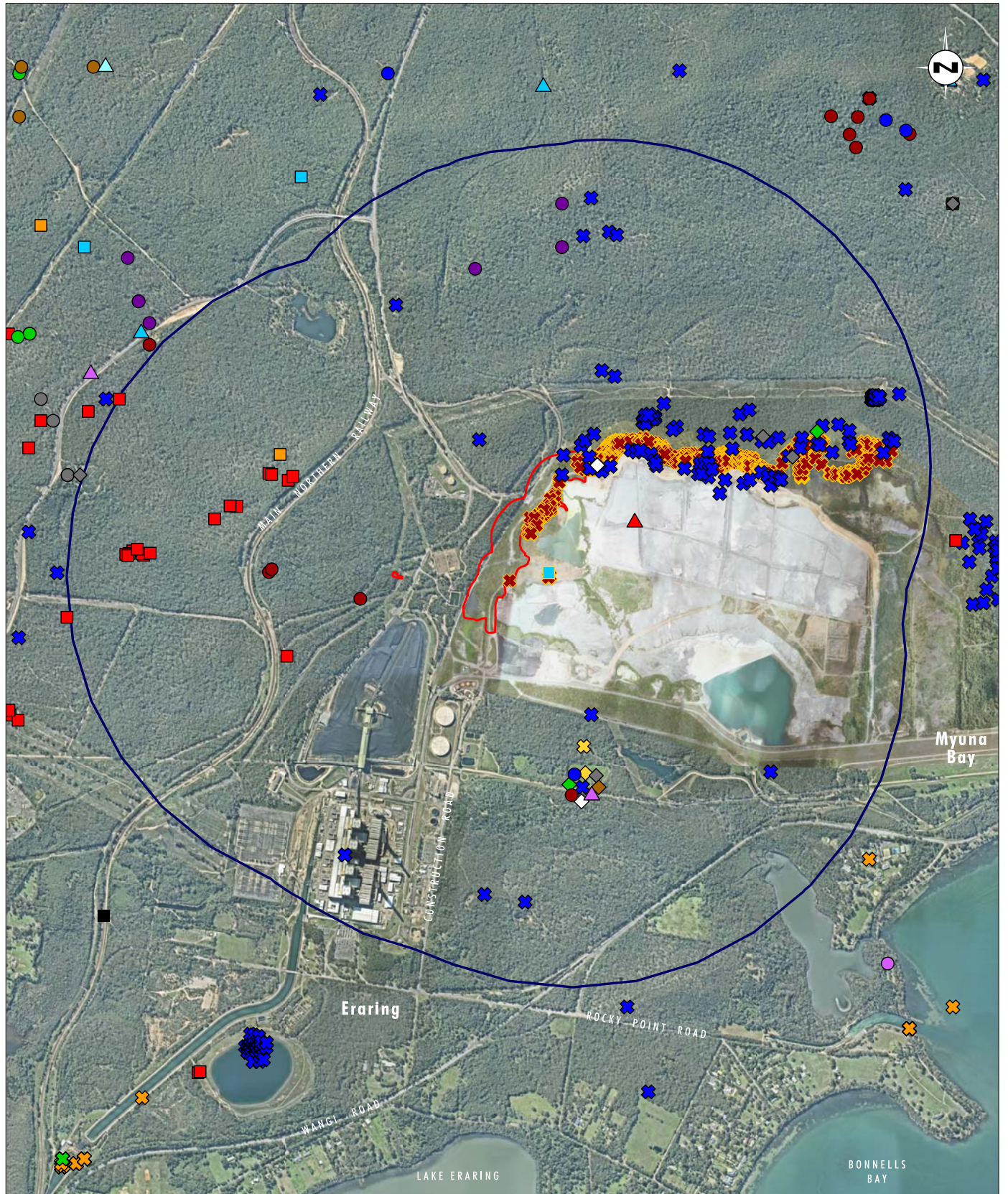


Image Source: Nearmap (Apr 2018), Origin (2018)  
Data Source: AECOM (2018), ATLAS (2018)

0 0.5 1.0 1.25 km  
1:25 000

### Legend

- |  |   |  |  |
|--|---|--|--|
| Development Footprint (Outside Existing Disturbed Areas)     | <span style="color: red;">■</span> <i>Acacia bynoeana</i>                               | <span style="color: blue;">▲</span> Glossy Black-Cockatoo    | <span style="color: lightblue;">▲</span> Sooty Owl           |
| 1500m Buffer Area  | <span style="color: green;">●</span> <i>Angaphora inopina</i>                           | <span style="color: orange;">✕</span> Green Turtle           | <span style="color: orange;">■</span> Spotted-tailed Quoll   |
| Umwelt Flora Records:  | <span style="color: red;">●</span> <i>Grevillea parviflora</i> subsp. <i>parviflora</i> | <span style="color: yellow;">◆</span> Grey-headed Flying-fox | <span style="color: cyan;">■</span> Squirrel Glider          |
| <span style="color: red;">✕</span> <i>Tetratheca juncea</i>  | Atlas Fauna Records:  | <span style="color: black;">■</span> Koala                   | <span style="color: purple;">▲</span> Stephens' Banded Snake |
| Umwelt Fauna Records:  | <span style="color: green;">■</span> Dusky Woodswallow                                  | <span style="color: black;">◇</span> Little Bentwing-bat     | <span style="color: purple;">●</span> Swift Parrot           |
| <span style="color: cyan;">■</span> Squirrel Glider          | <span style="color: green;">◆</span> Eastern Bentwing-bat                               | <span style="color: purple;">●</span> Little Lorikeet        | <span style="color: blue;">●</span> Varied Sittella          |
| Atlas Flora Records:   | <span style="color: red;">◆</span> Eastern False Pipistrelle                            | <span style="color: green;">✕</span> Loggerhead Turtle       | <span style="color: yellow;">✕</span> Wallum Froglet         |
| <span style="color: blue;">✕</span> <i>Tetratheca juncea</i> | <span style="color: brown;">◆</span> Eastern Freetail-bat                               | <span style="color: grey;">●</span> Masked Owl               | <span style="color: grey;">◆</span> White-bellied Sea-Eagle  |
|  | <span style="color: red;">▲</span> Eastern Osprey                                       | <span style="color: brown;">●</span> Powerful Owl            |  |

FIGURE 3.2  
Threatened Species