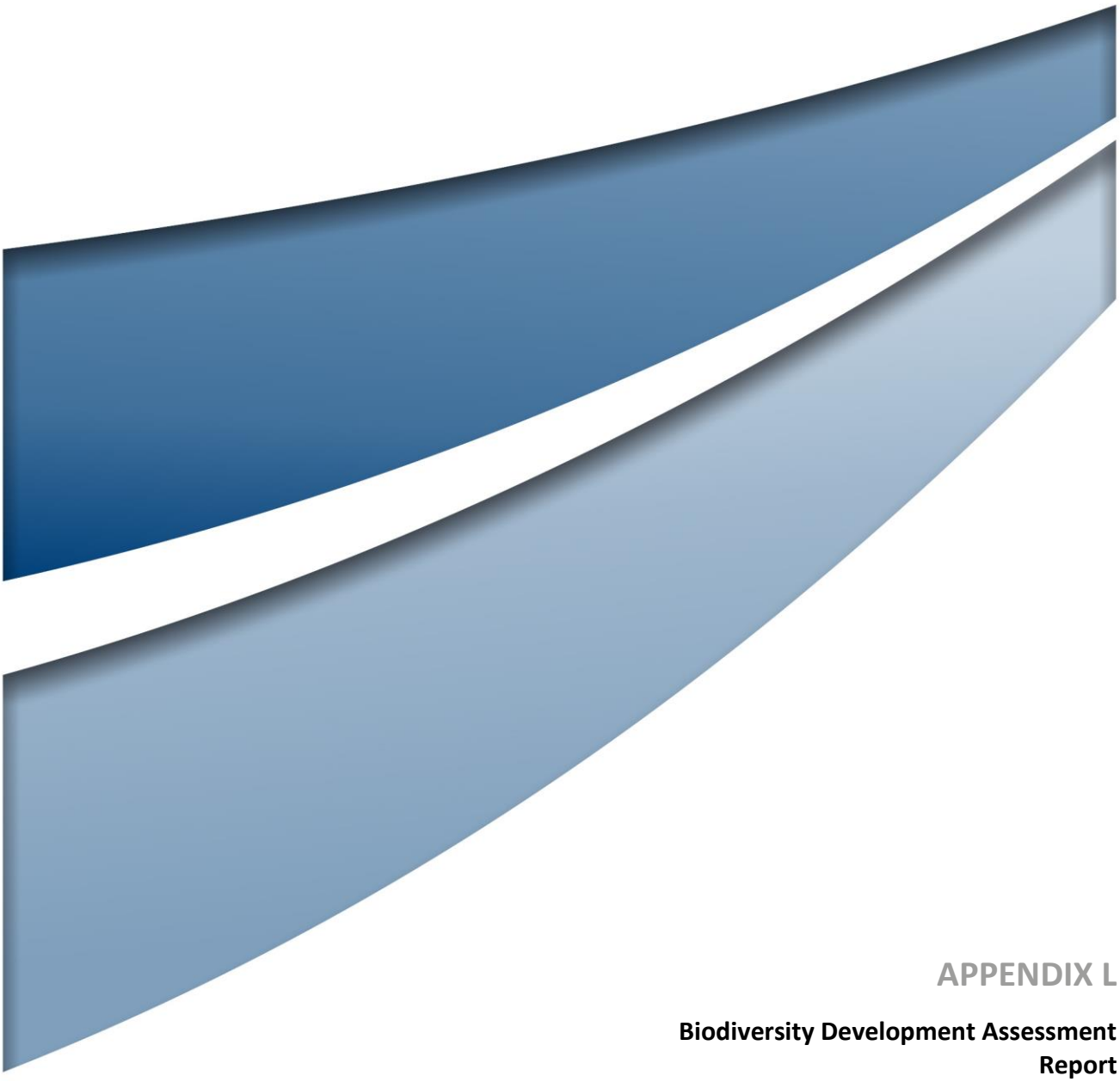

APPENDIX L

Biodiversity Development Assessment Report

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CONCRUSH INCREASE TO CAPACITY PROJECT

Biodiversity Development Assessment Report

FINAL

November 2018

CONCRUSH INCREASE TO CAPACITY PROJECT

Biodiversity Development Assessment Report

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Concrush Pty Ltd

Project Director:	Tim Browne
Project Manager:	Lachlan Sweeney
Technical Director:	Allison Riley
Technical Manager:	Kate Connolly
Report No.	3972/R06/V2/Final
Date:	November 2018

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Executive Summary

Concrush Pty Ltd (Concrush) is seeking development consent to increase the processing and storage capacity of the existing resource recovery facility located on part of Lot 2 DP 220347 at 21 Racecourse Road, Teralba, NSW. The Concrush increase to capacity project (the Project) will involve additions to the existing facility in order to provide greater on-site storage capacity that is sufficient for the increased level of throughput.

The Concrush site is located within the suburb of Teralba, in the Lake Macquarie Local Government Area. It covers an area of approximately 2.4 hectares and is located between Cockle Creek to the east and the Main North Rail Line to the west.

As the Project is State Significant Development (SSD) it requires a Biodiversity Assessment Method (BAM) assessment under the *Biodiversity Conservation Act 2016*. This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Concrush to assess the potential biodiversity impacts of the Project in accordance with the BAM.

The Concrush site is located in the northwest of the Lake Macquarie region. The land uses surrounding the site include a wrecker's yard including car sales to the north, a scrap metal recycling yard to the south and Teralba Colliery and Macquarie Coal Preparation Plant to the west. The Development Footprint is predominantly devoid of native vegetation, with the exception of some isolated planted trees which act as a wind break and visual screen for adjacent properties.

The biodiversity assessment involved literature and database reviews, site reconnaissance surveys, BAM floristic and vegetation integrity surveys and habitat assessments. The Development Footprint was found to be primarily dominated by exotic vegetation that has invaded areas previously disturbed. Despite the highly disturbed nature of the Development Footprint, the best fit Plant Community Type (PCT) was assigned to the vegetation following a review of regional vegetation mapping and the Vegetation Information System (VIS).

Following the application of the BAM calculator and appropriate avoidance measures, the BAM assessment identified that the PCTs occurring in the Development Footprint did not meet the minimum vegetation integrity score to require offsetting under the BAM.

Despite this, Concrush has committed to delivering a range of avoidance and minimisation measures to minimise the impacts on ecological values as a result of the Project. This includes:

- specific avoidance of freshwater wetland habitat to the west of the Developemnt Footprint
- demarcation of approved clearance boundaries
- weed management
- operational management of erosion, sedimentation, noise, dust and traffic.

Glossary

BDAR	Biodiversity Development Assessment Report
BAM	Biodiversity Assessment Methodology
BC Act	NSW *Biodiversity Conservation Act 2016*
CEEC	Critically Endangered Ecological Community
Development Footprint	The total impact zone associated with the Project representing impact areas not currently approved for disturbance..
DoEE	Commonwealth Department of the Environment and Energy
DNG	Derived Native Grasslands
Ecosystem credit	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values within theDevelopment Footprint and the gain in biodiversity values at an offset site.
EEC	Endangered Ecological Community
EP	Endangered Population
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
GDEs	Groundwater-dependent Ecosystems
GIS	Geographical Information System
IBRA	Interim Biogeographic Regionalisation for Australia (Version 7)
LGA	Local Government Area
MGA	Map Grid of Australia
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PMST	Protected Matters Search Tool
SEARs	Secretary of the Department of Planning and Environment
SEPP	State Environmental Planning Policy
Species credit	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates.
Strahler Stream Order	Classification system that gives a waterway an ‘order’ according to the number of tributaries associated with it.
TEC	Threatened Ecological Community
TBDC	Threatened Biodiversity Data Collection
VIS	Vegetation Information System

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1 Introduction

Concrush Pty Ltd (Concrush) is seeking development consent to increase the processing and storage capacity of the existing resource recovery facility located on part of Lot 2 DP 220347 at 21 Racecourse Road, Teralba, NSW (refer to **Figure 1.1**). The Concrush increase to capacity project (the Project) will involve alterations and additions to the existing facility in order to provide greater on-site storage capacity that is sufficient for the increased level of throughput.

The existing facility is located within the suburb of Teralba, in the Lake Macquarie Local Government Area (LGA). It covers an area of approximately 2.4 hectares (ha) and is located between Cockle Creek to the east and the Main North Rail Line to the west.

As the Project is State Significant Development (SSD) it requires a Biodiversity Assessment Method (BAM) assessment under the *Biodiversity Conservation Act 2016*. Approval is sought under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), for which the Minister for Planning is the consent authority.

This Biodiversity Development Assessment Report (BDAR) has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Concrush to assess the potential biodiversity impacts of the Project in accordance with the BAM and the the requirements of the Secretary of NSW Department of Planning and Environment (DPE) as detailed in **Section 1.2**.

1.1 The Project

Following strong demand for their recycling service, Concrush is seeking an increase to the processing and storage capacity of the existing facility. Concrush currently recycles approximately 108,000 tonnes (t) of waste material per annum (pa). Concrush is seeking approval for an increase in throughput capacity to up to 250,000 tpa of waste material recycled, including both construction and demolition waste and green waste. Concrush will require a waste storage capacity on-site that is sufficient for this level of throughput.

The Project will be constructed over two stages to allow for the proposed Project elements to come online as required in line with increasing production.

A description of the individual elements of the proposed Project including additional plant and equipment are summarised below.

Table 1.1 Proposed Project Components

Component	Description
Hardstand areas	Hardstands will be constructed in material processing areas and stockpile areas (will require some site levelling). Hardstands will consist of 200 mm thick recycled roadbase). Internal access roads will have a two coat seal.
Material Processing Areas	Processing areas for the crushers and screens.
Waste and Product Stockpile Areas	Waste and product stockpiles will be established with a stockpile height of up to 10 metres (m). It is anticipated that up to 150,000 t of material will be stored onsite.
Upgrade of existing facilities	The existing weighbridge and office will be upgraded, and the existing lunch room and maintenance shed will be relocated to facilitate the new site layout.
Waste Tracking System	The existing Wasteman software will be used to track the details of all inbound and outbound loads

Component	Description
Production Compound	The relocated lunch room, toilet and maintenance shed will be grouped together to form a compound for production staff.
Retail Area	This area will be restricted to light vehicles and small trucks and will include an area for tipping and an area containing concrete bays of products for sale.
Storage Bays	Concrete storage bays will be constructed using 1 m^3 concrete blocks.
Concrete Walls	A two metre high concrete wall will be constructed close to the southern Project site boundary using 1 m^3 concrete blocks. The wall will prevent stockpiled material encroaching on swale drains and moving offsite. Concrete walls may also be used to delineate other areas of the site.
Green Waste Pasteurisation	An aeration system using four electronically driven and computer controlled fans to push air through movable perforated pipes underneath the pasteurisation piles will be implemented in the green waste area. This system allows more control of oxygen levels in the pasteurisation process compared to the tradition turnover process.
Wheel Wash	A vehicle wheel wash bay will be constructed immediately after the exit weighbridge to reduce tracking of material onto public roads.
Concrete Washout Bay	A wet concrete washout bay will be constructed consisting of a bunded, impermeable area with an isolated catchment. Wet concrete and agitator washout will be captured in the concrete washout bay.
Water Management System	The existing Water Management System (WMS) will be upgraded involving resizing of existing sediment basins, new sediment basins, swale drains and a leachate dam and artificial wetland to treat nutrient runoff. Water tanks and associated poly pipe and pumps will be installed to allow collection and re-use of stormwater for dust suppression.
Trommel Screening Machine	Addition of a Trommel screening machine for sorting of green waste.
Primary Jaw Crusher	The primary jaw crusher will be replaced on a like for like basis as part of future operations.
Perimeter Landscaping - Mounds, Fencing and Lighting	Landscape mounds will be established on the perimeter to limit visibility. 1.8 m high security fencing and security lighting are also to be installed.
Utilities	The existing Ausgrid connection is via a power pole in the north east corner of the site. The power supply will be extended to the south west corner of the site via an underground connection.
Pug mill	A pug mill may be installed in the future to allow fast mixing of materials to produce products such as road base.
Ballast wash facility	A processing area may be dedicated to a ballast wash facility to allow for processing of rail ballast.

It is anticipated that the volume of materials recycled and products sold will increase over a period of time up to the maximum production level of 250,000 tpa. To most efficiently meet the increase in demand for recycling of materials and Concrush products, it is proposed to stage the Project by undertaking some elements of the site upgrade early and implementing other elements of the Project as required when a certain production level is reached. Two Project stages and the associated approximate production level have been identified as follows:

- Stage 1 – upon receipt of all approvals required for the Project (refer to **Figure 1.2**)
- Stage 2 – at approximately 200,000 tpa up to 250,000 tpa (refer to **Figure 1.3**).

The key components of the two Project stages are described below.

Stage 1

Stage 1 would be implemented once all approvals have been granted. The key elements of Stage 1 are:

- Construction of all hardstand areas (processing areas and waste and product stockpiles)
- Creation of the retail area
- Widen site access and install sliding gate
- Re-configuration of existing exit only weighbridge to allow for vehicle exit and entry to facilitate entry to the site
- Construct production compound by relocating maintenance shed and lunch room and toilet
- Augment the existing water management system to incorporate the leachate dam, constructed wetland, additional sediment basins, drainage swales, flood mitigation bund, water storage tanks and sprinkler systems
- Establish wheel wash, landscaping mounds, fencing, power line extension and lighting
- Two coat seal of internal access roads
- Replace primary jaw crusher.

Stage 2

Stage 2 would be implemented when production reaches approximately 200,000 tpa up to the Project limit of 250,000 tpa. The key elements of Stage 2 are:

- Relocation of the existing exit weighbridge, construction of a new entry weighbridge and establishment of the new weighbridge office
- The existing entry weighbridge becomes the retail area weighbridge and the existing weighbridge office becomes the retail area weighbridge office
- Construction of a new exit onto Racecourse Road from the retail area for light vehicles (less than 2 t) only
- Establish pug mill
- Establish ballast wash facility
- Establish trommel screening machine for green waste.
- Establish aeration system for green waste pasteurisation.

1.2 Purpose and Scope of this Report

This report provides the findings of the Biodiversity Assessment of the Project. It addresses the specific requirements of the BAM (OEH 2017a) as requested through the SEARs and the submission from OEH in relation to biodiversity impacts that informed the preparation of the SEARs (refer to **Table 1.1**).

The BDAR has been prepared in accordance with the BAM (OEH 2017a) which applies to all State Significant Development (SSD).

Table 1.2 SEARs Related to BDAR and OEH Submission on SEARs

Secretary's Environmental Assessment Requirements	Relevant BDAR Section
Flora and Fauna – including: • an assessment of impacts on biodiversity in accordance with the *Biodiversity Conservation Act 2016*	Throughout
• consideration of the North East Regional Forest Agreement and the Regional Forest Agreement Act 2002.	In the Project Environmental Impact Statement
OEH Input into SEARs	
1. Biodiversity impacts related to the proposed development (SSD 17_8753 are to be assessed in accordance with the Biodiversity Assessment Method and documented in a BDAR. The BDAR must include information in the form detailed in the Biodiversity Conservation 2016 (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and BAM.	Throughout
2. The BDAR must document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 4, 5 and 6
3. The BDAR must include details of the measures proposed to address the offset obligation as follows: • The total number and classes of biodiversity credits required to be retired for the development/project; • The number and classes of like-for-like biodiversity credits proposed to be retired • The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; • Any proposal to fund a biodiversity conservation action; • Any proposal to conduct ecological rehabilitation (if a mining project) • Any proposal to make a payment to the Biodiversity Conservation Fund If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	Table 7.1 N/A N/A N/A N/A N/A N/A
4. The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s.6.10 of the *Biodiversity Conservation Act 2016*.	Section 1.5

Image Source: Nearmap (May 2017)

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Legend

Site Boundary

FIGURE 1.1

Locality Plan

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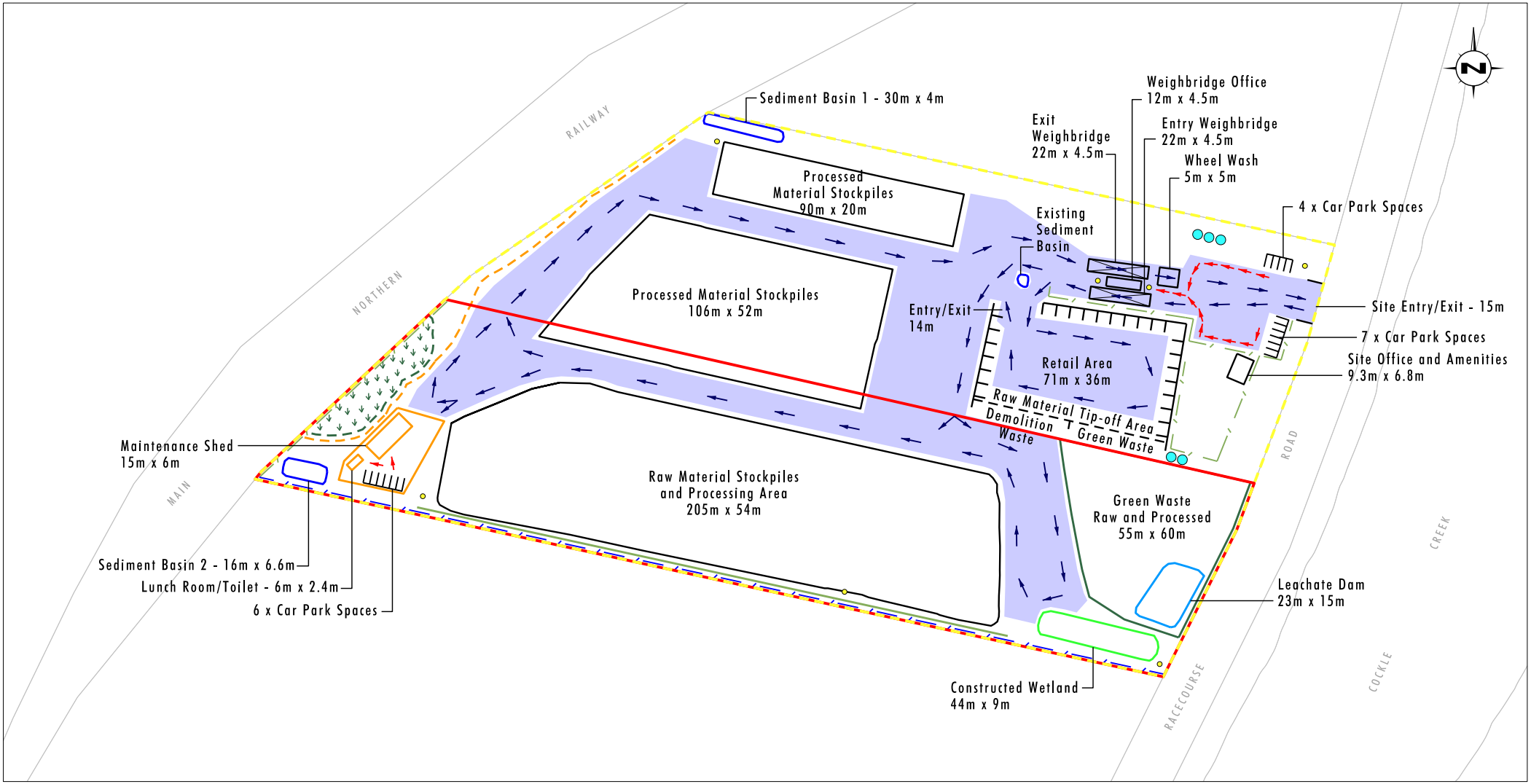

Data Source: Concrush (2018)

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Legend

- Site Boundary
- Development Footprint
- Production Compound
- Processing and Stockpile Areas
- Sediment Basin
- Green Waste Area
- Existing Wetland Area with Buffer
- Landscaped Earth Bund (1 in 100 Year Flood Mitigation)
- Existing Earth Bund
- Existing 2m High Fence
- Proposed 2m High Fence
- Proposed 2m High Concrete Block Wall
- Existing Water Tanks
- Proposed Security Lighting
- Pedestrian Movement
- General Vehicle Movement
- Internal Roads/Hardstand Area

FIGURE 1.2

Stage 1 - Conceptual Layout
Up to 200 000 Tonnes per Annum

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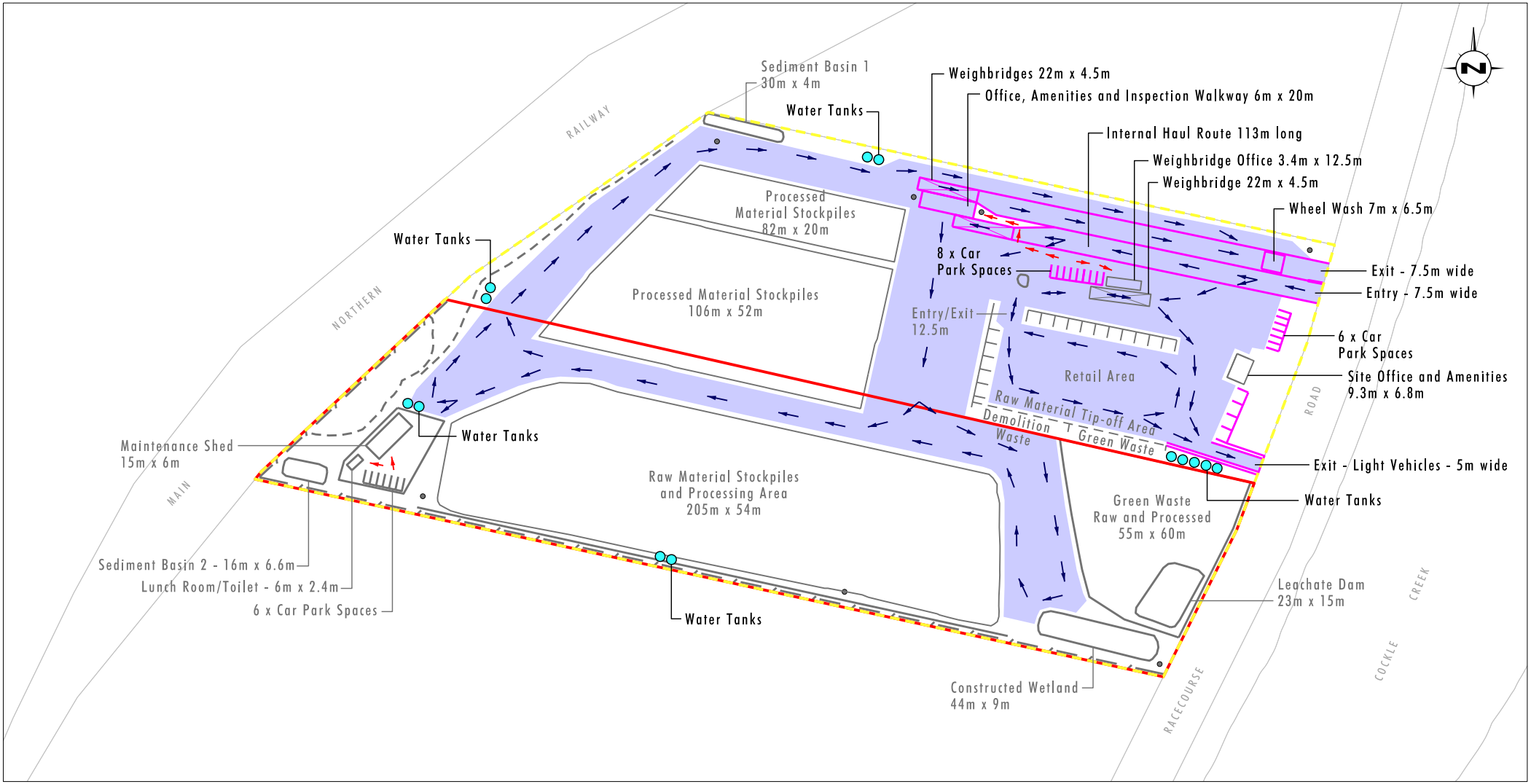
20181108 11.24



Data Source: Concrush (2018)

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Legend

- Site Boundary
- Development Footprint
- Stage 2
- Water Tanks
- Security Lighting
- Pedestrian Movement
- General Vehicle Movement
- Internal Roads/Hardstand Area

FIGURE 1.3

Stage 2 Conceptual Layout
Up to 250 000 Tonnes per Annum

File Name (A4): R06/3972_057.dgn
20181108 11.36

1.3 Development Footprint Information

The Development Footprint will be subjected to a range of disturbances as outlined in **Section 5.0**. The Development Footprint comprises the portion of the Concrush Recycling Facility that will be subject to unapproved impacts. The Development Footprint is shown on **Figure 1.2**.

The land uses surrounding the Development Footprint include a wrecker's yard to the north, a scrap metal recycling yard to the south and Teralba Colliery and Macquarie Coal Preparation Plant to the west. Access to the Development Footprint is via a driveway on Racecourse Road.

The Development Footprint is predominantly devoid of vegetation, with the exception of some isolated shrubs and grassy areas, as a result of the previously approved land uses. There are trees planted along the parts of the existing site boundaries which act as a wind break and visual screen for adjacent properties.

1.3.1 Location

The Development Footprint is situated in the suburb of Teralba, within the Lake Macquarie LGA, and currently covers an area of approximately 2.4 hectares (ha). It is bound to the west by the Main North Rail Line and to the east by Racecourse Road and Cockle Creek.

The Development Footprint occurs within the Sydney Basin IBRA bioregion and the Wyong IBRA subregion. Refer to **Figures 1.4** to **1.6** for the location of the Development Footprint and other relevant landscape features that pertain to this assessment. Refer to **Table 1.2** for a summary of the Development Footprint's location in the landscape.

Table 1.3 Development Footprint Location in the Landscape

Development Footprint Location in the Landscape	
IBRA Bioregion	Sydney Basin
IBRA Subregion	Wyong
Mitchell Landscape	Sydney-Newcastle Coastal Alluvial Plains
LGA	Lake Macquarie
Lot and DP	Lot 2 DP 220347
Assessment Type	Site-based
Development Footprint Size	2.4 ha

1.3.2 Size

The Development Footprint covers approximately 2.4 ha.

1.3.3 Local Ecological Context

The Development Footprint is located in the northwest of Lake Macquarie. The land uses surrounding the site include a wrecker's yard to the north, a scrap metal recycling yard to the south and Teralba Colliery and Macquarie Coal Preparation Plant to the west. The newly established Bunderra residential estate is located approximately 200 m to the east of the Development Footprint. The Development Footprint is predominantly devoid of vegetation, with the exception of some isolated trees that have been planted by Concrush along parts of the existing site boundaries which act as a wind break and visual screen for adjacent properties.

In the broader local area, key land uses include residential areas, recreation areas, infrastructure (such as mining land and quarries), transport routes and open space. The Development Fooptprint is located in an area immediately surrounded by industrial and residential disturbances, however a range of wetland areas associated with Lake Macquarie and its tributaries occur in the wider locality including mapped State Environmental Planning Policy (SEPP) Coastal Management wetlands.

Lake Macquarie's freshwater or brackish wetlands include areas of coastal lagoons, creek lines and alluvial flats. They can take the form of paperbark and casuarina forests, heath communities and sedge and reed associations. These communities occur along the floodplains of tributaries of Lake Macquarie including along Cockle Creek which borders the Development Footprint. These habitats can provide important spawning and nursery areas for many species of freshwater fish, provide habitat for a high number of bird and amphibian species and absorb and recycle nutrients through the ecosystem.

Where there is remnant native vegetation in the locality, a number of Threatened Ecological Communities (TECs) are known to occur including *Coastal Saltmarsh*, *Swamp Sclerophyll Forest on Coastal Floodplains*, *Freshwater Wetlands on Coastal Floodplains*, *Swamp Oak Floodplain Forest* and *Lower Hunter Spotted Gum – Ironbark Forest* all listed as endangered ecological communities (EECs) under the BC Act. Where there is suitable habitat a range of threatened flora species are known to occur in the wider locality including Charmhaven apple (*Angophora inopina*), black-eyed Susan (*Tetratheca juncea*) and netted bottle brush (*Callistemon linearifolius*) (OEH 2018a). Scattered records of threatened fauna species occur around the locality usually associated with the remaining vegetated areas that occur around existing residential, industrial and cleared easements around Teralba, Barnsley and Edgeworth to the west of the Development Footprint. This includes powerful owl (*Ninox strenua*), masked owl (*Tyto novaehollandiae*), sooty owl (*Tyto tenebricosa*), barking owl (*Ninox connivens*) squirrel glider (*Petaurus norfolcensis*) and yellow-bellied glider (*Petaurus australis*) (OEH 2018a).

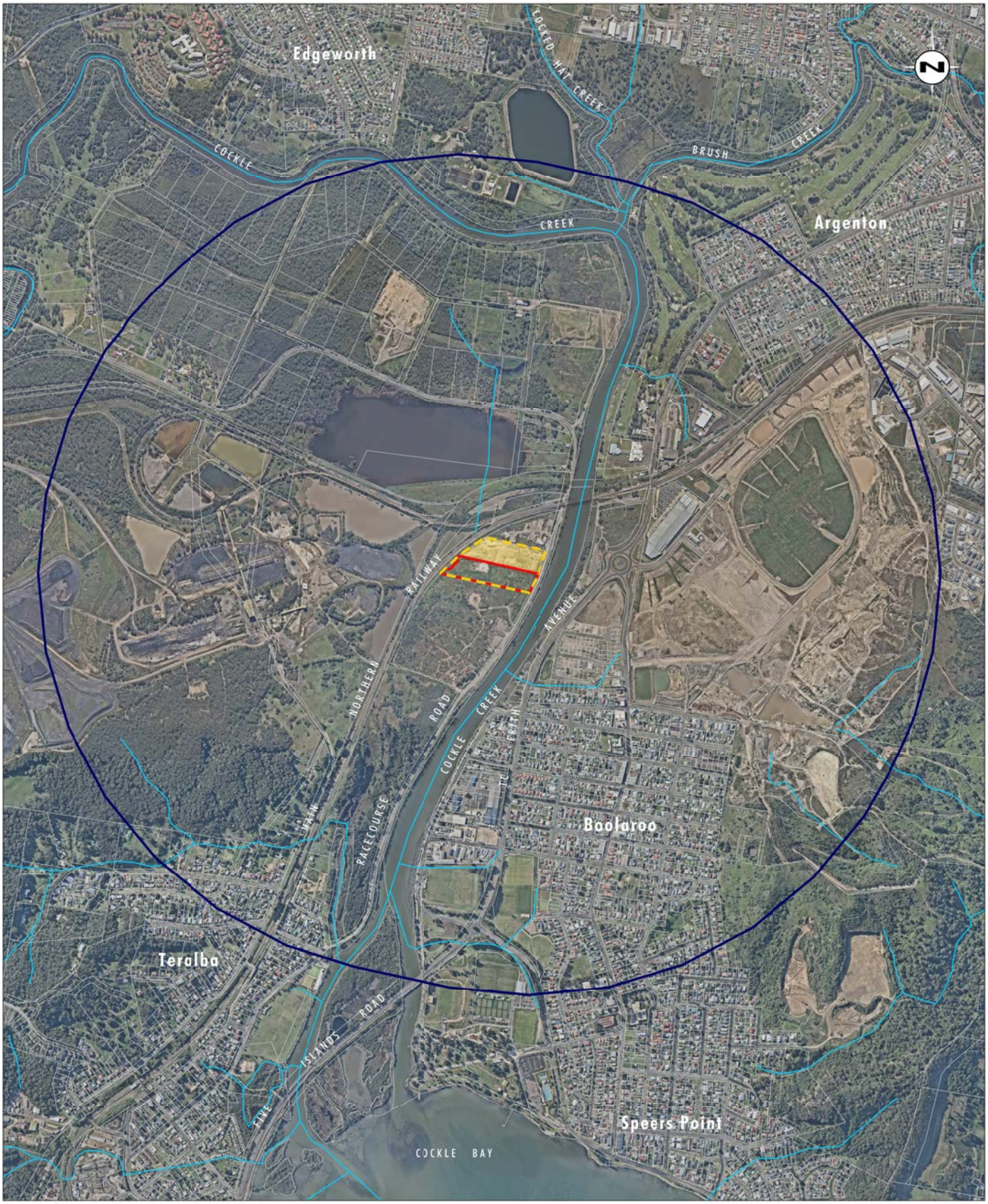

Image Source: Nearmap (Apr 2018)
Data Source: Department of Finance, Services & Innovation (2018)

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1:20 000

Legend

- Site Boundary
- Development Footprint
- 1500m Buffer Area
- Approved Disturbance
- Cadastre
- Drainage

FIGURE 1.4

Site Map

File Name (A4): R06/3972_041.dgn
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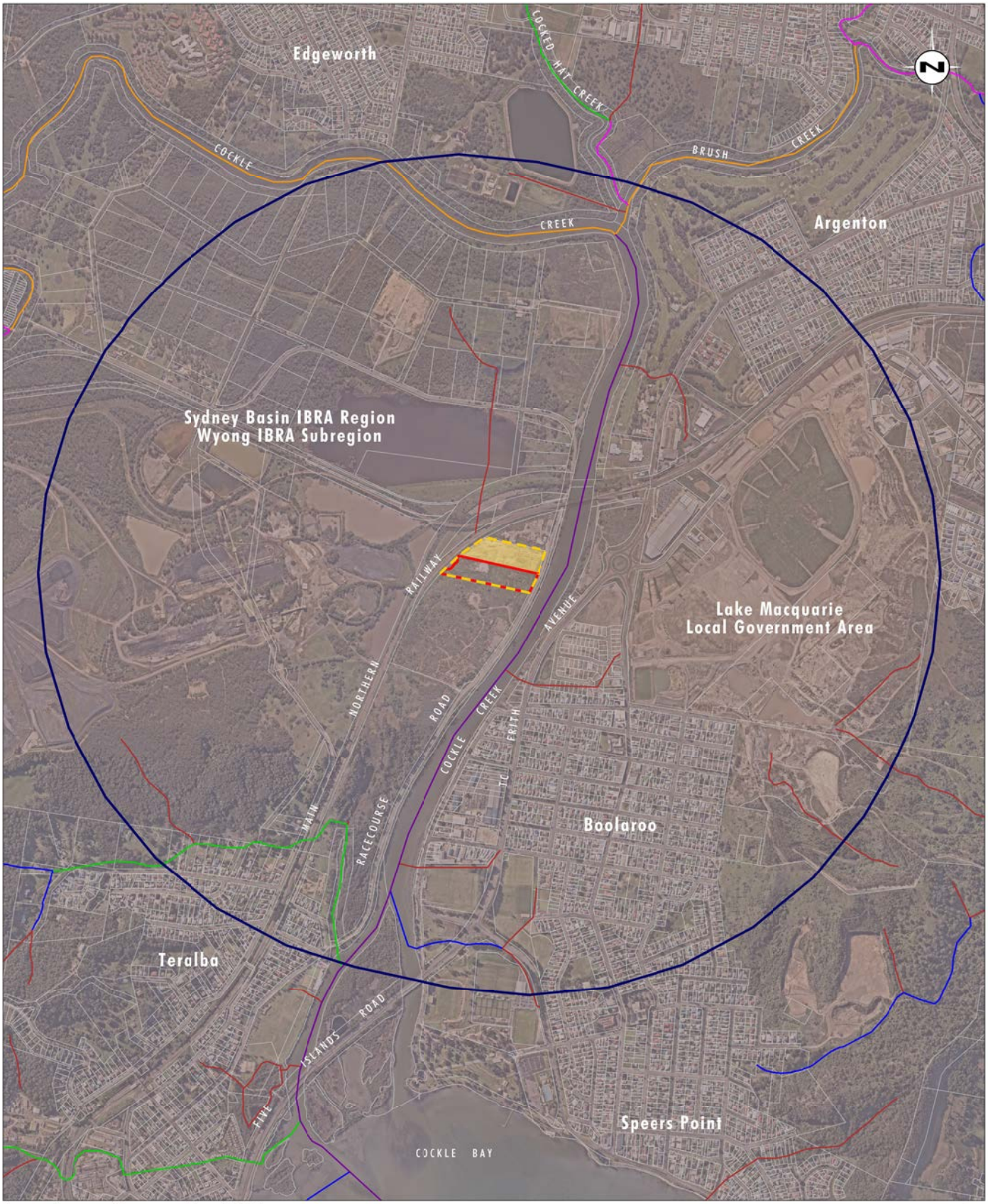

Image Source: Nearmap (Apr 2018)
Data Source: Department of Finance, Services & Innovation (2018), Australian Government Department of the Environment (2012), Commonwealth of Australia (2016)

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1:20 000

Legend

- Site Boundary
- Development Footprint
- 1500m Buffer Area
- Approved Disturbance
- Lake Macquarie City Council Local Government Area
- Cadastre
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- 6th Order Stream

FIGURE 1.5

Location Map - IBRA Regions/Subregions and Local Government Area

File Name (A4): R06/3972_042.dgn
20180904 11.54

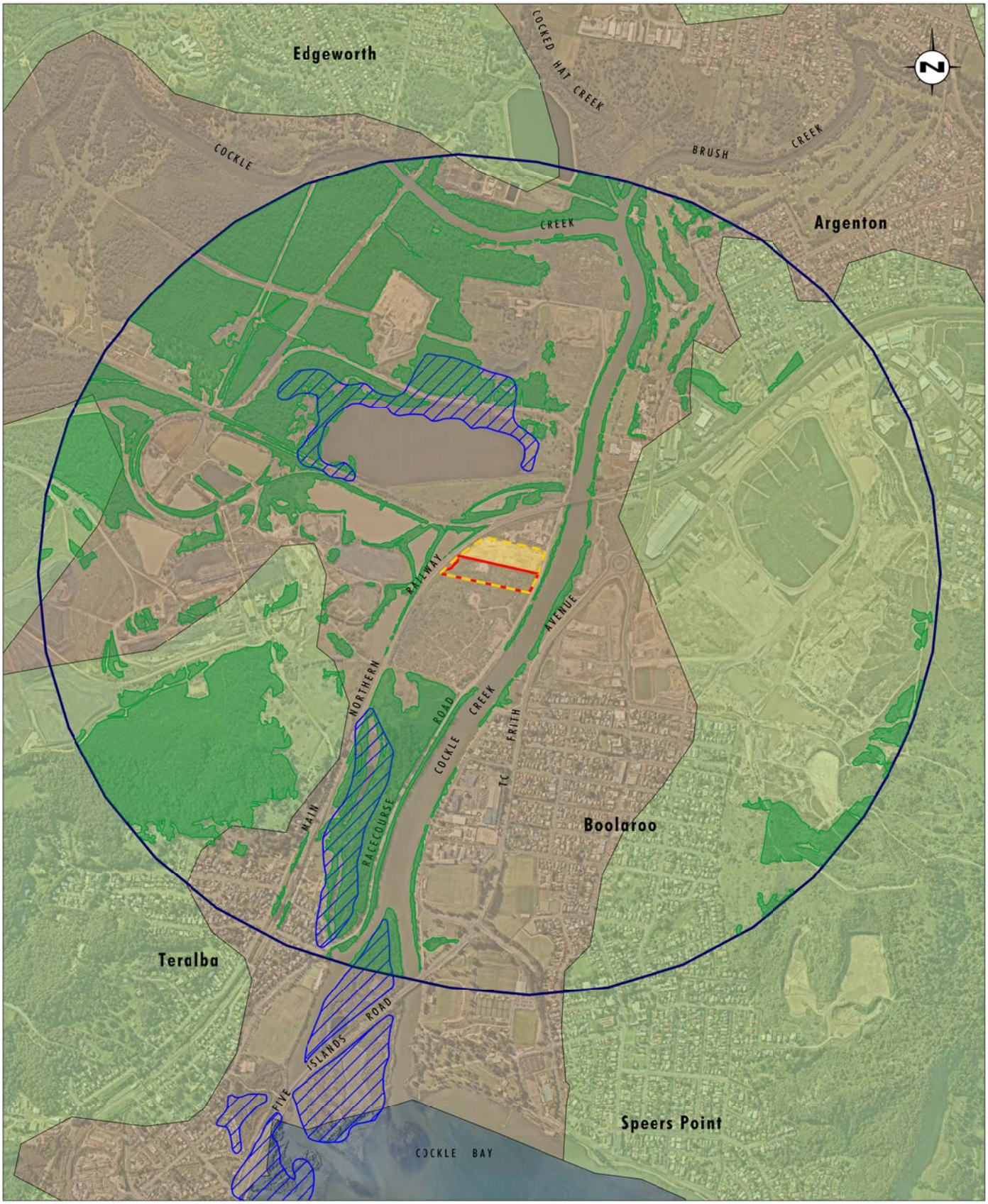

Image Source: Nearmap (Apr 2018)
Data Source: OEH (2017), Department of Planning and Environment (2017)

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1:20 000

Legend

- Site Boundary
- Development Footprint
- 1500m Buffer Area
- Approved Disturbance
- Native Vegetation
- SEPP 14 Wetlands

Mitchell Landscapes:

- Gosford-Cooranbong Coastal Slopes
- Sydney-Newcastle Coastal Alluvial Plains

FIGURE 1.6

Location Map - Landscape Features

File Name (A4): R06/3972_034.dgn
20180904 11.55

1.4 Key Resources, Policies and Documents

The following key resources, policies and documents were used during the preparation of this BAR for the Project:

- Biodiversity Assessment Method Order 2017
- Biodiversity Assessment Method Operational Manual (Stage 1)
- Biodiversity Assessment Calculator
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities –Working Draft (DEC 2004)
- BioNet Atlas of NSW Wildlife database and mapping tool (OEH 2018a), accessed August 2018
- Threatened Biodiversity Data Collection (TBDC) (OEH 2018b), accessed January 2018
- Vegetation Information System (VIS) Classification Database (OEH 2018c), accessed January 2018
- NSW Guide to Surveying Threatened Plants (OEH 2016) and
- Department of the Environment and Energy (DoEE) Protected Matters Search Tool (DoEE 2018), accessed August 2018.

1.5 Report Preparation

This BDAR was prepared by Kate Connolly (Principal Ecologist), with review and technical direction from Allison Riley (Principal Ecologist). Field surveys were undertaken by Kate Connolly and Ryan Parsons (Senior Ecologist – Botanist) with vegetation mapping verified by Ryan Parsons. All of these personnel are Accredited BAM Assessors under the BC Act. **Table 1.3** below outlines the details of the Accredited BAM Assessors involved in the survey, calculations and reporting for the Project.

Table 1.4 Accredited BAM Assessors and their Role on this Project

Name	Assessor ID	Role
Allison Riley ***Principal Ecologist***	BAAS17042	Review and technical direction
Kate Connolly ***Senior Ecologist***	BAAS17005	BDAR preparation BAM calculator application Field surveys
Ryan Parsons ***Senior Ecologist – Botanist***	BAAS17048	Field surveys and vegetation mapping

1.6 Structure of the Report

The structure of the report is outlined below as per requirements of Appendix 10 of the BAM (OEH 2017a):

- **Stage 1 Biodiversity Assessment:**
    - Section 1 – provides the introduction to the report

- Section 2 – outlines the methods used in the assessment
- Section 3 - outlines the results of the field surveys and BAM credit calculator application

- **Stage 2 Impact Assessment:**
  - Section 4 – describes the avoidance measures implemented and minimisation of impacts as part of the Project
  - Section 5 – provides an assessment of the impacts in accordance with the BAM
  - Section 6 – summarises the credit requirements for the Project
  - Section 7 – outlines the results of the Biodiversity Credit Report

- **Other sections:**
  - Section 8 - provides a list of references used throughout the report and assessment.

2 Methods

2.1 Landscape Features and Site Context

Landscape features such as IBRA bioregions, IBRA subregions and NSW Mitchell Landscape regions, native vegetation extent in the 1500 m buffer area, cleared areas, rivers, streams, wetlands and connectivity features were identified within the Development Footprint where appropriate in accordance with Section 4.2 of the BAM (OEH 2017a) (refer to **Figures 1.5** and **1.6**).

Determining the 'Site Context' of the Development Footprint is calculated by assessing the native vegetation cover and patch size within the Development Footprint in accordance with Section 4.3 of the BAM (OEH 2017a).

2.2 Native Vegetation Assessment

2.2.1 Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. The information obtained was used to inform field survey design, and was also used to assist in the assessment of potentially occurring threatened and migratory species, endangered populations (EPs) and TECs.

Relevant documents included:

- Vegetation Mapping of Lake Macquarie LGA: Stages 1-3 (Bell and Driscoll 2012)
- VIS Classification Database (OEH 2018c), accessed January 2018
- Threatened Biodiveristy Data Collection (OEH 2018b) reporting for known/predicted threatened communities in the Wyong IBRA subregion
- DoEE Protected Matters Search Tool for known/predicted EPBC Act-listed TECs, accessed August 2018.

2.2.2 Digital Aerial Photograph Interpretation

Digital imagery (aerial photographs) of the Development Footprint was viewed prior to and after vegetation survey to identify spatial patterns in vegetation, land use and landscape features. These informed field survey design and implementation, ecological assessment and vegetation community mapping of the Development Footprint.

Vegetation communities in the Development Footprint were mapped on-screen overlaying the April 2018 high resolution aerial photographs from Nearmap. Mapping was undertaken using the Manifold System 8.0 Enterprise Edition GIS in a 32 bit mode. Use of GIS allowed zooming to a relatively large scale.

2.2.3 Initial Site Reconnaissance

A preliminary site reconnaissance of the Development Footprint was undertaken on 6 October 2017 to confirm the vegetation communities and habitats present. The focus of this survey was to confirm the presence or otherwise of native vegetation and habitats for threatened and migratory species, populations and TECs and their potential habitats listed under the NSW *Biodiversity Conservation Act 2016* (BC Act), Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Fisheries Management Act 1994* (FM Act).

Nine rapid vegetation assessments were undertaken across the Development Footprint. The outcomes of this assessment were used to inform the likely survey requirements under the BAM.

2.2.4 Floristic and Vegetation Integrity Survey

The intial site inspection confirmed that the Development Footprint is highly modified and disturbed. Threatened species habitat across the site is very limited. Vegetation within the site is dominated by exotic species and no naturally-occurring plant community types (PCTs) occur within the Development Footprint.

Based on the outcomes of the intial site inspection, two floristic plot and vegetation integrity surveys were undertaken within the Development Footprint (refer to **Figure 2.1**) to determine whether the vegetation meets the minimum vegetation integrity threshold for the BAM. Nominally, and for the purposes of the BAM calculator, the exotic vegetation on the site was assigned to the PCT most likely to have occurred in the Development Footprint prior to the disturbance of the site.

Table 2.1 outlines the floristic survey effort in the Development Footprint.

Table 2.1 Adequacy of Vegetation Survey in the Development Footprint

Veg. Zone	Plant Community Type (PCT) ID/Biometric Vegetation Type (BVT) ID and Common Name *Condition Class*	Area in the Development Footprint (ha)	Number of Floristic and Vegetation Integrity Plots		Number of Rapid Assessments Completed
			Required	Completed	
1	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Disturbed Regeneration*	0.04	1	1	1
2	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Bund Plantings*	0.03	1	1	2
-	Exotic Vegetation	2.2	0	0	4
-	Cleared Land	0.14	0	0	0
TOTAL		**2.41**	**2**	**2**	**9**
-	Freshwater wetland (located outside Development Footprint)	0.03	0	0	2

2.2.4.1 Data Collected

At each floristic and vegetation integrity plot, data was recorded according to Section 5 of the BAM (OEH 2017a). This involved setting out 20 x 50 m, 20 x 20 m and 1 x 1m plots. The location of each plot was recorded using a hand-held GPS with accuracy of ± 5 m. The Map Grid of Australia (MGA) coordinate system was used.

At each plot/transect, approximately 45 to 60 minutes was spent searching for all vascular flora species present within the 20 x 20 m plot. Searches of each 20 x 20 m plot were generally undertaken through parallel transects from one side of the plot to another. Most effort was spent on examining the groundcover, which usually supported well over half of the species present, however the composition of any shrub, mid-storey, canopy and emergent layers were also thoroughly examined.

For each flora species recorded in the plot, the following data was collected in accordance with Table 2 of the BAM (OEH 2017a):

- stratum/layer in which the species occurs
- growth form
- scientific name and common name
- cover and
- abundance.

At each vegetation integrity plot the following attributes were recorded in accordance with the BAM (OEH 2017a) to determine the condition of the vegetation zone:

- ***Composition*** - native plant species richness by growth form (within the 20 x 20 m plot)
- ***Structure*** – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot)
- ***Function*** **-** (within the 20 x 50 m plot) including, number of large trees, presence or otherwise of tree stem size classes, presence or otherwise of canopy species regeneration, length of fallen logs, percentage cover for litter (recorded from five 1 x 1 m plots), number of trees with hollows and high threat exotic cover.

2.2.5 Meandering Transects

Meandering transects were walked across much of the Development Footprint. Opportunistic sampling of vegetation was undertaken along these transects, particularly searches for threatened and otherwise significant species, endangered populations and TECs. Meandering transects enable floristic sampling across a much larger area than plot-based survey, especially where the number of plots is limited. Records along transects supplemented floristic sampling carried out in plots, however, the data collected are in the form of presence records, rather than semi-quantitative cover abundance scores.

Meandering transects provided invaluable information on spatial patterns of vegetation that informed vegetation community mapping of the Development Footprint.

2.2.6 Plant Identification and Nomenclature Standards

All vascular plants recorded or collected within plots and on meandering transects were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002). Where known, changes to nomenclature and classification have been incorporated into the results. Updated taxonomy has been derived from PlantNET (Botanic Gardens Trust 2018).

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

2.2.7 Vegetation Mapping

Vegetation mapping was undertaken using best-practice techniques to delineate vegetation communities across the Development Footprint. Vegetation mapping involved the following key steps:

- preliminary review of digital airborne imagery to explore vegetation distribution patterns as dictated by change in canopy texture, tone and colour, as well as topography

- predicting the distribution of particular vegetation communities based on understanding the distribution of PCTs (OEH 2018) and plant communities as described by the Vegetation Mapping of Lake Macquarie LGA: Stages 1-3 (Bell and Driscoll 2012).
- ground-truthing of the vegetation map based on survey effort
- revision of vegetation community floristic delineations based on plot data, and
- revision of the vegetation map based on ground-truthing.

Vegetation communities were delineated through the identification of repeating patterns of plant species assemblages in each of the identified strata.

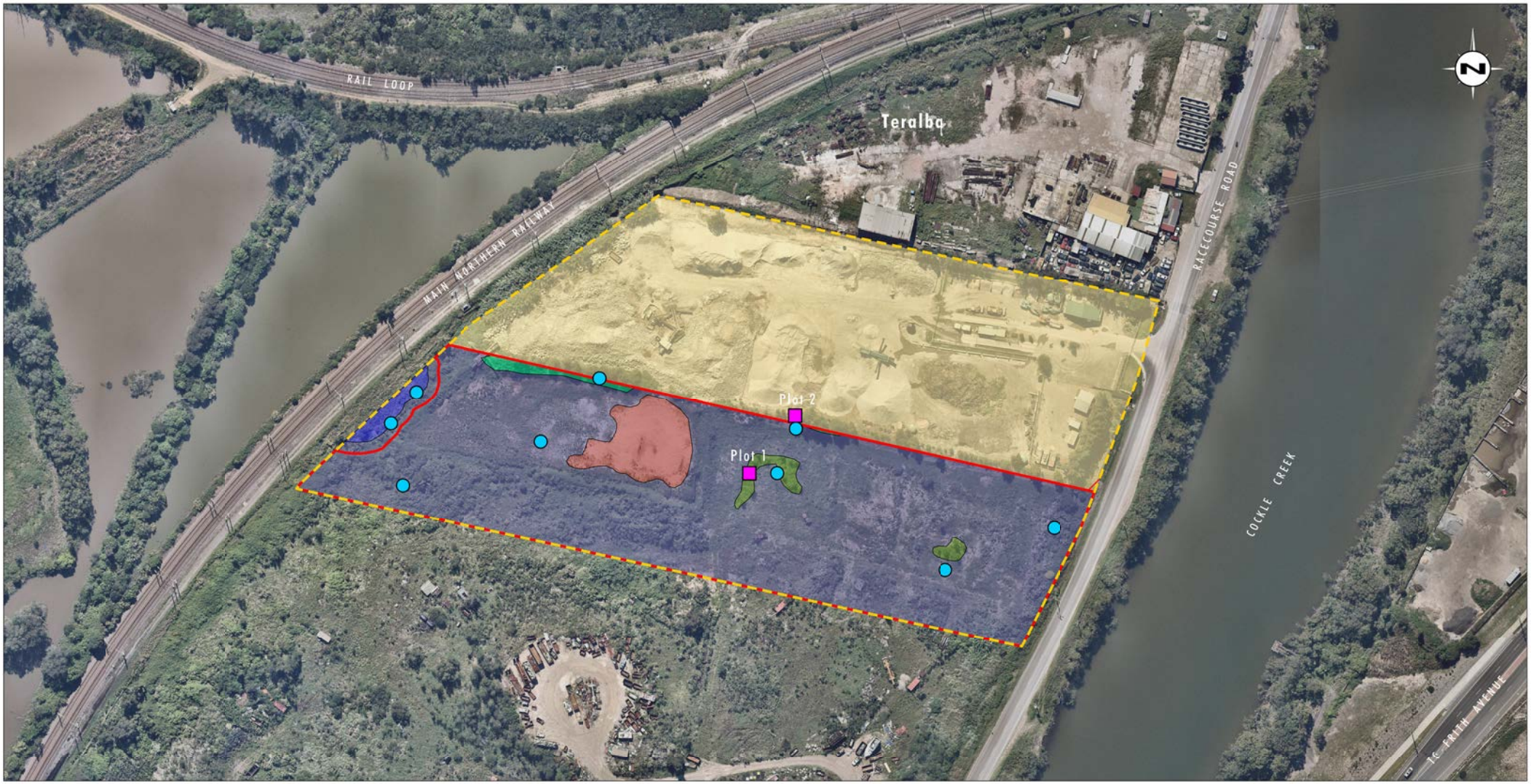

Image Source: Nearmap (Apr 2018)

0 50 100 125m
1:2500

Legend

- Site Boundary
- Development Footprint
- Approved Disturbance
- BAM Plot Location
- Rapid Plot Location
- Veg Zone 1 - 1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Disturbed Regeneration)
- Veg Zone 2 - 1727 - (Bund Plantings)
- Freshwater Wetland
- Exotic Vegetation
- Cleared Land

FIGURE 2.1

Survey Effort

File Name (A4): R06/3972_035.dgn
20180615 13.58

2.2.8 Threatened Ecological Community Delineation Techniques

Where applicable, vegetation communities identified in the Development Footprint were compared to TECs listed under the Commonwealth EPBC Act and NSW BC Act and an assessment of similarity with the NSW Scientific Committee Final Determinations and the Commonwealth Threatened Species Scientific Committee Listing and Conservation Advice. The following approach was used:

- full-floristic plot assessments and meandering surveys to determine floristic composition and structure of each ecological community
- comparison with published species lists, including lists of 'important species' as identified on the listing advice provided by the NSW Scientific Committee and/or Commonwealth Threatened Species Scientific Committee
- comparison with habitat descriptions and distributions for listed TECs
- assessment using guidelines and recovery plans published by the Commonwealth DoEE and NSW OEH
- comparison with other assessments of TECs in the region.

2.2.9 Plant Community Type (PCT) Allocation

Each of the vegetation communities described within the Development Footprint were aligned with an equivalent PCT as detailed in the VIS Classification Database (OEH 2018c). For each vegetation community described in the Development Footprint, the dominant and characteristic species were entered into the online plant community identification tab and an initial list of PCTs was generated. The profiles for each of the possible PCTs were then interrogated and the most appropriate match assigned based on floristic, structure, soil, landform and distribution details.

Further detail regarding this allocation for individual PCT is outlined in **Section 3.2.1.**

2.3 Threatened Species

2.3.1 Literature and Database Review

A review of previous documents and reports relevant to the Project was undertaken. This included ecological reports, previous ecological surveys undertaken in the vicinity of the Development Footprint and also relevant ecological database searches. The information obtained was used to inform survey design where requried, and was also used to assist in the assessment of potentially occurring ecosystem-credit and species-credit species. Relevant documents and resources included:

- OEH BioNet Atlas of NSW Wildlife database and mapping tool (OEH 2018a), accessed August 2018
- OEH Threatened Biodiversity Data Collection (OEH 2018b) for known/predicted threatened species in the Wyong IBRA subregion
- PlantNET (Botanic Gardens Trust) database search for threatened plants within a 5 kilometre radius search from Teralba, accessed August 2018
- DoEE Protected Matters Search Tool (DoEE 2018) for known/predicted EPBC Act-listed species, accessed August 2018.

A preliminary assessment using the TBDC was undertaken which provided a list of species-credit species that might require survey and the suitable survey periods for each species. The results of these database searches, literature review and TBDC review were used to design the appropriate survey requirements for species-credit species.

2.3.2 Ecosystem-credit Species

Ecosystem-credit species are those threatened species that can be predicted by vegetation surrogates and landscape features. Ecosystem-credit species are not required to be specifically targeted during field surveys, however an assessment of the suitability of habitat in the Development Footprint is undertaken to determine the species presence or otherwise in the vegetation zones identified.

Appendix A outlines the ecosystem credit species predicted by the BAM calculator or identified in the literature review.

2.3.3 Species-credit Species

Species-credit species are those threatened species that cannot be confidently predicted by vegetation surrogates and landscape features and therefore requires specific habitat assessment and/or surveys to determine presence or absence.

Due to the highly disturbed nature of the Development Footprint, as well as a lack of species-credit species records in the surrounding landscape, it was determined that habitat assessments and opportunistic species-credit species observations would be suitable for assessing the applicability of species-credit species that could be impacted by the Project. These were undertaken over the following days:

- 6 October 2017
- 11 January 2018.

Habitat assessments involved targeted searches of suitable habitat constraints for predicted species-credit species as outlined in the TBDC and opportunistic observations during all survey periods. Tracks and habitat assessment locations are shown on **Figure 2.1**.

Appendix A outlines the species-credit species predicted by the BAM calculator or identified in the literature review and the survey effort undertaken in accordance with BAM survey requirements.

2.3.4 Weather Conditions and Limitations

Table 2.2 below outlines the weather conditions for the surveys. Data is derived from the Lake Macquarie weather station in Newcastle University (061390) from the Bureau of Meteorology (2018).

Table 2.2 Weather Conditions for Surveys

Date	Daily Data			Monthly Data		
	Min-Max Temp.	Rainfall	Relative Humidity	Min-Max Temp (mean)	Rainfall (total)	Relative Humidity (mean)
6 October 2017	16.5-24.7	0mm	72%	14.7-25.6	113.8mm	73%
11 January 2018	NR-27.2	0mm	NR	19.7-30.8	16.8mm	71%

NR – Not recorded

3 Results

3.1 Landscape Value

3.1.1 Landscape Features

The 1500 m buffer area contains a range of landscape features typical of the landscapes around western Lake Macquarie. These landscape features are shown in **Figure 1.5** to **1.6** and outlined in relation to the Development Footprint in **Table 3.1** below.

Table 3.1 Landscape Features in the Development Footprint

Landscape Features	
IBRA Bioregion	Sydney Basin
IBRA Subregion	Wyong
Mitchell Landscape	Sydney-Newcastle Coastal Alluvial Plains
Rivers, Streams, Estuaries	6th Order Stream - Cockle Creek (adjacent)
Wetlands (within, adjacent to and downstream)	Lake Macquarie SEPP (Coastal Management) Wetlands
Native Vegetation Extent	187.4 ha in the 1500m buffer area (23%)
Connectivity Features	The Development Footprint is not an important link for any fauna movement and has not been identified in connectivity mapping.
Areas of Geological Significance and Soil Hazard Features	Natural soils in the Development Footprint at depths of 3.0 to 5.0 metres below ground level have been identified as potential acid sulfate soils.
Areas of Outstanding Biodiversity Value	None identified
Cleared Areas	0.14 ha within the Development Footprint^
Connectivity Features	Not identified within a Priority Investment Area (OEH 2017). Not identified as an important flyway for migratory species. Lake Macquarie City Council corridor mapping indicates that vegetation on the site does not contain any native vegetation that contributes significantly to movement and viability of flora and fauna in the LGA (LMCC 2015).

3.2 Native Vegetation within the Development Footprint

3.2.1 Plant Community Types and Vegetation Zones

Surveys of the Development Footprint identified one Plant Community Type (PCT) across two condition classes being (refer to **Figure 3.1**):

- PCT1727 Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
    - *Bund Plantings*
    - *Disturbed Regeneration*

It is acknowledged that the disturbed condition of the vegetation on the site is unlikely to be a suitable match for any native PCTs. Ordinarily, PCTs would be aligned with types described as part of the VIS Classification Database (OEH 2018c) based on the number of plant species conforming to PCT descriptions and suitable landscape factors. For the purposes of undertaking the BAM assessment and application of the BAM calculator, a PCT was assigned to this area that was most likely to conform to the vegetation occurring prior to the disturbances of the site. This was done to determine whether the condition of this exotic and disturbed vegetation on the site met the minimum offset threshold under the BAM.

A description of the vegetation zones is outlined in **Sections 3.2.1.1** below and a flora species list for all plots and rapids surveyed is included in **Appendix B**.

Image Source: Nearmap (Apr 2018)

0 50 100 125m
1:2500

Legend

- Site Boundary
- Development Footprint
- Approved Disturbance
- Veg Zone 1 - 1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Disturbed Regeneration)
- Veg Zone 2 - 1727 - (Bund Plantings)
- Exotic Vegetation
- Cleared Land

FIGURE 3.1

Vegetation Zones in the Development Footprint

File Name (A4): R06/3972_036.dgn
20180615 14.03

3.2.1.1 Zone 1 – PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast – Disturbed Regeneration

PCT Name	Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Condition	Disturbed Regeneration
Formation	Forested Wetlands
Class	Coastal Floodplain Wetlands
Percent cleared	60
Area (ha)	0.04
Patch Size (ha)	0
Bell Driscoll Map Unit (2012)	MU40 Swamp Oak Rushland Forest
General Description	This vegetation zone is located in a few discrete locations within highly disturbed and exotic vegetation growing on fill adjacent to the Concrush facility.
Canopy Description	This vegetation zone has a sparse canopy around 6 metres in height, dominated soley by regenerating swamp oak (*Casuarina glauca*).
Mid-storey Description	The midstorey of this vegetation zone is sparse and dominated soley by the noxious weed, groundsel bush (*Baccharis halimifolia*).
Ground Cover Description	This vegetation zone is characterised by a dense ground layer less than 1 metre in height and dominated by colonising exotic species. Commonly occuring exotic groundcovers include lambs tongues (*Plantago lanceolate*), cobblers pegs (*Bidens pilosa*), lacy ragweed (*Ambrosia tenuifolia*), purpletop (*Verbena bonariensis*), coastal morning glory (*Ipomoea cairica*), scarlet pimpernel (*Lysimachia arvensis*) and spear thistle (*Cirsium vulgare*). Exotic grasses include kikuyu (*Cenchrus clandestinus*), paspalum (*Paspalum dilatatum*), *Briza subaristata* and pampas grass (*Cortaderia selloana*). Minor occurences of common couch (*Cynodon dactylon*), caustic weed (*Euphorbia drummondii*) and regenerating common reed (*Phragmites communis*) represented the only native ground cover species.

PCT Name	Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Condition	Disturbed Regeneration
PCT Allocation	It is acknowledged that this highly exotic vegetation zone occuring on fill is unlikely to be adequately assigned to any naturally-occuring PCTs. For the purposes of this assessment and application of the BAM calculator, a PCT was required to be selected to determine the vegetation integrity score of this vegetation zone. Regional vegetation mapping by Bell and Driscoll (2012) was reviewed as well as the naturally-occuring vegetation in the surrounding landscape. The most likely vegetation community that previously occurred in this area is Swamp Oak Forest. Bell and Driscoll (2012) mapped surrounding vegetation as MU40 Swamp Oak Rushland Forest. In accordance with the Lake Macquarie Native Vegetation Community Map Unit Equivalents (Bell 2016), MU40 is equivalent to PCT1727. Upon review of the VIS database (OEH 2018c), it is considered that this is the most suitable PCT for the purposes of this assessment.
BC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the EPBC Act.

3.2.1.2 Zone 2 – PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast – Bund Plantings

PCT Name	Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	
Condition	Bund Plantings	
Formation	Forested Wetlands	
Class	Coastal Floodplain Wetlands	
Percent cleared	60	
Area (ha)	0.03	
Patch Size (ha)	0	
Bell Driscoll Map Unit (2012)	MU40 Swamp Oak Rushland Forest	
General Description	This artificially planted vegetation zone is located on top of an earth bund separating the operational area of the Concrush facility and the Development Footprint. It is currently utilised as a tree screen between the operational areas of the facilities and the land holdings to the south of the site.	

PCT Name	Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Condition	**Bund Plantings**
Canopy Description	This vegetation zone has a sparse canopy between 8-10 metres in height, dominated soley by planted swamp oak (*Casuarina glauca*).
Mid-storey Description	No midstorey is present in this vegetation zone.
Ground Cover Description	This vegetation zone is characterised by a very sparse ground layer less than 0.5 metres in height and dominated by colonising exotic species. These include common sowthistle (*Sonchus oleraceus*), paspalum (*Paspalum dilatatum*), bitou bush (*Chrysanthemoides monilifera* subsp. *rotundata*) and castor oil plant (*Ricinus communis*). Minor occurrences of regenerating common reed (*Phragmites communis*) were also present. Noting the lack of abundance and cover of these species on the bund, it is likely that this primarily exotic ground cover is routinely treated for weeds.
PCT Allocation	It is acknowledged that this artificial and planted vegetation zone is unlikely to be adequately assigned to any naturally-occuring PCTs. For the purposes of this assessment and application of the BAM calcaultor, a PCT was required to be selected to determine the vegetation integrity score of this vegetation zone. Regional vegetation mapping by Bell and Driscoll (2012) was reviewed as well as the naturally-occuring vegetation in the surrounding landscape. The most likely vegetation community that previously occurred in this area is Swamp Oak Forest. Bell and Driscoll (2012) mapped surrounding vegetation as MU40 Swamp Oak Rushland Forest. In accordance with the Lake Macquarie Native Vegetation Community Map Unit Equivalents (Bell 2016), MU40 is equivalent to PCT1727. Upon review of the VIS database (OEH 2018c), it is considered that this is the most suitable PCT for the purposes of this assessment.
BC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the BC Act.
EPBC Act Status	This vegetation zone is not consistent with any threatened ecological community listed under the EPBC Act.

3.2.2 Exotic Vegetation

The Development Footprint is primarily dominated by exotic vegetation that has invaded areas previously disturbed (refer to **Plate 3.1**). While there are minor occurrences of colonising native species (such as common couch (*Cynodon dactylon*), black wattle (*Acacia decurrens*) and regenerating swamp oak (*Casuarina glauca*)) the majority of this area comprises of exotic species including coastal morning glory (*Ipomoea cairica*), groundsel bush (*Baccharis halimifolia*), lantana (*Lantana camara*), crofton weed (*Ageratina adenophora*), purpletop (*Verbena bonariensis*) and lambs tongues (*Plantago lanceolata*). Dense exotic grasses include guinea grass (*Megathyrsus maximus*), pampas grass (*Cortaderia selloana*), kikuyu (*Pennisetum clandestinum*) and Coolatai grass (*Hyparrhenia hirta*).

A high number of species recorded in this area are identified as high threat weeds under the BAM. These are species that if not controlled will invade and outcompete native plant species, which is evident on this site. These are identified in the flora species list in **Appendix B**.

Plate 3.1 Exotic Vegetation dominating the Development Footprint

3.2.3 Threatened Ecological Communities

No threatened ecological communities were recorded within the Development Footprint. The following threatened ecological communities had the potential to occur in the Development Footprint, however were ruled out based on a lack of diagnostic features and conformance to descriptions outlined in NSW Scientific Committee and/or the Commonwealth Threatened Species Scientific Committee guidelines for interpreting listings for species, populations and ecological communities under the BC Act:

***Swamp Oak Floodplain Forest of the NSW North Coast Sydney Basin and South East Corner Bioregions EEC* under the BC Act**

PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast present in the Development Footprint is not likely to conform to the *Swamp Oak Floodplain Forest of the NSW North Coast Sydney Basin and South East Corner Bioregions* EEC.

The swamp oak occurring in the Development Footprint is not naturally-occurring, is growing on fill and planted on constructed earth bunds. While the historic presence of *Swamp Oak Floodplain Forest EEC* cannot be ruled out, the site has been extensively disturbed which has been invaded primarily by exotic species. The regenerating swamp oak occurring on the fill is likely to be colonising from the planted specimens occurring on the adjacent earth bunds.

Furthermore, a very restricted number of species listed in the Final Determination are present in the Development Footprint. The only species recorded from the Final Determination is swamp oak (*Casuarina glauca*), common couch (*Cynodon dactylon*) and common reed (*Phragmites australis*). It is not considered that PCT1727 in the Development Footprint would conform to *Swamp Oak Floodplain Forest of the NSW North Coast Sydney Basin and South East Corner Bioregions* EEC listed under the BC Act.

***Coastal Swamp Oak (Casuarina glauca) Forest of NSW and Queensland EEC* under the EPBC Act**

PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast present in the Development Footprint does not conform to the *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and Queensland EEC* listed under the EPBC Act. Based on the information outlined in the Conservation Advice (TSSC 2018) for the community, the EEC can be ruled out within the Development Footprint due to the PCT not meeting the minimum condition thresholds. This includes the following:

- The patch size is less than 0.5 hectares, the minimum size threshold as defined by the Conservation Advice (TSSC 2018).

- The community contains minimal native understorey species, with greater than 80% of the understorey vegetation cover being exotic and with the presence of transformer species as defined by the Conservation Advice (TSSC 2018). For example, in the regenerating form of PCT1727 on the site, the transformer weed kikuyu (*Pennisetum clandestinum*) was estimated at 80% cover.

The conservation advice also notes that "*Very small or degraded patches that do not meet the minimum condition thresholds will be excluded from national protection. In many cases, the loss and degradation is irreversible or rehabilitation is impractical because natural characteristics have been removed. For instance, areas permanently converted to improved pastures and/or once swampy areas that have been 'reclaimed' for building purposes, are unlikely to be rehabilitated*."The occurrence of PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast within the Development Footprint occurs on fill material, indicating that this community is growing on an artificial substrate and natural processes are likely to have been removed given the presence of an artificial bund along the Northern perimeter and drainage channel to the west which follows the edge of the railway tracks.

3.2.4 Vegetation Integrity Score

Table 3.2 below details the vegetation integrity scores for each of the vegetation zones in the Development Footprint. The vegetation integrity data for each of the vegetation zones is provided in **Appendix C**.

Table 3.2 Vegetation Zone Vegetation Integrity Scores

Veg Zone	PCT Name	Composition	Structure	Function	Current Vegetation Integrity Score
1	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Bund Plantings*	3.3	17.4	46.1	**13.9**

Veg Zone	PCT Name	Composition	Structure	Function	Current Vegetation Integrity Score
2	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Disturbed Regeneration*	6.3	9.6	27.8	**11.9**

3.3 Threatened Species within the Development Footprint

3.3.1 Ecosystem-credit Species

Table 3.3 below outlines the predicted ecosystem-credit species predicted to occur by the BAM Calculator and/or the literature review and whether they are considered likely to occur in the vegetation zones within the Development Footprint. Threatened species records are shown on **Figure 3.2**.

Table 3.3 Ecosystem-credit Species

Species	BC Act	EPBC Act	Presence/ Absence	Justification
spotted tailed quoll ***Dasyurus maculatus***	V	E	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Furthermore, this species has not been recorded in the wider locality. It is highly unlikely that this species would be impacted by the Project.
varied sittella ***Daphoenositta chrysoptera***	V	-	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Varied sittella has been recorded in the wider locality in remnant bushland near West Wallsend up to 4km away (OEH 2018a). It is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of suitable woodland habitat. It is highly unlikely that this species would be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
black bittern *Ixobrychus flavicollis*	V	-	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Black bittern has been recorded in the wider locality along the fringing vegetation of Cockle Creek (OEH 2018a), however, it is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of wetland habitat. It is highly unlikely that this species would be impacted by the Project.
white-bellied sea-eagle *Haliaeetus leucogaster*	V	-	Potentially present in all zones (foraging habitat only)	This species has been recorded in the locality of the Development Footprint (OEH 2018a). It is likely that the site is part of the wider foraging habitat in the Lake Macquarie area for the species. White-bellied sea-eagles are known to hunt whilst in flight over lakes, wetland margins and adjacent terrestrial areas.
eastern osprey *Pandion cristatus*	V	-	Potentially present in all zones (foraging habitat only)	This species has been recorded in the locality of the Development Footprint (OEH 2018a). It is likely that the site is part of a wider foraging area around Lake Macquarie for the species. Eastern ospreys are known to hunt whilst in flight over coastal areas.
gang-gang cockatoo *Callocephalon fimbriatum*	V	-	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Gang-gang cockatoo has been recorded in the wider locality in remnant bushland near Warners Bay up to 4km away (OEH 2018a). It is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of suitable woodland habitat. It is highly unlikely that this species would be impacted by the Project.
little eagle *Hieraaetus morphnoides*	V	-	Potentially present in all zones (foraging habitat only)	This species has been recorded in the locality of the Development Footprint near Five Island Road, Booragul within 2km of the site (OEH 2018a). It is likely that the site is part of the wider foraging habitat in the Lake Macquarie area for the species. Little eagles are known to hunt whilst in flight over terrestrial habitat for birds, reptiles and mammals.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
spotted harrier *Circus assimilis*	V	-	Potentially present in all zones (foraging habitat only)	This species has not been recorded within locality of the Development Footprint, however potentially suitable foraging habitat occurs on the site. Spotted harriers are known to hunt whilst in flight over terrestrial habitat for birds, reptiles and mammals.
Australasian bittern *Botaurus poiciloptilus*	E	E	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Furthermore, Australiasian bittern has not been recorded in the wider locality (OEH 2018a). It is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of wetland habitat. It is highly unlikely that this species would be impacted by the Project.
white-fronted chat *Epthianura albifrons*	V	-	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. White-fronted chat has been recorded in the locality in the wetland habitats adjacent to the The Weir Road, Teralba (OEH 2018a). It is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of suitable saltmarsh habitat. It is highly unlikely that this species would be impacted by the Project.
black-necked stork *Ephippiorhynchus asiaticus*	E	-	Absent in all zones	This species has not been recorded within the Development Footprint and no suitable habitat occurs. Black-necked stork has been recorded in the locality in the wetland habitats adjacent to the The Weir Road, Teralba, however it is unlikely to occur in the Development Footprint due to the highly disturbed nature of the site and lack of suitable wetland habitat. It is highly unlikely that this species would be impacted by the Project.

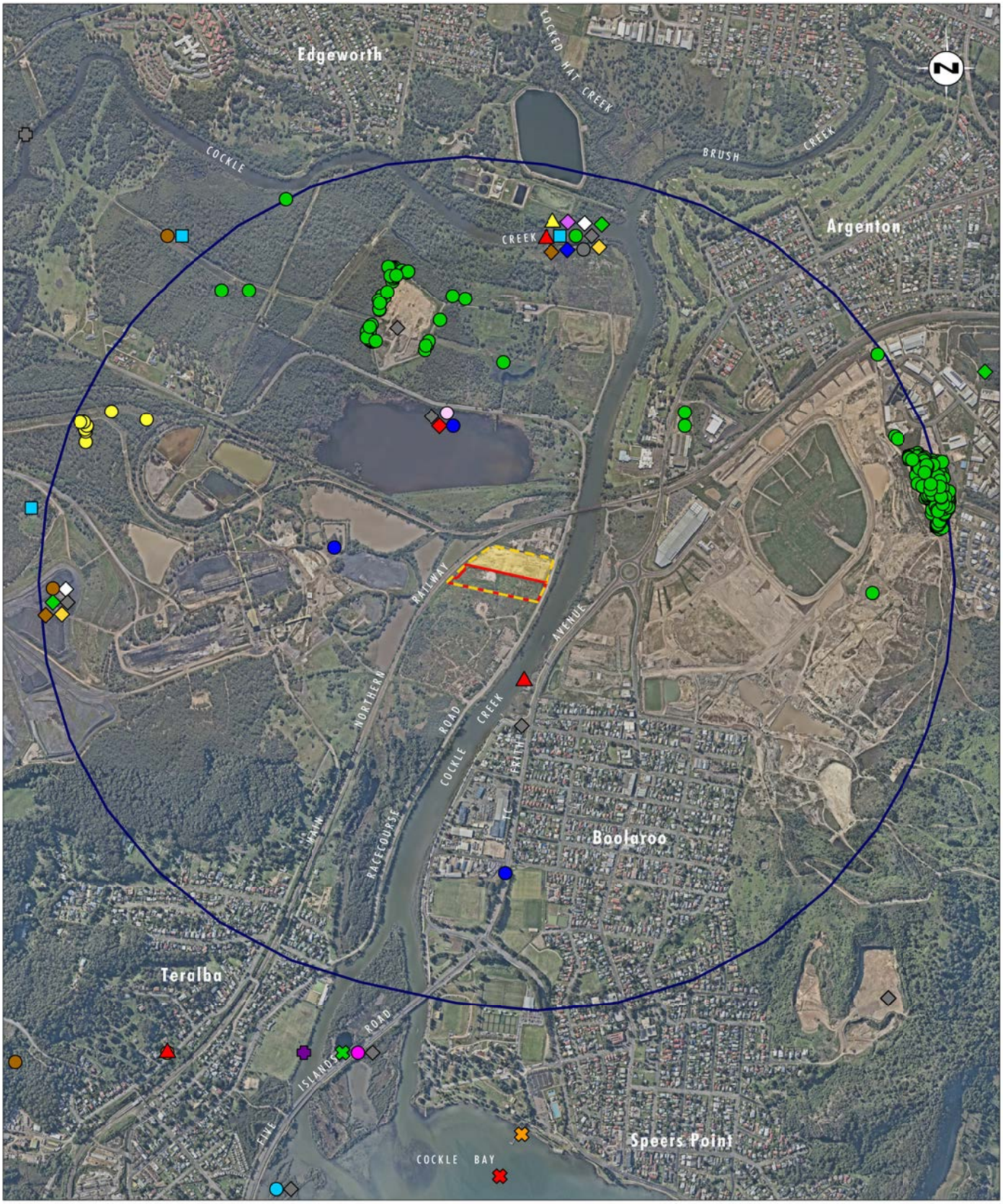

Image Source: Nearmap (Apr 2018)
Data Source: ATLAS (2018)

0 0.25 0.5 1.0km
1:20 000

Legend

- Site Boundary
- Development Footprint
- 1500m Buffer Area
- Approved Disturbance
- *Angophora inopina*
- *Callisiemon linearifolius*
- *Eucalyptus parramattensis subsp. parramattensis*
- *Syzygium paniculatum*
- *Tetratheca juncea*
- Black Bittern
- Black-necked Stork
- Comb-crested Jacana
- Curlew Sandpiper
- Dusky Woodswallow
- Eastern Bentwing-bat
- Eastern Freetail-bat
- Eastern Osprey
- Green Turtle
- Grey-headed Flying-fox
- Large-eared Pied Bat
- Lesser Sand-plover
- Little Bentwing-bat
- Little Eagle
- Masked Owl
- Powerful Owl
- Southern Myotis
- Squirrel Glider
- White-bellied Sea-Eagle
- White-fronted Chat

FIGURE 3.2

Threatened Species

File Name (A4): R06/3972_037.dgn
20180615 13.48

3.3.2 Species-credit Species

Table 3.4 below outlines the species-credit species predicted to occur by the BAM Calculator and/or the literature review and whether they are considered likely to occur in the Development Footprint.

Table 3.4 Predicted Species-credit Species

Species	BC Act	EPBC Act	Presence/ Absence	Justification
gang-gang cockatoo *Callocephalon fimbriatum*	V	-	Absent	No eucalypt tree species with hollows greater than 9 cm diameter occur on the Development Footprint. Therefore there is no suitable breeding habitat for the gang-gang cockatoo. Breeding habitat for this species will not be impacted by the Project.
white-bellied sea-eagle *Haliaeetus leucogaster*	V	-	Absent	No living or dead mature trees occur within the Development Footprint. Therefore there is no suitable breeding habitat for the white-bellied sea eagle. Breeding habitat for this species will not be impacted by the Project.
little eagle *Hieraaetus morphnoides*	V	-	Absent	No nest trees (live and occassionally dead large old trees). Occur within the Development Footprint. Therefore there is no suitable breeding habitat for the little eagle. Breeding habitat for this species will not be impacted by the Project.
green and golden bell frog *Litoria aurea*	E	V	Absent	No suitable wetland habitat occurs within the Development Footprint. While the species can occur in a wide range of habitats (including disturbed habitats), the green and golden bell frog has not been recorded and is not known from the locality of the Development Footprint (OEH 2018a). It is highly unlikely that this species would be impacted by the Project.
eastern osprey *Pandion cristatus*	V	-	Absent	No living and/or dead trees (>15m) or artificial nest structures occur within the Development Footprint. Therefore there is no suitable breeding habitat for the eastern osprey. Breeding habitat for this species will not be impacted by the Project.

Species	BC Act	EPBC Act	Presence/ Absence	Justification
tall knotweed *Persicaria elatior*	V	V	Absent	No suitable wetland habitat occurs within the Development Footprint. While the species can occur in a wide range of habitats (including disturbed swamps), tall knotweed has not been recorded and is not known from the locality of the Development Footprint (OEH 2018a). It is highly unlikely that this species would be impacted by the Project.
giant dragonfly *Petalura gigantea*	E	-	Absent	No suitable open swamp habitat or fringing swamp vegetation occurs within the Development Footprint. Furthermore, the giant dragonfly has not been recorded (either historically or recently) and is not known from the locality of the Development Footprint (OEH 2018a). It is highly unlikely that this species would be impacted by the Project.
brush-tailed phascogale *Phascogale tapoatafa*	V	-	Absent	No hollow bearing trees or suitable habitat occurs within the Development Footprint. Furthermore, the brush-tailed phascogale has not been recorded and is not known from the locality of the Development Footprint (OEH 2018a). It is highly unlikely that this species would be impacted by the Project.

3.3.2.1 Biodiversity Risk Weighting

No species-credit species have been determined likely to occur within the Development Footprint and therefore no biodiversity risk weighting scores are relevant to the final credit calculations.

3.3.2.2 Species Habitat Polygons

As no species-credit species have been determined likely to occur within the Development Footprint no species habitat polygons have been mapped.

4 Avoidance and Minimisation of Impacts

4.1 Avoidance and Minimisation

4.1.1 Avoidance of Native Vegetation and Habitat

Concrush has sought to avoid and minimise the potential impacts on the ecological values of the Development Footprint primarily through the careful selection of the location of the Project elements to avoid the area of freshwater wetland. All components of the Project have been carefully located in areas of very low biodiversity value and no native PCTs are proposed to be impacted as a result of the Project.

It is acknowledged that while the Development Footprint is located in primarily disturbed landscapes, due consideration is required for the surrounding lands and key biodiversity features to ensure that direct and indirect impacts are avoided and minimised, where possible. The Development Footprint is located adjacent to Cockle Creek (a large tributary of Lake Macquarie) in the east, wetlands associated with the Stockton Borehole Colliery Dam along Racecouse Road and The Weir Road in the north and west and the Five Island Wetlands in the south.

A small area of degraded freshwater wetland that occurs on the western boundary of the site was specifically avoided from impacts (refer to **Figure 4.1**). This wetland is expected to have been created following the construction of the adjacent rail line and the bund within the wider Project Area. While this area is also highly degraded and infested with weed species, the habitat in this area is considered more likely to comprise fauna habitat than other areas of the site. The proposed earth bund and drainage swale has been desgined to avoid this habitat.

Specific avoidance measures included the targeted avoidance of surrounding native vegetation communities and wetlands through maximising the use of existing facilities and locating all impacts in already disturbed and exotic-dominated land. The Project has sought to avoid all areas containing any biodiversity values and target impacts on where the land is in poorest condition.

As a result, the Project has located all impacts within areas where the vegetation and habitat condition is of such poor quality that biodiversity credits are not required to be offset and habitat features are low.

4.1.2 Avoidance of Prescribed Impacts

The following impacts are considered ‘prescribed impacts’ under the BC Regulation:

- impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation
- impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- impacts on movement of threatened species that maintains their life cycle
- impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

- impacts of wind turbine strikes on protected animals
- impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

As outlined in **Section 4.1.1** above, the Project has sought to avoid and minimise the potential impacts on the ecological values primarily through the careful selection of the location of the Development Footprint. All components of the Project have been located in areas of very low biodiversity value and no native PCTs are proposed to be impacted as a result of the Project.

Further detail on the assessment of prescribed impacts is outlined in **Section 5.2**.

4.1.3 Minimisation Measures

Concrush has committed to the design and implementation of a biodiversity mitigation strategy to mitigate the unavoidable impacts of the Project. The following specific control measures are considered to be integral to the minimisation of impacts on the biodiversity features of the Development Footprint and its surrounds:

- demarcation of approved clearance boundaries
- weed management
- pest animal control
- fencing and access control
- bushfire management
- providing appropriate environmental management measures as part of the operations to minimise the potential for indirect impacts including:
    - water management systems that seek to minimise the potential for damage to flora and fauna habitats from erosion and unnatural flooding events
    - erosion and sedimentation control
    - noise control systems
    - traffic control and speed limits
    - dust control measures
    - lighting controls

Each of these control measures will contribute to the maintenance of habitat quality adjacent to the Development Footprint outside existing approved disturbance.

4.1.4 Summary of Measures

Table 4.1 below outlines the avoidance and minimisation measures proposed for the Project including the timing, action, outcome and responsibility of these measures.

Image Source: Nearmap (Apr 2018)

0 50 100 125m
1:2500

Legend

- Site Boundary
- Development Footprint
- Approved Disturbance
- Area of Avoidance

FIGURE 4.1

Areas of Avoidance

Table 4.1 Avoidance and Minimisation Measures

Measure	Timing	Responsibility	Proposed Techniques	Outcome
Preliminary ecological site inspection	Pre-Project design	N/A	N/A	• Preliminary assessment of areas of avoidance to inform Project design.
Location and design of facilities in existing disturbed areas.	Project design	N/A	N/A	• Focus impacts on areas of low biodiversity value.
Location of earth bund and swale	Project design	N/A	N/A	• Avoidance of freshwater wetland habitat.
Demarcation of approved clearance boundaries	Prior to clearance and during clearance activities	Site Manager	• Establish construction fencing or marking tape around areas not proposed for clearance.	• Minimisation of unnecessary impacts to surrounding vegetation and habtiats.
Weed management	Construction and operation	Site Manager	• Chemical and/or physical removal of invasive weed species.	• Minimisation of environmental and noxious weeds in the site. • Minimisation of weed spread from and into the wider locality.
Fencing and access control	Construction and operation	Site Manager	• Where possible, fencing will not include barbed wire on the top line of the fence.	• Provides for access control to avoid unwanted human interference and disturbance to non-operational areas. • Minimisation of impacts to native fauna species from the use of barbed-wire fences.
Bushfire management	Construction and operation	Site Manager	• Bushfire management will consider assest protections and the consideration of the sensitivities of threatened species and threatened ecological communities.	• Protect life and property, while supporting appropriate conditions for the existing ecological features.

Measure	Timing	Responsibility	Proposed Techniques	Outcome
Water management systems	Operation	Site Manager	• Sprinkler system to be established on stockpiles.	• Minimisation of dust impacts to native vegetaion.
Erosion and sedimentation control	Construction and operation	Site Manager	• Control measures will be established during both the construction and operational phases of the Project.	• Minimisation of water quality impacts to surrounding waterways.
Noise control	Construction and operation	Site Manager	• Noise control will be maintained during Project operations.	• Minimise noise impacts including to fauna species in adjacent areas.
Traffic control	Operation	Site Manager	• Speed limits will be enforced on site.	• Minimise potential for fauna collision.
Dust control	Construction and operation	Site Manager	• Sprinkler system on stockpiles and use of water cart.	• Minimisation of dust deposition onto native vegetation.
Lighting control	Operation	Site Manager	• Lighting to be directed into the site.	• Minimise disturbance to fauna species in areas immediately surrounding the Project.

5 Assessment of Impacts

5.1 Impacts on Native Vegetation and Habitat

5.1.1 Direct Impacts

The Project will result in direct impacts on very minor biodiversity values within the Development Footprint. Direct impacts include the loss of vegetation and marginal fauna habitats as a result of construction and operations. The current condition of the vegetation and habitat in the Development Footprint is primarily exotic and disturbed vegetation occurring on fill surrounded by industrial landscapes.

No species-credit species habitat has been identified within the Development Footprint or in the wider locality. The site contains very few habitat features (no hollow-bearing trees, few fallen logs and minimal vegetation cover). No potentially-occurring species-credit species habitat will be directly impacted by the Project.

Table 5.1 below outlines the direct impacts on native vegetation, which totals approximately 0.07 ha. Other areas of native vegetation in the wider Concrush facility, such as areas of freshwater wetlands to the west of the proposed disturbance, have been specifically avoided by the Project design and will not be directly impacted by the Project. The final project footprint is shown in **Figure 5.1**.

Avoidance and mitigation measures associated with minimising the impacts of these direct impacts are discussed in **Section 4.0** above.

Table 5.1 Direct Impacts of the Project on Biodiversity Features

Species	Area within the Development Footprint (ha)
Plant Community Type	
PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Disturbed Regeneration*	0.04
PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Bund Plantings*	0.03
Species-credit Species Habitats	
None	N/A

Image Source: Nearmap (Apr 2018)

0 50 100 125m
1:2500

Legend

- Site Boundary
- Development Footprint
- Approved Disturbance
- Final Project Footprint
- Veg Zone 1 - 1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Disturbed Regeneration)
- Veg Zone 2 - 1727 - (Bund Plantings)
- Exotic Vegetation
- Cleared Land

FIGURE 5.1

Final Project Footprint

File Name (A4): R06/3972_039.dgn
20180615 14.06

5.1.2 Indirect Impacts

The Project is not expected to result in any substantial indirect impacts on the biodiversity values of surrounding lands. No indirect impacts are expected to occur on surrounding connectivity, corridors, habitat fragmentation or light emissions, However, some minor indirect impacts associated with noise, dust, weeds and feral animals may occur during the construction and operation of the Project. These are discussed below.

No indirect impact zones have been identified for this Project.

5.1.2.1 Noise Impacts

Noise impacts have the potential to adversely impact native species. Potential impacts include:

- noise disturbing the roosting and foraging behaviour of fauna species
- noise reducing the occupancy of areas of suitable habitat.

Details of the noise controls that will be implemented as part of the Project are outlined in the EIS.

Any additional impacts resulting from noise emissions are not expected to be of any level of significance in relation to threatened species, populations and communities.

5.1.2.2 Dust Impacts

Dust impacts have the potential to adversely impact native species during ground disturbing works. Potential impacts include dust covering vegetation thereby potentially reducing vegetation health and growth. The design of the Project will include inherent measures to minimise the potential for adverse dust impacts. These include:

- stabilisation of disturbed land
- dust suppression on operational areas to reduce vehicle and stockpile generated dust emissions
- a range of other dust control measures as discussed in the main text of the EIS.

Any additional impacts resulting from dust are not expected to be of any level of significance in relation to threatened species, populations and communities.

5.1.2.3 Weed and Feral Animal Encroachment

Weed species could be inadvertently brought into the Development Footprint with imported materials, or could invade naturally through removal of native vegetation. The presence of weed species within the Development Footprint has the potential to decrease the value of extant vegetation to native species. Mitigation measures outlined in **Section 4.0** will be implemented to minimise the potential for weed encroachment into areas surrounding the Development Footprint.

Populations of feral fauna species such as foxes, rabbits and cats can increase and quickly populate new areas as a result of disturbance. Clearing, thinning of vegetation and the creation of tracks have the ability to assist the establishment and spread of feral fauna species. Mitigation measures outlined in **Section 4.0** will minimise the potential for feral animal spread and impacts into surrounding areas around the Development Footprint.

There will be no substantial change to impacts from weeds or feral animals, given that the proposed extension is part of, and adjacent to, an existing operation with existing impacts. Any additional impacts resulting from weeds or feral animals are not expected to be of any level of significance in relation to threatened species, populations and communities.

5.2 Prescribed Impacts

Biodiversity values not considered through the application of the BAM calculator include:

- impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation.
- impacts on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
- impacts on movement of threatened species that maintains their life cycle
- impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities
- impacts of wind turbine strikes on protected animals
- impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

In the case of the Project, no impacts are expected to occur on threatened species or community habitat associated with karst, caves, crevices, cliffs and other geological features of significance, rocks or human-made structures such as these do not occur within the Development Footprint. Non-native vegetation is abundant across the site in the form of primarily exotic vegetation, however no known threatened species or communities are likely to occur in this habitat.

Important connectivity and movement habitat is unlikely to be impacted by the Project. The Development Footprint's current disturbed state does not provide any substantial movement habitat for terrestrial, arboreal or aquatic threatened species. The Development Footprint's location in the landscape is not conducive for fauna movement due to the barriers of Cockle Creek to the east and the rail line to the north and west.

As noted in **Section 4.1.1** above, a small area of degraded freshwater wetland that occurs on the western boundary of the site was specifically avoided from impacts (refer to **Figure 4.1**). The habitat in this area is considered more likely to comprise fauna habitat than other areas of the site, however this is unlikely to provide important habitat for threatened species. This area may conform to *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions EEC* listed under the BC Act. The proposed earth bund and drainage swale has been located to the east to avoid this habitat. The Soil and Water Impact Assessment undertaken for the Project identified that there would not be significant impacts on water quality or other hydrological processes that sustain threatened species and threatened ecological communities.

Only a minor change is proposed to vehicle site access. Access to the Development Footprint will continue via a driveway on Racecourse Road, however vehicle movement will be introduced into the Development Footprint. Due to the disturbed condition of the site, it is unlikely that any threatened species or animals that are part of a TEC would be adversely impacted by the increase in vehicle movement in the Development Footprint.

The impacts of wind turbines are not applicable to this Project.

5.2.1 Uncertain Prescribed Impacts

Uncertain impacts are those that are unable to be reliably predicted during the assessment process or are infrequent in nature. These usually refer to impacts associated with caves, cliffs, mine subsidence and wind turbine strikes and increased vehicle strikes. Indirect impacts associated with the interruption of ecosystem processes are also complex and difficult to quantify.

The Project is unlikely to result in any uncertain prescribed impacts.

5.3 Serious and Irreversible Impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with the principles prescribed in the BC Regulation. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW. These are impacts that:

- will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or
- will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or
- impact on the habitat of a species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or
- impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

One species-credit species (giant dragonfly (*Petalura gigantea*)) predicted by the BAM calculator for this Project is listed as a serious and irreversible impact (SAII) entity in the *Guidance to Assist a Decision-Maker to Determine a Serious and Irreversible Impact* (OEH 2017b). The giant dragonfly has been recorded from permanent wetlands, both coastal and upland, from Moss Vale northwards to southern Queensland. The species has been listed as a SAII entity due to its dependence on upland swamp habitat (OEH 2017b).

No suitable open swamp habitat or fringing swamp vegetation occurs within the Development Footprint and the species has not been recorded (either historically or recently) and is not known from the locality of the Development Footprint. As outlined in the TBDC, only developments that will result in disturbances to swamp hydrology have the potential to cause a serious and irreversible impact on this species. The Project design has specifically avoided freshwater wetland habitat on the site and no hydrological changes are anticipated.

No species or ecological communities listed as SAII entities are likely to occur within the Development Footprint and no further assessment of SAII is required.

6 Biodiversity Credit Impact Summary

6.1 Impacts Not Requiring Assessment

Impacts not requiring further assessment under the BAM include areas of land without native vegetation. The Development Footprint contains approximately 2.4 ha of cleared land and exotic vegetation that will be removed as a result of the Project that does contain native vegetation. This impact does not require further assessment under the BAM.

Figure 6.1 shows the areas within the Development Footprint not requiring assessment in accordance with Section 10.4 of the BAM.

6.2 Impacts Not Requiring Offset

Impacts on native vegetation not requiring offsets under the BAM include native vegetation that has a vegetation integrity score of less than 20 (where it is not associated with ecosystem-credit species habitat or a TEC), less than 17 (where it is associated with ecosystem-credit habitat or a VEC) or less than 15 (where it is representative of a EEC or CEEC).

The two vegetation zones identified within the Development Footprint both have vegetation integrity scores lower than the above thresholds (refer to **Table 3.2**). Therefore, the extent of PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast within the Development Footprint does not require offsetting under the BAM.

No species-credit habitat was recorded or is likely to occur within the Development Footprint and therefore, none of the habitats on the site require offsetting in relation to species-credits.

Figure 6.1 shows the areas within the Development Footprint not requiring offsetting in accordance with Section 10.3 of the BAM.

Image Source: Nearmap (Apr 2018)

0 50 100 125m
1:2500

Legend

- Site Boundary
- Development Footprint
- Approved Disturbance
- Area not requiring further Assessment
- Area not required to be Offset
- Area of Avcidance

FIGURE 6.1

Offsetting Requirement

6.3 Impacts Requiring Offset

Due to the low quality of the vegetation within the Development Footprint, the vegetation integrity scores indicate that the vegetation and habitats are not required to be offset in accordance with Section 10.3 of the BAM (OEH 2017a).

No species-credit habitat was recorded or is likely to occur within the Development Footprint and therefore, none of the habitats on the site require offsetting in relation to species-credits.

Table 6.1 summarises this outcome.

Table 6.1 Impacts Requiring Offset

Veg Zone	PCT/Species-credit	Vegetation Integrity Score			Credits Required
		Current	Future	Change	
1	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Bund Plantings*	13.9	0.0	-13.9	**0**
2	PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Disturbed Regeneration*	11.9	0.0	-11.9	**0**
-	Species-credit Species Habitat	-	-	-	**0**

7 Biodiversity Credit Report

A full Biodiversity Credit Report is included in **Appendix D**.

A summary of the key outcomes in provided in **Table 7.1**.

Table 7.1 Credits Required to Offset the Project

PCT/Species-credit	Credits Required
Ecosystem Credits	
PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast	0
Total	**0**
Species Credits	
None	0
Total	**0**

8 References

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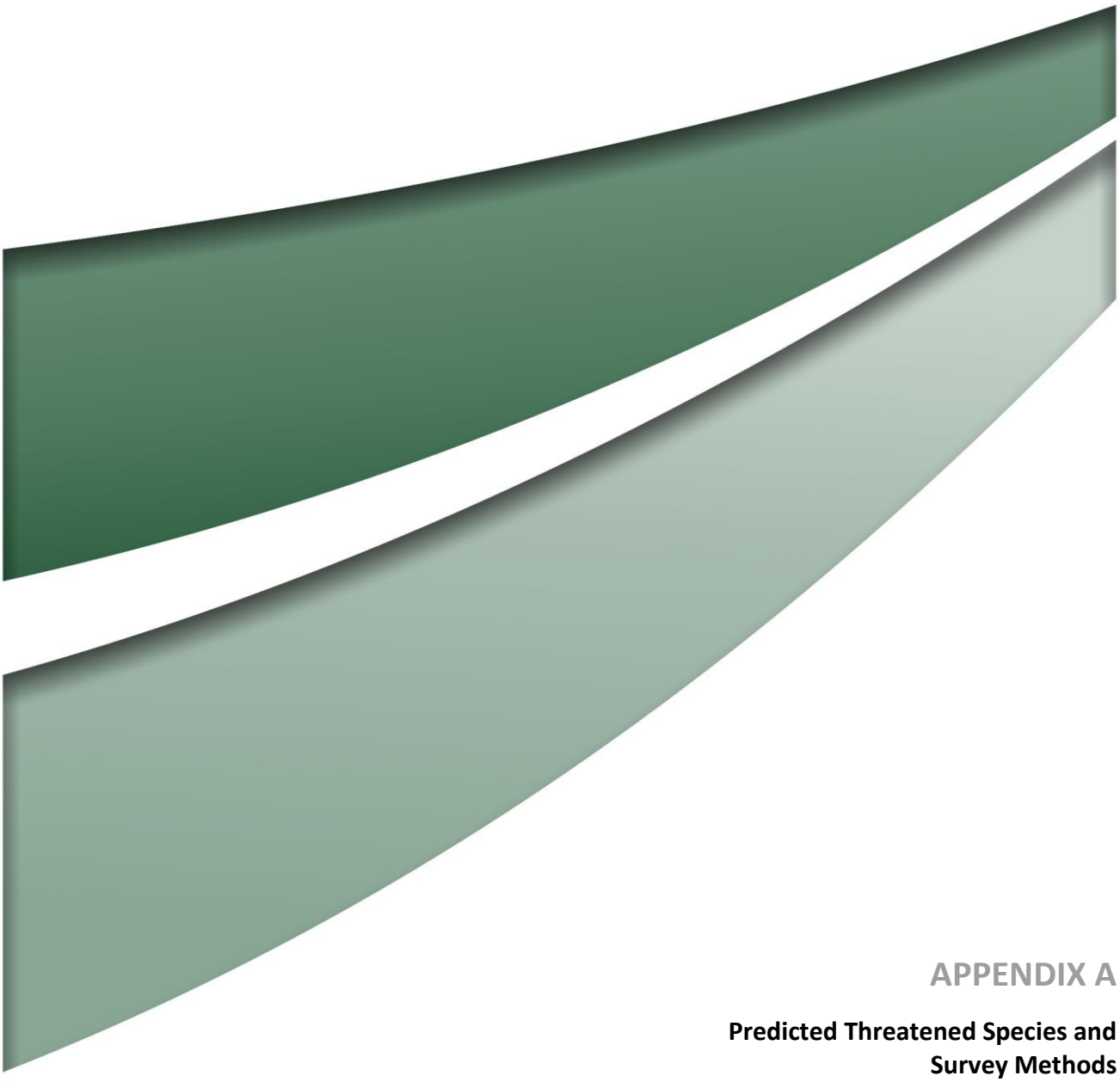


APPENDIX A

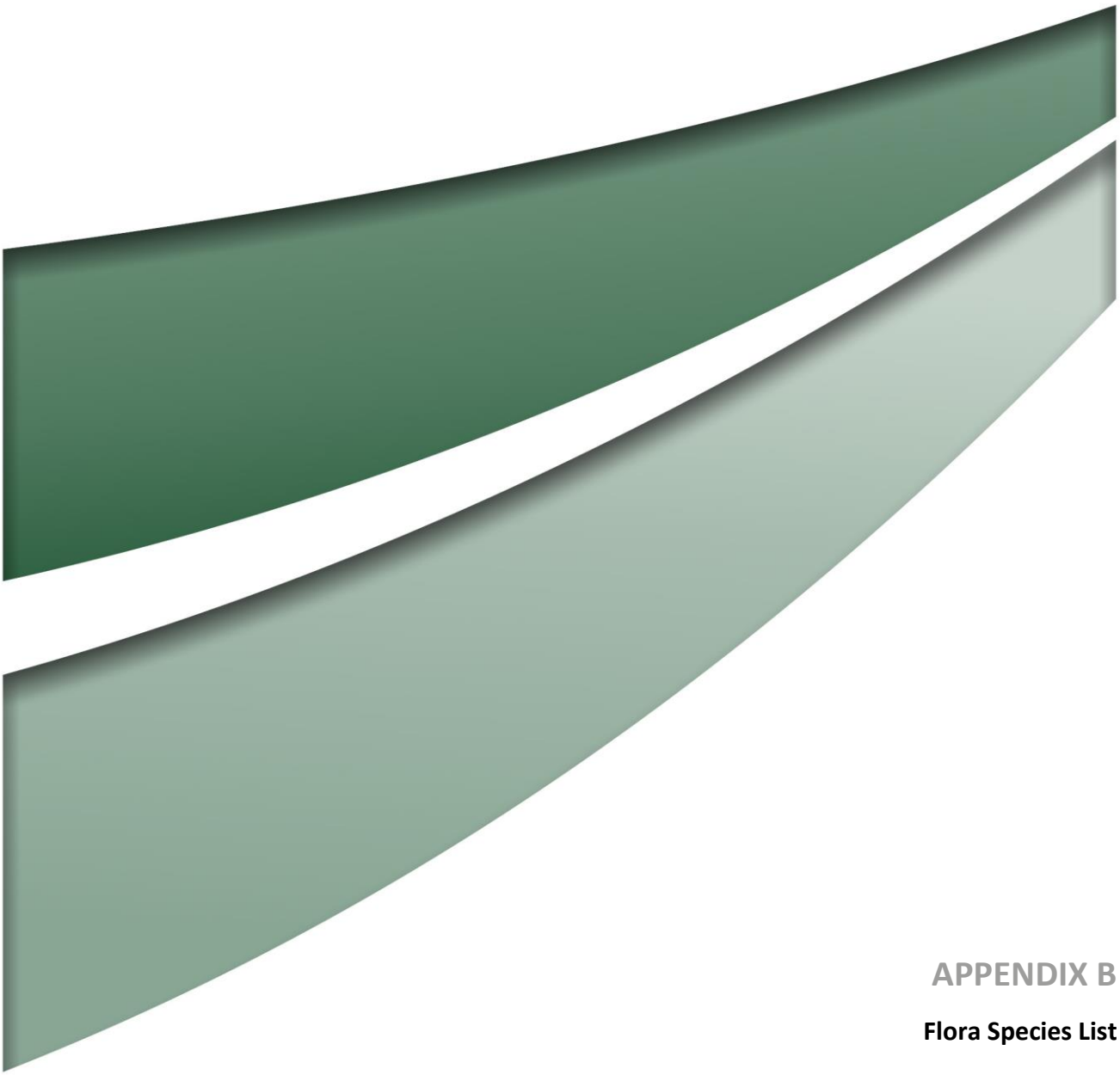
Predicted Threatened Species and Survey Methods

Predicted Ecosystem Credit Species

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint
spotted tailed quoll *Dasyurus maculatus*	V	E	High	-
varied sittella *Daphoenositta chrysoptera*	V	-	Moderate	-
black bittern *Ixobrychus flavicollis*	V	-	Moderate	Land within 40m of wetlands in permanent water and dense vegetation.
white-bellied sea-eagle *Haliaeetus leucogaster*	V	-	High	-
eastern osprey *Pandion cristatus*	V	-	Moderate	-
gang-gang cockatoo *Callocephalon fimbriatum*	V	-	Moderate	-
little eagle *Hieraaetus morphnoides*	V	-	Moderate	-
spotted harrier *Circus assimilis*	V	-	Moderate	-
Australasian bittern *Botaurus poiciloptilus*	E	E	Moderate	Brackish or freshwater wetlands.
white-fronted chat *Epthianura albifrons*	V	-	Moderate	-
black-necked stork *Ephippiorhynchus asiaticus*	E	-	Moderate	Shallow, open freshwater or saline wetlands or shallow edges of deeper wetlands, within 300m of swamps. Shallow lakes, lake margins and estuaries, wthin 300m of waterbodies.

Predicted Species Credit Species

Species	BC Act	EPBC Act	Sensitivity to Gain	Habitat Constraint	Survey Method
gang-gang cockatoo *Callocephalon fimbriatum*	V	-	High	Eucalypt tree species with hollows greater than 9 cm diameter.	Searches for suitable hollow-bearing trees.
white-bellied sea-eagle *Haliaeetus leucogaster*	V	-	High	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Searches for suitable nest trees.
little eagle *Hieraaetus morphnoides*	V	-	Moderate	Nest trees - live (occassionally dead) large old trees within vegetation.	Searches for suitable nest trees.
green and golden bell frog *Litoria aurea*	E	V	High	Within 1km of semi-permanent/ephemeral wet areas, swamps or waterbodies.	Searches for suitable wetland habitat.
eastern osprey *Pandion cristatus*	V	-	Moderate	Living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting.	Searches for suitable nest trees.
tall knotweed *Persicaria elatior*	V	V	Moderate	-	Opportunistic observations in October 2017 and January 2018.
giant dragonfly *Petalura gigantea*	E	-	Very High	Within 500 m of swamps.	Opportunistic observations in October 2017 and January 2018.
brush-tailed phascogale *Phascogale tapoatafa*	V	-	High	Hollow bearing trees	Searches for suitable hollow-bearing trees.



APPENDIX B

Flora Species List

Flora Species List

The following list was developed from the floristic plot rapid transect surveys of the Concrush Development Footprint. It includes all species of vascular plants observed during these surveys. It is acknowledged that the list is not comprehensive, as not all species are readily detected at any one time of the year. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only.

The following abbreviations or symbols are used in the list:

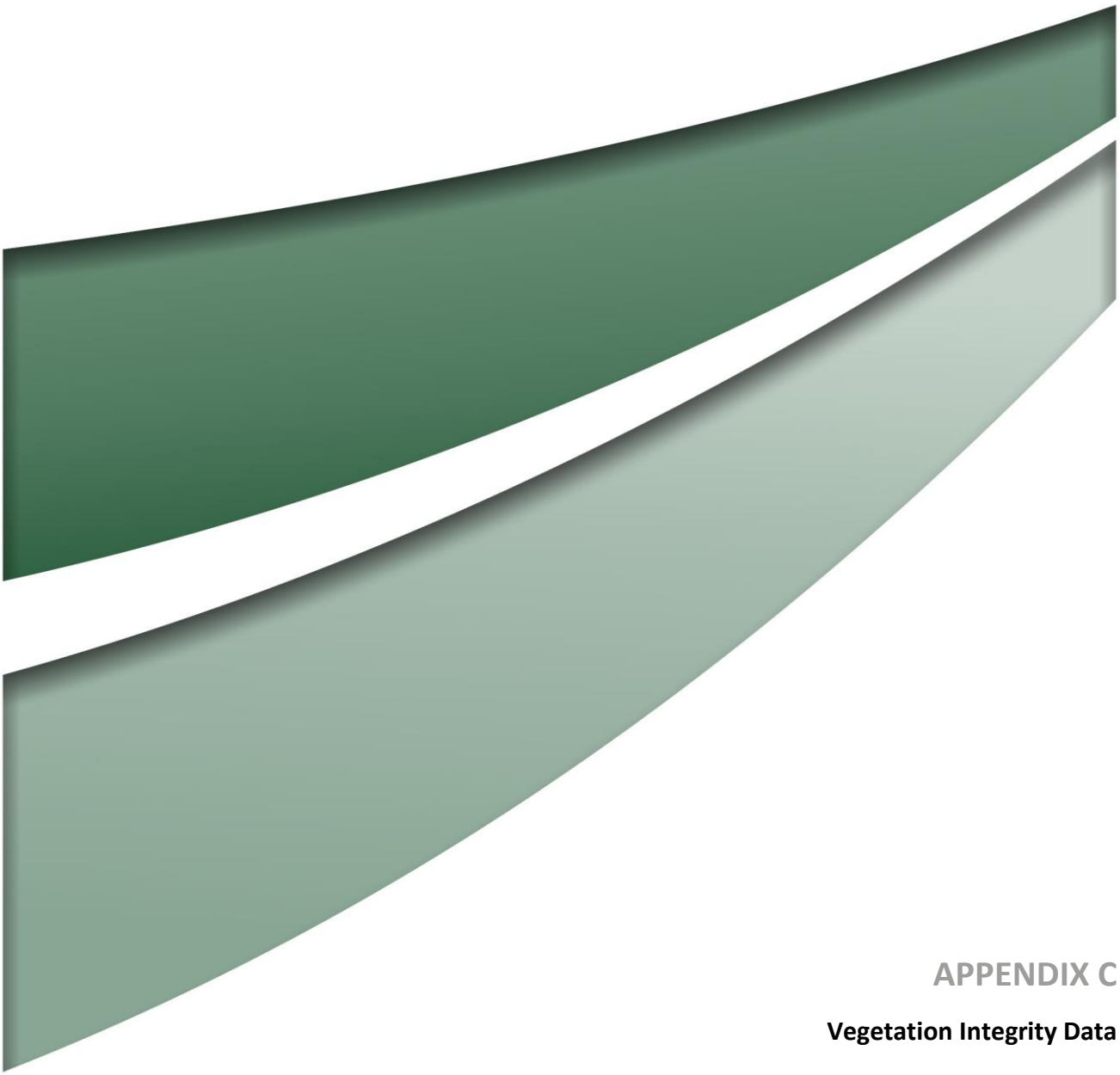
AR	denotes abundance rating according to BAM
C	cover measure according to BAM
asterisk (*)	denotes species non-native species
double asterisk (**)	denotes High Threat Weed species under the BAM
subsp.	subspecies and
var.	variety.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 and 2002) and Wheeler *et al.* (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2018), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 and 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Family Name	Scientific Name	Common Name	P01		P02		R01	R02	R03	R04	R05	R06	R07	R08
			AR	C	AR	C								
Magnoliopsida – Liliidae (monocots)														
Cyperaceae	*Cyperus* spp.								x					
Poaceae	**Briza subaristata*		2	0.1										
Poaceae	***Cortaderia selloana*	pampas grass	2	0.5			x				x			x
Poaceae	*Cynodon dactylon*	common couch	10	2			x						x	
Poaceae	***Hyparrhenia hirta*	coolatai grass							x					
Poaceae	***Megathyrsus maximus*		1	0.2			x							x
Poaceae	***Paspalum dilatatum*	paspalum	50	2	2	0.1			x		x		x	
Poaceae	**Pennisetum clandestinum*	kikuyu grass	500	80			x		x	x	x		x	
Poaceae	*Phragmites australis*	common reed	10	0.1	10	0.2		x			x			
Poaceae	***Stenotaphrum secundatum*	buffalo grass							x					
Typhaceae	*Typha orientalis*	broad-leaved cumbungi						x						
Magnoliopsida – Magnoliidae (dicots)														
Apiaceae	**Cyclospermum leptophyllum*	slender celery	10	0.1										
Asteraceae	**Ageratina adenophora*	crofton weed					x							x
Asteraceae	**Ambrosia tenuifolia*	lacy ragweed	100	5										
Asteraceae	***Baccharis halimifolia*	groundsel bush	20	0.5			x	x	x		x		x	x
Asteraceae	***Bidens pilosa*	cobbler's pegs	10	0.1				x						
Asteraceae	***Chrysanthemoides monilifera subsp. rotundata*	bitou bush			1	0.1								
Asteraceae	**Cirsium vulgare*	spear thistle	20	0.2			x		x					
Asteraceae	**Conyza* spp.	a fleabane												x
Asteraceae	***Senecio* spp.	fireweed						x						
Asteraceae	**Sonchus oleraceus*	common sowthistle	20	0.1	50	0.2					x	x		
Asteraceae	**Tagetes minuta*	stinking roger	20	0.2										
Casuarinaceae	*Casuarina glauca*	swamp oak	8	10	18	20	x	x		x	x	x	x	
Convolvulaceae	***Ipomoea cairica*	coastal morning glory	10	1			x							
Euphorbiaceae	**Chamaesyce drummondii*	caustic weed	1	0.1										
Euphorbiaceae	*Chamaesyce drummondii*				1	0.1								
Euphorbiaceae	***Ricinus communis*	castor oil plant			50	1	x			x				
Fabaceae (Faboideae)	**Lotus subbiflorus*	hairy birds-foot trefoil	5	0.1										
Fabaceae (Mimosoideae)	*Acacia decurrens*	black wattle					x							

Family Name	Scientific Name	Common Name	P01		P02		R01	R02	R03	R04	R05	R06	R07	R08
			AR	C	AR	C								
Lauraceae	***Cinnamomum camphora*	camphor laurel												x
Malvaceae	***Modiola caroliniana*	red-flowered mallow	50	0.2										
Malvaceae	**Sida rhombifolia*	paddy's lucerne	20	0.5							x			
Myrsinaceae	**Anagallis arvensis*	scarlet pimpernel	50	0.2					x					
Plantaginaceae	**Plantago lanceolata*	lamb's tongues	50	15			x							
Polygonaceae	**Rumex crispus*	curled dock											x	
Rosaceae	***Rosa* spp.						x							
Verbenaceae	***Lantana camara*	lantana					x							
Verbenaceae	**Verbena bonariensis*	purpletop	30	0.5				x			x		x	



APPENDIX C

Vegetation Integrity Data

Vegetation Integrity Data

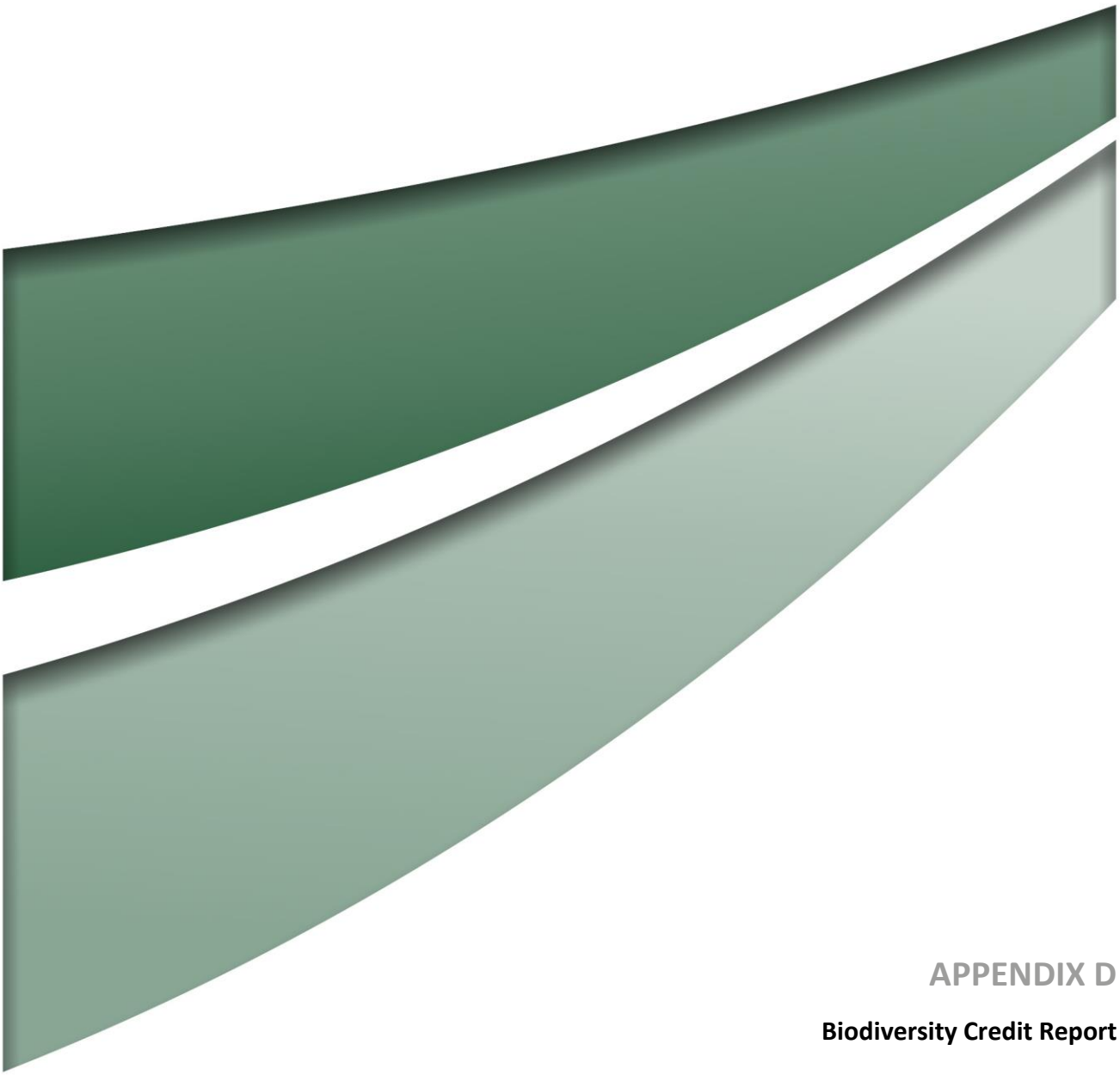
The following vegetation integrity data was collected from surveys of the Concrush Development Footprint. It includes the composition, structure and function attributes that are recorded in each BAM plot. This data is assessed against benchmark data for PCTs and entered into the BAM Calculator to assess the condition of each PCT in the Development Footprint.

The following abbreviations are used in the table below:

Tr	Tree (growth form)
Sh	Shrub (growth form)
Gr	Grass (growth form)
Fb	Forb (growth form)
Fn	Fern (growth form)
Ot	Other (growth form)

Vegetation Integrity Data

	COMPOSITION						STRUCTURE						FUNCTION										
	Tr	Sh	Gr	Fb	Fn	Ot	Tr	Sh	Gr	Fb	Fn	Ot	Regen	Stem Classes (cm)					No. Large Trees	No. Hollow Trees	Litter (%)	Fallen Logs (m)	High Threat Weeds
													>5	5-10	10-20	20-30	30-50	50-80					
Vegetation Zone 1 - PCT1727 - Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Bund Plantings*																							
P02	1	0	1	1	0	0	20	0	0.2	0.1	0	0	1	1	1	1	1	0	0	0	85	2	1.2
Vegetation Zone 2 – PCT1727 – Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast *Disturbed Regeneration*																							
P01	1	0	2	1	0	0	10	0	2.1	0.1	0	0	1	1	1	0	0	0	0	0	13	0	84.2



APPENDIX D

Biodiversity Credit Report

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00009555/BAAS17005/18/00009616	Concrush	24/02/2018
Assessor Name	Report Created	BAM Data version *
Kate Connolly	18/06/2018	3
Assessor Number	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BAAS17005		

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Candidate SAII	Ecosystem credits
Swamp Oak - Sea Rush - Baumea juncea swamp forest on coastal lowlands of the Central Coast and Lower North Coast								
1	1727_Bund	13.9	0.0	0.25	High Sensitivity to Potential Gain	1.75		0
2	1727_Regen	11.9	0.0	0.25	High Sensitivity to Potential Gain	1.75		0
							Subtotal	**0**
							Total	**0**

BAM Credit Summary Report

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Candidate SAII	Species credits

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