

STAGE 1 BIODIVERSITY MANAGEMENT PLAN

June 2019
J156455-04

NSW Health Infrastructure
Tweed Valley Hospital

C107778: DL

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Document and Project Control

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Site Details:			Tweed Valley Hospital		
Project Number:			J156455-04		
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Client Number:			C107778		
Signatures:					
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Conflict of Interest Statement		<p>Greencap warrants that as at the date of lodgement of the Stage 1 Biodiversity Management Plan , no actual, perceived or potential conflict of interest exists between it or between any one or more of Greencap’s officers, employees, consultants or agents and Health Infrastructure, or is likely to arise in relation to the Report that is submitted for this project, and if any conflict of interest arises or is likely to arise Greencap will immediately notify Health Infrastructure in writing of that actual, perceived or potential conflict of interest.</p>			

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Stage 1 Biodiversity Management Plan

NSW Health Infrastructure Tweed Valley Hospital

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Glossary, Acronyms and Abbreviations

Abbreviation	Definition
APZ	Asset Protection Zone
BC Act	<i>Biodiversity Conservation Act 2016</i>
BC Regulation	<i>Biodiversity Conservation Regulation 2016</i>
BAM	<i>Biodiversity Assessment Method Order 2017</i>
Coastal Management SEPP	State Environmental Planning Policy (Coastal Management) 2018
CKPoM	Tweed Coast Comprehensive Koala Plan of Management 2015
EEC	Ecological communities that are listed as 'endangered' under the <i>Biodiversity Conservation Act 2016</i> .
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cth)
FMP	Fauna Management Plan
LGA	Local Government Area
OEH	Office of Environment and Heritage
PCT	Plant Community Type
PMF	Probable Maximum Flood
TEC	Ecological communities that are listed as 'threatened' under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> and the <i>Biodiversity Conservation Act 2016</i> .
TSC	Tweed Shire Council
VI	Vegetation Integrity
VMP	Vegetation Management Plan
WM Act	NSW Water Management Act 2000
WoNS	Weeds of National Significance
WQMP	Water Quality Management Plan

1. INTRODUCTION

1.1 Overview

Greencap Pty Ltd (Greencap) was commissioned by TSA Management (TSA) on behalf of Health Infrastructure to prepare a Biodiversity Development Assessment Report (BDAR) to support the approval process for the proposed Tweed Valley Hospital (the Project). The approval process for the Project consists of a State Significant Development (SSD) application under Section 4.22 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). All projects which are classified as SSD require the preparation of a BDAR in accordance with the requirements of the NSW *Biodiversity Conservation Act 2016* (BC Act) and the *Biodiversity Assessment Method Order 2017* (BAM).

The BDAR (Greencap 2019) identifies a range of measures to avoid, minimise or mitigate the potential impacts of the Project on biodiversity. This Stage 1 Biodiversity Management Plan (Stage 1 BMP) provides a plan for how these commitments will be actioned.

1.2 Purpose, aim and objectives

The aim of this Stage 1 BMP is to identify the activities that will be undertaken to avoid, minimise and/or mitigate impact on biodiversity during the early works construction of the Project. The purpose of this Stage 1 BMP is to provide an implementation plan for what, when, how and by whom these activities will be undertaken during pre-construction, construction and operational phases. The objectives of the Stage 1 BMP are to:

- Avoid, minimise and mitigate the impact of the project on threatened species and ecological communities;
- Enhance existing flora and fauna habitats and corridors that are proposed to be retained; and
- Control the movement of weeds on and off the Project site in accordance with the general biosecurity duty.

This Stage 1 BMP is comprised of three sub-plans, namely:

- Vegetation Management Plan (VMP) in Section 2;
- Fauna Management Plan (FMP) in Section 3; and
- Water Quality Management Plan (WQMP) in Section 4.

The three sub-plans are to be implemented during the Stage 1 pre-construction and construction phases of the Project and include adaptive management measures for impacts on biodiversity that are uncertain.

1.3 Related plans

As per SSD Schedule 3 Condition B25, a Construction Environmental Management Plan (CEMP) outlines measures to mitigate environmental impacts during the construction phase. The CEMP addresses a range of indirect impacts on biodiversity that were identified in the BDAR (Greencap 2019). This stage 1 BMP refers to the *Project Construction Environmental, Health & Safety Management Plan (CEMP)*. Issue No 5.0 (LLB 2019).

The CEMP contains several sub-plans, including but not be limited to, the following:

(a) Details of:

- (i) hours of work;
- (ii) 24-hour contact details of the site manager;
- (iii) management of dust and odour to protect the amenity of the neighbourhood;
- (iv) stormwater control and discharge;
- (v) measures to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving the site;
- (vi) groundwater management plan including measures to prevent groundwater contamination;
- (vii) external lighting in compliance with AS 4282-1997 Control of the obtrusive effects of outdoor lighting;
- (viii) community consultation and complaints handling;
- (b) Construction Traffic and Pedestrian Management Sub-Plan (condition B27 Schedule 3);
- (c) Construction Noise and Vibration Management Sub-Plan (condition B28 Schedule 3);
- (d) Construction Waste Management Sub-Plan (condition B29 Schedule 3);
- (e) Construction Soil and Water Management Sub-Plan (condition B30 Schedule 3);
- (f) Flood Emergency Response Sub-Plan (condition B31 Schedule 3);
- (g) Construction Air Quality Management and Dust Management Sub-Plan (condition B32 Schedule 3);
- (h) details of location of protective fencing (exclusion fence) to protect the vegetation on the Site, identified for retention in the approved plans in condition A2 of Schedule 3;
- (j) details to demonstrate that the proposed exclusion fence on the site would not impinge on species movement within the site and the adjoining 'coastal wetlands' during the construction works;
- (j) An unexpected finds protocol for contamination and associated communications procedure.

Whilst not strictly relating to impacts on biodiversity, the Landscape Management Report (LMR; Turf 2019) overlaps with this Stage 1 BMP. The corresponding Landscape Zonal Concept Plan (Turf 2019) which was developed as part of Stage 1 works but will be implemented under Stage 2, has been developed with consideration of the existing landscape context and ecology with plant selection that relates to the local climate and landscape character. It is intended that this Stage 1 BMP informs the development of implementation plans subsequent to the LMR.

1.4 Legal requirements

1.4.1 Related environmental legislation

The following legislation is applicable to the management of biodiversity on this site:

- *Biodiversity Conservation Act 2016*
- *Environmental Planning and Assessment Act 1979* and related instruments, including:
 - SEPP Coastal Management 2018
 - SEPP 44 Koala Habitat Protection
- *Coastal Management Act 2016*

- *Biosecurity Act 2015*; and
- *Environmental Protection and Biodiversity Conservation Act, 1999 (Cth)*

1.4.2 Conditions of approval

The State Significant Development (SSD 9575) Final Conditions of Consent dated 11 June 2019 Conditions B33 and B34 as per Schedule 3 Part B – Prior to Commencement of Construction are addressed in this Stage 1 BMP as shown in **Table 1**.

Table 1 Final conditions

Condition	BMP Reference
B33. The Applicant must prepare a Biodiversity Management Plan for the Stage 1 works (Stage 1 BMP) and the plan must address, but not be limited to the following: (a) all recommendations to mitigate the direct, indirect and prescribed impacts for Stage 1 works contained in the endorsed BDAR, the MNES Report and the management and mitigation measures in Appendix 2;	Section 1.11
(b) details of measures to protect the vegetation on the northern part of the Site, specifically the coastal wetlands mapped under Coastal Management SEPP;	VMP Section 2 Protection of trees during Stage 1 works (pre-construction and construction)
(c) details of measures to protect all trees identified for retention in Drawing No L-EIS-1 Rev F Tree Removal and Preservation Plan prepared by Turf Design dated 03/05/2019 and in the Preliminary Arboricultural Report prepared by Arbor safe dated 17 October 2018	VMP Section 2 Section 2.3; Table 4 (Items 1 and 2)
(d) the feasibility of translocation of the one <i>Cryptocarya foetida</i> proposed to be removed from the Site;	VMP Section 2 Section 2.3; Table 4 (Item 15)
(e) a Vegetation Management Sub-Plan (VMP) for the Site during the construction works;	VMP Section 2
(f) a Habitat Management Sub-Plan (HMP) for the identified threatened species, ecological endangered communities (EEC) and threatened ecological communities (TEC) including the Koala food trees Zone 6;	Introduction Section 1.10 VMP Section 2 FMP Section 3 and WQMP Section 4
(g) A Fauna Management Sub-Plan (FMP) for the Site including details of impacts and proposed mitigation measures due to impact on movement, construction traffic, proposed construction hours, details of any fencing, restricting developments in identified areas, light spill, construction noise and on-site crane movements; and	FMP Section 3
(h) measures to communicate to the construction workforce the biodiversity values that are to be retained and protected.	VMP Section 2 Section 2.3; Table 4 (Item 16); Table 6 (Item 72)

Condition	BMP Reference
B34. The Stage 1 BMP must be prepared in consultation with OEH and be submitted to the Planning Secretary for approval prior to the commencement of any works on the Site, approved under Stage 1 of this consent.	Introduction Section 1.9

1.5 Guidelines and standards

A range of guidelines and industry standards have been referenced throughout this plan including:
Industry specific guidelines

- *AS 4970-2009 Protection of trees on development sites* (Standards Australia 2009)
- *Byron Shire Council: Excluding cane toads from water bodies* (BSC 2013)
- *National Standards for the Practice of Ecological Restoration in Australia* (SERA 2018)
- *New South Wales Weed Control Handbook: A guide to weed control in non-crop, aquatic and bushland situations, NSW DPI Management Guide* (DPI 2018)
- *Planning for Bushfire Protection* (RFS 2006)
- *Standards for Asset Protection Zones* (RFS 2007)
- *Subtropical Rainforest Restoration: A practical manual and data source for landcare groups, land managers and rainforest regenerators* (BSRLG 2005)
- *Tweed Shire Council: Native Species Planting Guide* (TSC 2019)
- *Tweed Shire Council: Development Design Specification D7 Stormwater quality* (TSC 2016)
- *Water Sensitive Urban Design: Technical design guidelines for south east Queensland* (Healthy Waterways 2006).

The full citation the above and other references are detailed in **Section 6**.

1.6 The Site

The Project site is located at 771 Cudgen Road, Cudgen (Lot 11 DP 1246853) within the Tweed Shire Council LGA (**Figure 1** and **Figure 2**) (the 'Site'). The 19.4 ha Site is located between the existing residential areas of Kingscliff and Cudgen, situated opposite Kingscliff TAFE. Approximately 16.4 ha of the Site is above the Probable Maximum Flood (PMF), a legislated requirement for hospital developments.

The northern section of the Site is located on the Tweed River floodplain and is part of an important forested wetland that has been mapped under *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP). The wetland is part of a mapped regional fauna corridor (Department of Environment, Climate Change and Water [DECCW], 2010;) and is a significant stepping-stone habitat to the Cudgen Creek estuary located approximately 800 m to the south-east of the Site.

The southern section of the Site was a working farm under cultivation (approximately 16.3 ha) and apart from the self-sown windrows along the Site boundary, most of the southern section has been cleared of native vegetation.

The northern section of the Site has high biodiversity value and is part of a mapped fauna corridor that affords connectivity and enables the movement of threatened species. At a local scale this

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forested wetland with associated rainforest components blends eastward into a coastal floodplain wetland (Keith, 2004) that extends to within 200 m of the coast. This area of remnant vegetation has been avoided by the development footprint and therefore avoids directly impacting threatened species and Threatened Ecological Communities (TECs). Direct impacts on several other windrows located along the western, southern and eastern boundaries of the site have also been avoided.

The only areas of native vegetation proposed to be cleared are parts of the self-sown windrows in the southern section of the Site. These windrows are composed of self-sown early regrowth rainforest species and also contain High Threat Exotic woody weeds including mature planted slash pine *Pinus elliottii* with an understory predominately consisting of camphor laurel *Cinnamomum camphora*, small leaved privet *Ligustrum sinense* and umbrella tree *Schefflera actinophylla*.

1.7 The Project

The Project will be developed in two stages. Stage 1 includes concept proposal as well as early and enabling works consisting of:

- Construction compound for Stage 1 Works;
- Augmentation and connection of permanent services for the new facility (water, sewer, electricity, telecommunications);
- General clearance of Site vegetation within the footprint of construction works, including tree stumps;
- Chipping of cleared vegetation (excluding weed species) to use on Site for ground stabilisation/ erosion control, or off-site disposal as required;
- Bulk earthworks to establish the required site levels and create a stable landform in preparation for hospital construction;
- Piling and associated works;
- Stormwater and drainage infrastructure for the new facility;
- Rehabilitation and revegetation of part of the wetland area;
- Construction of internal road ways for use during construction and in preparation for final road formations in Stage 2;
- Retaining walls;
- New Site Accesses and Turnock Street Roundabout Improvements; and
- Remediation

In Stage 2, works will include detailed design, construction and operation of the Tweed Valley Hospital, including the roadway upgrades at the Tweed coast Road/Cudgen Road intersection area as shown in **Figure 2**.

This Stage 1 BMP has been prepared for the Stage 1 early works based on the concept design and Project information made available for Stage 1. The concept masterplans for the development are identified in **Appendix A**.

1.8 Timing

The timing of the Stage 1 BMP early works activities has been described as per the following two Project phases:

- Pre-construction (P); and
- Construction (C).

In this Stage 1 BMP the Construction (C) phase activities only include early works as described in **Section 1.7**.

1.9 Consultation

In accordance with Schedule 3 Condition B34, this Stage 1 BMP has been prepared in consultation with the NSW Office of Environment and Heritage (OEH) and will be submitted to the Planning Secretary for approval prior to the commencement of any works on the Site, approved under Stage 1 of this consent.

Initial consultation with the OEH was undertaken by a teleconference meeting on 7 May 2019. Attendees were; Rachel Lonie (OEH), Stuart Clark (TSA), Sue Folliott (TSA), Steve Chaseling (TSA), Todd Lee (HI), Damian Licari (Greencap) and Christina Maloney (Greencap). Following this, Rachel Lonie (OEH), reviewed and provided feedback on the draft Stage 1 BMP Rev C document in May 2019. This final Stage 1 BMP Rev 1 document includes amendments based on the recommendations provided by the OEH.

1.10 Habitat Management Plan

In accordance with Schedule 3 Condition B33 (f), this Stage 1 BMP must include a Habitat Management Sub-Plan (HMP) for the identified threatened species, ecological endangered communities (EEC) and threatened ecological communities (TEC) including the Koala food trees Zone 6. Although a standalone HMP is not included in this BMP, the mitigation and management measures for the identified threatened species, EEC's and Koala food trees identified on or directly adjacent to the Site are addressed within the VMP (**Section 2**), FMP (**Section 3**) and WQMP (**Section 4**) sub-sections and therefore collectively these sub-plans address the requirements for a HMP.

1.11 Mitigation measures

This Stage 1 BMP addresses all recommendations to mitigate the direct, indirect and prescribed impacts for Stage 1 works contained in the endorsed BDAR, the MNES Report and the management and mitigation measures in Appendix 2 of the final conditions.

Mitigation measures and where they are addressed in this Stage 1 BMP is shown in **Attachment 1**.

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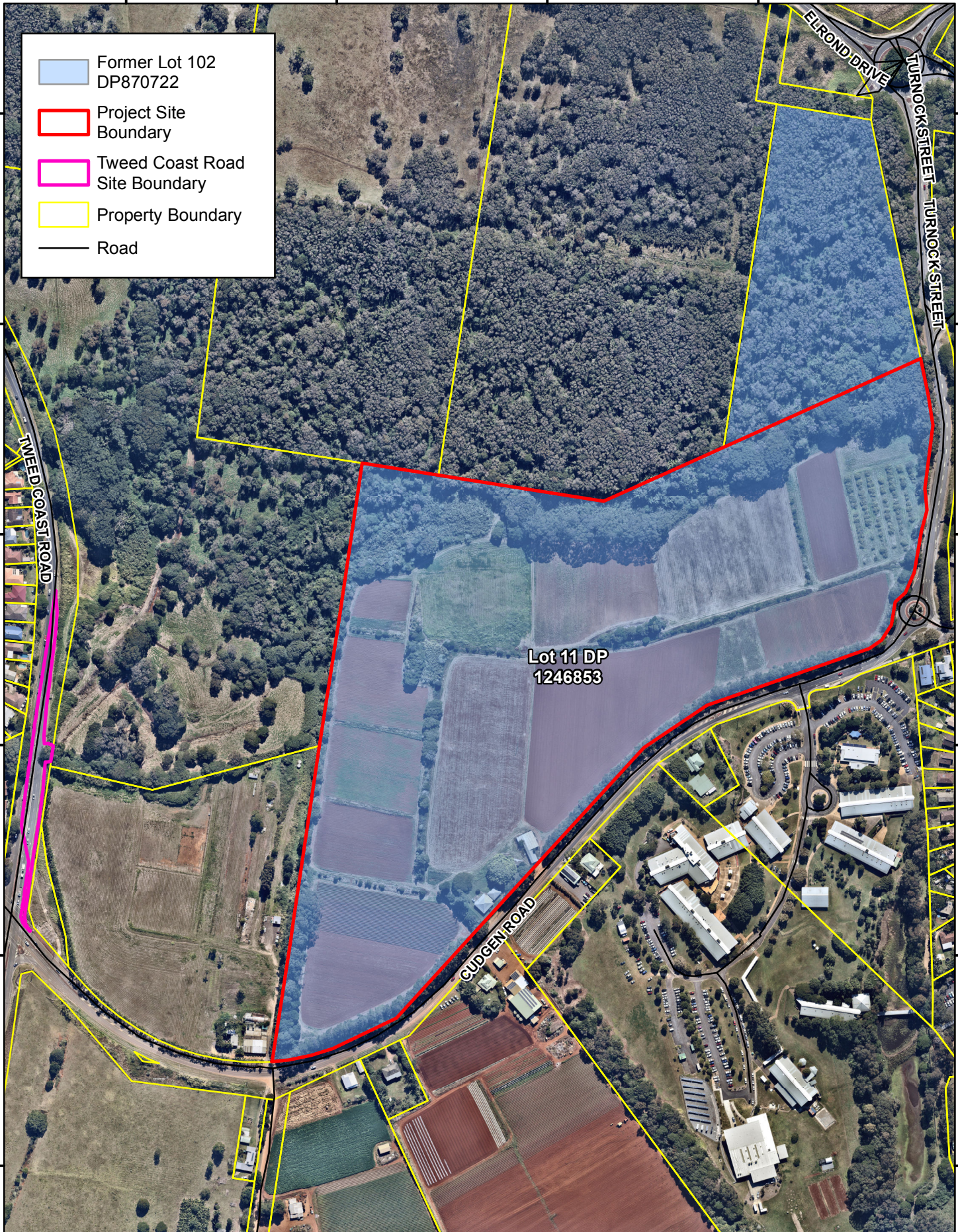
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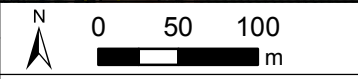
6873200

6873000

- Former Lot 102 DP870722
- Project Site Boundary
- Tweed Coast Road Site Boundary
- Property Boundary
- Road



Client: C107778
Job #: J156455
Author: M. Nunn
Checked: D. Licari
Date: 4/06/2019



Scale (@A4): 1:4,750

Coordinate System: GDA 1994 MGA Zone 56

Note: All data is approx only & subject to survey. Imagery 8th August 2018 (7.5 cm) © Nearmap 2018 Cadastre © NSW Department of Finance, Services and Innovation 2018

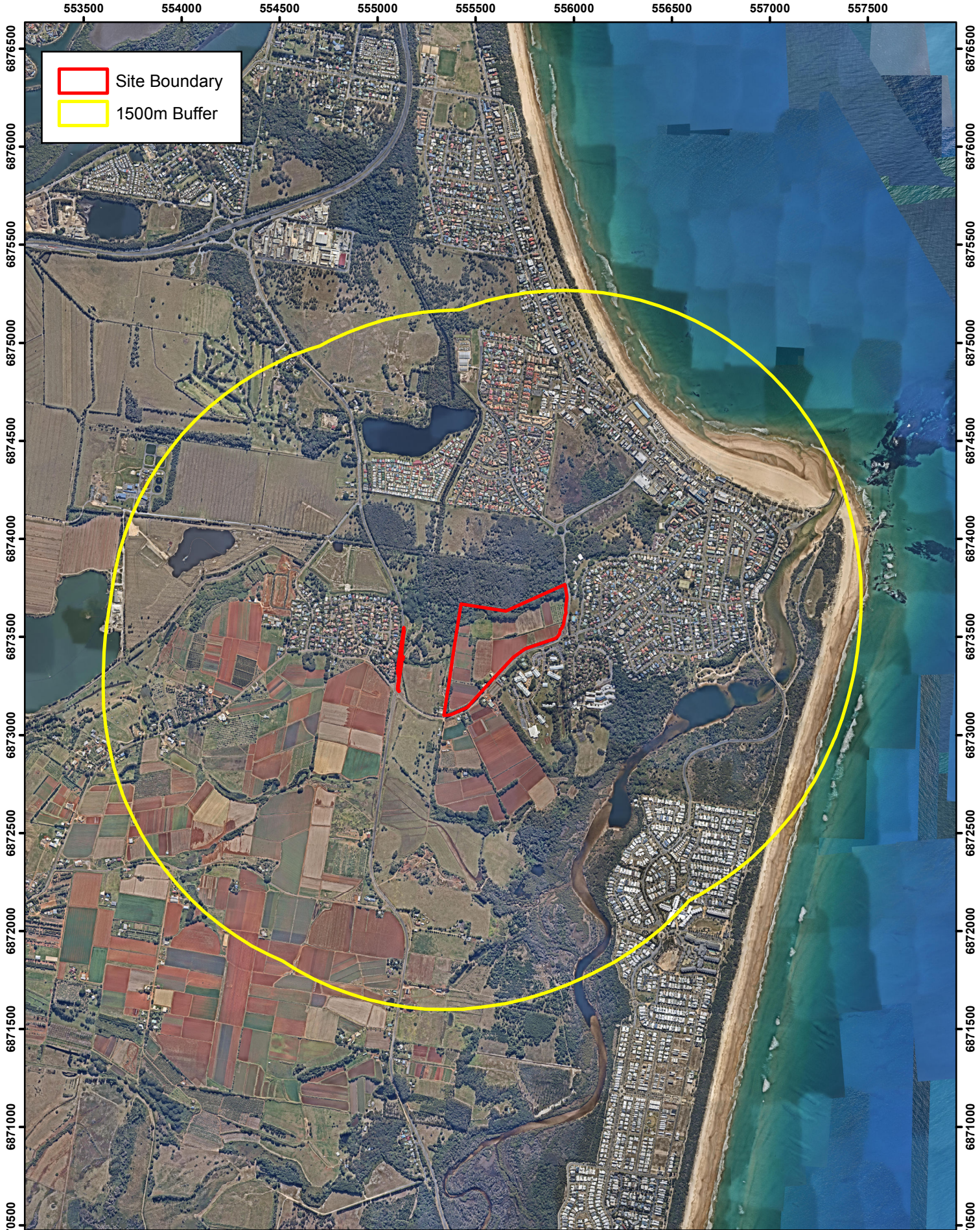
Site Map

Tweed Valley Hospital BMP
771 Cudgen Road
Cudgen NSW

**Figure
1**


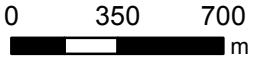


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	Site Boundary
	1500m Buffer

Client: C107778
Job #: J156455
Author: M. Nunn
Checked: D. Licari
Date: 4/06/2019
GREENCAP

		Scale (@A4): 1:25,000
Coordinate System: GDA 1994 MGA Zone 56		

Location Map	
Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW	Figure 2

*Note: All data is approx only & subject to survey.
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2. VEGETATION MANAGEMENT PLAN

2.1 Vegetation management aims and objectives

The objective of this Vegetation Management Plan (VMP) is to contribute to the conservation and enhancement of biodiversity values on the Site and avoid and mitigate any potential impacts on threatened species, in particular the Mitchell's rainforest snail *Thersites mitchellae* which have been identified adjacent to this site, Threatened Ecological Communities (TEC), koala food trees and the coastal wetlands mapped under Coastal Management SEPP. In order to achieve this objective, several activities will be undertaken at different phases of the Project during Stage 1 as outlined in **Table 4**. These measures will mitigate the residual impacts of the Project as outlined in the BDAR [Appendix I and J] Greencap (2019). This Vegetation Management Plan refers to the Vegetation Management Zones as shown in **Figure 6**.

2.2 Existing vegetation on the Site

Observations from field surveys indicated the presence of two distinct areas of vegetation (Greencap 2019). The northern section of the Site that is located on the floodplain is substantially remnant native vegetation. The southern section of the Site that is located on a ridge is land that has been substantially cleared of native vegetation.

The remnant native vegetation is classified as forested wetland and rainforest formations (Keith 2004; **Table 2**). Adjoining the remnant vegetation is a large patch of exotic vegetation near the north-west corner and planted eucalypt windrows classified as wet sclerophyll forest shrubby sub-formation. Along the southern edge of this vegetation and extending roughly west to east across the Site, rocks that have been cleared from the cultivated fields have formed a steep slope and, in some areas, have been fashioned into a dry-stone wall up to 3 m high.

Most of the southern section of the Site is cleared land under cultivation. Rocks that have been cleared from the cultivated fields have been piled into linear mounds composed of loosely consolidated rock and soil throughout the Site. Early regrowth rainforest species and woody weeds that are classified as High Threat Exotics (HTE) under the BAM have self-sown in these areas to form windrows classified as rainforest. Along the Cudgen Road/Turnock Street boundary there is a planted slash pine *Pinus elliottii* windrow with an understory also composed of self-sown early regrowth rainforest species and woody weeds. There is also a planted eucalypt windrow in the south-west corner of the Site classified as wet sclerophyll forest shrubby sub-formation. On the eastern boundary of the Site there is a planted casuarina windrow classified as a forested wetland.

Plant community types (PCT), TECs and BDAR vegetation zones were identified using plot-based vegetation surveys undertaken as part of development of the BDAR (Greencap 2019). A combination of the quantitative data recorded in the plot-based floristic vegetation surveys, mapping data and Site observations was used to identify PCTs and Vegetation Zones (**Table 2, Figure 3**). In addition to the data and information above, the Final Determinations of the former NSW Scientific Committee were then employed to confirm TECs that are located on the Site. It was assessed that two TECs are located on the Site, namely; Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC and Lowland rainforest on floodplain in the NSW North Coast Bioregion EEC, comprising of a total 1.8 ha (**Figure 3**).

A total of 63 native and 51 exotic plant species were recorded in vegetation surveys. All plant species recorded during the plot-based floristic surveys are presented in **Appendix B**. Given that the vegetation surveys were undertaken using a plot-based methodology this represents an indicative list of the plant species recorded on the Site, not a comprehensive inventory. Targeted flora species

greencap.com.au

surveys were also undertaken to address the requirements set out in the BAM (GreenCap 2019). Except for an observation of three, three-veined laurel *Cryptocarya foetida* plants there were no threatened flora species recorded during the targeted surveys (**Figure 4**).

All native vegetation on the Site will be retained with the exception of 0.95 ha of native White Booyong - Fig subtropical rainforest vegetation in self-sown windrows (Zones 4 and 8) which will be cleared for the Project (**Figure 5**). The majority of windrow vegetation on the southern site boundary along Cudgen Road will be cleared as documented in the Stage 1 BDAR (GreenCap 2019). However, native vegetation in the windrow marked as 'vegetation to be removed' in the Stage 1 BDAR Figure 21, which will eventually form part of the MZ 7 vegetation buffer during Stage 2 works, may be retained if possible.

Table 2 Plant Community Types, Threatened Ecological Communities and BDAR Vegetation Zones identified on the Site

PCT	PCT Common Name	Vegetation formation	Vegetation class	Threatened Ecological Community	BDAR Vegetation Zone	Condition class	Area (ha)
1064	Paperbark swamp forest	Forested Wetland	Coastal Swamp Forest	Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions EEC	1	Moderate	0.29
1302	White Booyong – Fig subtropical rainforest	Rainforest	Subtropical Rainforest	Lowland rainforest on floodplain in the NSW North Coast Bioregion EEC	2	Moderate	0.73
					3	Low	0.36
				Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	4	Self-sown windrow	0.61 (0.55 to be cleared)
1569	Flooded Gum – Brush Box – Tallowood mesic tall open forest	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forest	This PCT is not a TEC	5	Planted windrow	0.57
				This PCT is not a TEC	6	Planted windrow	0.29
1235	Swamp Oak swamp forest	Forested Wetland	Coastal Floodplain Wetlands	This PCT is not a TEC. Did not conform to Final Determination.	7	Planted windrow	0.05
1302	White Booyong – Fig subtropical rainforest	Rainforest	Subtropical Rainforest	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	8	Self-sown windrow	0.75 (0.40 to be cleared)
N/A	Barner Grass – Camphor Laurel – Small-leaf Privet exotic vegetation	N/A	N/A	N/A	9	Exotic	1.02

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







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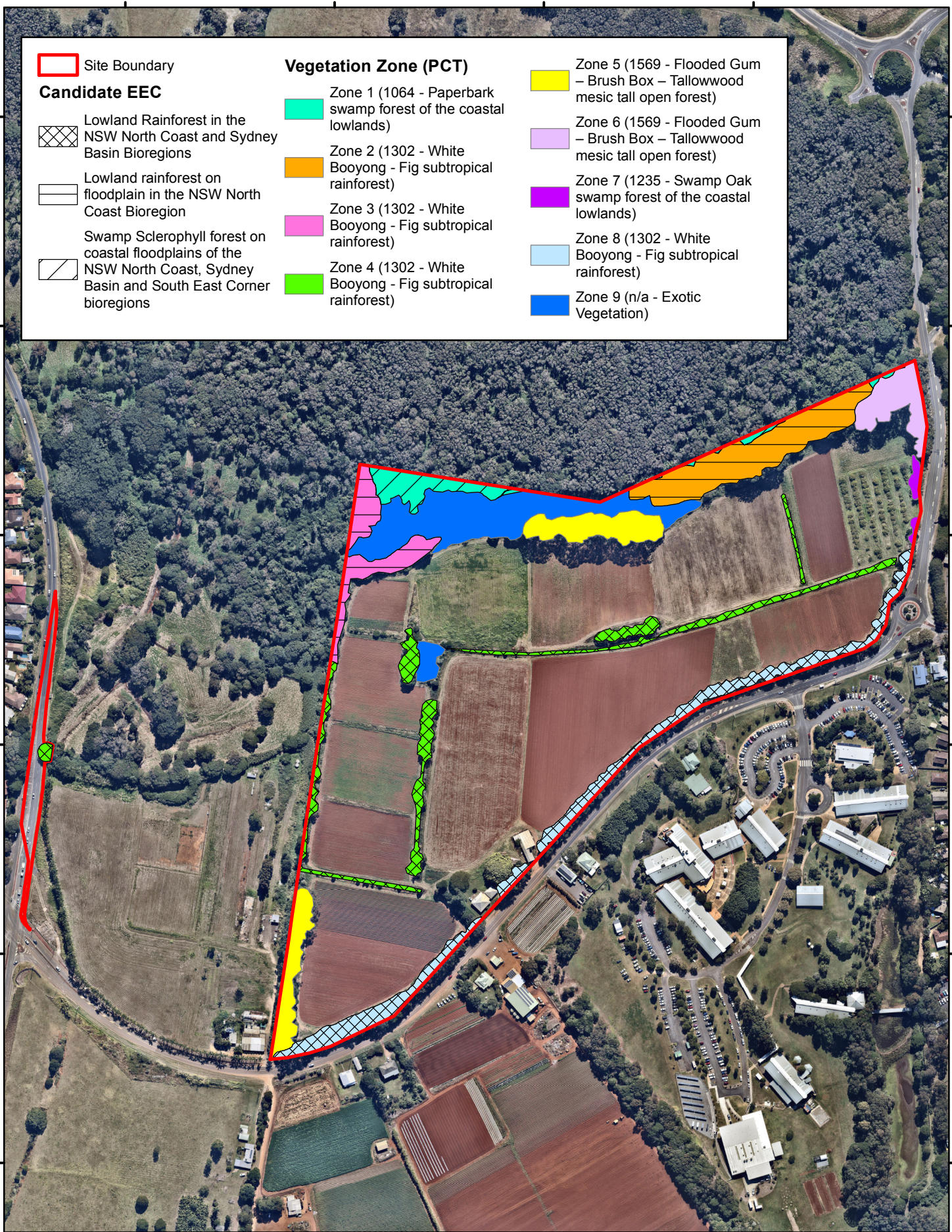
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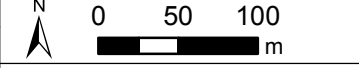

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 Site Boundary	Vegetation Zone (PCT)		 Zone 5 (1569 - Flooded Gum – Brush Box – Tallowwood mesic tall open forest)
Candidate EEC	 Zone 1 (1064 - Paperbark swamp forest of the coastal lowlands)	 Zone 2 (1302 - White Booyong - Fig subtropical rainforest)	 Zone 6 (1569 - Flooded Gum – Brush Box – Tallowwood mesic tall open forest)
 Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	 Zone 3 (1302 - White Booyong - Fig subtropical rainforest)	 Zone 4 (1302 - White Booyong - Fig subtropical rainforest)	 Zone 8 (1302 - White Booyong - Fig subtropical rainforest)
 Lowland rainforest on floodplain in the NSW North Coast Bioregion			 Zone 9 (n/a - Exotic Vegetation)
 Swamp Sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions			



Client: C107778		Scale (@A4): 1:4,750	BDAR Vegetation Zone (PCT) and Threatened Ecological Community	
Job #: J156455				
Author: M. Nunn	Coordinate System: GDA 1994 MGA Zone 56		Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW	
Checked: D. Licari	<i>Imagery 8th August 2018 (7.5 cm) © Nearmap 2018</i> <i>Vegetation mapping: Greencap (2018)</i>			
Date: 4/06/2019			Figure 3	
				
<small>No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.</small>				

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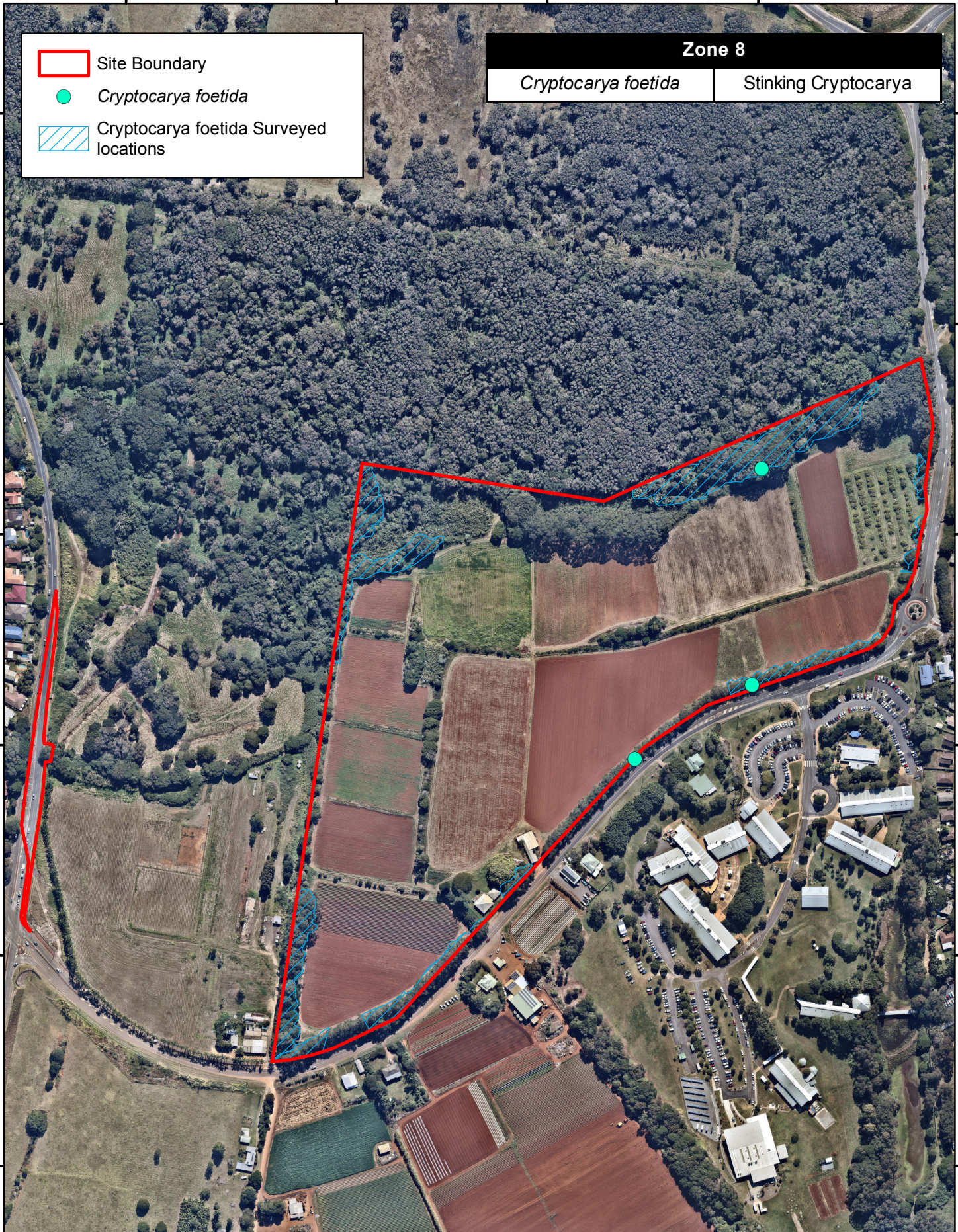
 Site Boundary

 *Cryptocarya foetida*


 *Cryptocarya foetida* Surveyed locations

Zone 8

<i>Cryptocarya foetida</i>	Stinking <i>Cryptocarya</i>
----------------------------	-----------------------------



Client: C107778
Job #: J156455
Author: E. Lewis
Checked: C. Maloney
Date: 4/06/2019

 0 50 100 m

Scale (@A4): 1:4,750

Coordinate System: GDA 1994 MGA Zone 56

Imagery 8th August 2018 (7.5 cm) © Nearmap 2018

Vegetation mapping: Greencap (2018)

**Threatened Flora -
Three-veined laurel
Cryptocarya foetida plants**

Tweed Valley Hospital BMP
771 Cudgen Road
Cudgen NSW

**Figure
4**



No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.

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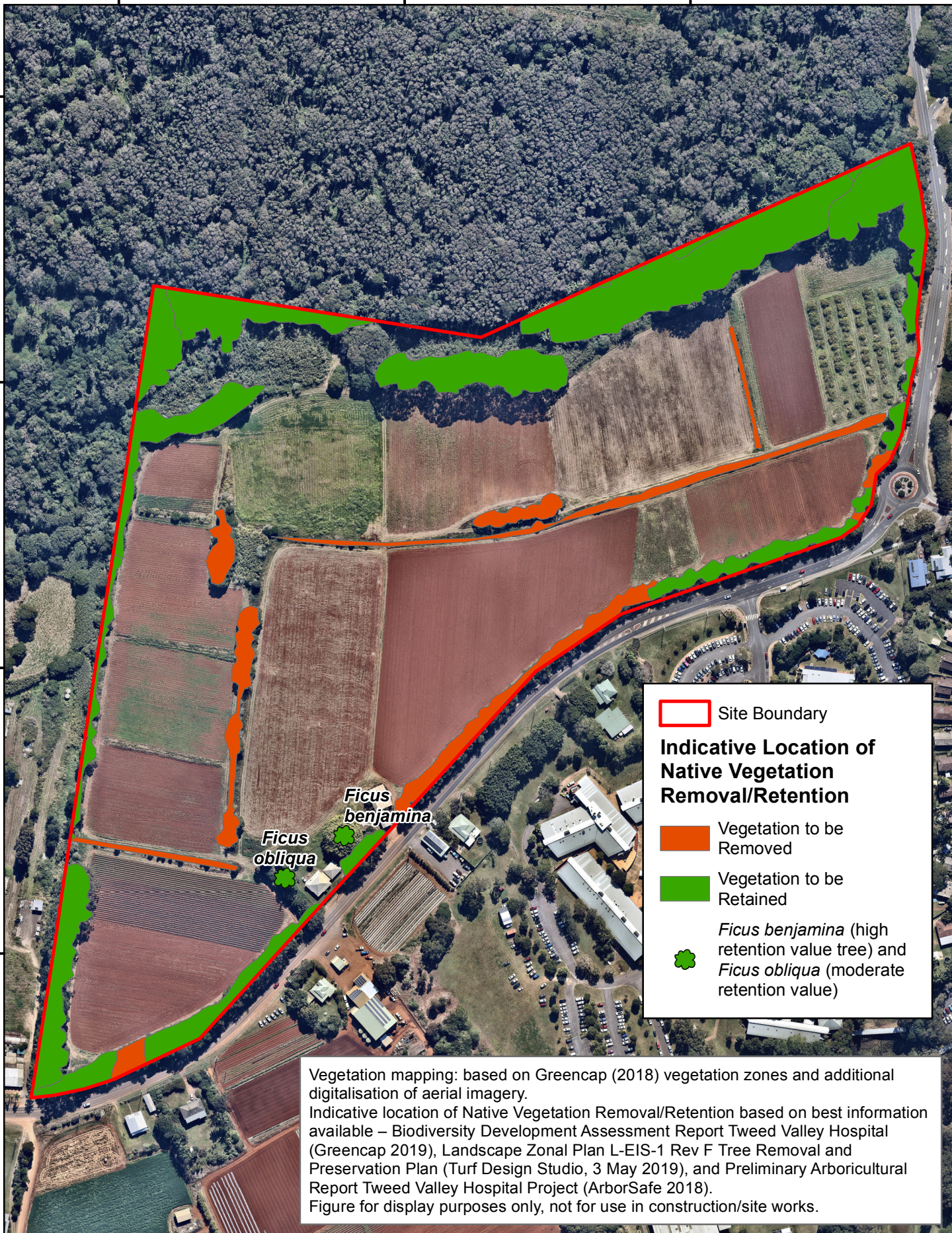
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Site Boundary

Indicative Location of Native Vegetation Removal/Retention

Vegetation to be Removed

Vegetation to be Retained

Ficus benjamina (high retention value tree) and *Ficus obliqua* (moderate retention value)

Vegetation mapping: based on Greencap (2018) vegetation zones and additional digitalisation of aerial imagery.
 Indicative location of Native Vegetation Removal/Retention based on best information available – Biodiversity Development Assessment Report Tweed Valley Hospital (Greencap 2019), Landscape Zonal Plan L-EIS-1 Rev F Tree Removal and Preservation Plan (Turf Design Studio, 3 May 2019), and Preliminary Arboricultural Report Tweed Valley Hospital Project (ArborSafe 2018).
 Figure for display purposes only, not for use in construction/site works.

Client: C107778		Scale (@A4): 1:3,500	<p>Indicative location of Native Vegetation Removal/Retention</p> <p>Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW</p>	
Job #: J156455		Coordinate System: GDA 1994 MGA Zone 56		
Author: M. Nunn	Imagery 8th August 2018 (7.5 cm) © Nearmap 2018			
Checked: D. Licari				
Date: 20/06/2019				
GREENCAP	<small>No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.</small>			

2.3 Vegetation management overview

To enable effective vegetation management throughout the life of the project this BMP identifies vegetation management zones (MZ) in **Figure 6**. The MZs reflect the landscape zones that have been identified in the landscape zonal plan (LZP) (Turf 2019) and MZs broadly reflect the BDAR Vegetation Zones (GreenCap 2019) as shown in **Table 3**.

A range of vegetation management activities will be implemented on the Site throughout Stage 1 of the project including:

- Weed control (biosecurity risk);
- Native vegetation protection; and
- Weed control monitoring, reporting and evaluation.

A range of general vegetation management and biosecurity controls to mitigate the impact of Stage 1 Project activities on biodiversity are identified in **(Table 4)**. Vegetation management activities including; revegetation, regeneration, maintenance, monitoring and reporting will be addressed in the Stage 2 BMP. Therefore, some management zones (i.e. MZ 6 and 7) will not be established until revegetation is undertaken in Stage 2.

Table 3 BMP Vegetation management zones

BMP Management Zone	BMP Management Zone (MZ) Description	LZP (Turf, May 2019)
1.1	Remnant paperbark swamp forest	Retained undisturbed forest
1.2	Remnant and regrowth white booyong – fig subtropical rainforest	
1.3	Flooded Gum tall open forest planted windrow	
1.4	Exotic vegetation – Barner grass <i>Cenchrus purpureus</i>	
1.5	Exotic vegetation – Camphor laurel <i>Cinnamomum camphora</i> with understorey of small-leaf privet <i>Ligustrum sinense</i>	
1.6	Flooded Gum and Tallowwood - dominated tall open forest planted windrow	
2.1	Low maintenance Native Landscape	Low maintenance Native Landscape
2.2	Self-sown native rainforest and exotic windrow with Barner grass <i>Cenchrus purpureus</i>	
2.3	Sediment basins	
3	Hospital Landscape	Hospital Landscape
4	Farm Landscape	Farm Landscape
5	WSUD car park and roadway planting	WSUD car park and roadway planting
6	10 m wide vegetated buffer	Vegetated buffer (10 m)
7	30 m wide vegetated buffer	Vegetated buffer (30 m)
8	Farm Dam	N/A

Table 4 General vegetation management controls

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
Protection of trees during pre-construction and construction						
1	Establish tree protection zone (TPZ) around all retained native vegetation, including the two high and moderate retention value <i>Ficus sp.</i> Trees	<ul style="list-style-type: none"> During Stage 1 vegetation protection exclusion fences (temporary boundary fence or TPZ) should be defined around all native vegetation to be retained in accordance with AS4970 – 2009 to address Conditions of Consent for Stage 1 Works Schedule 3 C25 Tree Protection and B33 (c). The TPZ must not be less than 2 m nor greater than 15 m (except where crown protection is required). As per the Preliminary arboricultural report (ArborSafe, October 2018), the TPZ for the high retention value tree Weeping fig <i>Ficus benjamina</i> is 15m and the SRZ is 3.9m and the TPZ for the moderate retention value tree Small leafed Fig <i>Ficus obliqua</i> identified for retention within the development footprint area is 12m, and the SRZ is 4.4m, measured at a radial distance from the centre of the trunk. The average TPZ for the regenerating native trees in the windrow along Cudgen Road boundary is 2m, as per Section 5.4.12 of the Preliminary arboricultural report (ArborSafe, October 2018), however, all vegetation protection exclusion fences should installed to allow for any revegetation works which will occur in the 10 m or 30 m wide vegetated buffers (MZ 6 and 7) and be managed as per Schedule 3 Conditions of Consent for Stage 1 Works C25 Tree Protection. Due to the limited space available for the proposed construction and the radial size of the TPZ's, construction works may be required within the TPZ's. If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ the project arborist must demonstrate that the trees would remain viable post construction (ArborSafe 2018). 	<ul style="list-style-type: none"> Retained trees and native vegetation are protected from construction related activity. Activity that is excluded from the TPZ includes: excavation (including trenching), parking of vehicles/plant, refuelling, cleaning/wash down, placement of fill and soil level changes (refer to AS4970 – 2009 for a comprehensive list of exclusions). 	<ul style="list-style-type: none"> Construction activity is excluded from the TPZ of retained vegetation. 	P, C	Management, Construction Contractor
2	Erect protective fencing and signage	<ul style="list-style-type: none"> Erecting temporary fencing around the tree protection zone of any retained trees and vegetation as per Figure 7. Install signage that identifies the TPZ. 		<ul style="list-style-type: none"> Temporary fencing 1.8 m high is to be erected before machinery and materials are brought 	P, C	Management, Construction Contractor

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
				onto Site and before commencement of works. <ul style="list-style-type: none"> ○ Once erected, temporary fencing must not be removed or altered without approval. ○ Shade cloth or similar material may be attached to reduce the transport of dust. ● Install signage that is visible from within the construction footprint to identify the TPZ. 		
Engagement of suitably qualified contractors						
3	Suitably qualified and experienced bush regeneration contractors must be engaged to undertake vegetation management works within areas containing native vegetation	<ul style="list-style-type: none"> ● Bush regeneration contractors must be members of the Australian Association of Bush Regenerators or fulfil the membership criteria. ● Team leaders should hold a Certificate III in Conservation & Land Management or possess equivalent field experience and certification. ● For bush regeneration works to be conducted in MZ 1.1-1.6 it is highly desirable that the contractor has demonstrated experience working in Mitchell's rainforest snail <i>Thersites mitchellae</i> (MRS) habitat. ● Bush regeneration contractors are not required to undertake vegetation clearance works within the areas of vegetation to be 	<ul style="list-style-type: none"> ● Bush regeneration contractors carry out best practice bush regeneration techniques in accordance with relevant legislation and/or guidelines. 	<ul style="list-style-type: none"> ● Evidence of membership, certification and experience is provided by contractors prior to engagement. 	P, C	Management, Bush Regeneration Contractor

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
		removed as depicted in Figure 5 or to undertake hydro mulching. <ul style="list-style-type: none"> Upon project approval, the bush regeneration contractor should be engaged and provide a detailed schedule of prioritised management actions for the site in consideration of the strategies outlined in Section 2.4. 				
4	Suitably qualified and experienced arborists must be engaged to undertake vegetation clearing works	<ul style="list-style-type: none"> Arborist contractors must be members of Arboriculture Australia or fulfil the membership criteria. Team leaders should hold Diploma of Arboriculture (Level 5) or possess equivalent filed experience and certification. 	<ul style="list-style-type: none"> Arborist contractors conduct vegetation clearing works in accordance with industry best practice. 		P, C	Management, Arborist Contractor
Managing biosecurity risk						
5	Establishment of a vehicle inspection and wash-down facility	<ul style="list-style-type: none"> Be established in a location to minimise the risk of weed spread both on- and off-site). The facility should be located: <ul style="list-style-type: none"> With consideration of the site's run-off and away from watercourses and drains A relatively flat area to help prevent run-off and to ensure operator safety A cleared, well-grassed area to reduce mud and minimise risk of undetected weed spread Away from the property boundary Install signage that identifies the inspection and wash-down facility. 	<ul style="list-style-type: none"> All personnel working on site are take reasonable measures to prevent, eliminate or minimise biosecurity risks. 	<ul style="list-style-type: none"> The facility is established prior to commencement of clearing works. The facility is inspected at least quarterly for weed seedlings which may have germinated from seeds washed off vehicles. <ul style="list-style-type: none"> Any weeds should be immediately controlled. 	C	Management, Construction Contractor
6	Develop and implement of inspection and	<ul style="list-style-type: none"> Washdown of vehicles, plant and equipment for seeds will be implemented based upon a risk evaluation, including visual inspection, based upon the activities being conducted (See item 5). 		<ul style="list-style-type: none"> Vehicle inspection and wash-down procedures are developed and 	P, C	All Site Personnel

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
	wash-down procedures	<ul style="list-style-type: none"> Vehicles, plant and equipment cannot leave the Site without being clean and free from weed and seed material. Vehicles will be cleaned in accordance with the 'Decontamination of vehicles and equipment guide' prepared by the NSW Department of Primary Industries available at: https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0010/545554/procedure-decontamination-vehicles-and-equipment.pdf 		implemented prior to clearing works.		
7	Top soil management	<ul style="list-style-type: none"> Topsoil stripped from areas containing high densities of weed will be managed appropriately to ensure that weed impacted top soil does not contribute to the spread of weeds across the Site. Weed inspections undertaken throughout preconstruction/construction including of topsoil stockpiles will identify the likely density of weed seeds expected to be in topsoil. 		<ul style="list-style-type: none"> Contaminated/potentially contaminated topsoil identified and managed appropriately. 	C	Management, Contractor
8	Implementation of wash-down procedures to keep entering/exiting vehicles free of weeds	<p>To prevent spreading weeds, all site personnel entering/exiting the site have a general biosecurity duty to keep their vehicle free of weeds by:</p> <ul style="list-style-type: none"> Ensuring as far as is reasonably practicable that all plant equipment and vehicles are free of plant material before entering the Site; Avoiding driving through weedy areas; Vehicles, plant and equipment that may have been exposed to weeds or weed seed (i.e. driven in areas off designated construction roads) shall be inspected and washed down on entering and exiting the site, it is the driver's responsibility to ensure a wash-down is completed; and Checking clothing, footwear and vehicle (including floor mats) on the completion of works. Plant material found in these items should be removed and appropriately disposed of in order to mitigate the biosecurity risk. 		<ul style="list-style-type: none"> Vehicles, plant and equipment entering/exiting Site are free of weeds. 	P, C	Management, Contractor
9	Communicate biosecurity risk	<ul style="list-style-type: none"> Training on biosecurity risk and vehicle inspection and wash-down procedures is undertaken during site induction. 		<ul style="list-style-type: none"> Personnel understand their obligations 	P, C	Management, All Site Personnel

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
	management to all personnel			regarding biosecurity risks.		
10	Disposal of weed contaminated material	<ul style="list-style-type: none"> Vegetation that has been cleared is to be mulched/chipped on site and disposed of at an approved green waste facility 		<ul style="list-style-type: none"> Contractors to provide documentation as evidence that weed contaminated material has been disposed of appropriately. It is an acceptable solution for weeds that have been treated with herbicide to be left <i>in situ</i>. 	P, C	Management, Contractor
11	Weed control monitoring and reporting	<ul style="list-style-type: none"> Following the completion of Stage 1 works, a final report evaluating the effectiveness of all weed control measures undertaken will be prepared and provided to the OEH within three months of the completion of Stage 1 works. 	<ul style="list-style-type: none"> Monitoring, reporting and evaluation of Stage 1 weed control measures. 	<ul style="list-style-type: none"> Final report submitted to the OEH 	C	Management, Contractor
Clearing of vegetation						
12	Approved vegetation clearing in BDAR Zones 4 and 8	<ul style="list-style-type: none"> Prior to the commencement of any clearing: <ul style="list-style-type: none"> Areas of vegetation approved to be cleared will be surveyed and the extent of the area will be marked on-ground with survey pegs. Areas of vegetation approved to be cleared will be identified on clearing plans that can be easily interpreted by clearing contractors. Clearing plans are to be provided to contractors responsible for clearing prior to commencing works. All personnel involved in the clearing works will be made aware of the clearing boundary on both the clearing plans and on ground. 	<ul style="list-style-type: none"> Only vegetation that is approved to be cleared is removed. 	<ul style="list-style-type: none"> Clearing of vegetation is only conducted within the surveyed clearing area. 	C	Management, Contractor

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
13	Removal of slash pine <i>Pinus ellioti</i> from retained vegetation	<ul style="list-style-type: none"> Staged removal of the mature slash pines <i>Pinus ellioti</i> from the windrows during the construction-clearance phase (Stage 1 and Stage 2) can be completed using mechanical removal. Great care must be taken to avoid any impact on native rainforest understory vegetation in areas which are to be retained as buffer zones. <i>Cryptocarya foetida</i> plants to be flagged for conservation in vegetation to be retained, see Figure 4. 	<ul style="list-style-type: none"> Self-sown early regrowth rainforest trees. 	<ul style="list-style-type: none"> Pines removed with no off target species damage 	Commencing in C	Management, Arborist Contractor
14	Weed control measures	<ul style="list-style-type: none"> Exotic vegetation - Camphor laurel <i>Cinnamomum camphora</i> with understorey of small-leaf privet <i>Ligustrum sinense</i> and Barner grass <i>Cenchrus purpureus</i> monocultures in MZ 1.4 and 1.5 are adjacent to the Subtropical rainforest vegetation which is habitat for the MRS, therefore a staged approach to remove this vegetation should be employed to mitigate any potential impacts of habitat desiccation. 	<ul style="list-style-type: none"> Exotic plant monocultures removed with no impact on adjacent threatened species habitat 	<ul style="list-style-type: none"> MRS monitoring criteria as per Section 3.2.2 	Commencing in P/C	Management, Bush Regeneration Contractor
15	Translocation of threatened plant <i>Cryptocarya foetida</i>	<ul style="list-style-type: none"> Prior to vegetation clearance, the single <i>Cryptocarya foetida</i> plant (sapling) along the Cudgen Road boundary windrow that will be cleared is to be translocated for conservation. Rhonda James from Bushland Restoration Services (2019, pers. comm. 6 June 2019) in a personal conversation provided the following recommendations for the translocation of the single <i>Cryptocarya foetida</i> sapling: The translocation will be undertaken by staged approach involving; <ol style="list-style-type: none"> Identifying the sapling within the area of vegetation to be cleared and erecting a temporary protective barrier around the sapling before any works begin, see Figure 7. Trenching around the sapling approximately a week prior to the translocation. Removing the sapling, preferably with machinery if available, or by hand digging. Translocating the sapling to a predetermined suitable area of native vegetation elsewhere on the Site (i.e. MZ 1.2 or 6) that will be retained. 	<ul style="list-style-type: none"> No avoidable loss of threatened plant species 	<ul style="list-style-type: none"> Successful translocation and survival of the <i>Cryptocarya foetida</i> plant 	P, C	Management, Specialist Ecologist Contractor

Item	Task	Description/method	Outcome	Performance measure	Project Phase ¹	Who
		e) Ongoing care and maintenance including regular checks, watering and weeding.				
16	Contractor awareness	<ul style="list-style-type: none"> • Information on this Stage 1 BMP including biodiversity values that are to be retained and protected are to be provided to all contractors during an induction prior to commencing works. Including, but not limited to; <ul style="list-style-type: none"> ○ All personnel involved in the clearing works will be made aware of the clearing boundary on both the clearing plans and on ground; ○ Biosecurity measures (i.e weed control); ○ Exclusion zones (i.e. TPZ and areas of conservation significance); ○ Fauna interaction protocols and Fauna Management Procedure; and ○ Waste management protocols. 	<ul style="list-style-type: none"> • Information outlining biodiversity values that are to be retained and protected to be included in the Site induction 	<ul style="list-style-type: none"> • No avoidable loss of threatened plant or animal species 	P, C	Management, Contractors

¹Project phases: Pre-construction (P) and Construction (C)

2.3.1 Weed management

2.3.1.1 Weeds identified on the Site

A total of 51 exotic plant species were recorded on Site including 18 species classified as High Threat Exotic (HTE) species under the BAM. Three of these HTE species are also classified as Weeds of National Significance (WONS), namely: ground asparagus *Asparagus aethiopicus*, bitou bush *Chrysanthemoides monilifera* and lantana *Lantana camara*. Exotic and HTE species that were recorded on the Site are detailed by MZ in **Appendix B**.

Several classes of weeds are defined under the *Biosecurity Act 2015*. No high priority weeds were detected during plot-based vegetation surveys undertaken as part of the BDAR, however, the regional priority weeds giant devil's fig *Solanum chrysotrichum* (MZ 1.1 and 1.2) and the State priority weed Bitou bush *Chrysanthemoides monilifera* (MZ 1.6) were recorded.

Field assessment of the existing farm dam located at the north of the Site (MZ 1.4) recorded dense mature infestations of salvinia *Salvinia molesta* (Greencap 2019). Salvinia is a WONS and is regulated under the *Biosecurity Act 2015* with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk. The presence of salvinia has substantially degraded this microhabitat. Management of this weed is discussed below in **Section 2.6** and will be addressed further in the Stage 2 BMP.

2.3.1.2 Stages of weed control

In order to ensure efficient and effective use of resources weed control will be undertaken by suitably qualified contractors using best-practice methods in three stages:

- Primary weed control;
- Secondary; and
- Maintenance.

The Stage 1 works involve the commencement of weed control measures (i.e. Primary and potentially Secondary stages) upon Stage 1 project approval. Primary weed control refers to the initial control of weed species on the Site that will be undertaken in accordance with published guidelines (i.e. BSRLG 2005; DPI 2018). It is anticipated that primary weed control will employ a range of techniques depending upon factors such as the species and life-stage of the weed and may include:

- Hand weeding
- Mechanical removal (e.g. slashing, cutting)
- Herbicide application (e.g. spot spraying, cut and paint, stem injection)
- Mulching
- Hydro mulching of cleared land
- Natural shading techniques (revegetation).

As a follow up to primary weed control, systematic and appropriately timed secondary weed control by experienced contractors is critical for ensuring long term success. Secondary weed control aims to control weeds that have regrown following primary treatment, new weeds that have germinated in response to the availability of resources (e.g. light, nutrients) and allow native plant species to re-establish.

Regular and ongoing maintenance of areas that have undergone primary and secondary weed control is critical to success and will be undertaken during Stage 2 works. Weeds can re-establish through

natural dispersal or from weed propagules remaining in the soil. Undertaking maintenance activity to control the movement of weeds on and off a site can be considered a reasonable measure for a landholder to undertake that is in accordance with the general biosecurity duty identified in the *Biosecurity Act 2015*.

2.3.1.3 Hydro mulching

In Stage 1 early works, areas of cleared land (MZ's 2.1, 2.3 and 4) will be treated with hydro mulching. The majority of land in MZ's 2.1 and 2.3 was treated with hydro mulch in the pre-construction phase, however ongoing maintenance throughout Stage 1 and Stage 2 will need to be undertaken to control weed growth in areas of bare or disturbed soil. The following process is recommended for the most efficient establishment and effective long term weed control (Marcus Koolen, Perfect Earth, Pers. comm., 27 February 2019):

- Prior to achieving successful weed control and full coverage with hydro mulch, irrigation should cease in all areas to reduce weed growth and allow greater sunlight access to soil surfaces which should assist desired grass germination;
- Slashing can be undertaken prior to herbicide treatment to remove weed flowers, prevent development of weed seed and to maintain sunlight access to topsoil to enable cover crop/native seed germination.
 - During months where flower and seed is not visible slashing will not be required.
 - For areas that cannot be mechanically slashed these will need to be managed through hand slashing or brush cutting;
- Apply primary weed control with an appropriate herbicide (e.g. broad-acre glyphosate);
- Leave treated areas for approximately 4 weeks to allow weed seeds germinate;
- Apply secondary weed control with an appropriate herbicide;
- 24 hours after secondary weed control, cultivate land running parallel to contour lines to prepare for hydro mulching;
 - Cultivation is more effective if weeds are ploughed-in before flowering and under reasonably dry conditions;
- Hydro mulch with grass seed mix;
 - Depending upon the season that hydro mulching is being conducted, it is recommended to use either a millet or a rye cover crop to suppress weed growth and improve soil condition (BSRLG 2005).
 - Grass seed varieties must be suitable for use within an APZ and must meet the requirements of Appendix 4 of Planning for Bushfire Protection (PBP) 2017.
 - Stabilisation of sediment basin banks is a high priority for hydro mulching and has been undertaken in pre-construction works.
- Establishment of grasses
 - Maintenance to control weeds is undertaken by slashing and/or spot spraying.
 - Upon inspections following the primary and secondary weed control measures and hydro mulching, should any notable or dense areas of weed species be observed, then these areas should be slashed/brush cut to remove flower heads and prevent weed seed formation.

2.4 Mitchell's rainforest snail *Thersites mitchellae* habitat weed control

For bush regeneration works conducted in the retained undisturbed forest (i.e. MZs 1.1-1.6) it is essential that the contractor has demonstrated experience working in Mitchell's rainforest snail (MRS)

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habitat. Upon Stage 1 SSD approval, a bush regeneration contractor should be engaged and provide a detailed schedule of prioritised weed management actions for the site in consideration of the strategies outlined below.

As described in **Table 5** the removal of barner grass *Cenchrus purpureus* in MZ 1.4 and woody weeds in MZ 1.5 should be undertaken in a staged approach together with revegetation of a hard edge in order to prevent desiccation of adjacent rainforest habitat.

Core habitat for MRS is in the paperbark swamp forest of MZ 1.1 and subtropical rainforest of MZ 1.2. Weed control within MZs 1.1 and 1.2 will be targeted (spot spraying, drill and fill or cut and paint methods) and staged to minimise any potential direct impact on the MRS. Weed control in MZ 1.1 and 1.2 should be undertaken in a staged approach to retain undisturbed areas for MRS habitat to allow areas under weed management to recover and regenerate with native plant species, thereby developing additional preferable habitat for the MRS.

Weed control activities should be initially undertaken in non-core areas of MZs 1.3 to 1.6 which contain a higher density of weeds. This will enable the MRS to disperse into the rehabilitated areas before disturbing the core MRS habitat (MZ 1.1 and 1.2). The following strategies have been adapted from the *Weed Reduction Strategy Mitchell's Rainforest Snail Habitat At specified section of Lot 13 DP871753 Kingscliff, New South Wales* by Bushland Restoration Services (January 2016) for restoration of MRS habitat. These were developed in consultation with Dr John Stanisic, an MRS expert, and should be undertaken to control weeds in MRS core habitat MZ 1.1 and 1.2;

- Plan activities and methods to minimise impact on canopy and forest debris (e.g. logs, leaf litter, fallen palm fronds and edges of the remnant vegetation);
- Identify and target invasive weed species that threaten or degrade MRS habitat (e.g. Madeira Vine *Anredera cordifolia*, barner grass *Cenchrus purpureus*, Morning Glory *Ipomoea indica* and climbing asparagus fern *Asparagus aethiopicus*);
- Stage the removal of weed species that provide MRS habitat (e.g. alexander palm *Archontophoenix alexandrae* and umbrella trees *Schefflera actinophylla*). These species should be controlled later as condition of the MRS habitat improves;
- Target areas along edges that do not provide habitat for MRS as a first priority (e.g. dense areas of Lantana *Lantana camara* or barner grass *Cenchrus purpureus*) to encourage fast-growing native rainforest species to colonise and create a new 'closed edge' and expand habitat; and
- Maintain areas under management by controlling weed regrowth and encourage regeneration of native species; and
- Report and evaluate progress as per **Section 2.5**.

2.5 Monitoring, reporting and performance criteria

Regular monitoring and reporting should be undertaken to evaluate the progress and compliance with the VMP. The monitoring programme should commence following completion of any primary and secondary weed control works undertaken during Stage 1.

The contractor will undertake monitoring in accordance with the performance criteria as specified below. If a performance criterion is not met, then a review of methods would be undertaken and follow up weed control measures would be implemented.

Following the completion of Stage 1 works, a final report evaluating the effectiveness of all weed control measures undertaken will be prepared and provided to the OEH within three months of the completion of Stage 1 works.

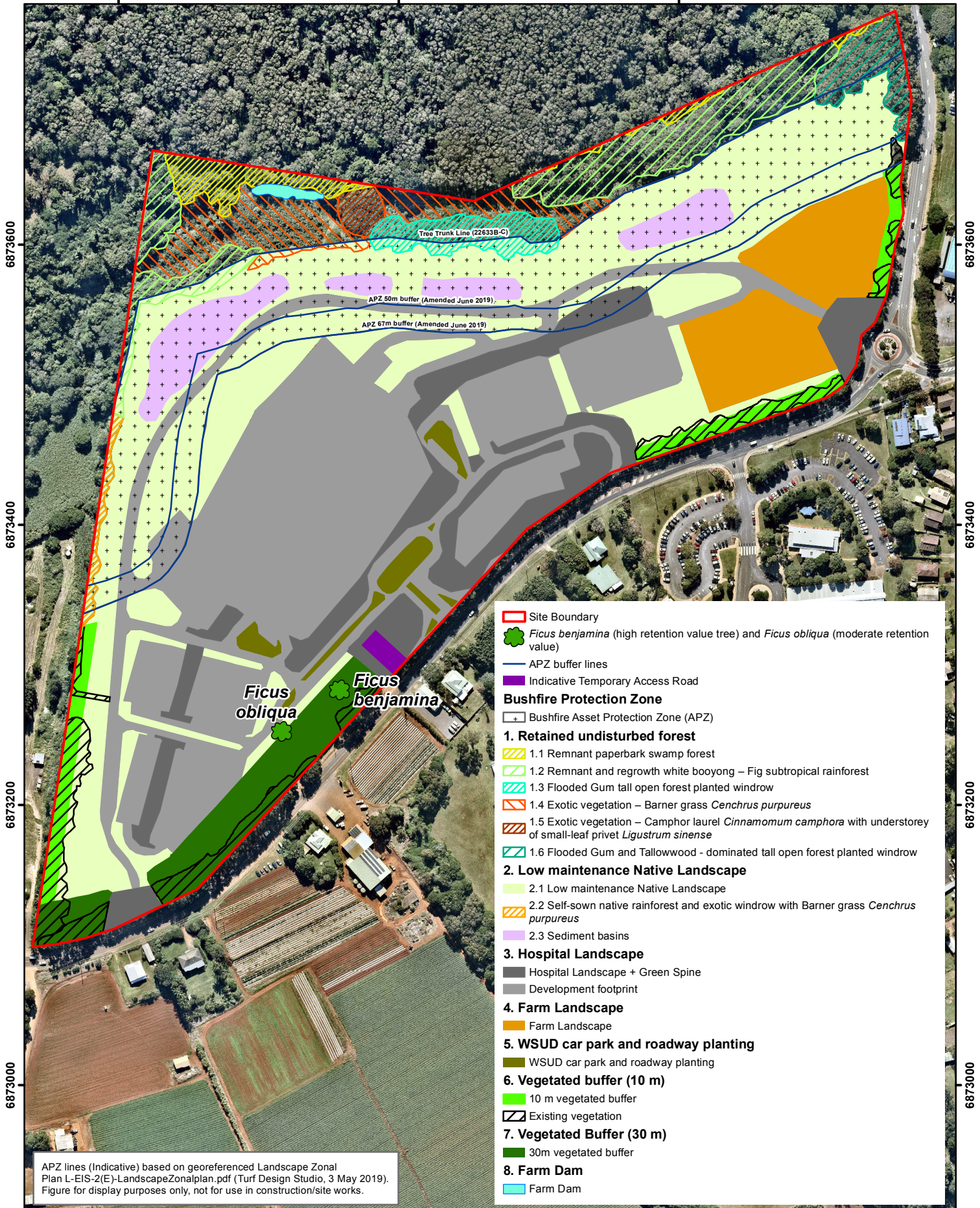
For each weed control event, contractors must complete a record of all works undertaken, including but not limited to:

General information

- Date;
- Personnel;
- Time including time spent on each task;
- Location;
- Works carried out;
- Weather;
- Site conditions;
- A description of any issues/problems;
- Quarterly photo monitoring images relative to the baseline (initial event);

Weed control

- Area treated;
- Weed control methods used;
- Herbicide and other chemicals used, including quantity, dilution rate and other relevant information;
- Weed species treated;
- If required, photos and/or maps of weed distribution and density; and
- Following completion of primary and secondary weed control works, key indicators of weed control success on the Site is less than 5% weed cover is recorded at every monitoring event.



- Site Boundary
- + *Ficus benjamina* (high retention value tree) and *Ficus obliqua* (moderate retention value)
- APZ buffer lines
- Indicative Temporary Access Road
- Bushfire Protection Zone**
- Bushfire Asset Protection Zone (APZ)
- 1. Retained undisturbed forest**
- 1.1 Remnant paperbark swamp forest
- 1.2 Remnant and regrowth white booyong – Fig subtropical rainforest
- 1.3 Flooded Gum tall open forest planted windrow
- 1.4 Exotic vegetation – Barner grass *Cenchrus purpureus*
- 1.5 Exotic vegetation – Camphor laurel *Cinnamomum camphora* with understorey of small-leaf privet *Ligustrum sinense*
- 1.6 Flooded Gum and Tallowwood - dominated tall open forest planted windrow
- 2. Low maintenance Native Landscape**
- 2.1 Low maintenance Native Landscape
- 2.2 Self-sown native rainforest and exotic windrow with Barner grass *Cenchrus purpureus*
- 2.3 Sediment basins
- 3. Hospital Landscape**
- Hospital Landscape + Green Spine
- Development footprint
- 4. Farm Landscape**
- Farm Landscape
- 5. WSUD car park and roadway planting**
- WSUD car park and roadway planting
- 6. Vegetated buffer (10 m)**
- 10 m vegetated buffer
- Existing vegetation
- 7. Vegetated Buffer (30 m)**
- 30m vegetated buffer
- 8. Farm Dam**
- Farm Dam

APZ lines (Indicative) based on georeferenced Landscape Zonal Plan L-EIS-2(E)-LandscapeZonalplan.pdf (Turf Design Studio, 3 May 2019). Figure for display purposes only, not for use in construction/site works.

Client: C107778		Scale (@A4): 1:3,500	Vegetation Management Zones	
Job #: J156455	Coordinate System: GDA 1994 MGA Zone 56		Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW	
Author: D. Correa				
Checked: C. Maloney	<small>Imagery 8th August 2018 (7.5 cm) © Nearmap 2018 Vegetation mapping: GreenCap (2018). Vegetation management zones based on best information available – Biodiversity Development Assessment Report Tweed Valley Hospital (GreenCap 2019), georeferenced Landscape Zonal Plan L-EIS-2(E)-LandscapeZonalplan.pdf (Turf Design Studio, 3 May 2019), Preliminary Arboricultural Report Tweed Valley Hospital Project (ArborSafe 2018), and the Civil Engineering Drawings Aerial Overlay (Indicative) (Lendlease Group, May 2019). Figure for display purposes only, not for use in construction/site works.</small>		Figure	
Date: 26/06/2019			6	
<small>GREENCAP No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.</small>				

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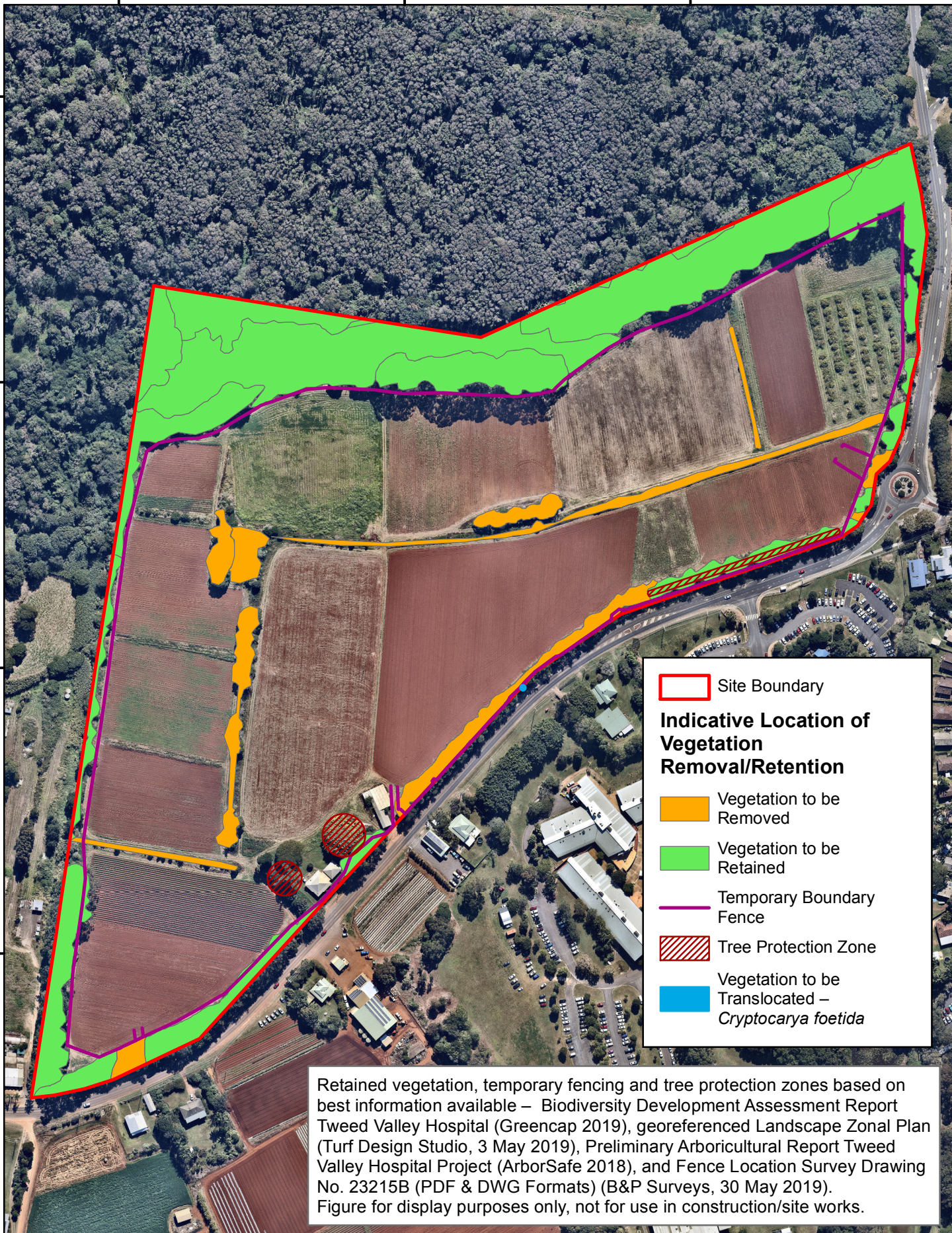
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Client: C107778		Scale (@A4): 1:3,500	Temporary Boundary Fencing and Vegetation Protection Fencing
Job #: J156455		Coordinate System: GDA 1994 MGA Zone 56	
Author: M. Nunn	Imagery 8th August 2018 (7.5 cm) © Nearmap 2018	Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW	
Checked: D. Licari		Figure 7	
Date: 26/06/2019			
		<small>No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.</small>	

2.6 Stormwater Management

Sediment basins will be incorporated into Stage 1 activities in order to minimise the impact of water quality and protect the TEC in the wetland area. Sediment basins (MZ 2.3) have been constructed as part of preliminary works which will capture and treat stormwater on the Site during the pre-construction and construction phases of the project. The sediment basins function by providing a large, standing body of water such that stormwater runoff entering the basins, which is laden with sediments, has a chance to settle to the base of the basin before it overflows via the weir into the receiving watercourse. The weir and headwalls have been constructed with rock scour protection which will dissipate the water via sheet flow across the land to mitigate any direct impact on native vegetation directly within the discharge area. The basins have been sized in accordance with the Landcom Blue Book. Each sediment basin is lined so water should only be able to escape by overtopping the weir or through evaporation. The basins have been designed for 5 day rainfall, and adequate settling is required four days from the conclusion of each storm event. Each basin will be dosed with flocculent per rain event and the sediment will typically settle and water quality will be confirmed by site specific testing prior to being pumped out within five days from the conclusion of a rainfall event.

The sediment basins will be converted to bio-detention basins which will be addressed in the Stage 2 BMP.

Water quality outcomes for Stage 1 of the Project are addressed further in the WQMP in **Section 4**.

Management of Cane toad *Rhinella marina* around sediment basins is addressed in the FMP, **Section 3.4**.

Plant selection

Plant selection which will be undertaken during Stage 2 works should consider the different species which are suitable for growing in different zones of the sediment and/or bioretention basins.

Salvinia exclusion

Aquatic weed infestations are common within the agricultural drains that are prevalent in the wetland area to the north of the site. Monitoring the sediment basins for aquatic weeds in (particularly salvinia *Salvinia molesta*) must be undertaken. Early detection is critical to eradicate an infestation before it has time to establish. Consideration should be given to planting native aquatic species such as nardoo *Marsilea mutica*, duck weed *Lemna spp.* or azolla *Azolla filiculoides* that may outcompete and potentially suppress the growth of salvinia *Salvinia molesta*.

2.7 VMP Overview

The guidance presented in this VMP is intended to facilitate effective vegetation management throughout Stage 1 of the project via the application of tailored weed control, maintenance, monitoring and reporting. The timing of various activities is also aligned with the different phases of the Project. **Table 5** provides a general overview of the key objectives, activities and timing.

2.7.1 Timing

The timing for weed control measures (primary and secondary) and maintenance (if required) as shown for each MZ in the Project Phase column of **Table 5** is indicative only. Weed control will commence during Stage 1 early works immediately upon Stage 1 SSD approval and continue throughout Stage 2. However, some measures, such as hydro mulching, have already been undertaken at the time of writing this Stage 1 BMP. Weed control measures undertaken during Stage 1 will include areas of priority, a product of the Management Zone Objectives as presented in **Table 5**, such as around the site entrances (sections of MZ 2.1, 6 and 7), the farm dam (MZ 1.4 and 1.5), the farm landscape (MZ 4), the low maintenance native landscape (MZ 2.1) and in the koala *Phascolarctos cinereus* habitat (MZ 1.6). Depending on specific requirements and timing considerations, weed control measures in some management zones may not commence until Stage 2. Therefore, weed control measures will also be addressed in the Stage 2 BMP.

Table 5 Description of Management Zones, Management Zone objectives, key activities and timing

Item	MZ ⁴	Description	Management Zone Objective	Key Activities	Description/method	Project Phase ¹	Who ²
17	1.1	Remnant paperbark swamp forest	<ul style="list-style-type: none"> Retain and restore biodiversity values Mitigate indirect impacts of development 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control in Paperbark swamp forest. 	C	Management, Bush Regeneration Contractor
18				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control. 	C	
19				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
20	1.2	Remnant and regrowth white booyong – fig subtropical rainforest	<ul style="list-style-type: none"> Retain and restore biodiversity values Mitigate indirect impacts of development 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control within White Booyong – Fig subtropical rainforest. Staged removal of weeds at edges. 	C	
21				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control. 	C	
22				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
23	1.3	Flooded Gum tall open forest planted windrow	<ul style="list-style-type: none"> Retain and enhance biodiversity values 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control in Flooded Gum tall open forest planted windrow. 	C	
24				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control. 	C	
25				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
26	1.4	Exotic vegetation – Barner grass	<ul style="list-style-type: none"> Revegetate to lowland 	Primary weed control	<ul style="list-style-type: none"> Conduct staged primary weed control within exotic vegetation Leave dead grass <i>in situ</i> to mulch down 	C	

Item	MZ ⁴	Description	Management Zone Objective	Key Activities	Description/method	Project Phase ¹	Who ²
27		<i>Cenchrus purpureus</i>	rainforest on floodplain	Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control 	C	
28			<ul style="list-style-type: none"> Increase area of habitat available for threatened species 	Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
29	1.5	Exotic vegetation – Camphor laurel <i>Cinnamomum camphora</i> with understorey of small-leaf privet <i>Ligustrum sinense</i>	<ul style="list-style-type: none"> Revegetate to lowland rainforest on floodplain Increase area of habitat available for threatened species 	Primary weed control	<ul style="list-style-type: none"> Conduct staged primary weed control within exotic vegetation Canopy trees are of a size that require drill/stem injection. Leave in situ or fell dead trees into MZ 1.4 as habitat features if practical. 	C	
30				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control 	C	
31				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
32	1.6	Flooded Gum and Tallowwood - dominated tall open forest planted windrow	<ul style="list-style-type: none"> Retain and enhance biodiversity values and Koala habitat values 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control within planted windrow 	C	
33				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control 	C	
34				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	
35	2.1 & 2.3	Low maintenance native landscape	<ul style="list-style-type: none"> Revegetate to form low maintenance landscape 	Primary weed control	<ul style="list-style-type: none"> Slashing (if required, see Section 2.3.1.3); Apply primary weed control with an appropriate herbicide (e.g. glyphosate); Leave treated areas for approximately 4 weeks to allow weed seeds germinate. 	P	Management, Weed Control/ Hydro mulch Contractor

Item	MZ ⁴	Description	Management Zone Objective	Key Activities	Description/method	Project Phase ¹	Who ²
36				Secondary weed control	<ul style="list-style-type: none"> Slashing; Spot spray with herbicide (e.g. glyphosate) 	P, C	
37				Maintenance ³	<ul style="list-style-type: none"> At least 4 maintenance rotations per year with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). Maintenance to control weeds that is undertaken by spot spraying and slashing (i.e. mechanical removal/ brush cutting). Follow up hydro mulch application where required. 	P, C	
38	2.2	Self-sown native rainforest and exotic windrow with Barner grass <i>Cenchrus purpureus</i>	<ul style="list-style-type: none"> Revegetate to lowland rainforest on floodplain Stabilise bund 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control in self-sown windrow vegetation (Subtropical + Exotic Barner grass along the Western Site boundary) 	C	Management, Bush Regeneration Contractor
39			Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control. 	C		
40			Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C		
41	4.0	Farm landscape	<ul style="list-style-type: none"> Retain for amenity value Reduce ability to act as a source of weed propagules 	Weed control	<ul style="list-style-type: none"> Brush cutting and spot spraying along row of orchard trees. Hydro mulch between rows as per method described in Section 2.3.1.3 	P	Management, Weed Control Contractor
42				Maintenance ³	<ul style="list-style-type: none"> Minimum of 6 maintenance rotations per year (slashing/brush cutting and spot spraying) to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	

Item	MZ ⁴	Description	Management Zone Objective	Key Activities	Description/method	Project Phase ¹	Who ²
					<ul style="list-style-type: none"> Follow up hydro mulch application where required. 		
43	6.0 and 7.0	10m and 30m wide vegetated buffers	<ul style="list-style-type: none"> Retain and revegetate to subtropical rainforest Increase area of habitat available for threatened species Create stepping stone habitat corridors across the site 	Primary weed control	<ul style="list-style-type: none"> Conduct primary weed control of woody and herbaceous weeds in understorey of slash pine <i>Pinus ellioti</i> windrow prior to removal clearing of slash pines. 	P	Management, Bush Regeneration Contractor
44				Secondary weed control	<ul style="list-style-type: none"> Secondary weed control to be conducted 6-8 weeks following primary weed control. 	P	
45				Clear exotic pines	<ul style="list-style-type: none"> Mechanical removal of slash pine <i>Pinus ellioti</i>, leaving understorey of self-sown regenerating rainforest trees and shrubs intact. 	C	Management, Arborist Contractor
46				Maintenance ³	<ul style="list-style-type: none"> 4 maintenance rotations per year to control weeds with provisions to allow for additional events during the peak growth period over summer and spring (i.e. every month). 	C	Management, Bush Regeneration Contractor
47	N/A	Project footprint	<ul style="list-style-type: none"> Prevent spread of weeds 	Primary/secondary and follow up weed control	<ul style="list-style-type: none"> See Section 2.3.1.3 for hydro mulching 4 maintenance rotations per year with provisions to allow for additional events during the peak weed growth period over summer and spring (i.e. every month). 	P, C	Management, Weed Control/Hydro mulch Contractor

¹ Project phases: Pre-construction (P) and Construction (C)

² Suitably qualified and experienced bush regeneration contractors must be engaged to undertake vegetation management works within all areas containing native vegetation with the exception of mechanical removal of slash pine *Pinus ellioti*.

³ Prior to the undertaking of each maintenance event a site inspection is to be completed to determine what, if any, weed control is required.

⁴ Vegetation management works within MZ 1.1 to 1.6 should refer to strategies to protect the MRS habitat as per **Section 2.4**.

3. FAUNA MANAGEMENT PLAN

3.1 Fauna management aims and objectives

The objective of this Fauna Management Plan (FMP) is to conserve and enhance biodiversity values on the Site and avoid and mitigate any potential impacts on threatened species, in particular the Mitchell's rainforest snail *Thersites mitchellae* (MRS), which has been identified adjacent to the Site. In order to achieve this objective, several activities will be undertaken at different phases of the Project during Stage 1 as outlined in **Table 6**.

These measures will mitigate the residual impacts of the Project as outlined in the BDAR [Appendix I and J] (Greencap 2019). This FMP refers to the Vegetation Management Zones (MZ) as shown in **Figure 6**.

3.2 Threatened Species

Threatened species surveys were undertaken on the Site in 2018 to inform the development of a Biodiversity Development Assessment Report (BDAR; Greencap, 2019). Targeted fauna surveys were undertaken using methodology as detailed in the BDAR (Greencap, 2019). There were no threatened fauna species recorded on the Site. However, the MRS was found outside and adjacent to the Project Site boundary (**Section 3.2.2**),

The following subsections address potential impacts of the Project on the known population of the endangered MRS directly adjacent to the Site and a small area of preferred habitat for the endangered population of koala *Phascolarctos cinereus* on the Site. Water quality impacts on pH dependent threatened amphibians in the downstream receiving wetland environment are also addressed. Furthermore, highly mobile threatened species that have been recorded in the Tweed LGA, namely; grey-headed flying fox *Pteropus poliocephalus*, eastern osprey *Pandion cristatus* and white-bellied sea eagle *Haliaeetus leucogaster* are described below and potential impacts on these species due to Project related aviation activities will be addressed in the Stage 2 BMP.

3.2.1 Koala *Phascolarctos cinereus* habitat

The Tweed Coast Koala *Phascolarctos cinereus* population between the Tweed and Brunswick Rivers east of the Pacific Highway is listed under the BC Act as an endangered population, consisting of an estimated 144 animals (TSC 2014). A small 0.2 ha area of preferred koala *Phascolarctos cinereus* habitat is located on Site in MZ 1.6, in the far north-east corner of the Site outside the Project footprint area (**Figure 6**). This vegetation contains preferred food source trees (Tallowwood *Eucalyptus microcorys*) and meets the definition of 'Secondary (Class A) Habitat' as defined in the Tweed Coast Comprehensive Koala Plan of Management (CKPoM) and 'Potential Koala Habitat' as defined in State Environmental Planning Policy 44 – Koala habitat protection 44.

Targeted koala *Phascolarctos cinereus* surveys were undertaken in July and December 2018 to inform the development of the BDAR, however no koalas *Phascolarctos cinereus* were recorded (Greencap, 2019). Whilst undertaking the survey, it was also observed that weedy vegetation and growth of vines would be challenging for koalas *Phascolarctos cinereus* to utilise the trees. Whilst no koalas *Phascolarctos cinereus* were recorded on Site during the BDAR surveys, measures will be taken to avoid any disruption to the movement or impacts on habitat connectivity for this species as outlined below in **Section 3.3** or any impacts during the native vegetation clearing activities as outlined below in **Section 3.7**. Weed control measures in the area of preferred koala *Phascolarctos cinereus* habitat (MZ 1.6) will commence during Stage 1 early works as outlined in the VMP **Sections 2.3** and **2.4**. Ongoing weed control works during Stage 2 will be a priority for this area of habitat. A tree protection zone (TPZ) and signage has been installed to protect this area of koala *Phascolarctos cinereus* habitat as outlined in the VMP **Section 2.3**.

3.2.2 Mitchell's rainforest snail *Thersites mitchellae*

3.2.2.1 Records

Figure 9 presents the locations of the MRS survey results and habitat (MZs 1.1 and 1.2) as well as an area of Subtropical rainforest restoration that will potentially provide further suitable habitat for this species (MZs 1.4 and 1.5). Three specimens were detected during surveys, however, all of these were recorded outside the Project Site boundary in the northern portion of former Lot 102 DP 870722. There was an opportunistic recording of MRS on 19 November 2018 by Dr Damian Licari and David Milledge. One live individual was recorded at the ecotone between the subtropical rainforest and paperbark swamp, and one dead shell was recorded on the perimeter of MZ 1.2.

Targeted diurnal and nocturnal surveys for the snail concentrating on windrow vegetation to be cleared were undertaken on 19 and 20 December 2018 by Dr Stephanie Clark (invertebrate identification specialist), Dr David Robertson and Craig Faulkner. Whilst no specimens were recorded in windrow vegetation to be cleared on Site, the target species was detected in paperbark forest in the northern extremity of former Lot 102 DP 870722. One living individual and three dead shells were found. In addition, there are known records for MRS (NSW BioNet database searched, 7 December, 2018) to the east and west of this location. The targeted survey undertaken by Dr Clark concluded that the clearance of 0.95 ha of rainforest vegetation from the proposed development area would not significantly impact Mitchell's rainforest snail habitat as this was not considered suitable habitat for MRS (Clark 2019).

3.2.2.2 Protection of snail populations and habitat

The MRS is classified as endangered in NSW under the BC Act (OEH 2018) and Critically Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and has an adopted recovery plan (NPWS 2001). Under the BMP, MRS habitat will be managed to protect this threatened species, including the management of vegetation and invasive species which may be harmful to threatened species, in particular weeds and rats which are one of the known threats to the MRS (OEH 2018; NPWS 2001). Ongoing long-term monitoring and reporting should be undertaken to establish an estimated population size at the Site and to monitor any changes in population over time. Changes to MRS populations are to be addressed with adaptive management actions. Mitigation and management measures to protect MRS populations are described below.

Vegetation Management

Vegetation in core MRS habitat (MZs 1.1 and 1.2) will be managed to protect and increase the quality of habitat by improving key habitat requirements of well-developed leaf litter and intact canopy (NPWS 2001). Stage 1 management activities will involve weed control as outlined in the VMP (**Section 2**) and assisted regeneration with rainforest plants which will be addressed in the Stage 2 BMP.

Under the BMP, the Vegetation Management Plan (VMP) incorporates revegetation of MZs 1.4 and 1.5 (total area of approx. 0.95 ha) which are currently dominated by weed species barner grass *Cenchrus purpureus* and camphor laurel *Cinnamomum camphora*. Once established, revegetation of MZs 1.4 and 1.5 will represent an overall net increase in MRS Subtropical rainforest habitat on the Site. Revegetation should consist of high density planting with a diverse range of rainforest species to achieve a closed canopy rainforest with a thick leaf litter cover which will be addressed in the Stage 2 BMP.

As described in the VMP **Section 2.4**, weed control activities within the retained undisturbed forest should be undertaken in a staged approach to minimise the disturbance on MRS habitat and preferably by a bush regeneration contractor who has demonstrated experience working in MRS habitat.

Bushfire prevention will be managed in accordance with the adopted guidelines (RFS 2006) and Asset Protection Zone (APZ) regulations (RFS 2007). Furthermore, during construction of the Project, if smoking is

to be permitted on site, designated smoking areas will be established and suitable receptacles will be provided for cigarette butts.

Pest management

Predation by introduced black rat *Rattus rattus* is a potential impact on the MRS (OEH 2018; NPWS 2001). Several black rats were detected on the Site during BAM surveys (Greencap 2019). This has consequently been identified as a potential threat to the MRS on the Site. Therefore, it is recommended that a black rat *Rattus rattus* control program be implemented during construction of the Project. In order to avoid impact on non-target native species, control measures are to be undertaken around the ancillary facilities and not within native animal habitat (i.e. MZs 1.1 to 7). A specialist pest control contractor should be engaged to develop a black rat *Rattus rattus* control program for the Site.

Water quality

The quality of stormwater entering the downstream wetland MRS habitat (MZs 1.1 and 1.2) will be managed and monitored in accordance to measures outlined in the WQMP in **Section 4** of this BMP.

Monitoring program

A Specialist invertebrate consultant, Dr Stephanie Clark, has been engaged to develop a scientific survey and monitoring program for the MRS. A pre-construction survey was undertaken in May 2019 to collect baseline data on population size, with further surveys to resume later in the year (likely September) when the weather warms and is more suitable for observing snails whilst they are more active. The survey was undertaken at night within the MRS habitat within the Site boundary (MZs 1.1 and 1.2). An ongoing repeatable monitoring program will ensure long term consistency of data to determine the population size.

It is recommended that ongoing, long term monitoring be conducted every second year (NPWS 2001) to identify any changes in the status of the species. Ongoing monitoring and reporting and adaptive management will be addressed in the Stage 2 BMP.

Reporting

As part of the baseline monitoring program, a specialist invertebrate consultant will submit a report including, but not limited to; date of survey, personnel, weather, areas surveyed, survey methodology, results of population size, observations, photos, impacts on the MRS, an evaluation of the monitoring program and any recommendations.

3.2.3 Aquatic fauna

During the development of the BDAR, two pH dependent amphibians were identified by the BAM Calculator as candidate threatened species – Wallum froglet *Crinia tinnula* and Olongburra frog *Litoria olongburensis* (Greencap, 2019). There are records for these species within the 1,500 m assessment area and within the receiving catchment.

The use of gypsum as a flocculent in the sediment basins to rapidly settle sediment-laden stormwater runoff during construction may have an impact upon pH dependent amphibian species following discharge to the downstream receiving wetland environment. To avoid any potential changes in pH and impacts on these threatened species, other commercially available flocculants that work as effectively as a gypsum replacement yet do not create the large changes in pH will be used on the Site.

As part of a Water Quality Monitoring Program as outlined in the Water Quality Management Plan (WQMP) in **Section 4**, physico-chemical parameters including pH will be monitored in water discharged from sediment basins and in the downstream wetland environment.

The impact of erosion and sedimentation on terrestrial and aquatic flora and fauna during Stage 1 early works will be managed in accordance with an erosion and sediment control plan (ESCP) prepared for the Site to effectively manage erosion and subsequent sediment mobilisations. The ESCP will be implemented prior to

the commencement of construction works, especially prior to the onset of each wet season (from late February to late April). The ESCP is reviewed and updated, as required, and at least annually prior to the onset of the wet season to reflect changes in site conditions as construction progresses. An erosion assessment will be conducted on these areas by a Certified Practitioner in Erosion and Sediment Control (CPESC) during the planning phase of the ESCP development. ESC design should be in accordance with the guidelines in the Landcom Blue Book.

3.2.4 Flying Fox Camps

Initial desktop assessment determined that there were two flying fox camps located within a 1 km radius of the Site (Grencap, 2018), however, there are no flying fox camps located on the Site. Potential impacts (injury/mortality) from aviation activities on flying foxes during operations of the Project will be addressed in the Stage 2 BMP.

3.2.5 Coastal Raptor Nests

No coastal raptor nests were recorded on the Site (Grencap, 2019). However, coastal raptors known from the Tweed LGA, and two known nests have been recorded within 1,500 m of the Site (TSC, 2018). Potential impacts (injury/mortality) from aviation activities on coastal raptors during the operations of the Project will be addressed in the Stage 2 BMP.

3.3 Habitat Connectivity

3.3.1 Fencing

The primary impact on movement of threatened species relates to boundary fencing of the site, noting that species would be able to move around the Project site unless impeded by a boundary fence. In respect of the current fencing on the site, the only existing permanent fencing in proximity to the site is the wildlife fencing along the Turnock St roadside. The Project will not impact this existing fencing.

Temporary boundary fencing has been installed during the pre-construction works. Tree Protection Zones (TPZ) will be installed around native vegetation and specific trees to be retained adjacent to the construction footprint (See VMP **Table 4** and **Table 5**). This temporary fencing will be removed at the conclusion of the construction phase of the development. Temporary boundary fencing has been fitted with a 'post and bridge' system at least every 50 m in accordance with published guidelines (KRS 2009) to facilitate movement of koala *Phascolarctos cinereus* and other arboreal marsupials. As per the Stage 1 SSD application, there is no intent for a permanent boundary fence to be installed for the operation phase of the Project, thereby allowing movement of threatened species.

3.3.2 Habitat corridors

Habitat connectivity will be maintained across the Site by vegetation management measures as outlined in the VMP (**Section 2.3**), primarily through the installation of TPZ's to protect retained native vegetation during the Stage 1 early works.

Importantly, to facilitate the movement of fauna, vegetated buffer zones (MZs 6 and 7) will be substantial (10 m and 30 m wide) and representative of forest types being connected by these zones. Vegetation buffer zones will connect to the retained Subtropical rainforest vegetation in the northern portion of the site and will run north to south in line with the mapped regional fauna corridor (**Figure 8**). This will provide important stepping stone and refuge habitat for threatened species and will represent an improvement in connectivity from the existing use of the Site. Revegetation will be undertaken during Stage 2 works and will be addressed in the Stage 2 BMP.

Furthermore, stormwater management will incorporate WSUD principles and the make use of landscaped areas for filtering runoff, swale drains and vegetated sediment basins. New plantings in MZs 2.3 and 5 as part of Stage 2 works will treat both stormwater quality and contribute to providing a range of native habitat or 'moist corridors' across the site.

Where possible, landscaping will include habitat features such as rocks that have been salvaged from other areas of the Site (cleared windrows) that will create habitat for ground dwelling species (Turf, 2018).

3.4 Pest animal management

No major pest species have been identified on the Site, with the exception of the black rat *Rattus rattus* which poses a potential impact on MRS populations. A black rat *Rattus rattus* control program will be implemented during Stage 1 of the Project as discussed in **Section 3.2.2.2**.

The introduction of pest species or disease onto the Site will be mitigated by installing an environmental protection area (or TPZ) to protect retained vegetation on the Site during construction. Furthermore, weed control and high density Subtropical rainforest revegetation across the Site will also provide habitat for specialist rainforest dependant species such as the Mitchell's rainforest snail *Thersites mitchellae* and avoid attracting open habitat generalist species or exotic species.

Cane toad exclusion

In accordance with TSC (2016) sediment basins on the site should incorporate measures to discourage breeding of cane toads *Rhinella marina* in accordance with published guidelines (BSC 2013).

- Cane toad *Rhinella marina* exclusion fencing will be installed around sediment basins consisting of:
 - Shade cloth or similar material;
 - 900 mm wide cloth provides enough height (at least 700 mm) and depth into the ground (at least 100 mm);
 - Posts should be spaced approximately 1.6 m apart;
 - Dig a trench at least 100 mm deep and drive posts into the trench;
 - Secure the cloth tightly between posts with the base of the cloth in the ground;
 - Backfill the trench to cover the base of the fencing material; and
 - Once the barrier has been erected, check regularly to make sure no toads are trapped inside the fence.

Timing for installation of the Cane toad *Rhinella marina* exclusion fencing will follow the conclusion of civil works directly around/involving the sediment basins. Due to this, the Cane toad *Rhinella marina* exclusion fencing may be installed during Stage 2 works and therefore will also be addressed in the Stage 2 BMP.

3.5 Native fauna management

Documentation of all native fauna injuries and deaths will be recorded in incident registers to monitor species mortality, including fauna mortality resulting from vehicle strikes or entanglement. Should an increase in the frequency of Project related fauna mortality/injury incidents occur, it will trigger investigation by the Site's environmental manager/advisor (or suitably qualified subcontractor) and appropriate adaptive management actions will be implemented to mitigate the impacts.

To minimise interactions with fauna, it is recommended that Site Management enforce the following policies on the Site:

- Catching or feeding of native or feral animals on Site is prohibited.
- Site personnel will be prohibited from harming or intentionally killing any wildlife.
- No pets are permitted in areas of environmental conservation on the Site.
- Discarding food wastes on the Site is strictly prohibited.

The following fauna management practices will be implemented on the Site:

- Excavations will exclude fauna entry or allow for fauna egress. Where it is not practical to provide fauna egress, daily checks will be undertaken before work commences.
- All excavations left open overnight will be inspected each morning.
- Uninjured trapped fauna will be released to a predetermined species-relevant nearby area of suitable habitat away from the Site by a suitably qualified and wildlife handler.
- Dead native animals that are found on the Site will be recorded in a fauna incident register, reported, collected and disposed of appropriately so as not to attract predators or scavengers.
- Injured native animals will be collected and taken to nearby veterinary facilities for treatment, as required.
- Personnel will record fauna sightings/encounters during construction activities using a fauna register.

Site inductions will include the following specific components for flora and fauna management:

- Commentary regarding the flora, fauna and ecological values within and in the vicinity of the Site.
- Project commitments specific to how flora and fauna are protected during construction or operation works.
- Procedures in the event that fauna are encountered within the Site.
- Requirement that all clearing/earthworks/construction activities are to be confined within the Site boundary.

3.6 Waste management

Construction activities on the Site during Stage 1 works will be managed in accordance with the approved CEMP Construction Waste Management Sub-Plan (CWMSP).

The following measures should be included to prevent fauna being attracted to Site:

- The 'eliminate, reduce, re-use, recycle' disposal waste management principles will be applied.
- Limit the amount of rubbish and waste onsite through good housekeeping practices.
- Food waste will be disposed of at a designated facility.
- Putrescible wastes will be stored in secure bins with lids or transported offsite daily for disposal.

3.7 Fauna management procedure during vegetation clearing and rock removal

To minimise impacts and ensure the safety of any native ground dwelling and arboreal fauna occupying trees, vegetation and around rocks proposed for removal, a suitably qualified and experienced fauna rescue person shall be present to supervise the clearing activities. A Fauna Management Procedure for vegetation and rock clearance activities on the Site is outlined below in sequential order:

1. A suitably qualified and experienced ecological consultant will be engaged to undertake fauna rescue for native vegetation clearing and rock removal activities. Relevant qualifications/licenses include:
 - a. 'Animal Research Authority' as approved by the Animal Care and Ethics Committee (Department of Primary Industries).
 - b. A biodiversity conservation licence granted under Part 2 of the [BC Act](#) that allows handlers to legally catch and release reptiles (usually snakes) from commercial and residential homes and backyards.
2. A pre-clearing inspection will be done of all areas to be cleared, including around rocks within windrow vegetation being cleared. All trees within 30 metres of those trees to be cleared are to be inspected for the presence of native fauna. The pre-clearance inspection will assess for presence of any native fauna, tree hollows, bird nests etc.

3. A pre-clearing inspection report will be submitted to TSA Management containing pre-clearing inspection results and any recommendations such as elevated work platform requirements for working at heights.
4. During vegetation and rock clearing works a daily survey will be undertaken before works commence to assess if any fauna has moved into the area overnight or within 30 metres of those trees to be cleared (including construction of bird nests etc.).
5. Fauna spotters / rescue personnel at 1 person per operational machine will be present at all times during clearing works. The fauna rescue personnel must be responsible for identifying fauna present on the site and will remain on site during any clearing works to ensure that any tree occupied by fauna is not accidentally cleared or interfered.
6. If any fauna is found during clearing, where possible, uninjured native fauna detected will be caught by the fauna rescue personnel and released at a predetermined location of appropriate habitat that is nearby, but outside of the Project footprint.
7. Any injured native fauna detected shall be rescued and transferred to a local veterinarian for treatment and/or WIRES for rehabilitation.
8. The Fauna rescue consultant will submit a post-clearance report outlining at a minimum any observations, mortality, injuries, captures and translocations.

If koalas *Phascolarctos cinereus* are found on the Site during vegetation clearing works and/or earthworks;

- All construction clearing/earthwork activities must be temporarily suspended within a range of 30 metres from any tree which is occupied by a koala.
- Works are to be avoided in any area between the koala and the nearest areas of habitat to allow the animal to move to adjacent undisturbed areas.
- Works must not resume until the koala has moved from the tree of its own volition.

3.8 Traffic management

3.8.1 On site

The proposed Stage 2 development will widen the access road (Cudgen Road) and traffic volumes will incrementally increase to greater than 5,000 vehicles per day along Cudgen Road and Turnock Street at the peak of the operations phase (Bitzios, 2018). There is an existing wildlife fence along Turnock Street that owned and managed by TSC that is located adjacent to MZs 1.1, 1.2 and 1.6 (**Figure 1**). The wildlife fence is located adjacent to the koala habitat on the Site (MZ 1.6).

In general the wildlife fence is in good condition and affords good protection for small to medium size ground dwelling mammals. However, overgrown vegetation on both sides of the fence allows arboreal mammals such as koala *Phascolarctos cinereus* to cross the fence and the road. Consequently, this provides connectivity between areas of habitat for arboreal mammals, it also places these species at risk of vehicle strike. Weed control measures outlined in **Section 2.3.1** will improve the function of this fence as a barrier and will provide better protection for risk of vehicle strike to fauna trying to cross Turnock Street.

Furthermore, the following traffic management measures will reduce the risk of impact on wildlife:

- A Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) will be produced as part of an approved CEMP and their prescriptions will be implemented.
- Traffic will be restricted to the Project footprint in the southern portion of the Site which is approximately 67 m from the intact remnant native vegetation.
- Construction traffic must maintain low vehicle speeds (speed limit to be confirmed) and operators shall take care and be aware of any wildlife that may be in the area. Should wildlife enter the

construction footprint, a suitably qualified fauna handler should be notified and actions taken in accordance with the CEMP.

- Appropriate speed limits for both earthmoving equipment and light vehicles will be implemented, signposted and enforced on all roads throughout the Site to minimise the risk of fauna injury or mortality.
- Documentation of all native fauna injuries and deaths will be recorded in incident registers to monitor species mortality and any direct impacts will trigger investigation by the Site's environmental manager/advisor (or suitably qualified subcontractor) and adaptive management actions implemented where required.
- Any injured native fauna detected shall be rescued and transferred to a local veterinarian for treatment and/or WIRES for rehabilitation.

3.8.2 Off site

Prior to the commencement of Stage 1 works, the Applicant must submit design plans to the relevant road authority and obtain necessary permits and approvals to implement measures on the Turnock Street and/or Cudgen Road to reduce the risk of impact on wildlife. All roads and traffic facilities must be designed to meet the requirements standards/road specifications of Council and/or RMS. To reduce the risk of impact on wildlife, traffic calming measures should include;

- Install roadside street lighting in accordance with the design standards.
- On the uphill and downhill approaches to the access road install a wildlife crossing including:
 - Two 50 kilometre an hour speed limit signs and two wildlife warning signs (e.g. 'Wildlife Dawn to Dusk' sign or similar) or two signs that combine both messages; and
 - Two permanent radar speed signs that display vehicle speed on approach or display a warning when the vehicle speed on approach is greater than the speed limit.

3.9 Managing indirect impacts on fauna

Sensitive environmental receptors relevant to dust, vibration and light spill impacts include vegetation communities and wildlife adjacent to the Project's construction activities. The impact of dust, air quality, vibration and light spill on surrounding flora and fauna will be managed in accordance with management plans including guideline criteria and any prescriptions will be implemented as part of an approved CEMP and sub-plans, including the Construction Air Quality Management and Dust Management Sub-Plan (CAQMDMSP) and the Construction Noise and Vibration Management Sub-Plan (CNVMSP).

Where avoidance of light spill, airborne noise, vibration and dust generation is not practicable, key mitigation measures to address residual impacts from light, noise, vibration or dust generated as a result of construction activities will be implemented, as outlined below.

3.9.1 Light spill impacts displacing or disrupting terrestrial fauna

Light sensitive species are presumed unlikely to be present at the Site and impacts of light spill is likely to be negligible. Construction will be restricted to the Project footprint in the southern portion of the Site where the project footprint is at least 67 m from the remnant native vegetation. This provides a natural buffer zone to dissipate light spill impacts.

All construction works and associated activities would be delivered in compliance with AS4282 and AS1158. As per the Sites CEMP; the lighting designer will have the appropriate competence in the fields of illuminating engineering and environmental design. Lighting shall be positioned in consideration with the local environment and ensure upward waste light ratios do not exceed the standard requirements. In addition, the local government will be consulted to determine any restrictions on the frequency of use and hours of

operation of the external lighting. Consideration will be given to applicable safeguards and management measures before works commence including daily timing of construction activities such as avoiding night works and directing lights away from remnant vegetation.

All construction works must be undertaken between the hours of 7.00am and 6.00pm Monday to Friday, between the hours of 8.00am and 1.00pm Saturday. No work will be undertaken on Sunday or Public Holidays (CEMP 2019).

3.9.2 Airborne noise and vibration impacts displacing or disrupting terrestrial fauna

Noise during construction will be mitigated by applying appropriate safeguards and management measures before works commence including daily timing of construction activities and such as restricting works to approved construction hours in accordance with the Interim Noise Guidelines (2009) and the approved CEMP. Furthermore, construction will be restricted to the southern portion of the Site where the project footprint is at least 67 m from the remnant native vegetation. This provides a natural buffer zone to dissipate noise and vibration impacts.

Noise and vibration levels during construction will be delivered in accordance with the approved CEMP Construction Noise and Vibration Management Sub-Plan.

3.9.3 Dust impacting vegetation which is fauna habitat

Where avoidance of dust-generation is not practicable, mitigation measures to address impacts from dust generated as a result of construction activities will include:

- Air quality monitoring will be regularly undertaken and the effectiveness of management controls periodically reviewed.
- Dust suppression techniques will be applied where necessary to protect vegetation health. This may include spraying from water trucks, irrigation, or stabilisation and revegetation of cleared areas that are no longer needed as soon as practicable during construction.
- Temporary stockpiles that are not required for imminent use will be stabilised.
- For unpaved roads, the periodic application of water will be used for dust suppression, dependent up on weather conditions and traffic volumes. Additional measures for high-volume traffic areas, such as impermanent gravel cover may also be required. For paved roads, the removal of accrued material from roadways will occur when possible.
- Maximum speed limits will be implemented to limit dust generated on site.
- On-site roads required for the operations phase will be sealed during the construction phase.
- Clear distinction between trafficable and non-trafficable areas with speed limits implemented.
- Multiple handling of soil or rock materials will be minimised.
- Loads in all trucks transporting soil, aggregate or other dust-generating materials to and from the on-site development area will be covered.
- Planning of construction activities will consider dust management requirements where practicable.
- Avoid excavation during high wind and extreme wet weather conditions.
- Periodic inspection of surrounding roads to ensure no construction contamination and initiation of road sweeping if required.
- Dust management and suppression will be undertaken during and following vegetation clearing and earthwork activities.

Dust levels during construction will be delivered in accordance with the approved CEMP Construction Air Quality Management and Dust Management Sub-Plan.

Table 6 Fauna Mitigation Measures

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/ Trigger Criteria
Mitchell's rainforest snail <i>Thersites mitchellae</i>						
48	1.1 and 1.2	A Specialist invertebrate consultant will be engaged to develop a robust and repeatable scientific survey and monitoring program (capture, mark, release, recapture methodology) to estimate the local population size of the MRS at the Site.	P	Management and Specialist consultant	A robust and repeatable scientific survey and monitoring program for the MRS	No decreasing trend in MRS population in comparison to baseline data
49	1.1 and 1.2	A pre-construction baseline survey of MRS to determine population size at the Site.	P (May 2019)	Management and Specialist consultant	Baseline data on MRS population size	Pre-construction baseline survey completed
50	1.1 and 1.2 and 1.3 and 1.4 once vegetation is established	A baseline survey report will be submitted by the specialist invertebrate consultant including; the date, personnel, weather, areas surveyed, survey methodology and results including population size, observations, photos, any potential impacts on the MRS, and any recommendations.	P (early/mid 2019)	Management and Specialist consultant	Baseline report on MRS population size	Pre-construction baseline report submitted
51	1.4 and 1.5	Staged removal of weeds in MZ 1.4 and 1.5 to avoid desiccation of adjacent MRS habitat as per Section 2.4 .	C	Management & Bush regeneration contractor	Avoid desiccation of adjacent MRS habitat	Staged removal of weeds in MZ 1.4 and 1.5 is adhered to
52	1.1, 1.2, 1.3,1.4 and 1.5	Vegetation Management to protect MRS populations including weed control as per Section 2.4 and creation of diverse, dense Subtropical rainforest with a closed canopy suitable with key habitat components: well developed leaf litter, intact canopy.	C	Management & Bush regeneration contractor	Conserve and enhance MRS habitat	Maximum 5% weed cover following weed control activities Vegetation condition Monitoring

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
						performance criteria as per Stage 2 BMP
Bushfire Prevention						
53	All areas	<p>A bushfire assessment report (Land & Fire Assessments 2018) has been prepared for Stage 1 that addresses the requirements for Special Fire Protection Purpose development as detailed in Planning for Bush Fire Protection 2006 (NSW RFS).</p> <p>In accordance with Schedule 2 Condition B19, the 67m APZ will be managed and maintained in accordance with the requirements of Asset Protection Zone Standards (Appendix 4 of PBP; RFS 2018).</p>	C	Management and Specialist consultant	Prevention of bush fires	The bushfire assessment report will be adhered to
54	All areas	If smoking is permitted on the Site, designated smoking areas will be established and suitable receptacles will be provided for cigarette butts.	All times	Management and all contractors	Prevention of bush fires	Designated smoking areas and receptacles will be established and adhered to by all Site personnel
Vertebrate Pest Management						
55	All areas	In the event pest species increase in population, spread in area or a new pest species is introduced to Site, corrective actions will be implemented during construction and operations phases to rectify any potential or actual environmental harm.	P	Management and contractors	Conservation of native species	Corrective actions implemented to rectify any potential or actual environmental harm
Aquatic Fauna Protection						

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
56	Sediment basins	To avoid any potential changes in pH and impacts on threatened aquatic species (i.e. Wallum froglet and Olongburra frog) other commercially available flocculants that work as effectively as a gypsum replacement yet do not create the large changes in pH will be used on the Site (i.e. Turbiclear).	C	Management and contractors	Threatened aquatic species conservation	No change to pH in receiving environment waters pH meets water quality criteria outlined in the WQMP, Section 4.6.4.
57	Sediment basins and receiving environment	Physico-chemical parameters including pH will be monitored in water discharged from sediment basins and in the downstream wetland environment to protect aquatic wetland fauna.	C	Management and contractors	Threatened aquatic species conservation	No change to pH in receiving environment waters pH meets water quality criteria outlined in the WQMP, Section 4.6.4.
58	All areas	The impact of erosion and sedimentation on terrestrial and aquatic flora and fauna during construction will be managed in accordance with an erosion and sediment control plan (ESCP). An erosion assessment has been conducted on the Site by a Certified Practitioner in Erosion and Sediment Control (CPESC) during the planning phase of the ESCP development. Refer to Drawing No C-2-105 Revision 3 (RBG 2019).	C	Management and all contractors	Mitigating impacts of erosion and sedimentation on terrestrial and aquatic flora and fauna during construction	Performance criteria as per the approved erosion and sediment control plan (ESCP)
Fauna Movement and Habitat Protection/Generation						

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
59	All areas	Temporary boundary fencing has been installed with a 'post and bridge' system at least every 50 m. Tree Protection Zones (TPZ) will be installed around all native vegetation to be retained adjacent to the construction footprint. This fencing will be removed at the conclusion of the construction phase of the development.	P, C	Management and contractors	Habitat connectivity/facilitating movement of threatened species	Temporary fencing installed with features allowing movement of threatened species
60	Vegetated buffer MZs 6 and 7	Habitat connectivity will be maintained across the Site by vegetation management measures as outlined in the VMP (Section 2.3). Importantly, to facilitate the movement of fauna, vegetated buffer zones will connect to the retained Subtropical rainforest vegetation in the northern portion of the site, and will run north to south, in line with the mapped regional fauna corridor.	C	Management and vegetation clearance contractors	Habitat connectivity/facilitating movement of threatened species	Maximum 5% weed cover following weed control activities Clearing of vegetation is only conducted within the surveyed clearing area
61	All landscaped areas	Where possible, landscaping will include habitat features such as rocks that have been salvaged from other areas of the Site (cleared windrows) that will create habitat for ground dwelling species.	C	Management, Landscape designers and bush regeneration contractors	Conserve and enhance habitat quality	Habitat features such as salvaged rocks included in Landscaping
Weed and Pest Management						
62	All areas with trees and native vegetation	The introduction of pest species or disease onto native vegetation areas on the Site will be mitigated by installing an environmental protection area (or TPZ) to protect retained vegetation on the Site during construction.	C	Management, bush regeneration contractors and all Site personnel	Prevent introduction of pest species or disease	Environmental protection area exclusion zone adhered to

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
Fauna-related Interactions and Incidents						
63	All areas	Documentation of all native fauna injuries and deaths will be recorded by the Site's environmental manager/advisor in incident registers to monitor species mortality, including fauna mortality resulting from vehicle strikes and entanglement.	C	Environmental manager/advisor and all Site personnel	All native fauna injuries and deaths will be recorded in incident registers	Increases in frequency or multiple fauna mortality/injury incidents
64	All areas	Should increases or multiple fauna mortality/injury incidents occur, it will trigger investigation to be undertaken by the Site's environmental manager/advisor (or suitably qualified subcontractor) and where practical adaptive management actions and mitigation will be implemented.	C	Environmental manager/advisor	Reducing impacts on native fauna	Reduction in frequency or multiple fauna mortality/injury incidents
65	All areas	To minimise interactions with fauna, Site Management will enforce the following policies on the Site: <ul style="list-style-type: none"> • Catching or feeding of native or feral animals on Site is prohibited. • Site personnel will be prohibited from harming or intentionally killing any wildlife • No pets are permitted in areas of environmental conservation on the Site • Discarding food wastes on the Site is strictly prohibited. 	C	Management, all Site personnel and general public	Nil impacts on native fauna	Adherence to policies
66	Project footprint	Excavations will exclude fauna entry or allow for fauna egress. Where it is not practical to provide	C	Management and construction/	Nil impacts on native fauna	Excavation exclusion/egress measures undertaken,

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
		fauna egress, daily checks will be undertaken before work commences.		earthworks contractors		recorded and checked by Site supervisor Adherence to fauna management policies
67	Project footprint	All excavations left open overnight will be inspected each morning.	C	Management and construction/earthworks contractors	Nil impacts on native fauna	Daily checks undertaken, recorded and checked by Site supervisor Adherence to fauna management policies
68	All areas	Uninjured trapped fauna will be released to a predetermined nearby area of suitable habitat away from the Site by a suitably qualified and wildlife handler.	C	Management, all Site personnel and suitably qualified and wildlife handler	Nil impacts on native fauna	Adherence to fauna management policies
69	All areas	Injured native animals will be collected and taken to nearby veterinary facilities for treatment, as required.	C	Management, all Site personnel and suitably qualified and wildlife handler	Nil impacts on native fauna	Adherence to fauna management policies
70	All areas	Personnel will record fauna sightings/encounters during construction activities using a fauna register.	C	Management, all Site personnel and suitably qualified and wildlife handler	Nil impacts on native fauna	Adherence to fauna management policies

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/ Trigger Criteria
71	All areas	Dead native animals that are found on the Site will be recorded in a fauna incident register, reported, collected and disposed of appropriately so as not to attract predators or scavengers.	C	Management, all Site personnel and suitably qualified and wildlife handler	Nil impacts on native fauna	Adherence to fauna management policies
72	All areas	Site inductions will include but are not limited to the following specific components for flora and fauna management: <ul style="list-style-type: none"> • The flora, fauna and ecological values within and in the vicinity of the Site, and the Project commitments how flora and fauna are protected during construction or operation works • the procedures in the event that fauna are encountered within the Site • the requirement that all clearing/earthworks/construction activities are to be confined within the Site boundary 	C	Management, all Site personnel	Site personnel aware of specific components for flora and fauna management	Adherence to fauna management policies
73	All areas	The following measures will be included to prevent fauna being attracted to Site: <ul style="list-style-type: none"> • The “eliminate, reduce, re-use, recycle” disposal waste management principles will be applied • Limit the amount of rubbish and waste onsite through good housekeeping practices • Food waste will be disposed of at a designated facility 	C	Management, all Site personnel	Site personnel aware of waste management policies	Adherence to waste management policies

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/ Trigger Criteria
		<ul style="list-style-type: none"> Putrescible wastes will be stored in secure bins with lids or transported offsite daily for disposal 				
74	Project footprint	A suitably qualified and experienced fauna rescue person shall be present to supervise the clearing activities and the Fauna Management Procedure for Clearing native vegetation and rocks will be adhered to.	C - clearing	Management and suitably qualified wildlife rescuer	Protection of native fauna	Adherence to Fauna Management Procedure for Construction- Clearing (Section 3.7)
75	Project footprint within a range of 30 metres from any tree which is occupied by a koala	<p>If koalas <i>Phascolarctos cinereus</i> are found on the Site during vegetation clearing works and/or earthworks:</p> <ul style="list-style-type: none"> All construction clearing/ earthwork activities must be temporarily suspended within a range of 30 metres from any tree which is occupied by a koala. Works are to be avoided in any area between the koala and the nearest areas of habitat to allow the animal to move to adjacent undisturbed areas. Works must not resume until the koala has moved from the tree of its own volition. 	C - clearing	Management and suitably qualified wildlife rescuer	Protection of native fauna	Adherence to Fauna Management Procedure for Construction- Clearing (Section 3.7)
76	1.6 and 1.1	Weed control measures outlined in Section 2.3.1 will improve the function of the wildlife fence along Turnock Street and provide better protection for risk of vehicle strike to fauna trying to cross Turnock Street.	C - clearing	Management and bush regeneration contractors	Protection of native fauna	Maximum 5% weed cover following weed control activities
77	All trafficked areas	A Traffic Control Plan and Access and Movement Plan and supporting documentation will be produced as part of an approved CEMP and their prescriptions will be implemented.	C	Management and all Site personnel	Site personnel aware of traffic management policies	Adherence to traffic management policies

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
78	Project footprint	General Site traffic will be restricted to the southern portion of the Site where the project footprint is, which is approximately 62 m from the intact remnant native vegetation.	C	Management and all Site personnel	Site personnel aware of traffic management policies	Adherence to traffic management policies
79	All trafficked areas	Construction traffic must maintain low vehicle speeds and operators shall take care and be aware of any wildlife that may be in the area. If wildlife enters the construction area, a suitably qualified fauna handler should be notified and actions taken in accordance with the CEMP.	C	Management and all Site personnel	Site personnel aware of traffic management policies	Adherence to traffic management policies
80	All trafficked areas	Appropriate speed limits for both earthmoving equipment and light vehicles will be implemented, signposted and enforced on all roads throughout the Site to minimise the risk of fauna injury or mortality.	C	Management and all Site personnel	Site personnel aware of traffic management policies	Adherence to traffic management policies
81	Project footprint	Light will be restricted to the Project footprint in the southern portion of the Site where the project footprint is at least 62 m from the remnant native vegetation. This provides a natural buffer zone to dissipate light spill impacts.	C	Management and all Site personnel	No disruption or dissipation of native fauna	Increase in frequency of fauna mortality/injury events
82	Project footprint and all surrounding native vegetation	The impact of dust, air quality, vibration and light spill on surrounding flora and fauna will be managed in accordance with management plans and any prescriptions will be implemented as part of an approved CEMP.	C	Management and construction contractor	No disruption or dissipation of native fauna	Increase in frequency of fauna mortality/injury events
83	Project footprint and all surrounding native vegetation	Timing of construction activities to avoid night works, work within the approved construction hours as per Section 3.9.1 and direct lights away from remnant vegetation.	C	Management and construction contractor	No disruption or dissipation of native fauna	Increase in frequency of fauna mortality/injury events

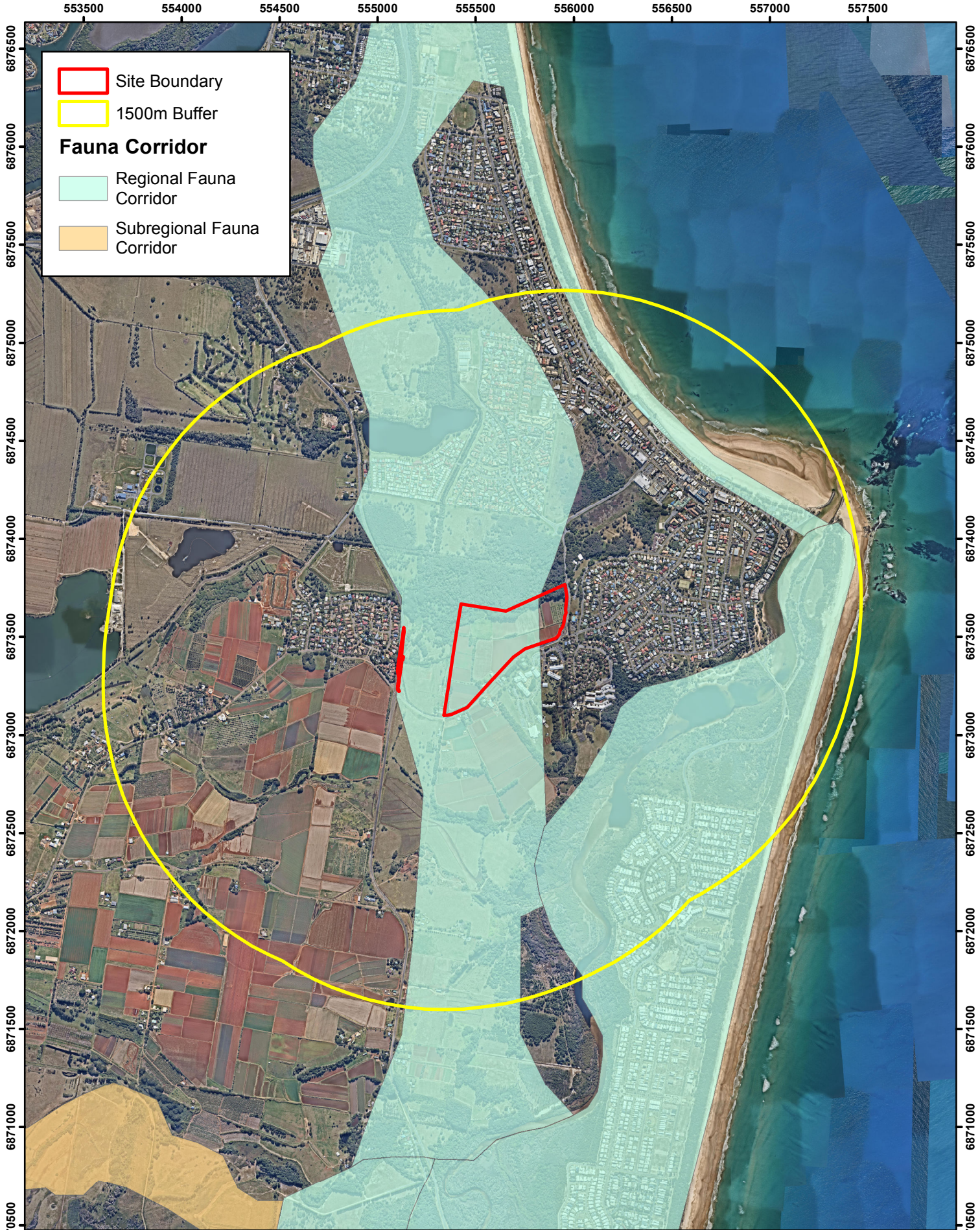
Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
84	Project footprint and all surrounding native vegetation	Limit high-impact noise to daylight hours and work within the approved construction hours as per Section 3.9.1 .	C	Management and construction contractor	No disruption or dissipation of native fauna	Increase in frequency of fauna mortality/injury events
85	Project footprint and all surrounding habitat	Noise levels during operations would be delivered in accordance with an approved CEMP that details safeguards and management measures in accordance with the POEO (Noise Control) Regulation 2017 or any other relevant Tweed Shire Council noise regulation.	C	Management and construction contractor	No disruption or dissipation of native fauna	Increase in frequency of fauna mortality/injury events
86	Project footprint and all surrounding native vegetation	Monitoring of dust generation and the effectiveness of management controls will be regularly undertaken.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented
87	Project footprint	Dust suppression techniques will be applied where necessary to protect vegetation health. This may include spraying from water trucks, irrigation, or stabilisation and revegetation of cleared areas that are no longer needed as soon as practicable during construction.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented Vegetation Management Criteria in Section 2.4 .

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
88	Project footprint	For unpaved roads, the periodic application of water will be used for dust suppression, dependent up on weather conditions and traffic volumes. Additional measures for high-volume traffic areas, such as impermanent gravel cover, may also be required. For paved roads, the removal of accrued material from roadways will occur when possible.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented Vegetation Management Criteria in Section 2.4.
89	Project footprint	Maximum speed limits will be implemented during construction works to limit dust generated on site.	C	Management and construction contractor	No native fauna vehicle strikes	Increase in frequency of fauna mortality/injury events
90	Project footprint	On-site roads required for the operations phase will be sealed during the construction phase.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented Vegetation Management Criteria in Section 2.4.

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/Trigger Criteria
91	Project footprint	Multiple handling of soil or rock materials will be minimised.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented
92	Project footprint	Loads in all trucks transporting soil, aggregate or other dust-generating materials to and from the Project construction area will be wetted down to reduce dust.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented
93	Project footprint	Planning of construction activities will consider dust management requirements where practicable.	C	Management and construction contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and any prescriptions will be implemented
94	Project footprint	Dust suppression will be undertaken during and following vegetation clearing and earthwork activities.	C	Management and construction clearing contractor	Avoid or minimise impact in native fauna habitat	Dust suppression managed in accordance with air quality management plans specifying guideline criteria and

Item	Management Zone	Activity Description	Timing/Project Phase ¹	Responsibility	Outcome	Performance/ Trigger Criteria
						any prescriptions will be implemented
95	All area	Should monitoring results indicate performance criteria non-compliance or potential impacts from Project activities which could result in an increasing in frequency of non-compliance events, management will undertake an investigation into addressing the issue and adaptive measures will be implemented to mitigate any impacts.	At all times	Management and consultants	Protecting fauna	Non-compliance to performance criteria in Table 7 will trigger investigation and adaptive management measures will be implemented

¹Project phases: Pre-construction (P) and Construction (C).



Site Boundary
 1500m Buffer
Fauna Corridor
 Regional Fauna Corridor
 Subregional Fauna Corridor

Client: C107778
Job #: J156455
Author: M. Nunn
Checked: D. Licari
Date: 4/06/2019
GREENCAP

		Scale (@A4): 1:25,000
Coordinate System: GDA 1994 MGA Zone 56		
Imagery 8th August 2018 (59.7 cm) © Nearmap 2018 Fauna corridors for NE NSW © Office of Environment and Heritage (OEH) 2010.		

Habitat Corridors	
Tweed Valley Hospital BMP 771 Cudgen Road Cudgen NSW	Figure 8

No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.

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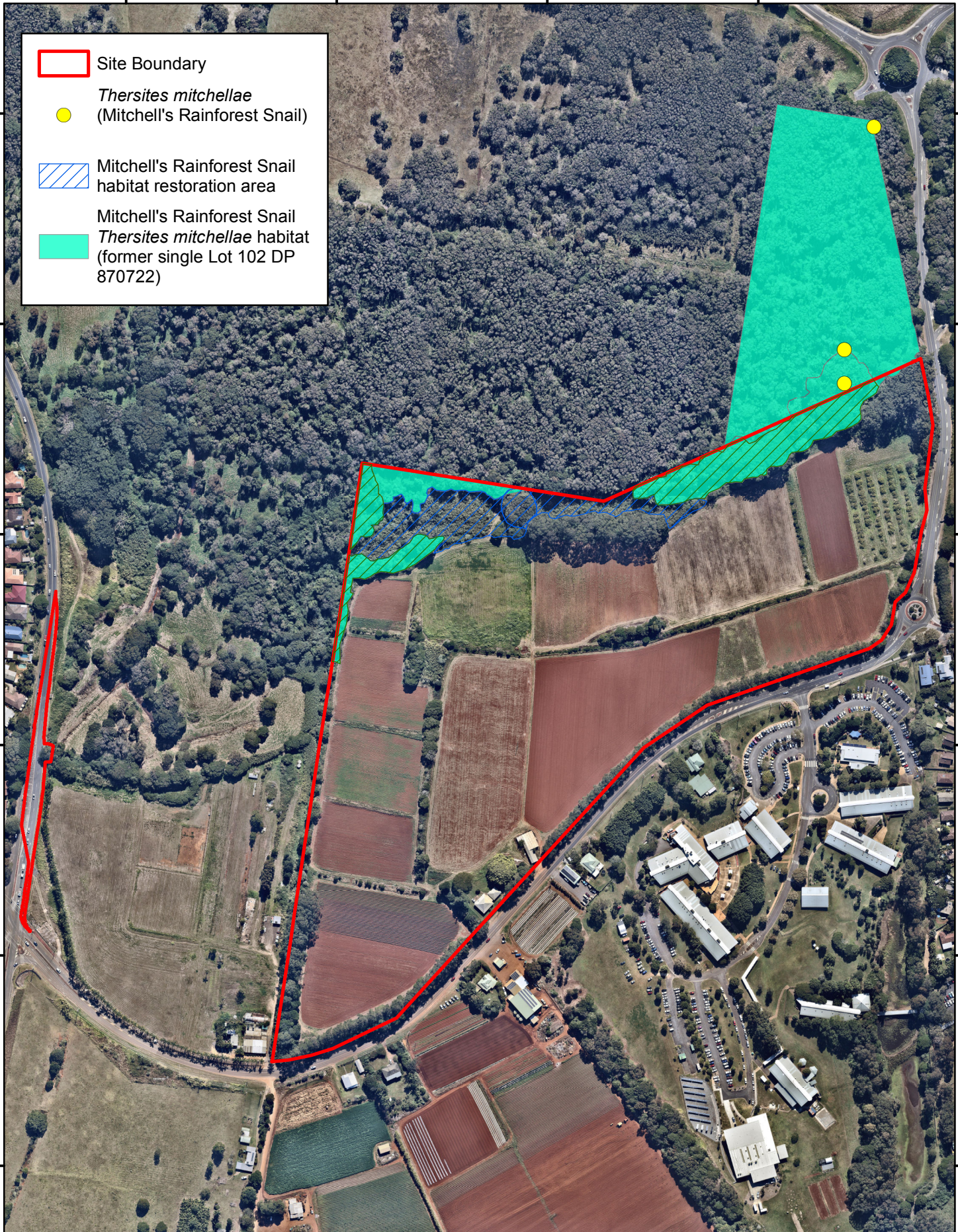
6873000

 Site Boundary


 *Thersites mitchellae*
(Mitchell's Rainforest Snail)

 Mitchell's Rainforest Snail
habitat restoration area

 Mitchell's Rainforest Snail
Thersites mitchellae habitat
(former single Lot 102 DP
870722)



Client: C107778
Job #: J156455
Author: E. Lewis
Checked: C. Maloney
Date: 4/06/2019

 0 50 100 m

Scale (@A4): 1:4,750

Coordinate System: GDA 1994 MGA Zone 56

Imagery 8th August 2018 (7.5 cm) © Nearmap 2018

Vegetation mapping: Greencap (2018)

Mitchells Rainforest Snail Habitat and Survey Results

Tweed Valley Hospital BMP
771 Cudgen Road
Cudgen NSW

Figure 9



No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.

4. WATER QUALITY MANAGEMENT PLAN

4.1 Water quality management aims and objectives

The aim of this Water Quality Management Plan (WQMP) is to avoid or mitigate any impacts from Stage 1 of the Project on water quality, water bodies and hydrological process that sustain threatened species and threatened ecological communities (TECs). Particular attention is drawn to the downstream forested wetlands and pH dependent amphibians, namely; Wallum froglet *Crinia tinnula* and Olongburra frog *Litoria olongburensis*. Notably, the northern section of the Site is part of an important wetland mapped under the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP) (**Figure 10**). In order to achieve this, several activities will be undertaken at different phases of the Project during Stage 1 as outlined in **Table 8**.

These measures will mitigate the residual impacts of the Project as outlined in the BDAR [Appendix I and J] (GreenCap 2019). Based on the civil design for stormwater and the application of erosion and sediment controls, the Project is likely to result in improved water quality as the previous land use was agricultural with no stormwater management system. This Water Quality Management Plan refers to the Vegetation Management Zones (MZ) as shown in **Figure 6**.

4.2 Stormwater management

4.2.1 Current conditions

Stormwater management under the current conditions – Pre construction/approval

The current land use is agricultural, site observations indicate that the cultivated fields are ploughed across the topographic contours (GreenCap 2019). Under this cultivation regime, sediment-laden stormwater is encouraged to run downhill through ploughed furrows. Observations during site inspections also indicated frequent use of pesticides on the crops. Apart from a bund that has been constructed along the western boundary of the Site which adjoins an open drain, there is currently no stormwater management system in place. In the western section of the Site the aspect of the land is roughly west to north-west and the bund currently directs untreated stormwater flows to three discharge points that have been bulldozed through the bund wall. The aspect of the rest of the Site is roughly north and the ploughing regime directs sediment-laden stormwater to discharge directly into the receiving catchment and wetland located to the north of the Site. Furthermore, a Council owned drain carrying untreated stormwater flows from Turnock Street discharges directly into the receiving catchment.

The *Civil and Structural Design Report* (Bonacci, 2019) for the Project summarises the results of the MUSIC model that was developed for the site. It assesses water quantity and water quality under the existing land use, across the following parameters:

- Flow;
- Total suspended solids;
- Total phosphorus;
- Total nitrogen; and
- Gross pollutants.

4.2.2 Proposed stormwater management during construction

Soil erosion and stormwater quality will be managed during construction of the Project in accordance with current industry standards as per the Sites approved Erosion and Sediment Control Plan (ESCP) and CEMP Construction Soil and Water Management Sub-Plan (CSWMSP) and which sets out the key items to manage stormwater runoff, as follows:

- Installation of Sedimentation Basins (installed as part of Preliminary Works package).
- Regular inspections of basins (both fortnightly and within 24 hours of a rain event).
- Retained capacity in detention basins
- Test, treat and discharge collected stormwater off-site if it cannot be reused on site.
- No discharge of non-compliant water or off-site pollution

During construction, mitigation measures will be undertaken to minimise the risk of erosion and of sediment-laden stormwater being discharged into the receiving catchment and wetland located to the north of the site. These measures will include but are not limited to:

- A sediment fence/catch drain (or diversion bund) around the Site;
- Temporary access to Site with shaker pad;
- Sediment fencing around stockpile areas. Stockpiles will be located out of water flow paths and will be protected by earth banks/drains as required; and
- Four adequately sized sediment basins with a total capacity of 7,562 m³ volume have been constructed to capture flows (Bonacci 2019). The receiving catchment will be protected by providing diversion stormwater drainage lines that bypass the construction site. Sediment basins will be appropriately monitored and managed in accordance with an erosion and sediment control plan (ESCP) as outlined in **Section 4.2.2.1**.

For details of how soil and stormwater quality will be managed refer to the approved *Stage 1 Early and enabling works construction sediment and erosion plan drawings C-2-105* (RBG 2019).

The Sites CEMP will incorporate all relevant safeguards and mitigation measures detailed in the Environmental Impact Statement and any requirements detailed in the development consent conditions. All construction staff and site personnel will be made aware of their environmental responsibilities and safeguard measures within the CEMP to avoid and minimise environmental impacts. The CEMP will be submitted to the Department of Planning and Environment for review and approval prior to commencement of works.

4.2.2.1 Erosion and sediment controls

The impact of erosion and sedimentation during the construction phase will be managed in accordance with an ESCP prepared for the Site to effectively manage erosion and subsequent sediment mobilisations. The ESCP will be implemented prior to the commencement of construction works, especially prior to the onset of each wet season (from late February to late April). The ESCP is reviewed and updated as required, and at least annually prior to the onset of the wet season to reflect changes in site conditions as construction progresses. An erosion assessment will be conducted on these areas by a Certified Practitioner in Erosion and Sediment Control (CPESC) during the planning phase of the ESCP development. ESC design should be in accordance with the guidelines in Best practice erosion and sediment control (IECA 2008), the NSW Landcom Managing Urban Stormwater “Blue Book” (2004) and the Tweed Shire Council Development Design Specification - D7. The Site ESCP is to be submitted to and approved by the consent authority on the advice of an independent suitably qualified expert in accordance with any conditions of approval.

The erosion and sediment control management strategy aims to minimise offsite impacts by diverting overland surface flows to sediment controls, and to manage any active discharge so that it meets the applicable water-quality criteria, such as the IECA (2008) guidelines for discharge from detention basins and the Tweed Shire Council Development Design Specification - D7. Key erosion and sediment control activities are outlined in **Table 8**.

4.2.3 Wetland hydrology

In respect of the TECs located within the wetland area, it is noted that these species are generally located in areas subject to periodic inundation (NSW Scientific Committee, 2004). The sediment basins will function to allow the wetland area to continue to occur in line with the pre-construction land use. The quality of the water entering the downstream wetland environment will be managed under the approved CEMP as described in **Section 4.2.2**.

The location of the development footprint on the Site seeks to minimise interference with hydrological flows through the wetlands, including contributions from groundwater. As described in **Section 4.4**, due to the construction design, it is not anticipated that piles will create a barrier to any shallow or perched groundwater flow that currently occurs within the Project footprint, minimising the potential for the development to impact groundwater contributions to the wetlands.

4.2.4 Aquatic fauna

During the development of the BDAR, two pH dependent amphibians were identified by the BAM Calculator as candidate threatened species, namely; Wallum froglet *Crinia tinnula* and Olongburra frog *Litoria olongburensis* (Greencap, 2019). There are records for these species within the 1,500 m assessment area and within the receiving catchment. The use of gypsum as a flocculent in the sediment basins to quickly settle sediment-laden stormwater runoff during construction may impact the abovementioned threatened amphibian species upon discharge from basins to the downstream receiving wetland environment. To avoid any potential changes in pH and impacts on these threatened species, other commercially available flocculants that work as effectively as a gypsum replacement yet do not create the large changes in pH will be used to treat stormwater before discharge on the Site.

As part of a Water Quality Monitoring Program as outlined in the WQMP in **Section 4.6**, physico-chemical parameters including pH will be monitored in water discharged from sediment basins and in the downstream wetland environment.

4.2.5 Cane toad *Rhinella marina* management

Sediment basins and WSUD features have the potential to attract cane toads and provide breeding habitat which could impact native fauna species, in particular the Wallum froglet *Crinia tinnula* and Olongburra frog *Litoria olongburensis* or other reptiles and birds that prey on cane toads. Measures to mitigate the impacts of Cane toad *Rhinella marina* on the Project Site are described in the FMP, **Section 3.4**.

4.2.6 Sediment basin discharge criteria

Assessment of the relevant discharge parameters will be carried out prior to active discharge offsite from sediment detention basins, excavations or other areas of collected water. Monitoring of the parameters will be conducted using calibrated hand-held monitoring devices and/or sample collection for laboratory analysis. Active discharge of water from a sediment basin into the off Site receiving environment will require approval from a Project Environmental Representative/Manager.

At a minimum, stormwater actively discharged from a controlled sediment basin to receiving waters must comply with Tweed Shire Council stormwater discharge criteria (TSC 2016), the Sites approved ESCP and CEMP.

The Tweed Shire Council specifications (TSC 2016) require that stormwater discharge monitoring must take place at all surface water locations leaving the Site for the following parameters:

- suspended solids and non-filterable residue (NFR) – monthly or during a discharge event (defined as >25mm in any 24 hour period);

- pH – monthly or during a controlled discharge event; and
- Total phosphorus and Total nitrogen – every three months.

Furthermore, a monthly water quality monitoring program will monitor water quality at sediment basin discharge points (near the outlet) and in the wetland received environment as described in **Section 4.6**.

4.3 Contamination pathways

All Stage 1 works and associated activities are to be delivered in accordance with an approved CEMP Contamination Management Sub-Plan in order to avoid any impacts on groundwater, particularly during piling and excavation activities.

Contaminated land investigations in the form of a Preliminary Site Investigation (PSI) and Detailed Site investigation (DSI) were undertaken at the site by Octief with field work undertaken on 14 June 2018 and 1-3 August 2018 respectively. The DSI included the collection of:

- 55 primary soil samples from 50 locations using a hand auger;
- two sediment samples, one from each of the storage dams on-site;
- a surface water sample from each dam; and
- the installation and subsequent sampling for a groundwater monitoring bore.

The investigations concluded that based on the conceptual site model presented in the report, exposure pathways of identified soil and groundwater contamination to ecological receptors were unlikely to be complete.

4.4 Groundwater

The location of the Project's development footprint on the Site seeks to minimise interference with hydrological flows, including contributions from groundwater.

Other than what may be required for piling, subsurface excavations will be at a shallower depth than measured depth to groundwater on the Site. The geotechnical investigations undertaken by Morrison Geotechnical (2018) identified that the water table sits at approximately RL 11.0.

Many of the piles will not extend below RL 11.0. The proposed less intrusive method of pile construction using a continuous flight auger (CFA) or Bore Pile type should remove the requirement to de-water from groundwater table during piling activities (Darren Chow, Lendlease Building Pty Ltd, pers. comm. 25 June 2019). Piles will be between 600 mm and 1,200 mm in diameter (generally 900 mm) and will typically be spaced 8.4 m apart. As the piles are not continuous it is not anticipated that they will create a barrier to any shallow or perched groundwater flow that currently occurs within the Project footprint, therefore the design will not have any significant impacts to groundwater flow or on groundwater contributions to base flow in the wetlands.

While no site specific groundwater modelling data is currently available for the Site, the level that groundwater has been encountered in the bores which are situated upslope from the wetlands is at a higher elevation than the wetlands, indicating that there is potential for groundwater to influence the wetlands and provide some base flow. However, the extent to which groundwater influences flows and water quality within the wetlands is unknown based on available site information.

There is a very low risk of any reduction of groundwater recharge during Stage 1 works.

4.5 Spill management

A spill prevention and response management plan along with supporting documentation will be produced as part of the Project's CEMP and their prescriptions will be implemented to minimise the risk of surface water or groundwater contamination.

Material safety data sheets (MSDSs) will be available on all chemical products brought onto Site to aid in the identification of appropriate spill clean-up and disposal methods.

Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their transport, transfer, storage, use and disposal.

Spill response materials and equipment (including personal protective equipment) will be available during all project phases and will contain equipment to remediate or contain both chemical and hydrocarbon spills. All spills will be reported to management and recorded in the incident register as per the Project's CEMP and OEMP procedures.

4.6 Surface water quality monitoring program

The surface water monitoring objectives for the Site are to detect changes during construction in receiving water quality resulting from the Project, with stormwater discharges potentially containing increased sediment loads, nutrients, total and dissolved metals, hydrocarbons or other contaminants such as pesticides.

Surface water monitoring results and trends will be reported in monthly factual report and an annual interpretative report. Water quality results shall be compared against water quality guidelines for ecosystem health. Monitoring parameter exceedances which indicate increasing trends and/or results that are not generally consistent with background data will trigger investigation by the Site's environmental manager/advisor (or suitably qualified subcontractor) and adaptive management actions.

As part of the adaptive management approach, the water quality monitoring program will be reviewed periodically once sufficient data is available to ensure alignment with any changes in Site activities and potential impact pathways and determine whether any parameters should be excluded from further monitoring rounds. Based on the seasonality of rainfall in the region, it is anticipated that 12 months of monitoring data would be required to adequately assess all parameters, as such it is proposed that this is undertaken as part of the annual reporting process with recommendations for any change in parameters included in the report.

4.6.1 Background data

Water quality monitoring

In addition to the modelling undertaken by Bonacci (2019) as described above, Greencap conducted three surface water sampling events on 19 and 26 November and 19 December 2018 to record water quality conditions under the existing land use. The intention of this sampling was to create some background data to enable detection of potential changes during construction and operation in receiving water quality resulting from the Project. The water quality monitoring program collected water quality data over two sampling events on existing stormwater which flows into the downstream forested wetland and the east-flowing floodplain drain receiving environment. Sample locations were selected to allow a best possible indication of stormwater runoff quality upstream and downstream of the Site and the receiving environment (wetland).

Given the objective for detection of changes to water quality in receiving water bodies during construction and operation of the Project, specific contaminants of concern were selected as listed above. Organochlorine Pesticides (OCP) and Organophosphorus Pesticides (OPP) as a result of the historic and current agricultural land-use. Physico-chemical parameters were also monitored for pH dependent threatened species such as the wallum froglet *Crinia tinnula* and olongburra frog *Litoria olongburensis*.

4.6.2 Sampling locations

Sample locations have been selected to allow a best possible indication of stormwater runoff quality upstream and downstream of the Site and the receiving environment (wetland). It is noted that under pre-construction conditions the majority of stormwater run-off from the site would be sheetflow heading in a northerly direction. As sheetflow cannot be readily sampled, the locations detailed below are considered the most appropriate to obtain relevant site data.

To effectively assess the water quality of stormwater discharge and its impact on the receiving environment, particularly the wetlands, five sampling locations are proposed (**Figure 11**) for monthly sampling:

- Dam and Dam Drain:
 - Dam drain: to assess water entering the dam - upstream/paddock run off*
 - Dam: catchment for on Site/off Site drains, water diverted from wetland*

*These locations will only be monitored in the pre-construction and early stages of construction works in the event the dam is decommissioned during the construction phase. This is further detailed in the Vegetation Management Plan (**Section 2.3**) as a control measure for the *Salvinia molesta* infestation.
- Upstream and Receiving Environment:
 - Upstream West: upstream of the wetland stream/drain to the west, along Tweed Coast Rd (background quality).
 - Downstream East: upstream of the wetland stream/drain, to the east along Turnock street (background quality).
 - Upstream North West; water flowing through the wetland stream/drain from the river and urban catchment.
- In addition to the nine sampling locations listed above, event-based sampling will also include three drains around the perimeter of the site:
 - Cudgen Road Drain - to assess stormwater runoff entering the Site (upstream, background quality).
 - Lowest paddock drain - to assess runoff from the site.
 - Turnock St Drain - assess upstream water entering the wetland.
- Prior to a discharge event, the four sediment basin will be sampled at the discharge points (near the outlet) to ensure the quality of water released is consistent with the water quality objectives.

4.6.3 Sampling frequency

Ongoing monitoring will be undertaken during Stage 1 prior to controlled discharge events and in the event of an uncontrolled discharge to assess potential impacts resulting from surface water discharges on the receiving environment.

4.6.4 Sampling parameters and performance criteria

The list of proposed sampling analytes, field parameters and the trigger criteria they will be assessed against are based on the following guidelines:

1. NSW Water Quality Objectives for the Tweed River Catchment for Aquatic Ecosystems (Tweed 2006);
2. Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000).

A summary of the proposed sampling analytes is provided in **Table 7**.

Table 7 Surface Water Quality Monitoring Parameters

Analyte		Trigger Criteria	
In-Field	Unit	Tweed (2006)	ANZECC (2000) 95% species protection
pH	pH Units	7.0 - 8.5	6.5 - 8.5
Turbidity	NTU	0.5 - 10	6.0 - 50
Electrical Conductivity (EC)	mS/cm	30 - 2,200	N/A
Dissolved Oxygen (DO)	%	80 - 110	85 - 110
Temperature	°C	N/A	N/A
Oxidation Reduction Potential (ORP)	mV	N/A	N/A
Oil and grease	Visual observation	N/A	N/A
Laboratory			
Total Suspended Solids (TSS)	mg/L	N/A	N/A
Total Dissolved Solids (TDS)	mg/L	N/A	N/A
Ammonia	µg/L	15	20
Chlorine	mg/L	N/A	N/A
Chlorophyll-a	µg/L	4	5
Filterable Reactive Phosphorus	µg/L	N/A	20
Nitrate	µg/L	N/A	N/A
Oxides of Nitrogen	µg/L	15	40
Total Nitrogen	µg/L	300	350
Total Phosphorus	µg/L	30	25
Aluminium (pH >6.5)	µg/L	N/A	55
Arsenic (filtered) ²	µg/L	N/A	24
Boron (filtered)	µg/L	N/A	370
Cadmium (filtered)	µg/L	5.5	0.2
Chromium (filtered) ²	µg/L	4.4	1.0
Copper (filtered)	µg/L	1.3	1.4
Cobalt (filtered)	µg/L	1.0	N/A
Lead (filtered)	µg/L	4.4	3.4
Manganese (filtered)	µg/L	N/A	1,900
Mercury (filtered)	µg/L	0.4	0.6
Nickel (filtered)	µg/L	70	11
Selenium (filtered)	µg/L	5	11

Analyte		Trigger Criteria	
Silver (filtered)	µg/L	1.4	0.05
Zinc (filtered)	µg/L	15	8.0
Benzene	mg/L	N/A	0.95
Toluene	mg/L	N/A	N/A
Ethylbenzene	mg/L	N/A	N/A
Xylene - Total	mg/L	N/A	0.95
Naphthalene	mg/L	N/A	0.016
Total Recoverable Hydrocarbons (TRH)	mg/L	N/A	N/A
TRH Silica-gel Clean-up ¹	mg/L	N/A	N/A
Organochlorine Pesticides (OCP)			
4,4'-DDE	µg/L	N/A	0.03
4,4'-DDT	µg/L	N/A	0.01
Aldrin	µg/L	N/A	0.001
γ-BHC (Lindane)	µg/L	N/A	0.2
Chlordane	µg/L	N/A	0.08
Dieldrin	µg/L	N/A	0.01
Endosulfan	µg/L	0.01	0.2
Endrin	µg/L	0.02	0.02
Heptachlor	µg/L	N/A	0.09
Toxaphene	µg/L	N/A	0.2
Organophosphorus Pesticides (OPP)			
Azinphos-methyl	µg/L	N/A	0.02
Chlorpyrifos	µg/L	0.009	0.01
Demeton-S	µg/L	N/A	0.04
Diazinon	µg/L	N/A	0.01
Dimethoate	µg/L	N/A	0.15
Fenitrothion	µg/L	N/A	0.2
Malathion	µg/L	N/A	0.05

¹TRH silica gel clean-up provides an indication of whether reported hydrocarbons are petroleum based or non-petroleum based.

² If a sample returns detectable concentrations of these analytes, additional analyses (speciation) may be required to enable comparison against additional trigger criteria or trace potential sources of contaminants.

4.6.5 Quality control

A suitable number of QA/QC samples will be collected in accordance with AS4482.1-2005 which stipulates a minimum of 1 duplicate sample, as well as a field and trip blank.

Surface water samples will be collected using industry standard practices for surface water sampling and in general accordance with:

- AS/NZS 5667.1:1998 Water Quality – Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS/NZS 5667.1);
- AS/NZS 5667.4:1998 Water Quality – Sampling Part 4: Guidance on sampling from lakes, natural and man-made (AS/NZS 5667.4); and
- AS/NZS 5667.6:1998 Water Quality – Sampling Part 6: Guidance on sampling of rivers and streams (AS/NZS 5667.6).

4.6.6 Reporting

A brief summary letter report will be prepared for each monthly and event-based sampling round that will include:

- Site details;
- Sampling objective and monitoring methodology; and
- Sample and monitoring results, exceedances of the adopted trigger values will be highlighted.

An annual report will be submitted providing interpretation of water quality data, evaluating water quality exceedances and trends and a review of the water quality monitoring program following the completion of the 12-month period of monitoring. The report may include recommendations for any future monitoring parameters and frequencies based on the previous 12 months monitoring results, or changes in site conditions.

4.7 Summary of water quality mitigation measures

Table 8 summaries the various activities, timing and responsibilities required to achieve the water quality management aims and objectives.

Table 8 Water quality mitigation measures

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
Stormwater Management - Construction						
96	All areas	All construction works will be delivered in accordance with a Construction Environmental Management Plan (CEMP) including an Erosion and Sediment Control Plan (ESCP)	C	Management, all construction staff and site personnel	Mitigate any impacts from the Project on water quality/ hydrological processes that sustains threatened species and TECs	As per approved CEMP and ESCP
97	All areas	All construction staff and site personnel will be made aware of their environmental responsibilities and safeguard measures within the CEMP to avoid and minimise environmental impacts. The CEMP will be submitted to the Department of Planning and Environment for review and approval prior to commencement of works.	C	Management, all construction staff and site personnel	Mitigate any impacts from the Project on water quality/ hydrological processes that sustains threatened species and TECs	Adherence to water quality management policies
98	All areas	The CEMP will be submitted to the Department of Environment and Planning for review and approval prior to commencement of construction works	P	Management	Mitigate any impacts from the Project on water quality/ hydrological processes that sustains threatened species and TECs	Approved Project CEMP

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
99	All areas	The ESCP will be implemented prior to the commencement of construction works, especially prior to the onset of each wet season (from late February to late April).	P	Management and all contractors	Mitigate any impacts from the Project on water quality/ hydrological processes that sustains threatened species and TECs	Approved Project ESCP criteria
100	All areas	The ESCP is reviewed and updated, as required, and at least annually prior to the onset of the wet season to reflect changes in site conditions as construction progresses.	Annually/ C	Management	ESCP will reflect changes in site conditions as construction progresses	Approved Project ESCP criteria
101	All areas	An erosion assessment will be conducted on these areas by a Certified Practitioner in Erosion and Sediment Control (CPESC) during the planning phase of the ESCP development.	P (planning)	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	CPESC erosion assessment undertaken
102	All areas	ESC design should be in accordance with the guidelines in Best practice erosion and sediment control (IECA 2008), the Tweed Shire Council Development Design Specification - D7 and the Landcom Managing Urban Stormwater "Blue Book".	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
103	All areas	The ESCP will include a sediment barrier (or diversion bund) around the Site and sediment ponds to control the quality of water released from the Site into the receiving environment.	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria
104	All areas	Erosion and sediment control management of stockpiles is to be consistent with relevant guidelines and the most recent ESCP.	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria & industry guidelines
105	All areas	Erosion and sediment control measures including sealed areas will be inspected regularly to check for compliance and that they are maintained and are in good working order.	Monthly/ C	Project Environmental Representative	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Compliance with approved Project ESCP criteria
106	All areas	ESC compliance inspection reports shall be provided to Project Management (TSA).	Monthly/ C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Reporting of all ESCP non-compliances
107	All areas	In the event that an ESCP non-compliance is identified, Management shall be notified as soon as practical.	As required/ C	Management, Project Environmental Representative	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Compliance with approved Project ESCP criteria

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
				and all contractors		
108	All areas	<p>All erosion and sediment controls must be maintained, e.g. restoring capacity of the sedimentation basins and rock filter dams through desilting as necessary after rainfall events, subject to daily inspections and when weather conditions permit, in accordance with the IECA (2008) guidelines.</p> <p>Temporary sediment traps will be retained until after the lands they are protecting are completely rehabilitated.</p>	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	<p>Approved Project ESCP criteria</p> <p>Evidence of ESCP onsite audits</p>
109	All areas	If soil erosion is evident, exposed surfaces at the affected area will be stabilised with whatever means is considered practicable and satisfactory (e.g. matting, soil stabiliser, mulching) to mitigate and stabilise the area in accordance with the relevant ESCP and guidelines.	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria
110	All areas	<p>The Site manager will keep a logbook making entries at least weekly, immediately before forecast rain or after rainfall. Entries will include:</p> <p>Volume and intensity of rainfall events, the condition of any soil and water management works, the condition of vegetation and any need to</p>	C	Management and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
		irrigate, the need for dust prevention strategies any remedial works to be undertaken.				
111	Project footprint and sediment basins (MZ 2.3)	The following events must be reported to Project Management (TSA); ESC measures have not been fully implemented prior to the commencement of earthworks/construction, inspections not conducted at the required frequency, failed ESC during a rain event that it was design to withstand and sediment controls have not been restored in accordance with IECA guidance timeframes following rain events.	C	Construction contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Approved Project ESCP criteria
112	Project footprint and sediment basins (MZ 2.3)	Personnel who are involved in maintenance of erosion and sediment controls, and dewatering activities will be suitably trained in the appropriate installation and operation of controls, discharge water-quality requirements, treatment processes and incident reporting procedures.	C	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Qualification review of suitably qualified contractors engaged to undertake activities
113	All areas	Contaminated soils (i.e. sediment removed from basins that could potentially be contaminated) will be managed in accordance with the Sites Waste Management Procedure (WMP). The WMP will outline the waste management strategies including the process for waste identification, characterisation, storage, labelling, inspection, transport onsite and transfer to the appropriate waste vendor, including completion of all required waste disposal documentation.	C	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to all Site Waste Management Procedures

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
114	Sediment basins (MZ 2.3)	Assessment of the relevant discharge parameters will be carried out prior to active discharge offsite from sediment detention basins, excavations or other areas of collected water.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Compliance with approved Project ESCP discharge water criteria
115	Sediment basins (MZ 2.3)	Active discharge of water from a sediment basin into the off Site receiving environment will require approval from a Project Environmental Representative/ Manager.	C	Project Environmental Representative/ Manager and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Compliance with approved Project ESCP discharge water criteria
116	Sediment basins (MZ 2.3)	Stormwater actively discharged from a controlled sediment basin, excavations or other areas of collected water to off Site receiving waters must comply with the Tweed Shire Council Development Design Specification - D7 stormwater discharge criteria and any conditions of approval which were not available at the time of compilation of this document.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Compliance with approved Project ESCP discharge water criteria and TSC D7 Criteria: Suspended solids and non-filterable residue (NFR) monthly or during a discharge event (defined as >25mm in any 24 hour period), pH monthly or during a controlled discharge event and Total Phosphorus and

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
						Total nitrogen every three months
Stormwater Management - Operation						
117	Project footprint and receiving environment	The stormwater management system for operation of the Project will be designed in accordance with the locally appropriate standard (TSC 2016).	P (design phase)	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Maintain or improve the quality of stormwater that is discharged from the Site.
118	Project footprint and receiving environment	The stormwater management system design will cater for water volume discharges associated with design storms up to and including 100-year ARI (1% AEP) storm events as detailed in local development design specifications (TSC, 2016). In regards to water quality, the system will also be designed to meet water quality performance criteria detailed in TSC 2016	P (design phase)	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	No decrease in the quality of stormwater that is discharged from the Site.
Water Sensitive Urban Design Measures						
119	Farm dam in MZ 1.4	The management of the farm dam located at the north of the site will be addressed in the Stage 2 BMP.	C	Manager and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	TBC

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
120	MZ 2.3	A transition plan will be developed outlining the stages of activities and timing for converting the sediment basins into bioretention basins.	C/ O	Management, Wetland design Contractor	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Sediment basin/ Bioretention basin transition plan
Groundwater						
121	Project footprint	Other than what may be required for piling, subsurface excavations will be at a shallower depth than measured groundwater depths on the Site. Piles will be between 600 mm and 1200 mm in diameter and will typically be spaced 8.4 m apart, except under lift and/or stairwell cores where they will be not less than 2m apart. As the piles are not continuous, it is not anticipated that they will create a barrier to any shallow or perched groundwater flow that currently occurs within the Project footprint.	P (design phase)	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Maintain shallow or perched groundwater flow that currently occurs within the Project footprint
Wildlife						
122	MZ 2.3	To avoid any potential changes in pH and impacts on threatened aquatic species, other commercially available flocculants that work as effectively as a gypsum replacement yet do not create the large changes in pH will be used on the Site.	C	Management and contractors	Threatened aquatic species conservation	No change to pH in receiving environment waters pH meets water quality criteria outlined in the approved Site ESCP and Section 4.6.4

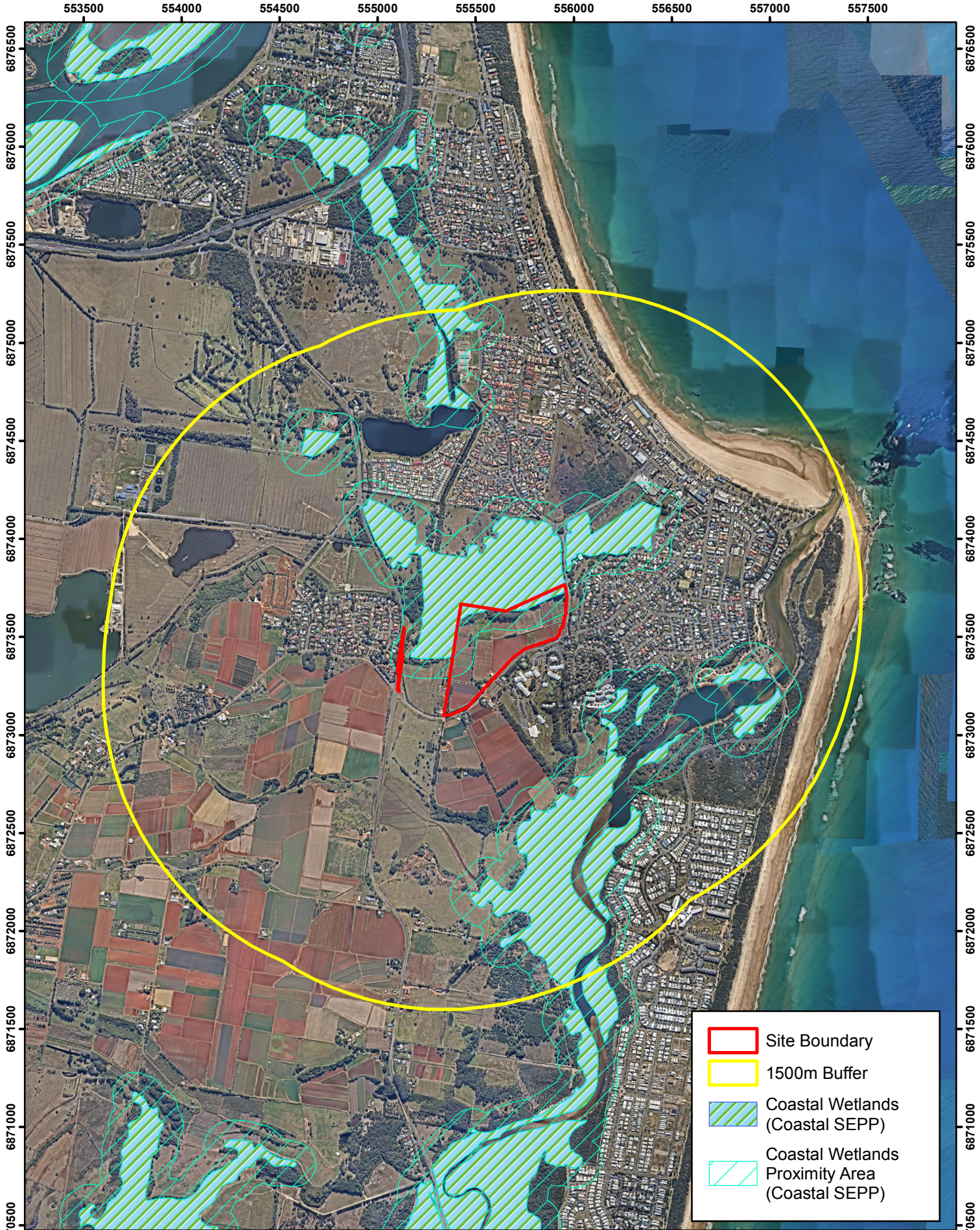
Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
123	MZ 2.3	A Cane toad <i>Rhinella marina</i> exclusion fencing will be installed around sediment basins and bioretention basins.	C	Manager and contractors	Mitigate any impacts from the Project that sustains threatened species and TECs	Cane toad <i>Rhinella marina</i> exclusion fencing installed
Spill prevention and response management						
124	All areas	A spill prevention and response management plan and supporting documentation will be produced as part of the Projects CEMP and their prescriptions will be implemented to minimise the risk of surface water or groundwater contamination.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to spill prevention and response management procedures Water quality criteria outlined in the approved Site ESCP and Section 4.6.4
125	Project footprint	Material safety data sheets (MSDSs) will be available on all chemical products brought onto Site to aid in the identification of appropriate spill clean-up and disposal methods. Chemicals and hazardous substances used during all phases of the Project will be selected and managed to minimise the potential adverse environmental impact associated with their transport, transfer, storage, use and disposal.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to spill prevention and response management procedures.





Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
126	Project footprint	Spill response materials and equipment (including personal protective equipment) will be available during all project phases and will contain equipment to remediate or contain both chemical and hydrocarbon spills.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to spill prevention and response management procedures.
127	Project footprint	All spills will be reported to management and recorded in the incident register as per the Projects CEMP procedure.	C	Management, Project Environmental Representative and all contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to spill prevention and response management procedures. All spills recorded in the incident register.
Surface Water Quality Monitoring						
128	Receiving environment (wetland) and sediment basins	The surface water monitoring objectives for the Site are to detect changes in receiving water quality resulting from the Site activities and discharges offsite of water potentially containing nutrients, dissolved metals, hydrocarbons or other contaminants such as Organochlorine Pesticides (OCP) and Organophosphorus Pesticides (OPP)	C Monthly NB: this monitoring program will be reviewed to be in line with any conditions of approval.	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	NSW Water Quality Objectives for the Tweed River Catchment for Aquatic Ecosystems (Tweed 2006); Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000).

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
						Water quality criteria outlined in Section 4.6.4
129	Receiving environment (wetland) and sediment basins	Surface water monitoring results will be reported in monthly factual report and an annual interpretative report evaluating water quality exceedances and trends and a review of the water quality monitoring program.	Monthly/Annual C	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Monthly/ Annual water quality reports submitted. Water quality criteria outlined in Section 4.6.4
130	Receiving environment (wetland) and sediment basins	Monitoring parameter exceedances which indicate increasing trends and are not generally consistent with background data will trigger investigation by the Site's environmental manager/advisor (or suitable qualified subcontractor) and adaptive management actions.	C	Environmental manager/advisor and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Water quality criteria outlined in Section 4.6.4
131	Receiving environment (wetland) and sediment basins	Surface water sampling events undertaken to record water quality conditions under the existing land use to enable detection of potential changes during construction and operation in receiving water quality resulting from the Project.	P	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Water quality criteria outlined in Section 4.6.4
132	Receiving environment (wetland) and sediment basins	A suitable number of QA/QC samples will be collected in accordance with AS4482.1-2005 which stipulates a minimum of 1 duplicate sample, as well as a field and trip blank.	C	Contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to industry standard practices for sampling QA/QC

Item #	Management zone	Activity Description	Timing/ Project Phase ¹	Responsibility	Outcome	Performance criteria
133	Receiving environment (wetland) and sediment basins	Surface water samples will be collected using industry standard practices for surface water sampling and in general accordance with: <ul style="list-style-type: none"> AS/NZS 5667.1:1998 AS/NZS 5667.4:1998; and AS/NZS 5667.6:1998 	C	Contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Adherence to industry standard practices for surface water sampling
134	Receiving environment (wetland) and sediment basins	Physico-chemical parameters including pH will be monitored in water discharged from sediment basins and in the downstream wetland environment to protect aquatic wetland fauna.	C	Management and contractors	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	No change to pH in receiving environment waters. Water quality criteria outlined in Section 4.6.4
135	All areas	Should water quality monitoring results indicate performance criteria non-compliance, increasing trends in metals/nutrient concentrations and results are not generally consistent with background data, or impacts from Project activities are identified which could result in an increase in frequency of non-compliance it will trigger investigation by the Site's environmental manager/advisor and adaptive measures will be implemented to mitigate any impacts.	At all times	Management and consultants	Mitigate any impacts from the Project on water quality that sustains threatened species and TECs	Non-compliance to performance criteria will trigger investigation and adaptive management measures will be implemented

¹Project phases: Pre-construction (P) and Construction (C).



	Site Boundary
	1500m Buffer
	Coastal Wetlands (Coastal SEPP)
	Coastal Wetlands Proximity Area (Coastal SEPP)

Client: C107778
 Job #: J156455
 Author: M. Nunn
 Checked: D. Licari
 Date: 4/06/2019

GREENCAP

N
 0 350 700 m
 Scale (@A4): 1:25,000

Coordinate System: GDA 1994 MGA Zone 56

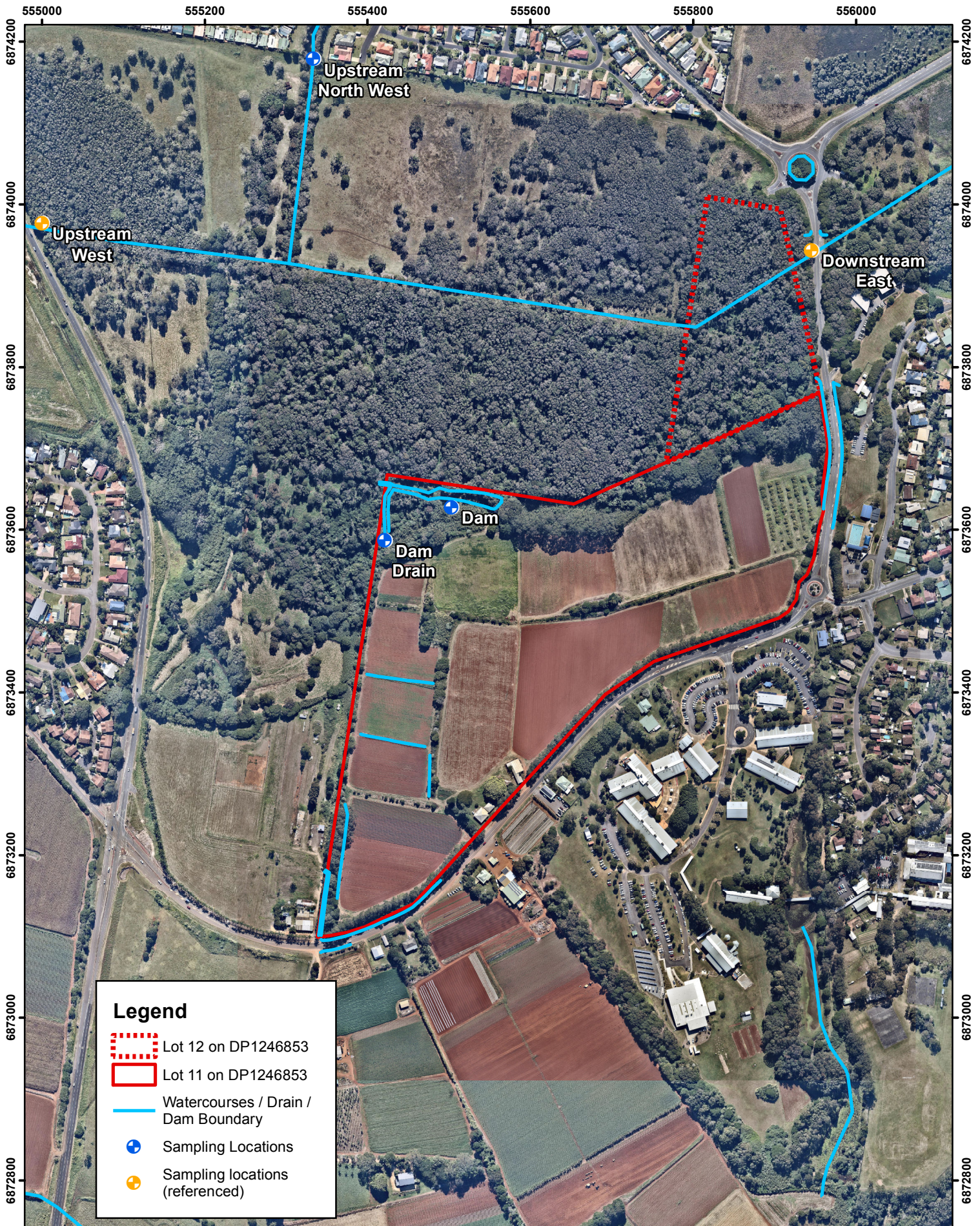
Imagery 8th August 2018 (59.7 cm) © Nearmap 2018
 Coastal SEPP mapping © Department of Planning and Environment (DPE) 2018

Wetlands

Tweed Valley Hospital BMP
 771 Cudgen Road
 Cudgen NSW

Figure 10

No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.



Client: C107778
 Job #: J156455
 Author: E. Lewis
 Checked: C. Maloney
 Date: 4/06/2019

Scale (@A4): 1:6,000
 Coordinate System: GDA 1994 MGA Zone 56

*Note: All data is approx only & subject to survey.
 Imagery 8th August 2018 (7.5 cm) © Nearmap 2018
 Hydrolines and Hydroarea (NSW Hydrography) ©
 Department of Finance, Services and Innovation (2018)*

Surface Water Sampling Locations

Tweed Valley Hospital BMP
 771 Cudgen Road
 Cudgen NSW

Figure 11



No warranty is given in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.

5. REVIEW AND EVALUTATE

This Stage 1 BMP will be reviewed on a periodical basis during Stage 1 works to assess whether objectives are being achieved and in accordance with changes in conditions. If required, revisions will be made to this Stage 1 BMP to improve proficiency. In the long term, it is important to keep track of control efforts and ensure that the activities being undertaken are contributing to the objectives of this BMP.

6. REFERENCES

- ArborSafe (2018) *Preliminary Arboricultural Report Tweed Valley Hospital Project*.
- Aviation SEARS response: Tweed Valley Hospital (AviPro), September 2018.
- Australian Transport Safety Bureau (2017) *The Australian aviation wildlife strike statistics report (2006 to 2015)*, https://www.atsb.gov.au/media/5772313/ar2016063_final-report.pdf
- Bushland Restoration Services (January 2016) *Weed Reduction Strategy Mitchell's Rainforest Snail Habitat At specified section of Lot 13 DP871753 Kingscliff, New South Wales*. South Murwillumbah, NSW.
- Byron Shire Council (BSC) (2013). *Excluding cane toads from water bodies*. Mullumbimby.
- Big Scrub Rainforest Landcare Group (BSRLG) (2005). *Subtropical Rainforest Restoration: A practical manual and data source for landcare groups, land managers and rainforest regenerators*. Second Edition. Big Scrub Rainforest Landcare Group, Bangalow, NSW.
- Catterall, C.P. and Kanowski, J. (2010) *Rainforest restoration: approaches, costs and biodiversity outcomes*. Reef & Rainforest Research Centre Ltd, Cairns.
- Clarke, S. A (2019) *Targeted survey for Thersites mitchellae (Cox, 1864) (Mitchell's Rainforest Snail) at 771 Cudgen Rd, Cudgen, NSW, site for the proposed Tweed Valley Hospital*, Prepared for Herbert Smith Freehills LLP by Invertebrate Identification Australasia, Faulconbridge NSW.
- Allen, C. and Phillips, S. (2008). *Grid-based SAT (RGB-SAT) sampling for the purposes of identifying areas being utilized by koalas in the South-east Forests of NSW*. Project update & future directions. Unpublished report to NSW Department of Environment and Climate Change.
- Bates Smart (2018). *Tweed Valley Hospital Masterplan*.
- Biodiversity Conservation Act 2016 (NSW)*.
- Bonacci (2018), *Tweed Valley Hospital Development – Design Report Civil & Structural, Revision B*. Bonacci Group (NSW) Pty Ltd, Sydney.
- Bonacci (2019), *Tweed Valley Hospital Development – Design Report Civil & Structural, Addendum 1 to Design Report, Revision E*. Bonacci Group (NSW) Pty Ltd, Sydney.
- DECCW (2010), *Far North Coast Regional Conservation Plan*, Department of Environment, Climate Change and Water, Sydney.
- Koala Response Strategy (2009), *Koala Safety Fencing and Measures Guideline: A Guidelines for the draft South East Queensland Koala Conservation State Planning Regulatory Provisions*. Queensland Government.
- Ecosure (2018), *Tweed Flying-fox Camp Management Plan - Final Report to Tweed Shire Council*, Ecosure, Burleigh Heads, Queensland.
- Greencap (2019a), *Matters of National Environmental Significance Report – Tweed Valley Hospital*. Greencap Pty Ltd, Brisbane.
- Greencap (2019b), *Biodiversity Development Assessment Report – Tweed Valley Hospital*. Greencap Pty Ltd, Brisbane.
- Healthy Waterways (2006), *Water Sensitive Urban Design: Technical design guidelines for south east Queensland*. Brisbane City Council and Moreton Bay Waterways and Catchments Partnership, Brisbane.
- IECA (2008) *Best Practice Erosion & Sediment Control*. International Erosion Control Association (IECA) Australasia Chapter, Picton, NSW. ISBN: 978-0-9806146-0-2

Interim Noise Guidelines (2009)

Keith, D.A. (2004), *From ocean shores to desert dunes: the vegetation of New South Wales and the ACT*, Department of Environment and Conservation, Hurstville.

Landcom (2004), *Managing Urban Stormwater: Soils and Construction Volume 1*, Fourth Edition. Landcom, Parramatta.

Land & Fire Assessments (2018) *Bushfire Assessment for Proposed State Significant Development at Lot 102 DP870722 Revision No. 05*.

Lendlease Building Pty Ltd (LLB) (2019) *Project Construction Environmental, Health & Safety Management Plan (CEMP)*. Issue No 5.0.

Nature Conservation Council (NCC) of NSW, *Creating bird-friendly gardens in bush fire prone areas: Fact Sheet*. Viewed 24 March 2019: <https://www.nature.org.au/media/1794/bird-friendly-garden-factsheet.pdf>

NSW Scientific Committee (1999), *Lowland rainforest on floodplain in the NSW North Coast Bioregion – endangered ecological community listing*. NSW Scientific Committee final determination.

OEH (2018) Mitchell's Rainforest Snail - profile. Viewed 6 March 2019: <https://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10801>

RFS (2006), *Planning for bush fire protection: A guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service, Granville.

RFS (2007), *Standards for Asset Protection Zones*. NSW Rural Fire Service, Granville.

RFS (2018), *Planning for bush fire protection: A guide for councils, planners, fire authorities and developers*. Pre-release issued August 2018. NSW Rural Fire Service, Granville.

Robert Bird Group (RBG) *Stage 1 Early and enabling works construction sediment and erosion plan drawings C-2-105*. Sydney, NSW.

Standards Reference Group SERA (2017) *National Standards for the Practice of Ecological Restoration in Australia*. Second Edition. Society for Ecological Restoration Australasia. Available from URL: www.seraustralasia.com

Tim Fitzroy & Associates (2018) *Land Use Conflict Risk Assessment Mixed Agricultural Use on Proposed Tweed Valley Hospital Lot 102 DP 870722 Cudgen Road, Cudgen*. Prepared for: Health Infrastructure. REVISED FINAL V7.0.

TSC (2019), *Tweed Shire Council Native Species Planting Guide*. Viewed 25 February 2019. <https://www.tweed.nsw.gov.au/NativeSpeciesPlantingGuide/Tweed>

The Hills Shire Council, 2015. *Vegetation Management Plan Guideline*

TSA Management. (2018), *Tweed Valley Hospital Concept Proposal and Design*.

TSC (2016), *Tweed Shire Council – Development Design Specification D7 Stormwater quality*, Tweed Shire Council, Murwillumbah.

Turf (2019) *Drawing No L-EIS-1 Rev F Tree Removal and Preservation Plan* dated 3 May 2019. Turf Design Studio, Cronulla.

Turf (2019) *Drawing No L-EIS-2 Rev E Landscape Zonal Plan* dated 3 May 2019. Turf Design Studio, Cronulla.

Tweed Shire Council (2018), *Kingscliff Locality Plan Volume 1 Context and locality wide strategies*, Tweed Shire Council, Murwillumbah.

NSW Weed Wise <https://weeds.dpi.nsw.gov.au/>. Viewed 25 February 2019.

Water by Design (2014), *Bioretention Technical Design Guidelines (Version 1.1)*. Healthy Waterways Ltd, Brisbane.

Stage 1 Biodiversity Management Plan

NSW Health Infrastructure Tweed Valley Hospital

ATTACHMENT 1 TWEED VALLEY HOSPITAL MITIGATION MEASURES

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
Revegetation	1	Regeneration and revegetation of areas detailed in the Landscape Masterplan Report (TURF 2018) will enhance connectivity within the site when compared to the existing land use.	BDAR - Table 8, Design - Point 4	BMP Stage 2	BMP Stage 2: Section 2.3.3 (Restoration); Section 3.3.2 Habitat Connectivity; Figure 6 (MZ 6 and 7)
Native vegetation Clearing	2	No remnant native vegetation will be cleared.	BDAR - Table 8, Design - Point 5	BMP Stage 1	BMP Stage 1: Table 4 item 1, 2, 15, 12, 16 BMP Stage 2: Table 4 item 1, 2, 11, 12, 14, 15
Ecological restoration, rehabilitation and ongoing maintenance of retained native vegetation on Site	3	All remnant native vegetation outside of the development footprint will be protected and maintained	BDAR - Table 8, Project Planning- Point 10	Both	BMP Stage 1 VMP Section 2.3 BMP Stage 2 VMP Section 2.3
Ecological restoration, rehabilitation and ongoing maintenance of retained native vegetation on Site	4	All areas of intact remnant native vegetation on Site and remaining areas of planted or self-sown windrow vegetation at the Site will be retained and managed in accordance with the vegetation management performance criteria to be set out in the Biodiversity Management Plan to preserve and enhance current biodiversity values.	BDAR - Table 8, Project Planning- Point 11	Both	BMP Stage 1 VMP Section 2.3.1 Weed Management Measures; Section 2.4. BMP Stage 2 - VMP Section 2.3.5
Vegetation clearance	5	In accordance with section 9.4.2 of the BAM, a Biodiversity Management Plan will incorporate a Vegetation Management Plan with measures to monitor vegetation at the Site, including objectives and thresholds which, in the event of exceedances, will trigger investigation and adaptive management actions.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 VMP Section 2.5 BMP Stage 2 VMP Section 2.3.5
Vegetation clearance	6	<u>Landscape plan Zone 2</u> Low maintenance native landscape including detention basins and vegetation buffer that provide stepping stone habitats to include: • Locally indigenous native rainforest trees, shrubs and groundcovers • Inclusion of habitat features such as rocks that have been salvaged from other areas of the Site (cleared windrows) that will create habitat for ground dwelling species	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT BDAR S3.2.7	BMP Stage 2	BMP Stage 2 VMP Section 2.3 & Appendix C
	7	<u>Landscape plan Zone 5</u> • New plantings within rain gardens that both treat stormwater quality and contribute to providing a range of native habitat across the site • Locally indigenous native trees along roadways • Water adapted ground covers (e.g. from the Cyperaceae, Juncaceae and Poaceae families) are to be planted in rain gardens			
	8	<u>Landscape plan Zone 6 and 7</u> Retention and enhancement of established windrows (vegetation buffers): • 10m wide vegetated buffer for Zone 6 and 30m wide vegetated buffer for Zone 7 • Augment existing vegetation buffers to increase biodiversity values, including habitat connectivity • Removal of High Threat Exotic weeds that have self-sown within the windrows (e.g. camphor laurel Cinnamomum camphora, small leaved privet Ligustrum sinense, umbrella tree Schefflera actinophylla) • Staged removal of slash pine Pinus elliotii			
Habitat	9	In accordance with section 9.4.2 of the BAM, a Biodiversity Management Plan will set out provisions for the ecological restoration, rehabilitation and/or ongoing maintenance of native vegetation habitat on or adjacent to the development Site. Actions will be undertaken in both construction (see above) and operations phases.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 VMP Section 2.3 (weed management) BMP Stage 2 VMP Section 2.3 (restoration, rehabilitation and/or ongoing maintenance)
Habitat	10	Weed removal shall be undertaken to preserve biodiversity values in the remnant native vegetation areas on Site, in particular areas of remnant White Booyong - Fig subtropical rainforest, Paperbark swamp and Flooded Gum forest. Weed removal will include: • Removal of an exotic grassland monoculture composed of barner grass Pennisetum purpureum located amongst remnant native vegetation in the northern section of the Site (Zone 9) and revegetation with native rainforest species • Decommissioning of the dam located in the central northern section of the Site that contains a Salvinia molesta infestation • Removal of weeds such as alexandra palms Archontophoenix alexandrae, morning glory Ipomea caerica and Singapore daisy Sphagneticola trilobata in the remnant native vegetation.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 VMP Section 2.3.1 BMP Stage 2 - VMP Section 2.3.2
Prescribed Impacts on Connectivity of Different Areas of Habitat of Threatened Species	11	In response to the removal of 'stepping stone' habitat in the southern portion of site the following action will be undertaken: • A 10m wide vegetation buffer will be established along the western boundary of the site. This buffer will connect to the retained vegetation in the northern portion of site, and will run north to south, in line with the mapped regional fauna corridor. This will be an improvement in connectivity from the existing use of the site. • The stepping stone habitats removed from the southern portion of the site will be replaced with new stepping stone habitats in the form of rain gardens (identified in the Landscaping Plan for the project). These will provide habitat for threatened species within the cleared areas of the site.	BDAR S3.2.6	BMP Stage 2	BMP Stage 2 - VMP Section 2.3.2; Figure 6 (MZ 6 and 7) and FMP Section 3.3
Unplanned loss of habitat	12	All native vegetation not identified for removal shall be protected from damage during construction work. This protection shall consist of: • Establishment of a Tree Protection Zone in accordance with AS 4970-2009 (Protection of trees on development sites) around vegetation adjacent to the construction footprint • Installation of temporary protective fencing (1800mm high), securely installed beneath the outer canopy of any tree to be retained • Trees and vegetation may be fenced off in clusters where it is not practical to fence off individual trees • No stockpiling, storing materials, parking machinery, washing machinery or changes to existing soil levels within the fenced areas • Retention of Ficus obliqua tree located at the existing Site entry	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	BMP Stage 1	BMP Stage 1: Table 4 item 1, 2, 15, 12, 16 BMP Stage 2: Table 4 item 1, 2, 11, 12, 14, 15
Weeds	13	Implement weed hygiene practices in accordance with an approved CEMP and sub plans, including a Biodiversity Management Plan to avoid the introduction or spread of weeds on the Site.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 VMP Section 2.3 Table 4 Items 5 to 11; Section 2.3.1 Weed Management Measures. BMP Stage 2 VMP Section 2.3 Table 4 Items 5 to 10; Section 2.3.2 Weed Management Measures.
Weeds	14	Mulch generated from exotic trees and/or other weed species that have been cleared shall not be used on site. The mulch shall be removed from the site and disposed of in accordance with legislative requirements.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	BMP Stage 1	BMP Stage 1 VMP Section 2.3 Table 4 Item 10; Section 2.3.1 Weed Management Measures. BMP Stage 2 VMP Section 2.3 Table 4 Item 10.

Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
15	In accordance with section 9.4.2 of the BAM, a Biodiversity Management Plan will include measures to monitor ground water quality on the Site and will include water quality objectives which in the event of exceedances will trigger investigation and adaptive management actions.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	BMP Stage 2	BMP Stage 2 WQMP Section 4.3
16	Water quality impacts to the wetlands will be avoided by employing erosion and sediment control measures prior to the commencement of construction. This will include the following: <ul style="list-style-type: none"> Implementation of swales, enviropods, bioretention basins and extended detention basins Roof runoff will be directed into the bioretention basin by a pit and pipe system while hardstand runoff will be first treated by enviropods, and then either swales that discharge to the bioretention system or directly into the bioretention systems. A sediment fence/catch drain (or diversion bund) around the Site. Most stormwater will end up in an extended detention basin where it will settle and discharge to the receiving waters in a controlled manner, resulting in a net 	BDAR - Table 8, Project Planning- Point 7	Both	BMP Stage 1 WQMP Section 4.2, Table 8 and VMP Section 2.8 BMP Stage 2 WQMP Section 4.2
17	Impacts to water quality and hydrological processes will be minimised through the use of Water Sensitive Urban Design (WSUD) measures that maintain flows to the wetlands and maintain or improve water quality. The development footprint of the Site has been located to minimise interference with hydrological flows to wetlands, including contributions from groundwater. Subsurface excavations will be shallower than measured groundwater depths on site, with the exception of those required for piling. Piles will be between 800 mm and 1200 mm in diameter and will be spaced 8.4 m apart, except under lift and/or stairwell cores where they will be not less than 2m apart. As piles are not continuous, they are unlikely to create barriers to shallow or perched groundwater flows within the development footprint.	BDAR - Table 8, Project Planning prescribed impacts - Point 7	Both	BMP Stage 1 WQMP Section 4.2, Table 8, VMP Section 2.8 and WQMP Section 4.3 and 4.4. BMP Stage 2 WQMP Section 4.2 and 4.3
	Impacts to wetland water quality will be minimised by employing erosion and sediment control measures prior to the commencement of construction activities. The stormwater management system for operation of the Project will be designed in accordance with the locally appropriate standard (TSC 2016).	BDAR - Table 8, Project Planning prescribed impacts - Point 8	Both	BMP Stage 1 WQMP Section 4.2.2.1 BMP Stage 2 WQMP Section 4.2.2.3
18	Nine sampling locations have been selected to monitor water quality across the Site. These locations have been selected to allow a best possible indication of stormwater runoff quality upstream and downstream of the Site and the receiving environment (wetland). The objective of the water monitoring program is to detect changes during construction and operation in receiving water quality resulting from the Project. Analytical parameters selected for testing include sediment, nutrients, dissolved metals, hydrocarbons and other contaminants such as pesticides. Organochlorine Pesticides (OCP) and Organophosphorus Pesticides (OPP) have been included for testing as these contaminants are likely present due to current agricultural land use. Physico-chemical parameters will be monitored due to the presence of pH dependent threatened species such as the wallum froglet <i>Crinia tinnula</i> and olongburra frog <i>Litoria olongburensis</i>	BDAR S3.2.5	Both	BMP Stage 1 WQMP Section 4.6 BMP Stage 2 WQMP Section 4.5
19	Soil erosion and stormwater quality will be managed during construction of the Project in accordance with current industry standards (Landcom, 2004). Mitigation measures will be undertaken during construction to minimise the risk of erosion and of sediment-laden stormwater being discharged into the receiving catchment located to the north of the site. These measures will include: <ul style="list-style-type: none"> A sediment fence/catch drain (or diversion bund) around the Site; Temporary access to Site with shaker pad; Sediment fencing around stockpile areas. Stockpiles will be located out of water flow paths and will be protected by earth banks/drains as required; and A sediment basin of minimum 7126 m3 volume will be constructed to capture flows. The receiving catchment will be protected by providing diversion stormwater drainage lines that bypass the construction site. For further details refer to Bonacci 2018 (drawings C0005 Soil and Water Management Plan, C0006 Soil and Water Management Details and C0007 Soil and Water Management Calculations). Construction works will be delivered in accordance with a Construction Environmental Management Plan (CEMP) and will incorporate the Soil and Water Management Plan. The CEMP will incorporate mitigation measures detailed in the Environmental Impact Statement and the development consent. Construction staff and site personnel will be made aware of their environmental responsibilities within the CEMP The CEMP will be submitted to the Department of Environment and Planning for review and approval prior to commencement of works.	BDAR S3.2.5	Both	BMP Stage 1 Intro Section 1.3, WQMP Section 4.2 & Table 8 BMP Stage 2 Intro Section 1.5, WQMP Section 4.2 & Table 9
20	An integrated stormwater management system will be implemented during project operation to carry stormwater runoff from buildings, roads, carparks and landscape areas. The stormwater management system will be designed to mimic natural flows to minimise impacts to the receiving catchment and wetland located to the north of the Site. The farm dam located at the north of the site will be filled to return the catchment to a more natural flow regime. The stormwater management system design will cater for a variety of potential water volume discharges, including 100-year ARI (1% AEP) storm events as detailed in local development design specifications (TSC, 2016). The stormwater management system will be designed to meet water quality performance criteria detailed in TSC 2016, namely: <ul style="list-style-type: none"> Reduction of Mean Annual Load of Gross Pollutants – 90% (greater than 5mm). Reduction of Mean Annual Load of Total Suspended Solids – 80%. Reduction of Mean Annual Load of Total Phosphorous – 60%. Reduction of Mean Annual Load of Total Nitrogen – 45%. 	BDAR S3.2.5	Both	BMP Stage 1 WQMP Section 4.2 & Table 8 BMP Stage 2 WQMP Section 4.2 & Table 9

Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
21	Soil erosion and stormwater quality will be managed during construction of the development in accordance with current industry standards (Landcom, 2004) and in accordance with an approved CEMP.	BDAR S3.2.5	Both	BMP Stage 1 WQMP Section 4.2, Table 8 and FMP Section 4.2.4
	Two pH dependent amphibians have been identified by the BAM Calculator as candidate threatened species (Wallum froglet <i>Crinia tinnula</i> and Olongburra frog <i>Litoria olongburensis</i>). Standard industry practice of using gypsum as a flocculant to settle sediment-laden stormwater runoff will not be conducted due to the potential to raise the pH of water. Other commercially available flocculants will be investigated for potential use.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT		BMP Stage 2 WQMP Section 4.2, Table 9 and FMP Section 3.2.3
22	TECs within the wetland generally occur in areas subject to periodic inundation (NSW Scientific Committee, 2004). Modelling demonstrates that inundation of the wetland area will continue to occur with implementation of the stormwater management system. The quality of water entering wetlands from Site is expected to improve. There is no requirement to offset the residual impact of the development on water quality, water bodies and hydrological processes.	BDAR S3.2.5	Stage 2	BMP Stage 2 WQMP Section 4.2.2 and Section 4.2.3
23	Erosion and sediment measures, including sediment barriers and sediment ponds, will be implemented as per the construction phase Erosion and Sediment Control Plan (ESCP). Construction phase erosion and sediment control measures will achieve water quality objectives outlined in the Tweed Shire Council Development Design Specification - D7.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 WQMP Section 4.2.1 & Table 8 BMP Stage 2 WQMP Section 4.2.2, 4.2.2.3 & Table 9
24	A stormwater drainage system will be constructed to convey stormwater runoff from Site. The system will be designed to minimise impacts to the endangered ecological community in the receiving wetland.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Stage 2	BMP Stage 2 WQMP Section 4.2; FMP Section 3.3.2
	The water quality standards of discharged water will be determined at design stage, guided by advice from a qualified ecologist. The water quality strategy for the Site is outlined in the <u>Tweed Valley Hospital Development Design Report (Bonacci 2018)</u> . In accordance with the CEMP, stormwater management will incorporate Water Sensitive Urban Design (WSUD) principles, including the use of landscaped areas for filtering runoff, swale drains, vegetated sediment basins and planting vegetation within rain gardens that treat stormwater and provide native habitat, or 'moist corridors', across the site (Turf 2018).			
25	Construction is to be delivered in accordance with an approved CEMP and sub plans, including a Soil and Water Management Plan, to avoid impacts to groundwater, particularly during piling and excavation activities.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 Section 1.3 and WQMP Section 4.3 and 4.4 BMP Stage 2 Intro Section 1.5, WQMP Section 4.3.1
26	Potential reduction in groundwater recharge due to development will be mitigated by WSUD measures such as: rain gardens, swales, car park plantings, and managing stormwater and ground water recharge through landscaping.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Stage 2	BMP Stage 2 VMP Section 2.4.2; WQMP Section 4.2.2.2
27	All fuels, chemicals, and liquids will be stored at least 50 m away from any drainage line or waterways as far as is practicable and will be stored in an impervious bunded and covered area within the compound site.	EIS Mitigation methods: Draft Condition Appendix 2	Both	BMP Stage 1 WQMP Sections 4.5, 4.6 and Table 8.
	Visual monitoring of local water quality (i.e. turbidity, sheen, oil and grease) will be undertaken regularly to identify any potential water quality issues.			BMP Stage 2 WQMP Section 4.4, 4.5 and Table 9.

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
Fauna Management	28	Where possible structures will be provided to enable connectivity for species - It is recommended that a wildlife crossing is established to the north-east of the Site where the Turnock Street roadway passes through the remnant vegetation. Fauna management guidelines will be detailed in the Biodiversity Management Plan.	BDAR - Table 8, Design - Point 6 Project Planning- Point 9	Stage 2	BMP Stage 2 FMP Section 3.8.2
Movement of threatened species	29	For construction of the development, the temporary boundary will be fitted with a 'post and bridge' system to facilitate movement of koala	BDAR - Table 8, Project Planning- Point 6 BDAR S3.2.7	Both	BMP Stage 1 FMP Section 3.3.1 & Figure 7 BMP Stage 2 FMP Section 3.3.1 & Figure 7
Movement of threatened species	30	For operation of the development, a boundary fence will not be installed, thereby facilitating movement of threatened species.	BDAR - Table 8, Project Planning- Point 6	Stage 2	BMP Stage 2 FMP Section 3.3.1
Movement of threatened species	31	Locating the project development area away from threatened species habitat areas and establishing a vegetated buffer will minimise impacts on the movement of threatened species.	BDAR - Table 8, Project Planning prescribed impacts - Point 6	Stage 1	BMP Stage 1 FMP Section 3.3.2 & Table 6
Traffic/ vehicle strikes	32	All works and associated activities are to be delivered in accordance with an approved CEMP and sub plans, including a Biodiversity Management Plan, Traffic Control Plan and Access and Movement Plan. In accordance with section 9.4.2 of the BAM, a Biodiversity Management Plan will incorporate a Fauna Management Plan, including measures to monitor fauna mortality. Where necessary, thresholds for threatened species mortality will be outlined based on current literature. Exceedance of these thresholds will trigger investigation and adaptive management actions. Traffic will be restricted to the southern portion of the Site where the project footprint is which is approximately 62m from the intact remnant native vegetation. Construction traffic must maintain low vehicle speeds and operators shall take be aware of wildlife that may be in the area. Should wildlife enter the construction footprint, a suitable qualified fauna handler should be notified and actions taken in accordance with the construction EMP. The following traffic calming measures on the access road are recommended to reduce the risk of vehicle strike on wildlife: •Installation of roadside street lighting in accordance with design standards •Installation of two 50 kilometre an hour speed limit signs and two wildlife warning signs (e.g. 'Wildlife Dawn to Dusk' sign or similar) on the uphill and downhill approaches to the road (or two signs that combine both messages). •Installation of two permanent radar speed signs that display vehicle speed on approach or display a warning when the vehicle speed on approach is greater than the speed limit.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3; FMP Section 3.8 & Table 6 BMP Stage 2 Intro Section 1.5; FMP Section 3.8 & Table 7
Habitat - Removal of wood or rocks along the windrows, particularly in Zone 4.	33	During vegetation clearing works, a suitably qualified and experienced person shall be present as a fauna spotter-catcher to supervise tree removal. Prior to vegetation clearing, all trees within 30 metres of trees to be cleared are to be inspected for the presence of native fauna by an experienced fauna spotter-catcher. During tree removal and major earth works a fauna spotter-catcher needs to be used at a minimum of one operator per machine. The fauna spotter-catcher must not be involved in the vegetation clearing works and will remain on site during any vegetation clearing works to ensure that trees occupied by a fauna are protected. Uninjured native fauna detected during the tree removal shall be rescued and relocated into an area of appropriate habitat that is nearby, but outside of the development footprint. Injured native fauna detected shall be rescued and transferred to a local veterinarian for treatment and/or WIRES for rehabilitation. Should koalas be found on the Site during vegetation clearing works and/or earthworks, tree clearing works and/or earthworks must be temporarily suspended within a range of 30 metres from any tree occupied by a koala. Works are to be avoided in areas between the koala and the nearest habitat to allow the animal to move to adjacent undisturbed areas. Works must not resume until the koala has moved from the tree of its own volition. To minimise direct impacts on ground dwelling and arboreal fauna, earthworks conducted to clear rocks and trees along the windrows (zone 4) shall have a suitably qualified fauna spotter-catcher.	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT BDAR S3.2.9	Both	BMP Stage 1 FMP Section 3.7 BMP Stage 2 FMP Section 3.7 (Tweed Coast Road / Cudgen Road intersection upgrade site)
Impacts of vehicle strikes on threatened species or animals that are part of a TEC	34	Minimise impacts to threatened species by locating the main site entrances on routes that are not adjacent to TECs. Main site entrance will be located off Cudgen Road Where possible impacts will be minimised by installing structures that enable species to avoid crossing roads. It is recommended that a wildlife crossing is established to the north-east of the Site where the Turnock Street roadway passes through the remnant vegetation.	BDAR - Table 8, Project Planning prescribed impacts - Point 8	Stage 2	BMP Stage 2 FMP Section 3.8
Prescribed Impacts on Movement of Threatened Species that Maintains their Lifecycle	35	Threatened species movement will be facilitated by the establishment of a 10m vegetation along the western boundary of the site, as well as a series of 'stepping stone' habitats across the cleared parts of the site.	BDAR S3.2.7	Stage 2	BMP Stage 2 VMP 2.3.3 and FMP Section 3.3.2
Adaptive Management for Uncertain Impacts	36	Biodiversity Management Plan will set out the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain in accordance with section 9.4 of the BAM. Uncertain impacts include impacts related to vehicle and aircraft strikes. Adaptive management actions may include actions such as auditory repellents, visual deterrents and physical barriers where for habitat containing birds, bats and other animals.	BDAR S3.3 BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Stage 2	BMP Stage 2 FMP Section 3.8 and Table 7
Aircraft strikes	37	Aviation operations for the development will be conducted in accordance with an approved Aviation Operations Manual. This manual will identify areas of bird and flying fox activity such as the Elrond Drive and Kingscliff Library flying fox camps that are located within 1km of the Site (Ecosure 2018, Greencap 2018).	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Stage 2	BMP Stage 2 FMP Section 3.8.3

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
		<p>Details of the Aviation Operations Manual will be incorporated into the Enroute Supplement Australia (ERSA) published by Airservices Australia. This publication contains information vital for planning a flight and for in flight operations for the aircraft pilot. The location of known flying fox camps will be identified as an 'avoid area' or a 'fly neighbourly' area.</p> <p>In accordance with section 9.4.2 of the BAM, a Biodiversity Management Plan will incorporate a Fauna Management Plan with measures to monitor fauna at the Site, including species mortality resulting from aircraft movement. The plan will outline objectives and thresholds for threatened species mortality which in the event of exceedances will trigger investigation and adaptive management actions.</p>			
Threatened species Habitat Cryptocarya foetida	38	The Project aims to support recovery of the species by retaining the key habitat of remnant lowland subtropical rainforest vegetation in Zones 2 and 3 and to preserve and enhance current biodiversity values, including the management of invasive species which may be harmful to threatened species.	Matter of National Environmental Significance Report (MNES) - Table 3	Both	BMP Stage 1 FMP Section 3.4 & Table 5 BMP Stage 2 VMP 2.3.3 & Table 6
Threatened species Habitat Grey-headed Flying Fox	39	Grey-headed Flying Fox may use the relatively undisturbed remnant forest (Zone 2 and 3) and paperbark swamp (Zone 1) on site. These areas will be retained for biodiversity values and managed under a Biodiversity Management Plan	MNES Report - Table 4	Both	BMP Stage 1 VMP Section 2, FMP Section 3, WQMP Section 4 BMP Stage 2 VMP Section 2, FMP Section 3, WQMP Section 4
Threatened species Habitat Mitchell's Snail	40	Known Mitchell's snail habitat in Zone 1 and 2 and potential habitat in Zone 3 will be retained and managed to preserve and enhance current biodiversity values and managed under a Biodiversity Management Plan (BMP).	MNES Report - Table 5	Both	BMP Stage 1 FMP Section 3.2.2 BMP Stage 2 VMP 2.3.3, Table 6 and FMP 3.2.2
Threatened species Habitat Pink Underwing Moth	41	Potential breeding habitat in subtropical rainforest in Zone 2 and 3 will be retained and managed to preserve and enhance current biodiversity values under a Biodiversity Management Plan (BMP).	MNES Report - Table 8	Both	BMP Stage 1 VMP Section 2, FMP Section 3, WQMP Section 4; Figure 5 BMP Stage 2 VMP Section 2, FMP Section 3, WQMP Section 4; Figure 5
Threatened Species Habitat Southern Black-throated Finch	42	Potential habitat in paperbark swamp forest in Zone 1 and flooded gum forest in Zone 6 and 7 will be retained and managed to preserve and enhance current biodiversity values and managed under a BMP.	MNES Report - Table 9	Both	BMP Stage 1 VMP Section 2, FMP Section 3, WQMP Section 4; Figure 5 BMP Stage 2 VMP Section 2, FMP Section 3, WQMP Section 4; Figure 5

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
All summary and recommendations	43	The Project will monitor and manage potential impacts which shall be outlined in a Biodiversity Management Plan (BMP) and its sub plans, including the following: <ul style="list-style-type: none"> •Vegetation Management Plan (VMP) that incorporates revegetation of the exotic grassland in Zone 9 with rainforest species, regeneration and weed management of remnant vegetation in the north of the Site. This plan will be linked to the Landscape Masterplan which focuses on the regeneration of windrows and native landscape plantings; •Water Quality Management Plan; and •Fauna Management Plan (FMP). 	Section 3.5 3.5 Summary of Recommendations BDAR 53.5	Both	BMP Stage 1 VMP Section 2, FMP Section 3, WQMP Section 4. BMP Stage 2 VMP Section 2, FMP Section 3, WQMP Section 4. BMP Stage 1 & Stage 2 FMP Section 3.2.2
		The BMP will include adaptive management for impacts on biodiversity that are uncertain in accordance with section 9.4.2 of the BAM. The BMP will detail measures to monitor impacts, guidelines, and thresholds that will trigger adaptive management actions.			
		The BMP will address proposed measures that will contribute to the recovery of the Mitchell's rainforest snail <i>Thersites mitchellae</i> that are consistent with the published recovery plan (NPWS 2011). Revegetation of the exotic grassland in Zone 9 (0.95 ha) to rainforest will increase the area of potential habitat available to the snail and will be outlined in the VMP and FMP.			
Light spill - Potential disruption of threatened species or reduced viability of adjacent habitat	44	Light sensitive species are unlikely to be present at the Site. Night-time construction activities will be avoided, if possible. If night construction is conducted then light will be directed away from remnant vegetation on Site.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 FMP Section 3.9.1 and Table 6 BMP Stage 2 FMP Section 3.9.1 and Table 7
Light spill - Potential disruption of threatened species or reduced viability of adjacent habitat	45	The Site does not contain habitat for threatened species that are drawn to light (i.e. turtles) that could be adversely impacted by light spill. The development will be located at least 62m (the width of the APZ) from vegetation (Zones 1,2,3). Provision of lighting will be delivered in accordance with an approved CEMP, which will include relevant standards and guidelines.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3, FMP Section 3.9.1 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.9.1 and Table 7
Rubbish and waste retained onsite attracting native fauna.	46	Activities on Site will be managed in accordance with the approved CEMP/OEMP, and designed to limit the amount of rubbish and waste onsite through good housekeeping practices.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3, FMP Section 3.6 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.6 and Table 7
Dust - Potential disruption of threatened species or reduced viability of adjacent habitat	47	Dust levels during operations would be managed in accordance with an approved CEMP that details management measures in accordance with relevant construction site guidelines including: <ul style="list-style-type: none"> •Daily monitoring of dust generated by construction activities; •Dust suppression measures such as setting maximum speed limits and application of dust suppressants; and •Commence revegetation as soon as practicable to minimise areas likely to create dust. 	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3, FMP Section 3.9.3 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.9.3 and Table 7
Dust - Potential disruption of threatened species or reduced viability of adjacent habitat	48	Adaptive dust monitoring programs to control air quality, in accordance with the approved OEMP.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Stage 2	BMP Stage 2 Intro Section 1.5, FMP Section 3.9.3 and Table 7
Air Quality and Dust	49	Should such visible dust emissions occur at any time, the contractor shall identify and implement all feasible and reasonable dust mitigation measures, including cessation of relevant works if no alternative available.	EIS Mitigation methods: Draft Condition Appendix 2	Both	BMP Stage 1 FMP Section 3.9.3 and Table 6 BMP Stage 2 FMP Section 3.9.3 and Table 7
		An Air Quality and Dust Management Plan as a sub-plan of the Construction CEMP will be prepared by the contractor. The objective of the Management Plan would be to ensure that impacts on air quality are minimised.	EIS Mitigation methods: Draft Condition Appendix 3	Stage 1	BMP Stage 1 Intro Section 1.3, FMP Section 3.9.3 and Table 6

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
Habitat - Increased fire risk	50	Landscaping within Landscape Zone 2 (Turf 2018) largely coincides with the mandatory 62m Asset Protection Zone (APZ) for the development. Consequently, all plantings will be designed and maintained in accordance with current published guidelines (RFS 2006, 2007) and in consultation with the NSW Rural Fire Services, as detailed in the Tweed Valley Hospital Landscape Masterplan Report (Turf 2018).	BDAR APPENDIX I. PRESCRIBED IMPACT ASSESSMENT	Stage 2	BMP Stage 2 VMP Section 2.4.1 and Table 6
Habitat - Increased fire risk	51	Construction will be restricted to the southern portion of the Site where the project footprint is at least 67 m (the width of the proposed Asset Protection Zone for bushfire protection) from the remnant native vegetation.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 FMP Table 6 Item 56 BMP Stage 2 VMP Section 2.4.1 and Table 6
Changing Fire Regimes	52	Bushfire impacts will be identified and managed through bushfire impact assessment and associated management plan	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 FMP Table 6 Item 56 BMP Stage 2 VMP Section 2.4.1 and Table 6

Aspect	Item #	Commitment	Original Document Reference	BMP Document (Stage 1, 2 or both)	BMP Sub-plan and reference
Noise - Potential disruption of threatened species or reduced viability of adjacent habitat	53	All construction is to be delivered in accordance with an approved Construction Environmental Management Plan (CEMP) and sub plans, including a Noise Mitigation Plan. Mitigation measures will include avoiding construction during night.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3, FMP Section 3.9.2 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.9.2 and Table 7
Noise - Potential disruption of threatened species or reduced viability of adjacent habitat	54	Noise levels during operations will adhere to criteria outlined in the Operational Environmental Management Plan (OEMP) that details safeguards and management measures in accordance with the POEO (Noise Control) Regulation 2017 or any other relevant Tweed Shire Council noise regulation.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Stage 2	BMP Stage 2 Intro Section 1.5, FMP Section 3.9.2 and Table 7
Vibration - Potential disruption of threatened species or reduced viability of adjacent habitat	55	Construction is to be delivered in accordance with an approved CEMP and sub plans, including a Vibration Mitigation Plan. Construction during the night will be avoided, where possible, to minimise vibration impacts.	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Both	BMP Stage 1 Intro Section 1.3, FMP Section 3.9.2 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.9.2 and Table 7
Vibration - Potential disruption of threatened species or reduced viability of adjacent habitat	56	Vibration levels (if any) during operations will adhere to criteria outlined in the Operational Environmental Management Plan (OEMP).	BDAR APPENDIX J. INDIRECT IMPACT ASSESSMENT	Stage 2	BMP Stage 2 Intro Section 1.5, FMP Section 3.9.2 and Table 7
Noise and vibration	57	Limiting more intensive works, such as excavator hammering to the least sensitive times of the day (i.e. avoid early morning, early evening where practical). Including Respite Periods where activities are found to exceed the 75 dB(A) Highly Affected Noise Level at receivers, such as 3 hours on 1 hour off. Consideration of localised screening or barriers for high noise level / isolated works Consider implementing equipment-specific temporary screening for noisy equipment, or other noise control measures recommended in Appendix E of AS2436. This is most likely to apply to noisier items such as jackhammers Locate specific activities such as carpentry areas (use of circular saws etc) to internal spaces or where shielding is provided by existing structures or temporary screening Limit the number of trucks and heavy vehicles on site at any given time (through scheduling deliveries at different times).	EIS Mitigation methods: Draft Condition Appendix 2	Both	BMP Stage 1 FMP Section 3.9.2 and Table 6 BMP Stage 2 Intro Section 1.5, FMP Section 3.9.2 and Table 7



APPENDIX A. TWEED VALLEY HOSPITAL MASTERPLAN



- LEGEND**
- SITE BOUNDARY
 - MAXIMUM PLANNING ENVELOPE ABOVE GROUND LEVEL
 - MAXIMUM PLANNING ENVELOPE BELOW GROUND LEVEL
 - TREE TRUNK LINE
 - APZ (2006) 50m OFFSET
 - APZ (DRAFT 2017) 67m OFFSET
 - PROBABLY MAXIMUM FLOOD LINE (PMF)
 - AGRICULTURE BUFFER
 - INDICATIVE BUILDING ENTRIES

NOTE: MAXIMUM ENVELOPE DOES NOT REPRESENT BUILDING FORMS. The Maximum Planning Envelope describes the height, width and breadth limits of the proposed building forms. It is to be construed that the maximum planning envelope extends to interface with the existing natural ground level (and capturing basement levels and associated substructure) or modified natural ground level. The Maximum Planning Envelope excludes secondary architectural features including as examples: glazed canopies, unenclosed covered walkways, building services, hard landscaping, flag poles, lighting poles, fencing and wayfinding signage or the like, which will occur beyond the boundary of the Maximum Planning Envelope

REV	DESCRIPTION	DATE
06	ISSUED FOR INFORMATION	22/01/2019
07	ISSUED FOR INFORMATION	23/04/2019

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TSA
 MANAGEMENT

CLIENT
Health Northern NSW Infrastructure Local Health District

PROJECT
TWEED VALLEY HOSPITAL
 771 Cudgen Road, Cudgen
 DRAWING TITLE
MASTERPLAN
CONCEPT PLAN

SCALE
 0 10 20 30 40 50
 m
SCALE DATE 23/04/2019 DRAWN BY CE CHECKED BS
PROJECT No 10363.00 **DRAWING No** AR-SKE-10-006 **REVISION** 07



AGRICULTURAL BUFFER (10m)

AGRICULTURAL BUFFER (30m)

ESSENTIAL ENERGY SWITCHING STATION

PRODUCE FARM

KINGSCLIFF TAFE

TWEED VALLEY HOSPITAL

STAFF CARPARK

PUBLIC CARPARK

SUPPORT (HEALTH HUB)

BUS STOP

CUDGEN ROAD

TURNNOCK STREET

ENVIRONMENTAL AREA

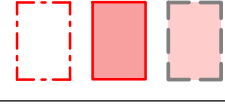
TREE TRUNK LINE

APZ (2006) - 50M

APZ (DRAFT 2017) - 67M

PMF LEVEL (AHD +8.0)

LEGEND



*NOTE: BUSHFIRE HAZARD VEGETATION AND BUFFER BASED ON TWEED SHIRE COUNCIL'S BUSHFIRE PRONE LAND (2012)

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PROJECT MANAGER



CLIENT



Health Infrastructure Northern NSW Local Health District

PROJECT

TWEED VALLEY HOSPITAL

771 Cudgen Road, Cudgen

DRAWING TITLE

SITE ANALYSIS

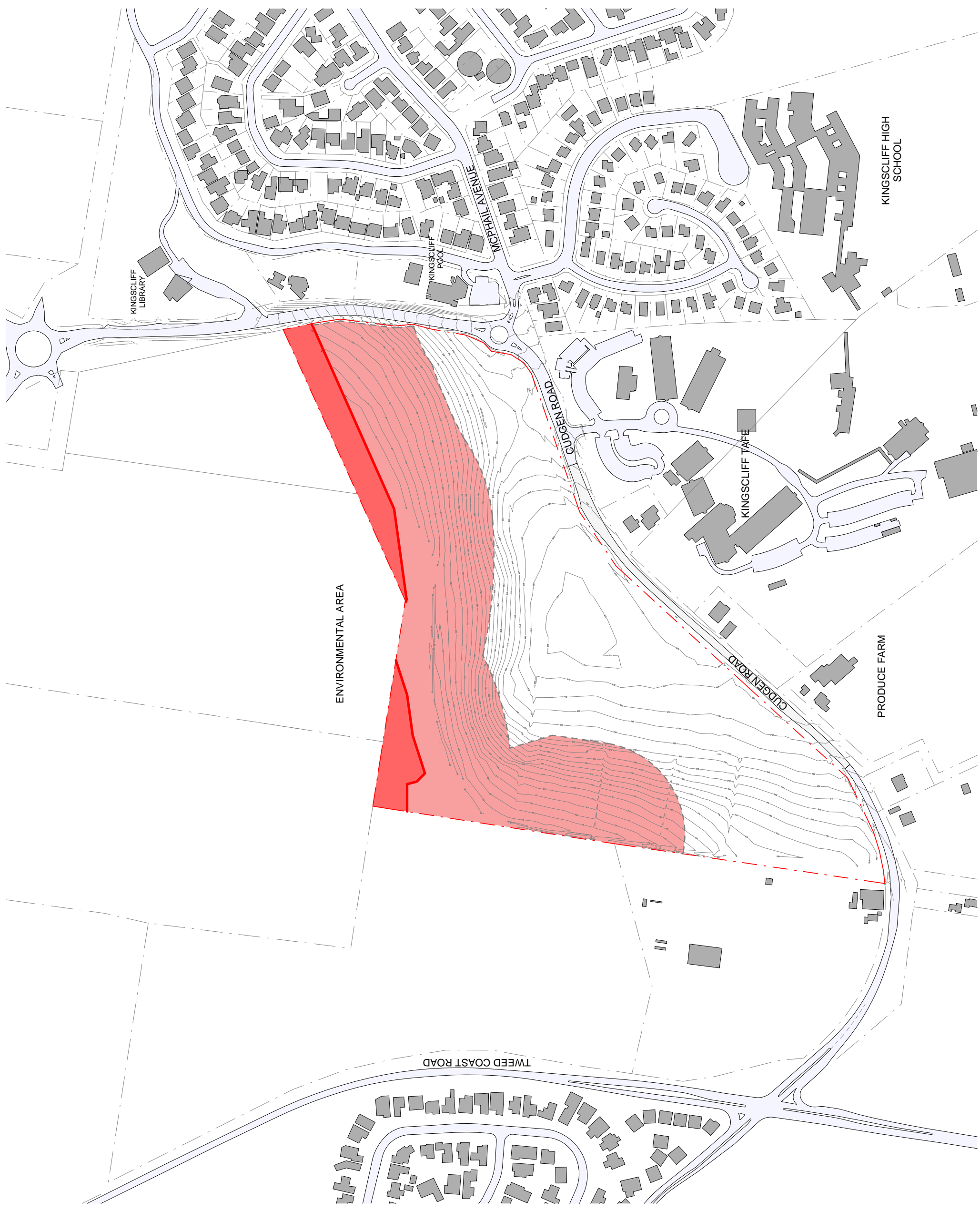
BUSHFIRE PRONE LAND

SCALE 0 40 80 120 160 200 m

SCALE DATE 22/01/2019 SL

PROJECT No 103633.00 AR-SKE-02-005

REVISION 01



LEGEND

- SITE BOUNDARY
- PROBABLE MAXIMUM FLOOD LEVEL (PMF)
- COASTAL WETLAND
- PROXIMITY AREAS TO COASTAL WETLANDS (100m)

*NOTE: COASTAL WETLAND ZONES BASED ON SEPP COASTAL MANAGEMENT

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TSA
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CLIENT
Health Northern NSW Infrastructure Local Health District

PROJECT
TWEED VALLEY HOSPITAL
771 Cudgen Road, Cudgen

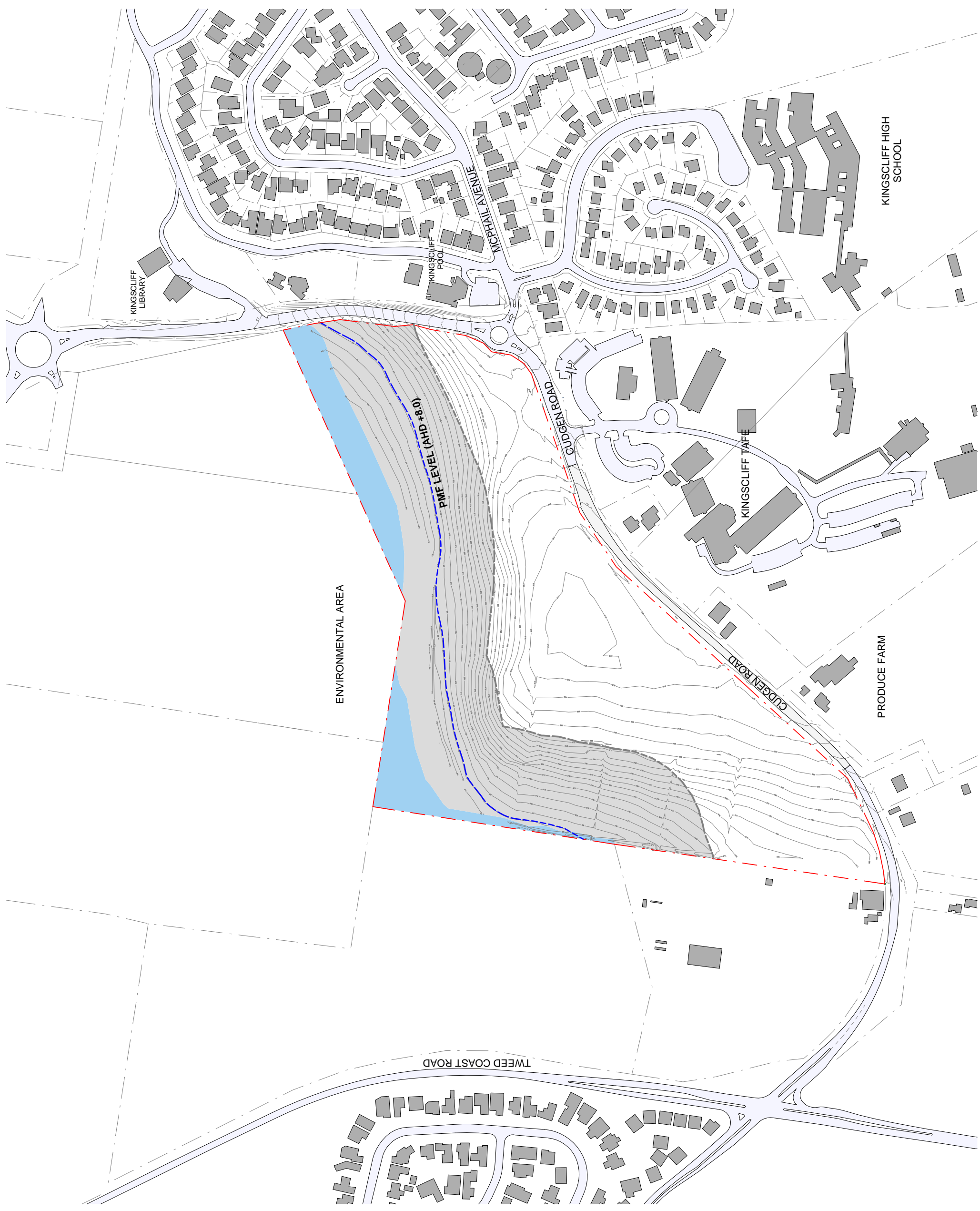
DRAWING TITLE
SITE ANALYSIS
COASTAL WETLAND & FLOODING

SCALE
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m

SCALE
DRAWN BY: CE
CHECKED: BS







1:4000 @ A3 **22/01/2019** **CE** **BS**

PROJECT No **DRAWING No** **REVISION**
10363.00 **AR-SKE-02-006** **01**



LEGEND



-  SITE BOUNDARY
-  MAXIMUM PLANNING ENVELOPE ABOVE GROUND LEVEL
-  MAXIMUM PLANNING ENVELOPE BELOW GROUND LEVEL
-  ROAD / CARPARK FOOTPRINT
-  PROJECT AREA OF INFLUENCE BEYOND TITLE BOUNDARY
-  PRELIMINARY WORKS

NOTE: MAXIMUM ENVELOPE DOES NOT REPRESENT BUILDING FORMS. The **Maximum Planning Envelope** describes the height, width and breadth limits of the proposed building forms. It is to be construed that the maximum planning envelope extends to interface with the existing natural ground level (and capturing basement levels and associated structure) or modified natural ground level. The **Maximum Planning Envelope** excludes secondary architectural features including as examples; glazed canopies, unenclosed covered walkways, building services, hard landscaping, flag poles, lighting poles, fencing and wayfinding signage or the like, which will occur beyond the boundary of the **Maximum Planning Envelope**.

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PROJECT MANAGER

CLIENT



TWEED VALLEY HOSPITAL

771 Cudgen Road, Cudgen

DRAWING TITLE

MASTER PLAN

BUILDING FOOTPRINT & AREA OF INFLUENCE

SCALE

0 10 20 30 40 50

— SCALE — DATE — DRAWN BY — CHECKED —

1:2500 @A3 23/04/2019 MD BS

PROJECT No. DRAWING No. REVISION

10363.00 AR-SKE-10-003 03

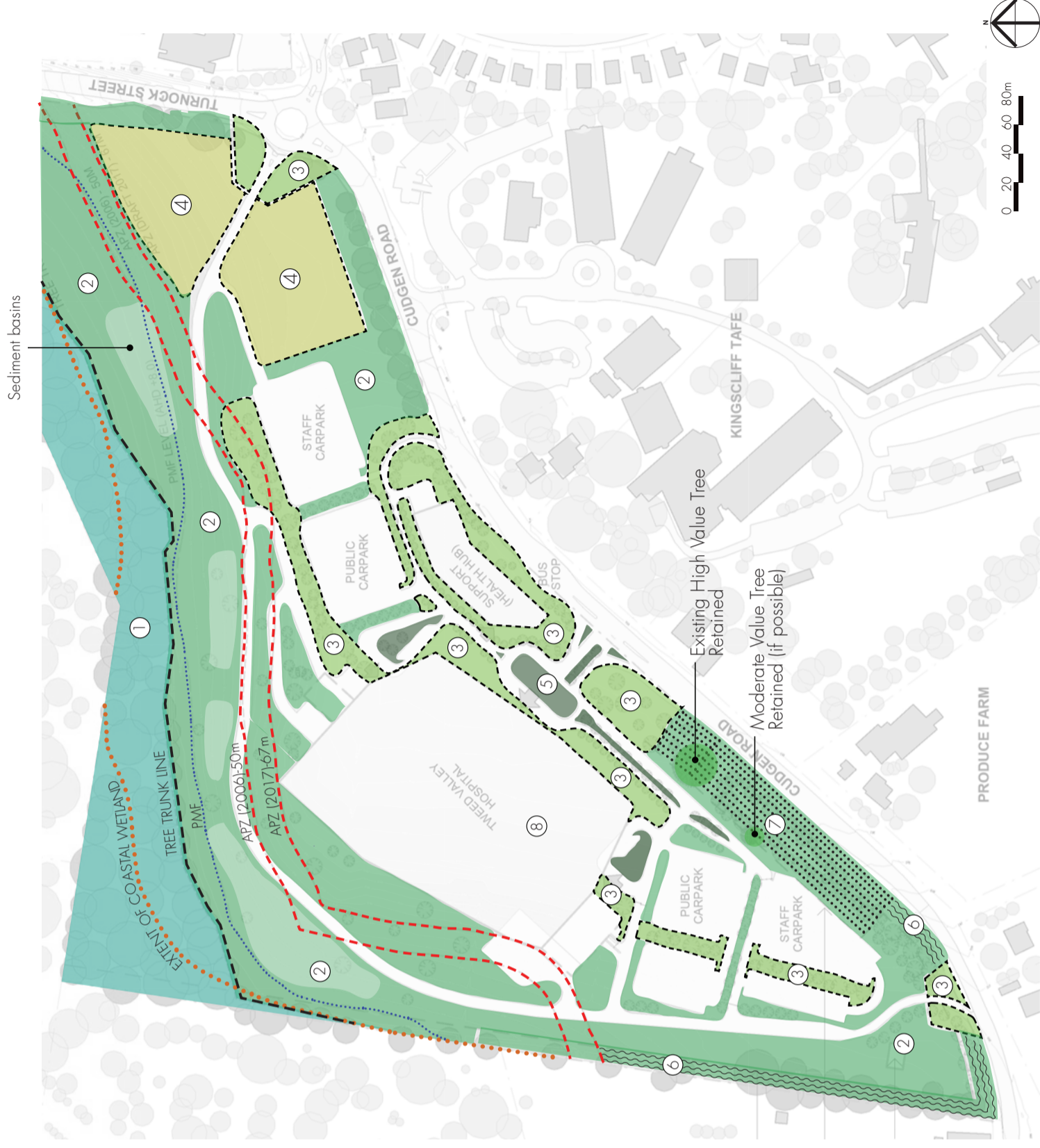


LANDSCAPE PROPOSAL

LANDSCAPE ZONAL PLAN

LEGEND

- APZ - Asset Protection Zone
- PMF - Probable Maximum Flood
- 1. Retained undisturbed forest
- 2. Low Maintenance Native Landscape*. Includes sediment basins and buffer planting.
- 3. Hospital landscape + Green Spine. Character complementary to context. (Gardens, breakout spaces, open lawns, plazas and kitchen gardens)
- 4. Farm landscape. Orchards, food crops and existing fruit tree orchard.
- 5. WSUD car park and roadway planting (trees and planting in rain gardens)
- 6. 10m wide vegetated buffer. Retain and augment existing boundary vegetation (selective removal to achieve required access and sight lines). Staged replacement of pine trees and understorey with native species.
- 7. 30m wide vegetated buffer. Retain and augment existing boundary vegetation (selective removal to achieve required access and sight lines). Staged replacement of pine trees and understorey with native species.
- 8. Landscaped courtyards within hospital envelope
- 9. Communal Food Garden. To be included as part of the hospital development, size and location to be determined.



*Note: All zones vegetated in accordance with Asset Protection Zone (APZ) guidelines where required refer to 'Bushfire Constraints Assessment'.

SCALE 1:1250
0 10 20 30 40m

- 1 ISSUED FOR SSBM
- 2 ISSUED FOR SSBM
- 1 ISSUED FOR SSBM

RC OR 06.05.19
RC OR 23.04.19
RC OR 23.04.19
By: ASJ 2019

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REFER TO GENERAL NOTES UNLESS NOTED OTHERWISE

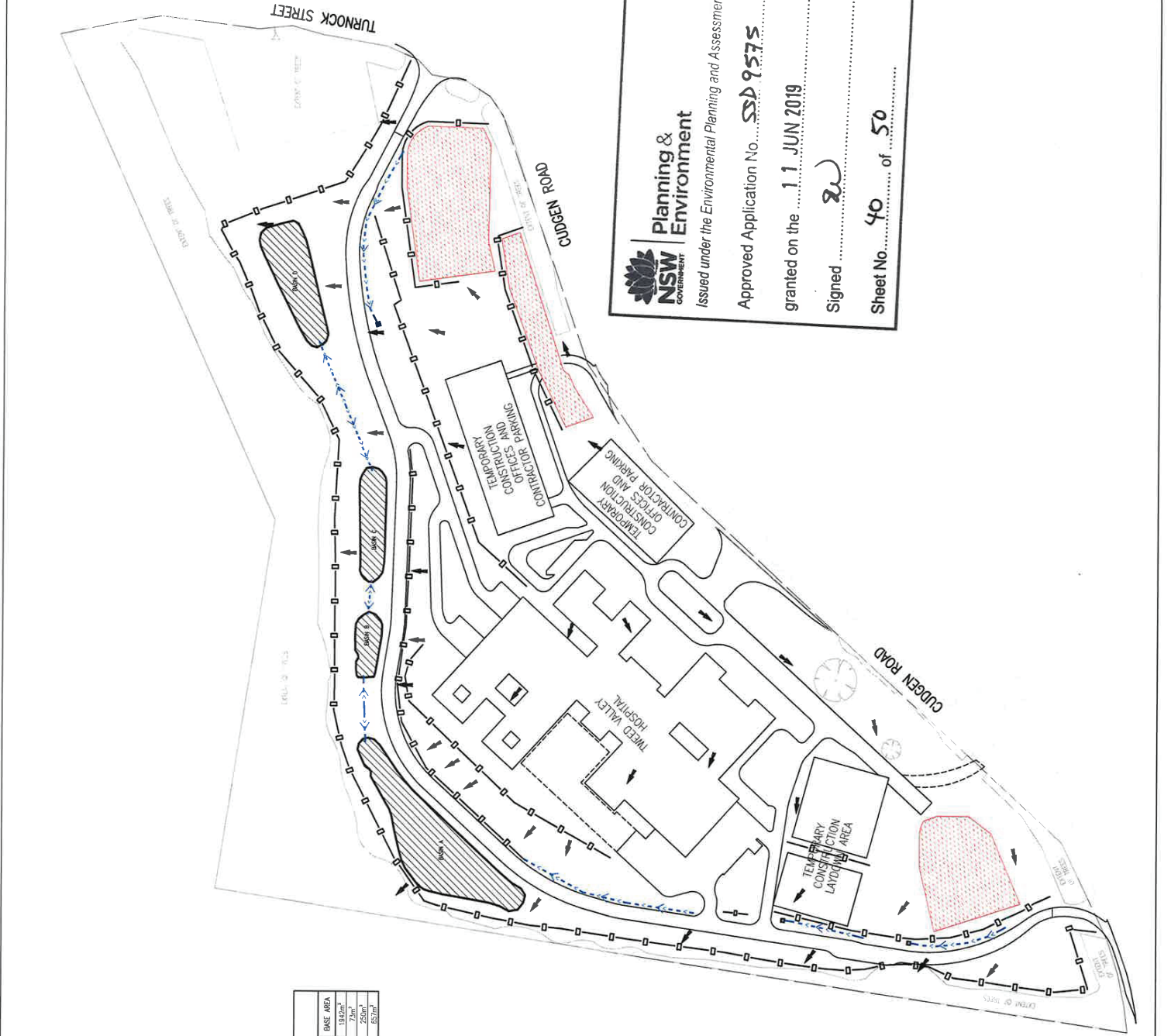
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Project
TWEED VALLEY HOSPITAL
771 CUDGEN ROAD, CUDGEN NSW

Drawn: RULL
Checked: AS SJW
Design: C.RDPE
Job Number: 18005

NOT FOR CONSTRUCTION
Drawing Number: C-2-105
Revision: 3



NSW GOVERNMENT | **Planning & Environment**
 Issued under the Environmental Planning and Assessment Act 1979
 Approved Application No. **SSP 9575**
 granted on the **11 JUN 2019**
 Signed **ASJ**
 Sheet No. **40** of **50**

LEGEND

- FALLS (TYP)
- SEDIMENT FENCE
- CATCH DRAIN
- LAND BOUNDARY
- PROPOSED TEMPORARY STOCKPILE LOCATION WITH SEDIMENT FENCE AROUND
- EXISTING SEDIMENT BASIN (CONSTRUCTED AS PRELIMINARY WORKS)
- FIELD INLET PIT

NOTES
 1. SEDIMENT BASINS TO BE MODIFIED TO BIG-DEFLECTION BASINS ON COMPLETION OF SITE EARTHWORKS.

SEDIMENT BASIN SCHEDULE

BASIN REFERENCE	VOLUME (MM)	BASE RL	HIGH CREST RL	TOP BUND RL	BASE AREA
A	5832m ³	7.0	8.45	8.6	3120m ²
B	278m ³	7.0	8.45	8.6	250m ²
C	705m ³	8.6	10.45	11.2	250m ²
D	1833m ³	5.5	7.35	8.1	6577m ²

Stage 1 Biodiversity Management Plan

NSW Health Infrastructure Tweed Valley Hospital

APPENDIX B. PLOT-BASED FLORISTIC SURVEY PLANT SPECIES

Site Species List - BDAR BAM Survey Floristics

Scientific Name	Common Name	BAM Growth Form Group	BAM Species Type	Weeds of National Significance (WONS)
<i>Acmena smithii</i>	Lilly Pilly	Tree	Native	
<i>Ageratina riparia</i>	Mistflower	N/A	High Threat Exotic	
<i>Ageratum conyzoides</i> subsp. <i>Conyzoides</i>	Goatweed	N/A	Exotic	
<i>Alocasia brisbanensis</i>	Cunjevoi	Forb	Native	
<i>Alpinia caerulea</i>	Native Ginger	Forb	Native	
<i>Ambrosia Artemisiaefolia</i>	Common Ragweed	N/A	Exotic	
<i>Amylotheca dictyophleba</i>	Brush Mistletoe	Other	Native	
<i>Archontophoenix alexandrae</i>	Alexandra Palm	N/A	Exotic	
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	Other	Native	
<i>Asparagus aethiopicus</i>	Ground Asparagus	N/A	High Threat Exotic	x
<i>Baumea rubiginosa</i>	Soft twigrush	Grass or grass like	Native	
<i>Bidens pilosa</i>	Cobblers Pegs	N/A	High Threat Exotic	
<i>Blechnum indicum</i>	Swamp Water Fern	Fern	Native	
<i>Callistemon viminalis</i>	Weeping Bottlebrush	Tree	Native	
<i>Capparis arborea</i>	Native Pomegranate	Shrub	Native	
<i>Carex appressa</i>	Tall Sedge	Grass or grass like	Native	
<i>Casuarina glauca</i>	Swamp Oak	Tree	Native	
<i>Cenchrus purpureus</i>	Barner Grass	N/A	Exotic	
<i>Cestrum nocturnum</i>	Lady of the Night	N/A	Exotic	
<i>Cestrum</i> sp.	Cestrum	N/A	Exotic	
<i>Chloris gayana</i>	Rhodes Grass	N/A	High Threat Exotic	
<i>Christella dentata</i>	Binung	Fern	Native	
<i>Chrysanthemoides monilifera</i>	Bitou Bush	N/A	High Threat Exotic	x
<i>Cinnamomum camphora</i>	Camphor Laurel	N/A	High Threat Exotic	
<i>Commersonia bartramia</i>	Brown Kurrajong	Tree	Native	
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	N/A	Exotic	
<i>Cordyline congesta</i>	Narrow-leaved Palm Lily	Other	Native	
<i>Crinum pedunculatum</i>	Swamp Lily	Forb	Native	
<i>Cryptocarya triplinervis</i>	Three-veined laurel	Tree	Native	
<i>Cryptocarya triplinervis</i> var. <i>triplinervis</i>	Three-veined laurel	Tree	Native	
<i>Cupaniopsis anacardioides</i>	Tuckeroo	Tree	Native	
<i>Desmodium intortum</i>	Green-leaved Desmodium	N/A	Exotic	
<i>Diospyros fasciculosa</i>	Grey Ebony	Tree	Native	
<i>Diplocyclos palmatus</i>	Native bryony	Other	Native	
<i>Eragrostis tenuifolia</i>	Elastic Grass	N/A	Exotic	
<i>Eucalyptus grandis</i>	Flooded Gum	Tree	Native	
<i>Eucalyptus microcarys</i>	Tallowwood	Tree	Native	
<i>Eupomatia bennettii</i>	Small Bolwarra	Shrub	Native	
<i>Ficus coronata</i>	Creek Sandpaper Fig	Shrub	Native	
<i>Ficus fraseri</i>	Sandpaper Fig	Tree	Native	
<i>Ficus macrophylla</i>	Moreton Bay Fig	Tree	Native	
<i>Ficus obliqua</i>	Small-leaved Fig	Tree	Native	
<i>Flagellaria indica</i>	Whip Vine	Other	Native	
<i>Geitonoplesium cymosum</i>	Scrambling Lily	Other	Native	
<i>Glochidion ferdinandi</i>	Cheese Tree	Tree	Native	
<i>Glochidion ferdinandi</i> var. <i>pubens</i>	Cheese Tree	Tree	Native	
<i>Glochidion sumatranum</i>	Umbrella Cheese Tree	Tree	Native	
<i>Guioa semiglauc</i>	Guioa	Tree	Native	
<i>Hibbertia scandens</i>	Climbing Guinea Flower	Other	Native	
<i>Hibiscus diversifolius</i>	Swamp Hibiscus	Shrub	Native	
<i>Hypochaeris glabra</i>	Smooth Catsear	N/A	Exotic	
<i>Hypolepis muelleri</i>	Harsh Ground Fern	Fern	Native	
<i>Ipomoea cairica</i>	Coastal Morning Glory	N/A	High Threat Exotic	
<i>Ipomoea indica</i>	Morning Glory	N/A	High Threat Exotic	
<i>Ipomoea purpurea</i>	Common Morning Glory	N/A	High Threat Exotic	
<i>Lantana camara</i>	Lantana	N/A	High Threat Exotic	x
<i>Leersia hexandra</i>	Swamp Ricegrass	Grass or grass like	Native	
<i>Lepironia articulata</i>	Grey Rush	Grass or grass like	Native	
<i>Ligustrum sinense</i>	Small-leaved Privet	N/A	High Threat Exotic	
<i>Lygodium microphyllum</i>	Climbing Snake Fern	Fern	Native	
<i>Macadamia integrifolia</i> x <i>tetraphylla</i> (hybrid)	Macadamia	Tree	Native	
<i>Macaranga tanarius</i>	Blush Macaranga	Tree	Native	
<i>Maclura cochinchinensis</i>	Cockspur Thorn	Other	Native	
<i>Macroptilium atropurpureum</i>	Siratro	N/A	Exotic	
<i>Mallotus discolor</i>	White Kamala	Tree	Native	
<i>Mallotus philippensis</i>	Red Kamala	Tree	Native	
<i>Marsdenia rostrata</i>	Milk Vine	Other	Native	
<i>Megathyrsus maximus</i> var. <i>coloratus</i>	Guinea Grass	N/A	Exotic	
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Tree	Native	
<i>Melicope elleryana</i>	Pink-flowered Doughwood	Tree	Native	
<i>Melinis minutiflora</i>	Molasses Grass	N/A	High Threat Exotic	
<i>Melinis repens</i>	Red Natal Grass	N/A	Exotic	
<i>Monstera deliciosa</i>	Fruit Salad Plant	N/A	Exotic	
<i>Mucuna gigantea</i> subsp. <i>gigantea</i>	Burny Bean	Other	Native	
<i>Murraya paniculata</i>	Murraya	N/A	Exotic	
<i>Myrsine Howittiana</i>	Brush Muttonwood	Shrub	Native	
<i>Myrsine variabilis</i>	Muttonwood	Shrub	Native	
<i>Notelaea longifolia</i>	Large Mock-olive	Tree	Native	
<i>Ochna serrulata</i>	Mickey Mouse Plant	N/A	High Threat Exotic	
<i>Oplismenus aemulus</i>	Australian Basket Grass	Grass or grass like	Native	
<i>Oxalis</i> Sp.	Oxalis	Forb	Native	
<i>Parsonia straminea</i>	Common Silkpod	Other	Native	
<i>Paspalum conjugatum</i>	Sour Grass	N/A	Exotic	
<i>Paspalum mandiocanum</i>	Broadleaf Paspalum	N/A	Exotic	
<i>Passiflora edulis</i>	Common Passionfruit	N/A	Exotic	
<i>Passiflora suberosa</i>	Cork Passionflower	N/A	Exotic	
<i>Passiflora subpeltata</i>	White Passionflower	N/A	Exotic	
<i>Persea americana</i>	Avocado	N/A	Exotic	

Site Species List - BDAR BAM Survey Floristics

Scientific Name	Common Name	BAM Growth Form Group	BAM Species Type	Weeds of National Significance (WONS)
<i>Persicaria dichotoma</i>	Blume	Forb	Native	
<i>Persicaria sp.</i>	Persicaria	Forb	Native	
<i>Persicaria strigosa</i>	Spotted Knotweed	Forb	Native	
<i>Phragmites australis</i>	Common Reed	Grass or grass like	Native	
<i>Pinus elliotii</i>	Slash Pine	N/A	High Threat Exotic	
<i>Rhaphiolepis indica</i>	Indian Hawthorn	N/A	Exotic	
<i>Ricinus communis</i>	Castor Oil Plant	N/A	High Threat Exotic	
<i>Rivina humilis</i>	Coral Berry	N/A	Exotic	
<i>Schefflera actinophylla</i>	Umbrella Tree	N/A	High Threat Exotic	
<i>Senna pendula</i>	Senna	N/A	High Threat Exotic	
<i>Setaria sphacelata</i>	Setaria	N/A	Exotic	
<i>Smilax australis</i>	Lawyer Vine	Other	Native	
<i>Solanum americanum</i>	Glossy Nightshade	Forb	Native	
<i>Solanum chrysotrichum</i>	Devil's Fig	N/A	Exotic	
<i>Solanum mauritanum</i>	Wild Tobacco Bush	N/A	Exotic	
<i>Solanum nigrum</i>	Black-berry Nightshade	N/A	Exotic	
<i>Sonchus asper</i>	Prickly Sowthistle	N/A	Exotic	
<i>Stephania japonica</i>	Snake Vine	Other	Native	
<i>Strelizia Sp.</i>	Strelizia	N/A	Exotic	
<i>Syagrus romanzoffiana</i>	Cocos Palm	N/A	Exotic	
<i>Tabernaemontana pandacaqui</i>	Banana Bush	Shrub	Native	
<i>Tagetes minuta</i>	Stinking Roger	N/A	Exotic	
<i>Tradescantia fluminensis</i>	Trad	N/A	High Threat Exotic	
<i>Triumfetta rhomboidea</i>	Chinese Bur	N/A	Exotic	
<i>Trophis scandens</i>	Burny Vine	Other	Native	
<i>Vicia tetrasperma</i>	Slender Vetch	N/A	Exotic	