Appendix N
Site Rehabilitation & Pest Management Plan

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REVISED
SITE REHABILITATION AND PEST MANAGEMENT PLAN

Elysian
Residential Development Project

A Report Prepared for
Greenland Development Pty Ltd

NOVEMBER 2024

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		Name	Initials	Name	Initials
RW1	19/11/24	Belinda Whyburn	BW	Adam McArthur	AM

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1 INTRODUCTION

1.1 Background

JWA Pty Ltd (JWA) have been engaged by Greenland Development Pty Ltd ('the applicant') to prepare a Revised Site Rehabilitation and Pest Management Plan (SRPMP) for consideration by the Department of Planning, Housing and Infrastructure (DPHI) to modify the Major Project ('Concept Plan') Approval No. 08_0234 for Elysian, formerly known as the 'Rise', located at Marana Street, Bilambil Heights NSW 2486. The subject site is formally described as Lot 32//DP1085109, Lot 33//DP1085109, Lot 31//DP850230, Lot 2//DP867486, Lot 4//DP822786, Lot 1//DP1033807, Lot 1//DP595529 and Lot 1//DP1033810, Lot 2//DP1156202, Lot 1//DP1033811.

The proposal seeks approval to modify the Major Project consent pursuant to clause 3BA(5) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* (Transitional Regulation).

The modification seeks changes to the land uses of the approved project and the conditions of the consent. It is proposed to modify the approval by consolidating and simplifying land uses, omitting inappropriate uses and removal of the detailed layout to allow for flexibility at the detailed design stage.

A summary of the proposed changes include:

- Consolidation and updating of land uses and precincts
- Change of residential product type and density
- Increase in residential areas with an overall reduction in the yield of the development
- Deletion of precincts for a private school and nursing home
- Increase in open space overall, including additional land for conservation
- Reduced village centre precinct area
- Reduction in the number of precincts allocate for retirement living
- Realignment of major spine road and internal roads
- Relocation and consolidation of the reservoirs
- Change in tenure from Community title scheme/ Body corporate to Freehold.

The Major Project Approval No. 08_0234 was originally approved on 29th June 2010, with two subsequent modifications approved on 4th April 2018 (Mod 1) and 31st October 2022 (Mod 2). It is proposed to change the approval description as follows:

- Concept plan for the development of a mixed residential development including 1,300 residential dwellings, 2,400 m^2 gross floor area of retail space, 4,250 m^2 gross floor area of commercial space, and associated infrastructure and landscaping.

It is considered that the proposed changes are substantially the same development for which the consent was originally granted.

This report provides details on rehabilitation objectives, restoration methodology, pest animal management strategy, monitoring programs, and performance targets for areas within the Stage 1 (MP08_0234) of the Elysian development site that are proposed to be subject to revegetation/rehabilitation measures. These works will be completed on a precinct-by-precinct basis. A detailed Precinct Specific SRPMP will be prepared for each precinct at the time of lodgement of the respective Development Application.

It should be noted that this SRPMP applies to the Stage 1 (MP08_0234) component of the Elysian development only. Further rehabilitation and pest management works are planned within the balance area of the site as part of the future Stage 2 development works. Details of additional rehabilitation within the balance area will be subject to a separate management plan to be prepared at the time of lodgement of the respective Stage 2 Development Application.

1.2 The Subject Site

The subject site consists of the disused Terranora Golf Resort and associated grazing land and covers a total area of ~189.16 ha (**FIGURE 1**).

The subject site is located to the west of the Bilambil Heights residential area and ~9 km west from the coastline. The Terranora and Cobaki Broadwater's are ~2.5 km to the east and ~4.5 km to the northeast, respectively.

While much of the subject site is cleared (92.11 ha; grasslands) or has been substantially modified (10.55 ha; i.e. scattered mature trees lining disused golf fairways), patches of vegetation varying in quality occur across ~86.51 ha, including a large area of subtropical rainforest in the southern portions of the subject site. Most of the native vegetation on the subject site is heavily infested with exotic species, namely Camphor laurel (*Cinnamomum camphora*).

The subject site undulates from 3 m Australian Height Datum (AHD) in the low-lying northern portion to 216 m AHD in the central and southern portions and includes steeply sloping land.

An aerial photograph of the subject site is shown in **FIGURE 2**.

1.3 The Proposed Development

The proposed development is split into seven (7) precincts, and includes (among other things):

- A mixed residential development with 1,300 residential dwellings;
- 2,400 m^2 gross floor area of retail space;
- 4,250 m^2 gross floor area of commercial space;
- Associated infrastructure and landscaping;
- Open space and parks; and

- Environmental conservation areas

A concept layout of the proposed development is provided in **FIGURE 3**.

1.4 Responsibilities for the Implementation of this Plan

Rehabilitation and pest animal control works within each precinct will have a minimum timeframe of five (5) years. The proponent will be responsible for the implementation of this SRPMP during this timeframe including:

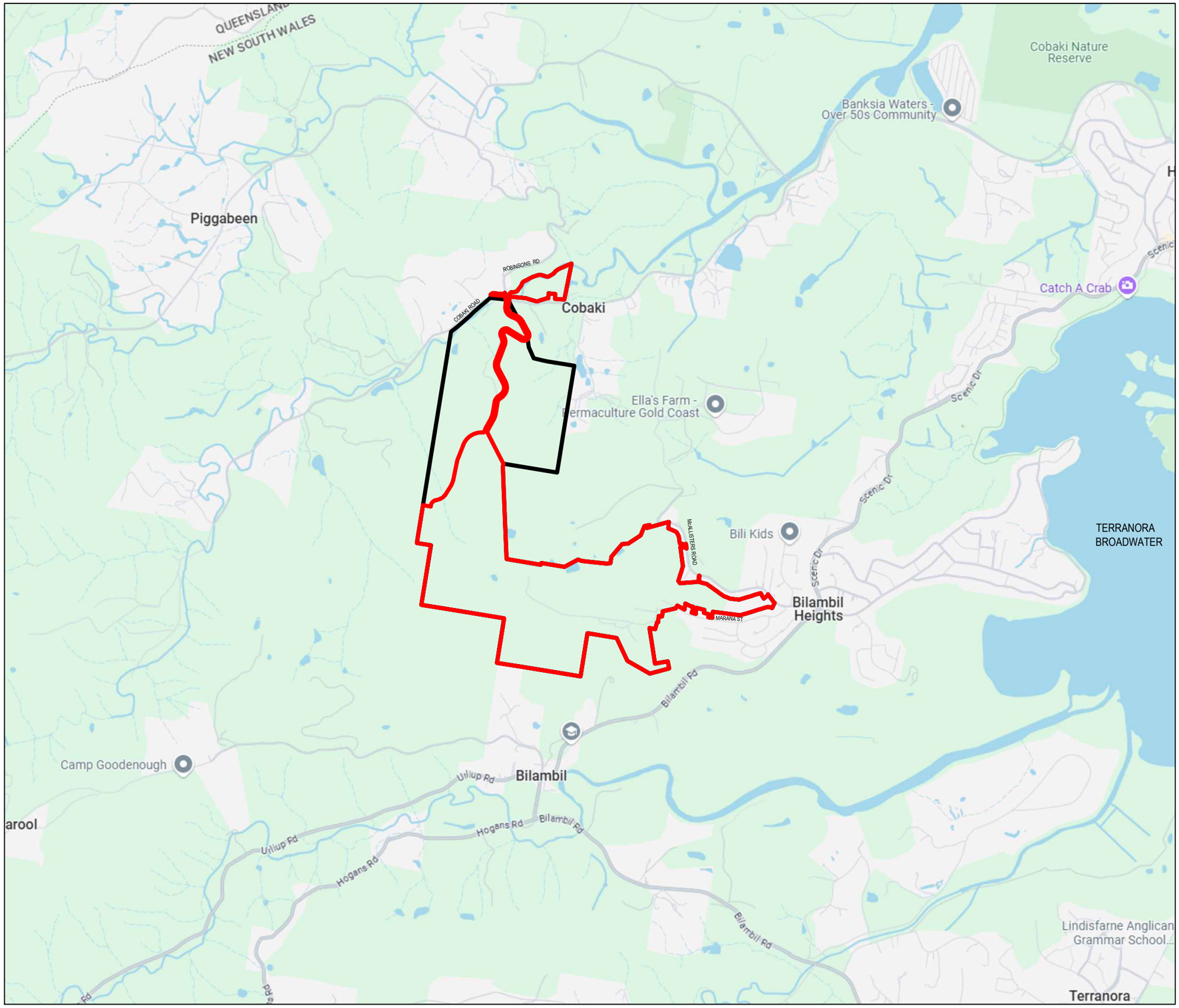
- An Establishment Period of twelve (12) months; and
- A Maintenance Period that shall extend for a further minimum period of four (4) years after the Establishment Period.

Maintenance works within each precinct will continue until Council assess the success of the management plan for that precinct and accept it as off-maintenance. Council will then take over responsibility for the ongoing maintenance of the Environmental conservation area.

1.5 Aims and Objectives

The objectives of this SRPMP are to:

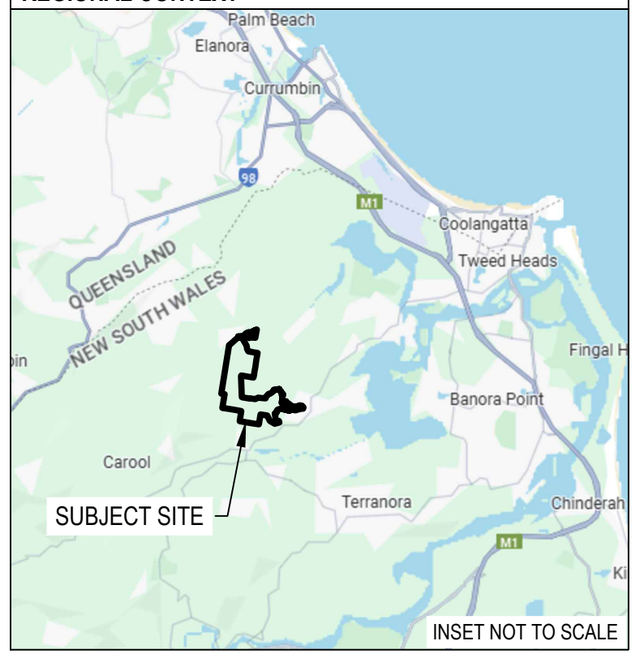
- Provide a plan for the revegetation and regeneration of the development site;
- To offset the removal of any Threatened Ecological Communities (TEC's), Threatened flora species, and habitat for Threatened flora and fauna species, to ensure no net loss as a result of the development;
- Identify areas of retained vegetation that will be maintained through weed control and general maintenance;
- Identify areas that will be rehabilitated using natural regeneration or enhancement plantings;
- Provide management guidelines for the revegetation, natural regeneration and weed control to be implemented;
- Outline a maintenance and monitoring program for the site;
- Provide management guidelines for pest animal species that may occur on the site; and
- Provide management guidelines for the on-going conservation of vegetation on the site.



LEGEND

- Stage 1 Boundary
- Site Boundary

REGIONAL CONTEXT



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0 200m 400m 600m 800m 1000m

SOURCE: Google Maps

SCALE: 1 : 25 000 @ A3

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FIGURE 1

PREPARED: BW
DATE: 18 November 2024
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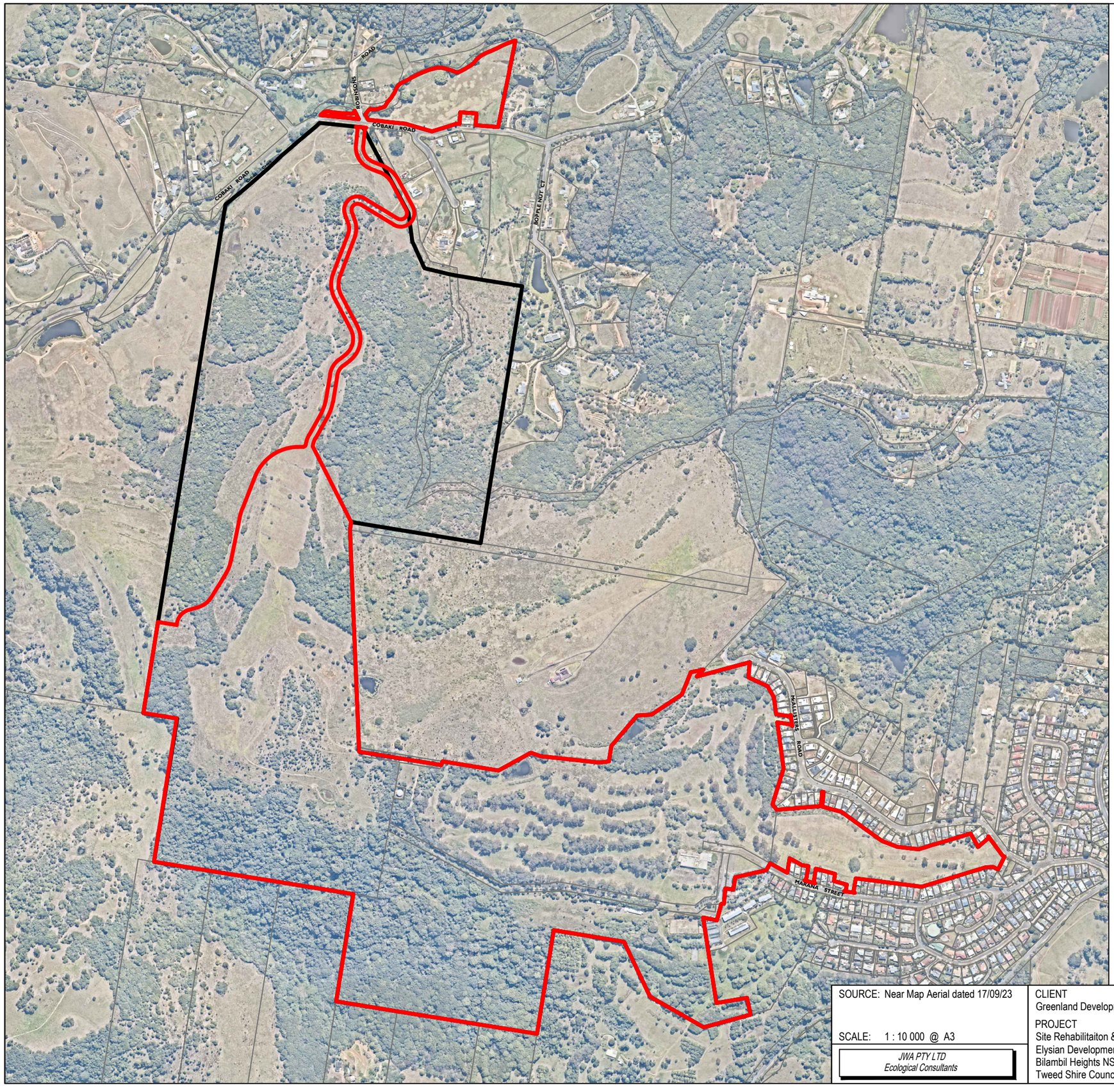
TITLE

LOCALITY PLAN



LEGEND

Stage 1 Boundary

Site Boundary

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Scale 1 : 10 000

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SOURCE: Near Map Aerial dated 17/09/23

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FIGURE 2

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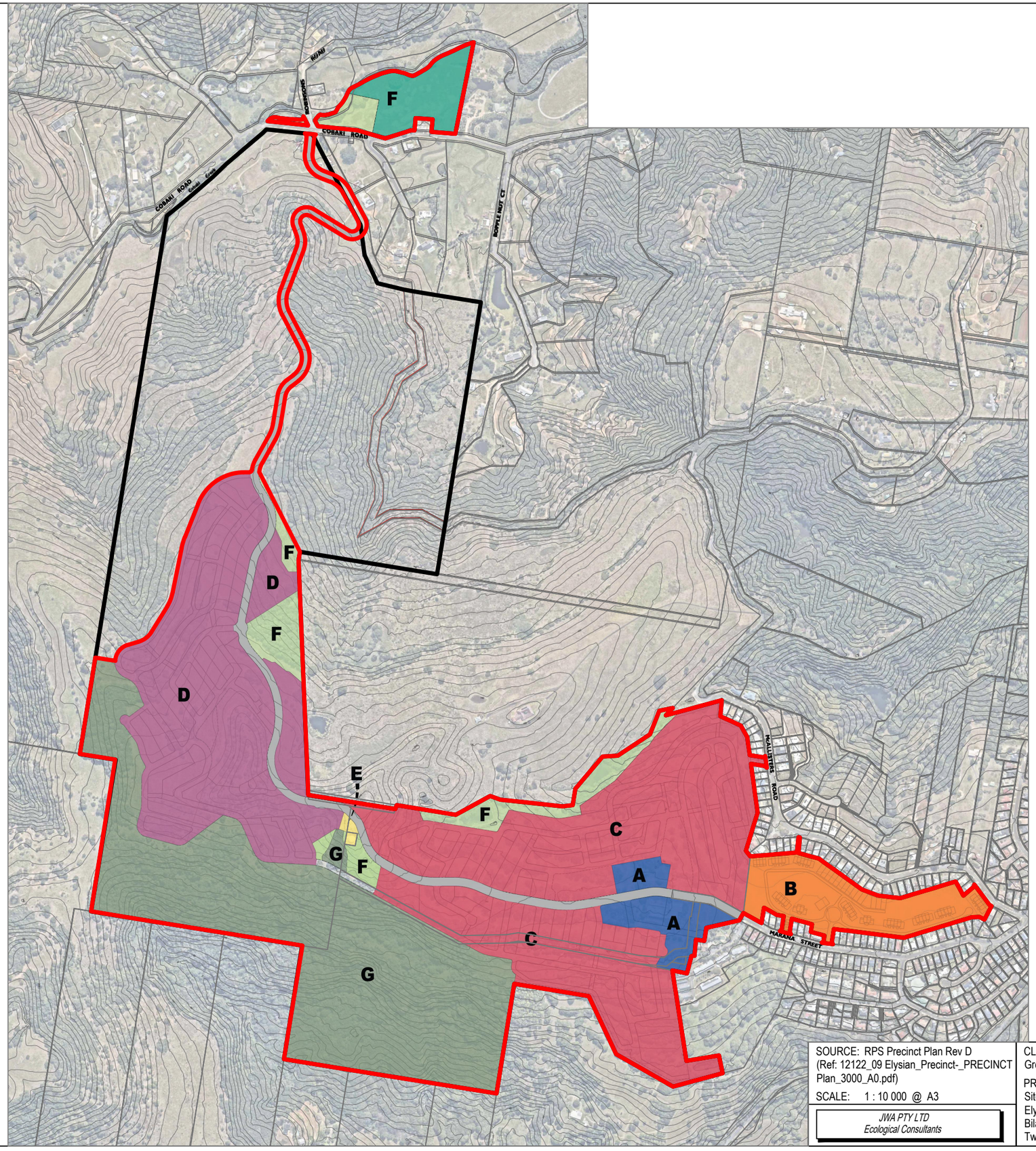
TITLE

AERIAL PHOTOGRAPH



LEGEND

- Stage 1 Boundary
- Site Boundary

Proposed Development Layout

- Precinct A - Village Centre
- Precinct B - Retirement Living
- Precinct C - Low Density Housing
- Precinct D - Hilltop Village
- Precinct E - Reserve
- Precinct F - Open Space
- Precinct G - Conservation
- Precinct H - Structured Open Space

N

Scale 1 : 10 000

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SOURCE: RPS Precinct Plan Rev D (Ref: 12122_09 Elysian_Precinct-_PRECINCT Plan_3000_A0.pdf)

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FIGURE 3

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TITLE

PROPOSED CONCEPT PLAN

2 EXISTING SITE VALUES

2.1 Introduction

Extensive surveys of the site have been completed since 1996 (WBM Oceanics 1996). Since that time, JWA have completed multiple field assessments in 2004, 2005, 2006, 2007, 2009, 2020 and 2023 to:

- Ground truth (and amend as necessary) vegetation mapping;
- Complete targeted surveys for threatened flora species listed within schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the NSW Biodiversity Conservation Act (BC Act) in accordance with relevant current survey guidelines);
- Collect detailed data from the vegetation proposed to be removed to allow an assessment of its ecological value; and
- General fauna assessments and targeted surveys for threatened fauna species listed within schedules of the EPBC Act and/or BC Act at the appropriate time of year and in accordance with relevant current survey guidelines.

The following section describes the existing ecological values of the site. Further details can be found in the Revised Ecological Assessment (JWA 2024).

2.2 Threatened Flora

TABLE 1 lists the threatened flora species listed within schedules of the EPBC Act or the BC Act that have been recorded on the subject site. Locations of known plants are shown in **FIGURE 4**.

TABLE 1
THREATENED FLORA SPECIES RECORDED ON THE SUBJECT SITE

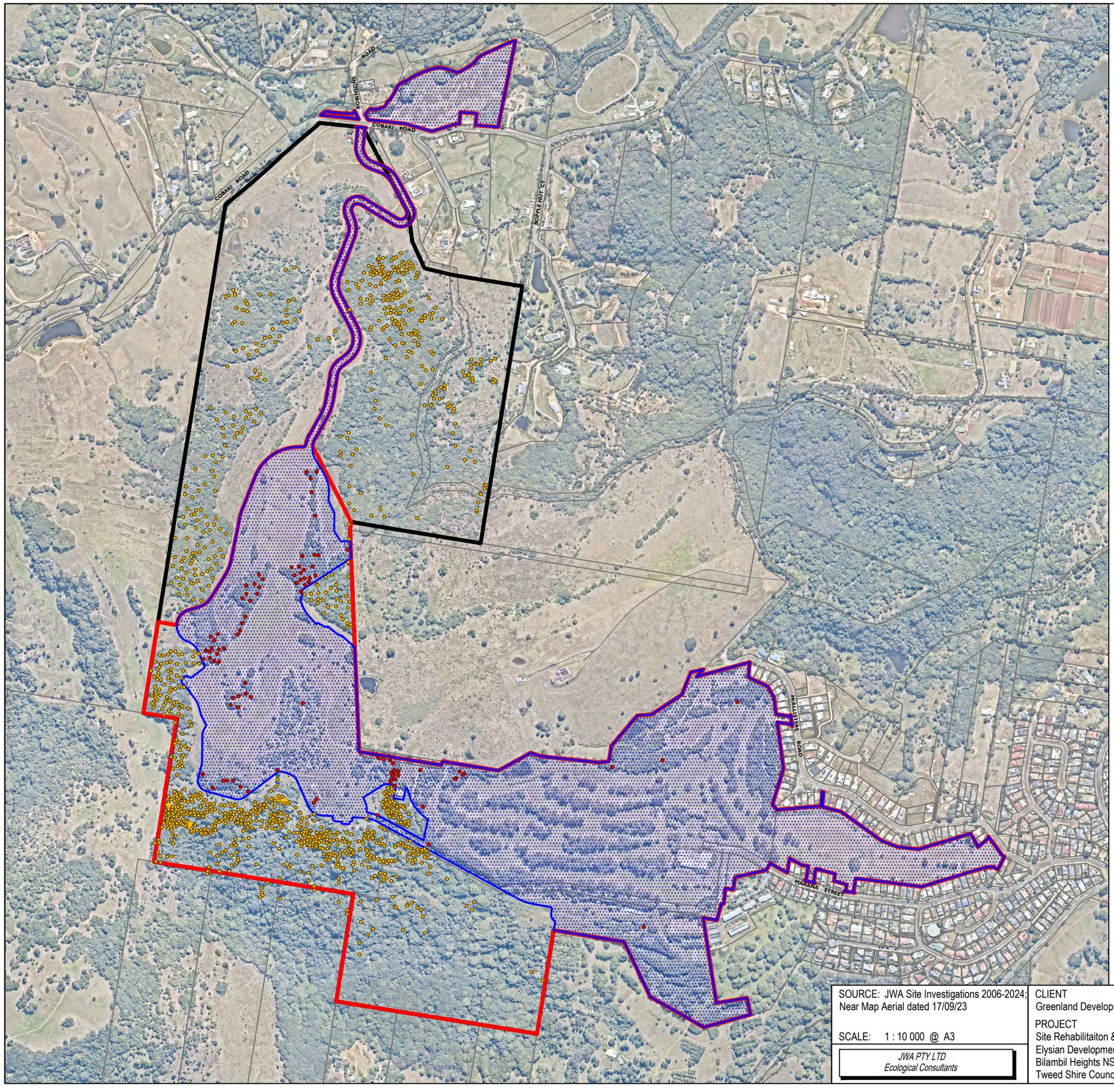
Scientific Name	Common Name	BC Act	EPBC Act
Acacia bakeri	Marblewood	V	
Archidendron hendersonii	White lace flower	V	
Bosistoa transversa	Yellow satinheart	V	V
Coatesia paniculata	Axe-breaker	E	
Cryptocarya foetida	Stinking cryptocarya	V	V
Diospyros yandina	Shiny-leaved ebony	E	
Diploglottis campbellii	Small-leaved tamarind	E	E
Drynaria rigidula	Basket fern	E	
Endiandra hayesii	Rusty rose walnut	V	V
Endiandra muelleri subsp. bracteata	Green-leaved rose walnut	E	
Floydia praealta	Ball nut	V	V
Gossia fragrantissima	Sweet myrtle	E	E
Grevillea hilliana	White yiel yiel	E	
Hicksbeachia pinnatifolia	Red bopple nut	V	V
Lepiderema pulchella	Fine-leaved tuckeroo	V	
Macadamia tetraphylla	Rough-shelled bush nut	V	V
Ochrosia moorei	Southern ochrosia	E	E

Scientific Name	Common Name	BC Act	EPBC Act
Peristeranthus hillii	Brown fairy-chain orchid	V	
Phyllanthus microcladus	Brush sauropus	E	
Randia moorei	Spiny gardenia	E	E
Rhodamnia maideniana	Smooth scrub turpentine	CE	CE
Syzygium hodgkinsoniae	Red lilly pilly	V	V
Syzygium moorei	Durobby	V	V

BC Act – NSW *Biodiversity Conservation Act 2016*
EPBC Act - Commonwealth *Environment Protection Biodiversity and Conservation Act 1999*
Conservation status: CE - Critically endangered; E – Endangered; V – Vulnerable; NT – Near threatened

2.3 Vegetation Communities

A total of five (5) vegetation communities (VCs) (plus sub-VCs) have been identified on the subject site based on different broad condition states (**FIGURE 5**). **TABLE 2** identifies which of the VCs are representative of a TEC listed within schedules of the EPBC Act and/or the BC Act. A description of each community is provided below.



LEGEND

- Impact Area
- Stage 1 Boundary
- Site Boundary

Threatened Flora Records

- Threatened Flora to be Retained
- Threatened Flora to be Removed

N

Scale 1 : 10 000

0 100m 200m 300m 400m 500m

SOURCE: JWA Site Investigations 2006-2024; Near Map Aerial dated 17/09/23

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FIGURE 4

PREPARED: BW
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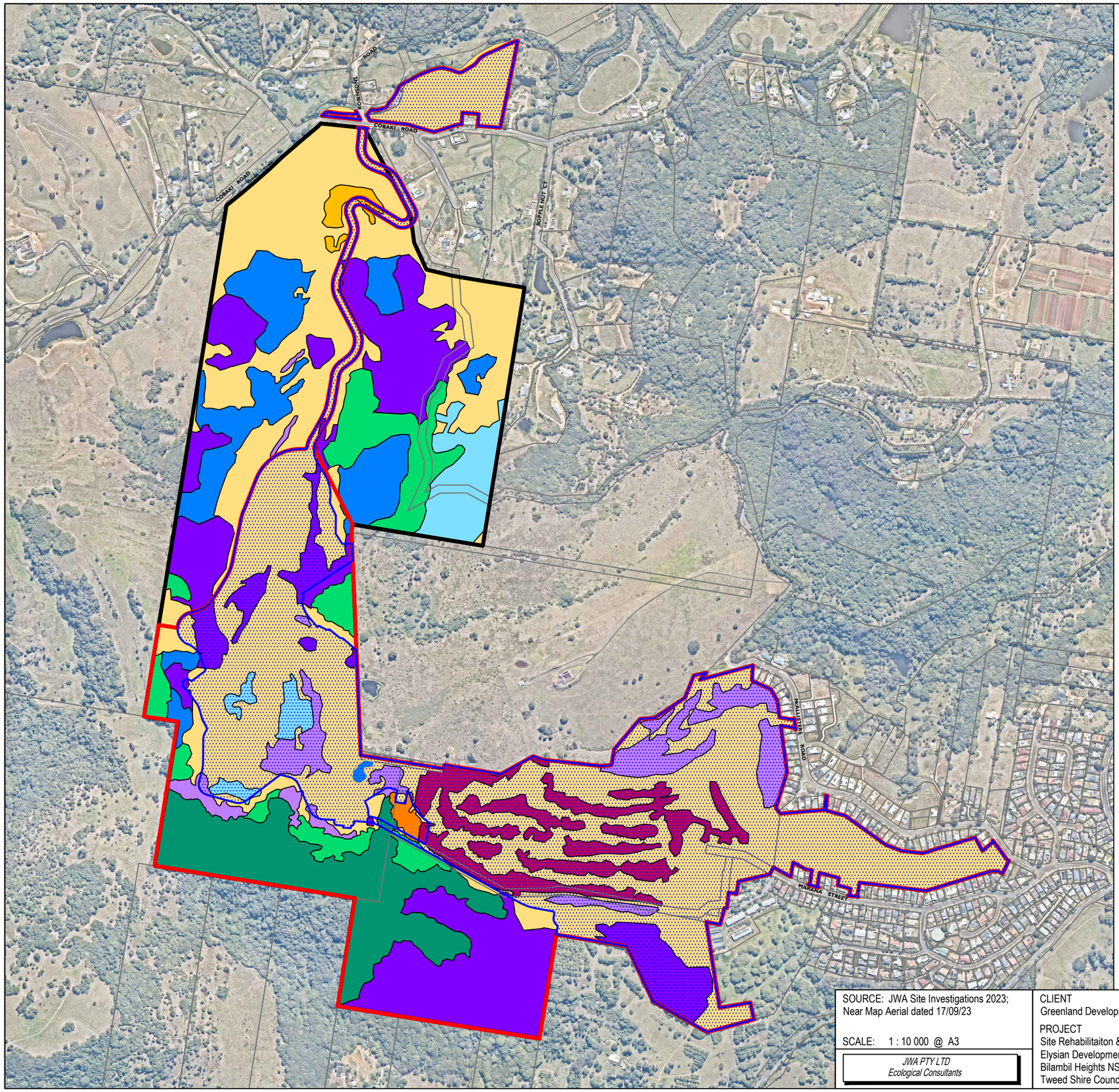
TITLE

THREATENED FLORA RECORDS



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LEGEND

- Impact Area
- Stage 1 Boundary
- Site Boundary

Vegetation Communities (VC)

- VC1A - Tall subtropical rainforest (PCT 3011)
- VC1B - Mid-high to tall subtropical rainforest (PCT 3011)
- VC2A - Tall closed sclerophyll forest (*Lophostemon confertus*) (PCT 3148)
- VC2B - Tall open sclerophyll forest (*Lophostemon confertus* / *Cinnamomum camphora*) (PCT 3148 - derived)
- VC3A - Mid-high to tall closed forest (*Cinnamomum camphora* +/- mixed species) (PCT 3011 - derived)
- VC3B - Low to mid-high closed regrowth (*Cinnamomum camphora* +/- mixed species) (PCT 3011 - derived)
- VC4A - Mid-high to tall closed forest (*Cinnamomum camphora*)
- VC4B - Low to mid-high regrowth (*Cinnamomum camphora*)
- VC5 - Planted trees / landscaping
- Grassland and Disturbed Areas

Scale 1 : 10 000

0 100m 200m 300m 400m 500m

SOURCE: JWA Site Investigations 2023; Near Map Aerial dated 17/09/23

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FIGURE 8

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TITLE

VEGETATION COMMUNITIES

TABLE 2
VEGETATION COMMUNITIES PRESENT ON THE SUBJECT SITE

Vegetation Community (VC)	Brief Description	Representative PCT	Representative TEC	
			EPBC Act	BC Act
VC1A	Tall subtropical rainforest	3011 – Far North Lowland Subtropical Rainforest	Lowland Rainforest of Subtropical Australia	Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC1B	Mid-high to tall subtropical rainforest	3011 - Far North Lowland Subtropical Rainforest	Lowland Rainforest of Subtropical Australia	Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC2A	Tall closed sclerophyll forest (*Lophostemon confertus*)	3148 - Far North Brush Box-Walnut Wet Forest	Lowland Rainforest of Subtropical Australia	Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC2B	Tall open sclerophyll forest (*Lophostemon confertus* / *Cinnamomum camphora*)	3148 (derived) - Far North Brush Box-Walnut Wet Forest	Lowland Rainforest of Subtropical Australia	Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC3A	Mid-high to tall closed forest (*Cinnamomum camphora* +/- mixed species)	3011 (derived) - Far North Lowland Subtropical Rainforest		Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC3B	Low to mid-high closed regrowth (*Cinnamomum camphora* +/- mixed species)	3011 (derived) - Far North Lowland Subtropical Rainforest		Lowland Rainforest in the NSW North Coast and Sydney Bioregions
VC4A	Mid-high to tall closed forest (*Cinnamomum camphora*)	n/a	n/a	n/a
VC4B	Low to mid-high closed regrowth (*Cinnamomum camphor*)	n/a	n/a	n/a
VC5	Planted trees / landscaping	n/a	n/a	n/a
	Grassland and disturbed areas	n/a	n/a	n/a

2.3.1 Vegetation Community 1A – Tall subtropical rainforest

Location

This VC comprises the highest quality vegetation on the subject site and occurs over ~15.08 ha in the southern extent (**FIGURE 5**).

Description

Mature trees occur at heights of up to 30 m, and include Giant stinging tree (*Dendrocnide excelsa)*, Giant water gum (*Syzygium francisii)*, Celerywood (*Polyscias elegans)*, White fig (*Ficus virens)*, Cudgerie (*Flindersia schottiana)*, Broad-leaved apple (*Acmena hemilampra)* and the threatened Small-leaved tamarind (*Diploglottis campbellii*).

The portion of this VC in the south-west of the subject site is representative of dry rainforest with common midstorey species including Yellow tulip (*Drypetes deplanchei* subsp. *Deplanchei)*, Python tree (*Gossia bidwillii)*, Whalebone (*Streblus brunonianus)*, Native holly (*Alchornea ilicifolia)*, Prickly alyxia (*Alyxia ruscifolia)*, Small-leaved acalypha (*Acalypha capillipes)* and Rough-leaved elm (*Aphananthe philippinensis)*. The threatened Spiny gardenia (*Randia moorei*) and Sweet myrtle (*Gossia fragrantissima*) occur sporadically. The ground layer is generally sparse, although the exotic species Coral berry (*Rivina humilis*) is scattered throughout.

From the middle of the VC to the east, the vegetation shifts to species more representative of subtropical rainforest, with a dense midstorey tangled with Lawyer vine (*Calamus muelleri)* and Whip vine (*Flagellaria indica)*, along with numerous shrubs and small trees such as Glossy laurel (*Cryptocarya laevigata)*, Bleeding heart (*Omalanthus populifolius)*, Smooth wilkiea (*Wilkiea austroqueenslandica)*, Brown pearwood (*Niemeyera antiloga)*, Brush bloodwood (*Baloghia inophylla)* and Actephila (*Actephila lindleyi)*. Several steep drainage lines run south from this part of the VC, and there are several large gaps in the vegetation from tree fall where Lantana (*Lantana camara*) has colonised, but due to the shady conditions, does not extend into the rainforest.

Where this VC occurs at its eastern extent, species composition becomes lower, and there is evidence of previous disturbance (large Lantana gaps, informal tracks) until it intergrades with disturbed Camphor laurel (*Cinnamomum camphora*) forest. It appears that much of the eastern portion of this VC was cleared to some extent, and the current vegetation consists of regrowth, although several mature figs species remain. The subtropical rainforest extends onto adjacent land to the south, where threatened flora have also been recorded.

Seventeen (17) threatened species were recorded in this VC and include:

- Axe-breaker (*Coatesia paniculata*);
- Brown fairy-chain orchid (*Peristeranthus hillii*);
- Brush Sauropus (*Phyllanthus microcladus*);
- Coolamon (*Syzygium moorei*);
- Fine-leaved tuckeroo (*Lepiderema pulchella*);
- Green-leaved rose walnut (*Endiandra muelleri* subsp. *bracteata*);

- Marblewood (*Acacia bakeri*);
- Red lilly pilly (*Syzygium hodgkinsoniae*);
- Rough-shelled bush nut (*Macadamia tetraphylla*);
- Rusty rose walnut (*Endiandra hayesii*);
- Shiny-leaved ebony (*Diospyros yandina*);
- Small-leaved tamarind (*Diploglottis campbellii*);
- Southern ochrosia (*Ochrosia moorei*);
- Spiny gardenia (*Randia moorei*);
- Sweet myrtle (*Gossia fragrantissima*);
- White yiel yiel (*Grevillia hilliana*); and
- Yellow satinheart (*Bosistoa transversa*).

Conservation value
VC1A is best represented by PCT 3011 – Far North Lowland Subtropical Rainforest. This PCT is representative of the Lowland Rainforest of Subtropical Australia TEC and Lowland Rainforest in the NSW North Coast and Sydney Bioregions EEC.

This VC is considered to have an extremely high conservation value on the subject site due to its relatively undisturbed nature, alliance with TECs, and the presence of numerous threatened flora. Of note in the VC were ten (10) mature Small-leaved tamarind that were fruiting heavily at the time of the February 2006 survey, which is likely to constitute a significant local population of this species. In addition, the occurrence the Axe breaker, which is the sole record across the Tweed LGA.

2.3.2 Vegetation Community 1B – Mid-high to tall subtropical rainforest

Location
This VC is in several areas across the subject site and covers ~9.97 ha (**FIGURE 5**). In the south, this VC is located along the northern fringe of VC1A; however, fragmented patches occur further north that are typically in association with VC3A, VC3B and/or VC4A.

Description
VC2B comprises a diversity of species but lacks the maturity of the vegetation within VC1A in the south of the subject site. Typical canopy species include Guioa (*Guioa semiglauca*) and Red kamala (*Mallotus philippensis*), although occasional emergent species include Giant water gum and the threatened Smooth scrub turpentine (*Rhodamnia maideniana*) and White yiel yiel. Midstorey species are like those found within VC1A, although there is a lack of vines and scramblers.

Conservation value
VC1B is best represented by PCT 3011 – Far North Lowland Subtropical Rainforest. This PCT is representative of the Lowland Rainforest of Subtropical Australia TEC and Lowland Rainforest in the NSW North Coast and Sydney Bioregions EEC.

This VC is considered to have a high conservation value on the subject site.

2.3.3 Vegetation Community 2A - Tall closed sclerophyll forest (Lophostemon confertus)

Location
This VC occurs in one small patch (0.57 ha) immediately below the water reservoir (**FIGURE 5**).

Description
VC2A comprises and features a canopy of Brushbox (*Lophostemon confertus*) to a height of approximately 20-25 m. The midstorey is generally sparse and appears to have been cleared at some stage.

Common species include those from the neighbouring rainforest community (VC1A) such as Palm lily (*Cordyline spp.*), Guioa, Lilly pilly (*Acmena smithii*), Three-veined laurel (*Cryptocarya triplinervis* var *Pubens)*, and Veiny laceflower (*Archidendron muellerianum*). Lantana and Prickly smilax (*Smilax australis*) commonly occur. The ground layer is primarily comprised of the exotic species Mistflower (*Ageratina riparia**).

Conservation value
VC2A is best represented by 3148 - Far North Brush Box-Walnut Wet Forest, which is also representative of the Lowland Rainforest of Subtropical Australia TEC.

This community is considered to have a moderate-high conservation value due to its small size and historically disturbed nature.

2.3.4 Vegetation Community 2B - Tall open sclerophyll forest (Lophostemon confertus / Cinnamomum camphora)

Location
This VC comprises two (2) small and isolated patches (totalling 1.03 ha) in the northern portion of the subject site surrounded on all sides by grassland and disturbed areas (**FIGURE 5**).

Description
VC2B is comprised of several scattered sub-mature to mature Brushbox amongst dense regenerating Camphor laurel.

Conservation value
VC2B is considered to be a highly disturbed/derived version of PCT 3011 – Far North Lowland Subtropical Rainforest. This PCT is representative of the Lowland Rainforest of Subtropical Australia TEC.

This VC is considered to have a low-moderate conservation value on the subject site due to its size, isolation and disturbed nature.

2.3.5 Vegetation Community 3A - Mid-high to tall closed forest (Cinnamomum camphora +/- mixed species)

Location

This VC occurs throughout the central and northern portions of the subject site and accounts for ~12.72 ha. In most cases this VC forms part of larger patches containing VC4A, which is more notably dominated by Camphor laurel (**FIGURE 5**).

Description

Vegetation within this VC has been degraded to varying degrees from invasion by Camphor laurel (*Cinnamomum camphora*) (50-70%) and (to a lesser degree) Large-leaved privet (*Ligustrum lucidum*). Vegetation also consists of regrowth subtropical rainforest; however, these areas have undergone substantial modification from clearing for grazing and other land-uses, and as noted by WBM Oceanics (1996), a 1961 aerial photograph of the subject site indicates that areas supporting most of this VC were extensively cleared.

Typical native canopy species present include Guioa, Red kamala and Rough-leaved elm. Occasional mature trees (20-30 m in height) occur, but are generally scarce, with examples including Red apple (*Acmena ingens*), Guioa, Cudgerie and Teak (*Flindersia australis*). Several very large mature figs also occur, with the White fig particularly common.

Common midstorey species include Steelwood (*Sarcopteryx stipata*), Pepperberry (*Cryptocarya obovata*), Whalebone and Glossy laurel, along with Cockspur (*Maclura cochinchinensis*) and Lantana. The ground layer is generally sparse. Numerous other species are present and occur to varying degrees within each remnant.

The threatened species Rough-shelled bush nut and Fine-leaved tuckeroo occur occasionally throughout this VC. Other threatened flora species occur sporadically, often in localised areas.

Conservation value

VC3A is considered to be a highly disturbed/derived version of PCT 3011 – Far North Lowland Subtropical Rainforest. This PCT is representative of the Lowland Rainforest of Subtropical Australia TEC and Lowland Rainforest in the NSW North Coast and Sydney Bioregions EEC.

2.3.6 Vegetation Community 3B – Low to mid-high closed regrowth (Cinnamomum camphora +/- mixed species)

Location

This VC covers ~6.18 ha across several areas on the subject site (**FIGURE 5**). In the south, this VC is located along the northern fringe of VC1A; however, fragmented patches occur further north that are typically in association with VC3A and/or VC4A.

Description

VC3B is comprised of regrowth vegetation and is generally dominated by Camphor laurel with a mixture of pioneer rainforest species also present including Guioa (*Guioa semiglauca*) and Red kamala (*Mallotus philippensis*).

Conservation value
VC3B is considered to be a regrowth and highly disturbed/derived version of PCT 3011 – Far North Lowland Subtropical Rainforest. This PCT is representative of the Lowland Rainforest of Subtropical Australia TEC and Lowland Rainforest in the NSW North Coast and Sydney Bioregions EEC.

2.3.7 Vegetation Community 4A – Mid-high to tall closed forest (Cinnamomum camphora)

Location
This VC is located across several areas on the subject site totalling ~32.04 ha, and in most cases forms part of a larger patch of vegetation with varying degrees of disturbance (**FIGURE 5**).

Description
This VC has a more simplified species structure than VC3A, generally dominated by Camphor laurel (70-90%), and with only secondary occurrences of native species such as Macaranga, Guioa, Red kamala and Three-veined laurel also occur. This VC includes large areas colonised by dense infestations of Lantana, Crofton weed and Wild tobacco.

Threatened species have been recorded in this VC, including the occasional Rough-shelled bush nut and Fine-leaved tuckeroo. Notwithstanding this, due to the high density of Lantana and steep topography in some areas, access was difficult. As such, there are likely to be further occurrences of threatened flora species, mostly within the most southerly portion of this community.

Conservation value
VC4A is not considered to be representative of any PCTs described within the BioNet Vegetation Classification or representative of any TECs listed within schedules of the EPBC Act or BC Act.

2.3.8 Vegetation Community 4B – Low to mid-high tall closed regrowth (Cinnamomum camphora)

Location
This VC is in several areas across the subject site (**FIGURE 5**). In the south, this VC is located along the northern fringe of VC1A; however, fragmented patches occur further north that are typically in association with VC3A, VC3B and/or VC4A.

Description
VC4B is almost completely comprised of dense regrowth Camphor laurel, almost to the exclusion of any other species.

Conservation value
VC4A is not considered to be representative of any PCTs described within the BioNet Vegetation Classification or representative of any TECs listed within schedules of the EPBC Act or BC Act.

2.3.9 Vegetation Community 5 – Planted trees / landscaping

Location

Landscape plantings (~10.55 ha) are primarily associated with the eastern portion of the subject site which constitutes the disused Terranora golf course.

Description

Plantings include a variety of both native and exotic trees and shrubs, the most common of which are Swamp mahogany (*Eucalyptus robusta*), Spotted gum (*Corymbia citriodora*), Cadagi (*C. torelliana**), Crimson bottlebrush (*Callistemon citrinus*), Grevillea (*Grevillea sp.*), Tea tree (*Leptospermum parvifolium)* and Tibouchina (*Tibouchina sp.*). Other species include Jacaranda (*Jacaranda mimosifolia*)*, Blackbutt (*E. pilularis*), Grey gum (*E.* propinqua), Grey box (*E. moluccana*), Forest red gum (*E. tereticornis*), Poinciana (*Delonix regia*), Figs (*Ficus spp.*) and Broad-leaved paperbark (*Melaleuca quinquenervia)*. A small area of planted Swamp mahogany (with an understorey of regrowth Camphor laurel) occurs in the north-western portion of the golf course close to the water reservoir.

Threatened flora occurring include a single mature Small-leaved tamarind (*Diploglottis campbellii*) which occurs along the eastern boundary of this portion of the subject site. A single mature Rough-shelled bush nut (*Macadamia tetraphylla*) also occurs in remnant regrowth vegetation adjacent to the northern fairway. Four (4) planted Coolamon (*Syzygium moorei*) and two (2) Small-leaved tamarind also occur. The provenance of these trees is not known.

Conservation value

VC5 is not considered to be representative of any PCTs described within the BioNet Vegetation Classification. This VC has a relatively low conservation value, although individual trees such as mature figs and Eucalypts have value as a resource for fauna (including the Koala), and threatened species have individual conservation value.

2.3.10 Grasslands and disturbed areas

Location

Large portions of the subject site (~92.11 ha) comprise highly disturbed grasslands typically associated with agricultural land (central and northern portions), the disused golf course (eastern portion) and parts of an area historically used as a shooting range (south-eastern portion) (**FIGURE 5**).

Description

These areas have been significantly disturbed and are highly degraded with little native vegetation occurring. Occasional scattered trees occur, including Camphor laurel and native species such as mature Teak (*Flindersia australis*) and Figs (*Ficus* sp.).

Exotic species (as prevalent examples) include Molasses grass (*Melinis minutiflora*)*, Paspalum (*Paspalum dilatatum*)*, Pigeon grass (*Setaria sphacelata*)*, regrowth Camphor laurel, Wild tobacco (*Solanum mauritianum*)*, Lantana, White passionflower (*Passiflora subpeltata*)*, Chinese burr (*Triumfetta rhomboidea*)*, Crofton weed (*Ageratina adenophora**) and Singapore daisy (*Wedelia trilobata*)*. Molasses grass and Singapore daisy occurring in dense blankets.

Other annual weed species present include Blue billygoat weed (*Ageratum houstonianum*)*, Cobbler's pegs (*Bidens pilosa*)* and Fleabane (*Conyza albida*)*.

One (1) Threatened flora species occurs, a single mature Coolamon (*Syzygium moorei*) adjacent to the treatment pond in the vicinity of the shooting range.

Conservation value
These areas have been significantly degraded by past land-use activities and are therefore considered to have a low conservation value on the subject site.

2.4 Threatened Fauna

A total of nine (9) threatened fauna species listed within schedules of the EPBC Act or BC Act have been recorded on the site (**FIGURE 6**):

- Eastern bent-wing bat (*Miniopterus schreibersii oceanensis*);
- Eastern free-tail bat (*Mormopterus norfolkensis*);
- Grey-headed flying-fox (*Pteropus poliocephalus*);
- Little bent-wing bat (*Miniopterus australis*);
- Little lorikeet (*Glossopsitta pusilla*);
- Pink underwing moth (Phyllodes imperialis smithersi);
- Rose-crowned fruit-dove (*Ptilinopus regina*);
- White-bellied sea-eagle (*Haliaetus leucogaster*); and
- White-eared monarch (Monarcha leucotis).

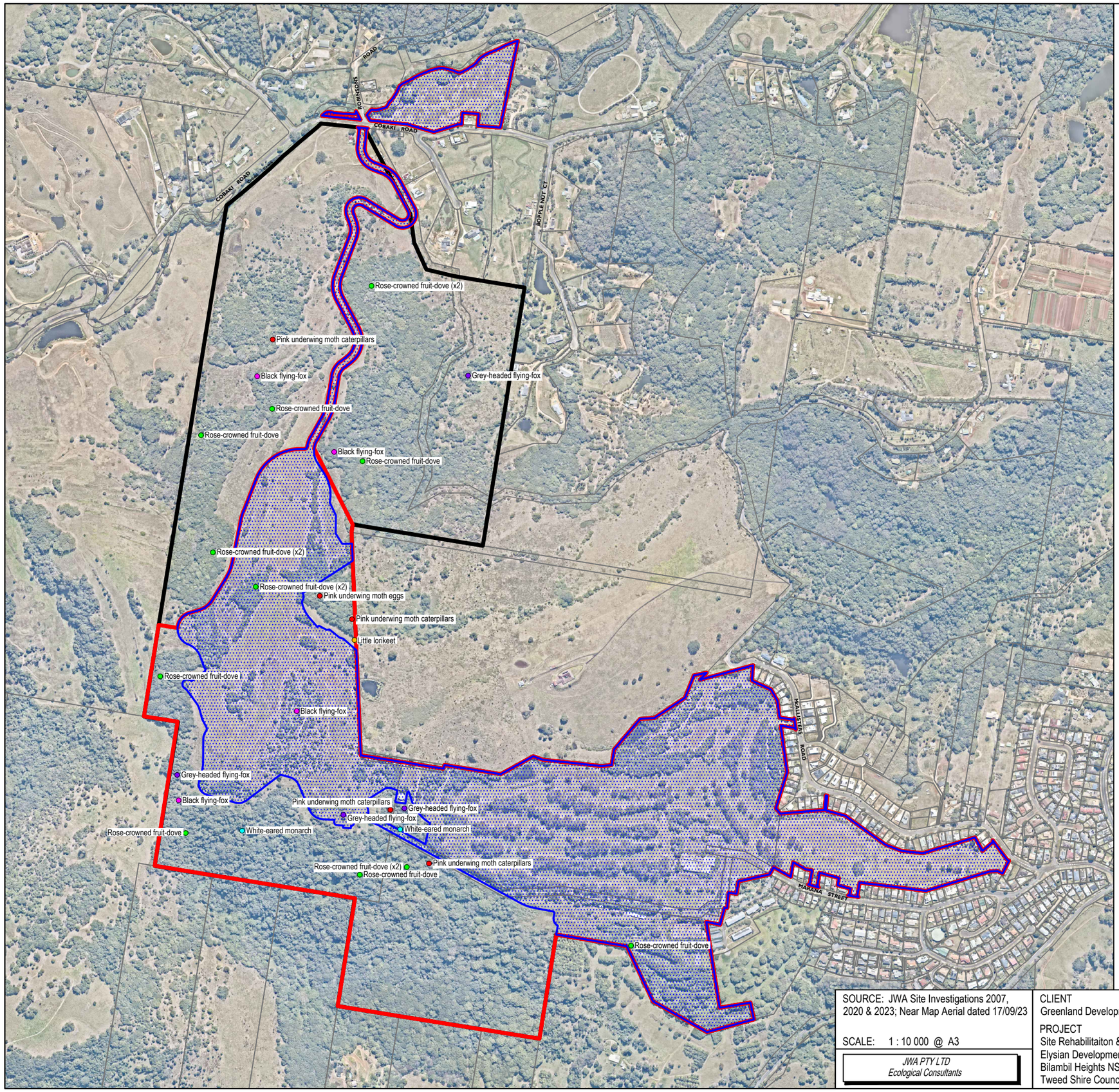
Two (2) migratory species as listed within schedules of the EPBC Act have also been recorded:

- Rufous fantail (*Rhipidura rufifrons*); and
- Spectacled monarch (*Monarcha trivirgatus*).

Based on field surveys, habitat suitability assessments and interrogation of historical records, the following additional threatened fauna species are either known to occur on the subject site based of past field surveys, or are considered possibly or likely to occur:

- Barking owl (*Ninox connivens*);
- Barred cuckoo-shrike (*Coracina lineata*);
- Black-breasted button quail (*Turnix melanogaster*);
- Bush stone-curlew (*Burhinus grallarius*);
- Common planigale (*Planigale maculata*);
- Coxen's fig parrot (*Cyclopsitta diophthalma coxeni*);
- Eastern long-eared bat (*Nyctophilus bifax*);
- Koala (*Phascolarctos cinereus*);

- Large bent-wing bat (*Miniopterus orianae oceanensis*);
- Masked owl (*Tyto novaehollandiae*);
- Mitchell's rainforest snail (*Thersites mitchellae*);
- Northern free-tailed bat (*Ozimops lumsdenae*);
- Powerful owl (*Ninox strenua*);
- Scarlet robin (*Petroica boodang*);
- Sooty owl (*Tyto tenebricosa*);
- Spotted-tail quoll (*Dasyurus maculatus*);
- Superb fruit-dove (*Ptilinopus superbus*);
- Three-toed snake-tooth skink (*Coeranoscincus reticulatu*s);
- White-throated needletail (*Hirundapus caudacutus*);
- Wompoo fruit-dove (*Ptilinopus magnificus*); and
- Yellow-bellied sheathtail bat (*Saccolaimus flaviventris*).



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LEGEND

- Impact Area
- Stage 1 Boundary
- Site Boundary

Threatened Fauna Records

- Grey-headed flying fox (*Pteropus poliocephalus*)
- Little lorikeet (*Glossopsitta pusilla*)
- Pink underwing moth (*Phyllodes imperialis smithersi*)
- Rose-crowned fruit-dove (*Ptilinopus regina*)
- White-eared monarch (*Carterornis leucotis*)

Scale 1 : 10 000

0 100m 200m 300m 400m 500m

SOURCE: JWA Site Investigations 2007, 2020 & 2023; Near Map Aerial dated 17/09/23

SCALE: 1 : 10 000 @ A3

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Elysian Development Project
Bilambil Heights NSW
Tweed Shire Council LGA

FIGURE 6

PREPARED: BW
DATE: 18 November 2024
FILE: N01057_EA_20241025.dwg

TITLE

THREATENED FAUNA RECORDS

3 REHABILITATION STRATEGY

3.1 Introduction

The following section provides conceptual details the proposed rehabilitation works to be completed for the Stage 1 (MP08_0234) of the Elysian development site. Rehabilitation works will focus on buffering and embellishing retained TEC onsite and offsetting Threatened flora to be removed as a result of the development. These works will be completed on a precinct-by-precinct basis. A detailed Precinct Specific SRPMP will be prepared for each precinct at the time of lodgement of the respective Development Application.

3.2 Rehabilitation Areas

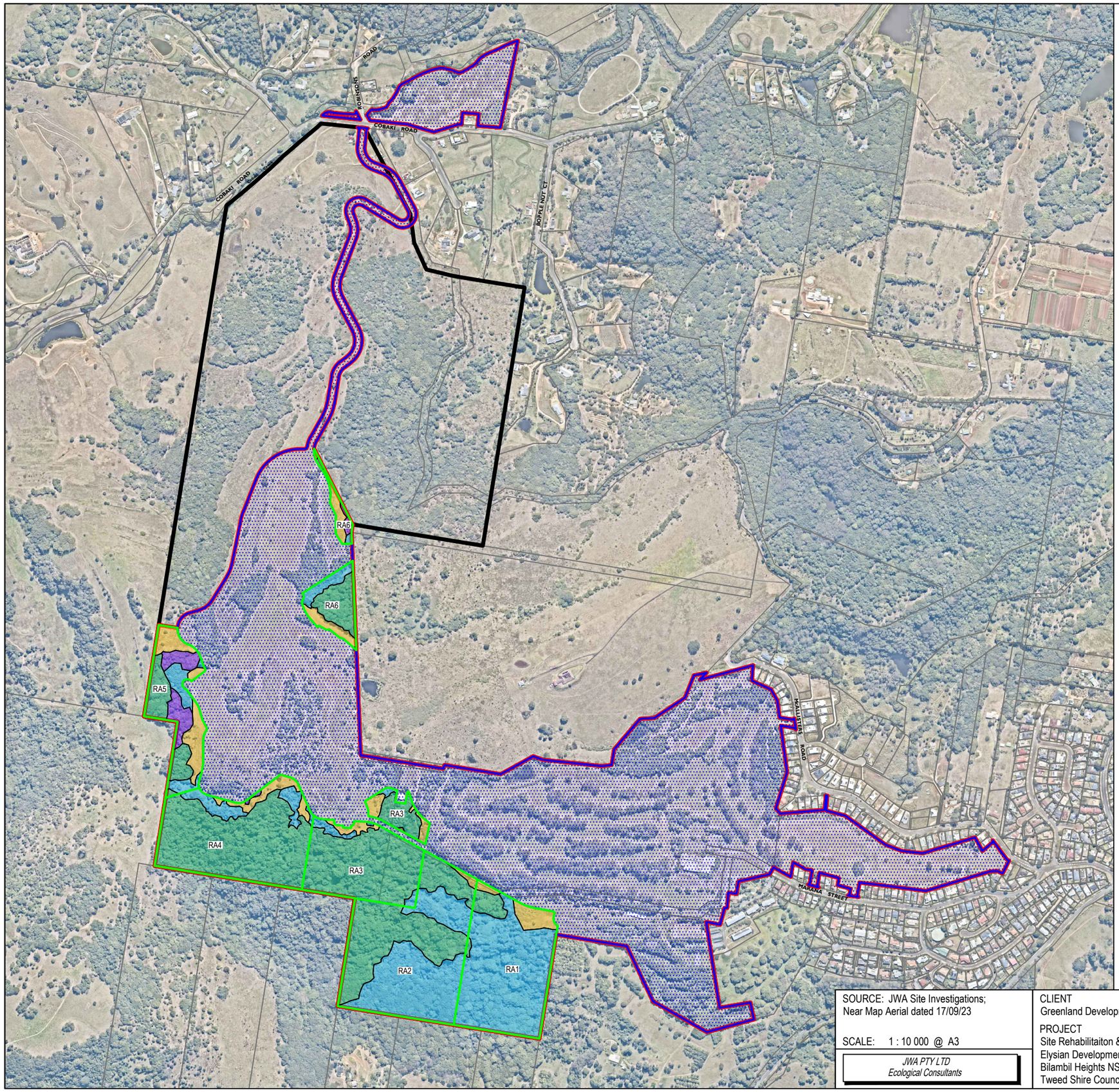
Approximately 38.28 ha of Environmental conservation areas associated with the Stage 1 (MP08_0234) of the Elysian development site will be subject to revegetation/rehabilitation works. Rehabilitation works will be comprised of the following treatment types (**FIGURE 7**):

- Restoration and embellishment of approximately 19.73 ha of existing mature TEC (52% of rehabilitation area);
- Assisted regeneration of approximately 1.02 ha of existing regenerating TEC (3% of rehabilitation area);
- Regeneration of approximately 13.71 ha of disturbed land/depauperate rainforest to create additional TEC (36% of rehabilitation area); and
- Revegetation of approximately 3.81 ha cleared land to create additional TEC (10% of rehabilitation area).

Rehabilitation works will be completed on a precinct-by-precinct basis. **TABLE 3** provides a breakdown of the proposed rehabilitation works to be completed for each precinct.

TABLE 3
REHABILITATION WORKS BY PRECINCT

Treatment Type	Precinct 1	Precinct 2	Precinct 3	Precinct 4	Precinct 5	Precinct 6	Total Area
Restoration and embellishment of existing mature TEC	0.49 ha	4.86 ha	5.37 ha	6.80 ha	1.20 ha	1.01 ha	19.73 ha
Assisted regeneration of existing regenerating TEC	0 ha	0 ha	0 ha	0.03 ha	0.88 ha	0.10 ha	1.02 ha
Regeneration of disturbed land/ depauperate rainforest to create additional TEC	6.30 ha	5.05 ha	0.38 ha	0.85 ha	0.66 ha	0.47 ha	13.71 ha
Revegetation of cleared land to create additional TEC	0.64 ha	0.11 ha	0.60 ha	0.57 ha	1.19 ha	0.71 ha	3.81 ha
TOTAL	**7.43 ha**	**10.02 ha**	**6.35 ha**	**8.25 ha**	**3.94 ha**	**2.30 ha**	**38.28 ha**



N

LEGEND

- Impact Area
- Stage 1 Boundary
- Site Boundary

Rehabilitation Areas

- Rehabilitation Area Boundary
- Restoration and embellishment of existing mature TEC (19.73ha)
- Assisted regeneration of existing regenerating TEC (1.02ha)
- Regeneration of disturbed land/depauperate rainforest to create additional TEC (13.71ha)
- Revegetation of cleared land to create additional TEC (3.81ha)

Scale 1 : 10 000

0 100m 200m 300m 400m 500m

SOURCE: JWA Site Investigations; Near Map Aerial dated 17/09/23

SCALE: 1 : 10 000 @ A3

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CLIENT
Greenland Development Pty Ltd

PROJECT
Site Rehabilitaiton & Pest Managamenet Plan
Elysian Development Project
Bilambil Heights NSW
Tweed Shire Council LGA

FIGURE 7

PREPARED: BW
DATE: 18 November 2024
FILE: N01057_EA_20241025.dwg

TITLE

REHABILITATION AREAS

Retained patches of TEC will be buffered from the proposed development and embellished to increase the overall extent of isolated patches and reduce existing anthropogenic impacts. Importantly, any revegetation/regeneration works would need to consider and comply with bushfire safety requirements.

3.3 Offsets for Threatened Flora

Four hundred and fifty-four (454) stems of Threatened flora will be removed as a result of the proposed development. **TABLE 4** provides a summary of the Threatened flora to be impacted. The most significant losses are to the Fine-leaved Tuckeroo and Rough-shelled bush nut.

Threatened flora species removed during the development will be offset at a minimum rate of 5:1 (i.e. 5 replacement plants for every 1 removed) within the Rehabilitation Areas. The number of replacement plantings for each species is provided in **TABLE 4**.

TABLE 4
THREATENED FLORA SPECIES TO BE IMPACTED

Scientific Name	Common Name	BC Act	EPBC Act	Number to be Removed	Number to be Planted
Acacia bakeri	Marblewood	V	-	0	-
Archidendron hendersonii	White lace flower	V	-	0	-
Bosistoa transversa	Yellow satinheart	V	V	0	-
Coatesia paniculata	Axe-breaker	E	-	0	-
Cryptocarya foetida	Stinking cryptocarya	V	V	1	5
Diospyros yandina	Shiny-leaved ebony	E	-	0	-
Diploglottis campbellii	Small-leaved tamarind	E	E	1	5
Drynaria rigidula	Basket fern	E	-	0	-
Endiandra hayesii	Rusty rose walnut	V	V	0	-
Endiandra muelleri subsp. bracteata	Green-leaved rose walnut	E	-	0	-
Floydia praealta	Ball nut	V	V	0	-
Gossia fragrantissima	Sweet myrtle	E	E	4	20
Grevillea hilliana	White yiel yiel	E	-	2	10
Hicksbeachia pinnatifolia	Red bopple nut	V	V	0	-
Lepiderema pulchella	Fine-leaved tuckeroo	V	-	311	1,555
Macadamia tetraphylla	Rough-shelled bush nut	V	V	113	565
Ochrosia moorei	Southern ochrosia	E	E	0	-
Peristeranthus hillii	Brown fairy-chain orchid	V	-	0	-
Phyllanthus microcladus	Brush sauropus	E	-	0	-
Randia moorei	Spiny gardenia	E	E	12	60
Rhodamnia maideniana	Smooth scrub turpentine	CE	CE	2	10
Syzygium hodgkinsoniae	Red lilly pilly	V	V	0	-
Syzygium moorei	Durobby	V	V	8	40
			TOTAL	**454**	**2,295**

BC Act – NSW *Biodiversity Conservation Act 2016*
EPBC Act - Commonwealth *Environment Protection Biodiversity and Conservation Act 1999*
Conservation status: CE - Critically endangered; E – Endangered; V – Vulnerable; NT – Near threatened

APPENDIX 1 contains species profiles for all Threatened flora species recorded from the subject site including description, conservation status, distribution, habitat, ecology and threats to the species.

3.4 Rehabilitation Timing

Rehabilitation works will be undertaken within each precinct in four (4) phases. These phases are as follows:

- **Phase 1: Site Preparation Works and Weed Management** - Aims to prepare the site for regeneration works and revegetation planting. Works will include removal of any rubbish, fencing where necessary and primary weed control. Phase 1 will commence after bulk earthworks are completed.
- **Phase 2: Establishment Period** – Aims to bring vegetation to a point where maintenance is not required in excess of the standard council maintenance regime. A twelve (12) month establishment period is proposed. The following is to be undertaken as part of the establishment period:
    - Initial planting in revegetation areas - will commence as soon as the rehabilitation contractor is satisfied that weed species have been successfully controlled;
    - Growth and maintenance (i.e. weeding) - will continue in the revegetation and regeneration areas for the remainder of the establishment period; and
    - Supplementary planting – replacement of dead seedlings in the revegetation areas will be undertaken prior to the end of the establishment period.
- **Phase 3: On-maintenance Period** - Will continue for a minimum period of four (4) years from the completion of the establishment period. Site works during on-maintenance will include weeding, rubbish control and replanting if necessary. Monitoring during this phase will include monitoring against rehabilitation performance criteria.
- **Phase 4: Off-maintenance Period** – Maintenance works will continue until Council assess the success of the rehabilitation and accept it as off-maintenance. Council will then take over responsibility for the ongoing maintenance of the rehabilitation areas.

3.5 Rehabilitation Team

On-ground restoration works must be undertaken by suitably experienced persons, or under the supervision of a qualified bush regenerator or senior ecologist.

3.6 Site Preparation

3.6.1 Background

Site preparation includes all works that will take place before the rehabilitation works commence. This includes providing information to site workers/contractors in relation to the Rehabilitation Areas and the restoration strategy, erosion and sediment control measures, bank stabilisation and grading, and site protection and access fencing.

3.6.2 Site Workers Responsibilities

Site workers will be informed of their responsibilities before the commencement of works within the Rehabilitation Areas including:

- Responsibilities under this SRPMP and any other associated management plans where relevant; and
- Activities prohibited in the Rehabilitation Areas:
  - storage of goods and equipment;
  - mixing of materials;
  - liquid disposal;
  - machinery repairs and/or refuelling;
  - combustion of any material;
  - stockpiling of soil, rubble or debris;
  - any filling or excavation including trenching, topsoil skimming and/or surface excavation, unless otherwise approved by Council's General Manager or delegate; and
  - unauthorised pesticide, herbicide or chemical applications.

3.6.3 Erosion and Sediment Control Measures

Erosion and sediment control works shall be completed where necessary in accordance with an approved Stormwater Management Plan (SWMP). The erosion and sediment control measures are not to be dismantled until the works on site have been completed and all areas where soils have been disturbed have been rehabilitated or covered with a mulch layer to a depth of approximately 100 mm. Jute matting or other forms of groundcover may be used where appropriate.

Erosion and sediment control measures shall be monitored and managed in accordance with an approved SWMP.

3.6.4 Site Protection and Access Fencing

Any fencing required to be installed in the Rehabilitation Areas should be installed before weed control and planting works commence. All fencing is to be "fauna friendly" i.e. a minimum 300 mm gap provided between the bottom of the webbing or the bottom strand of wire and the ground.

3.7 Weed Management

3.7.1 Background

Weed control works are to commence at the beginning of the Establishment Period and will be completed across the entire Rehabilitation Area. The weed management program will include the following strategic management actions:

- All weeds shall be managed such that alternative weeds do not become established where declared weeds have been removed;
- Weed management shall include follow up weed control in areas disturbed as a result of weed removal; and
- Assisted regeneration shall encourage native plant regeneration and ensure that bank and soil stability is maintained despite the removal of weed infestations.

Weed treatments are to be completed in accordance with *South East Queensland Ecological Restoration Framework: Code of Practice* (Chenoweth EPLA & Bushland Restoration Services 2012) and/or *Subtropical Rainforest Restoration* (Big Scrub Landcare Group 2005). Preferred treatment methods are provided in **APPENDIX 2**.

3.7.2 Weed Management Protocols

Weed management protocols are as follows:

- Management of all weed species will occur utilising suitable control measures (i.e. chemical and/or physical control) (**APPENDIX 2**). All weeds shall be controlled during the Establishment Period and the Maintenance Period.
- A progressive weeding/planting program should be utilised involving gradually replacing weeds with local native species to manage potential bank stability issues.
- Where weeds are removed, non-fertile material vegetation waste shall be mulched and retained on site for re-use in landscape and rehabilitation works. Vegetation mulching will be suitably controlled to avoid contamination. Any vegetation not suitable for mulching (i.e. fertile weed specimens) will be transported off-site to an appropriate disposal facility.
- Weed or potential weed species shall not be planted within rehabilitation and landscaping areas of the site.
- All nursery stock for revegetation purposes shall be weed, pest and disease free and certified as such by the supplier where feasible. The certificates are to be obtained prior to the commencement of any regeneration/revegetation works on site.

3.7.3 Primary Weeding

Primary weeding will be undertaken through localised treatment of grass and herbaceous species via mechanical removal (hoe/rake, hand pulling and/or slashing) or with Roundup Bioactive©. Woody weed species will be hand pulled or controlled using weed control techniques listed within **APPENDIX 2**.

All chemical users shall be experienced and licensed in accordance with the relevant legislation. Utmost care must be taken when utilising chemicals to ensure that no drift or runoff occurs outside of the treatment area. Spraying shall not occur on windy days or within 24 hours of predicted rainfall.

Preparation before spraying, in the form of manual clearing weeds from around native plants, is to be completed where appropriate. Small native plants less than 20 cm in height are to be marked with a stake and flagging tape to indicate retention.

3.7.4 Secondary Weeding

Secondary weeding involves the eradication of weeds that have been overlooked or re-shoot after the primary treatment. Secondary weeding will occur six (6) months after primary weeding.

3.7.5 Weed Maintenance

The Rehabilitation Areas will require ongoing weed control as part of the rehabilitation Establishment and Maintenance Periods. Weed monitoring visits will be completed every month for the duration of the establishment period, and every four (4) months during the maintenance period. Weed control methods will be informed by these visits.

Once revegetation plantings and regeneration have become established (i.e. achieve canopy closure) it is likely that weed incidence will be minimised through competition with maturing native species. The ongoing maintenance requirements are therefore likely to be reduced over time.

3.8 Rehabilitation Works

3.8.1 Background

Rehabilitation works on the site will consist of a combination of natural regeneration and revegetation works. Natural regeneration will be encouraged throughout the Rehabilitation Areas and will be continually monitored for the life of the restoration strategy. Where natural recruitment is poor, active revegetation works through planting will be completed in accordance with the following sections.

3.8.2 Rehabilitation Stages

Revegetation works will be undertaken on a precinct-by-precinct basis in five (5) stages:

- **Stage 1: Initial planting -** Initial planting will be installed within six (6) months of commencement of works.
- **Stage 2: Establishment and maintenance** - The establishment period is the period when the greatest assistance is required such as watering and weeding of the newly planted vegetation. The establishment period shall extend for a period of twelve (12) months.
- **Stage 3: Supplementary planting to replace dead seedlings** - Will commence within two (2) months of the initial planting and replacement of any seedlings that have perished will occur.
- **Stage 4: Additional plantings** – Will be completed every six (6) months for the duration of the maintenance period where the bush regenerator determines that additional plantings are necessary to satisfy the objectives of this CSRP.

- **Stage 5: Ongoing maintenance** - Will continue for a minimum period of four (4) years following the initial twelve (12) month establishment period, or until the revegetation area becomes self-sustaining. A self-sustaining site is achieved once canopy closure is achieved and all weeds are removed.

3.8.3 Natural Regeneration

Natural regeneration refers to the natural process by which plants replace or re-establish themselves. Plant species may recover through re-sprouting or germination from remnant soil seed banks or seed that naturally disperse from nearby vegetation (Standards Reference Group SERA 2021).

Natural regeneration is a powerful tool that can be used to re-establish native vegetation. It ensures that the new growth is derived from genetic material (i.e. parents) that currently occupies the site and as such is adapted to local conditions. Additionally, the chance of outbreeding depression is reduced.

Natural regeneration will be encouraged throughout the Rehabilitation Area. Existing native trees and shrubs, which have regenerated since the start of rehabilitation works, should be retained in the Revegetation Area.

Where natural recruitment is determined to be not currently occurring within retained vegetation and Rehabilitation Areas (e.g. areas devoid of native vegetation after weed control works), active revegetation through planting will be completed. Revegetation methods (if necessary) will follow those outlined below.

3.8.4 Planting Densities

When starting with an area devoid of native vegetation cover, the plantings should be established at a density that will result in rapid canopy closure so that exotic species are excluded. Experience has demonstrated that planting trees and shrubs spaced at 1.5 m centres achieves this aim. Wider tree spacings often mean there is a longer time before canopy closure and therefore a prolonged period of weed control (Chenoweth EPLA & BRS 2012). This will be achieved using the following planting ratios:

- Trees (where applicable) at 2.5 m spacings; and
- Small trees/shrubs (where applicable) at 1.5 m spacings.

3.8.5 Species Selection

Rehabilitation Areas will be revegetated with rainforest tree and shrub species represented on site and within similar vegetation communities occurring in the locality (i.e. PCT 3011). A schedule of locally occurring rainforest plant species is provided in **TABLE 5**.

Species diversity will be maintained throughout the Rehabilitation Areas through the following numbers per 100 m^2:

- A minimum of six (6) different tree species to comprise the canopy stratum; and

- A minimum of four (4) different small tree/shrub species.

TABLE 5
REVEGETATION SPECIES LIST

Strata	Common Name	Scientific Name	Planting Density
Canopy Trees	Moreton Bay fig	*Ficus macrophylla*	2.5m spacings
	White fig	*Ficus virens*	
	Pepperberry	*Cryptocarya obovata*	
	Tuckeroo	*Cupaniopsis anacardioides*	
	Hairy walnut	*Endiandra pubens*	
	Black bean	*Castanospermum australe*	
	Guioa	*Guioa semiglauca*	
	Cudgerie	*Flindersia schottiana*	
	Rosewood	*Dysoxylum fraserianum*	
	Red bean	*Dysoxylum muelleri*	
	Hoop pine	*Araucaria cunninghamii*	
	Maiden's blush	*Sloanea australis*	
	Bangalow palm	*Archontophoenix cunninghamiana*	
Small trees/Shrubs	Foambark	*Jagera pseudorhus*	1.5m spacings
	Macaranga	*Macaranga tanarius*	
	Common lilly pilly	*Acmena smithii*	
	Blueberry ash	*Elaeocarpus reticulatus*	
	Red kamala	*Mallotus philippensis*	
	Three-veined laurel	*Cryptocarya triplinervis var. pubens*	
	Blackwood wattle	*Acacia melanoxylon*	
	Broad-leaved palm lily	*Cordyline petiolaris*	
	Wing-leaved tulip	*Harpullia alata*	
	Hairy-leaved bolly gum	*Neolitsea dealbata*	
	Walking stick palm	*Linospadix monostachyos*	
	Creek sandpaper fig	*Ficus coronata*	

3.8.6 Sourcing Offset Plants

A minimum of 2,295 Threatened flora plants (5:1 offset ratio for the plant to be impacted) will be planted within the Rehabilitation Area (**SECTION 3.3**). These offset plants are to be sourced from cuttings and/or seed taken from either the plant to be impacted or a population in close proximity to the subject site. If suitable material cannot be sourced from the plant to be impacted or nearby populations, plants may be sourced from nurseries that can prove local provenance.

Where seed is to be taken from a local population, whenever possible, seed will be removed directly from plants by shaking or cutting branches over a tarpaulin. To ensure local populations can withstand this harvesting, the amount of seed collected will not exceed 5% per plant.

For offset plantings to succeed it is essential to use healthy plants free of pathogens and/or

disease. To ensure pathogens and/or disease are not introduced during the planting process, the highest standards of hygiene must be implemented at all times. The following hygiene plan has been developed for the site with consideration of the processes outlined in Hygiene in plant propagation developed by the Nursery and Garden Industry Australia (NGIA 2004) and should be followed by all personnel involved in the offset planting process:

- Ensure hands are clean, wear an apron and latex gloves;
- Use clean and disinfected tools and containers between each use - a plastic bottle with a 70% methylated spirits solution works well, or alternatively a 2,000ppm quaternary ammonium compound solution (e.g. PHYTOCLEANTM which contains 100g/litre benzalkonium chloride, or similar);
- Footwear should be scrubbed clean with a brush and disinfectant (see above) for at least 30 seconds prior to entering the work site; and
- Restrict site access to essential personnel only.

The sourcing of seed and propagation of offset plants (if possible) should occur during the fruiting period. Alternatively, the ordering of plants (from nurseries that can prove local provenance) should occur as early as possible so that planting can occurring concurrently with other regeneration and revegetation works to be completed within the Rehabilitation Area or as soon as possible thereafter.

Sourcing of seed and propagation of offset plants must ensure sufficient genetic diversity within cuttings and/or seed consistent with the relevant Australian Native Plant Conservation Florabank Guidelines.

3.8.7 Planting Program

The following section outlines the procedures to be employed during planting. If required, the bush regenerator or project ecologist may make minor alterations to this planting program depending on the site requirements.

Planting will occur at the optimum time of the year when there is high soil moisture (between January and May), unless irrigation is available and accessible. The following program will be employed:

- Seedling sites will be spot sprayed with Roundup Bioactive © one (1) week prior to commencement.
- Seedlings will be sufficiently developed so as to have a significant chance of survival. Seedlings will be at least the sixth leaf stage and/or 20 cm in height.
- Seedlings will be sun hardened (plants should be held in full sunlight and systematically stressed to the point of wilting for at least two (2) months prior to planting) prior to transport to the site.
- Seedlings shall be planted on the same day as their transport from the nursery, or planted as soon as practically possible. No seedlings will be left unprotected on the site whilst awaiting planting;

- Planting in areas exposed to full sun or westerly sun shall be avoided in the peak summer months, where possible.
- All seedlings will be soaked in water overnight prior to planting.
- All seedlings will be provided with a wetting agent such as rain-saver[1] crystals.
- All seedlings will be protected by a tree guard (commercial tubing or equivalent).
- Freshly planted tube stock seedlings shall be watered with at least one (1) bucket of water (6-9 litres) on the day of planting. Ongoing watering will be undertaken after the seedlings have been planted on an 'as needed' basis.
- A native TPK fertiliser can be placed in the planting environment.
- Weeds will be controlled, in the short term, through the application of suitable mulch around individual plantings (jute matting or other forms of groundcover may be more appropriate in some areas) and with spot applications of an appropriate herbicide.
- In no areas will the ground surface be left bare.
- Offset threatened flora specimens will be permanently marked with tags and their position recorded with a GPS.

3.8.8 Restoration Maintenance

Maintenance work within each precinct will be undertaken for a minimum period of four (4) years after the twelve (12) month Establishment Period. An indicative maintenance schedule has been formulated to provide the best rehabilitation outcomes (**TABLE 6**).

TABLE 6
INDICATIVE MAINTENANCE SCHEDULE

Activity	Timing
Watering	During planting and as needed within the first six (6) weeks after planting.
Mulch	Applied to 100 mm thick as soon as possible after the site preparation has been completed (dependent on usage of jute matting).
Replacement Plantings	Plant survival will be assessed during maintenance visits. A 90% survival rate will be required during the maintenance period.
Weed Control	Weed monitoring visits will be completed every month for the duration of the establishment period (year 1), and every four (4) months during the maintenance period (years 2 – 5). Weed control methods will be informed by these visits.
Inspection of Erosion and Sediment Control Measures	To be monitored and managed in accordance with an approved SWMP.

[1] Rain-saver is a polymer water crystal that has been specifically developed for plants. The polymer absorbs and holds water and nutrients at a specific tension which makes it available to plant roots but does not release to the soil. Rain-saver has proven very successful in more difficult environments (e.g. Roadside plantings on the Pacific Motorway between Brisbane and the Gold Coast and in frontal dunes at Pottsville (R. Keene *pers comm.* 2000).

3.8.9 Long Term Management

This SRPMP proposes a lifespan of five (5) years for Rehabilitation Works within each precinct. Beyond this timeframe, and after acceptance off-maintenance by Council maintenance works within the Rehabilitation Areas are likely to be limited to weed management on an as needs basis. These works would then be the responsibility of Council and should be completed in accordance with **SECTION 3.6** if necessary.

3.9 Monitoring and Reporting

3.9.1 Introduction

Monitoring and reporting are critical in ensuring the continuing success of restoration works and will be carried out for the duration of this plan. This section provides an indicative monitoring and reporting regime.

To assess the success of rehabilitation works, vegetation assessments will be completed by a suitably qualified ecologist using plot-based vegetation surveys (transects and quadrats) and photo point monitoring. In addition, the rehabilitation team will also maintain records of works completed. The following sections outline the methodology to be used to monitoring the rehabilitation works.

3.9.2 Bush Regeneration Team Monitoring

In addition to the rehabilitation monitoring completed by an ecologist, the bush regeneration team will also keep detailed work sheets for all works completed within the Rehabilitation Areas, recording the following:

- All work completed each day;
- Site conditions;
- Chemicals used;
- Problems encountered; and
- Future works required.

An example daily work sheet template is attached in **APPENDIX 3**. These records and general comments on progress will be provided to the Ecologist for consideration and inclusion in the Annual Rehabilitation Monitoring Report (**SECTION 4.2.6**).

3.9.3 Plot-Based Vegetation Surveys

3.9.3.1 Monitoring Locations

Monitoring locations will be established within each rehabilitation type.

3.9.3.2 Timing of Monitoring Events

The monitoring is to be completed by a qualified ecologist. Monitoring events should occur:

- Six (6) months after initial planting; and
- On an annual basis after planting until completion criteria have been achieved.

3.9.3.3 Methodology

Plot-based vegetation surveys (transects and quadrats) will be undertaken at each monitoring location. Vegetation survey sites will be permanently marked (i.e. star pickets or wooden stakes) and the end positions identified on a sitemap using a hand-held Global Positioning System (GPS).

The plot-based vegetation surveys will collect the information outlined in **TABLE 7** using the following methods:

- A central 50 m transect;
- Three (3) quadrats (5 m x 5 m) located at least 10 m apart along the transect; and
- Five (5) ground plots (1 m x 1m) located every 10 m along the transect.

TABLE 7
VEGETATION SURVEY DATA TO BE COLLECTED

Attribute	Survey Required
Native Canopy Cover	Native canopy cover will be measured via the 'line intercept method' along the 50 m transect. Key canopy species will be noted.
Weed Canopy Cover	Weed canopy cover will be measured via the 'line intercept method' along the 50 m transect. Individual canopy weed species should be assessed separately.
Native Midstorey Cover	Estimate the % foliage cover of each native species within the midstorey across the quadrats (5 m x 5 m quadrats). Cover should be recorded in decimals if less than 1% (0.1, 0.2…), or whole numbers up to 5% (1, 2, 3…), or to the nearest 5% where greater than 5% cover (5, 10, 15, 20, 25…).
Weed Presence in the Midstorey	Estimate the % foliage cover of each weed species within the midstorey across the quadrats (5 m x 5 m quadrats). Cover should be recorded in decimals if less than 1% (0.1, 0.2…), or whole numbers up to 5% (1, 2, 3…), or to the nearest 5% where greater than 5% cover (5, 10, 15, 20, 25…).
Groundcovers	Estimate percentage cover of native species vs. weeds within each of the quadrats (1 m^2 quadrats). Cover should be recorded in decimals if less than 1% (0.1, 0.2…), or whole numbers up to 5% (1, 2, 3…), or to the nearest 5% where greater than 5% cover (5, 10, 15, 20, 25…). Identify each native and weed groundcover species.

The full species name (genus species) must be recorded for all native species, unless insufficient diagnostic plant material is present, in which case the genus name followed by a species number must be used. Comments should also be included for all attributes (**TABLE 7**) on any notable variations elsewhere in the relevant management polygon - e.g. weeds occurring in the management polygon that are not (or poorly) represented in the transect.

Photo-monitoring points will also be completed as a means of demonstrating compliance or otherwise with performance criteria. Permanent photo stations are to be located at each monitoring location. Four (4) colour photos are to be taken from each photo point. Photos are to be taken to the north, south, east and west. Photos should be labelled with the:

- Monitoring point code;
- Direction of view; and
- Date and time.

Photos are to be included in the Annual Rehabilitation Monitoring Reports.

3.9.4 Threatened Flora Offset Monitoring

Monitoring of offset Threatened flora plantings is to be completed by a qualified ecologist. Monitoring events should occur:

- Immediately following planting;
- Every three (3) months for the remainder of the establishment period (year 1); and
- Every six (6) months during the maintenance period (years 2 - 5).

The following details will be recorded at each monitoring event:

- Number of plants surviving;
- Height, diameter at breast height (if/once plants reach an appropriate size) and canopy spread of all plants;
- Presence of reproductive structures;
- General health of plants; and
- Any potential issues threatening plant survival (e.g. weeds, soil erosion etc.).

3.9.5 Performance Targets and Corrective Actions

TABLE 8 provides the performance indicators and targets for the proposed rehabilitation works within Rehabilitation Areas. Corrective actions are provided that are to be implemented if performance targets are not met.

TABLE 8
PERFORMANCE TARGETS AND CORRECTIVE ACTIONS

Performance Indicator	Target – Establishment period[1]	Target – Maintenance period[2]	Corrective Actions
Survival and continued growth of Threatened flora offsets	100% survival of plantings during all monitoring events.	100% survival of plantings during all monitoring events.	Replacement plantings if necessary
Survival and continued growth of native vegetation seedlings (i.e. planted stock, non-threatened species).	>90% survival of plantings during all monitoring events.	>90% survival of plantings during all monitoring events	Irrigation if required. Additional planting if required.
Establishment of native canopy cover (where applicable) within revegetation areas.	Planted trees substantially established.	• >60% canopy cover of native tree species >1.5 m in height after three (3) years; • >80% canopy cover of native tree species >2.5m in height after five (5) years.	Monitoring and maintenance period must be extended until the targets are met.

Performance Indicator	Target – Establishment period[1]	Target – Maintenance period[2]	Corrective Actions
Natural recruitment of native species throughout rehabilitation areas.	Evidence of natural recruitment of shrub and ground cover species.	Increasing natural recruitment of shrub and groundcover species.	Where natural recruitment fails to meet performance targets discussions shall be initiated by the proponent or their consultants to consider adjustments to the assisted regeneration strategy being used to improve natural recruitment.
All identified weeds controlled to an acceptable level within retained vegetation and rehabilitation areas.	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points reduced to <10% within first year.	Foliage Projective Cover (FPC) (%) assessed using eye estimates or photo points: • reduced to <10% within first year; • <10% in second year; • <5% in the third year and consecutive years.	Weed control as necessary.

3.9.6 Reporting

An Annual Rehabilitation Monitoring Report will be prepared which discusses the results of the monitoring of retained vegetation and rehabilitation areas against the Monitoring Performance Criteria identified in **SECTION 4.2.5.** The information provided in the report should include, but not necessarily be limited to:

- Works undertaken (i.e. a summary of bush regenerators daily reports);
- A presentation of the results of the particular monitoring event/s;
- A detailed discussion of the results of each particular monitoring event;
- A detailed comparison with the baseline parameters and with previous survey data, as appropriate;
- A statement of compliance with the Monitoring Performance Criteria identified in **SECTION 3.9.5**;
- Any problems since the previous inspection (death of a significant number of seedlings, broken fences etc.) and what effects these issues have had on the regeneration area;
- Success or failure of measures implemented to rectify previously identified problems; and
- Measures to be taken to rectify new problems.

Reports will be received by the proponent and forwarded to Council each year for the duration of the Project.

4 PEST ANIMAL CONTROL STRATEGY

4.1 Introduction

The impacts of the feral animals known to occur on the site are generally related to their predation of, and competition with, native species of fauna (particularly threatened species) and their affect upon the biodiversity of a given area by modifying species richness, abundance and ecosystem function (NPWS 2003a).

Notwithstanding the landholders "general biodiversity duty" under the NSW Biodiversity Act (2015) to manage all pest species, this plan focuses on the following pest species that have been previously identified, or are considered likely to occur on the site:

- Wild dogs;
- Feral cats;
- Rabbits/hares;
- Cane toads;
- Foxes; and
- Feral pigs.

Pest species such as those listed above generally enjoy widespread distribution across a variety of habitat types, and typically have high mobility and reproductive rates. In addition, the long-term and effective control of pest species is problematic as their numbers are influenced by many factors including off-site management activities beyond the control of the landholders. Pests occur and move across the landscape irrespective of tenure boundaries. As such, eradication is not considered feasible, and management strategies should be focused on minimising populations in areas of high ecological value, where impacts are potentially greatest.

Detailed profile of all the species targeted for control in this management plan are provided in **APPENDIX 4**. These profiles include a comprehensive discussion on methods available for control of each targeted species.

4.2 Aim and Objectives

This Pest Animal Control Strategy is intended to assist Greenland Development Pty Ltd in managing and mitigating the impacts that feral animals may have on native fauna species on the site.

The aim of this Pest Animal Control Strategy is to develop a comprehensive and integrated approach to guide the immediate and ongoing management of feral animals on the site and to ensure the protection of native fauna species, with a primary focus on threatened species.

Specific objectives are to:

- Review relevant literature on feral animal and biting insect control;
- Identify feral animals which have been recorded at the site;

- Prioritise species considered to warrant priority management;
- Examine control and/or eradication methods for 'high priority' feral animals; and
- Recommend ongoing control methods, including monitoring and reporting.

4.3 Implementation Strategy

4.3.1 Introduction

Currently, there is limited information available in relation to feral animal populations on the site. The primary approach adopted by the Pest Animal Control Strategy therefore will be to complete a Baseline Targeted Monitoring Program in order to determine:

- What species are present;
- What assets are impacted;
- Where control should be implemented; and
- What the most appropriate control method will be.

The monitoring program will follow similar work TSC has been applying successfully across its bushland estate elsewhere on the Tweed Coast.

Based on the result of the targeted monitoring program, the need to control and/or manage individual feral animal species and the appropriate control methods will then be determined if a significant issue or threat posed by a target species is detected.

4.3.2 Baseline Targeted Monitoring Program

4.3.2.1 Introduction

The Baseline Targeted Monitoring Program for feral animals will be undertaken by a suitably qualified ecologist and will commence with the commencement of construction of the site. Depending on the result of the Baseline Monitoring Program, it may be necessary to replicate the program for subsequent years.

The Baseline Targeted Monitoring Program will use one or more of the following methods depending on the species:

- Heat and motion cameras (infrared and white flash) - targeting wide ranging landscape species such as feral dogs, foxes and feral cats;
- Detection dog searches - targeting potential fox den sites and hotspots of fox and cat activity (to guide trapping sites);
- Targeted searches for feral animals; and
- Opportunistic records from site workers/community and other monitoring programs.

Further information on each of these monitoring methods is provided in the following sections.

4.3.2.2 Heat and Motion Cameras

The use of heat and motion cameras (infrared and white flash) is particularly useful for detecting the presence of mobile landscape species such as dogs, foxes and cats. For these species, cameras are the most reliable method and cost effective for collecting data across time. Heat and motion cameras area also good for monitoring activity at a site before, during and after a control program. A network of fixed location cameras should provide comprehensive view of what is happening with dogs, foxes and cats across the site throughout the year. Cameras may also be deployed to target other priority species although this is typically done in conjunction with other methods such as targeted searches of known habitats (e.g. rabbits and hares).

Camera monitoring sites should be well managed sites in order to increase the efficiency of data collection and decrease the instances of cameras triggered by moving leaves and grass.

Given the size of the site, a minimum of ten (10) cameras should be deployed full time. Initially cameras should be left in place in these locations for a minimum of one (1) month. Depending on the results, cameras may need to be relocated to better reflect movement routes of target species both onto and across the site.

The following specific procedures will apply to the placement and management of cameras on the site:

- Cameras are to be of a high quality with rapid trigger speed.
- Cameras will be placed on a track or trail, ideally at a track intersection, at approximately 50 cm above ground level and at an approximate 45^{o} angle to the road;
- A security case and cable will always be used to secure the camera. All cameras will be code locked and the lock used while the camera is deployed. Affixed to each camera will be a notice informing the public that the camera is code-locked and that the camera is being used for wildlife monitoring purpose only.
- Initially, cameras will be checked fortnightly for the first year with data downloaded, batteries checked and all vegetation in front of the camera removed or trimmed to minimize false triggers. After the first year it may be possible to adjust this to monthly once the site is better understood.
- All images of people will be deleted when data is analysed.

4.3.2.3 Detection Dog Searches

Detection dog searches are an efficient method of monitoring to inform subsequent trapping and ground-baiting programs. Detection dogs can efficiently identify areas of increased or concentrated fox, cat or wild dog activity and to also identify the location of active fox or wild dog dens which may be subsequently fumigated.

Limitations in the use of detection dogs are primarily the expense and the need to have a defined focus area for the search. Use of this method is also limited to the cooler months of the year due to animal welfare and handler safety constraints.

Detection dog searches may be undertaken when resources permit and for a specific purpose such as locating active dens in areas identified from camera monitoring data (i.e. a fox or wild dog regularly attending a certain area or returning on a frequent basis with prey to an area suggesting provisioning of cubs or young pups).

Detection dog searches should be completed during August when considered necessary (i.e. when required to locate active fox den sites) and/or to identify "hotspots" of activity at which to focus either trapping or baiting events.

4.3.2.4 Targeted Searches

Targeted searches are key methods for monitoring:

- Dogs, foxes and cats;
- Cane toads; and
- European rabbit / Brown hare.

The following specific procedures will apply for targeted searched on the site:

- Spotlighting and scat searches targeting dogs, foxes and cats will be completed four (4) times per year utilising track network;
- Targeted searches of potential Cane toad breeding habitat will be completed three (3) times per breeding season (spring/ summer) during suitable conditions; and
- Targeted observations (dawn/dusk) and scat searches for European rabbit / Brown hare within preferred habitat (including grassy areas near cover) will be completed four (4) times per year.

4.3.2.5 Opportunistic Observations

All opportunistic observations and reports of target species (sightings, tracks, scats etc.) collected by the project Environmental Officer(s) from site workers and/or the community, as well as opportunistic observations noted during other monitoring programs are to be recorded and mapped in the Annual Feral Animal Monitoring report (refer **SECTION 6.3.7**) and used to inform the ongoing monitoring effort and control measures.

4.3.2.6 Summary of Baseline Monitoring Program

TABLE 9 provides a summary of the Baseline Targeted Monitoring Program to be implemented for the Year 1 of the Pest Animal Control Strategy.

TABLE 9
BASELINE TARGETED MONITORING PROGRAM

Monitoring Requirement	Target Species	Method/Location	Timing
Heat and Motion Cameras	Feral dogs / Feral cats / Red fox /	Ten (10) cameras across site on track network.	Full time for one (1) year with cameras checked fortnightly

Monitoring Requirement	Target Species	Method/Location	Timing
	Feral pigs Incidental sightings of Cane toads, European rabbit/Brown hare to inform target searches.	Cameras may need to be relocated to better reflect movement routes of target species both onto and across the site. Initially, cameras should be left in place for a minimum of one (1) month before being relocated once final "fixed location monitoring sites" are identified.	(data downloaded, batteries checked and all vegetation in front of the camera removed or trimmed to minimize false triggers)
Detection Dog Searches	Feral cats / Red Fox	Targeted to located fox dens and fox and cat hotspots.	August if considered necessary
Targeted Searches	Feral dogs / Feral cats / Red fox	Spotlighting and scat searches utilising track network.	Four (4) times during year
	Cane toad	Targeted searches of potential Cane toad breeding habitat.	Three (3) times per breeding season (spring/ summer) during suitable conditions
	European rabbit / Brown hare	Targeted observations (dawn/dusk) and scat searches of preferred habitat including grassy areas near cover.	Four (4) times during year
Opportunistic Searches	All species	Sightings from monitoring sites established for other management plans. Other incidental records from ecologists, construction workers and community.	Ongoing

4.4 Implementation of Control Measures

4.4.1 Introduction

If the Baseline Targeted Monitoring Program identifies a consistent presence of a priority feral animal species or a significant issue or threat posed by target species, targeted control measures for that species will be implemented for that species as soon as practicable. The

basis for the selection of a particular control/management method will be determined on a site-specific basis based on the results of the monitoring program and in consultation with NSW BCD and TSC considering factors such as:

- The level of threat as determined from the monitoring program and other relevant information.
- Key ecological assets to be protected.
- Control objectives for the species on the site:
    - Prevention – to prevent a feral animal species from arriving and establishing itself on the site;
    - Eradication – to permanently remove a feral animal species for the site and prevent its re-establishment;
    - Containment – to prevent the spread of a feral animal species; and
    - Asset protection – to reduce the impact of a feral animal species on key location and/or values.
- Requirements of relevant state and commonwealth Standard Operating Procedures and Control Orders. This includes managing any collateral risks to residents, local pet animals and native species and their habitats (e.g. risks from laying poison baits, trapping and shooting) and animal ethics considerations.
- Current best practice control techniques.
- The need to coordinate management with adjoining landholders i.e. NSW BCD and TSC.
- Seasonality and timing e.g. whether the method is implemented prior to or just after known breeding activities.
- Costs and available resourcing.

Once an agreed course of action is determined, a brief operational plan (1 - 2 pages plus a map) should be prepared to document the proposed control/management actions prior to implementation.

All pest animal management and control works are to be overseen by the project Environmental Officer with necessary specialist contractors utilised as required.

The following sections provide information on the targeted control options for each priority species including management triggers and specific procedures required to implement them. As the control of feral animals is an emerging field it is expected that over time new control measures will need to be considered. This will be achieved under the adaptive management procedures described in **SECTION 5**.

4.4.2 Feral Dogs, Red Foxes and Feral Cats

Dogs, foxes and cats are all landscape scale species, in that they are most often wide ranging and move across the landscape in search for food and other resources. Foxes and cats seem to have smaller home ranges on the Tweed Coast compared to wild dogs (P. Gray, TSC, pers. Com., Sept 2020).

TABLE 10 below sets out the management objectives and triggers for the control of dogs, foxes and cats on the Elysian Development site as well as the control measures that are considered the most appropriate.

The following specific provisions will apply to the control of dogs, foxes and cats on the Elysian Development site:

- In accordance with the North Coast Regional Wild Dog Management Plan 2015 (North Coast Local Land Services 2015), appropriate consideration should be given to balancing the management of wild dogs and the damage they can cause, with the ecological role dingos have in the landscape.
- All captured or killed wild dogs should be DNA tested to determine their genetic makeup. Such information should then be used to inform future management.
- Captured dogs, foxes and cats will be taken to the nearest veterinarian, checked for microchips and if necessary euthanised in a manner recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture).
- Stray dogs or cats within urban parts of the site would be reported to the ranger at TSC for removal.
- It is noted that the provisions of the Pesticide Control (1080 Wild Dog Bait) Order 2002, which falls under Section 38 of the *Pesticides Act 1999*, outlines a number of restrictions to the use of baits where domestic pets may be at risk. Specifically, Schedule 1 of the Pesticide Control (1080 Wild Dog Bait) Order 2002 – Permit to Allow Use of 1080 Baits for Control of Wild Dogs states that "1080 baits must not be laid within close proximity to urban areas unless the baiting program is planned in conjunction with, and has been agreed to, by an Authorised Control Officer. Such programs must include strategies for minimising risk to non-target animals. Proposals for baiting in closely settled farming areas or areas within four (4) kilometres of a village or any street with a speed restriction of 70 kilometres per hour or less fall within this requirement". The Elysian Development site falls within these criteria. Bait stations will therefore need to be deployed in locations not likely to be accessed by domestic pets, and the baiting program will need to be developed in consultation with an Authorised Control Officer.
- The siting, laying and retrieval of dog or fox baits are to be carried out strictly in accordance with relevant Pesticides Control Orders.
- Where possible control programs for dogs, foxes and cats should be carried out in an integrated way in conjunction with other neighbouring landholders.

TABLE 10
RECOMMENDED MANAGEMENT OBJECTIVES AND CONTROL MEASURES FOR DOGS, FOXES AND CATS

Species	Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
Feral Dog	To minimise the impact of dogs on key ecological assets while recognising the ecological role that Dingos have in the landscape.	Any of the following: • Two (2) or more passes of a dog past any camera in a two (2) week period. • More than one (1) opportunistic sighting in a two (2) week period. • Evidence of adverse impacts on key ecological assets.	Further monitoring and investigation	First line action to more closely examine behaviour patterns, site usage and other factors to determine if the dog(s) represents a threat to humans or native fauna and therefore needs control.
			Shooting	Preferred where a dog is considered a threat and shooting is viable. Potential use in threatened species habitat. Labour intensive.
			1080 baiting	Where domestic animal are unlikely to come into contact with bait.
			Cage trapping	Where domestic dogs are suspected of entering Environmental Conservation Area and require recapture.
			Soft jaw traps	Judicious use only – need to be confident that koalas and other fauna not at risk (e.g. open areas away from koala feed trees). Labour intensive.
Red Fox	To minimise the impact of foxes on key ecological assets such as small terrestrial and arboreal mammals, frogs, reptiles and birds.	Any of the following: • Two (2) or more passes of a fox past any camera in a two (2) week period. • More than one (1) opportunistic sighting in a two (2) week period. • Evidence of adverse impacts on key ecological assets.	Further monitoring and investigation	First line action to more closely examine behaviour patterns, site usage and potential denning to inform control methods
			Shooting	As per feral dogs where den fumigation is not possible.
			1080 baiting	Where domestic animal are unlikely to come into contact with bait.
			Cage trapping	Where animals area suspected of being bait-shy.
			Soft jaw traps	As per feral dogs.
			Den fumigation	Preferred method where active den sites are located.
Feral Cat	To minimise the impact of cats on key ecological assets such as small	Any of the following:	Further monitoring and investigation	First line action to more closely examine behaviour patterns, site usage to inform control methods.

Species	Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
	terrestrial and arboreal mammals, frogs, reptiles and birds.	• Two (2) or more passes of a cat past any camera in a two (2) week period. • More than one (1) opportunistic sighting in a two (2) week period. • Evidence of adverse impacts on key ecological assets.	Shooting	As per feral dogs.
			Poisoning	Generally not effective but new technologies on the horizon.
			Cage trapping	Where control is triggered.
			Soft jaw traps	As per feral dogs.

4.4.3 European Rabbit and Brown Hare

If monitoring identifies European rabbits and/or Brown hares at the site, a combination of biological and mechanical (warren ripping and harbour destruction) techniques will be implemented where appropriate. If necessary chemical control methods such as warren fumigation may also be used in consultation with relevant authorities such as TSC or NPWS. Further details of these control methods are provided in **APPENDIX 4**.

TABLE 11 sets out the management objectives and triggers for the control of European rabbits and Brown hares on the Elysian Development site as well as the control measures that are considered the most appropriate.

TABLE 11
RECOMMENDED MANAGEMENT OBJECTIVES AND CONTROL MEASURES FOR EUROPEAN RABBITS AND BROWN HARES

Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
To minimise the impacts of European rabbits and Brown hares on protected vegetation and habitats.	European rabbits and Brown hares detected in previously unoccupied natural areas.	Shooting	Preferred where a European rabbits and Brown hares are considered a threat and shooting is viable. Potential use in threatened species habitat. Labour intensive.
		Poisoning	Generally not effective but new technologies on the horizon.
		Cage trapping	Where control is triggered.
		Soft jaw traps	Judicious use only – need to be confident that koalas and other fauna not at risk (e.g. open areas away from koala feed trees). Labour intensive.
		Mechanical control (i.e. warren ripping and harbour destruction)	Locations where warrens are detected. Mechanical control should only be undertaken where works will not impact on retained or compensatory habitat areas. Labour intensive.
		Biological control	Where other control measures are not deemed to be appropriate or is unsuccessful.

The following specific provisions will apply to the control of European rabbits and Brown hares on the Elysian Development site:

- It is noted that the provisions of the Pesticide Control (Rabbit Haemorrhagic Disease Virus) Order 2017, which falls under Section 38 of the *Pesticides Act 1999*, outlines a number of restrictions to the use of Rabbit Haemorrhagic Disease Virus in NSW. The use of biological controls is to be carried out strictly in accordance with relevant Pesticides Control Orders.

- Rabbits and hares must only be killed by humane methods recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture) with minimal delay.
- Native wildlife may use rabbit warrens. Where use of a warren by wildlife is suspected, the warrens should be monitored before treatment to determine which animals are using the burrows. If monitoring shows that native fauna are using the warrens, these warrens should not be ripped.
- Where possible control programs for European rabbit and Brown hares should be carried out in an integrated way in conjunction with other neighbouring landholders.

4.4.4 Feral Pigs

TABLE 12 below sets out the management objectives and triggers for the control of feral pigs on the Elysian Development site as well as the control measures that are considered the most appropriate.

TABLE 12
RECOMMENDED MANAGEMENT OBJECTIVES AND CONTROL MEASURES FOR FERAL PIGS

Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
To minimise the impacts of feral pigs on protected vegetation and habitats.	Feral pigs detected in previously unoccupied natural areas.	Shooting	Preferred where feral pigs are considered a threat and shooting is viable. Potential use in threatened species habitat. Labour intensive.
		1080 baiting	Where domestic animal are unlikely to come into contact with bait.
		Cage trapping	Where control is triggered.
		Fencing	Feral pig proof fencing can be installed around assets. Potential use in threatened species habitat. Labour intensive and requires ongoing maintenance to be effective.

The following specific provisions will apply to the control of feral pigs on the Elysian Development site:

- It is noted that the provisions of the Pesticide Control (1080 Wild Dog Bait) Order 2002, which falls under Section 38 of the *Pesticides Act 1999*, outlines a number of restrictions to the use of baits where domestic pets may be at risk. Specifically, Schedule 1 of the Pesticide Control (1080 Wild Dog Bait) Order 2002 – Permit to Allow Use of 1080 Baits for Control of Wild Dogs states that "1080 baits must not be laid within close proximity to urban areas unless the baiting program is planned in conjunction with, and has been agreed to, by an Authorised Control Officer. Such programs must include strategies for minimising risk to non-target animals. Proposals for baiting in closely settled farming areas or areas within four (4) kilometres of a village or any street with a speed restriction of 70 kilometres per

hour or less fall within this requirement". The Elysian Development site falls within these criteria. Bait stations will therefore need to be deployed in locations not likely to be accessed by domestic pets, and the baiting program will need to be developed in consultation with an Authorised Control Officer.

- The siting, laying and retrieval of baits are to be carried out strictly in accordance with relevant Pesticides Control Orders.
- Where possible control programs for feral pigs should be carried out in an integrated way in conjunction with other neighbouring landholders.

4.4.5 Cane Toads

If monitoring identifies cane toads at the site, habitat management and modification is recommended for the control of Cane toads. Specifically, management strategies should consider factors such as promoting dense ground cover (or other physical barriers) in areas adjacent to waterbodies, leaving grassed areas unmown, avoiding the creation of tracks including both vehicular and foot trails.

The following additional control methods may be implemented where appropriate:

- Light traps;
- Cane toad muster;
- Manual survey and removal of eggs and tadpoles; and
- Chemical tadpole traps.

Further details of these control methods are provided in **APPENDIX 4**.

TABLE 13 sets out the management objectives and triggers for the control of Cane toads on the Elysian Development site as well as the control measures that are considered the most appropriate.

TABLE 13
RECOMMENDED MANAGEMENT OBJECTIVES AND CONTROL MEASURES FOR CANE TOADS

Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
To minimise the presence of Cane toads in the development envelope and prevent their spread into adjacent natural habitat areas.	Cane toads detected in WSF habitat. Cane toads detected in previously unoccupied natural areas. Cane toads detected in newly created wetlands, detention	Dense plantings of vegetation or physical barriers	Drainage lines created waterways and wetlands (e.g. stormwater detention basins, lakes etc.) within the development envelope and ecological buffers.
		Light traps	Locations where adult Cane toads are present in vicinity of a waterbody where there are no other light sources nearby.

Management Objective	Management Trigger	Control Measure	Situations Where this Measure may be Appropriate
	basins, waterbodies etc.	Cane toad muster	Small, preferably enclosed areas with large numbers of adult Cane toads.
		Manual survey and removal of eggs and tadpoles	Where egg clusters and/or tadpoles are observed.
		Chemical tadpole traps	Where Cane toad breeding activity has been detected. Most effective in waterbodies with shallow, slow moving water, gently sloping muddy banks, low surrounding vegetation and a sunny aspect.

The following specific provisions will apply to the control of Cane toads on the Elysian Development site:

- Cane toad control should only be undertaken by people trained and proficient in the identification of cane toads and native frogs of similar appearance.
- Cane toad control should take place prior to the breeding season and following significant rainfall events that may trigger breeding.
- When traps are in use, it must be inspected on a regular basis, preferably daily.
- When traps are left in the field but not in use, they must be rendered incapable of holding or catching Cane toads. Attractants should be removed when traps are not in use.
- Cane toads should be euthanised as soon as possible after capture and not held for long periods of time. The Methods for the field euthanasia of cane toads: Standard Operating Procedure – CAN001 (Sharp *et al*. 2011) contains current best practice for the euthanasia (or humane killing) of cane toads. Euthanasia procedures must be performed by persons competent in or qualified for the methods to be used, or under the direct supervision of a competent person.
- Where possible control programs for Cane toads should be carried out in an integrated way in conjunction with other neighbouring landholders.

4.5 Reporting

An Annual Feral Animal Monitoring Report will be prepared by a suitably qualified ecologist which discusses the results of the Baseline Targeted Monitoring Program. The information provided in the report should include, but not necessarily be limited to:

- A summary of monitoring activities undertaken over the previous 12 months;

- The details of any feral animals detected for the previous 12 month monitoring period;
- A summary of control actions taken in response to monitoring; and
- Any recommendations made for future monitoring and/or control actions.

Reports will be received by the proponent and forwarded to Council each year for the duration of the Project.

5 ADAPTIVE MANAGEMENT

Adaptive management is an approach that involves learning from management actions and using those lessons to improve upon the plan. The principles of adaptive management have been incorporated into the administration of restoration projects within a variety of governmental authorities and programs (Thom 1997).

Comprehensive, long-term monitoring is a component of successful adaptive management. The decision to alter or continue with strategies or management procedures, to ensure the objectives of the SRPMP are achieved, relies on the accumulation of supporting evidence. If established early in the project planning phase and implemented during successive monitoring and management phases, adaptive management can be a powerful method to systematically assess and improve the performance of restored ecosystems.

Before the implementation of any adaptive management strategies, the proposed management actions and the predicted outcomes from such management practices are to be approved by Council prior to implementation.

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APPENDIX 1 – THREATENED SPECIES PROFILES

Axe breaker

Scientific name: *Coatesia paniculata*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
Axebreaker grows from 3 to 6 m in height, and has a dense head of deep green to yellow-green foliage. As its name suggests, its timber is very hard. The branchlets are bright green turning grey to brown, and finely wrinkled. The smooth, glossy, dark-green leaves are oval, measuring 5 – 10 cm long. They are bluntly pointed at the tips, and are strongly fragrant when crushed. The leaf-stalk is about 11 mm long and deeply channelled on the upper surface. Flowers are small and white in small clusters. The dry brown fruit contain glossy black seeds.

Distribution
Moderately common in restricted habitat in Queensland between the Brisbane River and the central Queensland coast, but very rare in north-east NSW, where it is known from the Tweed, Lismore and Wardell areas.

Habitat and Ecology
Axebreaker is found in dry subtropical rainforest and vine scrub, often along rivers.

Threats

- Clearing and fragmentation of habitat for development and agriculture
- Risk of local extinction because numbers are low
- Infestation of habitat by introduced weeds
- Grazing and trampling by domestic stock
- Fire

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Avoid fire in and around the edges of rainforest patches.
- Exclude cattle from remnant rainforest by fencing.
- Control weeds in rainforest areas.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining remnants of habitat.

Ball nut

Scientific name: *Floydia praealta*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
This tree grows to 35 m tall, with rough, brown, slightly wrinkled bark. It is closely related to the Macadamia. The leaves are 10 – 25 cm long and 1 – 3 cm wide, tapering at the bases but rounded at the tips, and with slightly wavy margins. They are shiny green and leathery, without hairs. The flower buds are creamy brown, and when open are cream and spidery with a musky odour. The woody, globular, brown fruit is 5 cm in diameter and contains one or two inedible seeds.

Distribution
Small scattered populations distributed from Gympie in Queensland to the Clarence River in north-east NSW.

Habitat and Ecology
Riverine and subtropical rainforest, usually on soils derived from basalt.

Threats

- Clearing and fragmentation of habitat for coastal development, agriculture, roadworks and powerlines
- Risk of local extinction because numbers are small and sparsely distributed
- Infestation of habitat by weeds

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Fence rainforest remnants and isolated paddock trees to exclude grazing stock.
- Identify populations along roadsides and powerline easements and protect them during works.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of habitat from clearing or development.
- Expand and connect remaining remnants of habitat.

Basket fern

Scientific name: *Drynaria rigidula*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
The Basket Fern grows in a large clump, and has two quite different frond types. The lower 'nest' fronds, are short, papery, brown and shaped like an oak-leaf. The green, more erect fronds may be up to 2 m in length and are segmented into many blunt-toothed leaflets on short stalks. Round clumps of spores occur in two rows on the backs of the leaflets, making a bulge on the front of the leaflet. The green fronds may be lost during dry periods.

Distribution
Occurs widely in eastern Queensland as well as islands of the Pacific and parts of south-east Asia. In NSW it is only found north of the Clarence River, in a few locations at Maclean, Bogangar, Byron Bay, Mullumbimby, in the Tweed Valley and at Woodenbong.

Habitat and Ecology
Grows on plants, rocks or on the ground. Usually found in rainforest but also in moist eucalypt and Swamp Oak Forest.

Threats

- Loss of habitat through clearing for agriculture and development.
- Frequent fires, as the plant has limited tolerance for fire.
- Browsing and trampling by domestic stock.
- Invasion of weeds and habitat degradation, which limits opportunities for establishment of young plants.
- Removal of forest understorey, resulting in loss of habitat.
- Risk of local extinction because numbers are low.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Protect areas of rainforest, moist eucalypt and swamp forest from fire.
- Fence areas of habitat to exclude stock.
- Control weeds in rainforest, moist eucalypt and swamp forests.
- Protect known and potential habitat from clearing and development.
- Enhance and expand rainforest, moist eucalypt and swamp forest habitats.

Brown fairy-chain orchid

Scientific name: *Peristeranthus hillii*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: n/a

Description
Epiphyte forming semi-pendulous clumps, the coarse stems to 30cm long and about 5mm thick, turning up near the apex. Leaves three to ten, to 25cm x 40mm, oblong, more or less pendulous, light green with numerous prominent veins, the tips unequally lobed, often twisted. Racemes to 25cm long, pendulous, bearing numerous, fragrant, downward-facing flowers, about 7mm across, which are pale green with numerous crimson spots. Perianth segments narrow, widely spreading, usually incurved near the tips. Dorsal sepal erect and incurved, lateral sepals divergent, incurved, petals obliquely erect, slightly incurved. Labellum about 2.5mm long, hinged; lateral lobes about 1.5mm x 1.5mm, triangular; spur about 1mm long, tapered, hollow. Lamina callus of a conical, erect structure about 1mm long.

Distribution
Found in north-eastern NSW, north from Port Macquarie, extending to north-eastern Queensland as far as the Bloomfield River.

Habitat and Ecology
Restricted to coastal and near-coastal environments, particularly Littoral Rainforest and the threatened ecological community Lowland Rainforest on Floodplain. The species is an epiphyte, growing in clumps on tree trunks and thick vines. Flowers appear during September and October. Tiny scented flowers produce nectar and are pollinated by small beetles.

Threats

- Habitat destruction and fragmentation.
- Risk of local extinction because populations are small.
- Visitor disturbance leading to physical damage of plants.
- Weed invasion.
- Inundation of low lying areas due to sea level rise.
- Orchid lovers collecting plants

What needs to be done to recover this species?

- Control invasion and spread of weeds.
- Protect known habitat from clearing or disturbance.
- Manage or control opportunistic collection of plants.

Brush sauropus

Scientific name: *Phyllanthus microcladus*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
The Brush Sauropus is a small shrub to 35 cm tall, with stout main branches and small wedge-shaped or rounded leaves clustered on short, fine branchlets. The lower surface of the leaves is sometimes softly hairy and has a prominent midrib. Flowers are small and inconspicuous. The fruit is a round smooth capsule, about 3 mm long, and hangs on a long thin stalk.

Distribution
In NSW confined to a few locations in the Tweed, Brunswick, Richmond and Wilson River Valleys with an outlying population near Grafton. Also occurs in south-east Queensland.

Habitat and Ecology
Usually found on banks of creeks and rivers, in streamside rainforest or dry rainforest.

Threats

- Clearing and fragmentation of habitat for agriculture.
- Clearing and fragmentation of habitat for development.
- Invasion of creekside habitat by introduced weeds including cat's claw creeper, Lantana and soda apple.
- Grazing and trampling by domestic stock.
- Erosion of banks of creeks and rivers.
- Risk of local extinction because populations are small.
- Inappropriate fire regimes.

What needs to be done to recover this species?

- Protect areas of streamside rainforest habitat from clearing or development.
- Fence areas of known habitat to prevent grazing, trampling and erosion by stock.
- Provide stock watering points away from streams.
- Remove weeds in areas in known habitat.
- Expand and connect remaining fragments of streamside rainforest known habitat.
- Maintain viable ex-situ seedbank and/or living collection.

Durobby

Scientific name: *Syzygium moorei*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
Durobby, also known as Coolamon, is a tree growing up to 40 m tall, with dense dark foliage. The bark is red-brown, light grey or pinkish grey with soft papery scales. Its paired leaves are thick, oval-shaped or slightly elongated, 8 - 20 cm long, and usually rounded at the tips. Flowers are showy, pink to red, fluffy, and clustered directly on older leafless branches and the trunk of the tree. The white fleshy fruits are edible but tasteless. They have a diameter of up to 6 cm and enclose a single seed.

Distribution
Found in the Richmond, Tweed and Brunswick River valleys in north-east NSW and limited occurrence in south-east Queensland.

Habitat and Ecology
Coolamon is found in subtropical and riverine rainforest at low altitude. Often occurs as isolated remnant paddock trees.

Threats

- Clearing and fragmentation of habitat for development, agriculture and road-works
- Weed infestation and general degradation of rainforest habitat
- Grazing and trampling by domestic stock
- Illegal collection for horticulture

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Fence rainforest remnants and isolated paddock trees to exclude grazing stock.
- Control weeds in known and potential habitat.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remnants of suitable habitat and encourage regeneration of habitat around isolated paddock trees.

Fine-leaved tuckeroo

Scientific name: *Lepiderema pulchella*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: n/a

Description
Fine-leaved Tuckeroo is a small rainforest tree growing to 15 m tall. It has hairless, light-green glossy leaves, 7 – 15 cm long, which are made up of 4 – 14 narrow leaflets with wavy or toothed margins. The flowers are 2 – 3 mm long and yellowy-orange. The 8 – 10 mm long fruit is orange. This opens into three lobes revealing shiny dark-brown seeds with a yellow fleshy covering at the base. The fruit is ripe in December.

Distribution
The NSW north coast north of Brunswick Heads, and in Queensland. Most records in NSW are from the Tweed Valley, and the majority of known populations are on private land.

Habitat and Ecology
Lowland subtropical rainforest in NSW. Found on infertile metasediments and on fertile basalts in the Tweed Valley.

Threats

- Invasion of habitat by introduced weeds.
- Clearing and fragmentation of habitat for development.
- Collection of seed for horticulture.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries
- Remove weeds in known and potential habitat.
- Protect areas of lowland subtropical rainforest from clearing or fragmentation.
- Seek a permit from the DEC before collecting seed from wild plants.

Green-leaved rose walnut

Scientific name: *Endiandra muelleri* subsp. *bracteata*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
A tree up to 30 m tall with brown bark, often in loose round plates. Twigs and branchlets are covered in hairs. The moderately glossy leaves are oval or drawn out towards the tips, and measure 6 – 12 cm long and 3 – 5 cm wide, with three to five pairs of side veins. Flushes of new growth are pinkish-green. Flowers are small, yellowish and hairless, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5 – 3 cm long and black when ripe.

Distribution
Occurs in Queensland and in north-east NSW south to Maclean. It is sparsely distributed within this range.

Habitat and Ecology
Occurs in subtropical and warm temperate rainforests and Brush Box forests, including regrowth and highly modified forms of these habitats. Records are usually from poorer soils derived from sedimentary, metamorphic or acid volcanic rocks. The species is generally recorded at lower altitudes. Flowering and fruiting has been observed from November to May.

Threats

- Clearing and fragmentation of habitat for coastal development.
- Clearing and fragmentation of habitat for agriculture.
- Infestation of habitat by weeds.
- Clearing and fragmentation of habitat for road-works.
- Frequent fire.
- Disturbance from recreational users in reserve areas.
- Forestry related activities within wet sclerophyll forest habitat.
- Damage from domestic stock.
- Habitat loss and fragmentation as a result of infrastructure development including powerline construction.
- Insufficient understanding of distribution.

What needs to be done to recover this species?

- Protect known populations and areas of suitable habitat from clearing or development.
- Identify populations along roadsides and protect them during road-works.
- Protect known and potential habitat from fire.

- Remove weeds where they threaten adult plants or regeneration.
- Keep to established tracks in areas of habitat to avoid trampling small plants.
- Expand and connect remaining habitat remnants.
- Protect areas of known habitat from cattle grazing, logging and other activities that may impact on the species.

Marblewood

Scientific name: *Acacia bakeri*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: n/a

Description
Marblewood is a tree of 5 – 30 m with wrinkled bark and a rounded canopy that is much darker and denser than that of most wattles. Its curved leaves are broad and dark green, with three to four prominent longitudinal veins, and thickened veins around the edges. The flower heads are small, round, and pale or golden yellow, and are followed by large bunches of flat, brown seed-pods containing several black seeds.

Distribution
Restricted to coastal south-east Queensland and north-east NSW, where it occurs north from Mullumbimby. Most plants are on private property.

Habitat and Ecology
In or near lowland subtropical rainforest, adjacent eucalypt forest or regrowth of both. Usually occurs in the understorey but may occur as a large canopy tree.

Threats

- Loss of habitat through land development and agriculture.
- Invasion by weeds, particularly Lantana.
- Fire, which kills adult trees and encourages weed growth.
- Visitor impacts in high use areas.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Control fire in areas of known or potential habitat.
- Ensure walking tracks in tourist areas do not disturb known habitat and stay on established tracks in rainforest areas.
- Assist in control and removal of weeds from rainforest areas.
- Protect areas of rainforest and adjoining eucalypt forest from clearing and development.

Red bopple nut

Scientific name: *Hicksbeachia pinnatifolia*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
Red Bopple Nut is a small tree to 10 m tall, often with several unbranched stems rising from the rootstock. The leaves are leathery and compound, 40 – 100 cm long and deeply lobed, or with many leaflets and a winged central spine. The lobes or leaflets have prickly toothed margins and the veins are prominent on both sides. A loose spike of many spidery-flowers, 15 – 35 cm long, arises directly from the trunk from ground level upwards. The flowers are purplish brown with a strong, sickly scent. Bright red fleshy fruits, 2 – 4 cm long, follow the flowers.

Distribution
Coastal areas of north-east NSW from the Nambucca Valley north to south-east Queensland.

Habitat and Ecology
Subtropical rainforest, moist eucalypt forest and Brush Box forest.

Threats

- Clearing of rainforest habitat for development or agriculture.
- Invasion of habitat by introduced weeds, particularly Lantana and exotic vines.
- Fire.
- Collection of seed for horticulture.

What needs to be done to recover this species?

- Protect rainforest, moist eucalypt forest and Bush Box forest from fire.
- Control introduced weeds
- Protect remnant subtropical rainforest habitat.
- Initiate and support projects to rehabilitate remnant habitat and regenerate rainforest.

Red lilly pilly

Scientific name: *Syzygium hodgkinsoniae*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
This is a small tree to about 11 m tall. Its paired leaves are oval shaped or slightly elongated, 8 - 15 cm long, with a short blunt point at the tips. The flowers are off-white, fluffy and honey scented, about 25 mm in diameter, and are held in clusters at the ends of stems. The fruit are 4 cm in diameter, round and bright red. A thin layer of flesh, with a distinctive smell like that of an ashtray, encloses a single large seed.

Distribution
A restricted range from the Richmond River in north-east NSW to Gympie in Queensland. Locally common in some parts of its range, but otherwise sparsely distributed.

Habitat and Ecology
Usually found in riverine and subtropical rainforest on rich alluvial or basaltic soils.

Threats

- Clearing and fragmentation of habitat for development, agriculture, road-works and powerlines.
- Weed infestation and general degradation of rainforest habitat.
- Grazing and trampling of seedlings and saplings by domestic stock.
- Roadside slashing and mowing.
- Illegal collection for horticulture.
- Large scale, high intensity fire is likely to cause significant damage to the population.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Fence rainforest and riverbank remnants to protect them from grazing, trampling and erosion by stock.
- Identify roadside trees and protect them during road-works.
- Remove weeds in rainforest environments.
- Protect areas of suitable rainforest habitat from clearing or development.
- Expand, connect and rehabilitate remnants of rainforest.
- Report roadside trees to local authorities so that damage during road maintenance can be avoided.

Rough-shelled bush nut

Scientific name: *Macadamia tetraphylla*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
The Rough-shelled Bush Nut is a small to medium-sized, usually densely bushy, tree growing up to 18m tall. The leaves are 7 – 25 cm long and oblong or slightly lance-shaped. The leaf-margins are toothed and prickly. Creamy pink to purplish flowers hang in long strings among the leaves. The fruit is woody brown and globular, 2 – 3 cm in diameter. The edible seeds are enclosed in a hard, wrinkled, brown shell inside a round green husk. Most commercial macadamias are hybrids of this species and the Queensland species Macadamia integrifolia.

Distribution
Confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland.

Habitat and Ecology
Found in subtropical rainforest, usually near the coast.

Threats

- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks.
- Risk of local extinction due to low numbers.
- Grazing and trampling by domestic stock.
- Fire.
- Invasion of habitat by weeds.
- Loss of local genetic strains through hybridisation with commercial varieties.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Protect rainforest from fire.
- Exclude grazing stock from known areas of habitat by fencing.
- Control weeds in rainforest areas.
- Protect areas of rainforest habitat from clearing or development.
- Expand and connect remaining remnant patches of habitat.
- Plant commercial hybrid macadamias away from wild populations.

Rusty rose walnut

Scientific name: *Endiandra hayesii*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
Often a small crooked tree, but can grow to 35 m tall. It has grey to grey-brown bark, which is smooth or slightly scaly. The dull, hairy leaves are egg-shaped and measure 6 – 12 cm long and 3 – 6 cm wide. The leaves have a closely veined appearance. Flowers are small and white to pale green, and are held in small clusters. The fleshy fruits are egg-shaped, 2.5 – 3 cm long, and purplish-black when ripe.

Distribution
A restricted distribution from Burleigh Heads in Queensland to the Richmond River in north-east NSW. It is locally abundant in some parts of its range in NSW.

Habitat and Ecology
Sheltered moist gullies in lowland subtropical and warm temperate rainforest on alluvium or basaltic soils.

Threats

- Clearing and fragmentation of habitat for development, agriculture and road-works.
- Timber harvesting activities.
- Infestation of habitat by weeds.
- Fire.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Stay on established tracks in rainforests.
- Avoid fire in and near rainforest patches.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of rainforest habitat from clearing or development.
- Exclude areas of rainforest habitat from timber harvesting
- Expand and connect remaining areas of habitat.

Shiny-leaved ebony

Scientific name: *Diospyros yandina*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
Shiny-leaved Ebony can be a small tree up to 6 m tall but most specimens are shrubs of about 3 m. The larger stems are black and slightly fissured, and the branchlets are dark with numerous warty lumps. Fine, silvery or rusty hairs cover the new shoots, the leaf stalks and the backs of the younger leaves. The shiny leaves are about 4 – 7 cm long, feel rather papery and have distinct wavy edges. The summer fruits are round, hairy and may be red, yellow or brownish.

Distribution
In NSW this species is found only in Hogans Scrub at North Tumbulgum and on Mount Cougal, in the Tweed Valley. It also occurs in south-east Queensland.

Habitat and Ecology
It grows in the understorey of riverine or lowland subtropical rainforest.

Threats

- Loss of habitat through clearing for agriculture or other development.
- Browsing and trampling by domestic stock.
- Infestation of habitat by weeds, particularly Lantana.
- Fire affecting the margins of rainforest habitats.
- Seed collection for horticulture.
- The species is susceptible to extinction via stochastic processes due to its small known population size and restricted distribution.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Protect rainforest from fire.
- Exclude stock from rainforest areas by fencing.
- Control weeds.
- Protect known and potential rainforest habitat from clearing and development.
- Rehabilitate and expand habitat areas to enable regeneration of seedlings.
- Seek a permit from the OEH for the collection of seeds from wild plants.

Small-leaved tamarind

Scientific name: *Diploglottis campbellii*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: Endangered

Description
A large straight tree up to 30 m tall with greyish-brown bark with vertical cracks. New leaves are at first softly-hairy, but soon become more or less hairless. The leaves are 10 - 35 cm long and are divided into four to eight leaflets. Small clusters of greenish-white flowers. The fruits are creamy-brown and in crowded clusters about 10 cm long. The capsules, usually three-lobed, enclose one seed per lobe. Each seed is surrounded by yellow or deep pinkish-red flesh.

Distribution
Recorded from the coastal lowlands between Richmond River on the Far North Coast of NSW and Mudgeeraba Creek on the Gold Coast hinterland, Queensland.

Habitat and Ecology
Confined to the warm subtropical rainforests of the NSW-Queensland border lowlands and adjacent low ranges. The forest types in which the species occurs vary from lowland subtropical rainforest to drier subtropical rainforest with a Brush Box open overstorey. Occurs on basalt-derived soils and also on poorer soils such as those derived from quartz monzonite. Flowering times vary across its range depending on latitude and to some extent annual seasonal variations. Ripe fruits are generally present from January to early April, with peak fruiting during the last week of February and early March. Seed dispersal mechanisms are unclear.

Threats

- Clearing and fragmentation of habitat is believed to be the primary reason for decline.
- Risk of local extinction because populations are small.
- Loss of, or physical damage to plants from roadways and road maintenance.
- Physical damage to plants and compaction of soils from grazing and trampling by stock.
- Infestation of habitat by weeds.

What needs to be done to recover this species?

- Buy plants only from licensed nurseries.
- Encourage regeneration of the species and its habitat by fencing isolated paddock trees.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of suitable habitat from clearing and road-works.
- Undertake habitat restoration works in known and potential habitat.

Smooth scrub turpentine

Scientific name: *Rhodamnia maideniana*
Conservation status under NSW BC Act: Critically Endangered
Conservation status under Commonwealth EPBC Act: Critically Endangered

Description
Rhodamnia maideniana is a bushy shrub, commonly 1.5–3 m high, with reddish brown fibrous-flaky bark; young shoots sparsely pubescent, glabrescent. Leaves with lamina ovate to narrow-elliptic, 5–10 cm long, 2–4.5 cm wide, apex long-acuminate with a rounded tip, base cuneate, both surfaces ? glabrous; strongly 3-veined from base, lateral veins numerous, not transverse; oil glands numerous and distinct; petiole 5–6 mm long. Inflorescences 2–4 per axil, each 1–3-flowered; peduncles 1–3 mm long. Hypanthium ? glabrous. Sepals 1 mm long, persistent, pink. Petals 3–4 mm long, white. Stamens c. 4 mm long. Style 4 mm long. Berry globose, 8–12 mm diam., black

Distribution
Rhodamnia maideniana occurs in subtropical rainforest on basaltic soils, including red-brown loams and clay loams. It can be locally common on slopes and in gullies, growing from 40 – 1000 m above sea level. The distribution of Rhodamnia maideniana extends for Ballina and inland to Alstonville in NSW up into South-east QLD (Currumbin to Springbrook National Park).

Habitat and Ecology
Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.

Threats

- Decline in health/loss of mature plants and a lack of seed-based recruitment due to infection by *Austropuccinia psidii* (Myrtle Rust).
- Degradation of habitat and competition from transformer weed species.
- Clearing from rural, agricultural and urban development leading to edge effects, degradation and further fragmentation.
- Habitat degradation and clearing due to forestry operations.
- Too frequent/intense fire destroying habitat and individual plants.
- Road and track development and maintenance.
- Small and fragmented population.
- Changes in rainfall and moisture availability potentially impacting the species.
- Altered species ecology in response to fire.
- Altered species ecology in response to drought

Southern ochrosia

Scientific name: *Ochrosia moorei*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: Endangered

Description
Southern Ochrosia is a small tree, sometimes crooked with several stems, growing up to 11 m tall. The bark is very dark brown, finely wrinkled and rough. The leaves are 8 – 20 cm long, arranged in twos or threes, varying in shape but tapering to a long point at the tips and gradually narrowing at the base. They are green and shiny, paler beneath, and thin in texture. When picked, the leaf-stalk exudes a milky sap. Small white flowers are held in small clusters at the ends of branchlets. The shiny scarlet fruit is oval-shaped and 4 – 8 cm long.

Distribution
Southern Ochrosia is found in north-east NSW north from the Richmond River, and in south-east Queensland. It is very sparsely distributed within this range.

Habitat and Ecology
Southern Ochrosia is found in riverine and lowland subtropical rainforest.

Threats

- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks.
- Risk of local extinction because populations are small.
- Invasion of habitat by introduced weeds.
- Collection of seed for horticulture.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Buy plants only from licensed nurseries.
- Assist with the removal of introduced weeds.
- Protect areas of rainforest habitat from clearing or development.
- Expand and connect remaining remnant patches of habitat.
- Seek a permit from the DEC before collecting seed from wild plants.

Spiny gardenia

Scientific name: *Randia moorei*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: Endangered

Description
Spiny Gardenia is a tall shrub or small tree to about 8 m tall, often with coppice shoots and root suckers at the base. The paired leaves are mostly oval-shaped, and can be 2 - 6 cm long and 1 - 3 cm wide. The underside of the leaf is paler than the upper surface, and often has small pits in the angles of the veins. Flowers are small and white, with a strong sweet smell, and develop into round yellow to orange berries 6 - 9 mm long which eventually turn black. There are many seeds set in the pulp of each fruit.

Distribution
From Lismore in north-east NSW north to the Logan River in south-east Queensland. Sparsely distributed, with most records in the Tweed and Brunswick areas.

Habitat and Ecology
Subtropical, riverine, littoral and dry rainforest. In NSW, Hoop Pine and Brush Box are common canopy species.

Threats

- Clearing and fragmentation of habitat for development, agriculture and roadworks.
- Invasion of habitat by introduced weeds.
- Trampling by visitors.
- Fire.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Keep to established tracks to avoid trampling on small plants.
- Protect rainforest areas from fire.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of suitable habitat from clearing or development.
- Expand and connect remaining remnants of habitat.

Stinking cryptocarya

Scientific name: *Cryptocarya foetida*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
Stinking laurel is a small to medium-sized tree growing to 20 m tall, with a dark green crown, and brown, slightly fissured bark. The leaves are oval-shaped with a bluntly pointed tip, 5 – 12 cm long and 2 – 6 cm wide, dark green on the upper surface and paler below. The main leaf vein is prominent, yellow and characteristically crooked. The species is named from the offensive odour of the small creamy flowers, which are borne in small clusters. The purplish to black, fleshy, globular fruits are about 1 cm in diameter, and enclose a single round seed.

Distribution
Coastal south-east Queensland and north-east NSW south to Iluka.

Habitat and Ecology
Found in littoral rainforest, usually on sandy soils, but mature trees are also known on basalt soils. The seeds are readily dispersed by fruit-eating birds, and seedlings and saplings have been recorded from other habitats where they are unlikely to develop to maturity. Though seedlings can be fairly numerous, few mature trees are known.

Threats

- Risk of local extinction because populations are small.
- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks.
- Infestation of habitat by weeds.
- Trampling by visitors when accessing beach areas through littoral rainforest.
- Fire.

What needs to be done to recover this species?

- Keep to tracks and avoid trampling on small plants.
- Support local Landcare groups and bush regeneration teams.
- Avoid fire in and around the edges of patches of littoral rainforest.
- Remove weeds where they threaten adult plants or regeneration.
- Protect areas of littoral rainforest from clearing or development.
- Expand and connect remaining areas of habitat.

Sweet myrtle

Scientific name: *Gossia fragrantissima*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: Endangered

Description
Sweet myrtle (formerly Austromyrtus fragrantissima) is a multi-stemmed shrub or small tree, about 4 –10 m tall. The bark is rough, brown and fissured to flaky. Its small, glossy leaves usually have a tiny point at the apex and are paired on the stem. New leaves are shiny and reddish. The flowers are small, white and fragrant and are followed by small, round, yellow to orange berries.

Distribution
Occurs in south-east Queensland and in north-east NSW south to the Richmond River. Mostly found on basalt-derived soils.

Habitat and Ecology
Dry subtropical and riverine rainforest. As it can coppice from roots left in the ground when rainforest is cleared, it is found at several sites as isolated plants in paddocks or regrowth.

Threats

- Habitat degradation through weed invasion and disturbance.
- Loss of habitat through clearing and fragmentation.
- Risk of local extinction because populations are small.
- Grazing by domestic stock.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Fence rainforest remnants to protect them from cattle.
- Provide water for cattle away from creeks and rivers.
- Control weeds in dry subtropical and riverine rainforest.
- Protect areas of rainforest habitat.
- Expand and connect remaining remnants of habitat.

White lace flower

Scientific name: *Archidendron hendersonii*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: n/a

Description
White laceflower is a tree to 18 m tall, with light-brown bark. Its leaves are divided twice, into glossy hairless leaflets separated unequally by the midvein. Up to ten fragrant, fluffy creamy-white flowers are bunched in heads. Woody orange pods develop, splitting and curling to reveal glossy black seeds displayed against the red or yellow interior of the pod.

Distribution
From north Queensland south to the Richmond River in north-east NSW. It is found on a variety of soils including coastal sands and those derived from basalt and metasediments.

Habitat and Ecology
Riverine and lowland subtropical rainforest and littoral rainforest.

Threats

- Loss of habitat through clearing and fragmentation.
- Habitat degradation through weed invasion and disturbance.
- Illegal collection of seeds for horticulture.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Buy White Laceflower plants only from licensed nurseries.
- Control weeds in rainforest areas.
- Protect areas of rainforest habitat from clearing and development.
- Expand and connect remaining remnant patches of habitat.

White yiel yiel

Scientific name: *Grevillea hilliana*
Conservation status under NSW BC Act: Endangered
Conservation status under Commonwealth EPBC Act: n/a

Description
White Yiel Yiel is a rainforest tree 8 – 30 m tall. The young leaves are deeply lobed and mostly 25 – 40 cm long and 15 – 30 cm wide, while the adult leaves are often without lobes. The lower surface of both the young and the adult leaves is silvery and silky. The white to pale-green flower heads are cylindrical, 8 – 22 cm long and appear mainly during May to July.

Distribution
North from Brunswick Heads on the north coast of NSW and in Queensland. The only populations currently known in NSW are near Brunswick Heads and on the slopes of Mt Chincogan in Byron Shire and, in Tweed Shire in remnant patches of habitat, particularly around Terranora.

Habitat and Ecology
White Yiel Yiel grows in subtropical rainforest, often on basalt-derived soils.

Threats

- Risk of extinction because populations are small and distribution is restricted.
- Loss of habitat through clearing for development.
- Habitat degradation through invasion by introduced weeds.
- Seed collection for horticulture.

What needs to be done to recover this species?

- What needs to be done to recover this species?
- Buy plants only from licensed nurseries.
- Prevent weeds and garden plants from invading habitat.
- Protect remnant rainforest areas from development.
- Seek a permit from the DEC before collecting seed from wild plants.
- Report new occurrences to the DEC.

Yellow satinheart

Scientific name: *Bosistoa transversa*
Conservation status under NSW BC Act: Vulnerable
Conservation status under Commonwealth EPBC Act: Vulnerable

Description
A crooked tree up to 22 m tall with a dense dark-green crown. The broad, leathery leaves are heart-shaped at the base and paired on the stem. The lower leaf surface is paler green than the upper surface and has prominent veins. The small white flowers are borne in loose clusters at or near the tips of the branches. The fruits are hard, ribbed and egg-shaped with a flattened end, and contain a single kidney-shaped seed. Heart-leaved Bonewood is now considered to possibly belong to the same species as Yellow Satinheart (*Bosistoa transversa*).

Distribution
From Maryborough in Queensland south to the Nightcap Range north of Lismore in north-east NSW.

Habitat and Ecology
Lowland subtropical rainforest up to 300 m in altitude.

Threats

- Loss of habitat through clearing and fragmentation.
- Habitat degradation through weed invasion and disturbance.
- Grazing by domestic stock.
- Fire.
- Timber harvesting.

What needs to be done to recover this species?

- Support local Landcare groups and bush regeneration teams.
- Protect rainforest habitat from fire.
- Fence creeksides and rainforest areas to exclude stock.
- Control weeds.
- Protect remaining habitat from clearing and development.
- Expand and connect remaining areas of rainforest habitat.
- Undertake taxonomic study to clarify status of this species and *Bosistoa selwynii*.

APPENDIX 2 – WEED CONTROL METHODS

Weed Control Method	Technique
Terrestrial Weeds	
Bagging	Plants which can reproduce from plant material such as bulbs, tubers, corms, runners (stolons), underground horizontal stems (rhizomes), and plantlets formed on leaves should be bagged and removed from the site. Bagged plant material can be composted, burned or disposed in a landfill. Compost piles should be well anchored and positioned away from the flooding zone and from cattle. Compost piles should be appropriately monitored. Any burning should be undertaken away from the riparian zone and from native vegetation.
Basal bark treatment	Used for saplings up to approximately 75 mm in diameter. The entire surface of the stem is treated from ground level to about 300 mm above the ground. Herbicide can be applied by brush or by spraying with a low pressure setting.
Cut	The cut stump method must involve completely cutting the trunk or stem of the plant, at a level below the first branches or as near as practicable to ground level. Follow up maintenance (on an annual or bi-annual basis) to suppress regrowth, suckering and coppicing is essential.
Cut, scrape and paint	The cut, scrape and paint method must involve completely cutting the trunk or stem of the plant, at a level below the first branches or as near as practicable to ground level. Herbicide must then be immediately applied to the cut surface of the cut trunk or stem. Following the cut and paint, the exposed stem or root surface is scraped till a light green coloured layer is visible. Herbicide is then immediately applied to the scraped surfaces.
Debris management	In the case of non-locally indigenous plants species that reproduce or regenerate vegetatively, debris should be managed in a manner to ensure complete death and should not be stacked and burned within 20 m of remaining native vegetation.
Hand held foliar spraying	Foliar spraying involves spraying the foliage of the plant with an appropriate herbicide. Herbicide should be applied with a low-pressure concentrated spray stream sufficient to avoid misting and spray drift. Foliar spraying should only be used on plants that have a total height of 1.5 m or less. In the case of deciduous plants, foliar spraying should only be undertaken when foliage is present on the target weeds and before yellowing and leaf fall commences. Foliar spraying should only be undertaken in a manner that does not cause harm to any adjacent native vegetation. Any native vegetation within one metre of the target plant must be adequately protected from direct spray, splash or drift. Foliar spraying must not occur over any water body (whether still or flowing) or in any manner which may result in direct or indirect application to a water body. Foliar spraying must only be carried out in calm conditions and must avoid spray drift.
Hand pulling	Hand pulling must involve gripping and pulling the stem of the plant by hand to carefully remove the whole stem and root system from the ground. Hand pulling should only be used for plants that can be removed with minimal disturbance to the soil and existing litter or vegetative groundcover. Hand pulling is most effective when the plants to be removed are small and the soil is moist.
Herbicide use	All use of herbicide involved in the carrying out of clearing activities must comply with: • The directions on the attached labelling; or

Weed Control Method	Technique
	• The National Registration Authority "North Coast Off-label Permit", or NRA permit PER3512 covering methods listed in the Appendix to Common Weeds of Northern NSW Rainforests published by the Big Scrub Rainforest Landcare Group. Any mixing of herbicide must be carried out at least 20 metres away from any watercourse and used herbicide containers must be disposed of in an appropriate manner. All use of herbicide must be undertaken with regard to the provisions of the *Protection of the Environment Operations Act (1997)*. If a risk of pollution exists, a licence may be required from the Environment Protection Authority before work commences. Herbicide clearing methods must only be undertaken, or actively supervised, by a person or persons who have training and accreditation in the safe use and handling of chemicals. Herbicide clearing methods should only be used whilst the target plants are actively growing
Ringbarking	Ringbarking must involve the placing of a continuous sharp cut line (frill) around the entire trunk, to a depth below the sap flow zone, generally using an axe or tomahawk.
Scrape and paint	The scrape/gouge and paint, method is used for vine weeds with tubers such as Madeira vine (*Anredera cordifolia*). Sections of stem at least 300 mm long are scraped firmly, exposing the fibres of the stem, and the scraped sections are painted with herbicide (for Madeira vine, 75% Glyphosate is used). The stems must not be severed. Gouging may also be used in the case of plants with fleshy tubers. Gouging is like 'eying' a potato except that a deeper well is gouged with the tip of a knife and then filled with herbicide.
Stem injection – frilling, drilling, spearing	A series of drill-holes or cuts must be made into the sapwood around the trunk below the branches of the plant. Herbicide must then be immediately injected into each hole or cut at the recommended dosage. Holes and cuts must be angled downwards into the trunk to prevent herbicide escape. Stem injection must not be undertaken immediately before or after rain. In the case of deciduous plants, stem injection must be undertaken during late summer to early autumn. Plants that have been stem injected should be left in place undisturbed for a minimum of 12 months after herbicide application.
Vine removal	Where the vines are generally prostrate on the ground, aerial parts of the vine (stems and leaves) should be rolled into heaps then cut and paint or hand pulling applied. Where the vines are hanging from trees then cut and paint or hand pulling applied. Hand pulling of Madeira vine, Cape ivy and Climbing cactus must be avoided.
Aquatic Weeds	
Mechanical Control – Floating Plants	Salvinia and Water hyacinth are free floating plants and may be removed using a scoop net. A stretcher (scoop net) can be made from two poles and a piece of mesh that allows the weed to be scooped up from underneath the water and catapulted onto land where it can be moved from the edge of the lake for burial.
Mechanical Control - Emergent Plants	Cumbungi and Phragmites can be cut below the waterline in autumn, severely retarding their growth. This is particularly true of Cumbungi. Special underwater cutting machines are available for both submerged and emergent plants, but these are costly and do not eliminate the problem.
Mechanical Control -	Ribbon weed and Milfoils may be effectively removed by a wire rope weighted at intervals. Alternatively these plants can be cleared by dragging the dam using a heavy chain, anchored at a point on the dam bank. A tractor, with the other

Weed Control Method	Technique
Submerged Plants	end of the chain attached, is driven around the dam. The chain follows the bed of the dam, severing the plants close to the bottom. Where this does not work because of locality, or because trees are in the way, use an excavator or scoop.
Mechanical Control - Weeds that are Anchored to the Banks	Weeds that are anchored to the banks Weeds that are anchored to the banks are difficult to control by mechanical means. Mowing reduces the bulk of material but it is essential that mowing is carried out regularly.
Environmental Control	Control can be achieved by altering the water body in some way to limit the growth of aquatic plants, for example: • Out competing the potential weed growth with a dense, healthy crop of native aquatic species. • Shade the dam using bank-planted trees appropriate for the area.
Chemical Control	When herbicides are to be applied, the treatment must be carefully selected so that it will not kill fish and wildlife or damage native aquatic plants. Chemical control is suitable where the weed infestation is small. A small infestation means that only a small quantity of chemical is needed, and water contamination is minimal. Also, the decay of small amounts of vegetation will not reduce oxygen levels in the water sufficiently to kill fish. It is important to adhere strictly to the following procedures: • Identify the plant or plants correctly; • Select a chemical registered for use in water and on that particular plant; • Read the chemical label carefully and observe all special precautions; • Take particular note of toxicity to other plants, fish or wildlife, residual activity and withholding periods for treated water.

APPENDIX 3 – EXAMPLE DAILY WORK RECORD PROFORMAS

This form is to be filled by the team leader for each workday. The team leader will need to allow 15 minutes each day to gather any relevant information for team members and to fill in this form.

Name of Team Leader:	**Date:**
Vegetation Type:	**Site Number:**
Weather Conditions:	
Specific Work Zone/s:	

Work Team Details

Name	Zone No	Time Started	Time Finished	Hours Worked
Total No of Workers:		**Total No of Hours:**		

Description of Work Undertaken

(e.g. spraying, hand weeding, replanting, etc.). Mark work progress on project map.

Weed Control Undertaken	Weed Species	Material Used (tools/machinery)	Chemical Application (type/ratio/volume)	Zone No(s)	Area Worked (m^2)	No of People	Total Hours Worked
Spraying							
Tree injections							
Cut and paint							
Hand weeding							
Other (specify)							

Replanting Undertaken	Material Used (tools/machinery)	Fertilizer, Mulch, Tree Protection Used (type/ratio/volume)	Zone No(s)	No trees Planted	No of People	Total Hours Worked

Fencing Undertaken	Type of Fence	Material Used (tools/machinery)	Zone No(s)	Km of Fence	No of People	Total Hours Worked

Other Work (describe activity)	Material Used (tools/machinery)	Zone No(s)	Quantity	No of People	Total Hours Worked

Observations:
New native species or native species not previously recorded in work zone (please note date and zone no):

Name and date of any native plant species in flower or fruit, sudden and abundant regeneration of a particular species, or other relevant observations:

New weed species or weed species not previously recorded in work zone (please note date and zone no):

Any animal sightings (please indicate if by visual identification, called, nests, footprints, scats, claw marks, shed skin, diggings, smell, feeding etc.):

Blank Project Map:
Use map to indicate work undertaken for each day (e.g. hatching weed control progress).

Signature:

Chemical Operators Data Sheet

This form is to be filled by the team leader for each workday. The team leader will need to allow 15 minutes each day to gather any relevant information for team members and to fill in this form.

Location:	**Date:**	**Time:**
Operators:		

Herbicide	Batch No	Dilution Rate	Total	Operator	Equipment
Glyphosate:					
☐ RoundupBioactive®					
☐ Weedmaster Duo®					
Metsulfuron Methyl:					
☐ Brushkiller®					
☐ Brushoff®					
Glyphosate *PLUS* Metsulfuron Methyl:					
☐ RoundupBioactive®					
☐ Weedmaster Duo®					
☐ Brushoff®					
Triclopyr & Picloram:					
☐ Grazon®					
☐ Tordon T/C®					
Marker Dye:					
☐ White field marker					
☐ Red marker					
☐ Other					
Additive:					
☐ LI 700®					
☐ Agral®					
Other:					

Growing Conditions	Temperature	Weather Conditions	Wind Strength	Wind Direction
☐ Very Good	☐ Cool <20º	☐ Showers	☐ Strong	
☐ Good	☐ Warm 21º – 25º	☐ Overcast	☐ Gusty	
☐ Poor	☐ V/Warm 26º – 30º	☐ Clear Sky	☐ Light	
☐ Very Poor	☐ Hot >30º	☐ Variable	☐ Calm	

Zone/Area:
Comments:
Signature:

APPENDIX 4 - FERAL ANIMAL SPECIES PROFILES AND CONTROL STRATEGIES

1 FERAL DOG

1.1 Introduction

Feral dogs occur in a broad range of habitats including natural wilderness areas, grazing land and on the fringes of urban population centres. They feed opportunistically, with the diet including live prey items in addition to roadkill, vegetable matter and scraps from rubbish tips or compost heaps. Feral and domestic dogs are known to exert a high intensity of predation pressure on native fauna, especially medium to large macropods (Mitchell & Banks 2005, cited in DECC 2008). The preliminary listing for predation and hybridisation of feral dogs (DECC 2008) notes that there is a continual influx of domestic dogs to the wild.

Feral dogs have potential to prey on a variety of native fauna, and their impacts on several threatened species is of concern. Dog attack is well documented as being one of the major threats to koala populations, while ground-dwelling bird species are also particularly vulnerable to predation and disturbance by feral and domestic dogs.

1.2 Biology

Feral dogs may be stray domestic animals living wild or be wild dogs which have hybridised with dingo stock. Depending on the breed of parent dogs, feral dogs may weigh between 8 – 38 kg and can live for up to 12 years, although an average lifespan of around 5 – 7 years is more common (Moreton Bay Regional Council, undated). Feral/wild dogs may hunt in packs and usually take smaller prey such as rabbits, possums, bandicoots and wallabies. In grazing areas, calves and lambs are also vulnerable to feral dog attack. Domestic dogs and dingo-hybrids may have two (2) oestrus periods per year with pups born in spring and autumn (Catling *et al*. 1992, cited in DECC 2008), whereas pure dingos only breed once a year.

1.3 Habitat and Home Range

Feral dogs will utilise a broad variety of habitat types, with evidence that habitat modification and increased availability of prey have contributed to population increases (Corbett 2001, cited in DECC 2008). Home ranges of feral dogs may vary widely, depending on availability of resources and species numbers. A study of ten (10) free-roaming domestic dogs indicated that half of the dogs wandered widely with an average home range of 927 ha, while the remaining dogs roamed within the vicinity of the local community, with an average home range of 2.6 ha (Meek 1999).

1.4 Possible Control Methods

1.4.1 Background

The options currently available for the control of feral/wild dogs are:

- Shooting;

- Trapping;
- Exclusion fencing; and
- Baiting.

When planning and carrying out control activities, risks to human safety, non-target species, domestic animals and any other environmental concerns must be taken into account (NPWS 2005). As shooting is considered inappropriate in an urban context (without appropriate consultation with Game Council NSW, NPWS, TSC and adjacent landholders), the most practical control options for feral dog control are trapping, exclusion fencing and baiting. These control methods are further discussed below.

1.4.2 Trapping

Trapping for wild dogs is usually only undertaken in areas with low dog populations or where small numbers of 'problem' dogs occur. As for feral cats, deployment of soft-catch traps is a skilled, costly and time-consuming business, with risks associated with the catching of non-target animals and the risk of escaped dogs becoming wary and 'trap shy'.

1.4.3 Exclusion Fencing

Exclusion fencing (dog-proof and electric types) has been used for the control of wild dogs and dingoes with some success. So long as fencing is properly installed and regularly maintained, it represents a viable control option in targeted areas.

1.4.4 Baiting

Ground-baiting with buried 1080 baits is the most widely used method of wild dog control, and is the method employed by the BCD in park management. A new toxin called 'PAPP' (para-aminopropiophenone) is also now available in some states.

It is noted that the provisions of the Pesticide Control (1080 Wild Dog Bait) Order 2002, which falls under Section 38 of the *Pesticides Act 1999*, outlines a number of restrictions to the use of baits where domestic pets may be at risk. Specifically, Schedule 1 of the Pesticide Control (1080 Wild Dog Bait) Order 2002 – Permit to Allow Use of 1080 Baits for Control of Wild Dogs states that "1080 baits must not be laid within close proximity to urban areas unless the baiting program is planned in conjunction with, and has been agreed to, by an Authorised Control Officer. Such programs must include strategies for minimising risk to non-target animals. Proposals for baiting in closely settled farming areas or areas within four (4) kilometres of a village or any street with a speed restriction of 70 kilometres per hour or less fall within this requirement".

The Elysian Development site falls within these criteria. Bait stations will therefore need to be deployed in locations not likely to be accessed by domestic pets, and the baiting program will need to be developed in consultation with an Authorised Control Officer.

1.4.5 Ejectors

An ejector is a small cylindrical device that is buried in the ground, leaving only a 'bait head' exposed on the surface. The bait head contains a replaceable capsule of poison and is about the size of a cylindrical golf ball. When an animal puts its mouth over the bait head and pulls it, the poison is ejected into the mouth in a quick puff or spurt (Centre for Invasive Species Solutions 2016).

2 RED FOX

2.1 Introduction

The red fox (*Vulpes vulpes*) is the largest of the true foxes as well as being the most geographically spread member of the Carnivora order, being distributed across the entire northern hemisphere from the Arctic Circle to North Africa, Central America, and the steppes of Asia. Its range has increased alongside human expansion, having been introduced to Australasia, where it is considered harmful to native mammal and bird populations (Henry 1986).

Foxes are considered to be opportunist omnivores. They are known to take a wide range of vertebrate and invertebrates as well as fruits, fungi and carrion. They also feed on human refuse and rubbish. Diet studies conducted in Australia show sheep taken as carrion, rabbits and house mice to be the most common food (Saunders *et al*. 1995). The fox, however, is known to prey upon a diversity of native fauna species. According to the NSW TAP (NPWS 2010), although the impact of fox predation on the abundance of the majority of native fauna is not known, evidence of impacts is greatest for medium sized ground dwelling and semi-arboreal mammals, ground-nesting birds and chelid tortoises. Additionally, the TAP states that these impacts may be intensified in areas of minimal understorey.

2.2 Biology

Female foxes reproduce only once a year and the gestation period is 51 to 53 days with most cubs born during the period between August and September. The average litter size is four (4) and the maximum number of offspring is typically around ten (10). Both sexes become sexually mature from around ten (10) months of age. Although social groups of one male and several females (vixens) may exist, most foxes are thought to have only one mate. Males may leave their normal home territory temporarily in search of a mate (Saunders *et al*. 1995).

2.3 Habitat and Home Range

The red fox is widely distributed throughout the southern half of mainland Australia and can survive in habitats ranging from arid lands through to alpine landscapes as well as in urban environments (Saunders *et al*. 1995). Foxes are most active between dawn and dusk periods.

Fox groups typically have well defined home ranges. The size of the home range depends on the resources present but is usually around 30 hectares in an urban environment (Saunders *et al*. 1995).

As foxes are known to occur in urban, agricultural, disturbed, natural and semi natural areas, it is most probable that individual animals would roam between the neighbouring beach and private land into the Elysian Development site.

2.4 Possible Control Methods

2.4.1 Background

The options currently available for the control of foxes are:

- Trapping;
- Poisoning;
- Shooting;
- Control of food supply; and
- Exclusion fencing.

Each technique has a short-term effect on local fox numbers and no single control method will likely be successful on its own. Reducing the impact of the red fox relies on a mixture of control techniques as once foxes are removed from an area, reinvasion or immigration from existing untreated areas generally occurs within 2 to 6 weeks. The most efficient way to reduce the impact of foxes is to conduct a strategic coordinated program over a number of land holdings (NSW DPI 2020a). The implementation of any of these methods on the Elysian Development site should include collaboration with adjoining landowners (DPI 2007).

Research is currently being undertaken into the biological control of foxes including immunocontraception (which controls fertility rather than killing the host pest species). This research is, however, considered to be breaking new ground and has to address difficult scientific, technical and biological problems. Consequently, the research is considered high-risk, with long-term effects still unknown (Saunders *et al*. 1995).

Considering that shooting is generally regarded as an inappropriate, or illegal control method in urban, near-urban or semi-urbanised environments, the potentially available methods of control for foxes occurring at the Elysian Development site are poisoning, trapping and/or exclusion fencing. However, the Game Council NSW, a statutory authority established under the *Game and Feral Animal Control Act 2002*, may be utilised to harness the efforts of licensed, accredited hunters to assist in feral animal control (DPI 2012).

2.4.2 Baiting of Foxes

According to Saunders *et al*. (1995), poisoning using 1080 is the most suitable lethal technique for the control of foxes. This method can be made somewhat target-specific to foxes by controlling the amount of poison used, the form of the bait and bait placement (for example the bait can be buried which lessens the chance of the bait being taken by

non-target species particularly birds and reptiles). Because baiting using 1080 is the most effective and target specific method of fox control currently available, it is used widely throughout Australia (DPI 2007). The ability of a given baiting program to reduce fox populations will be limited by many factors including:

- Immigration and reproduction;
- The proportion of the population exposed to baits;
- The proportion of bait-shy individuals in the population; and
- The potential for compensatory increases in survival among unexposed and bait-shy foxes.

Most of these factors are influenced in turn by the methods employed in baiting programs (NPWS 2001). The National Feral Animal Control Program *Effective Implementation of Regional Fox Control Programs* (DPI 2007) details the importance of involving liaisons and cooperation between landholders and government agencies. The main aim is to implement strategic fox baiting over as large an area as possible to improve the efficiency and cost-effectiveness of baiting practices and to promote best practice techniques (DPI 2007). These techniques are, specifically, to:

- Synchronise baiting within a control group;
- Bait at least twice a year;
- Bait during periods when the fox is most susceptible (i.e. March-April, when juvenile foxes disperse from their natal dens to seek their own territories, and August-September, when vixens require additional food pre- and post-whelping);
- Regularly check and replace baits that are taken; and
- Continue the baiting program until bait take declines.

Bait stations are made up of bait mounds, comprising one or more baits buried in a mound of earth or sand, surrounded by an area that has been raked smooth to allow for the identification of tracks. A baiting program can be completed with an initial free-feeding period when un-poisoned baits are placed in the mound. This allows for the identification of visits by non-target animals and only mounds visited solely by target species are refilled with poisoned baits (Fleming *et al*. 2001). The NSW Fox TAP (NPWS 2001) provides preliminary guidelines for the use of 1080 baits to control foxes and these recommend that where quolls are absent from a given site, a free-feeding period is not necessary and that poison baits only be used.

Alternatively, Canid Pest Ejectors can be utilised. Canid Pest Ejectors are a spring-loaded toxin delivery device buried in the ground with an attractant attached. An animal pulls up on the attractant triggering a spring-loaded plunger that punctures a capsule of toxin and propels it into the animals mouth. These devices have been trialled extensively in NSW and QLD. The technique should be used in combination with other control methods and not seen as a single option (NSW DPI 2020a). The advantages of this method include:

- the target specificity associated with the pull strength required to trigger the ejector; and

- the placement of toxin in a stable capsule environment rather than in a bait substrate where degradation in toxin potency may occur over time.

Depending on the results of a baiting program, trapping and/or shooting may need to be considered for the subsequent control of individual foxes that are found to be bait-shy. The incidence of certain animals being wary of taking baits is well recorded.

It is noted that the provisions of the Pesticide Control (1080 Wild Dog Bait) Order 2002, which falls under Section 38 of the *Pesticides Act 1999*, outlines a number of restrictions to the use of baits where domestic pets may be at risk. Specifically, Schedule 1 of the Pesticide Control (1080 Wild Dog Bait) Order 2002 – Permit to Allow Use of 1080 Baits for Control of Wild Dogs states that "1080 baits must not be laid within close proximity to urban areas unless the baiting program is planned in conjunction with, and has been agreed to, by an Authorised Control Officer. Such programs must include strategies for minimising risk to non-target animals. Proposals for baiting in closely settled farming areas or areas within four (4) kilometres of a village or any street with a speed restriction of 70 kilometres per hour or less fall within this requirement".

The Elysian Development site falls within these criteria. Bait stations will therefore need to be deployed in locations not likely to be accessed by domestic pets, and the baiting program will need to be developed in consultation with an Authorised Control Officer.

2.4.3 Exclusion Fencing for Foxes

Foxes are agile and adaptable animals that are difficult to exclude with fences. Nevertheless, fences have been used successfully in some instances (Fleming *et al*. 2001). In the NSW TAP for the Red Fox (NPWS 2001) the NPWS acknowledges that "exclusion fencing may be particularly useful to protect colonial shore-nesting birds such as Little terns because nesting birds are restricted to small areas and human habitation (presumably to monitor/maintain) is often close".

In addition to appropriate design, the success of a fence depends upon appropriate construction, regular maintenance, frequent monitoring for breaches and quick action to remove any animals that break through (Fleming *et al*. 2001).

2.4.4 Trapping of Foxes

2.4.4.1 Introduction

The effectiveness of trapping can be hampered by the fact that it is labour intensive, requires training, can be considered inhumane and can harm non-target native fauna. However, considering the constraints on the use of poisoned baits and/or fencing at the site, trapping for the control of foxes has been included here as a preferred control option despite these limitations. Trapping methods for the control of foxes include treadle snare traps, soft catch traps and cage traps (Fleming *et al*. 2001).

It may be necessary to try different bait types in an area to determine the most attractive. One of the more successful baits is chicken fast food or rabbit (NSW DPI 2020a).

2.4.4.2 Treadle Snare Traps

In Victoria a treadle snare trap, originally designed for the control of wild dogs, has been used for the capture of foxes in urban areas where other control methods are not practical (for example, where poison baiting is deemed to be an unacceptable risk).

The treadle snare consists of a thrower arm activated by a trap plate which draws a cable noose about the target animal's leg. The snare cable usually causes minimal injury and non-target species can be released relatively unharmed. The snare plate is set to withstand a certain weight before triggering which minimises the risk to most smaller animals. Treadle snares need to be checked at regular intervals (preferably every 4-8 hours) so captured animals can be humanely removed.

2.4.4.3 Soft Catch Traps

Soft-catch or soft-jaw traps are a humane version of the traditional steel jaw trap. These traps have a rubber-like padding on each jaw, which cushions the initial impact and provides friction thus preventing the captured animal from sliding along or out of the jaws. They are designed to reduce the risk of injury to a captured animal by having the jaws offset, reduced spring strength, a spring added to the anchor chain and a centrally attached bottom swivel to which the chain is attached (Saunders *et al*. 1995). As for treadle snare traps above, soft catch traps need to be checked at regular intervals so captured animals can be humanely removed.

2.4.4.4 Cage Traps

Cage traps are a simple method of capturing animals whereby the door of the cage is set in an open position using a trigger mechanism that is connected either to a treadle plate or swinging bait. In the event that an animal enters the trap and either depresses the treadle plate or manipulates the swinging bait, the door of the trap is released and falls to a closed and locked position. There is sometimes limited success with this method of trapping as it relies on the typically wary target animal actually entering the confines of the cage.

One advantage of cage traps is that domestic pets and non-target animals captured in the trap can be released unharmed. Cage traps are most successful in towns and around houses where foxes are stealing pet food or poultry. Cage traps should be relatively large, 1200 mm x 500 mm x 500 mm to reduce the impression of entering a confined space. The trap must be pegged down to prevent the fox rolling it over and releasing the door and the wire floor should be covered with soil. All traps should be well concealed (NSW DPI 2020a).

2.4.5 Den Fumigation

Fox control can be difficult to achieve in urban areas. Fumigation of breeding, or natal dens with carbon monoxide (CO) gas is sometimes used to destroy young cubs. Carbon monoxide is a colourless, odourless gas that causes oxygen depletion leading to unconsciousness and rapid death without pain or discernible discomfort. The gas is

generated by the incomplete combustion of carbon using sodium nitrate within a fumigant cartridge.

3 FERAL CAT

3.1 Introduction

Feral cats occur in nearly all terrestrial habitats in Australia, with the main determinant of population size being the availability of food and shelter (NPWS 2000). In excess of 18 million feral cats occur on the continent (Mcleod 2004, cited in DEWHA 2008b) resulting in the decline and extinction of native fauna, particularly on islands. Feral cats prey upon a variety of fauna groups, with small ground-dwelling mammals consisting of the major part of the diet, with ground-nesting birds also at particular risk (NPWS 2000). Feral cats are capable of killing prey items up to 2-3 kg, however preference is shown for mammals weighing less than 220 grams, although reptiles, amphibians and invertebrates are also eaten (NPWS 2000).

3.2 Biology

Feral cats may weigh up to 9 kg, are solitary and predominantly nocturnal creatures. Breeding capabilities are reached after one (1) year, with females breeding in any season and producing up to two (2) litters/year, averaging four (4) kittens per litter, of which few survive (DEWHA 2008b).

3.3 Habitat and Home Range

Males may have home ranges of up to 10 ha, with females occupying smaller areas (DEWHA 2008b). All habitat types are utilised by the species with the exception of very wet rainforests. Feral cats are likely to occur within all habitats at the Elysian Development site.

3.4 Possible Control Methods

3.4.1 Background

The options currently available for the control of feral cats are:

- Shooting;
- Trapping;
- Exclusion fencing;
- Baiting;
- Fumigants;
- Biological control;
- Fertility control; and
- Commercial harvesting.

Of the above options the latter four (4) control methods are either very rarely used, or still under development. Furthermore, as shooting is not considered appropriate within proximity to urban/residential areas (without appropriate consultation with Game Council NSW, NPWS, TSC and adjacent landholders), the most practical control options for feral cats are trapping, exclusion fencing and baiting. These control methods are further discussed below.

3.4.2 Trapping

Trapping is an expensive, labour intensive and time-consuming control method and is usually only recommended on a small scale where eradication is the objective.

Although cage trapping is considered an ineffective tool for large areas, it may be useful in urban/residential areas where domestic cats are present, or where populations have already been reduced and individual cats need to be targeted. In urban/residential areas cage traps are preferred over leg hold traps as fewer injuries are sustained, non-target animals can be released unharmed and trapped feral cats can be transported away from the area for euthanasia (Sharp 2016).

Padded jaw leg-hold traps should only be used at sites where the animal can be destroyed by shooting whilst still held in the trap. Leg-hold traps may be more effective than cage traps for hard to-catch-cats that have had minimal exposure to humans (Sharp 2016).

Soft net traps consist of a flexible metal frame and netting and/or bag which collapses over the animal when triggered. Soft net traps rely on entanglement to secure and hold the targeted animal, potentially reducing the risk of injury. Soft net traps are used to trap feral and nuisance domestic cats and dogs, foxes, birds and rabbits as well as native animals such as small wallabies, bandicoots and possums. Although soft net trapping is considered an ineffective tool for control of large populations, it may be useful in urban/residential or where numbers have already been reduced and individual animals need to be targeted (Sharp and McLeod 2013).

3.4.3 Exclusion Fencing

Exclusion fencing has been used successfully in small reserves to preclude predators, including feral cats. Ideally, fencing should be combined with an integrated baiting or trapping program to reduce the risk of the fence being breached by predators.

3.4.4 Baiting

While baiting is the cheapest and most cost-effective technique for many small and medium-sized pest animals, baiting programs for feral cats tend to be less effective.

Baiting programs can be unsuitable for feral cat control as feral cats may have large home ranges, occur in low densities and are naturally wary animals. The timing of a baiting program is considered critical to successful feral cat control.

While 1080 is the bait poison most commonly used for other feral animals (dogs, foxes), it is not well-suited to feral cat control as it must be buried. Research into the use of cyanide is currently being pursued, although its use in Australia is currently illegal. The development of a specific cat toxin has been identified as a high priority for cat control.

4 CANE TOAD

4.1 Introduction

The cane toad (*Rhinella marina*) is a large ground-dwelling amphibian that was introduced into the sugar cane fields of North Queensland in 1935 to eradicate the cane beetle and its larvae from the sugar industry. The Toads thrived and have themselves become a major pest species in Australia with their range extending annually (DEH 2005).

The cane toad is an extremely adaptable species that can quickly reach high densities in suitable habitat. Densities of over 2000 individuals per hectare have been recorded (DEH 2005). In these situations, they can quickly outnumber native frogs. It is possible that it competes with some native species for resources and it is poisonous at all stages of its development (Robinson 1998).

In Australia, the cane toad has no natural enemies and is an opportunistic breeder and extreme generalist. There is concern in Australia over the impact of this species on native invertebrate populations and consequently their impact upon native frog and toad species.

Most significantly, the species possesses highly toxic chemical predator defences whereby they secrete a toxin from an enlarged pair of parotoid glands and this toxin can kill most native animals that normally eat frogs. All stages of the cane toad's life cycle are poisonous, including the eggs, tadpoles and frogs.

Cane toad tadpoles have been known to prey upon the eggs of some native frog species while the adult toads consume large volumes of invertebrates they will consume almost any small creature that fits in their mouth including small native mammals, birds, reptiles and frogs (Van Dam et. al. 2002). Cane toads have been recorded as consuming approximately 200 prey items a night, which is far more than a native frog would consume in the same period. Cane toads are also suspected of carrying diseases that may be transmitted to native frogs and fishes (CSIRO 2004).

The ability of cane toads to rapidly colonise an area, to rapidly reach high densities in a recently colonised area, to take advantage of a wide variety of habitats, and to consume a relatively large variety of prey types has led to concerns that the cane toad may be a key factor in the decline of many native frog and toad species (DEH 2005). It is for these reasons that the cane toad has been listed as a "Key Threatening Process" under both the EPBC Act 1999 and the NSW BC Act (2016).

4.2 Biology

Cane toads are considered to be extreme generalists capable of adapting to a wide range of habitats, climatic and environmental conditions and prey variety. Cane toads breed in

temporary or permanent still or slow-moving waters, can tolerate salinity levels up to 15% and have even been recorded in Mangroves. The species breeds quickly and is able to rapidly colonise and dominate an area (DEH 2005). Cane toad spawn occurs as long gelatinous strings comprising two (2) rows of black eggs which is usually interweaved around rocks or water plants in shallow water. This gelatinous string-like spawn is unique to the Cane toad in Australia, none of the native anurans lay such spawn. Females lay approximately 8,000 – 35,000 eggs at a time and usually breed twice a year. Eggs hatch in 48 to 72 hours and tadpoles develop into toadlets any time between 17 days to 6 months. Cane toads need between 6 and 18 months to reach sexual maturity and have a lifespan of approximately 5 years (CSIRO 2004).

In subtropical areas, breeding occurs during warmer periods that coincide with the onset of the wet season. Cane toads are considered to be opportunistic breeders, have a far greater fecundity than native anurans and tadpoles develop rapidly under suitable conditions (DEH 2005).

4.3 Habitat and Home Range

Cane toads were first recorded on the NSW North Coast in the 1960s and today they are considered to be resident along the wet coastal fringe as far South as the Clarence River with a smaller outlying population at Lake Innes South of Port Macquarie (DEH 2005).

The cane toad is found in most habitats within its range and can breed in fresh or brackish water. The species thrives in urban and disturbed areas and has been found in mangroves. Cane toads readily make their homes around areas inhabited by humans and feed on insects that are attracted to outside lights and breed in urban fishponds (Robinson 1998).

Cane toad numbers are often greatest in grassland and/or cleared or disturbed areas near to urban settlement (DEH 2005, Australian Museum 2002). Mown grassland areas in close proximity to bodies of water may be particularly favoured, as such areas provide ready access to water for egg laying. Cleared tracks may provide dispersal routes for the species and allow for movement through otherwise uninhabitable native vegetation.

The cane toad is an abundant breeding resident of the Tweed Shire, with principle populations occurring in more developed and disturbed areas such a farm dams, urban areas and areas of short mown grass.

This species is a common breeding resident at the Elysian Development site and it is likely that there is a relatively large population in the local area due to the diversity of habitats, degree of development and abundant water.

4.4 Possible Control Methods

4.4.1 Background

Aside from habitat management, there is little that can be done to permanently reduce cane toad levels in a given area. Possible control methods include:

- Light traps;
- Cane toad musters;
- Manual survey for eggs and tadpoles; and
- Tadpole traps.

These control methods are further discussed below.

4.4.2 Light Traps

Light traps as developed by Frogwatch in the Northern Territory have proved to be an effective and cost-efficient method to reduce cane toad densities within a defined area (Frogwatch 2006). Existing cane toad trap designs use lights to lure insects to traps, and toads enter the traps to feed. The traps have proven to be humane and cane toad specific. Acoustic attractants have also been found to enhance trapping success for cane toads – with up to three times more toads caught in traps with playbacks than in traps without playbacks (Schwarzkopf and Alford 2007).

Capture toads only should be euthanised in a manner recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture).

4.4.3 Cane Toad Muster

In the past some authorities have organised cane toad 'musters' whereby members of the public capture large numbers of individual toads by hand. Captured toads are later euthanised. This method of control, where it is completed without appropriate training and supervision, is now considered inappropriate as there is an element of risk to do with an unknowing public killing non-target (native) frog species.

Cane toad musters should only be undertaken by people trained and proficient in the identification of cane toads and native frogs of similar appearance. Cane toad musters should take place prior to the breeding season and following significant rainfall events that may trigger breeding. Toads should only be euthanised in a manner as recommended by the relevant Animal Care and Ethics Authority (NSW Agriculture).

4.4.4 Manual Survey for and Removal of Eggs and Tadpoles

Cane toad eggs and tadpoles can be manually removed using a dip-net. Cane toad spawn has the shape of long strings of black eggs arranged in pairs in continuous jelly, quite different to the spawn of all native frog species (Anstis 2002). While some native species string their eggs together, they are not usually in pairs.

If cane toads have laid eggs in a water body, or are about to do so, it is easier to destroy the spawn or catch adults that are mating than it is to trap tadpoles, which usually hatch within two (2) days of the eggs being laid (NSW OEH 2013).

4.4.5 Chemical Tadpole Traps

A chemical method of trapping tadpoles has recently been developed (Crossland *et al*. 2012) which may replace dip-netting in the future, except where the water is too shallow to install any traps. The chemical method involves funnel-traps placed in natural water bodies baited with toxins collected from adult cane toads. Cane toad tadpoles usually eliminate intraspecific competitors by consuming newly laid eggs, and they find these by searching for the toxins present in the eggs. As a result, almost all toad tadpoles will swim into these traps. Most native (non-target) tadpoles are repelled by the toad's toxins.

The chemical method not only can achieve targeted toad-tadpole removal, it can also provide an early-warning system to detect toad breeding in natural water bodies. The technology involved is quite simple and is well suited for use by land managers or community groups (NSW OEH 2013).

5 FERAL PIGS

5.1 Introduction

Domestic pigs were brought to Australia at the time of European settlement as a food source, and were transported around the country by 19th century settlers. Environmental damage caused by feral pigs can be hard to measure. By wallowing and rooting around the edges of watercourses and swamps, they destroy the vegetation that prevents erosion and provides food and nesting sites for native wildlife. They compete with native animals for food, pose a threat to ground-nesting birds, and can spread environmental weeds. Ground-burrowing native fauna are easy prey for digging pigs. Feral pigs are hosts for pathogens such as brucellosis and leptospirosis, and could also carry diseases such as foot-and-mouth disease, African swine fever and rabies, should those diseases be accidentally introduced into Australia.

5.2 Biology

Feral pigs have been estimated to originate from escaped and released domestic pigs (*Sus scrofa*). After several generations breeding in the wild, they look more like Eurasian wild boar than their domestic relatives; taller, leaner and more muscular with sparse coarse hair. Feral pigs have well developed necks and shoulders that taper to smaller and shorter hind quarters. Their ears are smaller, tail straighter and snout and tusks larger and longer than the domestic pig.

As a result of diverse source populations and interbreeding, feral pigs vary in colour and size. They are predominantly black, buff-coloured or black and white spotted. Piglets may be striped, which is typical of the European wild boar. Generally, females are smaller and weigh less (50–60 kg) than males (80–100 kg) (Koichi and Halliday 2020). Feral pigs are highly social and intelligent animals and normally form groups, known as 'mobs'. These groups are usually less than twelve (12) individuals although they can be as large as 400 in favourable conditions (Koichi and Halliday 2020). Feral pigs are generally shy and nocturnal – active from late afternoon to early morning.

Feral pigs can reproduce quickly, particularly in good conditions. Their fecundity often increases with age and body weight. With favourable conditions pigs can reproduce all year round. Sows can breed from about six (6) months of age and may produce two (2) litters of an average six (5) piglets in a little over one year (Koichi and Halliday 2020). They can recover quickly from the effects of control or drought.

5.3 Habitat and Home Range

Feral pigs are habitat generalists. They are highly adaptable and can tolerate a wide range of different climates. They can live almost anywhere if there is regular food, water and shelter. They are most abundant around wetlands and river systems and are not usually found in desert or dry inland areas. Feral pigs tend to stay within defined home ranges, in response to season or regular disturbance. Family groups of sows with piglets and juveniles tend to have more limited home ranges (2–20 km^2) while boars are typically solitary and can range between 8–50 km^2 (Koichi and Halliday 2020). Some boars have been genetically tracked, through siring young, over several hundred kilometres.

5.4 Possible Control Methods

5.4.1 Background

There are a variety of lethal and non-lethal tools are available to control feral pigs, however not all are useful or practical in every situation. A combination of techniques usually provides the best results, starting with the least intrusive so as not to alarm the population you are trying to control.

The options currently available for the control of feral pigs are:

- Poisoning;
- Trapping;
- Shooting; and
- Exclusion fencing.

There are currently no biological or fertility control agents suitable for feral pig control.

When planning and carrying out control activities, risks to human safety, non-target species, domestic animals and any other environmental concerns must be taken into account (NPWS 2005). As shooting is considered inappropriate in an urban context (without appropriate consultation with Game Council NSW, NPWS, TSC and adjacent landholders), the most practical control options for feral dog control are trapping, exclusion fencing and baiting. These control methods are further discussed below.

5.4.2 Poisoning

Ground-based poison baiting is one of the most economical and effective ways to control feral pigs on a broad scale. 1080 (sodium fluoroacetate) is the main toxin currently used in Australia and is the only poison available for aerial application. Only authorised persons can supply 1080. Other toxins, such as CSSP or SAP (yellow phosphorus) and warfarin, are

being phased out nationally due to animal welfare and non-target concerns. Sodium nitrite, a common human food preservative (250), is also available as an additional toxin for feral pig management. Selecting substances that feral pigs are already familiar with as a bait substrate may improve bait uptake. Grain (e.g. wheat, oats, barley, sorghum, soybeans and lupins) and pellet baits are often used in NSW and QLD. Fruit (e.g. bananas) is also used in fruit growing regions. Manufactured baits for feral pigs are also available and provide high target specificity. All poisonous baits must be coloured (usually in green or blue) to distinguish them from human and animal food and make them less attractive to birds.

Poison baiting is often used as an initial control tool with other methods as a follow-up.

5.4.3 Trapping

Trapping is useful where poison baiting or shooting is not feasible, such as near urban areas. Trapping is not practical for large scale control but can be used to manage pigs at relatively low densities for small areas of high production (<5000ha), where the operator has time to check traps regularly. Trapping is a process, not an event. Successful pig trapping hinges upon several key components, including timing, location, bait materials, pre feeding, setting a trap at the right time.

5.4.4 Exclusion Fencing

Although expensive, exclusion fencing is useful to protect high value areas, crops or animal enterprises as the initial outlay will generally be offset over time. For successful fencing, fences need to be constructed before pigs get used to crossing an area. Once pigs are aware of a food or water source inside the area and become habituated to the source, fencing will have little effect. You can modify existing fences to pig-proof standard through electrification. If electrified, you need to regularly control vegetation growing underneath fences to prevent shorting.

6 EUROPEAN RABBIT AND BROWN HARE

6.1 Introduction

The European rabbit (*Oryctolagus cuniculus*) was deliberately released on the Australian mainland in the mid to late 1800s and is now widely distributed and well adapted to climatic conditions in much of Australia (DEWHA 2008a). Rabbits and hares, along with foxes and cats, are considered to be Australia's most serious vertebrate pests. They are the most abundant small mammal in Australia (with the possible exception of the introduced house mouse) and cause significant impact to native flora and fauna, vegetation communities, landforms, geomorphic processes and sensitive sites, as well as primary industries (DEWHA 2008a).

Rabbits and hares have direct and indirect impacts on a variety of native flora and fauna including preventing regeneration of native vegetation by digging/grazing, and by competing with native fauna for food and shelter (DEWHA 2008a). They also support

populations of introduced species such as cats and foxes, and denude vegetation thereby exposing native fauna species to increased predation.

6.2 Biology

Rabbits and hares can increase their population size very quickly due to short gestation periods, early sexual maturity and large litter sizes (a single female can produce 30 to 40 young per year) (CSIRO 2011). Rabbits and hares reach sexual maturity at five months of age and mature females can be continuously pregnant between six (6) to eight (8) months per year under the right conditions (CSIRO 2011).

6.3 Habitat and Home Range

Rabbits and hares are abundant throughout Australia and can be found almost everywhere, with the exception of the wet tropics and dense coastal forests (CSIRO 2011). They are able to colonise a diverse range of habitat types (DEWHA 2008a) and are abundant where soils are deep and sandy, though they are scarce in areas with clay soils (DSEWPC 2011).

6.4 Possible Control Methods

6.4.1 Background

Effective control of the European rabbit and Brown hares requires integration of different methods, as any technique used in isolation is less effective than two or more techniques carefully combined (DSEWPC 2011). The current methods available for the control of rabbits and hares can be broadly categorised as:

- Biological control;
- Chemical control; and
- Mechanical control.

Other methods of control include rabbit-proof fencing, trapping, and shooting, however, these are used less extensively (DSEWPC 2011).

The following sections discuss potential biological, chemical and mechanical control options. **APPENDIX 4** contains a discussion of the possible constraints to the implementation of possible control methods on the Elysian Development site.

6.4.2 Biological Control

Biological controls include the myxoma virus causing the disease myxomatosis, which only affects rabbits and hares. This pathogen is very effective at reducing population sizes, however, some rabbits and hares have developed resistance to the virus (DSEWPC 2011). Rabbits and hares usually become infected after being bitten by an insect vector, typically mosquitos, but also European and Spanish rabbit fleas that have been introduced to Australia. While myxomatosis depresses rabbit and hare numbers, the percentage killed is usually too low to achieve a significant reduction in their impacts (NSW DPI 2020b).

The other important biological control, which has been more effective in wetter regions than in drier parts of the country, is the rabbit calicivirus disease (rabbit haemorrhagic disease virus - RHDV) (DSEWPC 2011). RHDV appears to be spread in rabbits and hares by direct contact and through insect vectors. The virus may be introduced to rabbits and hares on carrot and oat feed, by treating several warrens then allowing the disease to spread. The disease initially achieved a high level of control among rabbit and hare populations, particularly in more arid environments, however despite efforts to spread it the effects have been very patchy in some districts (NSW DPI 2020b).

6.4.3 Chemical Control

The main chemical control used for rabbits and hares is the poison - sodium fluoroacetate (1080), which provides a mortality rate of up to 90 per cent (DSEWPC 2011). There are also methods used to kill rabbits and hares while they are still in their warrens, in which pressure fumigation or diffusion fumigation techniques are used with toxins such as chloropicrin and carbon monoxide (DSEWPC 2011). Pindone is a registered rabbit poison and is more suitable for use in urbanised areas as it has an antidote (vitamin K1) (DPI 2007).

Poisoning is most effective during the non-breeding season (when rabbits and hares are less territorial and less tied to warrens) and feed is scarce. The best time is usually during mid to late summer (NSW DPI 2020b).

The objective of poisoning is to remove 90% or more of rabbits and hares, which will prevent the population from quickly recovering, allowing time to implement follow up control. Carrots are the preferred feed material for rabbits and hares, but oats and pellets may be used (NSW DPI 2020b).

6.4.4 Mechanical Control

The most widely used mechanical control method for rabbits and hares is the destruction of warrens and above ground harbours (DSEWPC 2011). The warren provides shelter and protection for rabbits and hares, to avoid extremes of weather and predators. Rabbits and hares do not readily dig new warrens, so destruction of warrens greatly inhibits resurgence and re-colonisation of treated areas.

Warren ripping can be an efficient, cost effective method for reducing rabbit and hare numbers and preventing reinvasion of the treated area, as it deprives rabbits and hares of a safe breeding place. Warren ripping is highly target specific and can be successfully employed during the breeding season (when poisoning programs are less effective). The aim of warren ripping is to simultaneously destroy the structure of the warren and kill all of the rabbits and hares. It is best to use dogs to force surface rabbits and hares into warrens before the start of ripping. Note that warrens may extend under fences, buildings, rock ledges and the root system of large trees. These inaccessible burrows should be fumigated some hours before ripping. In some situations where mechanical rippers cannot be used, explosives may be used to destroy warrens. Explosives may only be purchased and used by licensed operators (NSW DPI 2020b).

Rabbits and hares may also live among surface shelter, such as dense vegetation and weeds. Other rabbit and hare harbour includes blackberry, lantana, fallen logs, farm refuse, old machinery and rock piles. When removing vegetation, the onus is on the land manager to ensure that it is within clearing laws and does not threaten endangered species (NSW DPI 2020b).