

# CURRUMBIN ECO-PARKLAND ECOLOGICAL RESTORATION PLAN

**TITLE: Ecological Restoration Plan**

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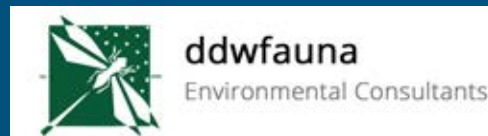
## **CLIENT**

**Economic Development Queensland**

January 2025 V.4



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## DOCUMENT INFORMATION

### Contact Details:

**MRA Environmental**

Unit 1/37 Commerce Drive  
ROBINA QLD 4226  
ABN: 21 082 910 218

mail@mraenvironmental.com.au  
Ph 07 55787040

**Project Manager:**

Natalie Hoskins  
P 0419522207  
E nhoskins@mraenvironmental.com.au

**MRA Environmental**

PO BOX 480  
ROBINA QLD 4226

**Authors:**

Natalie Hoskins (MRA Environmental)  
David Jinks (Gold Coast Botany)  
Damian White (ddwfauna)  
Narelle Power (ddwfauna)  
Jacob White (Gold Coast Botany)

### Client Details:

Client: Economic Development Queensland  
Client contact: Christopher Claude-Ealy  
Client Phone: c/o MRA Environmental 07 55787040

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DESI (QPWS)	✓			✓
City of Gold Coast	✓			✓



## LIMITATIONS

MRA Environmental, Gold Coast Botany and ddwfauna (The Consortium) has prepared this Ecological Restoration Plan for the sole use of Economic Development Queensland, to inform restoration activities for the Currumbin Eco-Parkland over Lot 247 RP854934, Lot 1 RP RP854934 and Lot 2 RP168012 on Piggabeen Road and Currumbin Creek Road Currumbin Valley.

The Consortium have performed its services for this project in accordance with the current MRA professional standards. No other warranty expressed or implied is made as to the professional advice included in this document.

Opinions and judgements expressed herein, which are based on The Consortiums understanding and interpretation of current regulatory standards, should not be construed as legal opinions. The report also contains comments and information provided by others. The Consortium cannot take responsibility for advice provided by any third party.

As this document has been prepared for the sole purpose of informing ecological restoration for the Currumbin Eco-Parkland, it may not contain sufficient information for the purposes of other parties, for other uses or at other locations. It does not purport to present final or detailed engineering designs for construction.

This report should not be altered, amended or abbreviated, issued in part or issued incomplete in any way without prior checking and approval by The Consortium. The Consortium accepts no responsibility for any circumstances that arise from the issue of the report, which has been modified in any way as outlined above.

Artificial intelligence was not used for the generation of any part of this report.



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## EXECUTIVE SUMMARY

The Queensland Government (represented by the Minister for Economic Development Queensland) is responsible for the delivery of a 148-hectare Eco-Parkland on the southern Gold Coast at Currumbin.

The Eco-Parkland will provide spaces for recreational activities, koala fodder plantations and enhancement of koala habitat, land rehabilitation for increased biodiversity and resilience, and opportunities for appreciation of the natural environment.

To support the establishment of these spaces, an Ecological Restoration Plan has been prepared. The implementation of the plan will transform the site from a vacant and historical grazing property, with ecologically significant features impacted by unmanaged recreational activities and weed infestations, to a biodiverse and connected property enjoyed and appreciated by the community.

To develop the Ecological Restoration Plan, the Eco-Parkland site was first subject to ecological surveys between 2022 and 2024 to determine the existing ecological features at the site and use this information as baseline data on which to establish goals and objective for the site as well as for future restoration monitoring. The site was found to contain many ecologically significant features including:

- 13 x Federally listed matters including vegetation communities, flora and fauna.
- 29 x State listed matters also including vegetation communities, flora and fauna.
- Numerous locally significant communities and species.
- Wetlands, watercourses and critical corridors.

Locally, the Currumbin Eco-Parkland (148ha) constitutes 0.36% of the Gold Coast land area (41,430ha), however, it contributes to 17% of plant species and 10% of vertebrate fauna species across the same area.

Further, the site provides flora and fauna habitat and linkages internally and externally across the landscape, and restoration and threat management conducted within the site will also benefit external landscapes.

Threatening processes to both the sites' biodiversity, and opportunities for community appreciation were also identified and the most significant included weed and pest impacts, unauthorised and unmanaged human access, altered hydrology and potential for unmanaged fire. Restoration goals include management and recommendations to minimise threatening processes.



For restoration planning, the site was divided into Zones and Sub-Zones having consideration for landform and ecological features, such as creeks, ridges and gullies, as well as walking and vehicular tracks. Ecological surveys throughout the zones determined the current condition of the environment within these zones and identified key significant features and threatening processes to the sites' biodiversity.

This enabled the development of Restoration Tables which describe the Zones and Sub-Zones, identify goals and objectives for each Sub-Zone, what restoration actions are required and the labour effort required to achieve the goals and objectives.

Key users of the Ecological Restoration Plan will be land management contractors undertaking on-ground restoration works. To assist the delivery of the Plan, restoration treatment methods, consistent across the property, and specific to particular areas of the Currumbin Eco-Parkland, have been included. For example, these differentiate methods for areas such as open paddocks with no canopy cover, canopy areas abutting open paddocks, and complete canopy areas. Specialised restoration treatments for Camphor laurel are also provided.

Important to the success of restoration are implementation strategies for land management personnel and the allocation of funding and commitment to support on-going restoration works. The Ecological Restoration Plan provides a framework for these strategies including for example standards to ensure the practitioners contracted have the necessary qualification and experience to carry out the restoration.

To monitor the on-going progress of land management contractors, budget allocations and the gains achieved towards project goals and objectives, restoration monitoring has been established. The Plan outlines methodologies, frequency and data analysis requirements for key monitoring programs such as photo monitoring, flora survey plot assessments, fauna surveys and aquatic habitat monitoring.

Monitoring data will be evaluated twice a year to inform and provide feedback to project managers on the progress, success or otherwise of management strategies and allow adaptation of restoration techniques and implementation schedules to achieve maximum positive outcomes. Data on evaluation and adaptive management required will be reported to the property managers and recommendations regarding ongoing management provided.

Opportunities to assist and enhance restoration of the Currumbin Eco-Parkland site, beyond the scope of the Ecological Restoration Plan, have been provided and include for example community activities, educational pursuits, additional funding and potential for koala offsets. Further, the Plan provides ancillary actions recommended to land managers of the Currumbin Eco-Parkland to facilitate the timely and effective implementation of the Ecological Restoration Plan.



## REPORT LAYOUT

### **Introduction**

Background, Project Vision, Acknowledging Indigenous Culture

### **Methodology**

Principles of Restoration and Reference States

### **Baseline Inventory**

Ecosystem Features, Flora and Fauna Species

### **Restoration Zones**

Establishment of Management Zones

### **Restoration Treatments**

Approach, Treatments and Restoration Tables

### **Implementation Strategies**

Contractor Requirements, Resource Allocations

### **Restoration Monitoring**

Photos, Flora and Fauna Surveys, Contractor DRS

### **Evaluation**

Monitoring Assessment and Adaptive Management Requirements

### **Reporting**

Reporting Requirements

### **Opportunities**

Community Engagement, Education, Grants, Offsets



## 1.0 INTRODUCTION

### 1.1 Background

In October 2020, the Honourable Anastacia Palaszczuk MP, Premier and Minister for Trade announced an election commitment to transform 148 hectares of land on the Southern Gold Coast into a major new Eco-Parkland.

The site identified for the Currumbin Eco-Parkland is located at 315 Currumbin Creek Road, Currumbin Waters. The site presents opportunities for the preservation and rehabilitation of the natural environment including flood plain storage and endangered ecosystems.

Planning for the parkland has commenced and once completed will include:

- sporting and recreational elements for family and community enjoyment.
- protections for local koala habitats, including fodder eucalypt plantation.
- nature based recreational trails and
- opportunities for rehabilitation and appreciation of the natural environment through eco-tourism.

To facilitate the design and delivery of ecological restoration, The Consortium was engaged by EDQ in 2023 to prepare an Ecological Restoration Plan (ERP). Ecological restoration is defined by the Society for Ecological Restoration<sup>1</sup> as:

*‘Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed’.*

Additionally, the National Restoration Standards<sup>2</sup> describes the practice of ecological restoration as:

*‘Seeks to transform humanity’s role from one where we are the agents of degradation to one where we act as conservators and healers of native ecosystems.’*

The Queensland Governments commitment to the delivery of the Currumbin Eco-Parkland including ecological restoration components aligns well with these definitions. The ERP has been prepared as a guide for site managers, to assist with property restoration utilising standard and respected restoration methodologies as contained in the South East Queensland Ecological Restoration Framework<sup>3</sup> and the National Restoration Standards<sup>2</sup>.

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<sup>1</sup> Society for Ecological Restoration International Science & Policy Working Group. 2004. The SER International Primer on Ecological Restoration. [www.ser.org](http://www.ser.org) & Tucson: Society for Ecological Restoration International.

<sup>2</sup> Standards Reference Group SERA, 2021. National Standards for the Practice of Ecological Restoration in Australia. Edition 2.2. Society for Ecological Restoration Australasia.

<sup>3</sup> Chenoweth EPLA and Bushland Restoration Services, 2012



## 1.2 Project Vision

The specific project scope is provided in Section 1.3, however the ERP wholistically aims to transform the restoration areas of the Currumbin Eco-Parkland site into a space that improves in-situ habitat value, provides pathways through the local and regional landscape for flora and fauna connectivity, and enables long-term community ownership & protection into the future.

By acquiring the Currumbin Eco-Parkland site, the Queensland Government has activated sections of this land for restoration. The engagement of traditional landowners, scientists, designers, specialist practitioners and local community will deliver the restoration. Restored vegetation communities will assist with the protection of threatened, otherwise significant flora and fauna species and endangered ecological communities and provide opportunities for on-going long-term persistence and resilience of the site biodiversity into the future.

Building climate resilient landscapes is a key vision of the ERP by providing the site flora and fauna with the best possible opportunity to survive and flourish under a predicted changing climate. Whilst this ERP cannot alter climate impacts, it can assist with the provision of linkages to corridors external to the site to allow biota to, where necessary, move across the landscape to more suitable habitats.

Whilst ecological restoration has become an important tool in environmental management, there is rising awareness of the connections between restoration and wellbeing<sup>4</sup>. The UN Strategy goals are to prevent, halt and reverse the degradation of ecosystems across the world, and to create:

*A world where — for the health and wellbeing of all life on earth and that of future generations — we have restored the relationship between humans and nature, by increasing the area of healthy ecosystems, and by putting a stop to their loss, fragmentation & degradation*

There are also benefits to human health and wellbeing that result from participation in ecological restoration activities<sup>5</sup> and this ERP includes opportunities for community to participate in the ecological restoration of the Currumbin Eco-Parkland.

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<sup>4</sup> The United Nations Decade on Ecosystem Restoration 2021-2031 (UN Strategy).

<sup>5</sup> March, P. Auckland, S. Dudley, T. Kendal, D. Flies, E. (2023) *A mountain of health benefits? Impacts of ecological restoration activities on human wellbeing*. Wellbeing, Space and Society Volume 4.



### 1.3 Project Scope

The ERP will deliver a framework for the restoration of parts of the Currumbin Eco-Parkland through the consideration of appropriate restoration planning, commitment to implementation, monitoring and evaluation to achieve the desired restoration outcomes.

Specifically, the ERP delivers:

1. An ecosystem baseline inventory for the property
2. Ground-truthed reference ecosystems across the property
3. Targets, goals and objectives for management zones and sub-zones across the property
4. Suggested restoration treatment prescriptions
5. Identification of opportunities to assist restoration
6. Identification of threats to the success of the ERP
7. Monitoring to evaluate progressive restoration outcomes
8. Evaluation and reporting

### 1.4 Project Area

The project area (Currumbin Eco-Parkland), shown on **Figure 1-1**, is located in the suburb of Currumbin Waters, within the lower catchment area of Currumbin Valley, and approximately 5km upstream from the mouth of Currumbin Creek. The Currumbin Eco-Parkland comprises Lot 2 RP168012 and Lots 1 & 247 on RP854934 which join to form a 148-hectare site situated between Currumbin Creek to the north and the Queensland New South Wales border to the south (**Figure 1-2**). Piggabeen Road forms the western site boundary and Hoffschildt Drive is to the east.

The site is located entirely within the City of Gold Coast Local Government Area, Queensland.

#### 1.4.1 Site Context

From a national context, the site is located within one of Australia's 15 Biodiversity Hotspots - #3 Border Ranges North and South (QLD & NSW sub-tropical and temperate hotspot) shown on **Figure 1-3**, and which is one of Australia's most biologically diverse landscapes and the most biodiverse area in New South Wales and Southern Queensland<sup>6</sup>.

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<sup>6</sup> Australia's Sixth National Report to the Convention on Biological Diversity March 2020.



**Figure 1-1**

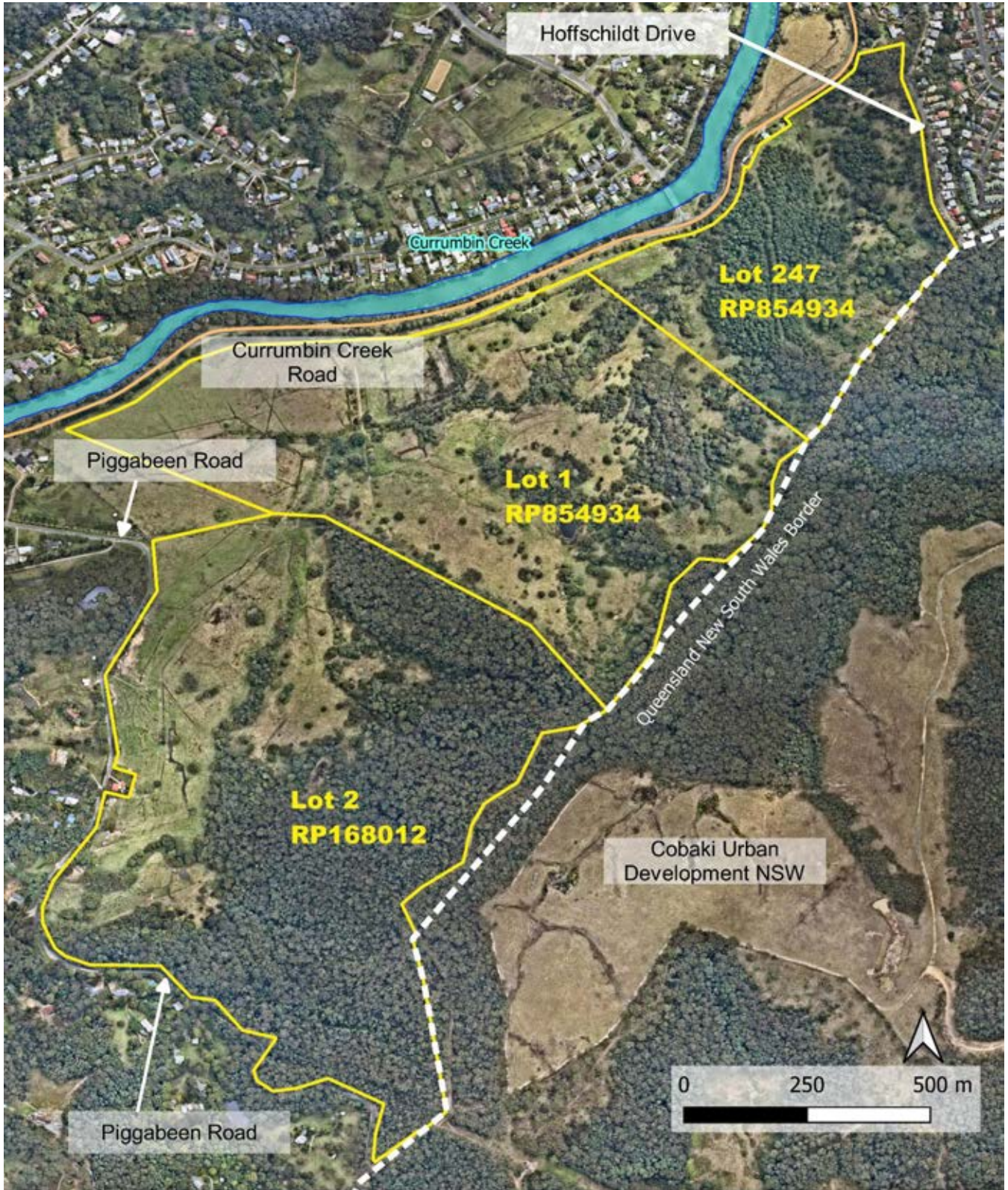
<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Site Location
<b>Data Source:</b> Nearmap	<b>Date:</b> 16.06.24	<b>Drawn:</b> NH



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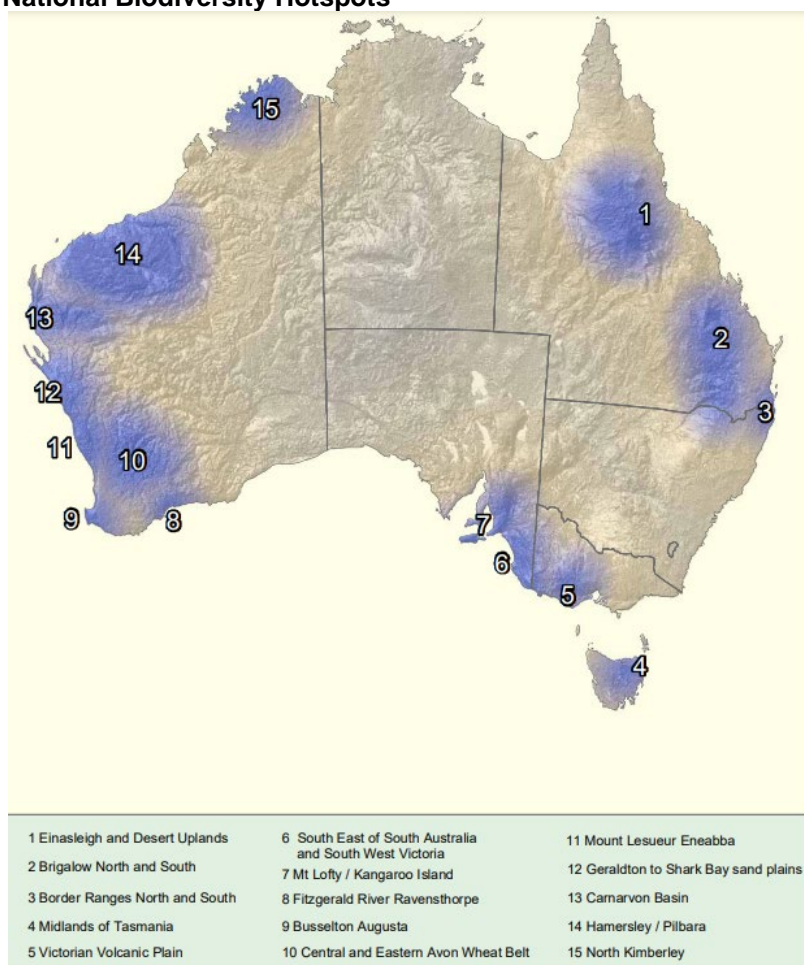
**ddwfauna**  
Environmental Consultants



**Figure 1-2**

<b>Client:</b>	<b>Project:</b>	<b>Title:</b>
Economic Development Queensland	Currumbin Eco-Parkland Ecological Restoration Plan	Site Extent
<b>Data Source:</b> Nearmap	<b>Date:</b> 26.08.24	<b>Drawn:</b> NH

**Figure 1-3: National Biodiversity Hotspots<sup>7</sup>**



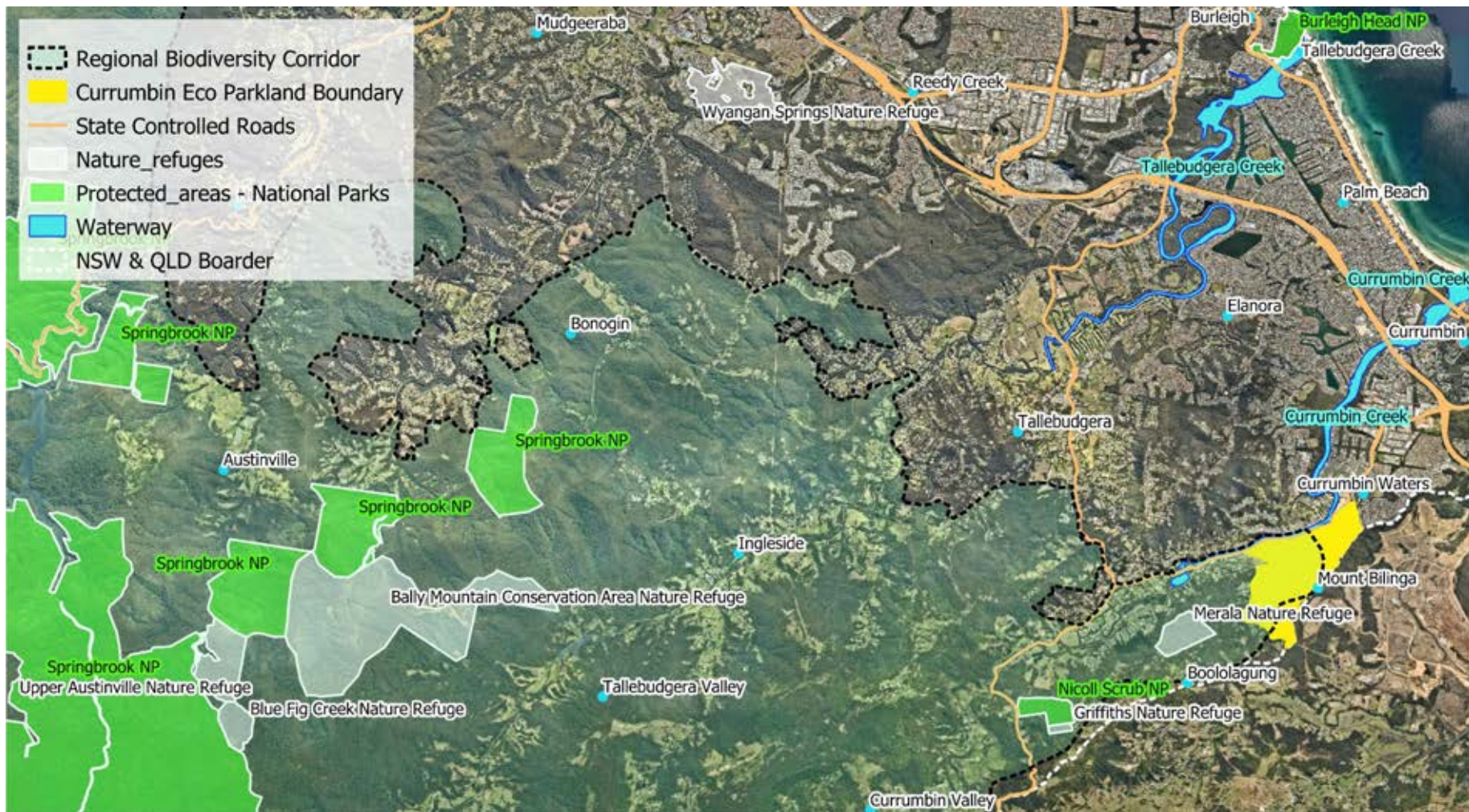
This region's high population growth, with associated urban and tourist developments along the coast, is a major cause of habitat loss and fragmentation. This hotspot (#3) is also under considerable threat from climate change, weeds, fire, and recreational use, amongst other threats<sup>8</sup>.

Regionally, the site is situated on the eastern end of a Statewide Biodiversity Corridor<sup>9</sup> linking Gondwana Rainforests of Australia World Heritage Area – Springbrook Section to Currumbin Creek estuary incorporating protected areas such as Nicoll Scrub National Park and nearby Merala and Griffiths Nature Refuges (**Figure 1-4**).

<sup>7</sup> Commonwealth of Australia 2003

<sup>8</sup> Department of Environment, Climate Change and Water NSW 2010, Border Ranges Rainforest Biodiversity Management Plan - NSW & Queensland, Department of Environment, Climate Change and Water NSW, Sydney

<sup>9</sup> A Biodiversity Planning Assessment - Southeast Queensland Bioregion – Summary Report Version 4.1 (2016)



**Figure 1-4**

<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Regional Context
<b>Data Source:</b> Nearmap	<b>Date:</b> 26.08.24	<b>Drawn:</b> NH





Locally, the site provides an open space area between high density residential development to the east and north, and rural residential/peri-urban areas along Currumbin Valley to the west. It provides species habitat in an area that is under pressure for ongoing development, including land clearing and habitat fragmentation. A large urban area (520Ha) to the south-east of the site in NSW is currently under urban development, significantly reducing habitat opportunities for local species and increasing the ecological value of retained ecosystems in the Eco-Parkland (**Figure 1-2**).

#### **1.4.2 Topography and Drainage**

The site is characterised by a ridgeline that runs the entire eastern property boundary at elevations up to RL105 at the peak of Mount Bilinga (**Figure 1-5**), with steep topography (>20%). These ridges are largely vegetated with Eucalypt forests except for several gullies on the northern side of Mount Bilinga that have been historically cleared for agricultural purposes including cattle grazing and mixed plantations.

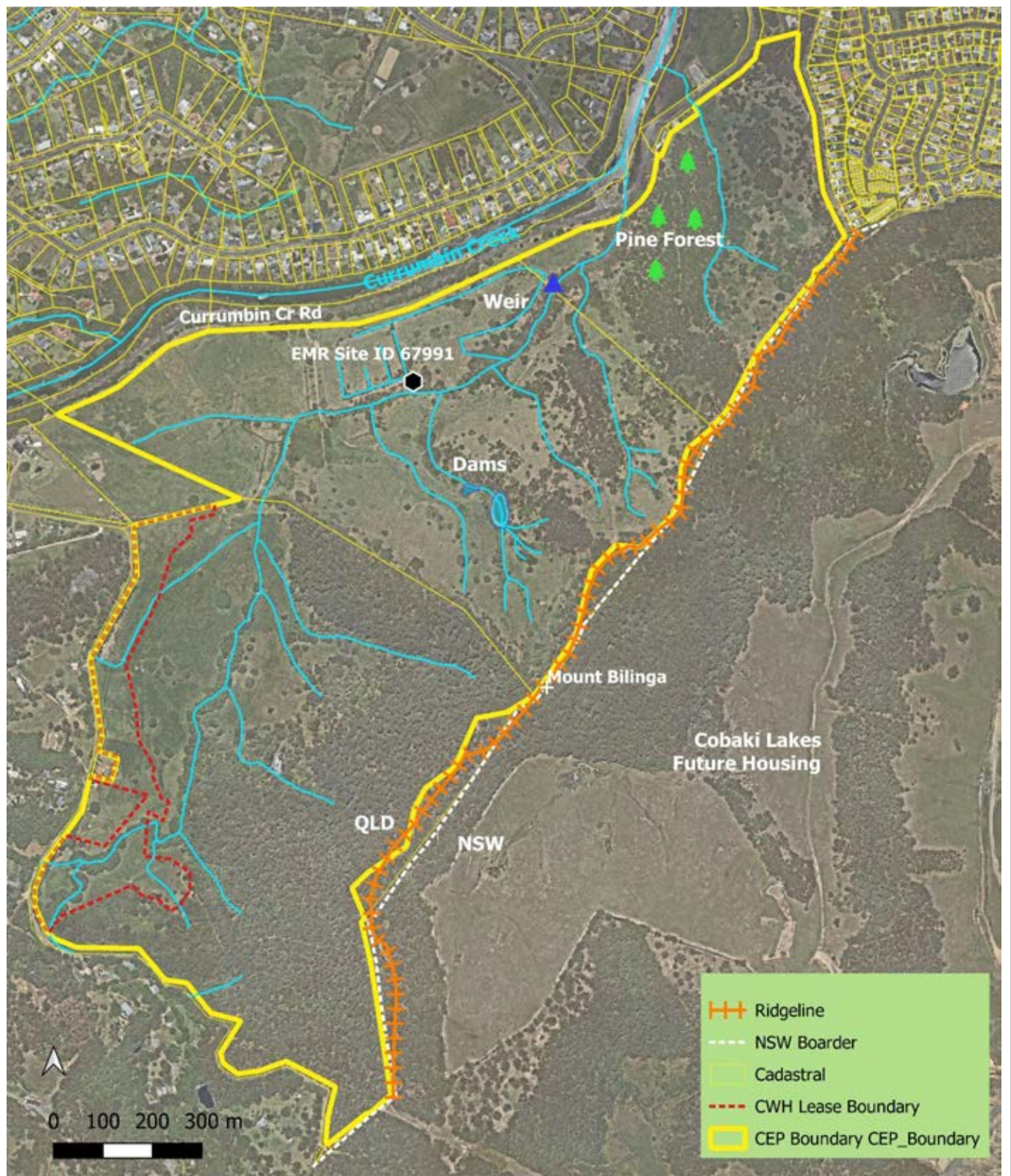
From the ridges, the site drops down in elevation to less than 10m AHD towards Currumbin Creek. The low-lying alluvial areas are largely cleared of vegetation with pasture grasses dominant and supporting grazing practices that have only very recently ceased. Manmade drainage channels cross through the low-lying areas. A non-functioning weir is shown on **Figure 1-5** and together with the drainage channels would have once assisted with both quicker site drainage and the exclusion of salt water into the site and, therefore, the subsequent maintenance of grazing pastures.

The lowland areas are prone to flooding from both local creek inputs and regional inundation from Currumbin Creek<sup>10</sup>.

The main drainage feature of the site is a centrally located creek running the length of the site from Piggabeen Road in the west to Currumbin Creek in the north. Whilst an official creek name has not been identified in our searches, it was colloquially referred to as Piggabeen Creek by a local resident. Another Piggabeen Creek has been identified just to the south of the site in New South Wales and so as not to generate confusion, this ERP refers to the site creek as 'unnamed'.

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<sup>10</sup> Design Flow (2021) Currumbin Eco Parkland Preliminary Flood Impact Assessment



**Figure 1-5**

<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Site Features
<b>Data Source:</b> Nearmap	<b>Date:</b> 26.08.24	<b>Drawn:</b> NH



### 1.4.3 Land Uses and Features

There are currently no buildings or significant structures on the site, except for a non-functioning weir and dam shown on **Figure 1-5**. An area listed on the Queensland Government Environmental Management Register (Site ID 67991) is also shown on **Figure 1-5**.

The site is essentially 100% vegetated, with approximately sixty percent treed with canopy cover, and the remainder dominated by species associated with open pasture grass and wetland/mangrove communities (**Photo 1**). These are largely in the lower northern and western portions of the site. The upper more southern elevations contain several vegetation communities dominated by *Eucalyptus* trees with numerous understorey rainforest species (**Photo 2**).

An exotic pine forest comprising the exotic *Pinus elliottii* (Slash Pine) is located in the northeastern portion of the site (**Photo 3**). It is believed to have been planted in the early 1980's and covers approximately 6.8Ha.

Several property maintenance trails are located on site, many currently unserviceable, and shown on **Figure 1-5**. They are a mix of vehicular and walking trails.

Historically, as discussed in Section 1.4, the site has been used for cattle and horse grazing (**Photo 4**) through large portions of the site, managed in part by internal fencing, and horse agistment in the lower western sections and on-site recreational horse trails. As a result, large parts of the site have been significantly modified from pre-clear condition.

## 1.5 Site History

Site vegetation has been changed significantly over time in many parts of the site because of various land use activities, including vegetation clearing for pasture in lower areas and mid-slopes, clearing for tracks, fences and dams, and clearing for domestic and agricultural infrastructure (including a farm residence and ancillary buildings, since demolished and removed). Particularly in lower sections, landform has also been changed, including numerous cut drainage lines. In combination with a weir (now disused) in the lower estuary, this has caused hydrological changes to vegetation.

Other historical uses have included logging, grazing, plantations including for softwood timber & fruit trees, and amenity planting associated with the previous farm residence.

Where grazing activities have reduced over time, there is a clear trend to a higher species biodiversity including for threatened plant species.

*Photos 1-4 (Photos N Power)*



Photo 1: Mangrove Community



Photo 2: Eucalypt Trees



Photo 3: Exotic Pine Forest

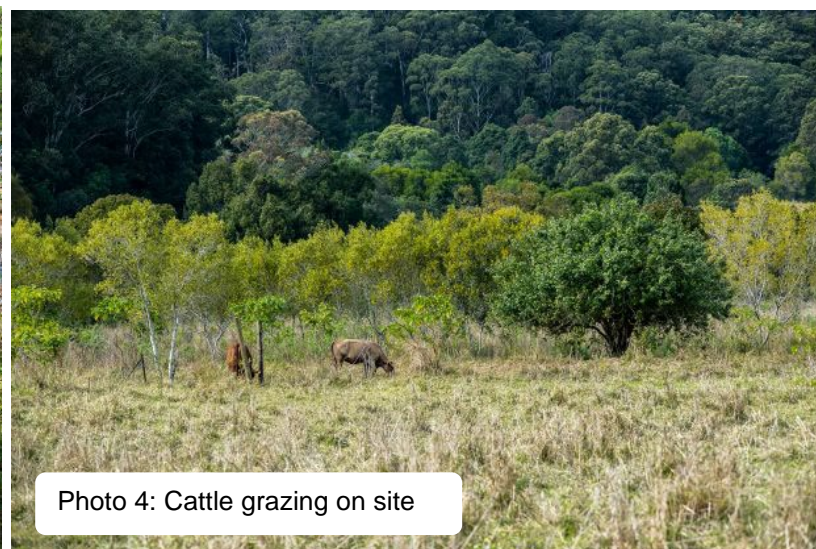


Photo 4: Cattle grazing on site



This is particularly evident in steeper gully areas, and, for example, in the small valley accessed from Piggabeen Road. While initially cleared, this area has now recovered with older regrowth and represents a diverse section of Lowland Rainforest on the site.

Lower elevations between the foothills and Currumbin Creek Road represent the most highly modified sections of the site. Except for only a few older trees, this area has been kept clear of vegetation other than pasture species and has been used for grazing and horse agistment over an extended period.

Notwithstanding the extent of historical modification, however, and the work required for future ecological restoration, the site contains a very high plant species diversity, significant areas of endangered forest and a large number of threatened species and habitat, which, together with adjoining natural areas, provides a substantial local seed source for site resilience and restoration.

## 1.6 Acknowledging Indigenous Rangers

There have been people living in the Gold Coast region for thousands of years using resources that the land provided and at the same time protecting it. In more recent times the landform has changed and the resources it once provided have changed also.

To restore the land and inject ecosystem resilience in the restoration, it was important that collaboration and knowledge-sharing between the restoration development team, Indigenous people and land managers occurred. The Consortium were fortunate to have the opportunity to work with a local Gold Coast Indigenous Land and Sea Rangers Program (Ngarang-Wal Rangers).

The following personnel from Ngarang-Wal Rangers participated in flora and fauna assessments contributing to the development of the ERP.

Justine Dillon

Kathleen Nube

April Hati

Harlem Kennaugh

Marshal Dickey

Kalib Nicholls

David O'Riley



## 1.7 Ecologically Significant Areas

In February 2023 the Consortium delivered an Ecological Assessment of the Currumbin Eco-Parkland to EDQ (DSDILGP-EDQ-3158-22)<sup>11</sup>. The assessment was undertaken to facilitate the master planning processes for the property by way of identifying and mapping environmental values of the site.

The assessment produced an inventory of environmental data, significant ecological mapping and identification of opportunities and recommendations to further inform the master planning process. **Figure 1-6** provides a summary of the ecologically significant areas identified in the 2023 assessment and areas recommended for restoration.

This 2023 Ecological Assessment<sup>11</sup> has been updated in 2024<sup>12</sup> to include further ecological information gained from the additional field work associated with the development of the Ecological Restoration Plan.

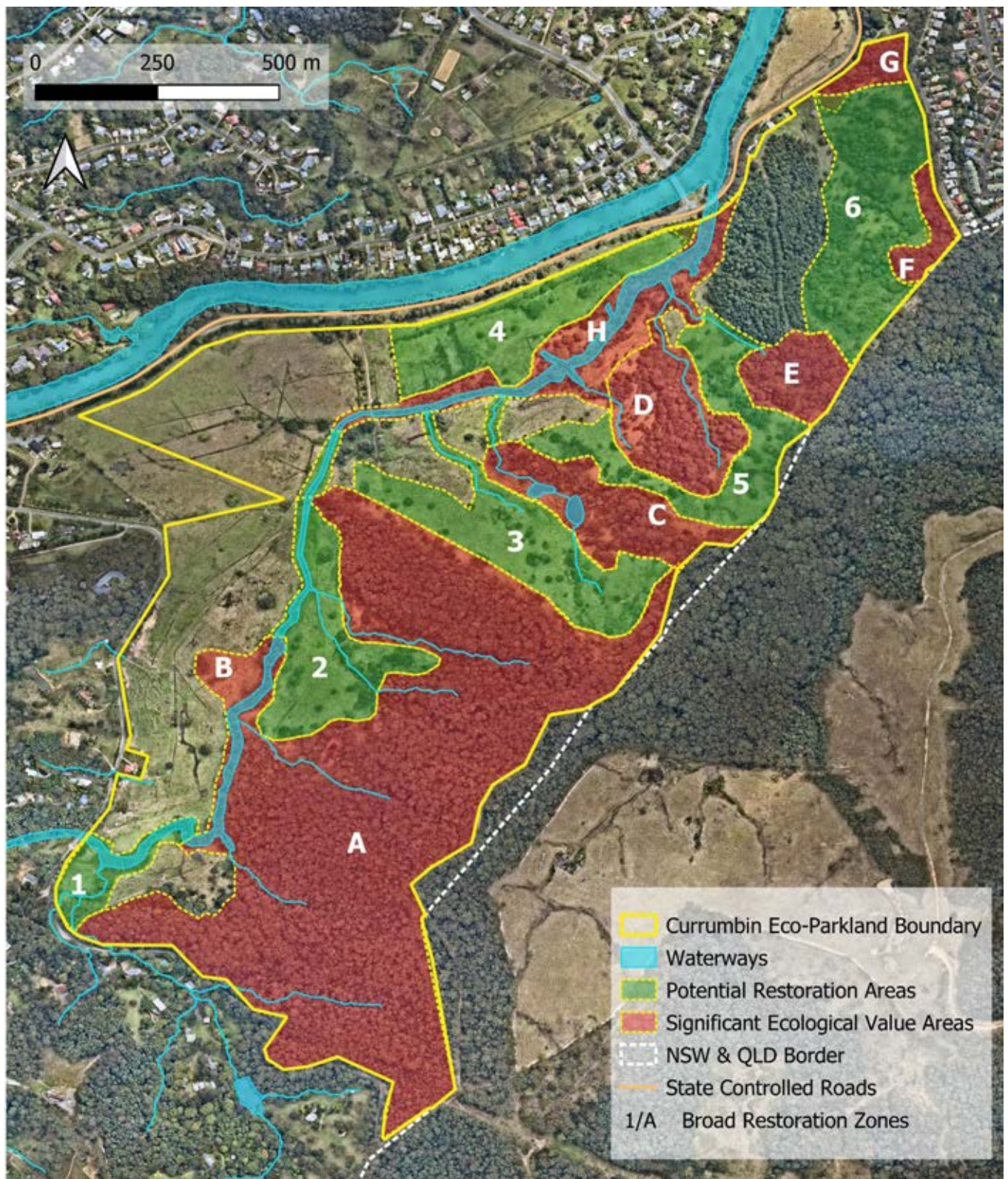
## 1.8 Importance of Restoration for Local Flora and Fauna

All flora and fauna at the Currumbin Eco-Parkland need food and shelter and the opportunity to move across landscapes as needed in response to temperature, rainfall, breeding and food sources. By restoring areas of the Currumbin Eco-Parkland, patches of native vegetation will be connected at the local scale and larger connectivity and stepping stones across the landscape will be formed to link Nature Reserves, National Parks, private bushland and waterways for the benefit of the wildlife and its survival in years to come. The site is now known to contain numerous threatened flora and fauna species, and threatened ecological communities, and the proposed restoration treatments to be applied will allow for the continued occupancy of these species within the site as well as providing opportunities for new species to establish.

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<sup>11</sup> Currumbin Eco-Parkland Ecological Assessment (MRA Environmental, Gold Coast Botany, ddwfauna) February 2023

<sup>12</sup> Currumbin Eco-Parkland Ecological Assessment (MRA Environmental, Gold Coast Botany, ddwfauna) August 2024



		<b>Figure 1-6</b>
<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Ecologically Significant Areas Potential Restoration Areas
<b>Data Source:</b> Nearmap	<b>Date:</b> 01 10 24	<b>Drawn:</b> NH

## 2.0 METHODOLOGY

A methodology adopted for the development of the Currumbin Eco-Parkland ERP largely follows the National Standards for the Practice of Ecological Restoration in Australia (the Standards) which identifies six (6) principles underpinning restoration philosophies and methods, and outlines the steps required to plan, implement, monitor and evaluate a restoration project to increase the likelihood of its success. The key principles described in the Standard are listed in **Table 1**.

### 2.1 Key Principles of Ecological Restoration

**Table 1: Key Principles of Ecological Restoration**

Principle	Description
1. Ecological restoration practice is based on an appropriate local native reference ecosystem.	The reference ecosystem, as well as an ecosystem baseline inventory, guides project targets and provides a basis for monitoring and assessing outcomes.
2. Restoration inputs will be dictated by level of resilience and degradation	The capacity for natural recovery will influence the prescribed intervention level of restoration and assist in the identification of the appropriate ecological restoration approach.
3. Recovery of ecosystem attributes is facilitated by identifying clear targets, goals and objectives.	Restoration project transparency, manageability and chance of success increases with clearly defined restoration targets and goals, and the translation into measurable objectives.
4. The goal of ecological restoration is full recovery, insofar as possible, even if outcomes take long timeframes or involve high inputs.	Qualification of a project as an ecological restoration activity is not determined by the duration of the project but by the intent to achieve the highest and best level of recovery possible.
5. Restoration science and practice are synergistic	Practitioner and stakeholder knowledge and experience is important for restoration practice. This knowledge comes from local communities, including traditional ecological knowledge holders, on-ground land and water managers, and restoration practitioners. This knowledge can also be supported by knowledge drawn from informal and formal science.
6. Social aspects are critical to successful ecological restoration.	Restoration is carried out to satisfy not only conservation values but also socioeconomic values, including cultural ones. Indigenous groups can play a major role in ecological restoration.



## 2.2 Ecosystem Baseline Inventory

As mentioned in Section 1.7, the Consortium delivered an Ecological Assessment of the Currumbin Eco-Parkland to EDQ (DSDILGP-EDQ-3158-22)<sup>13</sup> in 2023. The assessment was undertaken to facilitate the master planning processes for the property by way of identifying and mapping environmental values of the site. The assessment involved:

- Desktop assessment.
- Community consultation.
- Detailed flora and fauna field surveys.

The assessment produced an inventory of environmental data, significant ecological mapping and identification of opportunities and recommendations to further inform the master planning process. As also previously mentioned, in 2024, The Consortium undertook further ecological site assessments and updated the Ecological Assessment Report<sup>14</sup>. The revised ecological inventory now forms the ecosystem baseline inventory for the ERP and is summarised in **Section 3.0**.

## 2.3 Reference State Assessments

Reference ecosystem identification has been carried out to guide project targets and inform monitoring of the conservation outcomes for the restoration project. As identified in the ecosystem baseline inventory (**Section 3.0**), Currumbin Eco-Parkland contains several different ecosystems, and these are defined in Queensland as regional ecosystems (REs), which are based on vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil (Sattler and Williams 1999).

In the case where vegetation clearing has occurred to an extent that makes identifying the current REs difficult, pre-clearing REs are considered. These are defined as the vegetation or RE present before clearing and generally equate to 'pre-1750' prior to major impacts from non-indigenous people i.e. extensive clearing, altered fire regimes, grazing animals.

### 2.3.1 Regional Ecosystems

To confirm or otherwise the existence of specific REs across the site, and develop reference ecosystems for the ERP, Gold Coast Botany undertook field surveys which ground-truthed existing RE mapping (Refer **Section 3.1**). To further identify/confirm site RE's, secondary plot surveys were undertaken at seven locations across the site and in accordance with *The Methodology for Surveying and Mapping Regional Ecosystems and Vegetation Communities in Queensland Version 6.0*.

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<sup>13</sup> Currumbin Eco-Parkland Ecological Assessment (MRA Environmental, Gold Coast Botany, ddwfauna) Feb 23

<sup>14</sup> Currumbin Eco-Parkland Ecological Assessment (MRA Environmental, Gold Coast Botany, ddwfauna) Aug 24



Detailed methodologies and results of these surveys are provided in the updated Ecological Assessment (August 2024). Results are summarised in **Section 3.1** and **Figure 2-1** identifies flora plot locations.

### **2.3.2 Values Based Management Framework (DESI)**

Queensland Parks and Wildlife Service (QPWS) manages parks and forests under the internationally aligned Values-Based Management Framework (VBMF). Given the future long-term relationship between Currumbin Eco-Parkland and the Department of Environment, Science and Innovation (DESI), it is essential that monitoring and management tools for site restoration are appropriate and relevant to DESI's current practices. Fundamental to the VBMF is understanding the condition of key values and assessing how effectively DESI are managing parks over time.

At a State Planning Level, DESI assign Levels of Service (LoS) for nine (9) management themes (i.e. fire, pest management, visitor management) at each park, and these LoS guide the amount of time, people and money which is invested in each theme. Themes include:

- First Nations partnerships and cultural heritage management
- Fire management
- Pest management
- Natural values management
- Post-contact cultural heritage management
- Visitor management
- Community, partnerships, and other interests
- Field management capability
- Operational planning and support.

Planning for each park commences with an assessment of the park's values and this commenced in early 2024 when benchmark assessments of Key Values were conducted at the Currumbin Eco-Parkland. VBMF Plot locations are provided on **Figure 2-1**

Each key value was assessed for the following:

1. confirm key value description and map
2. assess current key value condition
3. assess current trend rating for condition
4. assign confidence in assessment for condition and trend
5. identify current threatening processes
6. calculate the threat ratings
7. draft strategic management directions for key values
8. set priorities for strategic management directions



These health checks were carried out between 10 March 2024 to 24 April 24, by GCB and DESI (with participation from Ngarang-Wal Rangers), using the Natural Values Health Checks guide, within each threatened vegetation community, these being regarded as high value areas by the VBMF Framework.

### 2.3.3 Targeted Fauna Surveys

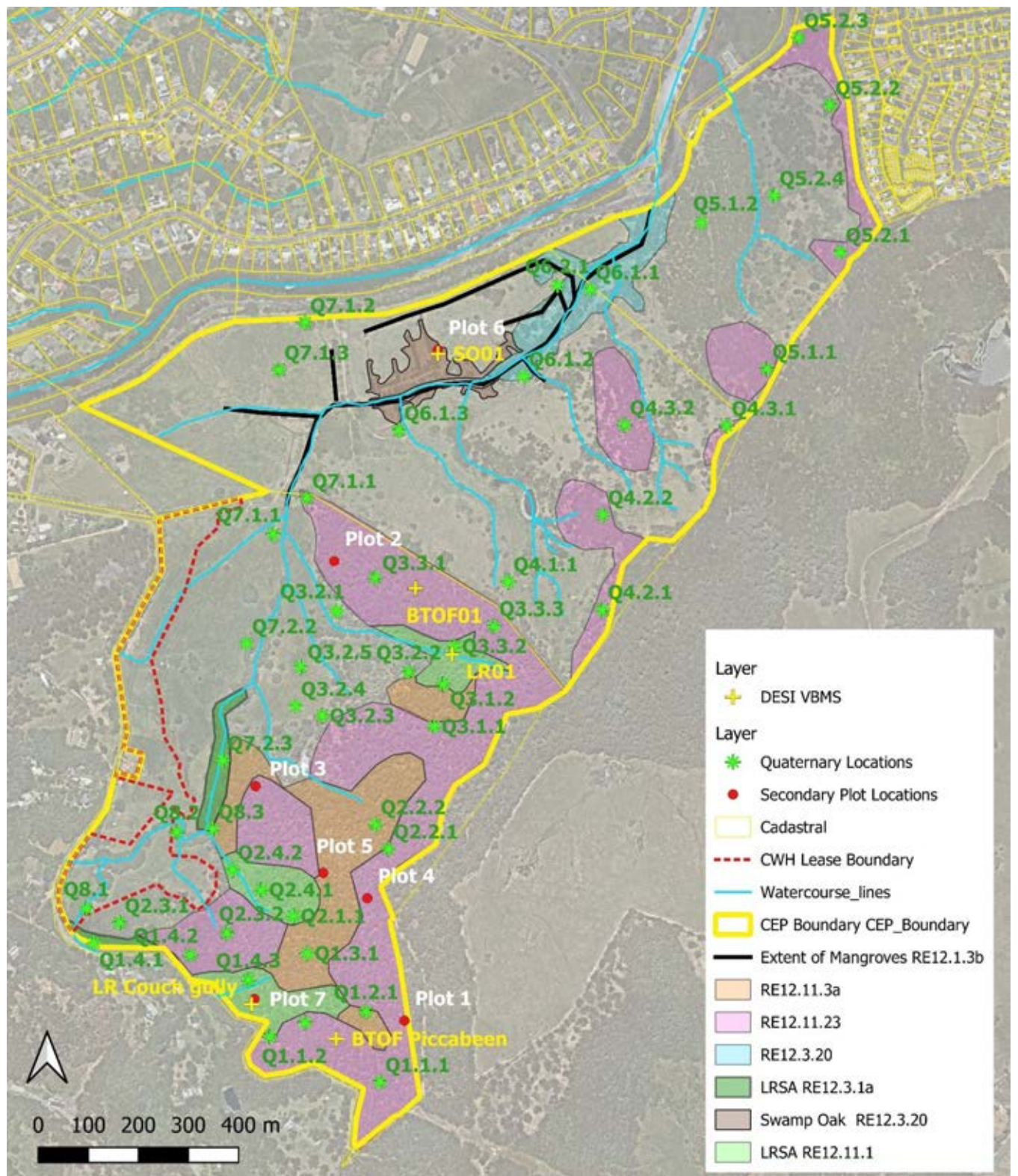
Following on from detailed baseline fauna surveys of the Currumbin Eco-Parkland undertaken in 2022, additional fauna surveys targeting threatened or otherwise significant species were carried out during 2023/24. These targeted surveys were designed to gain a greater understanding of the significant species present or potentially present and use this knowledge to provide input into an overall Ecological Restoration Plan. Additional targeted surveys were undertaken for:

- Hinterland crayfish (*Euastacus maida*)
- Pink Underwing moth (Southern) (*Phyllodes imperialis smithersi*)
- Richmond birdwing butterfly (*Ornithoptera richmondia*)
- Tuskefrog (*Adelotus brevis*)
- Powerful owl (*Ninox strenua*)
- Wetland birds
- Southern greater glider (*Petauroides* sp.)
- Koala (*Phascolarctos cinereus*)
- Eastern -grey kangaroo (*Macropus giganteus*)

Methodologies and results of the 2024 survey are provided in the updated Ecological Assessment (August 2024) and summarised in **Section 3.4**.

Echidna photo taken on site (N. Power)





**Figure 2-1**

<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Monitoring Locations – Flora Plots and DESI VBMS
<b>Data Source:</b> Nearmap	<b>Date:</b> 09/07/24	<b>Drawn:</b> NH



### 2.3.4 Aquatic Ecological Surveys

Blue Earth Environmental conducted an Aquatic Ecological Assessment of the lower portions of Currumbin Eco-Parkland in 2024, which consisted of both desktop and field assessments<sup>15</sup>.

The objectives of the assessments were to inform the Ecological Restoration Plan by:

- Validating the type, extent and condition of aquatic habitats occurring within the study area.
- Assessing locations for proposed ephemeral wetlands.
- Conducting in-situ water quality sampling to assess wetland and waterway function, and
- Undertaking sampling of fish communities within estuarine and freshwater reaches.

Methodologies and results of the aquatic ecological assessment are provided in the updated Ecological Assessment (August 2024) and summarised in **Section 3.5. Figure 3-3** identifies aquatic habitat and sample sites.

#### **White faced heron photo not taken on site (N. Power)**



<sup>15</sup> Currumbin Eco Parkland Aquatic Ecological Assessment – February 2024. Blue Earth Environmental BE1132-RE.001

### 3.0 BASELINE INVENTORY

An ecosystem baseline inventory has been established for the Currumbin Eco-Parkland from field surveys conducted by the Consortium, from public consultation and desktop assessment of the property. This section presents the baseline inventory for the Currumbin Eco-Parkland with additional information (detailed species lists) provided in **Attachment 1** for Flora and **Attachment 2** for Fauna. **Tables 2, 3** and **4** list ecosystem features, flora matters, and fauna matters respectively, and Section 3.5 provides a summary of results from the aquatic ecological surveys.

#### 3.1 Ecosystem Features

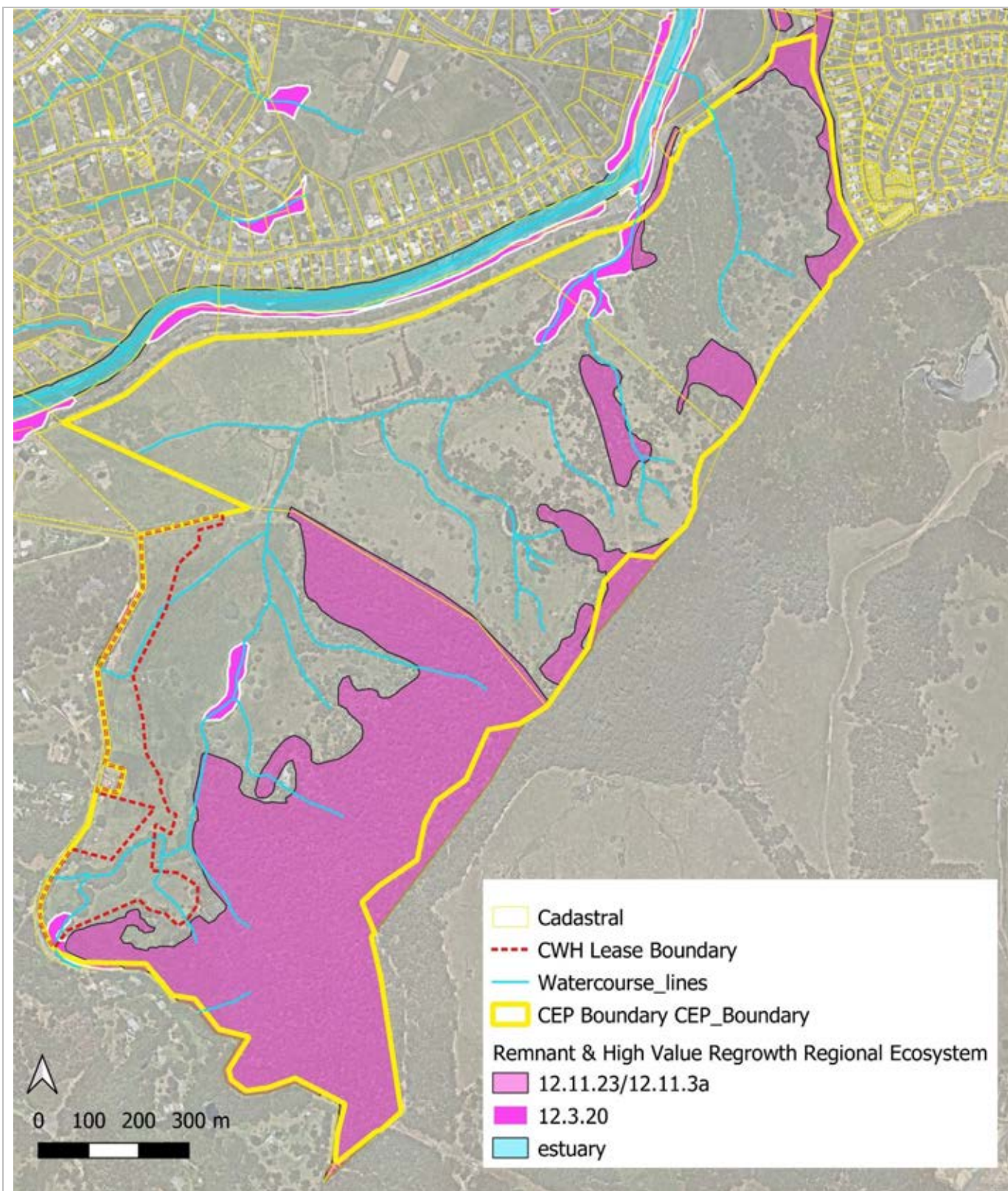
Ecosystem features within the Currumbin Eco-Parkland site have been identified during the ecological site assessments between 2022 and 2024, and these are listed in **Table 2**.

Table 2: Baseline Ecosystem Features 2024

Ecosystem Features	Description	Referral
State Mapped Regional Ecosystems	Department of Resources 2024 indicates the site supports remnant (Category B), regrowth (Category C) and non-remnant (Category X) vegetation. Specifically, the REs mapped include: <ul style="list-style-type: none"> <li>RE12.11.23 (Endangered);</li> <li>RE12.11.3a (Least Concern);</li> <li>RE12.3.1 (Endangered);</li> <li>RE12.3.20 (Endangered)</li> </ul>	Figure 3-1
Ground-truthed Regional Ecosystems (verified in 2023/2024)	RE 12.11.23 <i>Eucalyptus pilularis</i> open forest on coastal metamorphics and interbedded volcanics.	Endangered
	RE 12.11.3a <i>Lophostemon confertus</i> +/- <i>Eucalyptus microcorys</i> , <i>E. carnea</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> woodland.	Least Concern
	RE 12.11.1 Simple notophyll vine forest often with abundant <i>Archontophoenix cunninghamiana</i> (gully vine forest) on metamorphics +/- interbedded volcanics.	Least Concern
	RE 12.1.3b	Least Concern
		Figure 3-2 Site Regional Ecosystem Photos in Attachment 3

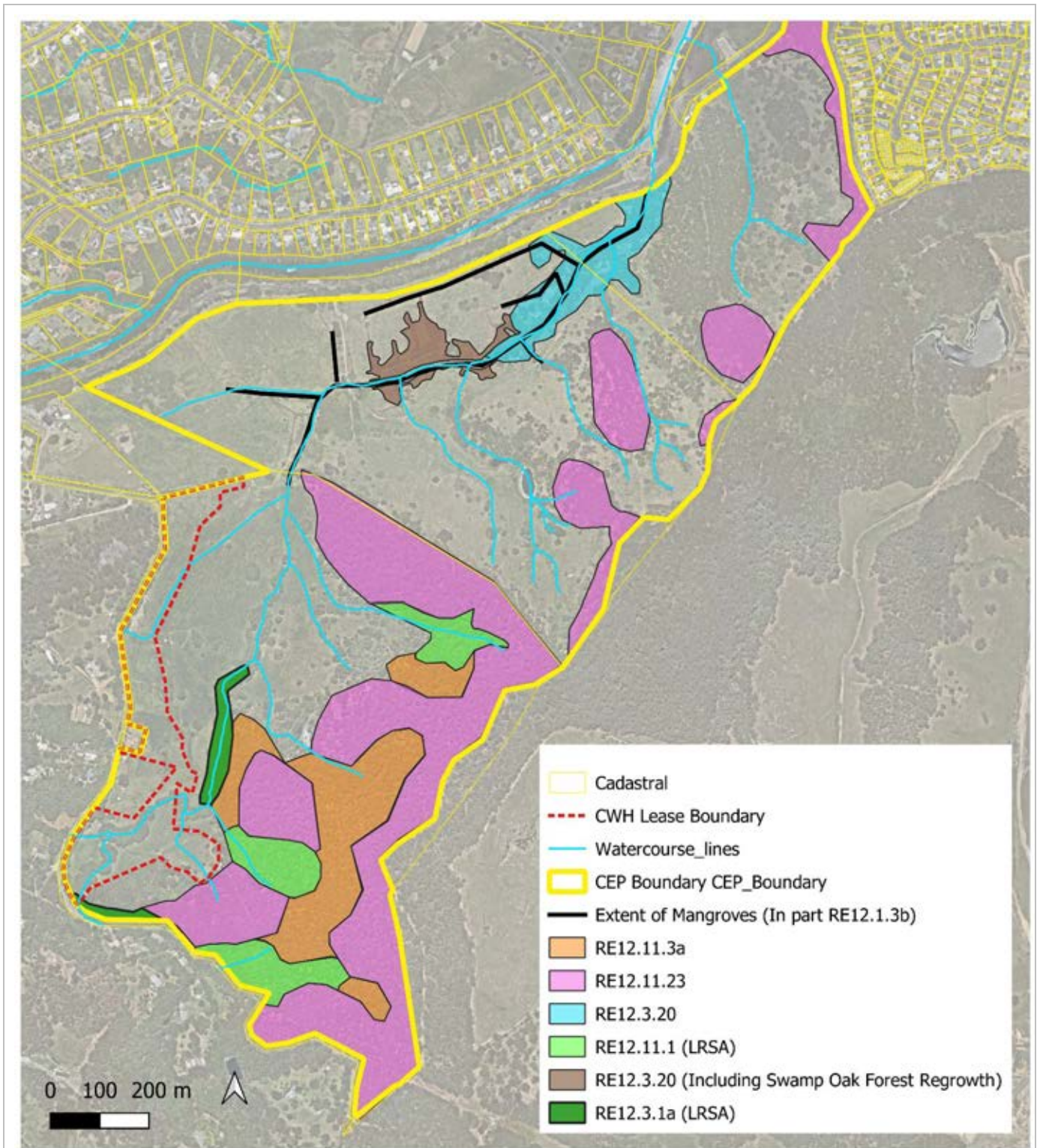
Ecosystem Features	Description	Referral
	<i>Avicennia marina</i> ssp. <i>australasica</i> dominated shrubland to low closed forest.	
	12.3.1a Gallery rainforest (notophyll vine forest) on alluvial plains.	Endangered
	12.3.20 <i>Melaleuca quinquenervia</i> , <i>Casuarina glauca</i> +/- <i>Eucalyptus tereticornis</i> , <i>E. siderophloia</i> , <i>M. styphelioides</i> open forest on low coastal alluvial plains.	Endangered
	Non-Remnant	Category X
Pre-Clearing Regional Ecosystems	Endangered RE12.11.23, RE12.11.3, RE12.3.20	Attachment 4
Coastal Swamp Oak ( <i>Casuarina glauca</i> ) Forest of New South Wales and Southeast Queensland ecological community	Federally Listed Endangered Regrowth of this community in associated RE RE12.3.20	Figure 3-2
Lowland Rainforest of Subtropical Australia	Federally Listed Critically Endangered Associated REs RE12.3.1a & RE12.11.1	Figure 3-2
Wetlands and Watercourses	Central easterly flowing water course supporting numerous drainage features. Wetlands associated with RE12.3.20, RE12.3.1a and RE12.1.3b. Wetlands include: <ul style="list-style-type: none"> <li>• Estuarine/Intertidal</li> <li>• Riverine</li> <li>• Lacustrine</li> <li>• Palustrine</li> </ul>	Figure 3-3
Bioregion Land zones notated in Regional Ecosystem nomenclature	Land zone 1: Deposits subject to periodic tidal inundations (tidal flats and beaches). Land zone 3: Recent Quaternary alluvial systems (alluvial river and creek flats)	N/A

Ecosystem Features	Description	Referral
	Land zone 11: Metamorphic rocks (hills and lowlands on metamorphic rocks)	
MLES Hinterland core habitat systems	These are extensive tracts of intact habitat within the hinterland that support a variety of vegetation associations and provide habitat for diverse fauna populations.	Attachment 5
MLES Hinterland to coast critical corridors	These are bioregional corridors that connect large intact remnant vegetation in the city's west to coastal areas in the east.	Attachment 5
MLES Vegetation Management	The site is mapped as containing High and Medium Priority Vegetation by City of Cold Coast	Attachment 5
Council Bushfire Hazard	The site is mapped as containing Very High Potential Bushfire Hazard on the elevated slopes with 3 patches of High Potential Bush Fire Hazard on the mid and lower slopes.	Attachment 5
Council Flooding	The site is mapped as containing areas in the lower flats as having a flood potential	Attachment 5
Council Landslide Hazard	The site is mapped as containing moderate and high landslip potential	Attachment 5



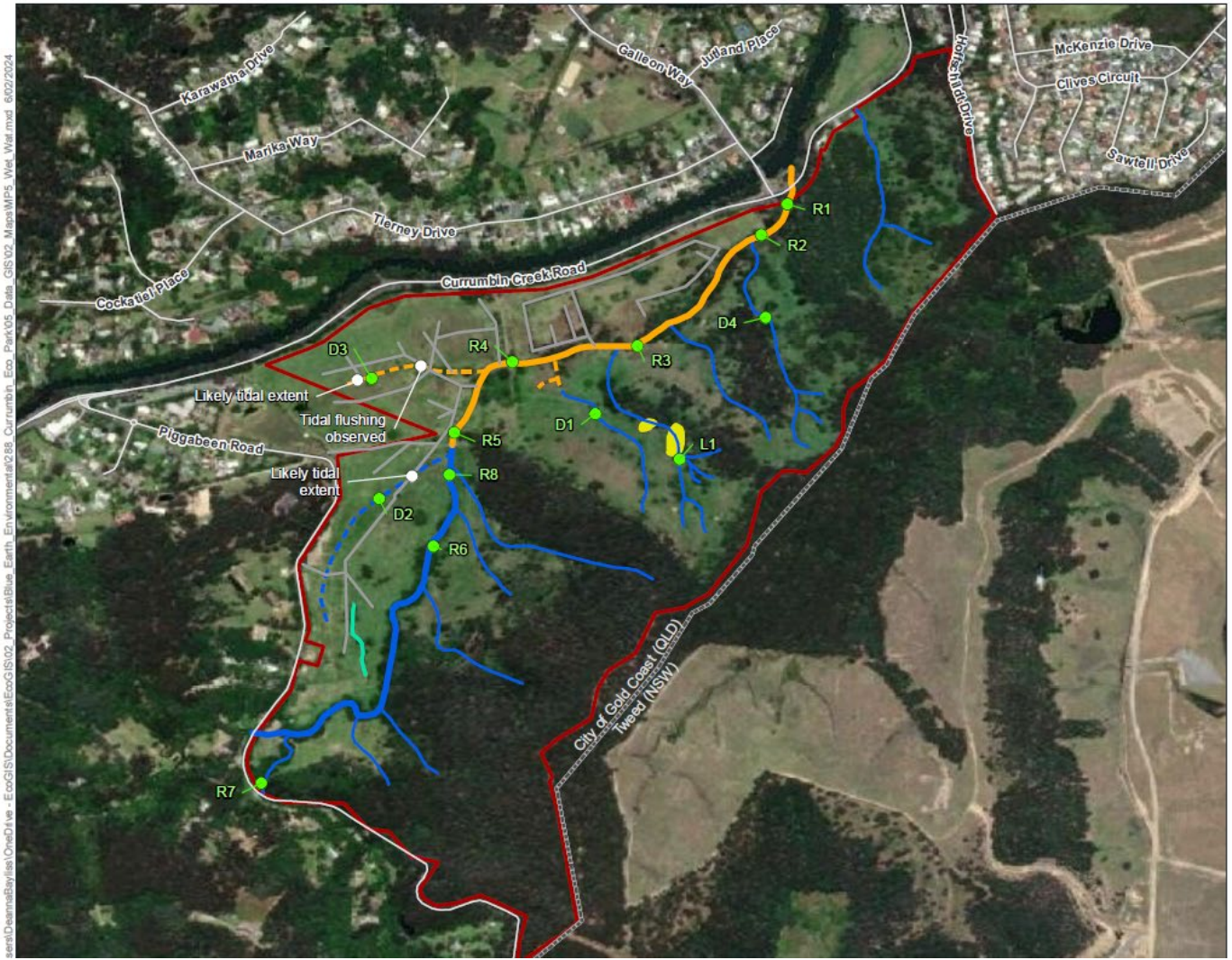
**Figure 3-1**

<b>Client:</b>	<b>Project:</b>	<b>Title:</b>
Economic Development Queensland	Currumbin Eco-Parkland Ecological Restoration Plan	Regional Ecosystem Mapping
<b>Data Source:</b> Nearmap	<b>Date:</b> 16 06 24	<b>Drawn:</b> NH



Note: The boundary between remnant and non-remnant, and between Regional Ecosystems themselves, though appearing as a static line on a map, typically contains an ecotone that can vary in width by 10s of metres.

		<b>Figure 3-2</b>
<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Ground-Truthed Remnant Regional Ecosystems
<b>Data Source:</b> Nearmap	<b>Date:</b> 16 06 24	<b>Drawn:</b> NH



- Currumbin Eco Parkland Boundary
- Local Government Area Boundary
- Sampling Site
- Observation
- Roads
- Lacustrine Wetland - Non Floodplain, Modified
- Riverine Main Channel
- Riverine
- - - Riverine - Modified Canal
- Intertidal - Channel and Mangrove
- - - Intertidal - Modified Canal
- Palustrine Wetland? Undetermined
- Drainage Canal - Undetermined



**FIGURE 5**  
Updated wetland mapping

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		<b>Figure 3-3</b>
<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Aquatic Habitat Wetlands, Waterways and sample sites
<b>Data Source:</b> Nearmap	<b>Date:</b> 22/08/24	<b>Drawn:</b> NH



### 3.2 Baseline Flora Species

Detailed flora surveys in 2022, 2023 and 2024 recorded 425 native species and 186 exotic species occurring throughout the site, including 16 species listed as threatened under National and State Government environmental legislation (**Table 3**) and 16 restricted weeds. A full flora species list is provided in **Attachment 1**. The 16 threatened species are also listed by City of Gold Coast as significant.

Forty-two (42) Special Least Concern flora species were observed on-site which are not included in **Table 3** and an additional twenty (20) species recognised as City of Gold Coast Priority Species<sup>16</sup> were observed on-site.

Species profile for all threatened flora species are provided in the updated Ecological Site Assessment for the Currumbin Eco-Parkland (August 2024).

**Table 5** lists significant flora matters observed on-site as of August 2024, and **Figure 3-4** locates threatened species across the site.

Table 3: Baseline Threatened Flora Species

Threatened Flora Species	Description	Referral
Near Threatened Species	<i>Cupaniopsis newmanii</i> (NT) (PS)	Figure 3-4  Species Profiles in the Currumbin Eco-Parkland Ecological Site Assessment Report 2024
	<i>Endiandra globosa</i> (NT)(PS)	
	<i>Pararistolochia praevenosa</i> (NT)(PS)	
Vulnerable Species	<i>Cassia marksiana</i> (V)(PS)	
	<i>Endiandra hayesii</i> (V*) (V)(PS)	
	<i>Leichhardtia coronata</i> (V)(PS)	
	<i>Leichhardtia longiloba</i> (V*) (V)(PS)	
	<i>Lepiderema pulchella</i> (V)(PS)	
<i>Macadamia integrifolia</i> (V*) (V)(PS)		
<i>Macadamia tetraphylla</i> (V*) (V)(PS)		
<i>Syzygium moorei</i> (V*) (V)(PS)		

<sup>16</sup> <https://www.goldcoast.qld.gov.au/Council-region/About-our-city/Environment-sustainability/Protecting-our-environment/Species-conservation/Priority-species>

Threatened Flora Species	Description	Referral
Endangered or Critically Endangered	<i>Gossia hillii</i> (CE*) (CE) (PS)	
	<i>Randia moorei</i> (E*) (E)(PS)	
	<i>Rhodamnia maideniana</i> (CE*) (CE)(PS)	
	<i>Rhodamnia rubescens</i> (CE*) (CE)(PS)	
	<i>Rhodomyrtus psidioides</i> (CE*) (CE)(PS)	

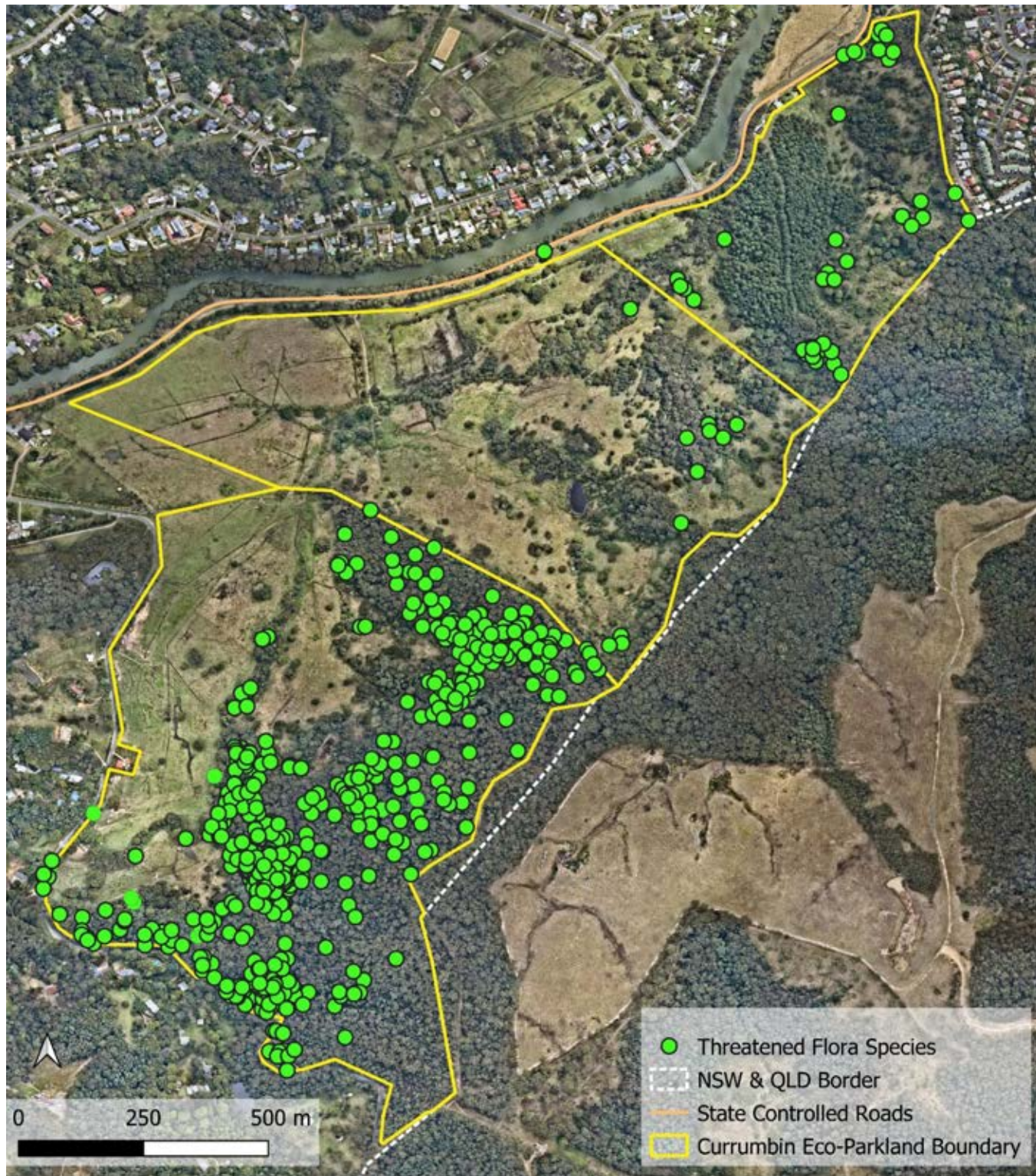
NT = Near Threatened (QLD); V = Vulnerable (QLD); V\* = Vulnerable (National); E = Endangered (QLD); E\* = Endangered (National); CE = Critically Endangered (QLD); CE\* = Critically Endangered (National) (PS) = Priority Species.

Ecological restoration activities proposed for the Currumbin Eco-Parkland will benefit the natural floristic landscape by increasing habitat quality and soil health for plant species, developing resilience to pests and disease and allow for the persistence of natural ecological processes. In an area with a particularly high concentration of threatened plants species, ecological restoration is very important to the ongoing survival of these species and the facilitation of their movement across a restored landscape.

In addition, without planned restoration, the loss of plant species, including endangered species, has significant consequences for our ecosystem. Plant species are integral components of ecosystem services such as pollination, soil fertility, and water regulation, which can have significant environmental and economic impacts on communities that depend on them.

The loss of plant species can also have cultural significance. Many plant species are deeply ingrained in the cultural practices and beliefs of indigenous communities. The loss of these plant species can lead to the loss of traditional knowledge and practices, which are essential for the preservation of cultural heritage.<sup>17</sup>

<sup>17</sup> <https://www.gviaustralia.com.au/blog/smb-endangered-species-of-plants-why-their-protection-matters/>



**Figure 3-4**

<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Threatened Flora Species Observed On-Site
<b>Data Source:</b> Nearmap	<b>Date:</b> 26 08 24	<b>Drawn:</b> NH



### 3.3 Weed Species

A weed is a plant that requires some form of action to reduce its negative effects on the economy, the environment and human health or amenity<sup>18</sup>. For the purpose of this report, weed species are both exotic species from overseas, and alien native species from other parts of Australia. Many weeds are recognised as Restricted Plants under the *Biosecurity Act 2014* (Qld), or as environmental weeds in accordance with the SEQ Environmental Weeds Strategy (2001). Some are also recognised as Weeds of National Significance (WONS).

Flora surveys in 2022, 2023 and 2024 recorded 186 exotic species occurring throughout the site. As part of the flora survey, quaternary plots (**Figure 2-1**), which focus on weed dominance, were surveyed throughout Currumbin Eco-Parkland to determine baseline weed data for future monitoring.

**Attachment 6** contains a table of 58 significant weeds from the flora survey, developed specifically to provide information on dominant weeds found at the Currumbin Eco-Parkland site. The weed table includes a description of each weed, photos, legislative status and methods of control as a guide for the Land Management Contractors.

Weeds are one of the most serious threats to biodiversity, and without intervention they will continue to dominate sections of the Currumbin Eco-Parkland, in particular, cleared and in disturbed areas. Weeds can also dominate following natural disasters such as fire, flood, landslides and drought and require more intense treatment following these events. Threatened species can be impacted from weed dominance by excluding native habitat and changing pollinator behaviour.

Whole ecosystems can be changed by weeds through their behaviours such as strangling, smothering and spreading:

- Strangle – some vine species found on-site such as Cat's Claw Creeper can kill mature trees and choke regrowth.
- Smothering - some ground covers found on-site such as Ground Asparagus can stop native species from germinating effectively and create monocultures.
- Spreading - some weeds spread easily such as Camphor Laurel form dense thickets and can grow in the shade.

Importantly, **Section 5.4** of the Ecological Restoration Plan identifies dominant weed species in each of the restoration sub-zones and will guide land management practices to control weeds at the Currumbin Eco-Parkland.

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<sup>18</sup> Australian Weeds Strategy 2017 – 2027, p6

### 3.4 Baseline Fauna Species

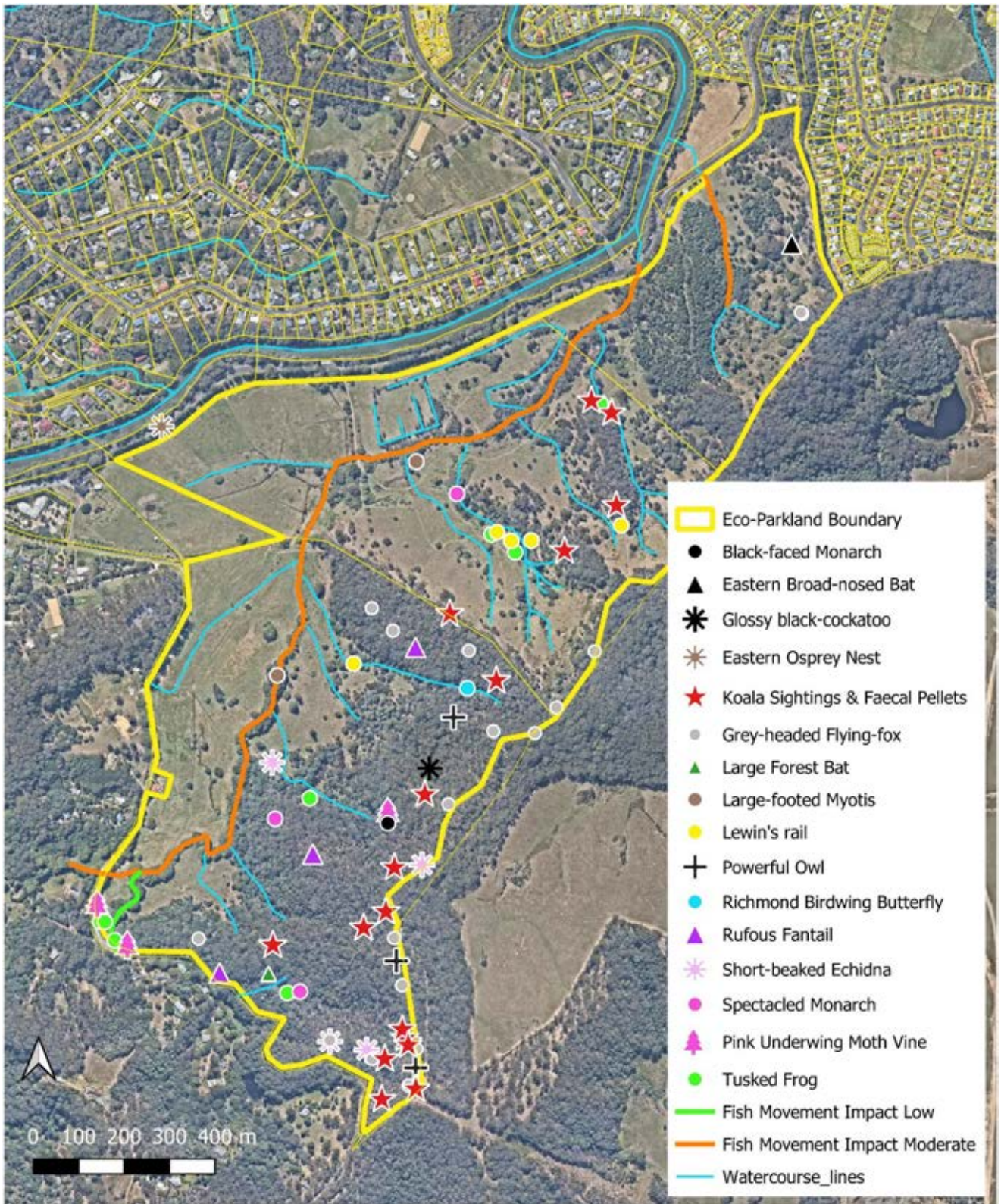
Detailed fauna surveys in 2022, 2023 and 2024 found 197 vertebrate and 113 invertebrate species (of the fauna groups surveyed), including 15 species listed as threatened or significant under National, State and Local Government legislation.

A fauna species list of fauna observed at the Currumbin Eco-Parkland is provided in **Attachment 2. Table 4** lists the significant fauna species observed on the property and **Figure 3-5** provides habitat and or sighting locations.

Table 4: Baseline Significant Fauna Matters

Significant Fauna	Description	Referral
Vulnerable	Grey-headed flying-fox ( <i>Pteropus poliocephalus</i> ) (V*) (LC) (PS) (CWS)	Figure 3-5
	Richmond birdwing butterfly ( <i>Ornithoptera richmondia</i> ) (V) (PS)	
	Powerful owl ( <i>Ninox strenua</i> ) (V) (CWS)	
	Tusked frog ( <i>Adelotus brevis</i> ) (V) (CWS)	
	Glossy Black-cockatoo ( <i>Calyptorhynchus lathamii</i> ) (CWS) (PS) (V) (V*)	
Endangered	Koala ( <i>Phascolarctos cinereus</i> ) (CWS) (PS) (E*) (E)	
Special Least Concern	Short-beaked Echidna ( <i>Tachyglossus aculeatus</i> ) (SLC)	Not mapped
	Eastern osprey (M*) (SLC) ( <i>Pandion haliaetus</i> )	
	Rufous fantail ( <i>Rhipidura rufifrons</i> ) (M*) (SLC)	
	Spectacled monarch ( <i>Symposiachus trivirgatus</i> ) (M*) (SLC)	
	Black-faced monarch ( <i>Monarcha melanopsis</i> ). (M*) (SLC)	
	Marine Bird species (x31) (Ma*)	
City Wide Significant	Lewin's rail ( <i>Lewinia pectoralis</i> ) (CWS)	Figure 3-5
	Large-footed Myotis ( <i>Myotis macropus</i> ) (CWS)	
	Eastern broad-nosed bat ( <i>Scotorepens orion</i> ) (CWS)	
	Large forest bat ( <i>Vespadelus darlingtoni</i> ) (CWS)	
Fish Passage	Site mapped as containing waterway for providing fish passage.	Figure 3-5
Koala Habitat	Koala Priority Area and Core Habitat	Figure 3-6

V = Vulnerable (QLD); V\* = Vulnerable (National); E = Endangered (QLD); E\* = Endangered (National); PS = Priority Species (CoGC); SLC = Special Least Concern (QLD & National); M\* Migratory (National); Ma\* = Marine (National); CWS = City Wide Significant (CoGC).



**Figure 3-5**

<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Significant Fauna Species Observed On Site
<b>Data Source:</b> Nearmap	<b>Date:</b> 18 08 24	<b>Drawn:</b> NH



Fifteen introduced species were identified including one (1) listed as a biosecurity matter (Red Fox), and four (4) species not listed, but with a high threat level to local diversity. These are:

- *Gambusia holbrooki* Plague Minnow (fish)
- *Xiphophorus hellerii* Swordtail (fish)
- *Rhinella marina* Cane Toad
- *Canis lupus familiaris* Domestic Dog

A summary of the results of the additional 2024 targeted fauna surveys are provided below with further details provided in the Ecological Assessment (August 2024). The benefit of the proposed restoration works for these targeted species are also provided.

Photos of fauna species which threaten biodiversity at the Currumbin Eco-Parkland. Photos by Narelle Power (not taken at the site).

Swordtail



Red Fox



Cane toad



Plague minnow





### 3.4.1 *Hinterland crayfish (Euastacus madae)*

None recorded on-site and deemed unlikely to occur.

### 3.4.2 *Pink Underwing Moth (southern) (Phyllodes imperialis smithersi)*

None recorded on-site (including caterpillars), however it is possible that this species utilises the CEP and may breed on the host plant present along the western property boundary (**Figure 3-5**) and in central forested areas.

The proposed activities of the ERP will improve the habitat suitability for this species in several ways including –

- 1) Providing additional suitable feeding resources for the adult moth which is known to feed on the soft fruits of native rainforest species.
- 2) Reducing the negative impact of weed species on the caterpillar host plant.
- 3) Increase the amount suitable habitat present by increasing the amount of canopy cover across the CEP as a whole as previously cleared habitat is restored.
- 4) Limit the likelihood and severity of wildfire which threatens both caterpillar host plants and also preferred adult moth rainforest feed species by removing fire prone or fire ladder weed species and undertaking ecologically sensible prescribed burns.

Photo: Pink underwing moth caterpillar (D. Jinks) Not taken from site.





### 3.4.3 *Richmond birdwing butterfly (Ornithoptera richmondia)*

Several butterflies were observed in the vicinity of the Richmond birdwing vine (*Pararistolochia praevenosa*) located on the Currumbin Eco-Parkland.

Although the vine and butterfly appear to be relatively uncommon within the Parkland, the proposed activities of the ERP will improve the habitat suitability for the Richmond birdwing butterfly and its host plant in several ways including –

- 1) Additional planting of the host plant and protection of areas where it is currently known to occur.
- 2) Reducing the negative impact of weed species on the caterpillar host plant.
- 3) Limit the likelihood and severity of wildfire which threatens caterpillar host plants.

Richmond Birdwing Caterpillar photo not taken from site (N. Power)





#### 3.4.4 *Tusked frog (Adelotus brevis)*

Located at a number of sites throughout the Parkland (**Figure 3-5**).

Provided the dams, which are a stronghold for frog species are retained, and any riparian restoration activities are undertaken with care, i.e. does not include dramatic short-term changes to vegetation or increases in water turbidity etc., it is likely that over-time the distribution and abundance of the tusked frog will be maintained or increase.

Tusked frog photo taken on-site (N. Power)





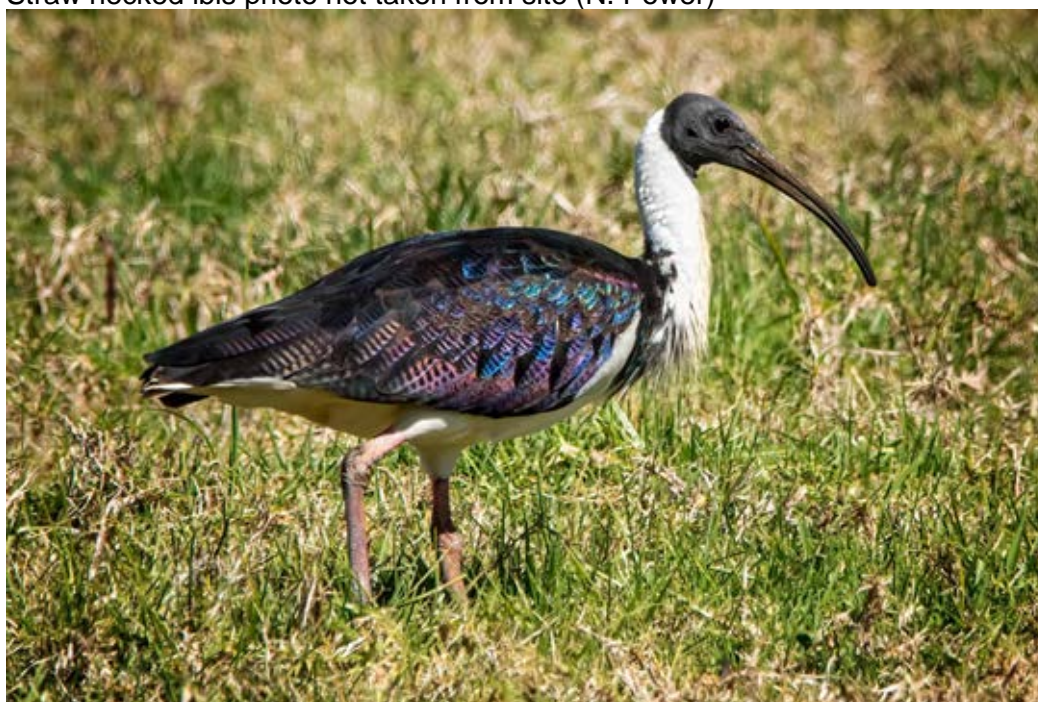
### 3.4.5 *Wetland birds*

Wetland birds were identified at the Currumbin Eco-Parkland and reported in the fauna species list (**Attachment 2**) however species were largely non-migratory.

Royal spoonbill photo not taken from site (N. Power)



Straw necked ibis photo not taken from site (N. Power)





### 3.4.6 *Powerful owl (Ninox strenua)*

Recorded on site (**Figure 3-5**) and confirms the Currumbin Eco-Parkland is included as part of a larger home range for a single pair of powerful owls.

The proposed activities of the ERP will improve the habitat for the powerful owl in several ways –

- 1) Limit the likelihood and severity of wildfire which threatens suitable nesting hollows and also the denning hollows of many of the suitable arboreal prey species recorded on site including, the sugar glider and various possum species.
- 2) Increase the degree of canopy cover within which the powerful prefers to hunt.
- 3) Removal of large woody weed species i.e. Camphor laurels which are of limited use to the powerful owl and often out compete other native species, thus reducing both the abundance and density of suitable hollow forming Myrtaceous species.

Powerful owl photo taken from site (N. Power)





### 3.4.7 Southern Greater glider (*Petauroides* sp.)

None recorded on-site although still possible that the greater glider is present.

If still present the proposed activities of the ERP will help to improve the habitat in the following ways –

- 1) Limit the likelihood and severity of wildfire which threatens suitable nesting hollows and also the denning hollows of many of the suitable arboreal prey species recorded on site including the sugar glider and various possum species.
- 2) Increase the amount of suitable habitat present including the regeneration of additional suitable fodder species.
- 3) Removal of large woody weed species i.e. Camphor laurels which are of limited use to the greater glider and often out compete other native species, thus reducing both the abundance and density of suitable hollow forming Myrtaceous species.

Greater glider photo not taken on site (N. Power)





### 3.4.8 Koala (*Phascolarctos cinereus*)

Both koalas and their characteristic scats were located from a number of locations during fauna investigation of the Currumbin Eco-Parkland (**Figure 3-6**). The aim of koala habitat restoration is to help conserve koala populations by reducing threats and increasing the quality, area and connectivity of existing and potential koala habitats<sup>19</sup> (DPE NSW 2022).

Koala photo not taken on site (N. Power)

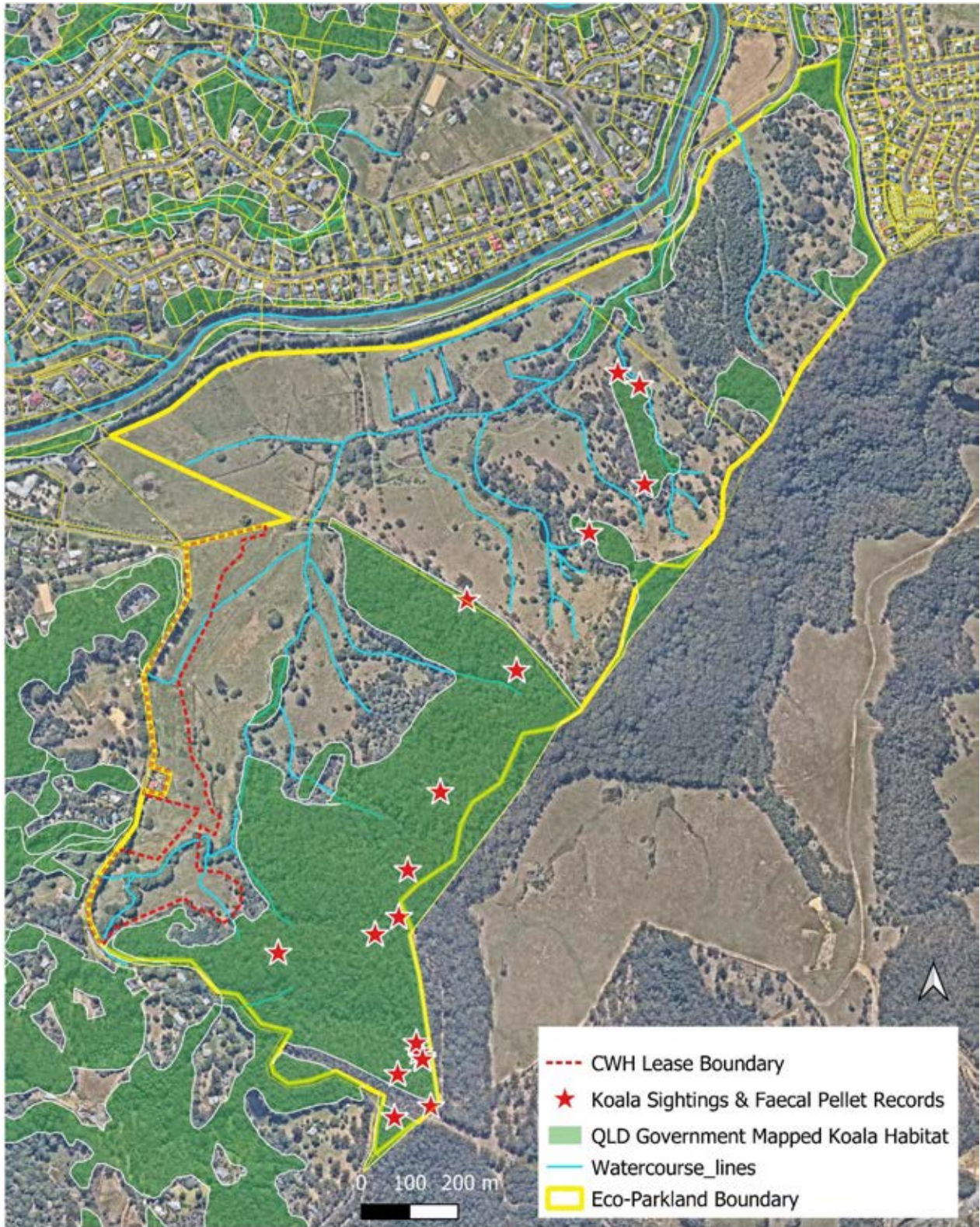


Koalas will undoubtedly benefit from the proposed ERP in a number of ways –

- 1) Increase the abundance and density of fodder trees across the CEP.
- 2) Increase the abundance and density of shelter trees across the CEP.
- 3) Removal of large woody weed species i.e. Camphor laurels which are of limited value to koalas and can out compete other native species, thus reducing both the abundance and density of suitable shelter and fodder species.
- 4) Limit the likelihood and severity of wildfire which threatened both individual koalas but also shelter and fodder trees.
- 5) Improve connectivity of vegetation and thus koala habitat across the CEP. This will reduce the amount of time koalas will need to traverse the CEP on the ground with limited cover, thus reducing the likelihood of predation. i.e. as prescribed in the ERP - the gradual reduction of pasture areas over time as edge treatments facilitate regrowth.

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<sup>19</sup> State of NSW and Department of Planning and Environment (2022). Koala Habitat Restoration Guidelines. A practical guide to identify, connect and restore koala habitat in New South Wales.



**Figure 3-6**

<b>Client:</b>	<b>Project:</b>	<b>Title:</b>
Economic Development Queensland	Currumbin Eco-Parkland Ecological Restoration Plan	Koala Habitat, Koala Sightings and Faecal Pellet Records during 2022 – 2024 Fauna Surveys
<b>Data Source:</b> Nearmap	<b>Date:</b> 18 08 24	<b>Drawn:</b> NH



### **3.4.9 Eastern grey kangaroo (*Macropus giganteus*)**

The number of eastern grey kangaroos (EGK) recorded on site in early 2024 ranged from between 26 and 35 (including observable pouch young) with an average of 31. These were largely confined to the lowland areas, i.e. Zones 6.1, 6.2, 7.1 and 7.2, with secondary usage of Zones 4.1, 4.2, 4.3 and 3.2 and incidental usage of other Zones.

The development of the CEP may impact the EGK population including -

- Loss of lowland grazing and resting habitat.
- Additional disturbance, sound and light, human and vehicle interactions.
- Fencing issues, particularly along Currumbin Creek Road.

The Zones which are likely to be negatively impacted by the proposed development of the CEP include 6.1, 6.2 due to loss of habitat and disturbance associated with the development of the Arrival Precinct and 7.2 due to loss of habitat associated with the development of an artificial wetland.

Loss of grazing habitat within these zones will likely be offset by the improvement of habitat within Zones 7.1, 3.2, 4.1, 4.2 and 4.3. Habitat improvement in these Zones can consist of additional slashing which may provide and improve grazing opportunities and the planting of small stands of canopy forming tree species in Zone 7.1 which can provide additional shade and resting locations within this Zone.

In order to reduce the likelihood of interaction with vehicles and visitors within the Arrival Precinct and to help discourage EGK's from exiting the parkland onto Currumbin Creek Road via the entrance and exit gates in Zones 6.1 and 6.2, several management actions can be undertaken. These may include fencing either post and rail or post and wire (not exclusion), dense planting of shrub species, and the elimination of freshwater water sources which will help to discourage EGK's from these Zones. Other strategies to inhibit the interaction of the EGK population and visitors will also be investigated, including educational signage for visitors, suitable lighting etc. Ensuring domestic dogs are prohibited from the parkland will also help to protect the EGK population in addition to other fauna present, including the koala for which domestic dog attack is a known threatening process.

Further, to protect the EGK population, retained grazing areas are required. The ERP in Section 5.0 recommends the maintenance of pasture areas in relation to the lowlands in Zone 7.0, parts of the central open hills in Zone 4.0 and limited sections of the lowland estuarine areas of Zone 6.0. Failure to retain sufficient grazing areas may result in the loss of the EGK within the Currumbin Eco-Parkland.



EGK photo taken on site (N. Power)



### 3.5 Baseline Aquatic Habitats and Species

Wetland types and habitat conditions for the aquatic habitats found on-site are summarised in **Table 5** and shown on **Figure 3-3**. These are different to the types and extents of wetlands identified in the Queensland Wetland Mapping (DESI 2024 – **Attachment 4**). Variations are likely the result of historic modifications to surface runoff on the floodplains. This includes damming off freshwater runoff within the estuarine reach, and construction of many drainage canals dissecting most sections of floodplain.

Water quality collected in early 2024 indicated that surface waters were moderately to highly acidic (pH of 3.5 to 6.8). These results indicate impacts to waterways and wetlands associated with acid sulphate soils that have likely been exposed within the artificial drainage canals.

A total of 14 fish species were recorded within the study area during the site inspection in December 2023. No threatened aquatic fauna species were identified to occur or likely to occur within either the desktop stage or site inspection.

A total of 21 freshwater macrophytes species were recorded within riverine and lacustrine wetland habitats, of these 15 species were recorded within the upper lacustrine wetland and an additional four were exotic species.

Table 5: Aquatic Habitats

Wetlands	Types	Significant Matters	Referral
Estuarine	• Intertidal / subtidal channel	HEV* Wetlands and Waterways	Figure 3-3
	• Intertidal mangroves		
	• Intertidal drainage canals with mangrove regrowth and jointed rush ( <i>Juncus kraussii</i> )		
Riverine	• Stream order four watercourse	Nil	
	• Ephemeral tributaries		
	• Ephemeral artificial drainage canals		
Lacustrine	• Dams above the floodplain	Special Least Concern Species - Water snowflake ( <i>Nymphoides indica</i> )	
Palustrine	• Possible coastal floodplain tree swamp	Nil	
	• Possible coastal grass, sedge, herb swamp		

\* High Environmental Value

A range of Special Least Concern macrophytes were also identified within the desktop stage as either likely to occur or have potential to occur. These species have recently been listed as Special Least Concern that are likely to be subject to increased harvesting pressure due to their commercial and recreational demand, and the nature of their growth and reproduction. Of these, water snowflake (*Nymphoides indica*) was recorded on site within the lacustrine wetland.

The habitat condition of wetlands ranged from poor to very good. Key processes impacting the condition of wetlands at the Currumbin Eco-Parklands included:

- Exposure of acid sulphate soils within drainage canals impacting water quality.
- Restriction of tidal flushing and fish passage from instream barriers (remnants of weir and several small culverts).
- Historic manipulation of freshwater runoff and riparian clearing resulting in a reduction in the extent and function of marine vegetation.
- Deterioration of defined stream banks (particularly on the floodplain) through clearing of riparian vegetation and cattle trampling.
- Occurrence of the invasive camphor laurel within riparian areas.

Strategies and actions proposed in the Ecological Restoration Plan target the key processes impacting the condition of the aquatic ecosystem and will result in significant habitat improvements.



### 3.6 Biosecurity Matters

With respect to the restoration of land at the Currumbin Eco-Parkland, the Queensland *Biosecurity Act 2014* manages risks associated with emerging, endemic and exotic pests and disease that impact on biodiversity and the natural environment. The purpose of the *Biosecurity Act 2014* is achieved by imposing a general obligation on persons to prevent or minimise the impact of biosecurity risk on human health, society, the economy and the environment. A review of biosecurity matters with the potential to apply to restoration activities at the Parkland found:

- No Category 1 or 2 restricted matters were observed on the property.
- Sixteen Category 3 restricted plant species were observed within the property during the flora surveys between 2022 and 2024. The Act states with regard to Category 3 restricted plants... 'The invasive plant must not be disturbed either by sale or gift or released into the environment'. Goals of the Ecological Restoration Plan are to eradicate and manage weed species including the 16 Category 3 restricted plants.
- Myrtle Rust – although not listed as a restricted matter under the *Biosecurity Act 2014*, is listed as one of Australia's National Priority Plant Pests<sup>20</sup>, has been observed on the site, and is currently impacting endangered plant species.
- One fauna species listed as a Category 3 Restricted Matter was observed on-site – the European Fox (*Vulpes vulpes*).
- Fire Ants – listed as a Category 1 Restricted Matter are a biosecurity risk and currently they have not been observed within the Currumbin Eco-Parkland boundary. Fire ant baiting as a preventative measure has occurred.

Biosecurity matters relating to fire ants and myrtle rust are further discussed in Section 7.0 Implementation Strategies.

#### Fire Ant (Photo: National Fire Ant eradication Program)



<sup>20</sup> National Priority Plant Pests (2019) Endorsed by Plant Health Committee Out of Session, 29 August 2019.



## 4.0 ECOLOGICAL RESTORATION ZONE DEFINITION

The property has been divided up into Ecological Restoration Zones and Sub-Zones for the purpose of planning, staging and resourcing the ecological restoration project (**Figure 4-1**).

The Sub-Zone boundaries have considered practical factors relating to access and visual delineation, such as a ridge or gully line, a walking or vehicle track, or a property boundary.

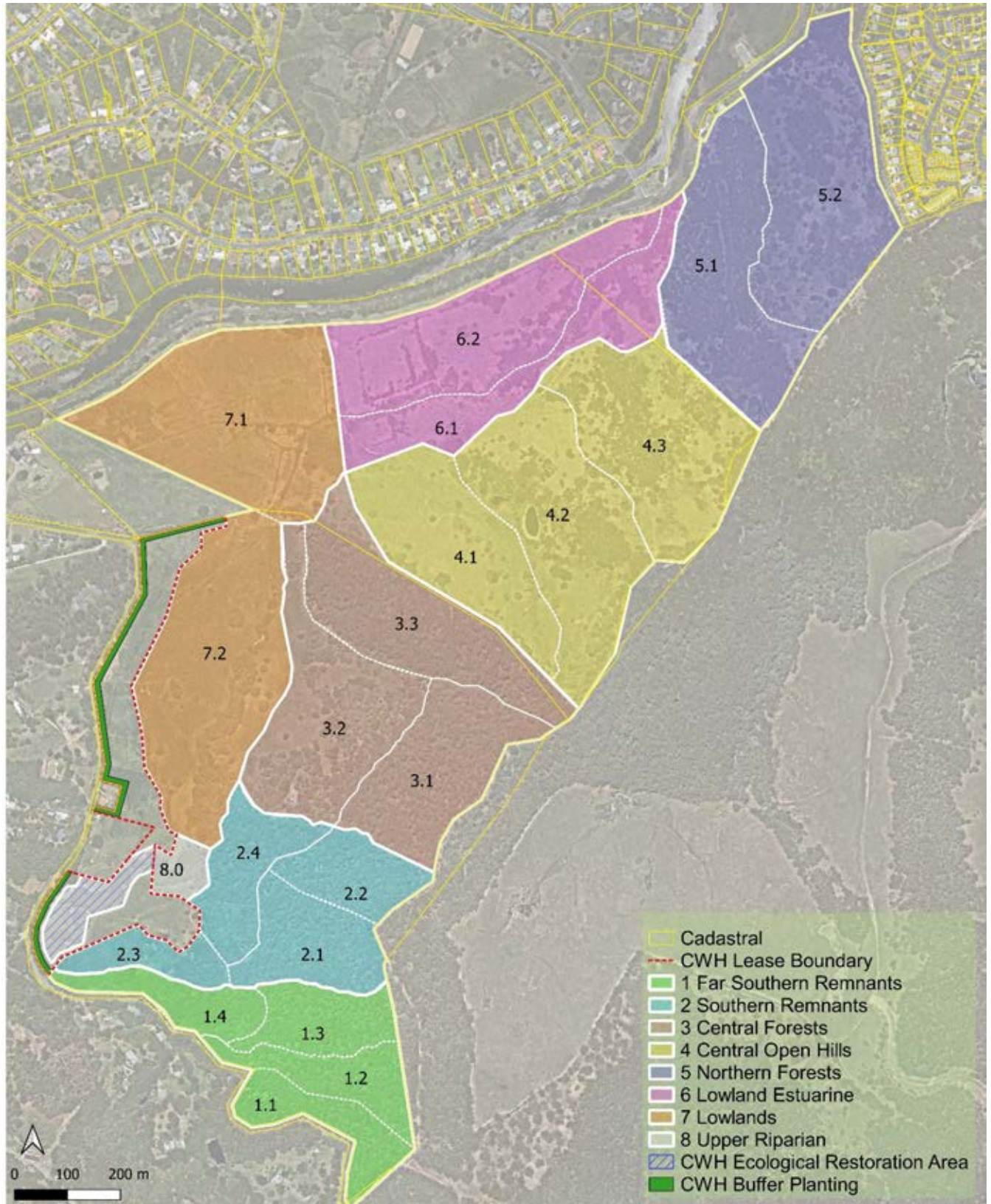
Accordingly, Zones and Sub-Zones are allocated based on several factors:

- Spatial ecological variation across the landscape
- Existing tracks or boundaries (where applicable)
- Ridges or gully lines (where applicable)
- The subsequent ease of zone identification in the field
- Proposed restoration strategies e.g. Zone 8 requires a unique approach

Remnant vegetation (Regional Ecosystem) boundaries have not been used, as they do not provide an exact boundary as a working line. The location where RE's meet is typically represented by an ecotone which can be 10's of metres wide, making differentiation between RE's impractical to use as a discreet management area. Accordingly, a Sub-Zone can include none, one, or several RE's.

For Land Management Contractors, a geo-referenced plan used with a suitable field app e.g. *Avenza*, will easily identify zone boundaries in the field. It is important that both work programming and recording and monitoring is undertaken in a precise Sub-Zone area.

The programming of on-ground restoration works including Sub-Zone priorities will be dependent upon the amount of labour available at any one time (i.e. budgetary constraints) and on seasonal conditions.



<b>DRAFT</b>		<b>Figure 4-1</b>
<b>Client:</b> Economic Development Queensland	<b>Project:</b> Currumbin Eco-Parkland Ecological Restoration Plan	<b>Title:</b> Ecological Restoration Zones
<b>Data Source:</b> Nearmap	<b>Date:</b> 29/07/24	<b>Drawn:</b> NH



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## 5.0 RESTORATION TREATMENTS

Choosing the appropriate approach to ecological restoration relies on an understanding of the type and extent of damage to the original ecosystem. It also requires an understanding of what the original ecosystem was, and whether only minor inputs are required (e.g. control of weeds) or substantial alteration of physical attributes of the landscape are needed to restore an ecosystem (e.g. reinstating overland flow paths). This influences the types of restoration treatment applied.

Restoration also involves the identification of threats to the success of the restoration plan and the management actions required to minimise these threats. A table of threats and management actions is provided for each of the Ecological Restoration Zones in **Section 5.4** with detailed threats and management actions provided in **Attachment 7**.

***Sections 5.0, 6.0 and 7.0 provide key information to assist Land Management Contractors and others undertaking restoration works across the site.***

**Section 5.0**  
Restoration Treatments in  
ZONES & SUB-ZONES

**Section 6.0**  
Specialised Restoration Treatments e.g.  
Camphor Laurel Conversion & Fire

**Section 7.0**  
Implementation Strategies



**Section 5.0** contains the following restoration information:

**Section 5.0**  
**RESTORATION TREATMENTS**

**Section 5.1**  
Restoration  
Approach

**Section 5.2**  
Restoration Methods for  
Canopy and Non-Canopy  
Areas

**Section 5.3**  
Consistent Restoration  
Treatments for Weed Species  
Management

**Section 5.4**  
Restoration Tables  
for Individual Zones  
and Sub-zones

## 5.1 Restoration Approach

The South East Queensland Ecological Restoration Framework presents four common and accepted restoration approaches that have been considered for the Ecological Restoration Zones in **Figure 4-1**. The four approaches are described in **Table 6**:

Table 6: SEQ Ecological Restoration Approaches

1	Natural Regeneration	Applicable to large intact and weed-free areas of native vegetation with an aim to re-establish original vegetation.
2	Assisted Natural Regeneration	Applicable to areas with healthy and functioning native plant communities. Works are likely to be focused on weed and landuse management.
3	Reconstruction (Revegetation)	Applicable to areas that are degraded, altered and the original vegetation communities cannot recover by natural means. Planting is likely to occur in association with weed and land management.
4	Fabrication (Type conversion)	Applies to areas that have been irreversibly changed.

The two (2) restoration approaches recommended by this Ecological Restoration Plan for the Currumbin Eco-Parkland are:

- #2. Assisted Natural Regeneration; and
- #3. Reconstruction/Revegetation

Natural regeneration is generally used in areas with intact canopy while assisted natural regeneration is used in non-canopy areas. However, this isn't always the case and the different approaches to restoration in canopy and non-canopy areas is detailed below.

## 5.2 Restoration Methods for Canopy and Non-Canopy Area

### 5.2.1 Canopy Areas

For this site, all Sub-Zones where there is existing native canopy, ranging from intact tall open forest to isolated paddock trees, will be subject to **#2. Assisted Natural Regeneration**.

### 5.2.2 Canopy Areas abutting Open Paddock

Where these 'canopy' areas abut open paddock areas, or where there are isolated paddock trees, the canopy 'edge' will be gradually extended through weed control at the canopy dripline. This allows for expansion of the tree crown and exposes the shaded area to dispersed native seed, encouraging germination. This combination of factors (weed control plus dripline expansion) will gradually increase the lineal extent of canopy areas over time.

As a consequence of these works, plant propagules dispersed to the site (whether native or exotic) by means such as birds, bats, insects, wind, water and gravity, will find niches to reestablish into the site, according to the species and the site conditions at the time. This is regarded as one of the most cost-effective means of restoration<sup>21</sup>.

### 5.2.3 No Canopy

At the current time, large previously modified portions of the property are actively regenerating through the process of natural succession, which can appear to be a slow progression in human terms (several years to several decades), but which results in optimal ecosystem restoration. An exemplary example of this, despite continued grazing and adjacent slashing, is the unplanned regrowth of Coastal Swamp Oak Forest in Zone 6, from cleared land which was almost completely devoid of tree growth as recently as 1985. Ultimately, with ongoing efforts to ensure appropriate weed control (and other vegetation management practices), the property will continue in a trajectory of ecological restoration.

In sub-zones where there is no existing canopy, 3. Revegetation can be considered in certain circumstances, and this is discussed in **Section 6.0 Specialised Restoration Treatment**. Revegetation can include planting for ecological restoration, for artificial wetlands, or for amenity landscape planting.

## 5.3 Consistent Restoration Treatments for Key Weed Species

While an experienced local contractor will be familiar with the general requirements for weed management, methods (including chemical treatments) and approaches to local conditions and anticipated weeds requiring control, the following treatment prescriptions are offered to highlight specific methods required across the site and to help avoid any misinterpretation.

Table 7: Consistent Restoration Treatment for Key Weed Species

Restoration treatment prescriptions	Sub-zone	Notes
Systematic weed control to be undertaken along contours or where required parallel to the longest polygon edge (whichever is most efficient or practical). Width of restoration lines will be dictated by the vegetation type and density of environmental weeds.	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 4.3, 5.1, 5.2, 6.1, 6.2, 7.1, 7.2.	
Larger <i>Lantana camara</i> to be hand pulled or cut, scraped and painted, then chopped up into ~50cm portions. This speeds up decomposition, improves access for follow up spray runs and reduces frames/ladders for exotic vines and fires to climb up.	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2, 7.1, 7.2, 8.0.	

<sup>21</sup> Shoo et. al. (2017) *Navigating Complex Decisions in Rainforest Investment*. Conservation Letters; Catterall, C.P. and Kanowski, J. (2010) *Rainforest restoration: approaches, costs and biodiversity outcomes*. Reef & Rainforest Research Centre Ltd, Cairns.

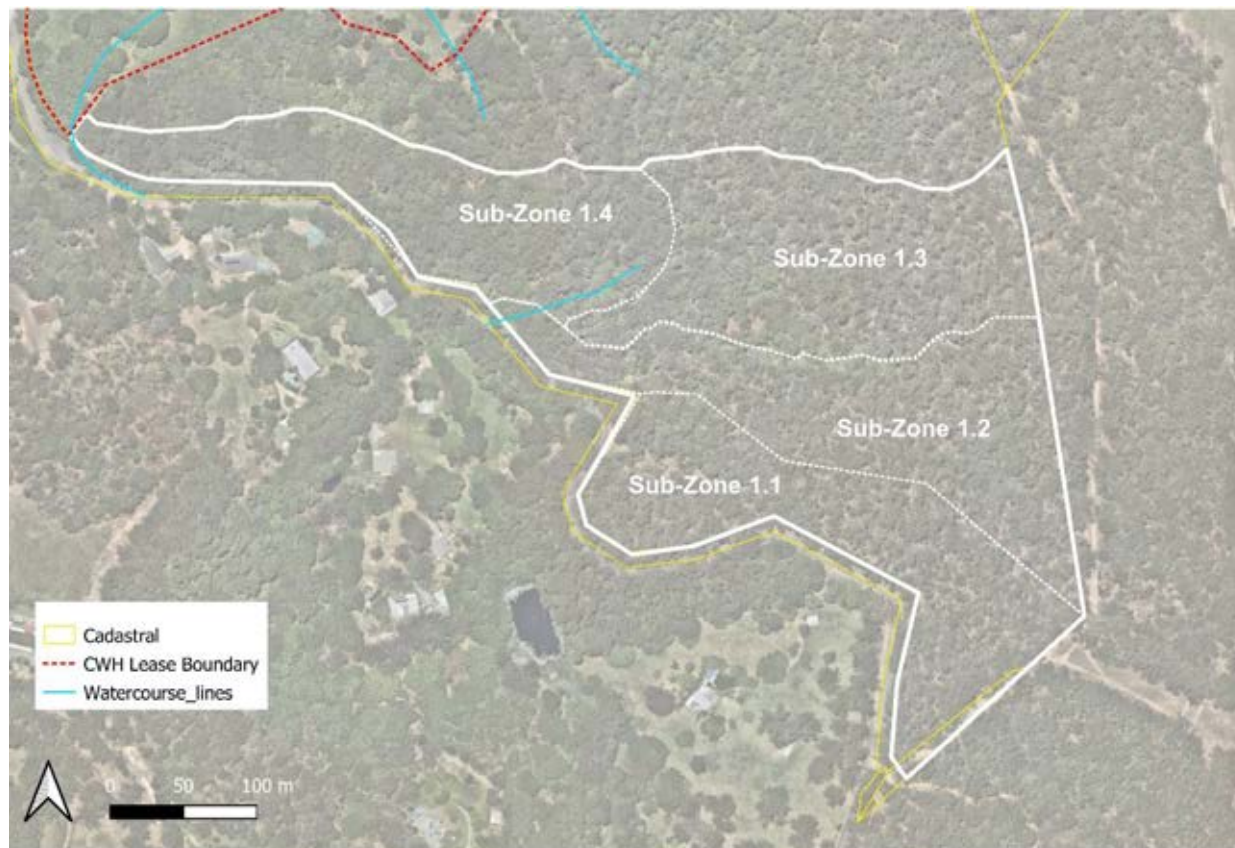
Restoration treatment prescriptions	Sub-zone	Notes
<i>Melinis minutiflora</i> and <i>Paspalum mandiocanum</i> to be foliar sprayed ensuring full coverage of the plant.	1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 3.1, 3.2, 3.3.	
<i>Cinnamomum camphora</i> too large to be hand pulled or safely hand sawed are to be stem injected. This is achieved by drilling downward sloping holes around the circumference of the tree approximately 5cm from the ground in a “brickwork pattern”. Exposed roots may also be drilled and filled with herbicide where needed.	1.1, 1.2, 1.3, 1.4, 2.3, 2.4, 3.1, 3.3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1, 6.2, 7.1, 7.2, 8.0.	For Zone 8, See <b>Section 6.1.1</b> Camphor Conversion
When undertaking weed control along riparian areas, systematic and staggered weed control may be required to minimise the risk of erosion and sedimentation into the waterways.	1.4, 2.4, 4.2, 4.3, 5.2, 6.1, 6.2, 7.1, 7.2, 8.0.	
The methods chosen for control of Cat’s Claw should be adapted to the type of native vegetation invaded. Also refer <b>Section 6.7</b> for biological control notes.  <i>Dolichandra unguis-cati</i> to be controlled systematically: on hillsides from the upper slopes downward and on creek lines starting upstream working downward due to wind and water dispersed seeds. Any stems climbing up trees larger than ~2cm diameter are to be cut at head height then again at ~5cm above ground level. Remove this cut portion off the trunk and cut, scrape and paint the remaining stump. Smaller diameter stems to be peeled off the tree or shrub, bundled up onto the ground and foliar sprayed, as for any ground runners or juvenile growth.  <b>DO NOT</b> dig tubers because seedlings and small plants have tubers that are difficult to dig out and the large tuberous root mass of older plants cannot be removed without excessive soil disturbance. At CEP, digging tubers is regarded as an inefficient use of time and is likely to cause excessive disturbance to soil and neighbouring roots, many of which are of threatened species.	2.1, 2.4, 6.1, 6.2, 7.1, 7.2, 8.0.	Ensure early control of small outbreaks which occur in several locations adjacent to streams.
In steep regrowth gullies, where practical and safe to do so, these areas are to be treated for exotic trees and woody weeds and treated to the canopy edge as outlined in <b>Section 5.2</b> .	4.1, 4.2, 4.3, 5.1, 5.2.	
<b>DO NOT</b> treat large areas of full-sun monoculture woody weeds (e.g. Giant Devil’s Fig) unless the area is able to be maintained satisfactorily immediately after treatment.	4.1, 4.2, 6.2, 7.1, 7.2, 8.0.	

Note: Methods for weed control are generally non-mechanical and rely on working manually with hand tools including backpack spray equipment. Broadacre or boom-spraying is not required or recommended. However, there may be one-off circumstances where splatter-gun or close-range overspray methods are necessary e.g. along tracks as required for track maintenance.



## 5.4 Restoration Zones and Subzones

### 5.4.1 Zone 1 Far Southern Remnants



Zone 1 is dominated by endangered Blackbutt Forest (RE12.11.23) and Federally listed Lowland Rainforest of Subtropical Australia (in part RE12.11.1 and RE12.3.1a) and contains areas of least concern Grey Gum Woodland (RE12.11.3a). It is the southernmost Zone of the Parkland and is bounded by the NSW border (fence and gravel track) to the east and Piggabeen Rd (fence and paved road) to the south-west. Gradient varies from flat to gently undulating in higher portions to steep hillsides and incised gullies in mid-portions to lower alluvial flats. Condition state also varied from relatively good condition in higher portions with older mature trees and good understorey diversity, to modified areas with various age-classes of regrowth. There is a significant landform change in mid-sections where several gullies converge in a small valley. While initially cleared, this area has now recovered with older regrowth and represents a diverse section of Lowland Rainforests of Subtropical Australia on the site.

Edge effects will be an ongoing management issue along the NSW border and Piggabeen Road. Some higher portions are also subject to use by bikes with several active tracks.

Key threats and management recommendations have been identified for Zone 1. Threats are summarised in **Table 8** and detailed, including management actions in **Attachment 7**.

Table 8: Zone 1 Key Threats

😊 Low Risk   😐 Medium Risk   😞 High Risk of Threat Occurring

Key Threats Zone 1	Risk
Unmanaged fire impact to restoration areas	😞
Vegetation management i.e. permits and approvals	😊
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	😞
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	😞
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	😞
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	😞
Altered hydrology from site activities	😊
Disturbance and erosion from internal tracks/trails	😐
Fences	😊
Management changes to resource commitments	😞
Inappropriate land management methods by contractors.	😐



**5.4.1.1 Sub-Zone 1.1**

**Figure 5-1: Ecological Restoration Zone 1.1**

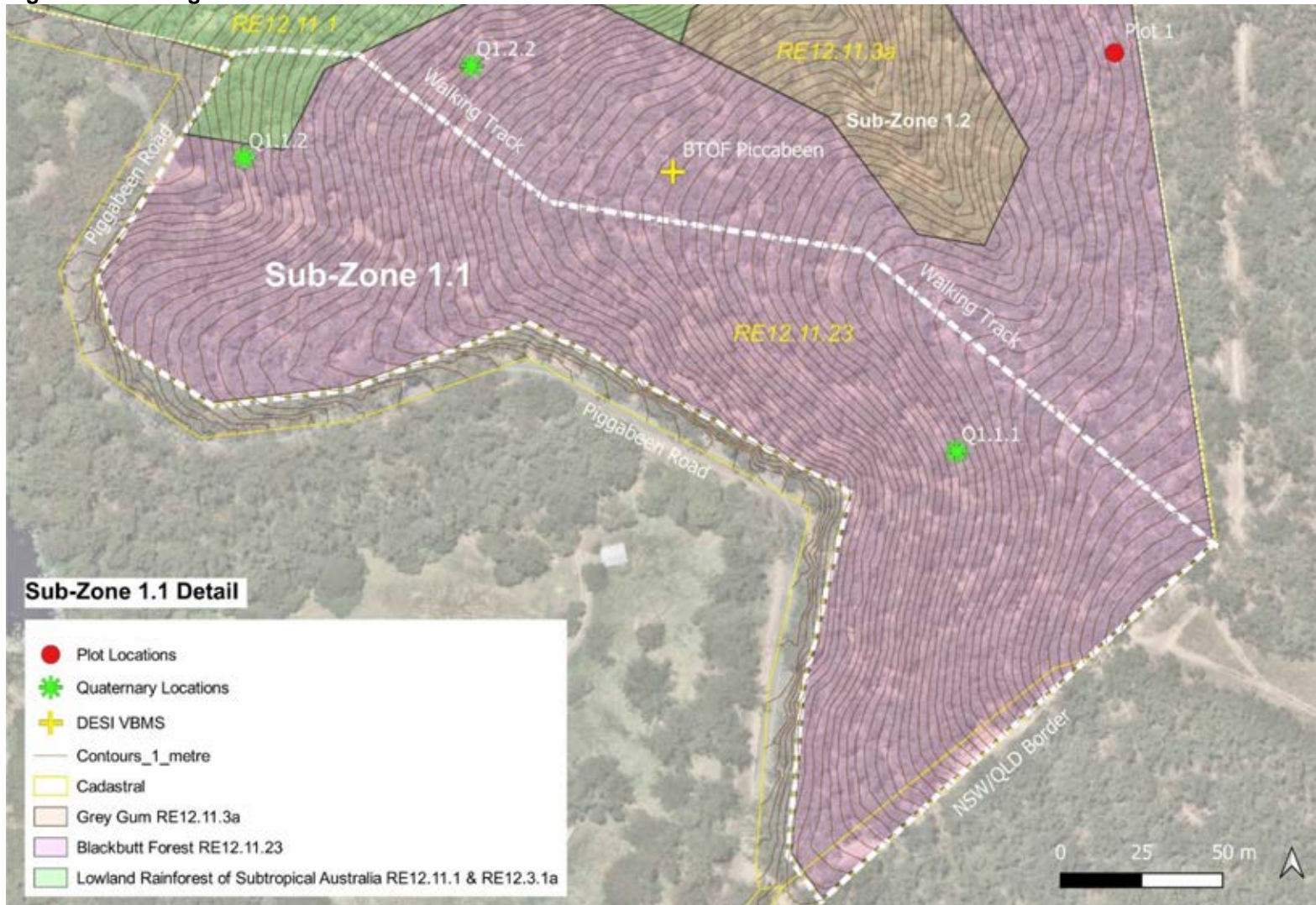


Table 9: Sub-Zone 1.1

Zone 1: Far Southern Remnants		Sub-Zone 1.1								
<b>Size Ha:</b>	2.863									
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.1			<b>Current Vegetation State</b>		Remnant + non-remnant (mature regrowth)				
<b>General description and current condition</b>	Steep mid and upper slopes, reasonably good condition overall, good canopy and stem density in most portions apart from old electricity easement. Occasional clusters of weeds. Active bike tracks in higher portions.									
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23 and 12.11.1</li> <li>• Prescribed burn for ecological health.</li> <li>• Remove unwanted tracks.</li> </ul>									
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Focus on weeds along Piggabeen Rd edge - continue in from road easement LMC*</li> <li>• Control weeds along southeastern (NSW) boundary edge - continue in from boundary easement LMC*</li> <li>• Control larger patches of <i>Melinis minutiflora</i> upper northern portion near bike track LMC*</li> <li>• Focus on both dense weed infestations and singular occurrences e.g. <i>Hedychium</i>, <i>Heptapleurum</i> LMC*</li> <li>• Ensure follow-up of weed trees and <i>Hedychium</i>. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Discourage bike entry and trail making. EDQ*</li> </ul>									
<b>Restoration approach</b>	Assisted Natural Regeneration									
<b>Dominant natives (EDL)</b>	<i>Eucalyptus pilularis</i> , <i>E. propinqua</i> , <i>E. resinifera</i> , <i>E. siderophloia</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> , <i>Allocasuarina torulosa</i> , <i>Alphitonia excelsa</i>									
<b>Dominant exotics</b>	Minimal patches of <i>Melinis minutiflora</i> , more near bike tracks, scattered <i>Lantana camara</i> and <i>Passiflora suberosa</i> ssp. <i>littoralis</i> , <i>Senna pendula</i> var. <i>glabrata</i> , patches of <i>Nephrolepis cordifolia</i> , occasional <i>Heptapleurum actinophyllum</i> , patches of <i>Hedychium gardnerianum</i> in lower section, seedlings of <i>Cinnamomum camphora</i>									
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Leichhardtia longiloba</i> , <i>Rhodamnia rubescens</i> .									
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Possibility to reinstate old vehicular track along northern sub-zone boundary (adjoining Z1.2).</li> <li>• Potential for improved boundary fencing including fauna-friendly and for bike exclusion.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	5	<b>Year 2</b>	2	<b>Year 1</b>	3	<b>Year 2</b>	2	<b>Perpetual</b>	3

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

5.4.1.2 Sub-Zone 1.2

Figure 5-2: Ecological Restoration Zone 1.2

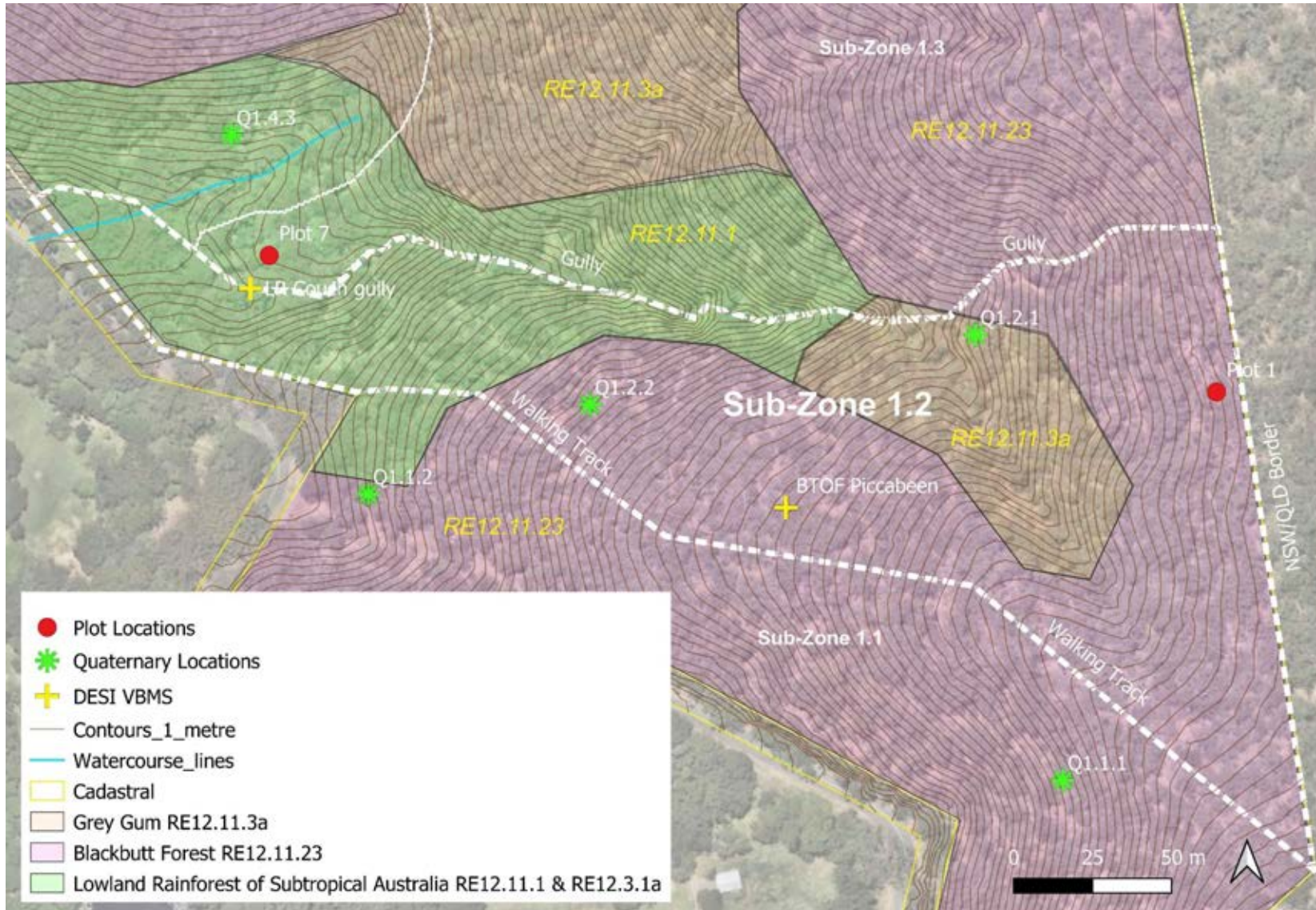


Table 10: Sub-Zone 1.2

Zone 1: Far Southern Remnants		Sub-Zone 1.2	
<b>Size Ha:</b>	2.917		
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.1; 12.11.1	<b>Current Vegetation State</b>	Remnant
<b>General description and current condition</b>	Steep upper slopes, undulating mid-slopes, steep gullies in upper, mid and lower portions. Reasonably good condition overall, good canopy and stem density in most portions, good diversity. Maturing regrowth rainforest in lower portions. Occasional clusters of weeds.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23, 12.11.3 and 12.11.1</li> <li>• Prescribed burn for ecological health.</li> <li>• Remove unwanted tracks.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Focus on weeds along Piggabeen Rd edge - continue in from road easement. LMC*</li> <li>• Control weeds along eastern (NSW) boundary edge - continue in from boundary easement. LMC*</li> <li>• Focus on larger weed patches and one-off weeds e.g. <i>Ardisia</i>, <i>Hedychium</i>, <i>Heptapleurum</i> LMC*</li> <li>• Ensure follow-up of weed trees, and <i>Ardisia</i> and <i>Hedychium</i>. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Discourage bike entry and trail making. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration		
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus carnea</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>E. microcorys</i> , <i>E. siderophloia</i> , <i>Alphitonia excelsa</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> , <i>Melaleuca salicina</i> , <i>Alphitonia excels</i> , lower portions <i>Commersonia bartramia</i> , <i>Euroschinus falcatus</i> , <i>Flindersia bennettiana</i> , <i>F. schottiana</i> . Thickets of <i>Backhousia myrtifolia</i> in mid-portion gullies.		
<b>Dominant exotics</b>	Patches of <i>Melinis minutiflora</i> , scattered <i>Lantana camara</i> , <i>Passiflora suberosa</i> ssp. <i>littoralis</i> and <i>P. pallida</i> , occasional <i>Ochna serrulata</i> , <i>Ardisia crenata</i> , <i>Heptapleurum actinophyllum</i> and <i>Hedychium gardnerianum</i> in lower sections, seedlings of <i>Cinnamomum camphora</i> . One-off occurrence of <i>Tabebuia chrysotricha</i>		
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Lepiderema pulchella</i> , <i>Randia moorei</i> , <i>Rhodamnia maideniana</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> .		
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat		



<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Possibility to reinstate old vehicular track from its entry off Piggabeen Rd in SW portions and continuing along southern sub-zone boundary (adjoining Z1.1)</li> <li>• Potential for improved boundary fencing including fauna-friendly and for bike exclusion.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	3	<b>Year 2</b>	2	<b>Year 1</b>	2	<b>Year 2</b>	1	<b>Perpetual</b>	2

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

5.4.1.3 Sub-Zone 1.3

Figure 5-3: Ecological Restoration Zone 1.3

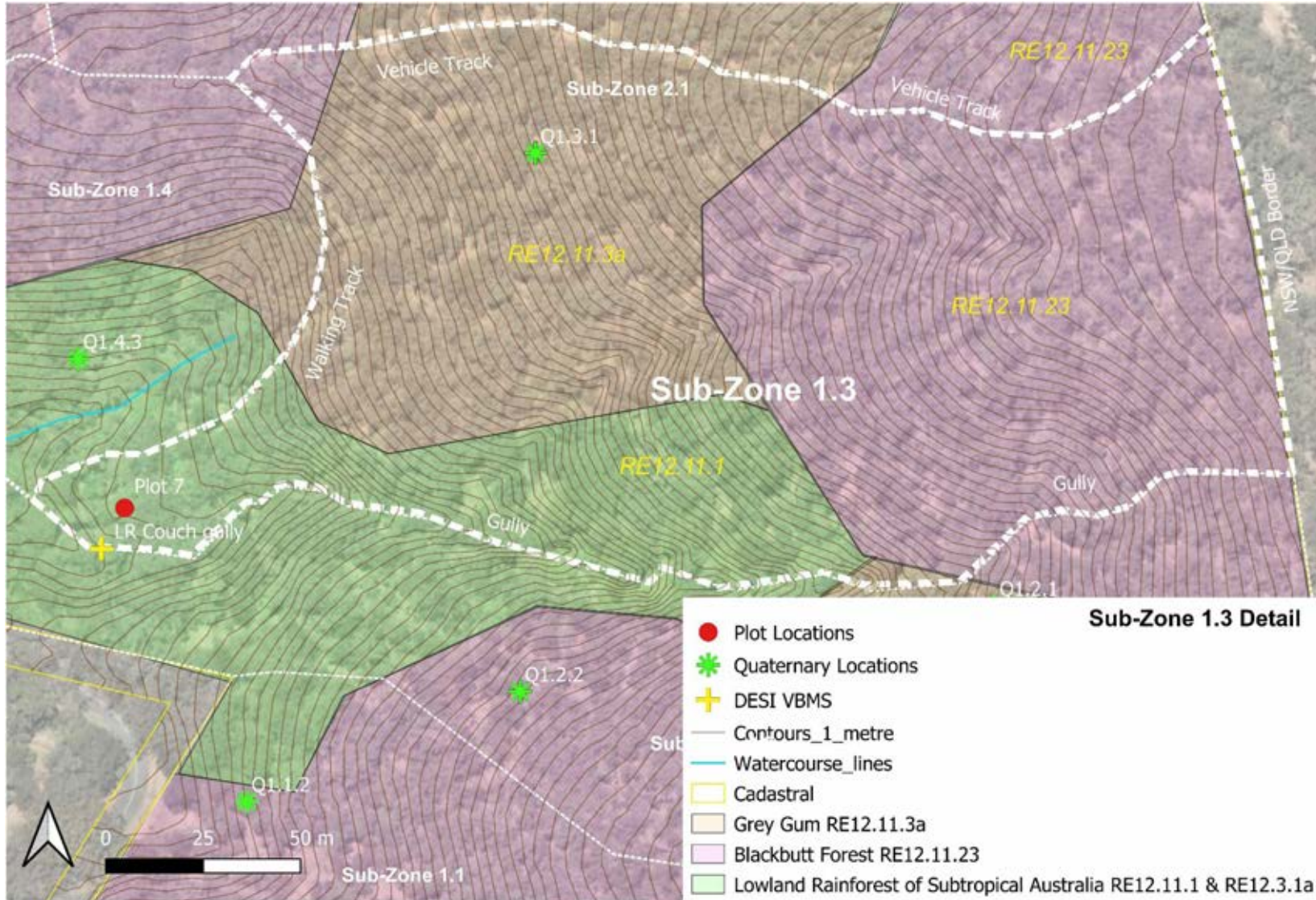


Table 11: Sub-Zone 1.3

Zone 1: Far Southern Remnants		Sub-Zone 1.3							
<b>Size Ha:</b>	3.160								
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.1; 12.11.1		<b>Current Vegetation State</b>			Remnant			
<b>General description and current condition</b>	Steep upper slopes, undulating mid-slopes, steep gullies mid and lower portions. Reasonably good condition overall, good canopy and stem density in most portions, good diversity. Maturing regrowth rainforest in lower portions. Occasional clusters of weeds. Western boundary of sub-zone follows a disused track that will be left to regenerate (borders Z1.4).								
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23, 12.11.3 and 12.11.1</li> <li>• Prescribed burn for ecological health.</li> <li>• Remove unwanted tracks.</li> <li>• Remove internal fences.</li> </ul>								
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Control weeds along eastern (NSW) boundary edge - continue in from boundary easement. LMC*</li> <li>• Focus on larger weed patches e.g. <i>Passiflora</i> spp., <i>Nephrolepis</i> LMC*</li> <li>• Ensure follow-up of <i>Nephrolepis</i> LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Discourage bike entry and trail making. EDQ*</li> <li>• Determine location of, and schedule removal of, internal fences EDQ*</li> </ul>								
<b>Restoration approach</b>	Assisted Natural Regeneration								
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus carnea</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>E. microcorys</i> , <i>E. siderophloia</i> , <i>Alphitonia excelsa</i> , <i>Lophostemon confertus</i> , <i>Melaleuca salicina</i> . Thickets of <i>Backhousia myrtifolia</i> in mid-portion gullies, lower portions <i>Commersonia bartramia</i> , <i>Euroschinus falcatus</i> , <i>Flindersia bennettiana</i> , <i>F. schottiana</i> , <i>Sloanea woolsii</i> . Stand of <i>Acacia bakeri</i> mid-portions.								
<b>Dominant exotics</b>	Scattered <i>Lantana camara</i> , clumps of <i>Passiflora suberosa</i> ssp. <i>littoralis</i> , occasional <i>Ochna serrulata</i> , <i>Senna pendula</i> var. <i>glabrata</i> , large patch of <i>Nephrolepis</i> part way up western (sub-zone) boundary track.								
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Rhodamnia maideniana</i> , <i>Rhodamnia rubescens</i> , <i>Lepiderema pulchella</i>								
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly and for bike exclusion.</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	5	<b>Year 2</b>	3	<b>Year 1</b>	2	<b>Year 2</b>	2	<b>Perpetual</b>

5.4.1.4 Sub-Zone 1.4

Figure 5-4: Ecological Restoration Zone 1.4

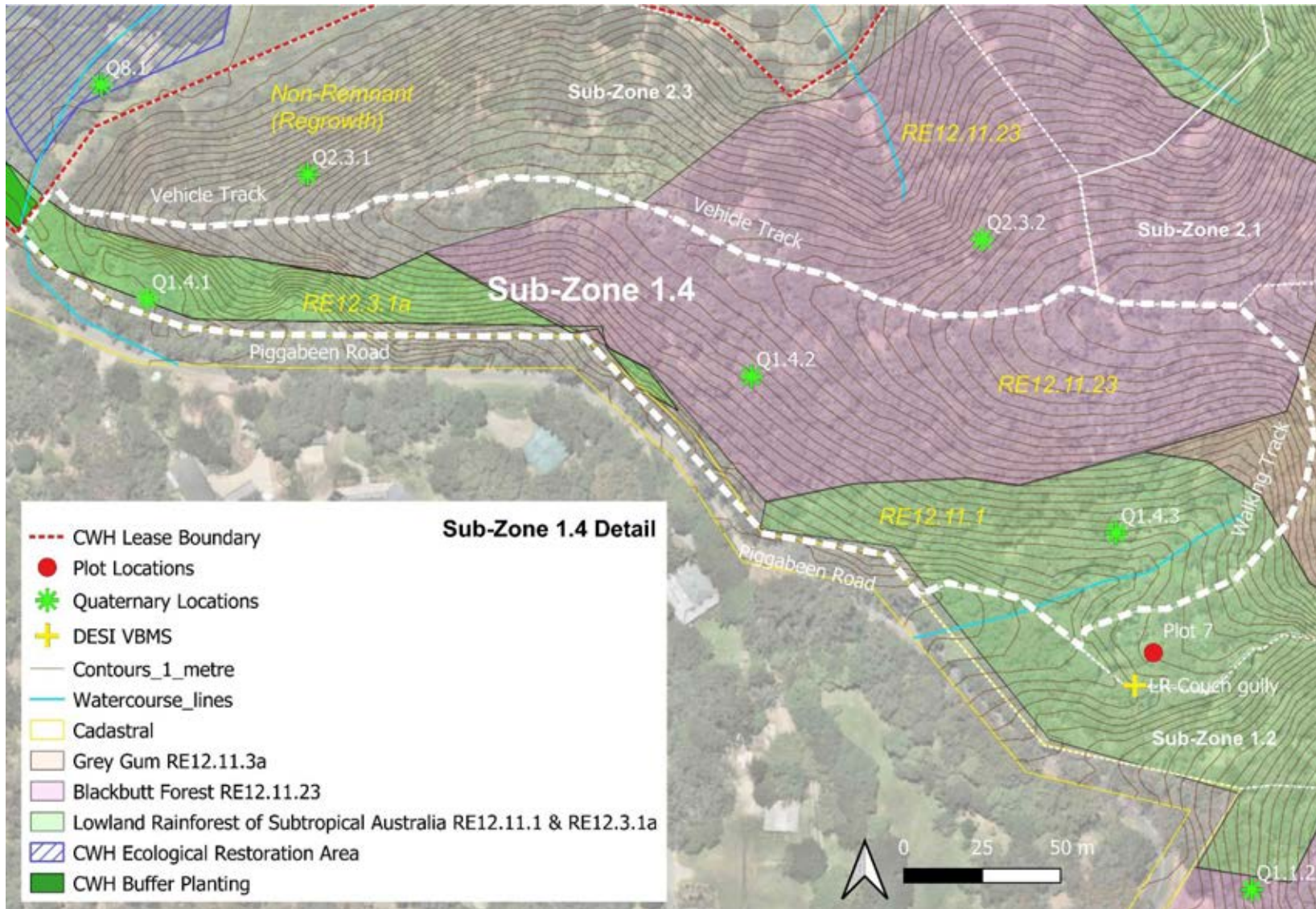


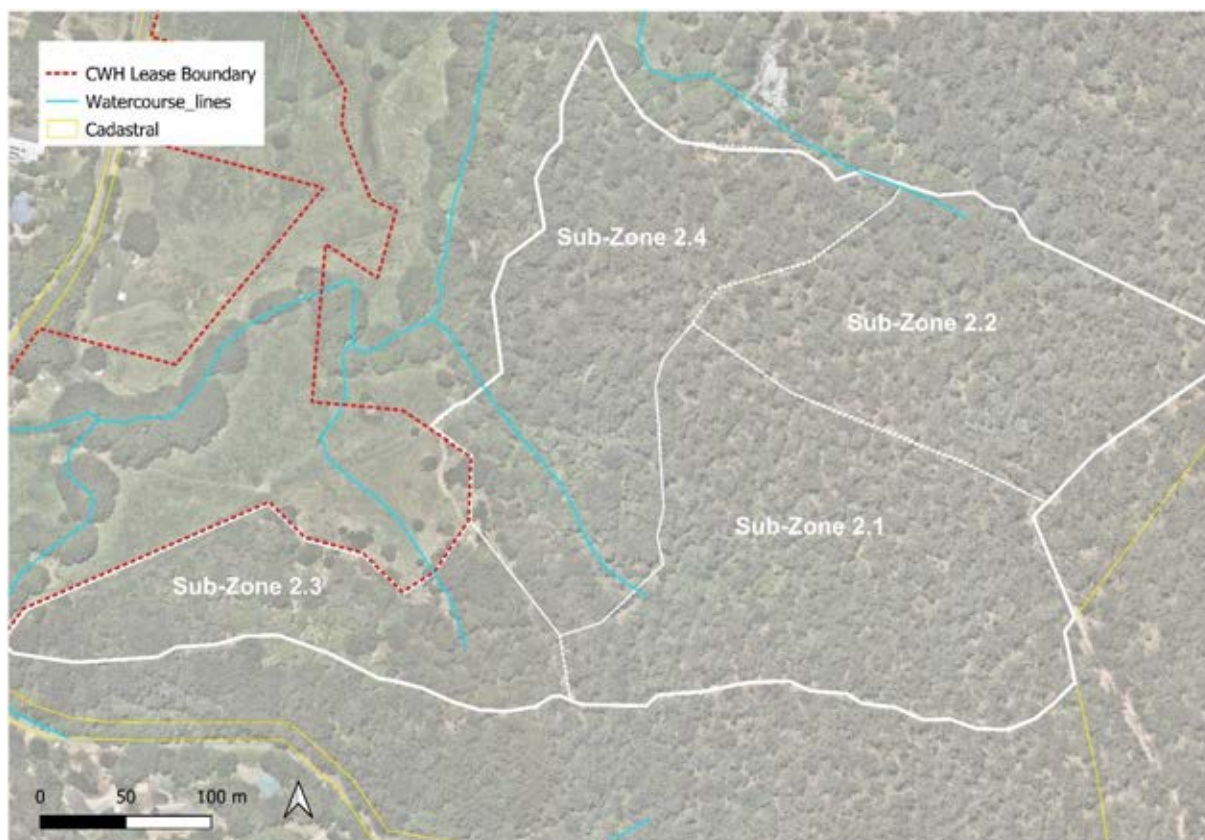
Table 12: Sub-Zone 1.4

Zone 1: Far Southern Remnants		Sub-Zone 1.4	
<b>Size Ha:</b>	2.584		
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.1; 12.11.1	<b>Current Vegetation State</b>	Remnant + non-remnant (mature regrowth)
<b>General description and current condition</b>	Steep lower slopes, undulating mid-slopes. Higher portions with good canopy but understorey disturbance, lower portions have dominant areas of Camphor Laurel in both T1 and T2 requiring a staged approach to allow for sub-canopy recovery over time. Maturing regrowth rainforest in lower portions also with high amount of Camphor Laurel in T2. Clusters of weeds common. Eastern boundary of sub-zone follows a disused track that will be left to regenerate (borders Z1.3).		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23, 12.11.3 and 12.11.1</li> <li>• Improve integrity of upper unnamed creek</li> <li>• Remove internal fences.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Focus on weeds along Piggabeen Rd edge - continue in from road easement. LMC*</li> <li>• Systematic/staged control of <i>Cinnamomum camphora</i> in lower portions. LMC*</li> <li>• Focus on isolated weed patches e.g. <i>Ardisia crenata</i>, <i>Sphagneticola trilobata</i> along Piggabeen Rd. LMC*</li> <li>• Ensure follow-up of <i>Hedychium</i> LMC*</li> <li>• Determine location of, and schedule removal of, internal fences EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration		
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus acmenoides</i> , <i>E. microcorys</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>Lophostemon confertus</i> , Lower portions <i>Argyrodendron trifoliolatum</i> , <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Pseudoweinmannia lachnocarpa</i> , <i>Quintinea verdonii</i> , <i>Sloanea woolsii</i> , <i>Synoum glandulosum</i> , thickets of <i>Backhousia myrtifolia</i> on SE slopes.		
<b>Dominant exotics</b>	Large areas of <i>Cinnamomum camphora</i> , some dominant T1, others dominant T2. Patches of <i>Hedychium gardnerianum</i> , <i>Heptapleurum actinophyllum</i> , scattered <i>Lantana camara</i> , clumps of <i>Passiflora suberosa</i> ssp. <i>litoralis</i> , occasional <i>Ochna serrulata</i> , <i>Senna pendula</i> var. <i>glabrata</i> , large patch of <i>Sphagneticola trilobata</i> near lower Piggabeen roadside.		
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Leichhardtia longiloba</i> , <i>Randia moorei</i> , <i>Rhodamnia maideniana</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> , <i>Lepiderema pulchella</i> .		
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat		



<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly.</li> <li>• Potentially suitable for volunteer community assistance in portions of unnamed creek adjacent to Piggabeen Rd.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	5	<b>Year 2</b>	5	<b>Year 1</b>	5	<b>Year 2</b>	5	<b>Perpetual</b>	6

#### 5.4.2 Zone 2 Southern Remnants



This Zone contains a significant area of endangered Blackbutt Forest (RE12.11.23), least concern Grey Gum woodland (RE12.11.3a) and Federally listed Lowland Rainforest of Subtropical Australia (RE12.11.1). It is also bounded by the NSW border (fence and gravel track) to the east. Gradient varies from flat to gently undulating in higher portions to steep hillsides and incised gullies in mid-portions to lower alluvial flats. Condition state also varied from relatively good condition in higher portions with older mature trees and good understorey diversity, to modified areas with various age-classes of regrowth. There is a significant area of weed infestation including Cat's Claw infestation covering parts of Sub-Zones 2.1 and 2.4, and large areas of canopy and sub-canopy Camphor Laurel in Sub-Zones 2.3 and 2.4.

Edge effects will be an ongoing management issue along the NSW border and some higher portions are also subject to use by bikes with several active tracks.

Key threats and management recommendations have been identified for Zone 2. These are summarised in **Table 13** and detailed, including recommended management action in **Attachment 7**.



Table 13: Zone 2 Key Threats

😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 2	Risk
Unmanaged fire impact to restoration areas	☹️
Vegetation management i.e. permits and approvals	😊
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	😊
Key persistent internal weeds not managed appropriately on-site	☹️
Biosecurity Myrtle Rust & Fire Ants	☹️
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	😐
Altered hydrology from site activities	😊
Disturbance and erosion from internal tracks/trails	😐
Fences	😊
Management changes to resource commitments	☹️
Inappropriate land management methods by contractors.	😐



**5.4.2.1 Sub-Zone 2.1**

**Figure 5-5: Ecological Restoration Zone 2.1**

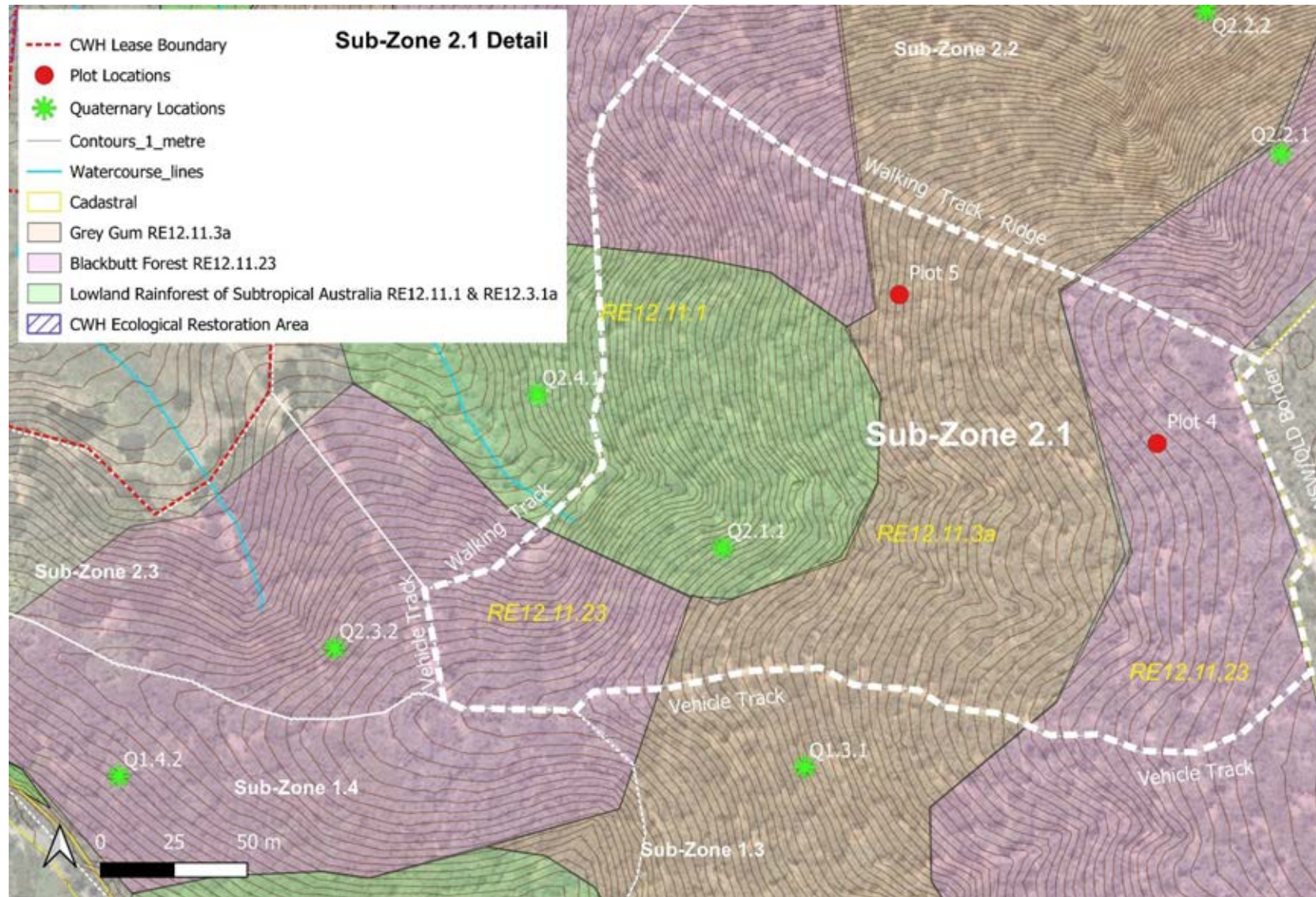


Table 14: Sub-Zone 2.1

Zone 2: Southern Remnants		Sub-Zone 2.1								
<b>Size Ha:</b>	4.209									
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.3; 12.11.1			<b>Current Vegetation State</b>				Remnant		
<b>General description and current condition</b>	Steep upper slopes, undulating mid-slopes, steep gullies and scree slopes mid and lower portions. Reasonably good condition overall in mid and upper portions, good canopy and stem density in most portions, good diversity, regrowth rainforest in lower portions with distinct change to RF understorey. Lower portions contain upper edge of significant Cat's Claw infestation (where some control works have been recently undertaken).									
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23, 12.11.3 and 12.11.1</li> <li>• Control large infestation of Cat's Claw Creeper.</li> <li>• Remove internal fences.</li> <li>• Prescribed burn for ecological health.</li> </ul>									
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Focus on staged control of Cat's Claw Creeper. LMC*</li> <li>• Ensure follow-up of Cat's Claw Creeper. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Determine location of, and schedule removal of, internal fences (east-west in higher portions) EDQ*</li> </ul>									
<b>Restoration approach</b>	Assisted Natural Regeneration									
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus pilularis</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Lophostemon confertus</i> , thickets of <i>Backhousia myrtifolia</i> on SE slopes.									
<b>Dominant exotics</b>	Large areas of <i>Dolichandra unguis-cati</i> (Cat's Claw Creeper) in lower portions, recently (until recent control) over-topping canopy, significant dominance in ground layer. Scattered <i>Lantana camara</i> , clumps of <i>Passiflora pallida</i> , <i>Paspalum mandiocanum</i> . Occasional <i>Cinnamomum camphora</i> seedlings.									
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Rhodamnia maideniana</i> , <i>Rhodamnia rubescens</i> , <i>Leichhardtia coronata</i> , <i>Rhodomyrtus psidioides</i> , <i>Lepiderema pulchella</i> .									
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	18	<b>Year 2</b>	8	<b>Year 1</b>	10	<b>Year 2</b>	5	<b>Perpetual</b>	8



5.4.2.2 Sub-Zone 2.2

Figure 5-6: Ecological Restoration Zone 2.2

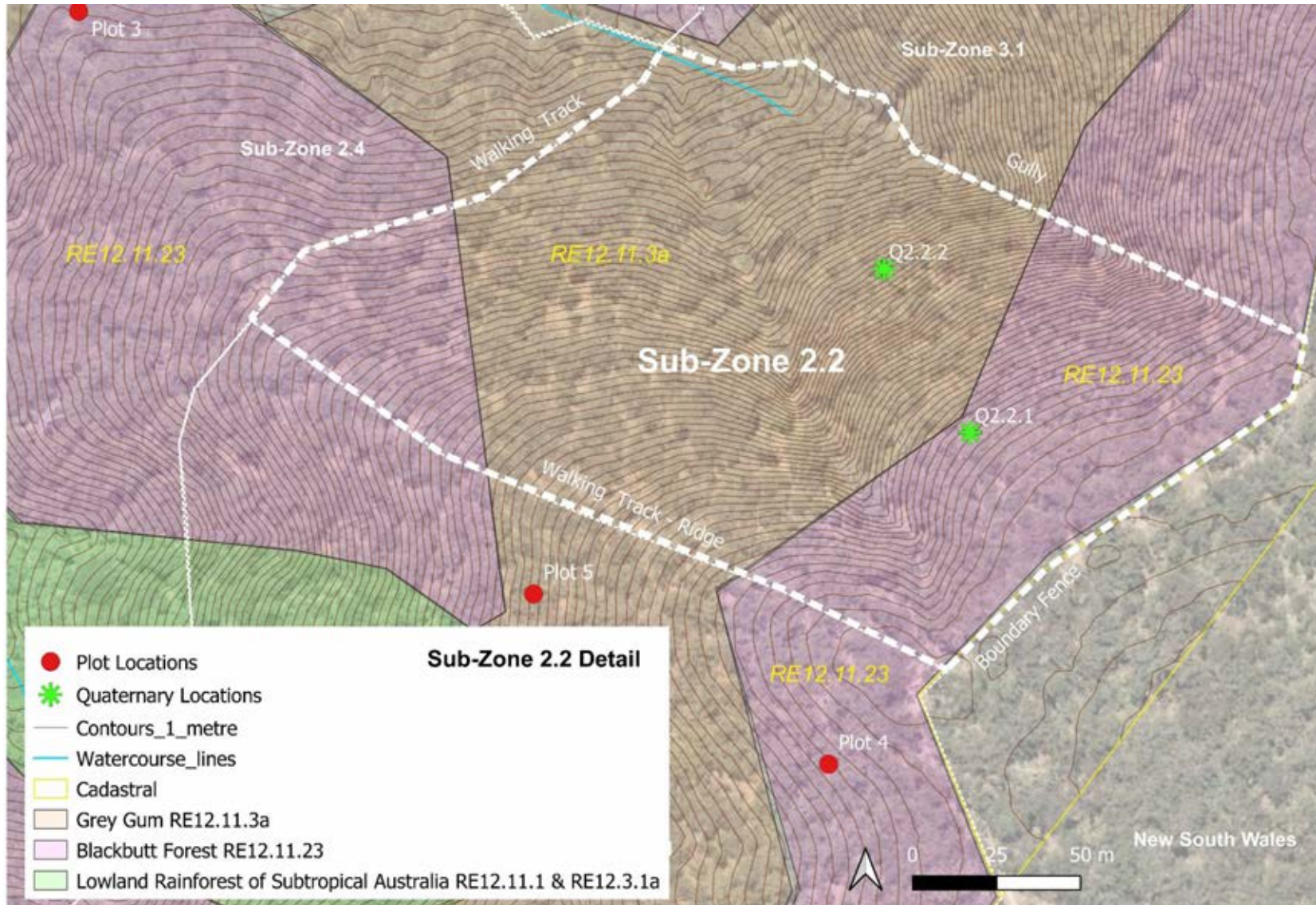


Table 15: Sub-Zone 2.2

Zone 2: Southern Remnants		Sub-Zone 2.2								
<b>Size Ha:</b>	3.071									
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.3			<b>Current Vegetation State</b>				Remnant		
<b>General description and current condition</b>	Steep upper slopes, undulating mid-slopes with steep gullies mid and lower portions. Reasonably good condition overall in mid and upper portions, good canopy and stem density in most portions, good diversity, tending to dense RF understorey in lower portions.									
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of RE12.11.23 and 12.11.3</li> <li>• Prescribed burn for ecological health.</li> </ul>									
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> </ul>									
<b>Restoration approach</b>	Assisted Natural Regeneration									
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus carnea</i> , <i>E. microcorys</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Alphitonia excelsa</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> , <i>Allocasuarina torulosa</i> , numerous stags (dead trees) in higher portions.									
<b>Dominant exotics</b>	Scattered <i>Lantana camara</i> , clumps of <i>Passiflora suberosa</i> ssp. <i>littoralis</i> , <i>P. pallida</i> , <i>Paspalum mandiocanum</i> . Occasional <i>Ageratina riparia</i> , <i>Heptapleurum actinophyllum</i> , <i>Jacaranda mimosifolia</i> , occasional <i>Cinnamomum camphora</i> seedlings.									
<b>Threatened plant species</b>	Mostly in lower portions: <i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Rhodamnia maideniana</i> , <i>Rhodamnia rubescens</i> , <i>Leichhardtia coronata</i> , <i>Rhodomyrtus psidioides</i> , <i>Lepiderema pulchella</i> .									
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	10	<b>Year 2</b>	5	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>	6

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland



5.4.2.3 Sub-Zone 2.3

Figure 5-7: Ecological Restoration Zone 2.3

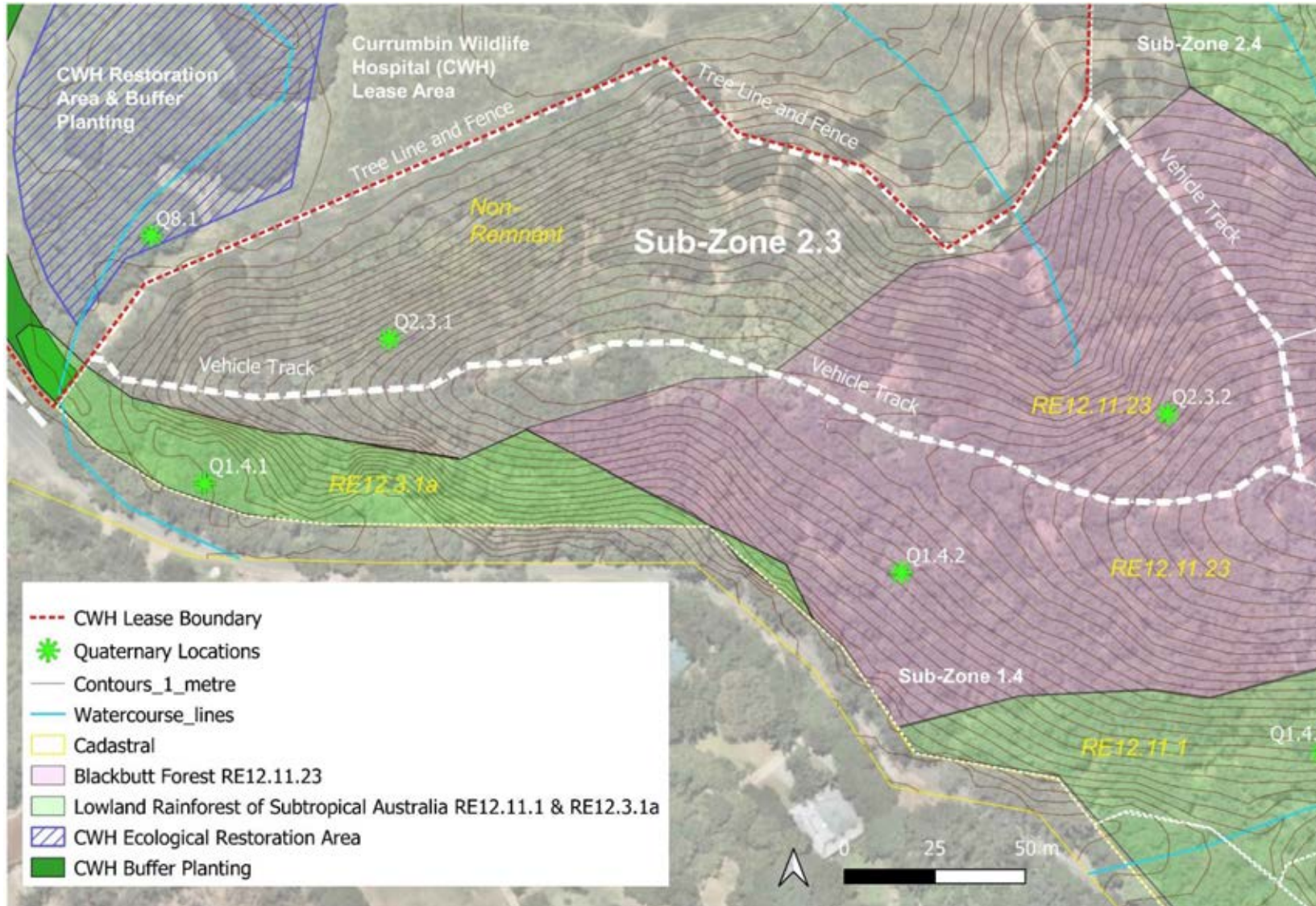


Table 16: Sub-Zone 2.3

Zone 2: Southern Remnants		Sub-Zone 2.3							
<b>Size Ha:</b>	2.047								
<b>Target - Reference state(s)</b>	12.11.23	<b>Current Vegetation State</b>			Remnant + non-remnant (regrowth + edge to open grassy)				
<b>General description and current condition</b>	Steep lower slopes, undulating mid-slopes. Lower regrowth sections abutting cleared areas have dominant areas of Camphor Laurel in both T1 and T2 (canopy layers) requiring a staged approach to allow for sub-canopy recovery over time. higher portions have good canopy and good understorey diversity.								
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23</li> <li>• Gradual increase to canopy edge</li> <li>• Gradual recovery of regrowth to remnant.</li> </ul>								
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Systematic/staged control of <i>Cinnamomum camphora</i> in lower portions LMC*</li> <li>• Systematic treatment to canopy edge to assist natural encroachment over time LMC*</li> </ul>								
<b>Restoration approach</b>	Assisted Natural Regeneration								
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus carnea</i> , <i>E. microcorys</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> , <i>Jagera pseudorhus</i> , <i>Guioa semiglauca</i> , <i>Allocasuarina torulosa</i> , <i>Alphitonia excelsa</i> , <i>Toechima dasyrrhache</i> .								
<b>Dominant exotics</b>	Lower portions EDL <i>Cinnamomum camphora</i> with only occasional native emergents (e.g. <i>C. intermedia</i> with Camphor dominance decreasing in elevation; patches of <i>Hedychium gardnerianum</i> , <i>Heptapleurum actinophyllum</i> , scattered <i>Lantana camara</i> , clumps of <i>Passiflora edulis</i> , <i>P. pallida</i> , occasional <i>Ochna serrulata</i> , <i>Senna pendula</i> var. <i>glabrata</i> , <i>Ardisia crenata</i> , <i>Paspalum mandiocanum</i> . Track shared with Sub-Zone 1.4 has patches of <i>Ardisia crenata</i> , <i>Hedychium gardnerianum</i> , <i>Paspalum mandiocanum</i> .								
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Cassia marksiana</i> , <i>Endiandra globosa</i> , <i>Randia moorei</i> , <i>Rhodamnia rubescens</i> .								
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
<b>Opportunities</b>	Nil								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>			<b>Annual Maintenance</b>		
	<b>Year 1</b>	4	<b>Year 2</b>	3	<b>Year 1</b>	3	<b>Year 2</b>	2	<b>Perpetual</b>

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland



### 5.4.2.4 Sub-Zone 2.4

Figure 5-8: Ecological Restoration Zone 2.4

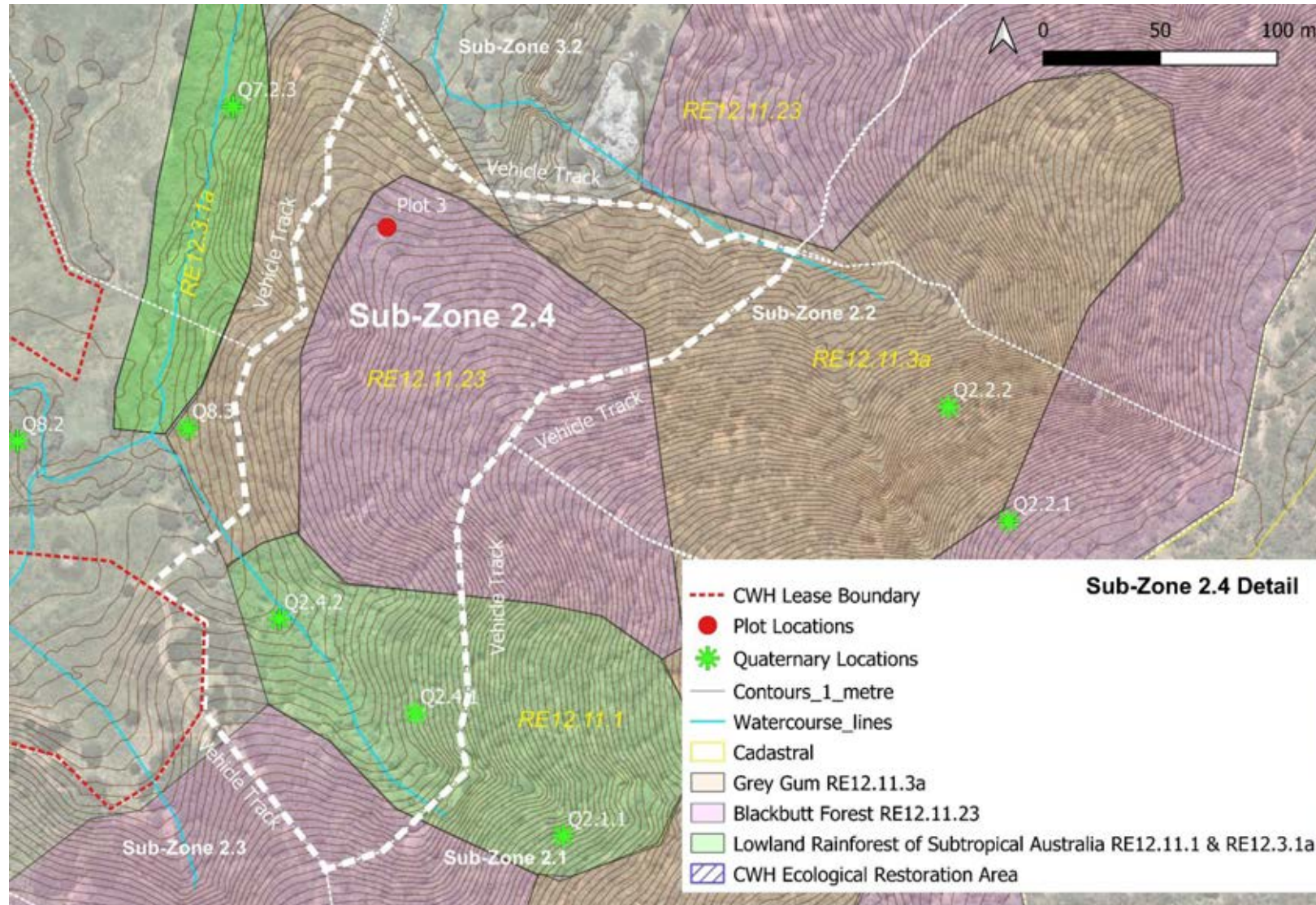


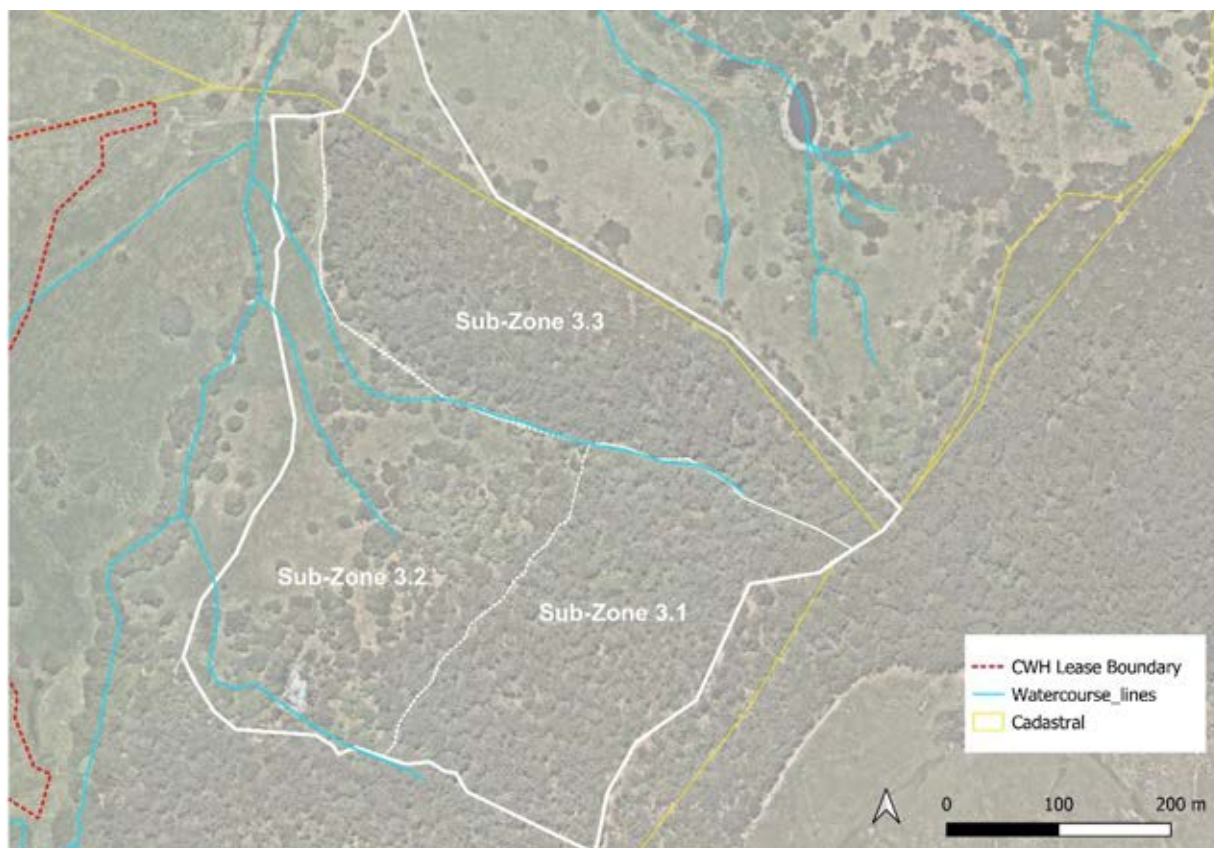
Table 17: Sub-Zone 2.4

Zone 2: Southern Remnants		Sub-Zone 2.4	
<b>Size Ha:</b>	3.696		
<b>Target - Reference state(s)</b>	12.11.1, 12.11.3, 12.11.23	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge to open grassy)
<b>General description and current condition</b>	Undulating mid-slopes with some steep gullies and scree slopes, including significant infestation of Cat's Claw (where some control works have been recently undertaken). Lower portions include rainforest (with a large <i>Syzygium moorei</i> [Coolamon] and juveniles) with good rainforest diversity in canopy T2 and understorey, including thickets of <i>Backhousia myrtifolia</i> , graduating to upper portions via a broad ecotone to tall open forest in reasonably good condition with good canopy and understorey diversity.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.1, 12.11.3 &amp; 12.11.23</li> <li>• Control large infestation of Cat's Claw Creeper</li> <li>• Gradual increase to canopy edge</li> <li>• Gradual recovery of regrowth to remnant.</li> </ul>		
<b>Objectives &amp; Responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach LMC*</li> <li>• Focus on staged control of Cat's Claw Creeper. LMC*</li> <li>• Ensure follow-up of Cat's Claw Creeper LMC*</li> <li>• Systematic/staged control of <i>Cinnamomum camphora</i> in lower portions LMC*</li> <li>• Systematic treatment to canopy edge to assist natural encroachment over time LMC*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration		
<b>Dominant natives (EDL)</b>	<i>Corymbia intermedia</i> , <i>Eucalyptus microcorys</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>Lophostemon confertus</i> , <i>L. suaveolens</i> . Lower portions <i>Dysoxylum mollissimum</i> , <i>Elaeocarpus obovatus</i> , <i>Endiandra muelleri</i> var. <i>bracteata</i> , <i>E. globosa</i> , <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Melaleuca salicina</i> , <i>Pentaceras australis</i> , <i>Sloanea woolisii</i> , <i>Synoum glandulosum</i> , <i>Syzygium moorei</i> , <i>Vitex lignum-vitae</i>		
<b>Dominant exotics</b>	Large areas of <i>Dolichandra unguis-cati</i> (Cat's Claw Creeper) in lower and mid gully and adjoining hillside portions, recently (until recent control) over-topping canopy, significant dominance in ground layer. Scattered <i>Lantana camara</i> , clumps of <i>Passiflora suberosa</i> ssp. <i>litoralis</i> , <i>P. pallida</i> , <i>Paspalum mandiocanum</i> . occasional <i>Heptapleurum actinophyllum</i> , <i>Ligustrum lucidum</i> , <i>Ochna serrulata</i> , numerous <i>Cinnamomum camphora</i> seedlings.		
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Cassia marksiana</i> , <i>Endiandra globosa</i> , <i>Endiandra hayesii</i> , <i>Leichhardtia longiloba</i> , <i>Lepiderema pulchella</i> , <i>Macadamia integrifolia</i> , <i>Rhodamnia maideniana</i> , <i>R. rubescens</i> , <i>Rhodomyrtus psidioides</i> , <i>Syzygium moorei</i>		

<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin’s Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>Potentially suitable for volunteer community assistance in the vicinity of the Cat’s Claw treatment area.</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>			<b>Annual Maintenance</b>		
	<b>Year 1</b>	18	<b>Year 2</b>	8	<b>Year 1</b>	11	<b>Year 2</b>	7	<b>Perpetual</b>

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

### 5.4.3 Zone 3 Central Forests



This Zone contains a significant area of largely intact remnant endangered Blackbutt Forest (RE12.11.23) in higher portions graduating to least concern Grey Gum Woodland (RE12.11.3a), and then Federally listed Lowland Rainforest of Subtropical Australia (RE12.11.1) in lower gullies. It also has open areas containing various stages of regrowth interspersed with pasture grasses. This zone contains a decommissioned dam, which has mostly retained the original built form apart from an intentionally excavated cut in the dam wall. Retention of this decommissioned dam is appropriate, subject to safety considerations, as removal may result in unnecessary disturbance to the surrounding ecosystem. The Zone is bounded in the east by the NSW border (fence and gravel track) and gradient varies from flat to gently undulating in higher portions to steep hillsides and incised gullies in mid-portions to lower alluvial flats. Condition state also varied from relatively good condition in higher portions with older mature trees and good understorey diversity, to modified areas with various age-classes of regrowth. The main east-west gully in mid and lower portions contains a diverse patch of rainforest including the only location where the Richmond Birdwing Vine, and also the butterfly, were observed. Lower creek portions offer an ideal opportunity for revegetation to connect this gully to the main creek. South-west portions dominated by pasture grass currently contains a magnificent large solitary Hoop Pine. Edge effects will be an ongoing management issue along the NSW border.

Key threats and management recommendations have been identified for Zone 3. These are summarised in **Table 18** and detailed, including recommended management action in **Attachment 7**.

Table 18: Zone 3 Key Threats

😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 3	Risk
Unmanaged fire impact to restoration areas	☹️
Vegetation management i.e. permits and approvals	😊
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	😊
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	☹️
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	😐
Altered hydrology from site activities	😊
Disturbance and erosion from internal tracks/trails	😐
Fences	😊
Management changes to resource commitments	☹️
Inappropriate land management methods by contractors.	😐



**5.4.3.1 Sub-Zone 3.1**

**Figure 5-9: Ecological Restoration Zone 3.1**

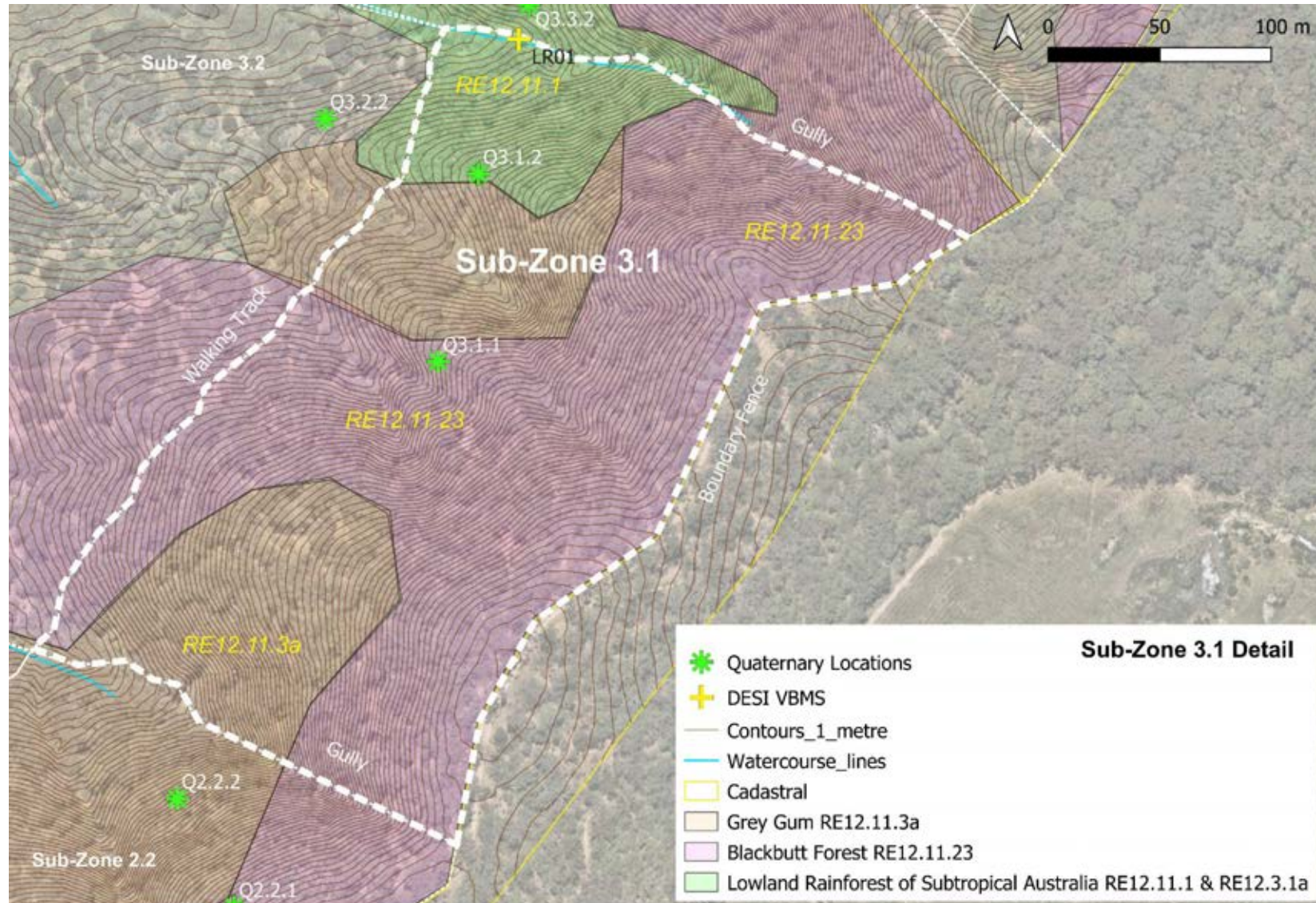


Table 19: Sub-Zone 3.1

Zone 3: Central Forests		Sub-Zone 3.1							
Size Ha:	6.704								
Target - Reference state(s)	RE12.11.23; 12.11.3; 12.11.1	Current Vegetation State		Remnant					
General description and current condition	Steep upper slopes, undulating mid-slopes with steep gullies mid and lower portions. Reasonably good condition overall in mid and upper portions, good canopy and stem density in most portions, good diversity, tending to dense RF understorey in north-eastern portions.								
Goals	<ul style="list-style-type: none"> <li>Full recovery of 12.11.23, 12.11.3 and 12.11.1</li> <li>Prescribed burn for ecological health.</li> </ul>								
Objectives & responsibilities	<ul style="list-style-type: none"> <li>Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> </ul>								
Restoration approach	Assisted Natural Regeneration								
Dominant natives (EDL)	Higher portions dominated by <i>Eucalyptus pilularis</i> with <i>Corymbia intermedia</i> , <i>E. microcorys</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Lophostemon confertus</i> , <i>Allocasuarina torulosa</i> , <i>Alphitonia excelsa</i> . Mid and lower portions have an increasing understorey of rainforest species with sub-canopy spp. including <i>Guioa semiglauca</i> , <i>Flindersia bennettii</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Polyscias elegans</i> . Shares a steep gully with Sub-Zone 3.3 which is a narrow band of LRSA with <i>Argyrodendron trifoliolatum</i> , <i>Baloghia inophylla</i> , <i>Harpullia pendula</i> , <i>Syzygium moorei</i> .								
Dominant exotics	<i>Lantana camara</i> (denser on lower slopes), clumps of <i>Passiflora suberosa</i> ssp. <i>litoralis</i> , <i>P. pallida</i> , <i>Paspalum mandiocanum</i> . occasional <i>Ochna serrulata</i> , <i>Cinnamomum camphora</i> seedlings.								
Threatened plant species	<i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Leichhardtia longiloba</i> , <i>Pararistolochia praevenosa</i> , <i>Randia moorei</i> , <i>Rhodamnia maideniana</i> , <i>R. rubescens</i> , <i>Rhodomyrtus psidioides</i> , <i>Syzygium moorei</i> .								
Habitat for significant fauna species	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
Opportunities	<ul style="list-style-type: none"> <li>Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> </ul>								
Labour suggestions (days per team of 3)	Primary treatment		Follow-up treatment		Annual Maintenance				
	Year 1	6	Year 2	6	Year 1	3	Year 2	3	Perpetual

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland



**5.4.3.2 Sub-Zone 3.2**

**Figure 5-10: Ecological Restoration Zone 3.2**

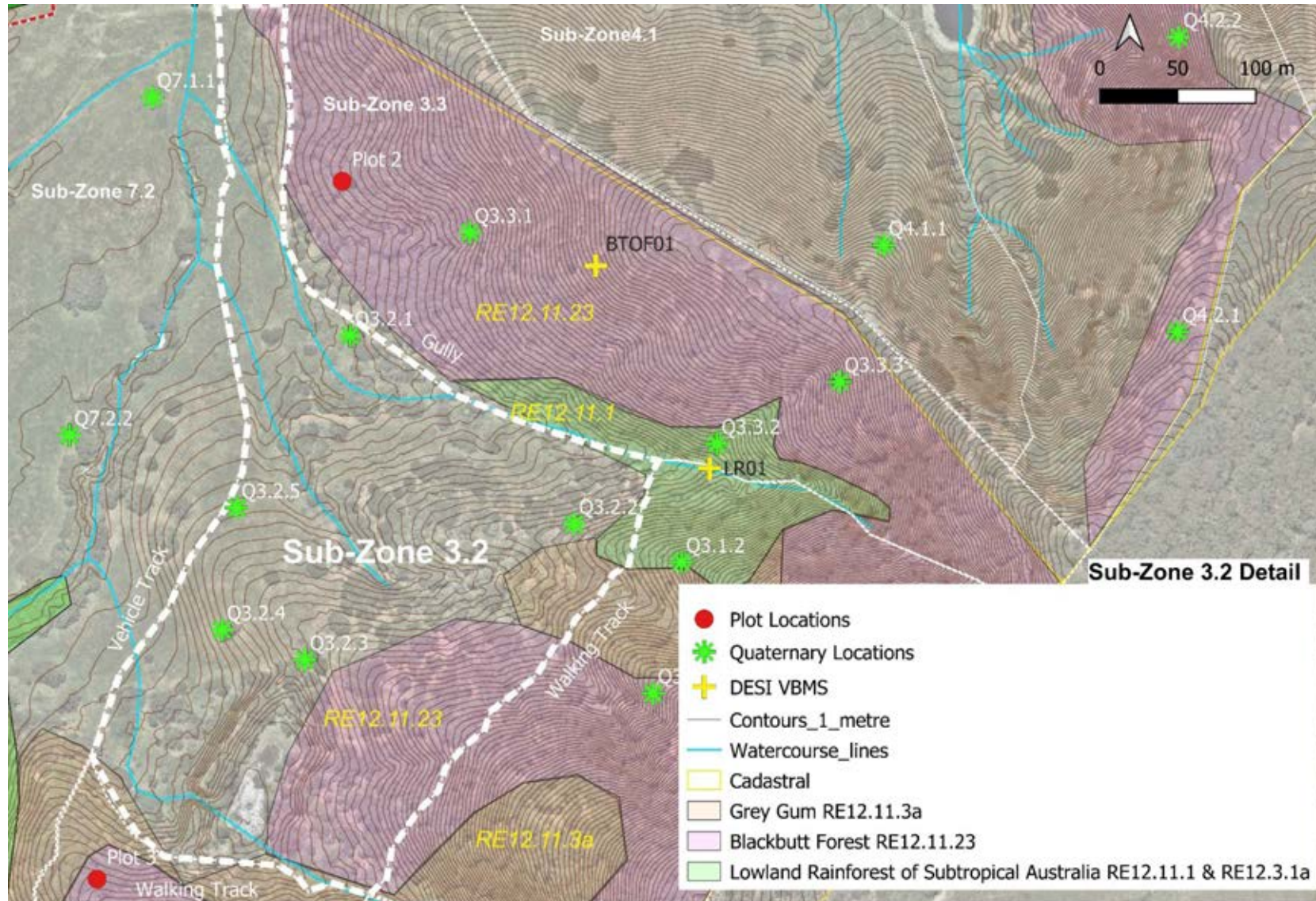


Table 20: Sub-Zone 3.2

Zone 3: Central Forests		Sub-Zone 3.2								
<b>Size Ha:</b>	8.666									
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.3; 12.11.1			<b>Current Vegetation State</b>		Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)				
<b>General description and current condition</b>	Lower steep to undulating foothills with remnant vegetation in eastern parts adjoining a large area of variable aged regrowth which contains isolated mature trees with scattered copses of trees and shrubs. In many places these join to form a connected canopy, interspersed with decreasing areas of pasture grass. Lower undulating western portions include areas of open pasture with scattered trees, including large, older remnant <i>Araucaria cunninghamiana</i> (Hoop Pine). Southern portions include a decommissioned earth dam which holds a small amount of water dominated by wetland species. There is no proposal to alter this modified landform.									
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23, 12.11.3 and 12.11.1 in remnant and regrowth portions LMC*</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth. LMC*</li> </ul>									
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> </ul>									
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part									
<b>Dominant natives (EDL)</b>	<i>Eucalyptus siderophloia</i> , <i>E. microcorys</i> , <i>E. propinqua</i> , <i>E. pilularis</i> (though minimal), <i>Acacia melanoxyton</i> , <i>Corymbia intermedia</i> , <i>Lophostemon confertus</i> , <i>Melaleuca salicina</i> (in parts), solitary <i>Araucaria cunninghamiana</i> in western portions.									
<b>Dominant exotics</b>	Varies according to canopy cover but includes <i>Corymbia torelliana</i> , <i>Cinnamomum camphora</i> , <i>Digitaria eriantha</i> , <i>Lantana camara</i> , <i>Ochna serrulata</i> , <i>Paspalum mandiocanum</i> , <i>Passiflora pallida</i> , <i>Senna pendula</i> , <i>Setaria sphacelata</i> , <i>Solanum chrysotrichum</i> , <i>S. mauritianum</i> , <i>S. seaforthianum</i> , <i>Vigna parkeri</i> .									
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Lepiderema pulchella</i> , <i>Rhodamnia rubescens</i> .									
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.									
<b>Opportunities</b>	Potential for revegetation planting to the modified creek in northern portions, which in time would provide a vegetated corridor to the main creek.									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	12	<b>Year 2</b>	12	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>	12

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland



**5.4.3.3 Sub-Zone 3.3**

**Figure 5-11: Ecological Restoration Zone 3.3**

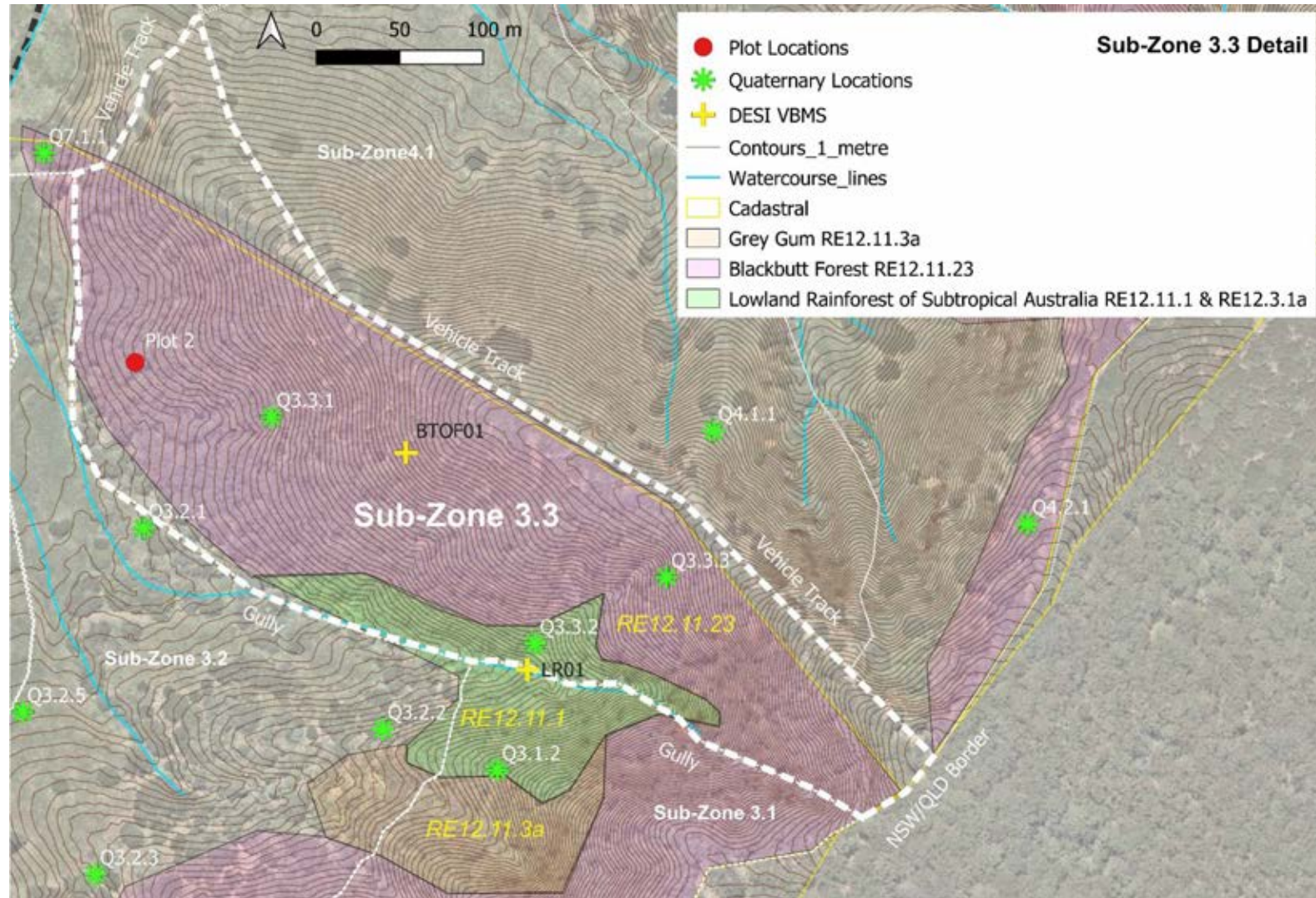
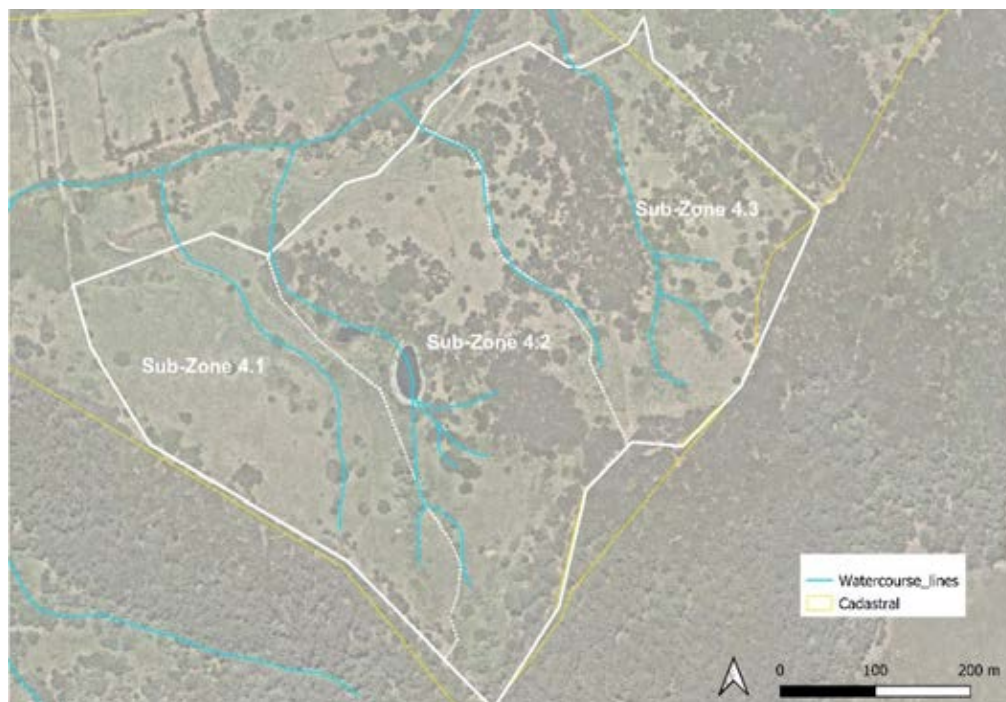


Table 21: Sub-Zone 3.3

Zone 3: Central Forests		Sub-Zone 3.3							
<b>Size Ha:</b>	8.535								
<b>Target - Reference state(s)</b>	RE12.11.23; 12.11.1			<b>Current Vegetation State</b>		Remnant + non-remnant (regrowth + edge to open grassy)			
<b>General description and current condition</b>	Steep upper slopes, undulating mid-slopes with steep gullies in mid and lower portions. Reasonably good condition overall in mid and upper portions, good canopy and stem density in most portions, good diversity, tending to dense RF understorey in southern portions. At the toe of the south-facing hillsides is a modified creek which should be prioritised for weed control and potential riparian planting. North-east portions include numerous exotic trees residual from the previous farmhouse (including several planted <i>Macadamia integrifolia</i> CV), interspersed with pasture grasses.								
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23, 12.11.3 and 12.11.1 in remnant and regrowth portions LMC*</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> </ul>								
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> </ul>								
<b>Restoration approach</b>	Assisted Natural Regeneration								
<b>Dominant natives (EDL)</b>	Higher portions dominated by <i>Eucalyptus pilularis</i> with <i>Corymbia intermedia</i> , <i>E. microcorys</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Lophostemon confertus</i> , <i>Allocasuarina torulosa</i> , <i>Alphitonia excelsa</i> . Mid and lower portions have an increasing understorey of rainforest species with sub-canopy spp. including <i>Cryptocarya microneura</i> , <i>Guioa semiglauca</i> , <i>Flindersia bennettii</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Polyscias elegans</i> . Shares a steep gully with Sub-Zone 3.1 which is a narrow band of LRSA with <i>Argyrodendron trifoliolatum</i> , <i>Baloghia inophylla</i> , <i>Harpullia pendula</i> , <i>Syzygium moorei</i> .								
<b>Dominant exotics</b>	<i>Lantana camara</i> (denser on lower slopes), clumps of <i>Passiflora suberosa</i> ssp. <i>litoralis</i> , <i>P. pallida</i> , <i>Paspalum mandiocanum</i> . Occasional <i>Ligustrum lucidum</i> , <i>Ochna serrulata</i> , <i>Cinnamomum camphora</i> seedlings. <i>Ipomoea purpurea</i> , <i>Solanum seaforthianum</i> and <i>Sorghum halepense</i> in NE section.								
<b>Threatened plant species</b>	<i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Lepiderema pulchella</i> , <i>Macadamia integrifolia</i> , <i>Pararistolochia praevenosa</i> , <i>Randia moorei</i> , <i>Rhodamnia maideniana</i> , <i>R. rubescens</i> , <i>Rhodomyrtus psidioides</i> , <i>Syzygium moorei</i> .								
<b>Habitat for significant fauna species</b>	Richmond Birdwing Butterfly, Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	12	<b>Year 2</b>	12	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

#### 5.4.4 Zone 4 Central Open Hills



This Zone has been highly modified through clearing and ongoing land use (mostly cattle grazing); however, there are fragmented portions of remnant endangered Blackbutt Forest remaining (RE12.11.23) plus areas of young and old regrowth. Remnant and regrowth along the track in higher portions and in gullies will require a concerted primary effort due to weed density.

Mid and higher portions contain cleared steep slopes dominated by pasture grasses which now cover a large part of the Sub-Zone. These slopes include numerous incised gullies, some of which are difficult to access, while some contain young native regrowth.

Due to the steep gradient and loose surface layers, some of these areas will be difficult to access and treat, and for safety reasons can remain untreated. However, in steep areas that can be treated, the risk of erosion can be minimised by utilising standard practices for woody weed control which includes cut & paste (not removal) and laying the cut material on the ground. Given the abundant local seed source, these areas will quickly re-colonise with new vegetation. Similarly, many of these slopes are regarded as too steep and impractical for revegetation. Where untreated, given the high ecological resilience and the concurrent weed control within the property, these areas will recover through natural succession. A discussion on restoration methods and timeframes for areas with varying levels of canopy cover is provided in Section 5.2.

There are two (2) man-made dams in middle portions which are described as '*modified and artificial lacustrine wetlands*' and anecdotally these appear to be spring fed. Central and lower foothills remained wet from seepage for several months following the wet seasons of 2022, 2023 and 2024.













Lower creeks that are now largely identified as wet depressions as a result of clearing (apart from a few exceptions where there is good regrowth), offer an ideal opportunity for revegetation to provide connectivity to the main creek. There is a degree of infiltration of juvenile Slash Pine from the adjoining plantation in Zone 5 and these need to be controlled as a priority.

Edge effects will be an ongoing management issue along the NSW border. During seasonally dry periods, seasonal grass dieback, and as a possible consequence of prescribed burns, unintended fire in this Zone remains a high risk.

Key threats and management recommendations have been identified for Zone 4. Threats are summarised in **Table 22** and detailed, including management actions in **Attachment 7**.

Table 22: Zone 4 Key Threats

 Low Risk  Medium Risk  High Risk of Threat Occurring

Key Threats Zone 4	Risk
Unmanaged fire impact to restoration areas	
Vegetation management i.e. permits and approvals	
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	
Key persistent internal weeds not managed appropriately on-site	
Biosecurity Myrtle Rust & Fire Ants	
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	
Altered hydrology from site activities	
Disturbance and erosion from internal tracks/trails	
Fences	
Management changes to resource commitments	
Inappropriate land management methods by contractors.	

5.4.4.1 Sub-Zone 4.1

Figure 5-12: Ecological Restoration Zone 4.1

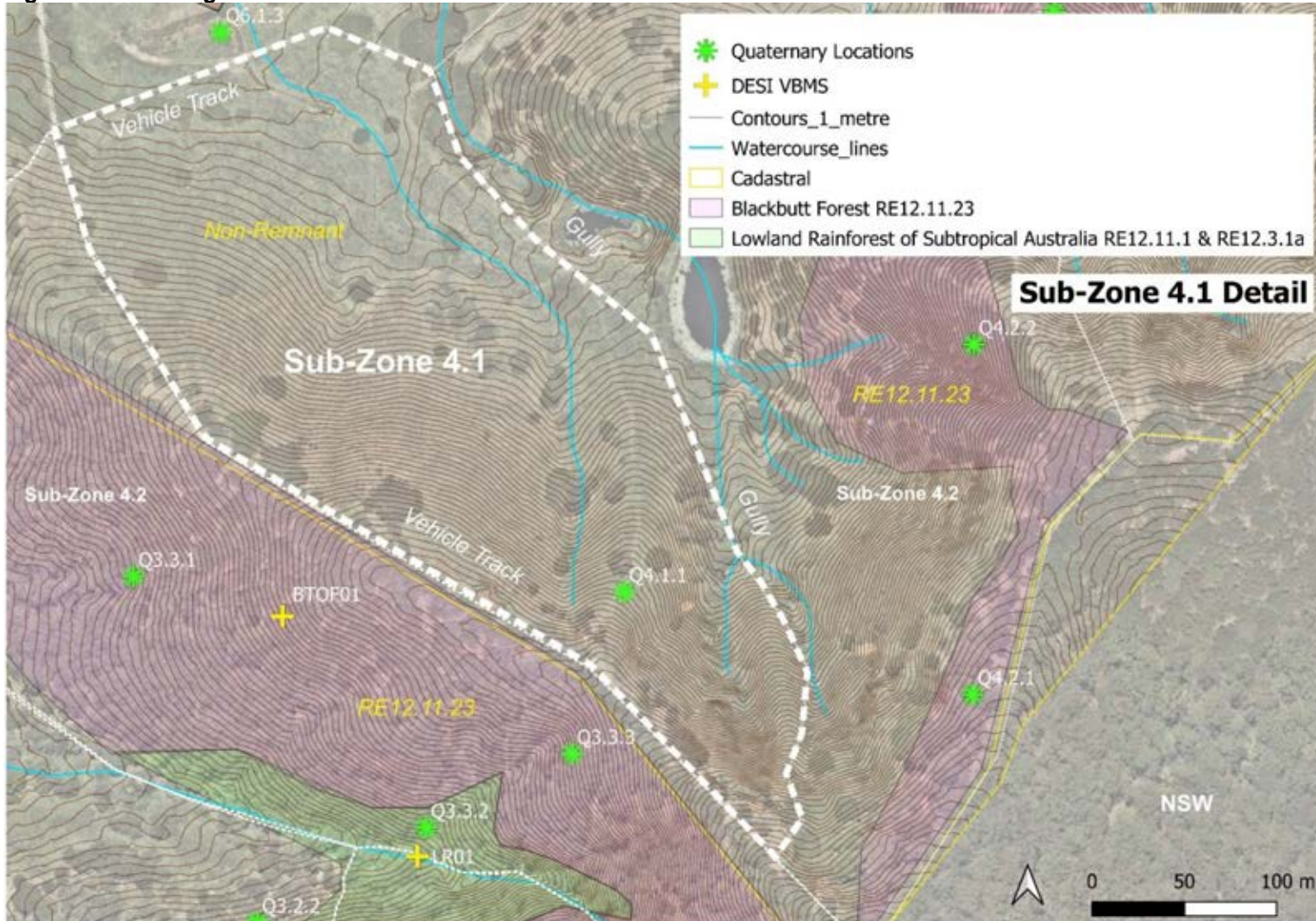


Table 23: Sub-Zone 4.1

Zone 4: Central Open Hills		Sub-Zone 4.1	
<b>Size Ha:</b>	7.789		
<b>Target - Reference state(s)</b>	RE12.11.23; 12.3.1a	<b>Current Vegetation State</b>	Regrowth + non-remnant (edge + open grassy with scattered trees)
<b>General description and current condition</b>	Mostly cleared with only occasional trees and tree copses. Some regrowth copses and individual trees along the southern ridge track. Very steep gradients and gullies in higher portions. Lower portions very wet from seepage after extended wet periods, alluding to the likelihood of pre-clear 12.3.1a in lower sections. Revegetation planting in steep sections impractical. Numerous solitary trees (native and exotic) amongst pasture grass currently offer ideal perch sites.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Partial recovery of 12.11.23 in remnant and regrowth portions.</li> <li>• Partial recovery of 12.3.1a in lower creek portions (subject to planting).</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> <li>• Control of <i>Pinus elliottii</i>.</li> <li>• Ensure view sheds are maintained from vantage points.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Control <i>Pinus elliottii</i> as a priority. *LMC</li> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Control exotic planted trees along the southern track. *LMC</li> <li>• Control solitary <i>Cinnamomum camphora</i>. *LMC</li> <li>• Control large mono-specific patches of <i>Solanum chrysotrichum</i>, pending the final planned use of each area, only when there is sufficient labour available to control successive germination. *LMC</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Maintain outlooks clear of regrowth LMC*</li> </ul>		
<b>Restoration approach</b>	<ul style="list-style-type: none"> <li>• Assisted Natural Regeneration, optional Revegetation in part</li> </ul>		
<b>Dominant natives (EDL)</b>	Ridgeline along the track has regrowth <i>Eucalyptus pilularis</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , occasional <i>Corymbia intermedia</i> and <i>Lophostemon confertus</i> . Predominantly open grassland with occasional solitary pioneer species including <i>Acacia leiocalyx</i> , <i>A. melanoxylon</i> , <i>Macaranga tanarius</i> , <i>Mallotus philippensis</i> , <i>Toona ciliata</i> .		
<b>Dominant exotics</b>	Predominantly pasture grasses e.g. <i>Setaria sphacelata</i> , <i>Digitaria eriantha</i> , with occasional <i>Cinnamomum camphora</i> , <i>Triumfetta rhomboidea</i> , <i>Vigna parkeri</i> , various herbaceous weeds. Occasional patches of <i>Lantana camara</i> , <i>Ligustrum lucidum</i> , <i>Schinus</i>		

	<i>terebinthifolius</i> , <i>Solanum mauritianum</i> . Numerous exotic planted species along the southern track e.g. <i>Jacaranda mimosifolia</i> , <i>Delonix Regia</i> , <i>Corymbia torelliana</i> .									
<b>Threatened plant species</b>	None observed.									
<b>Habitat for significant fauna species</b>	Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>Potential for revegetation planting to the modified creek(s) in lower portions, which in time would provide a vegetated corridor.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	13	<b>Year 2</b>	13	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>	12

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

**5.4.4.2 Sub-Zone 4.2**

**Figure 5-13: Ecological Restoration Zone 4.2**

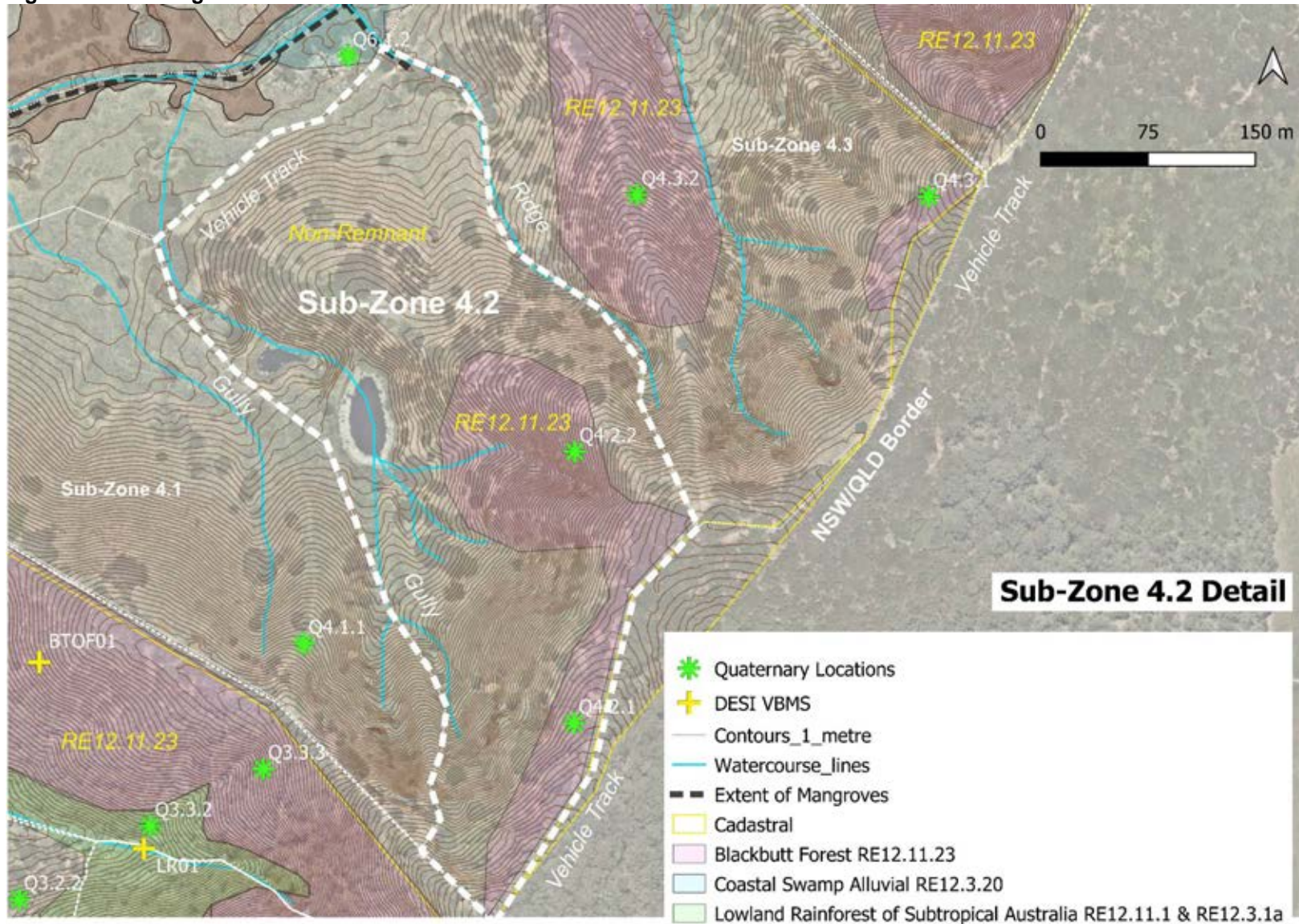


Table 24: Sub-Zone 4.2

Zone 4: Central Open Hills		Sub-Zone 4.2	
<b>Size Ha:</b>	10.419		
<b>Target - Reference state(s)</b>	RE12.11.23	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)
<b>General description and current condition</b>	Mostly cleared with a section of remnant in reasonable condition in mid and higher portions and some areas of significant regrowth plus occasional trees and tree copses. Very steep gradients and gullies in higher portions. Contains 2 large spring-fed dams. Similar to 4.1 where lower portions very wet from seepage after extended wet periods, alluding to the likelihood of pre-clear 12.3.1a in lower sections. Revegetation planting in steep sections impractical. Lower portions contain large mono-typic patches of mature <i>Solanum chrysotrichum</i> . Lower mid-portions contain an increasing number of <i>Pinus elliotii</i> . Numerous solitary trees (native and exotic) amongst pasture grass currently offer ideal perch sites.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23 in remnant and regrowth portions.</li> <li>• Partial recovery of 12.3.1a in lower creek portions (subject to planting).</li> <li>• Control of <i>Pinus elliotii</i>.</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Control <i>Pinus elliotii</i> as a priority. *LMC</li> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Control large mono-specific patches of <i>Solanum chrysotrichum</i> pending the final planned use of each area only when there is sufficient labour available to control successive germination. *LMC</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only (Refer Fire Plan) EDQ*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	In forested areas: <i>Eucalyptus microcorys</i> , <i>E. pilularis</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Corymbia intermedia</i> , <i>Acacia melanoxylon</i> , <i>Allocasuarina torulosa</i> . In open grassy areas: occasional pioneer regrowth including <i>Acacia</i> spp., <i>Alphitonia excelsa</i> , <i>Flindersia bennettii</i> , <i>Guioa semiglaucula</i> , <i>Jagera pseudorhus</i> , <i>Macaranga tanarius</i> , <i>Toona ciliata</i> .		
<b>Dominant exotics</b>	Pasture grasses in open areas e.g. <i>Setaria sphacelata</i> , <i>Digitaria eriantha</i> , with occasional <i>Celtis sinensis</i> , <i>Centrosema molle</i> , <i>Cinnamomum camphora</i> (dominant in lower sections), <i>Lantana camara</i> , <i>Ligustrum lucidum</i> , <i>Melinis minutiflora</i> , <i>Senna pendula</i> , <i>Syagrus romanzoffiana</i> , <i>Triumfetta rhomboidea</i> , <i>Vigna parkeri</i> , plus various herbaceous weeds.		
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> .		

<b>.Habitat for significant fauna species</b>	Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> <li>• Potential for revegetation planting to the modified creek(s) in lower portions, which in time would provide a vegetated corridors.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	18	<b>Year 2</b>	12	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>	12

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

**5.4.4.3 Sub-Zone 4.3**

**Figure 5-14: Ecological Restoration Zone 4.3**

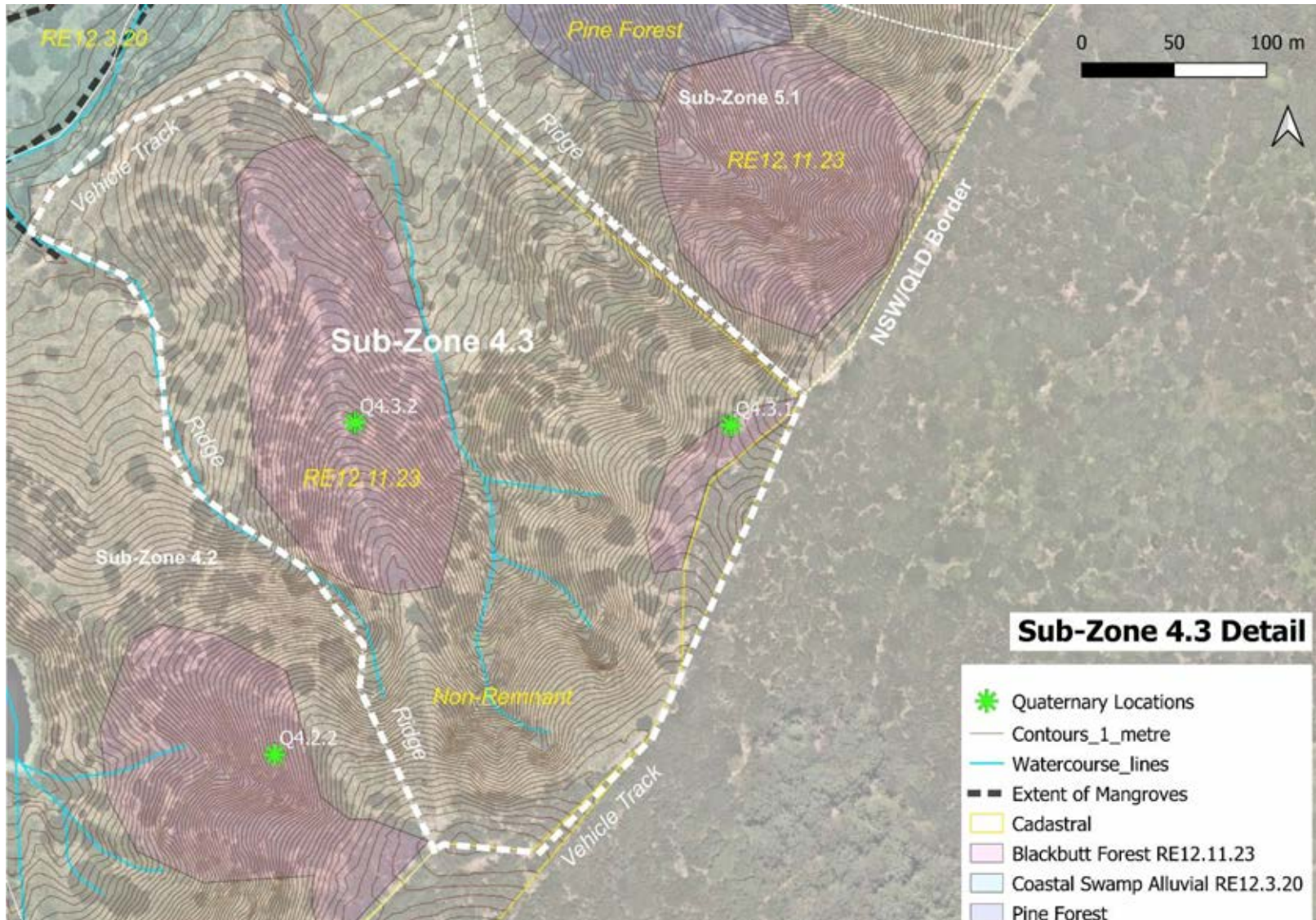


Table 25: Sub-Zone 4.3

Zone 4: Central Open Hills		Sub-Zone 4.3							
<b>Size Ha:</b>	9.831								
<b>Target - Reference state(s)</b>	RE12.11.23	<b>Current Vegetation State</b>			Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)				
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23 in remnant and regrowth portions.</li> <li>• Control of <i>Pinus elliotii</i>.</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> </ul>								
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Control <i>Pinus elliotii</i> as a priority. *LMC</li> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Control large mono-specific patches of <i>Solanum chrysotrichum</i> pending the final planned use of each area only when there is sufficient labour available to control successive germination. *LMC</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Maintain a slashed edge where pasture grass adjoins track adjacent to NSW boundary. EDQ*</li> </ul>								
<b>Restoration approach</b>	Assisted Natural Regeneration								
<b>General description and current condition</b>	Mostly cleared with a section of remnant in reasonable condition in mid and higher portions and some areas of significant regrowth plus occasional trees and tree copses. Very steep gradients and gullies in higher portions. Revegetation planting in steep sections impractical. Infiltration of juvenile <i>Pinus elliotii</i> from the adjoining plantation in Subzone 5.1. Numerous solitary trees (native and exotic) amongst pasture grass currently offer ideal perch sites.								
<b>Dominant natives (EDL)</b>	<i>Eucalyptus pilularis</i> , <i>E. propinqua</i> , <i>E. siderophloia</i> , <i>Corymbia intermedia</i> , <i>Lophostemon confertus</i> , <i>Guioa semiglauc</i> ,								
<b>Dominant exotics</b>	<i>Pinus elliotii</i> , <i>Lantana camara</i> , <i>Solanum chrysotrichum</i> , <i>Cinnamomum camphor</i> , <i>Corymbia torelliana</i> , <i>Setaria sphacelata</i> , <i>Passiflora</i> spp., <i>Triumfetta rhomboidea</i> , <i>Paspalum mandiocanum</i> , <i>Senna pendula</i>								
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Macadamia integrifolia</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> .								
<b>Habitat for significant fauna species</b>	Tusked Frog, Lewin's Rail, Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW).</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	18	<b>Year 2</b>	12	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland



### 5.4.5 Zone 5 Northern Forests



This Zone represents the northernmost portion of the property and contains two (2) north-south ridges: the northern ridge represents the northern property boundary and abuts Hoffschildt Road and the associated housing estate of Currumbin Waters (in part). Both the northern boundary (to Hoffschildt St) and north-eastern boundary (to NSW) contain a narrow strip of remnant endangered Blackbutt Forest (RE12.11.23). The section between the ridges contains steep hillsides with incised gullies and thickets of weed incursion, and in lower parts contains wetland areas where the hydrology has been permanently changed by the construction of Currumbin Ck Rd which now impedes natural flows.

The southern ridge acts as a physical division to southern portions of the property. This ridge and foothills have been cleared and planted with Slash Pine (in circa 1985) which covers approximately 6Ha.

This plantation appears not to have been managed for forestry with regard to trimming and sizing, nor has there been any recent understorey management. While there is currently good recovery in the understorey of native pioneer species, methods

for the control of Slash Pine to be determined once final use of the Plantation area has been resolved.

Edge effects will be an ongoing management issue along the NSW border, Hoffschildt Road and Currumbin Creek Road.

Key threats and management recommendations have been identified for Zone 5. Threats are summarised in **Table 26** and detailed, including management actions in **Attachment 7**.

Table 26: Zone 5 Key Threats

😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 5	Risk
Unmanaged fire impact to restoration areas	☹️
Vegetation management i.e. permits and approvals	😐
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	☹️
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	☹️
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	☹️
Altered hydrology from site activities	😐
Disturbance and erosion from internal tracks/trails	😐
Fences	😐
Management changes to resource commitments	☹️
Inappropriate land management methods by contractors.	😐

5.4.5.1 Sub-Zone 5.1

Figure 5-15: Ecological Restoration Zone 5.1

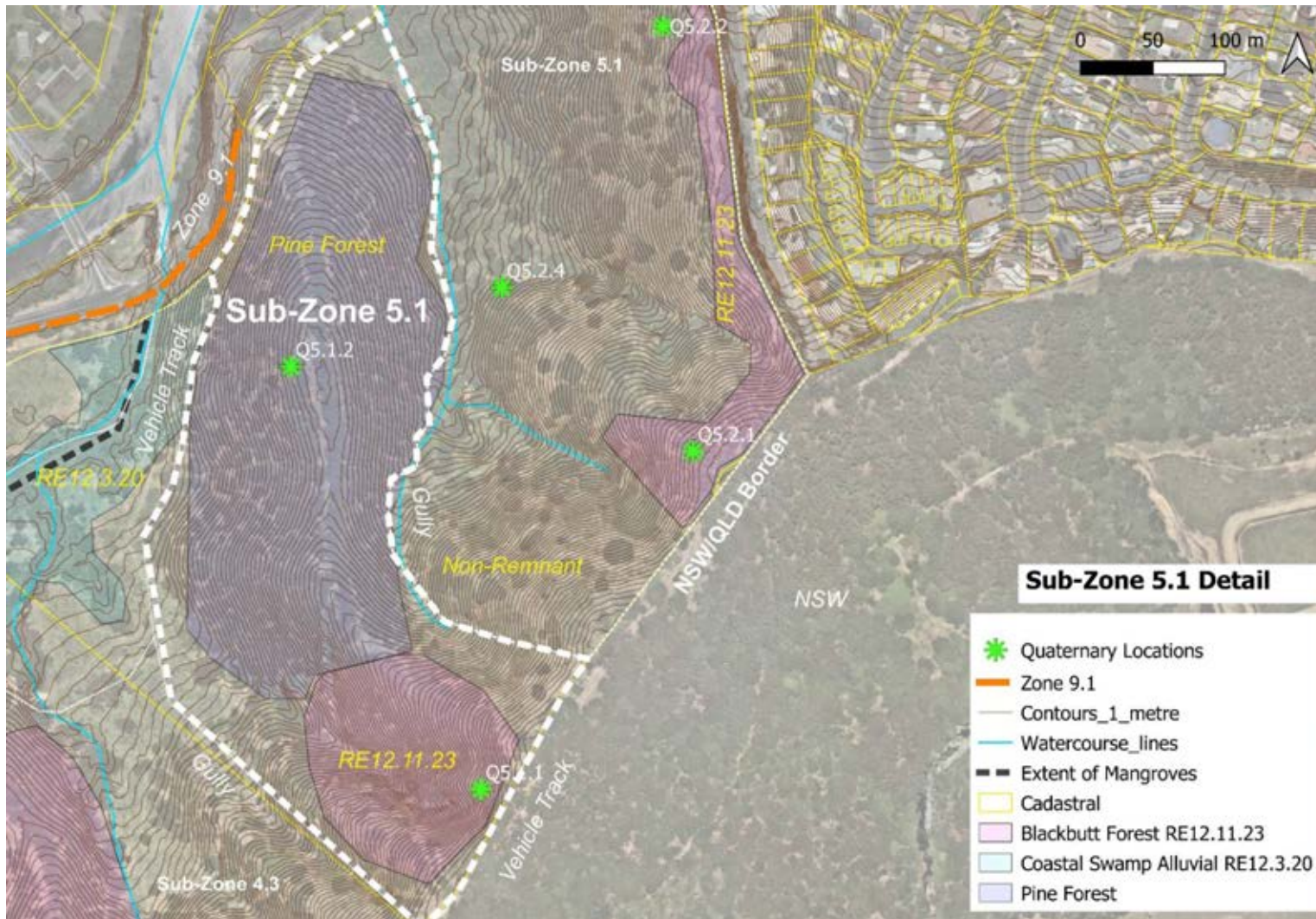


Table 27: Sub-Zone 5.1

Zone 5: Northern Forests		Sub-Zone 5.1							
<b>Size Ha:</b>	9.453								
<b>Target - Reference state(s)</b>	RE12.11.23	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge to open grassy + Pine Forest)						
<b>General description and current condition</b>	Large patch of remnant in higher portions plus occasional tree copses. Incorporates large area of Slash Pine plantation with a mixed understorey of weeds and pioneer/early secondary species. <b>NOTE:</b> Methods for the control of Slash Pine to be determined once final use of the Plantation area has been resolved.								
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23 in remnant and regrowth portions.</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> <li>• Eventual conversion of Pine plantation to 12.11.23</li> </ul>								
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Determination made regarding approach to pine plantation conversion. EDQ*</li> <li>• Ensure control of Slash Pine infiltrating from adjoining plantation. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only. EDQ*</li> <li>• Maintain a slashed edge for fire safety for the adjoining residential areas. EDQ*</li> <li>• Maintain a slashed edge where pasture grass adjoins track adjacent to NSW boundary. EDQ*</li> </ul>								
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part								
<b>Dominant natives (EDL)</b>	In higher portions <i>Eucalyptus pilularis</i> , <i>E. microcorys</i> , <i>Corymbia intermedia</i> , <i>Acacia</i> spp. Native species beneath the Slash Pine are dominated by pioneer species including <i>Alphitonia excelsa</i> , <i>Commersonia bartramia</i> , <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Melia azederach</i> , <i>Polyscias elegans</i> and <i>Trema tomentosa</i> .								
<b>Dominant exotics</b>	A large portion of this Sub-Zone is dominated by both planted and juvenile seedlings of <i>Pinus elliotii</i> . In all areas there are dense thickets of <i>Lantana camara</i> , <i>Triumfetta rhomboidea</i> <i>Solanum chrysotrichum</i> , <i>S. mauritanum</i> , <i>Senna pendula</i> , and various vine species including <i>Passiflora</i> spp., <i>Desmodium uncinatum</i> , <i>Macrotyloma axillare</i> .								
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Leichhardtii longiloba</i> , <i>Lepiderema pulchella</i> , <i>Rhodamnia rubescens</i> .								
<b>Habitat for significant fauna species</b>	Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly (eastern boundary to NSW) and exclusion fencing (northern boundary along Currumbin Creek Road).</li> <li>• Options for interim use of the plantation Pine Forest including potential for revegetation planting.</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>		<b>Follow-up treatment</b>				<b>Annual Maintenance</b>		
	<b>Year 1</b>	12	<b>Year 2</b>	12	<b>Year 1</b>	6	<b>Year 2</b>	6	<b>Perpetual</b>

**5.4.5.2 Sub-Zone 5.2**

**Figure 5-16: Ecological Restoration Zone 5.2**

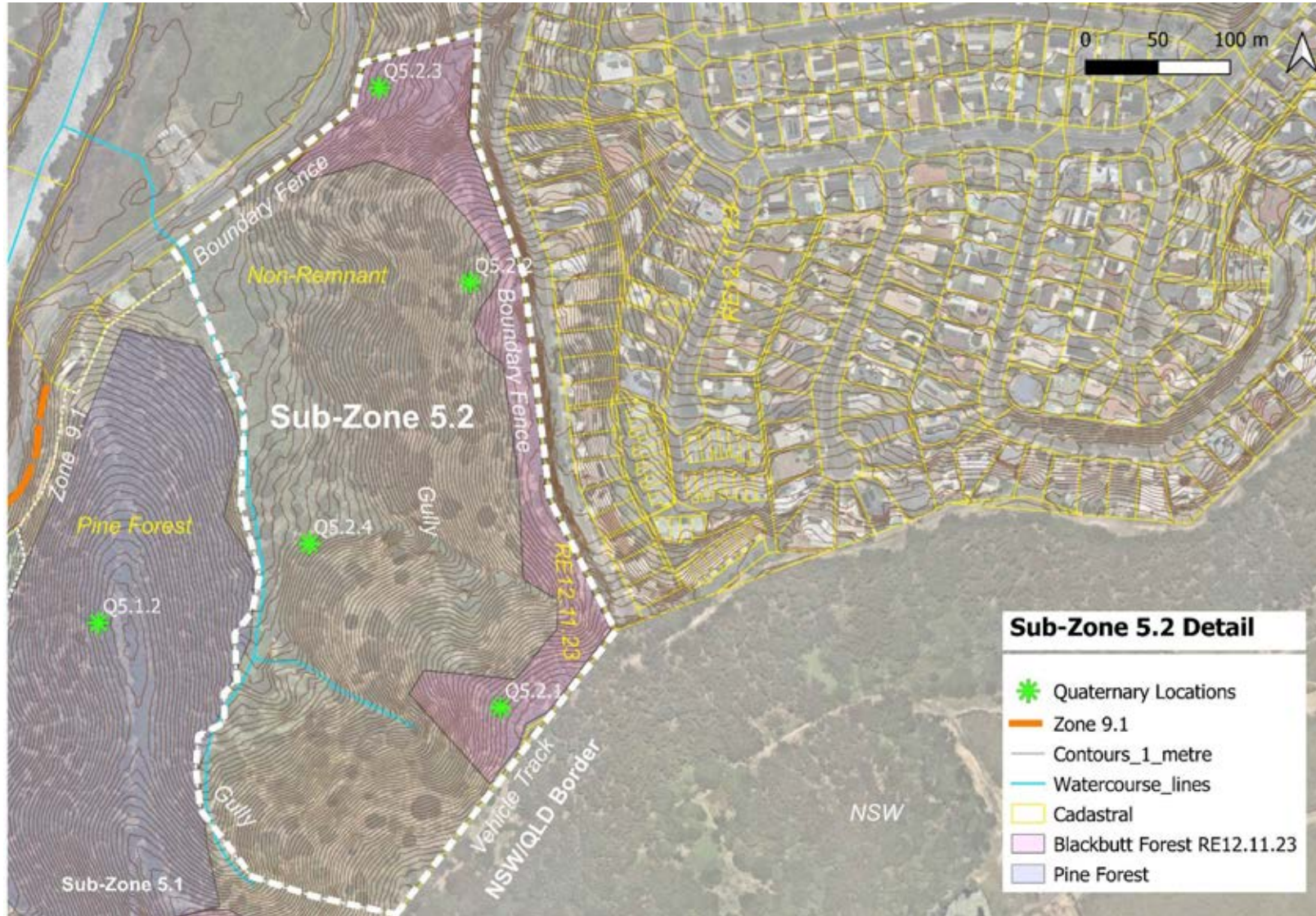


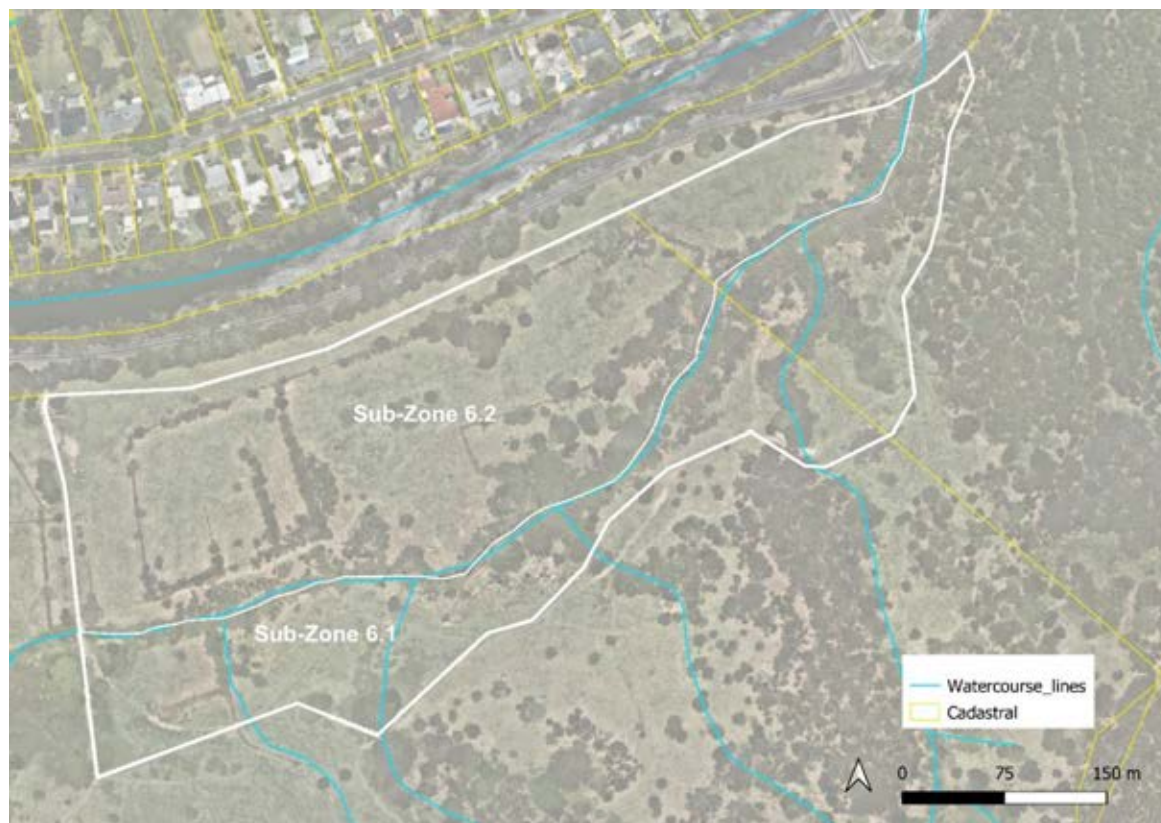
Table 28: Sub-Zone 5.2

Zone 5: Northern Forests		Sub-Zone 5.2	
<b>Size Ha:</b>	11.426		
<b>Target - Reference state(s)</b>	RE12.11.23; 12.3.20	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)
<b>General description and current condition</b>	Small patches of remnant in higher portions with regrowth and tree copses on steep hillsides and in steep incised gullies. Includes a concentration of rainforest species in the understorey in far northern portions (including the road reserve to Currumbin Ck Rd) and a small disused quarry. The hydrology in lower sections has been permanently changed by the construction of Currumbin Ck Rd which now impedes natural flows. This sub-zone shares a boundary along Hoffschildt Road with an extensive area of residential housing on the eastern side of that road. Implications relate to fire safety and potential incursion of garden weed escapes into the Parkland		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.11.23 in remnant and regrowth portions.</li> <li>• Partial recovery of 12.3.20 (subject to planting).</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> <li>• Facilitate future QPWS site management facility.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Schedule prescribed burns for tall open forest in elevated portions only and bushfire mitigation for nearby residential areas. EDQ*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Maintain a slashed edge where pasture grass adjoins track adjacent to NSW boundary. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	In higher and hillside portions <i>Eucalyptus pilularis</i> , <i>E. microcorys</i> , <i>Corymbia intermedia</i> , <i>Lophostemon confertus</i> , <i>Acacia</i> spp. Pioneer species include <i>Alphitonia excelsa</i> , <i>Commersonia bartramia</i> , <i>Guioa semiglaucula</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Melia azederach</i> , <i>Polyscias elegans</i> and <i>Trema tomentosa</i> .		
<b>Dominant exotics</b>	<i>Lantana camara</i> , <i>Solanum chrysotrichum</i> , <i>S. mauritianum</i> , <i>S. seaforthianum</i> , <i>Cinnamomum camphora</i> , <i>Triumfetta rhomboidea</i> , <i>Ligustrum lucidum</i> , <i>Senna pendula</i> , <i>Passiflora</i> spp., <i>Pinus elliotii</i> .		
<b>Threatened plant species</b>	<i>Cassia marksiana</i> , <i>Endiandra globosa</i> , <i>Lepiderema pulchella</i> .		
<b>Habitat for significant fauna species</b>	Powerful Owl, Glossy Black-cockatoo, Rufous Fantail, Spectacled Monarch, Black-faced Monarch, Short-beaked Echidna, Koala, Grey-headed Flying-fox, Eastern Broad-nosed Bat, Large Forest Bat.		
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for revegetation of 12.3.20 Swamp Oak to the lower wetter sections.</li> </ul>		

	<ul style="list-style-type: none"> <li>Potential for improved boundary fencing including fauna exclusion fencing along Currumbin Creek Road and fauna-friendly fencing along the eastern boundary to NSW and north-eastern boundary to Hoffschildt Drive.</li> </ul>									
Labour suggestions (days per team of 3)	Primary treatment				Follow-up treatment				Annual Maintenance	
	Year 1	18	Year 2	12	Year 1	6	Year 2	6	Perpetual	12

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

#### 5.4.6 Zone 6 Lowland Estuarine



This zone includes a tidal estuary with mangrove shrub land (RE12.1.3a) entering from the north which dissects the zone and for the most part is lined by a narrow strip of Mangroves. This Zone was almost completely cleared historically, including almost all Mangroves, but now contains sections of both Mangrove and terrestrial regrowth. There are numerous artificially cut drains where tidal influence has reached, and Mangroves have infiltrated. Currently some of these drains appear to be the source of acid water runoff and will require remedial works to improve local site water quality. Others not contributing to acid conditions will be used for drainage purposes from infrastructure development. Similarly, the subtle differences in elevation (above high tide) has enabled regrowth of Federally listed Coastal Swamp Oak Forest (RE12.3.20 in part) along and near some of these drains. There is an opportunity to extend and ameliorate the Coastal Swamp Oak Forest area through a combination of assisted natural regeneration and revegetation planting.

Northern portions contain a mix of scattered tree copses and pasture grasses, with some emergent canopy trees. Edge effects will be an ongoing management issue along Currumbin Creek Road. Western portions include low-lying swamp areas containing various sedge and rush species. This zone also includes two earth mounds presumably left as spoils from the cut drains. Portions abutting Currumbin Creek Road are designated as amenity areas in accordance with the Activation Plan. This area will be subject to construction activities and ground level modification associated with the installation of visitor infrastructure.

On completion of the active areas of the Currumbin Eco-Parkland, Zone 6 will be the visitor interface for the Parklands, and it is expected will be subject to high visitation from the public. Infrastructure will include amenity landscaping, carparks, picnic facilities, boardwalks and walking trails.

Key threats and management recommendations have been identified for Zone 6. Threats are summarised in **Table 29** and detailed, including management actions in **Attachment 7**.

Table 29: Zone 6 Key Threats

😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 6	Risk
Unmanaged fire impact to restoration areas	☹️
Vegetation management i.e. permits and approvals	☹️
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	☹️
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	☹️
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	😐
Altered hydrology from site activities	☹️
Disturbance and erosion from internal tracks/trails	😐
Fences	😊
Management changes to resource commitments	☹️
Inappropriate land management methods by contractors.	😐

5.4.6.1 Sub-Zone 6.1

Figure 5-17: Ecological Restoration Zone 6.1

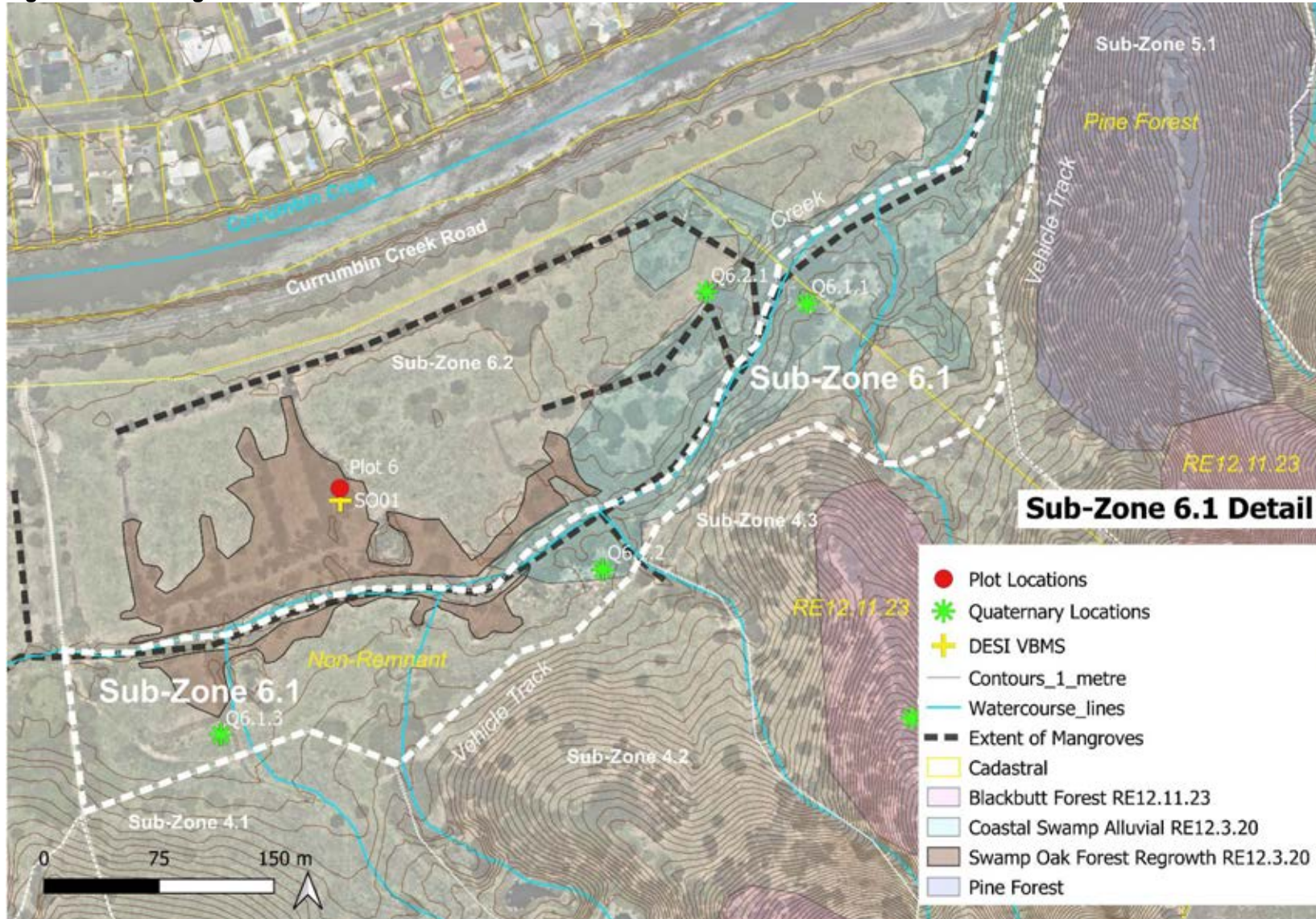


Table 30: Sub-Zone 6.1

Zone 6: Lowland Estuarine		Sub-Zone 6.1	
<b>Size Ha:</b>	6.268		
<b>Target - Reference state(s)</b>	RE12.3.20; 12.1.3a	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)
<b>General description and current condition</b>	<p>Incorporates a tidal estuary (in part) entering from the north which traverses the zone. Northern sections include lower hillsides adjacent to the Slash Pine Plantation and contain several older regrowth trees including mature copses of <i>Cinnamomum camphora</i>. Several short side gullies also include Mangroves in lower elevations with adjacent rainforest species recovering under an emergent <i>Eucalyptus grandis</i> canopy. There are numerous species of native (and exotic) seedlings under perch sites. Numerous open areas containing predominantly pasture grass, with western portions including low-lying swamp areas with various sedge and rush species. A few midportions (near Q.6.1.3) have uneven ground from spoils of previous earthworks.</p>		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.3.20 and 12.1.3a in remnant and regrowth portions and recovery of 12.11.23 in regrowth portions on lower eastern slopes.</li> <li>• Increase area of 12.3.20 Swamp Oak in lower elevations (subject to planting).</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> <li>• Integrate landscape amenity in relation to the Activation Plan.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Ensure small, isolated outbreaks of Cat's Claw Creeper are contained. *LMC</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Planting in suitable areas to increase patch size of 12.3.20. EDQ*</li> <li>• Control large mono-specific patches of <i>Solanum chrysotrichum</i>, pending the final planned use of each area, only when there is sufficient labour available to control successive germination. *LMC</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	<p>In canopy areas, mostly adjacent to streams, emergent <i>Eucalyptus grandis</i> including some large remnant trees, <i>Araucaria cunninghamii</i>, mid-storey <i>Acacia leiocalyx</i>, <i>Alphitonia excelsa</i>, <i>Corymbia intermedia</i>, <i>Guioa semiglauca</i>, <i>Jagera pseudorhus</i>, <i>Mallotus philippensis</i>, <i>Notelaea longifolia</i>, <i>Melaleuca salicina</i>, <i>Avicennia marina</i> along tidal edges and occasional <i>Casuarina glauca</i>.</p>		
<b>Dominant exotics</b>	<p><i>Corymbia torelliana</i>, <i>Cinnamomum camphora</i>, <i>Celtis sinensis</i>, <i>Lantana camara</i>, <i>Senna pendula</i>, <i>Solanum chrysotrichum</i>, <i>S. mauritianum</i>, <i>S. seaforthianum</i>, <i>Koeleruteria paniculata</i>, <i>Triumfetta rhomboidea</i>. Occasional isolated outbreaks of <i>Dolichandra unguis-cati</i>.</p>		

<b>Threatened plant species</b>	<i>Lepiderema pulchella, Rhodamnia rubescens, Rhodomyrtus psidioides.</i>									
<b>Habitat for significant fauna species</b>	Eastern Osprey and Large-footed Myotis									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>Potential for revegetation of 12.3.20 Swamp Oak to the lower sections.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	10	<b>Year 2</b>	0	<b>Year 1</b>	6	<b>Year 2</b>	0	<b>Perpetual</b>	6

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

5.4.6.2 Sub-Zone 6.2

Figure 5-18: Ecological Restoration Zone 6.2

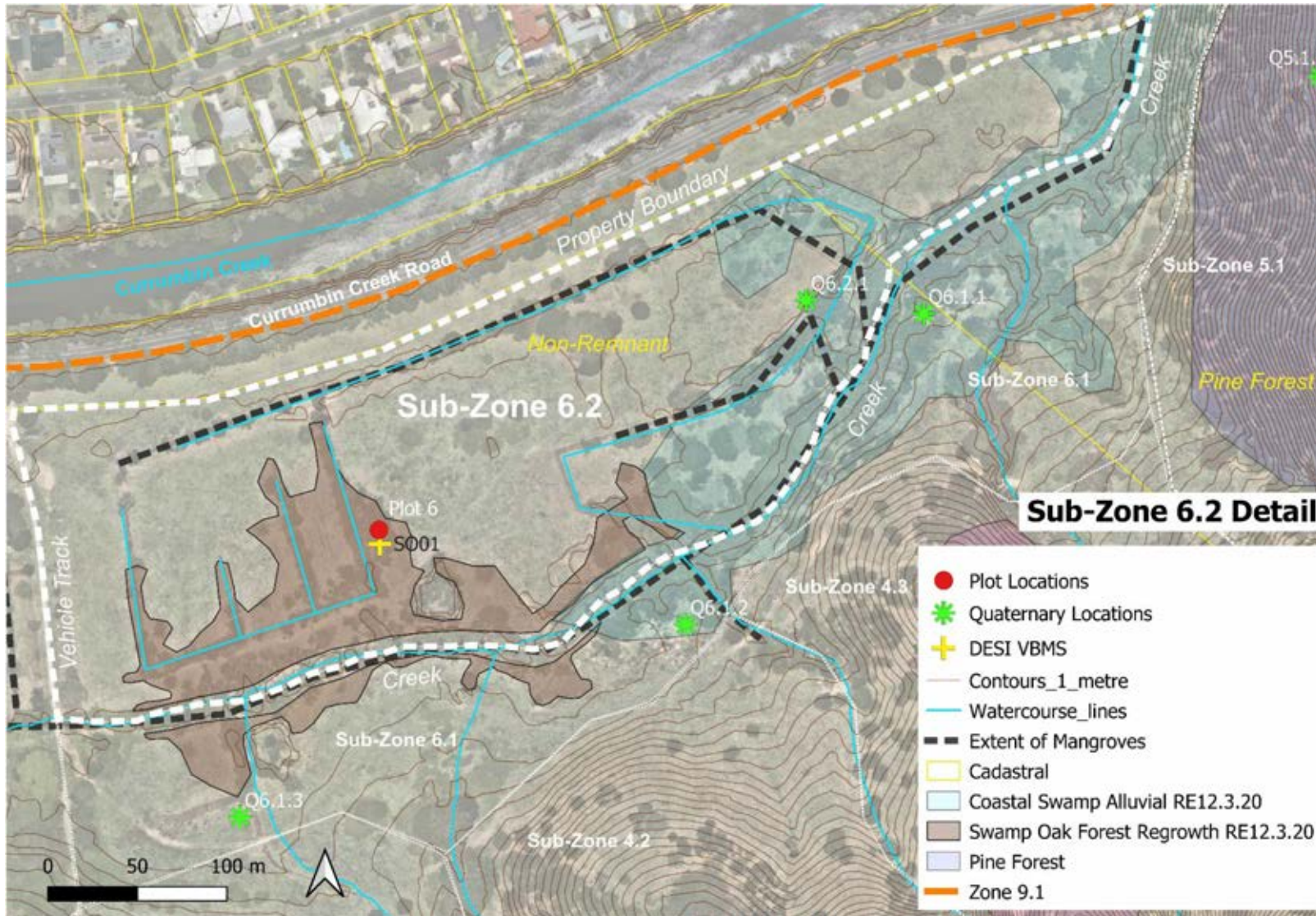


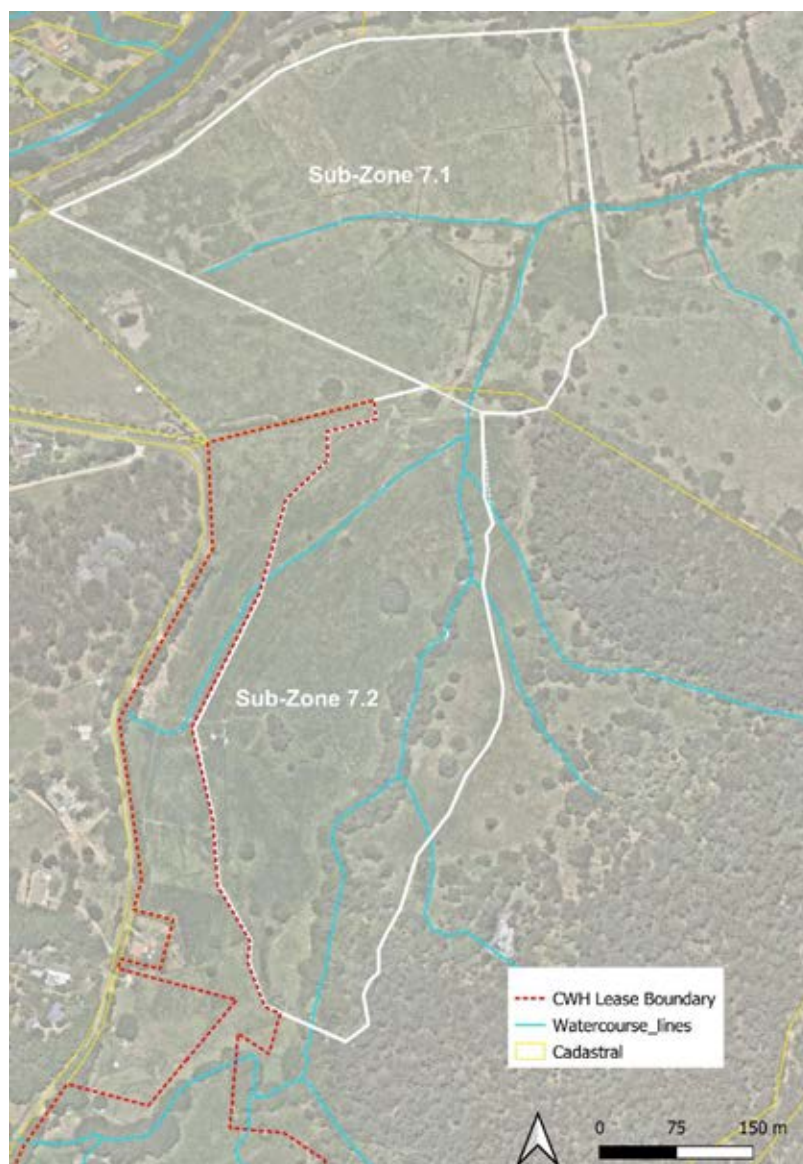
Table 31: Sub-Zone 6.2

Zone 6: Lowland Estuarine		Sub-Zone 6.2	
<b>Size Ha:</b>	9.477		
<b>Target - Reference state(s)</b>	RE12.3.20; 12.1.3a	<b>Current Vegetation State</b>	Remnant + non-remnant (regrowth + edge + open grassy with scattered trees)
<b>General description and current condition</b>	<p>Incorporates a tidal estuary (in part) entering from the north which traverses the zone and includes several artificially cut drains where Mangroves have infiltrated. Northern portions contain several older regrowth trees including some areas of persistent Cat's Claw Creeper. There are numerous open areas containing predominantly pasture grass. A significant proportion of the regrowth dominated by <i>Casuarina glauca</i> meets the criteria for Coastal Swamp Oak Forest. Western portions include low-lying swamp areas containing various sedge and rush species. One large Cadaghi (required to be treated) dominates regrowth in an open section of this area. Portions abutting Currumbin Creek Road are designated as amenity areas in accordance with the Activation Plan.</p>		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Full recovery of 12.3.20 and 12.1.3a in remnant and regrowth portions.</li> <li>• Increase area of 12.3.20 Swamp Oak in lower elevations (subject to planting).</li> <li>• Gradual reduction of pasture areas over time as edge treatments facilitate regrowth.</li> <li>• Integrate landscape amenity in accordance with Masterplan.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Ensure small, isolated outbreaks of Cat's Claw Creeper are contained. *LMC</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Planting in suitable areas to increase patch size of 12.3.20. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	<p>In canopy areas, mostly adjacent to streams, emergent <i>Eucalyptus grandis</i> including some large remnant trees, <i>Araucaria cunninghamii</i>, mid-storey <i>Acacia leiocalyx</i>, <i>Alphitonia excelsa</i>, <i>Corymbia intermedia</i>, <i>Cupaniopsis parvifolia</i>, <i>Guioa semiglauca</i>, <i>Jagera pseudorhus</i>, <i>Mallotus philippensis</i>, <i>Notelaea longifolia</i>, <i>Melaleuca salicina</i>. Numerous species of native seedlings under perch sites. <i>Avicennia marina</i> along tidal edges and occasional <i>Casuarina glauca</i>.</p>		
<b>Dominant exotics</b>	<p><i>Corymbia torelliana</i>, <i>Cinnamomum camphora</i>, <i>Celtis sinensis</i>, <i>Lantana camara</i>, <i>Senna pendula</i>, <i>Setaria sphacelata</i>, <i>Solanum chrysotrichum</i>, <i>S. mauritianum</i>, <i>S. seaforthianum</i>, <i>Triumfetta rhomboidea</i>.</p>		
<b>Threatened plant species</b>	None observed.		
<b>Habitat for significant fauna species</b>	Eastern Osprey and Large-footed Myotis		

<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing to exclude fauna along northern boundary to Currumbin Creek Road.</li> <li>• Potential for revegetation of 12.3.20 Swamp Oak to the lower sections.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	6	<b>Year 2</b>	3	<b>Year 1</b>	3	<b>Year 2</b>	2	<b>Perpetual</b>	4

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

#### 5.4.7 Zone 7 Lowlands



The lower portions of Zone 7 have been historically cleared of almost all vegetation and contains predominantly pasture grasses. Numerous artificially cut drains criss-cross this area and select drains will be retained and recontoured to assist with drainage. Other drains will be filled to assist with the current acid runoff.

The previous farmhouse and amenities were situated near the lower foothill portions and include a range of residual planted native and exotic tree species, most of which require control, other than local native species e.g. *Brachychiton acerifolius* and *Grevillea robusta*, and several large *Ficus hillii* which will be retained as feature trees. A small number of large remnant native trees have been retained in the southernmost parts of Sub-Zone 7.1.

Similarly, some large remnant native trees have been retained in the north-eastern extent; however, many of these are likely to be on the road reserve (despite being within the current fenced area).

The narrow gap that joins Sub-Zones 7.1 and 7.2 represents the interface between freshwater outflows and saltwater inflows. This portion will be revegetated as part of the proposed wetland infrastructure in Sub-Zone 7.2.

Southern portions in Sub-Zone 7.2 include a large proportion of the unnamed creek including sections of remnant Gallery Rainforest (RE12.3.1a) with numerous large remnant trees, and the south-western portion abuts the Currumbin Wildlife Hospital lease area. This zone is mooted for a potential artificial wetland and series of walking trails (design by others).



Revegetation works can be provided in accordance with the characteristics of the wetland(s) with species selection based on the final level of ephemeral and/or permanent water.

Edge effects will be an ongoing management issue along Currumbin Creek Road.

Key threats and management recommendations have been identified for Zone 7. Threats are summarised in **Table 32** and detailed, including management actions in **Attachment 7**.

Table 32: Zone 7 Key Threats

😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 7	Risk
Unmanaged fire impact to restoration areas	☹️
Vegetation management i.e. permits and approvals	😐
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	☹️
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	☹️
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	☹️
Altered hydrology from site activities	😐
Disturbance and erosion from internal tracks/trails	😐
Fences	😐
Management changes to resource commitments	☹️
Inappropriate land management methods by contractors.	😐

5.4.7.1 Sub-Zone 7.1

Figure 5-19: Ecological Restoration Zone 7.1

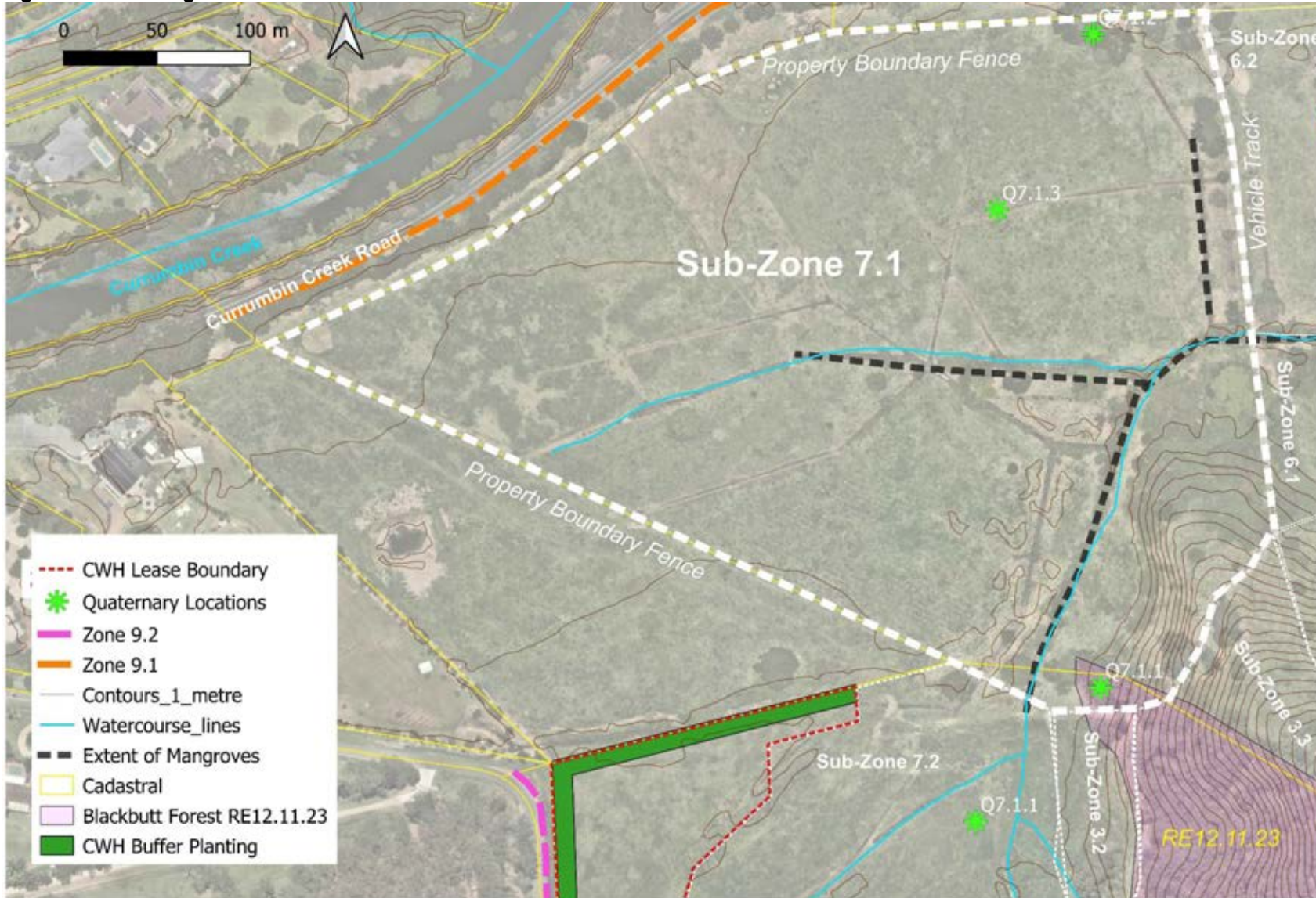


Table 33: Sub-Zone 7.1

Zone 7: Cleared Lowlands		Sub-Zone 7.1	
<b>Size Ha:</b>	12.17ha		
<b>Target - Reference state(s)</b>	RE12.3.20; 12.3.1a, 12.11.23	<b>Current Vegetation State</b>	Non-remnant (open grassy with scattered trees)
<b>General description and current condition</b>	<p>The majority of this Sub-Zone is predominantly cleared with several artificially cut drains including the extent of Mangrove infiltration. This Sub-Zone has been heavily grazed, is highly modified and the majority is dominated by pasture grasses. There are only occasional trees remaining e.g. some larger remnant trees in NE portions and in SE portions, including numerous planted <i>Ficus hillii</i>. South-east portions include lower foothills where the previous farmhouse and amenities were situated and includes a range of residual planted exotic tree species. North-east portions include numerous large weed trees e.g. <i>Cinnamomum camphora</i> and <i>Corymbia torelliana</i>.</p>		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase area of 12.1.3a along creek sections and 12.3.20 in lower elevations (subject to planting).</li> <li>• Full recovery of 12.11.23 in regrowth portions.</li> <li>• Slash the majority of the sub-zone while considering the needs of both macropods and seed-eating birds.</li> <li>• Retain the numerous large <i>Ficus hillii</i> as feature trees.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of intermittent tree copses in SE &amp; NE portions through progressive weed control. LMC*</li> <li>• Treat all exotic and alien native species with the exception of <i>Ficus hillii</i>. LMC*</li> <li>• Maintenance of pasture areas as above. EDQ*</li> <li>• Planting in suitable areas to increase creek corridor of 12.3.1a and patch size of 12.3.20. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	<p>In SE portions, <i>Eucalyptus pilularis</i>, <i>E. siderophloia</i>, <i>E. microcorys</i>, mid-storey <i>Jagera pseudorhus</i>, <i>Guioa semiglauca</i>, <i>Mallotus philippensis</i>. Numerus large, planted <i>Ficus hillii</i> (to be retained as feature trees). In NE portions <i>E. siderophloia</i>, <i>E. grandis</i>, <i>Lophostemon confertus</i>, <i>Melaleuca salicina</i>. The majority of the area is currently slashed pasture grasses with various exotic herbs and occasional small cut drains with native sedges.</p>		
<b>Dominant exotics</b>	<p><i>Cinnamomum camphora</i>, <i>Corymbia torelliana</i>, <i>Heptapleurum actinophyllum</i>, <i>Celtis sinensis</i>, <i>Solanum chrysotrichum</i>, <i>S. mauritianum</i>, <i>S. torvum</i>, <i>S. pseudocapsicum</i>, <i>Senna pendula</i>, <i>Passiflora</i> spp., <i>Triumfetta rhomboidea</i>. <i>Paspalum mandiocanum</i>. <i>Cestrum parqui</i>, <i>Murraya paniculata</i></p>		
<b>Threatened plant species</b>	None observed.		
<b>Habitat for significant fauna species</b>	Eastern Osprey and Large-footed Myotis		

<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing to exclude fauna along Currumbin Ck Rd.</li> <li>• Potential for revegetation of 12.3.1a (Gallery Rainforest) upstream riparian sections and 12.3.20 Swamp Oak to the lower sections.</li> <li>• Opportunity to improve water quality by managing artificially cut drains.</li> <li>• Opportunity for planting appropriate solitary shade trees for macropod habitat.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>				<b>Annual Maintenance</b>		
	<b>Year 1</b>	8	<b>Year 2</b>	3	<b>Year 1</b>	1	<b>Year 2</b>	3	<b>Perpetual</b>	3

LMC\* = Responsibility of Land Management Contractor EDQ\* = Responsibility of Economic Development Queensland

5.4.7.2 Sub-Zone 7.2

Figure 5-20: Ecological Restoration Zone 7.2

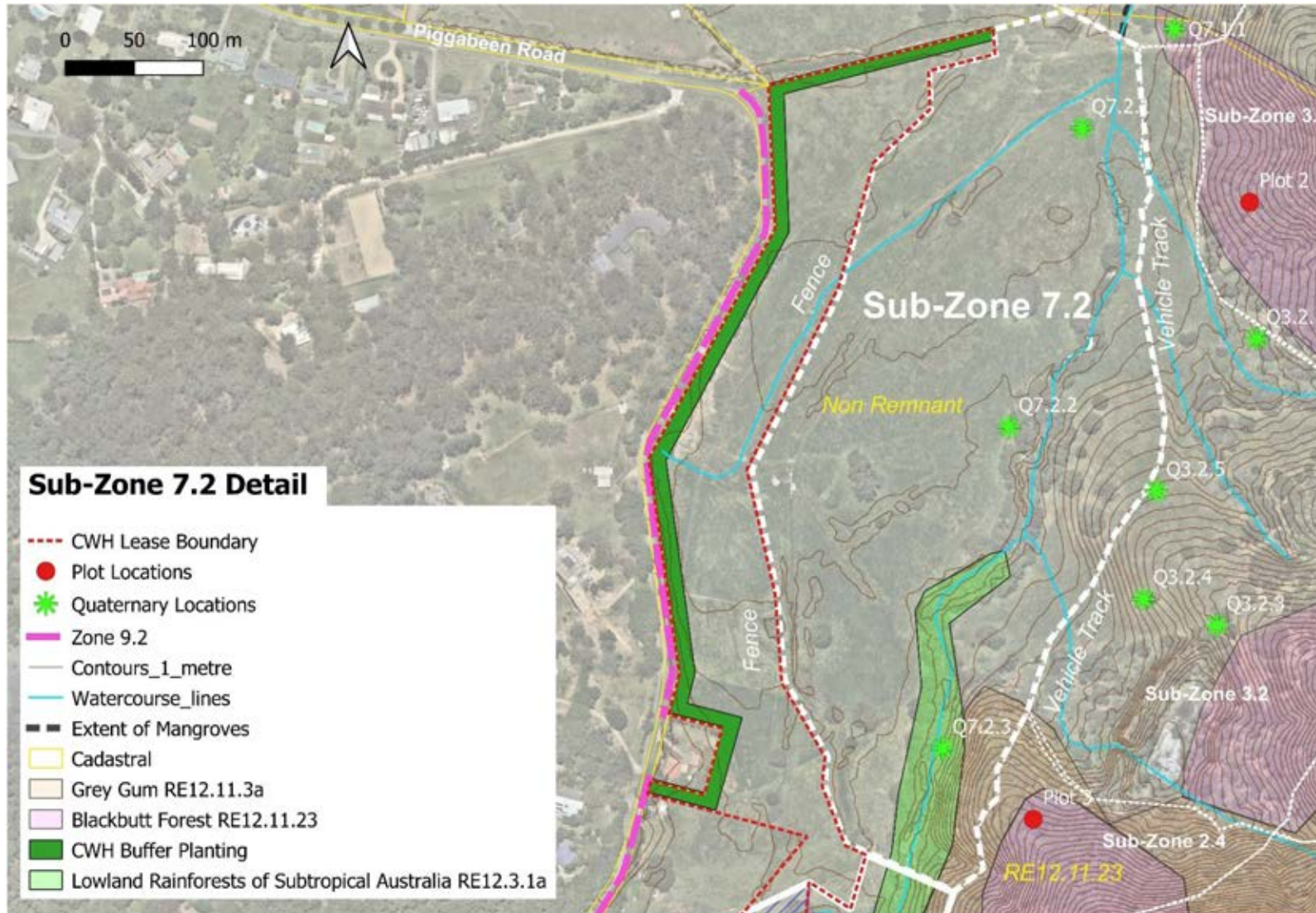


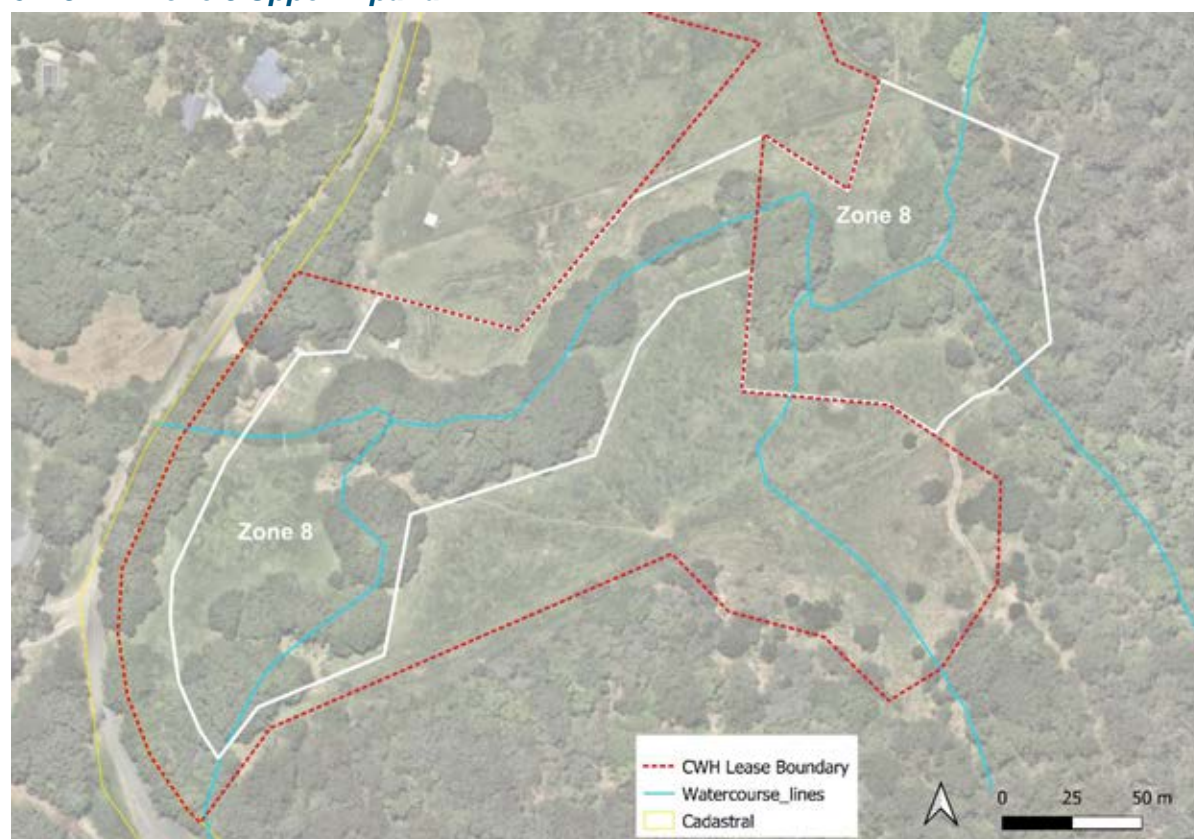
Table 34: Sub-Zone 7.2

Zone 7: Cleared Lowlands		Sub-Zone 7.2	
<b>Size Ha:</b>	12.312ha		
<b>Target - Reference state(s)</b>	RE12.3.20; 12.3.1a	<b>Current Vegetation State</b>	Non-remnant (open grassy with scattered trees)
<b>General description and current condition</b>	Lower middle sections are predominantly cleared with only occasional trees, including a small copse of <i>Eucalyptus robusta</i> , which presents an opportunity to reinstate a small area of the 'of concern' RE12.3.4. This area has been heavily grazed and is highly modified and is dominated by pasture grasses. South-east portions include a section of remnant Gallery Rainforest which includes numerous large trees including a large double-trunked <i>Syzygium moorei</i> , and numerous large <i>Araucaria cunninghamiana</i> , both along the creek and as isolated individuals amongst pasture grass.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase area of 12.1.3a along creek sections (subject to planting).</li> <li>• Recovery of 12.3.4 (subject to planting).</li> <li>• Integrate with artificial wetlands and landscape amenity in accordance with the Masterplan</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Pay particular attention to control small patches of <i>Dolichandra unguis-cati</i>, particularly along the stream. *LMC</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Planting to the artificial wetlands. EDQ*</li> <li>• Planting in suitable areas to increase creek corridor of 12.3.1a and initiate recovery of 12.3.4 around existing copse of remnant <i>Eucalyptus robusta</i> according to elevation relief. EDQ*</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration, optional Revegetation in part		
<b>Dominant natives (EDL)</b>	Paddock sections include a copse of <i>Eucalyptus robusta</i> , several <i>Ficus hillii</i> and scattered <i>Acacia</i> spp. Creek sections include scattered <i>Archontophoenix cunninghamiana</i> , large remnant trees dominated by <i>Araucaria cunninghamii</i> and <i>Eucalyptus grandis</i> , with rainforest trees such as <i>Syzygium moorei</i> , <i>Aphananthe philippinensis</i> , <i>Baloghia inophylla</i> . Dominant regrowth includes <i>Arytera divaricata</i> , <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Flindersia schottiana</i> and occasional large patches of <i>Maclura cochinchinensis</i> .		
<b>Dominant exotics</b>	<i>Cinnamomum camphora</i> , <i>Lantana camara</i> , <i>Solanum chrysotrichum</i> , <i>S. mauritianum</i> , <i>Triumfetta rhomboidea</i> , <i>Heptapleurum actinophyllum</i> , <i>Passiflora</i> spp., <i>Hypoestes phyllostachya</i> , occasional patches of <i>Dolichandra unguis-cati</i> ,		
<b>Threatened plant species</b>	<i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Leichhardtia longiloba</i> , <i>Lepiderema pulchella</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> .		

<b>Habitat for significant fauna species</b>	Eastern Osprey and Large-footed Myotis									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>Potential for revegetation of 12.3.1a (Gallery Rainforest) upstream riparian sections and 12.3.4 around the existing remnant copse of <i>E. robusta</i> according to elevation relief.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	4	<b>Year 2</b>	0	<b>Year 1</b>	2	<b>Year 2</b>	0	<b>Perpetual</b>	6



#### 5.4.8 Zone 8 Upper Riparian



This Zone is partly within the Currumbin Wildlife Hospital lease area and its main feature is the upper reaches of the unnamed creek which enters the property from Piggabeen Road in Subzone 1.4. The creek vegetation is dominated by *Cinnamomum camphora* as the prominent canopy and understorey, but there are several other mature native species including a very large *Cupaniopsis anacardioides*. The groundlayer includes numerous dominant exotics including *Colocasia esculenta* and *Sphagneticola trilobata*. This creek area will be subject to Camphor Conversion as detailed in **Section 6.1** which will incorporate treatment of Camphor trees plus strategic revegetation planting, including establishment maintenance. Areas outside this but within the lease area will be the responsibility of Currumbin Wildlife Hospital.

Key threats and management recommendations have been identified for Zone 8. Threats are summarised in **Table 35** and detailed, including management actions in **Attachment 7**.



Table 35: Zone 8 Key Threats

😊 Low Risk   😐 Medium Risk   😞 High Risk of Threat Occurring

Key Threats Zone 8	Risk
Unmanaged fire impact to restoration areas	😞
Vegetation management i.e. permits and approvals	😊
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	😞
Key persistent internal weeds not managed appropriately on-site	😐
Biosecurity Myrtle Rust & Fire Ants	😞
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	😞
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	😞
Altered hydrology from site activities	😐
Disturbance and erosion from internal tracks/trails	😐
Fences	😊
Management changes to resource commitments	😞
Inappropriate land management methods by contractors.	😐

5.4.8.1 Sub-Zone 8.0

Figure 5-21: Ecological Restoration Zone 8.0

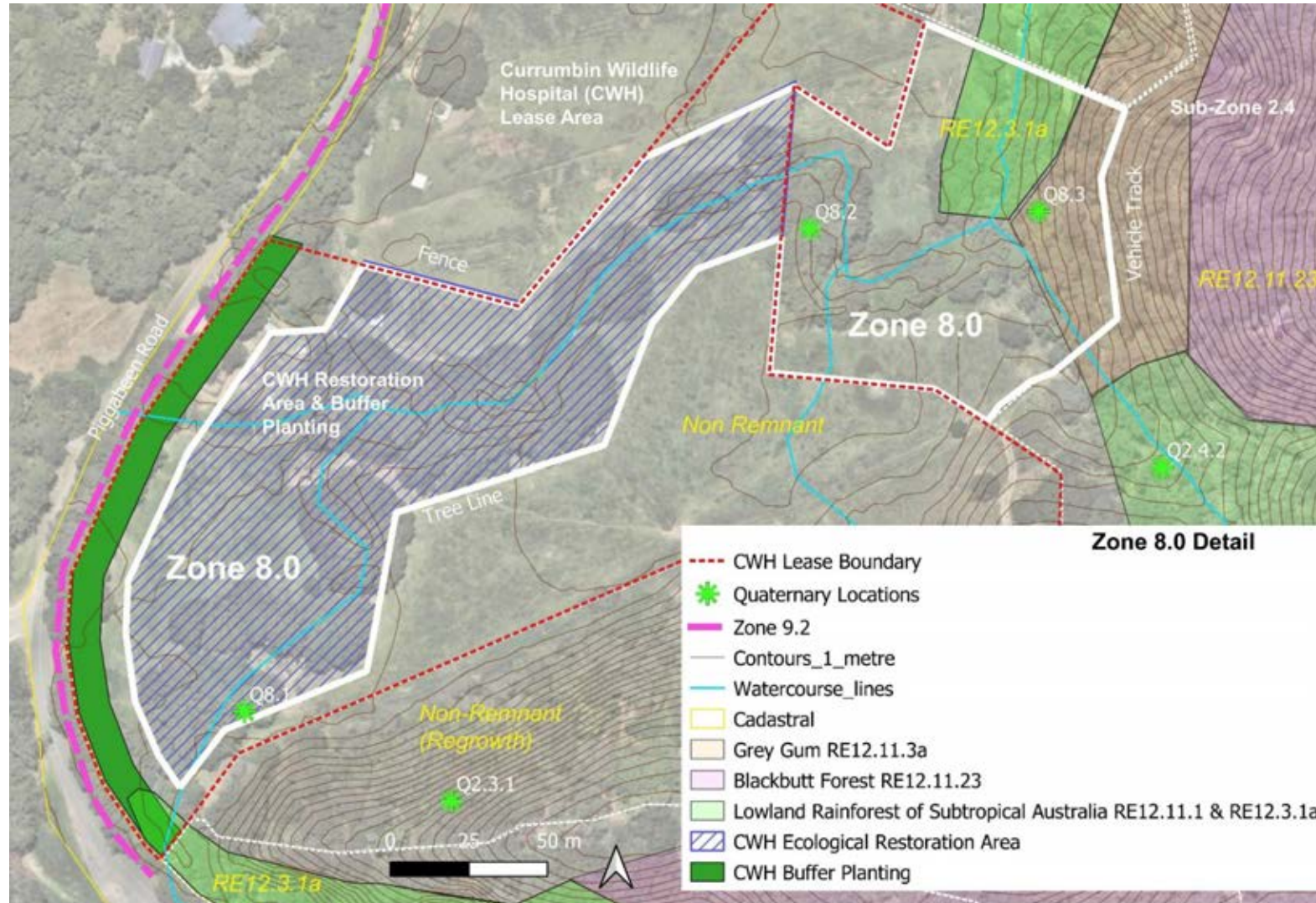


Table 36: Sub-Zone 8.0

Zone 8: Upper Riparian		Zone 8.0	
<b>Size Ha:</b>	2.6ha		
<b>Target - Reference state(s)</b>	RE12.3.1a; 12.11.3	<b>Current Vegetation State</b>	Remnant + regrowth + non-remnant (open grassy with scattered trees)
<b>General description and current condition</b>	Vegetation in this Zone is dominated by <i>Cinnamomum camphora</i> along the unnamed creek, with modified paddocks either side which until recently were heavily grazed by horses. Impacts from horses included the complete demise of groundlayer next to and into the creek where trampled mud and a heavy sediment load was the norm. Lower creek portions include remnant Gallery Rainforest. This portion also includes a patch of <i>Hypoestes phyllostachya</i> immediately adjacent to the creek which requires early and ongoing treatment.		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Increase area of 12.1.3a along creek sections (subject to Camphor Conversion and planting) to improve the environmental values of the creek system.</li> <li>• Gradual recovery of regrowth to remnant.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Coordinate all works within the Currumbin Wildlife Hospital (CWH) lease area with CWH. LMC*</li> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Early and ongoing control of <i>Hypoestes phyllostachya</i>. LMC*</li> <li>• Pay particular attention to control small patches of <i>Dolichandra unguis-cati</i>, particularly along the stream. *LMC</li> <li>• Initiate program of Camphor Conversion along the creek as detailed in <b>Section 6.1</b>. LMC*</li> <li>• Gradual connection of tree copses through progressive weed control. LMC*</li> <li>• Maintenance of pasture areas if/where required. EDQ*</li> <li>• Planting in suitable areas to increase creek corridor of 12.3.1a and initiate recovery of 12.3.4 around existing copse of remnant <i>Eucalyptus robusta</i> according to elevation relief.</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration; Revegetation associated with Camphor Conversion.		
<b>Dominant natives (EDL)</b>	Very few along upstream sections but includes a very large <i>Cupaniopsis anacardioides</i> , various pioneer species such as <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Mallotus philippensis</i> , <i>Toona ciliata</i> . Downstream portions include modified riparian with <i>Eucalyptus saligna</i> , <i>E. microcorys</i> , <i>Lophostemon confertus</i> , <i>Toechima dasyrrhache</i> .		
<b>Dominant exotics</b>	<i>Cinnamomum camphora</i> , <i>Lantana camara</i> , <i>Solanum chrysotrichum</i> , <i>S. mauritianum</i> , <i>Colocasia spp.</i> , <i>Sphagneticola trilobata</i> , <i>Senna pendula</i> , <i>Salvia coccinea</i> .		
<b>Threatened plant species</b>	<i>Cupaniopsis newmanii</i> , <i>Lepiderema pulchella</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> .		

<b>Habitat for significant fauna species</b>	Tusked frog and Pink underwing Moth vine									
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for revegetation of 12.3.1a (Gallery Rainforest) upstream riparian sections as part of Camphor Conversion.</li> <li>• Potentially suitable for volunteer community assistance in portions of unnamed creek adjacent to Piggabeen Rd.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	8	<b>Year 2</b>	4	<b>Year 1</b>	2	<b>Year 2</b>	2	<b>Perpetual</b>	4

### 5.4.9 Zone 9 Roadside

This zone incorporates the lineal road reserve along both road frontages: Currumbin Ck Rd and Piggabeen Rd and varies in width (~5-15m), from where vegetation begins near the edge of the road pavement, to the property boundary, or as currently determined by an existing fence line. It includes a range of vegetation types e.g. slashed areas devoid of trees, a few small pockets of remnant vegetation including threatened species, rows of planted native trees, predominantly *Araucaria cunninghamii*, and numerous weed trees including *Corymbia torelliana*, *Jacaranda mimosifolia* and *Cinnamomum camphora*. Works within the road reserve will require permission from the landowner(s) (TMR & CoGC) and safety precautions must be taken both with working near roadsides and with the potential of tree and branch fall from treated trees.

Key threats and management recommendations have been identified for Zone 9. Threats are summarised in **Table 37** and detailed, including management actions in **Attachment 7**.

Table 37: Zone 9 Key Threats

Key Threats 😊 Low Risk 😐 Medium Risk ☹️ High Risk of Threat Occurring

Key Threats Zone 9	Risk	Key Threats Zone 9	Risk
Unmanaged fire impact to restoration areas	☹️	Altered hydrology from site activities	😐
Vegetation management i.e. permits and approvals	😐	Disturbance and erosion from internal tracks/trails	😊
Weed and pest impacts from adjacent developments, i.e. dispersal into CEP	☹️	Fences	😊
Key persistent internal weeds not managed appropriately on-site	😐	Management changes to resource commitments	☹️
Biosecurity Myrtle Rust & Fire Ants	☹️	Inappropriate land management methods by contractors.	😐
Climate Change - Extreme heat - Fire risk - Significant rainfall - Changes in rainfall Sea level rises	☹️	Risk of tree or branch fall onto the road from trees treated within the road reserve	☹️
Unauthorised human access resulting in rubbish dumping, wood chopping, vandalism, accidental fire, physical disturbance from activities such as bikes and horses.	☹️	Risk of personal injury from traffic if traffic management not in place (where appropriate)	😐

5.4.9.1 Sub-Zone 9.1

Figure 5-22: Ecological Restoration Zone 9.1

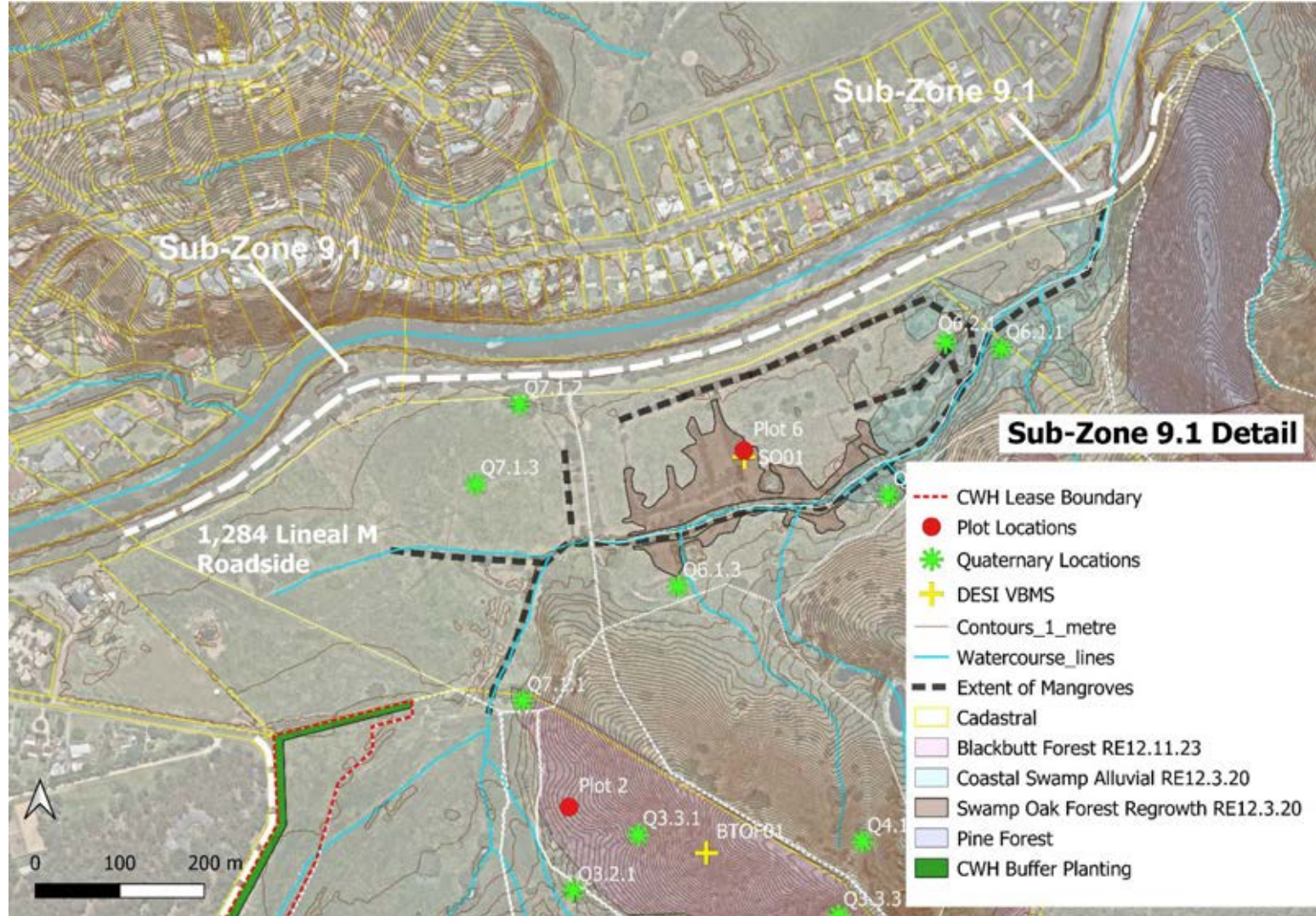


Table 38: Sub-Zone 9.1

Zone 9: Roadside		Sub-Zone 9.1	
<b>Size Ha:</b>	In relation to Currumbin Creek Road: this area incorporates 1,284 lineal metres of roadside beginning at 244 Currumbin Creek Road just east of the Galleon Way Bridge on Currumbin Creek Road, and continues west, stopping at 393 Currumbin Ck Rd.		
<b>Target - Reference state(s)</b>	RE 12.3.1a (in part)	<b>Current Vegetation State</b>	Regrowth; non-remnant (open grassy plus dense lineal sections of trees)
<b>General description and current condition</b>	<ul style="list-style-type: none"> <li>This Sub-Zone abuts the property as a narrow lineal road reserve of varying widths (~5-15m), from where vegetation begins near the edge of the road pavement, to the property boundary, or as currently determined by an existing fence line. Many sections are devoid of trees and are managed by slashing. The slashing area is largely determined by where there is little to no tree density, patch size or canopy shade. There are several treed areas, however, ranging from scattered trees which include both planted and regrowth exotic and native species, to areas of mature regrowth. <i>C. camphora</i> is dominant in most treed areas, while one patch of old regrowth is dominated by <i>Toona ciliata</i>, <i>Brachychiton acerifolius</i> and a large threatened <i>Endiandra globosa</i>. A section north from the unnamed estuary contains a small patch of regrowth with a high diversity including several threatened species (in or adjacent to this patch).</li> </ul>		
<b>Goals</b>	<ul style="list-style-type: none"> <li>Control weed species in non-slashed areas i.e. existing canopy with both native and exotic tree species.</li> <li>Sensitive control of <i>Cinnamomum camphora</i> and <i>Jacaranda mimosifolia</i> with regard to gradual reduction of viewsheds.</li> <li>Aim to increase natural understorey biodiversity.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>Progressive/systematic weed control throughout areas of native regrowth. LMC*</li> <li>With control of both <i>C. camphora</i> and <i>J. mimosifolia</i>, where dying parts of the tree(s) could pose a safety hazard to road users, liaise with the road authority to determine the appropriate response. *LMC through EDQ</li> <li>Coordinate with the road authority to ensure slash-able areas are properly maintained. *EDQ</li> <li><b>NOTE:</b> any work in road reserves must be carried out in accordance with current work safe standards and approved permits where applicable.</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration		
<b>Dominant natives (EDL)</b>	<i>Araucaria cunninghamii</i> including decades-old trees and their progeny in various stages of regrowth, plus <i>Grevillea robusta</i> , juvenile <i>Eucalyptus grandis</i> , <i>Acacia</i> spp. A small, dense copse midway is dominated by <i>Toona ciliata</i> , <i>Brachychiton acerifolius</i> and <i>Endiandra globosa</i> .		

<b>Dominant exotics</b>	<i>Cinnamomum camphora, Setaria sphacelata, Lantana camara, Heptapleurum actinophyllum, Celtis sinensis, Solanum chrysotrichum, S. mauritianum, Senna pendula, Murraya paniculata, Passiflora spp., Paspalum mandiocanum, Pinus elliottii, Syagrus romanzoffiana, Callisia fragrans.</i>								
<b>Threatened plant species</b>	<i>Cassia marksiana, Endiandra globosa, Lepiderema pulchella.</i>								
<b>Habitat for significant fauna species</b>	<i>Pandion haliaetus</i> (Eastern Osprey) nest top of a Hoop Pine in the western section of Sub-Zone 9.1.								
<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fauna exclusion fencing along Currumbin Creek Road.</li> <li>• Potential to retain and restore small patches of 12.3.1a (Gallery Rainforest) along the road reserve to assist as a buffer to the property.</li> <li>• Opportunity to improve the visual experience of road users.</li> </ul>								
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>			<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	6	<b>Year 2</b>	2	<b>Year 1</b>	2	<b>Year 2</b>	2	<b>Perpetual</b>



**Sub-Zone 9.2**

**Figure 5-23: Ecological Restoration Zone 9.2**

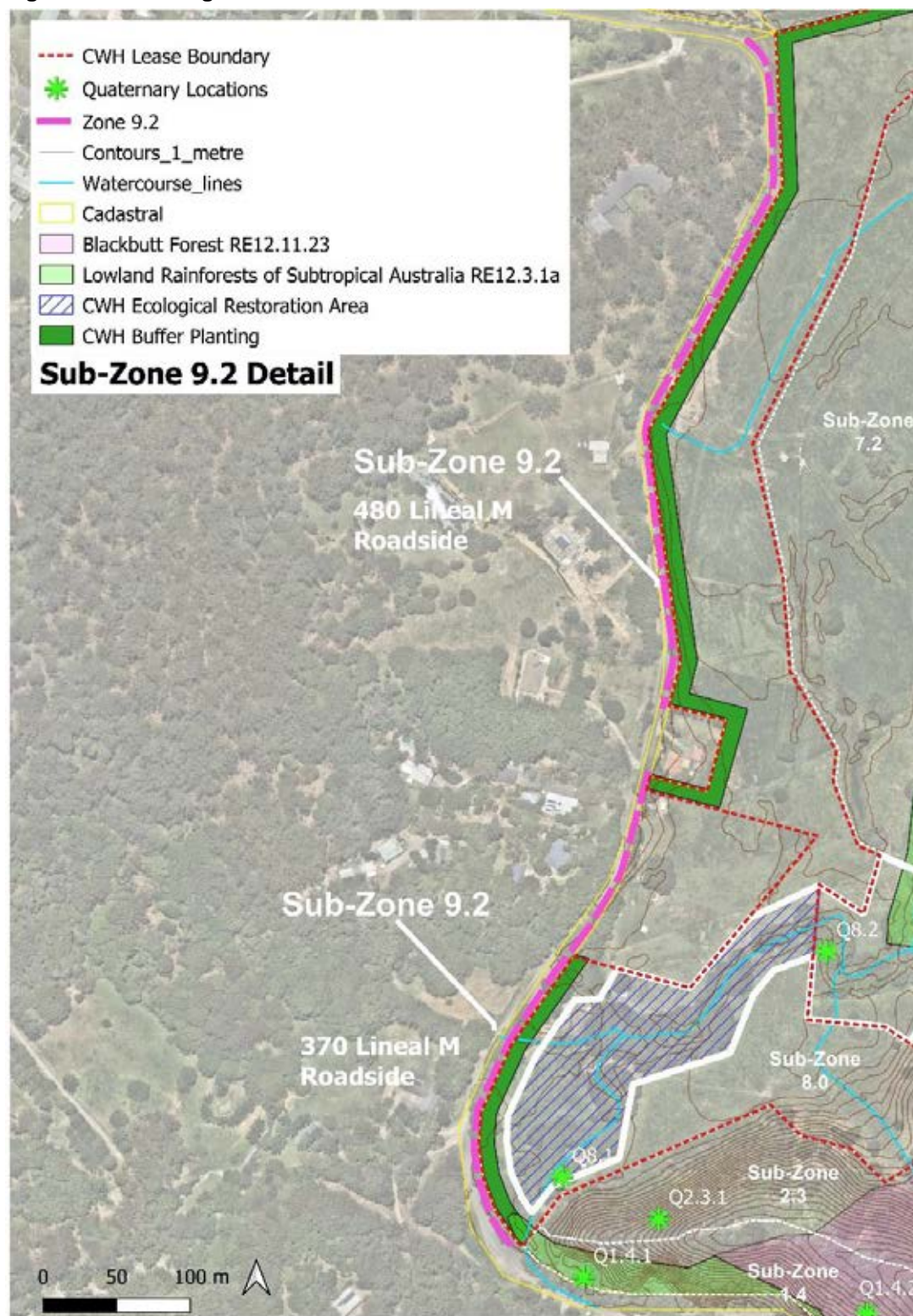


Table 39: Sub-Zone 9.2

Zone 9: Roadside		Sub-Zone 9.2	
<b>Size Ha:</b>	In relation to 107 Piggabeen Road: 480 lineal metres north (to the end of the CWH lease), and 370 lineal metres south (to the unnamed creek)		
<b>Target - Reference state(s)</b>	RE 12.3.1a (in part)	<b>Current Vegetation State</b>	Regrowth; non-remnant (open grassy with scattered trees)
<b>General description and current condition</b>	<p>This Sub-Zone abuts the property as a lineal road reserve of varying widths, from where vegetation begins near the edge of the road pavement, to the property boundary, or as currently determined by an existing fence line. The adjoining CEP property forms part of the CWH lease area. Many sections of the road reserve are devoid of trees and are managed by slashing. However, small sections contain maturing regrowth (albeit interspersed with many <i>Cinnamomum camphora</i>), from solitary trees to portions of small but contiguous forest. A patch of <i>Carronia multisepelea</i> was observed in the southern portion, growing into the canopy, this being one of only 2 locations it was observed on/adjacent to the property. This vine species is the only known food source for the endangered Pink Underwing Moth. The high proportion of threatened species observed in these sections is indicative as to the high biodiversity within RE12.3.1a.</p> <p>Several threatened species were observed in these sections.</p>		
<b>Goals</b>	<ul style="list-style-type: none"> <li>• Minimise weed species in existing canopy and native regrowth areas.</li> <li>• Sensitive control of <i>Cinnamomum camphora</i> with regard to gradual reduction of view-sheds.</li> </ul>		
<b>Objectives &amp; responsibilities</b>	<ul style="list-style-type: none"> <li>• Initial control of invasive weed species with a strategic systematic approach. LMC*</li> <li>• Progressive weed control throughout areas of native regrowth. LMC*</li> <li>• With <i>C. camphora</i> control, where dying parts of the tree(s) could pose a safety hazard to road users, liaise with the road authority to determine the appropriate response. *LMC through EDQ</li> <li>• Coordinate with the road authority to ensure slash-able areas are properly maintained. *EDQ</li> <li>• <u>NOTE:</u> any work in road reserves must be carried out in accordance with workplace safety standards.</li> </ul>		
<b>Restoration approach</b>	Assisted Natural Regeneration		
<b>Dominant natives (EDL)</b>	In remnant and regrowth portions, <i>Acacia</i> spp., <i>Guioa semiglauca</i> , <i>Jagera pseudorhus</i> , <i>Glochidion sumatranum</i> , <i>Oleas paniculata</i> , <i>Commersonia bartramia</i> , <i>Alphitonia excelsa</i> .		
<b>Dominant exotics</b>	<i>Cinnamomum camphora</i> , <i>Setaria sphacelata</i> , <i>Lantana camara</i> , <i>Cestrum parqui</i> , <i>Heptapleurum actinophyllum</i> , <i>Celtis sinensis</i> , <i>Solanum chrysotrichum</i> , <i>S. mauritianum</i> , <i>Senna pendula</i> , <i>Passiflora</i> spp., <i>Paspalum mandiocanum</i> .		
<b>Threatened plant species</b>	<i>Cassia marksiana</i> , <i>Cupaniopsis newmanii</i> , <i>Endiandra globosa</i> , <i>Lepiderema pulchella</i> , <i>Macadamia tetraphylla</i> .		
<b>Habitat for significant fauna species</b>	Not surveyed		

<b>Opportunities</b>	<ul style="list-style-type: none"> <li>• Potential for improved boundary fencing including fauna-friendly along Piggabeen Rd.</li> <li>• Potential for restoration 12.3.1a (Gallery Rainforest) along the road reserve to assist as a buffer to the property.</li> <li>• Opportunity to improve the visual experience of road users.</li> </ul>									
<b>Labour suggestions (days per team of 3)</b>	<b>Primary treatment</b>				<b>Follow-up treatment</b>				<b>Annual Maintenance</b>	
	<b>Year 1</b>	6	<b>Year 2</b>	2	<b>Year 1</b>	1	<b>Year 2</b>	0	<b>Perpetual</b>	2



## **6.0 SPECIALISED RESTORATION TREATMENT**

**Section 6.0** contains the following specialised restoration treatments:

### **Section 6.0 SPECIALISED RESTORATION TREATMENTS**

#### **Section 6.1 Camphor Laurel Treatment**

#### **Section 6.2 Revegetation / Reconstruction: Future opportunities in areas subject to Assisted Natural Re-generation**

#### **Section 6.3 Riparian Revegetation**

#### **Section 6.4 Artificial Drainage Channels**

#### **Section 6.5 Existing Weir**

#### **Section 6.6 Fire Treatment Discussion**

#### **Section 6.7 Cat's Claw Biological Control**



## 6.1 Camphor Laurel Treatment

Camphor Laurel is a serious weed in the CEP, has become dominant in several cleared and regrowth portions and is common as germinated seedlings throughout forested areas.

Camphor Laurel is an aggressive species, capable of dominating many habitats. Its wide canopy and extensive root system eliminate virtually all other vegetation under canopy. This, along with its shallow root system, promotes soil erosion, particularly along stream banks<sup>22</sup>.

Anecdotally, Camphor Laurel trees have strong allelopathic properties where only a few secondary native species will germinate or can coexist beneath mature trees. Several decades of experience has been gained in treating this species, particularly in northern NSW, where it is a dominant pest species in the Big Scrub area, and various academic papers have been published dealing with control techniques.

The term ‘*Camphor Conversion*’ was coined (Kanowski & Catterall) where the definition is to:

*“...strategically kill camphors to promote the growth and regeneration of rainforest plants that have recruited to camphor stands, or that are present in the soil seed bank. This is a relatively new approach, trialled at a limited number of sites over the last decade. It takes advantage of the presence of rainforest plants in camphor stands, is often cheaper than replanting, and can be used on steep or riparian sites where camphor removal is not a feasible option<sup>23</sup>.”*

There are four scenarios where Camphor Laurel occurs in the Currumbin Eco-Parkland. The Camphor Conversion principle is recommended in the first two following scenarios.

### 6.1.1 Camphor Conversion in Zone 8

Camphor Laurel is the dominant tree along the stream in Zone 8. Many large, mature trees line the stream bank with few other species occurring. Roots on these shallow rooted trees have an aversion to water and form dense mats above the saturation line. This leads to undercutting of the bank in a high velocity flow, where the weight of an undercut tree often causes it to topple into the stream, with the root mat pulling the adjacent bank with it. This causes accelerated erosion from bank instability and by blocking the waterway, further exacerbating the bank erosion.

Currently there are numerous places where undercutting is occurring; however, fortunately, the volume and velocity at this stream section (in the upper catchment) is minimal, such that no trees have yet fallen into the creek. See Photo below.

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<sup>22</sup> Kanowski, J. and Catterall, C. P. (2007) *Converting stands of camphor laurel to rainforest: What are the costs and outcomes of different control methods?* Griffith University, Nathan 4111 Australia (16 pp.)

<sup>23</sup> Catterall C.P. and Kanowski, J. (2007). *Costs and outcomes of converting stands of camphor laurel to rainforest.*



Recommended treatment:

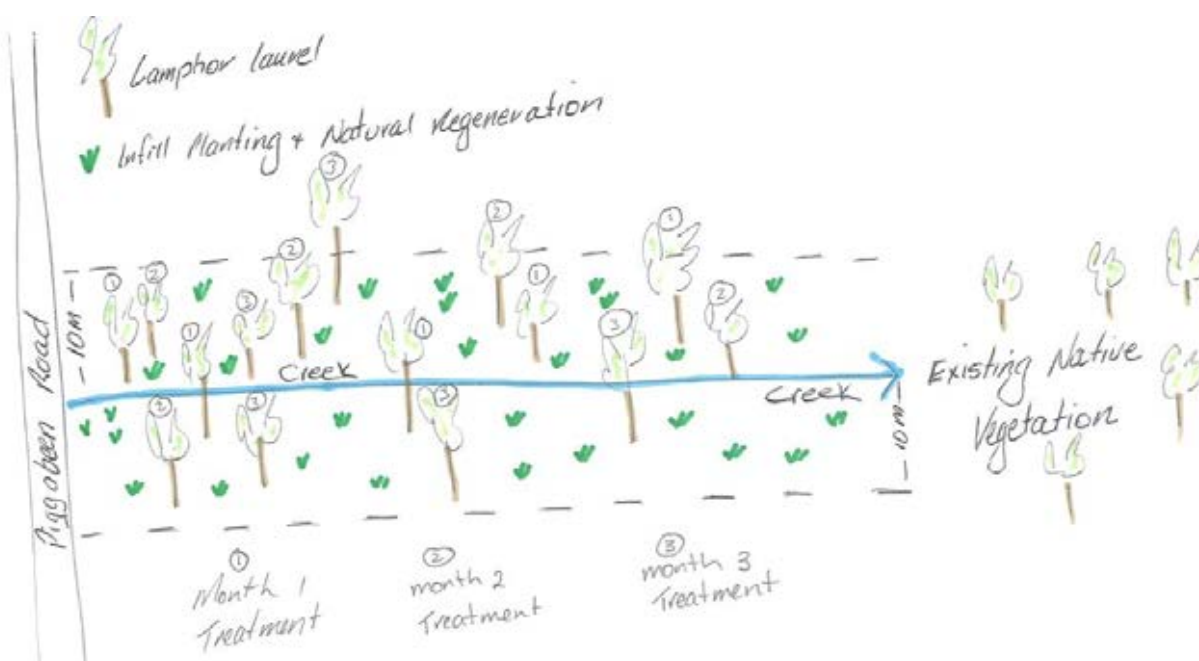
Camphor Conversion with planting. Staged treatment should occur over a 9-month period where trees are progressively treated in a staggered format i.e. 33% at month one (1), 33% at month five (5), and 33% at month nine (9), leaving them standing to decay. This treatment will ensure stream bank stability is maintained by the existing (but dying) roots, and the decaying branches will act as ideal perch sites for seed dispersal from avi-fauna.

Drill and inject trees with herbicide leaving them standing to decay. Method is to drill downward sloping holes around the circumference of the tree approximately 5cm from the ground in a 5x5cm “brickwork” pattern. Exposed roots may also be drilled and filled with herbicide where needed.

Six (6) months (or so) after the final treatment (i.e. month 15), the allelopathic volatile oils will have mostly dissipated from both surface and sub-soils such that they no longer pose a significant hindrance to natural recovery or to planting (pers. comm. Mark Dunphy).

At this point it would be considered reasonable to commence infill planting rather than to rely solely on natural recovery. This should incorporate a mix of late secondary and mature phase trees planted at ~1m spacing giving consideration to existing regrowth trees. Planting is to occur immediately on top of and along each side of the bank to a distance of +/-10m from the stream and lineally from the boundary of Piggabeen Road downstream to where the previous Camphor dominance blends-in to existing native species. Importantly, weed management should be undertaken between months 1 and 15 (prior to planting) to support and encourage any natural regeneration following Camphor treatment.

*Sketch: Treatment Timing and Infill Planting*





Tree species chosen for planting should be from RE12.3.1a (gallery rainforest) with preference given to species previously recorded on the site and species chosen for their known characteristics of rapid growth, dense canopy and ~horizontal lateral branches for perch sites.

Camphor Laurel dominating upper parts of the unnamed creek on site (D. Jinks)



### **6.1.2 Camphor Laurel on lower slopes**

Camphor Laurel is the dominant and sub-dominant tree in the lower foothills of Sub-Zones 1.2, 1.4, 2.3 and 2.4. It varies in dominance from the primary canopy tree (T1) through to a mix of emergent *Eucalyptus* with Camphor Laurel dominant in the sub-canopy (T2 and T3). In these cases, the ground and shrub layer also contain copious seedlings and saplings.

#### Recommended treatment:

Camphor Conversion with no planting. Drill and inject trees with herbicide leaving them standing to decay. Method is to drill downward sloping holes around the circumference of the tree approximately 5cm from the ground in a 5x5cm “brickwork” pattern. Exposed roots may also be drilled and filled with herbicide where needed. As the trees die, this treatment will enable existing secondary native species to rapidly grow, while decaying branches will act as ideal perch sites for seed dispersal from avi-fauna.



### **6.1.3 Scattered Camphor Laurel surrounded by pasture grasses**

Numerous solitary *Cinnamomum camphora* have a range of native (and exotic) species germinating beneath, indicating frugivore perch sites. Control weeds beneath these trees to assist germination of native species beneath. It is likely that such trees will facilitate natural recruitment faster, given appropriate weed control, than where there are no trees (just pasture grass).

#### Recommended treatment:

Undertake weed control under the canopy of the tree along with a ~1m perimeter beyond the canopy dripline. This allows for expansion of the tree crown and exposes the area's most receptive to dispersed native seed encouraging germination. At a time in the future when native trees have gathered sufficient maturity to provide their own canopy of shade, treat the Camphor Laurel in-situ by drilling as discussed previously.

### **6.1.4 Camphor Laurel in forested areas with good canopy**

Many maturing trees, smaller saplings and newly germinated seedlings occur throughout the site under-canopy in all forested areas regardless of the modification or current understorey condition. If allowed to continue growing, a light gap produced from a tree fall or storm damage will shortly thereafter initiate rapid growth.

#### Recommended treatment:

Trees too large to be hand pulled or safely hand sawed are to be stem injected (as detailed previously). Smaller trees are to be either hand pulled or safely hand sawed and treated with herbicide.

### **6.1.5 Camphor Laurel Along Road Reserves**

There are many *C. camphora* occurring along the abutting road reserves of both Currumbin Creek Road and Piggabeen Road. Many can be controlled with no adverse effect on the safety of passing vehicle or pedestrian traffic. However, where dying parts of the tree(s) could pose a safety hazard to the above, there will need to be liaison with the road authority to determine the appropriate response. That could include, for example, some limbs or whole trees being removed by a qualified arborist.

Additionally, the extent of *C. camphora* in some sections is such that it provides the majority of the view of vegetation as these roads are traversed. To lessen the visual impact of road users from the loss of trees, mature *C. camphora* can be gradually controlled over a time period. For example, control one in every three trees above 150mm DBH annually, while controlling all trees below this size in the first sweep. Then over the next two years, continue the one in three until all are controlled.



## 6.2 Revegetation/Reconstruction

Revegetation (as defined in the four restoration approaches in **Section 5.1 Table 6** has been identified as an opportunity in various sub-zones where planting may assist with a more rapid establishment of vegetation communities and/or habitat corridors. It is also an essential component of Camphor Conversion as discussed in **Section 6.1**.

Revegetation is regarded as one of the most cost-ineffective methods for restoration, and brings with it complexities such as using the right mix of species (typically limited by availability at the time), the potential to introduce new weeds and pathogens, and the costs of establishment risks including (but not limited to), plant loss from ineffective establishment watering, ineffective weed control, grazing from animals, and lack of water during dry periods prior to establishment. In some cases, planting can actually hold back the reinstatement of natural processes on a site, particularly where there is adequate regeneration of native species already occurring or likely to occur.

Notwithstanding this, there are circumstances where planting is the preferred method (as stated for Camphor Conversion), and where additions to existing vegetation would benefit e.g. rapidly increasing the area of the Swamp Oak Forest or revegetation of riparian habitats. Cleared creeks and riparian areas will benefit from the rapid recovery that revegetation would provide as connectivity corridors.

Areas suitable for revegetation on the site are typically highly modified and are unsuitable for Assisted Natural Regeneration and can include, for example:

- Habit connectivity i.e. riparian corridors
- Artificial Wetlands
- Expansion of vegetation communities e.g. Coastal Swamp Oak
- Buffer Planting e.g. between Piggabeen Road and the lease area
- Amenity landscape planting
- Offset planting e.g. for Koala Habitat
- Planting the Richmond Birdwing Vine *Pararistolochia praevenosa* to increase potential habitat

Any areas undergoing revegetation must be planned accordingly to take into consideration the vegetation community being installed, the species type with regard to successional stage and availability, the methods used (e.g. spacing, whether or not plant guards are required, type of fertilizer and mulch etc.) and must ensure that sufficient budgets are available to provide appropriate establishment maintenance.

**NOTE:** costing for this ERP has not included any revegetation planning, installation or maintenance.



### 6.3 Riparian Revegetation

Riparian vegetation describes the unique plant communities associated with riparian land along creeks and rivers. The provision of adequate riparian buffer zones increases ecological functions of a creek system. As well as enhancing the aesthetic value of a landscape and protecting biodiversity, riparian zones also mitigate/filter pollution, such as sediment, entering the waterway, provide corridor functions, increase bank stability, and provide creek shading and aquatic habitat. Notwithstanding the constraints stated above in **Section 6.2**, sections of riparian zones within the Currumbin Eco-Parkland are degraded and not providing the necessary functions for good aquatic ecosystem health. These areas would benefit from riparian zone revegetation to help 'kick-start' the natural restoration process.

The Aquatic Ecological Assessment Report for the Eco-Parkland assessed both the intertidal and freshwater habitats within the Currumbin Eco-Parkland site in 2023 and the results suggest site R1 (**Figure 3-3**) in the lower tidal section has a 'very good' rating while D3 in the upper modified channels was 'poor'. In between these two sites, which include the main section of the creek, were good with respect to the aquatic health rating. In relation to the freshwater sites, these ranged from fair in the minor and lower freshwater tributaries to good in the upper reaches of the site. Recommendations to assist in improving aquatic habitats across the site include:

- The infilling/reshaping of artificial drainage channels contributing to acidic conditions.
- Removal of barriers to improve tidal flushing and fish passage to upstream freshwater habitats and within intertidal reaches.
- Removal of exotic riparian vegetation (i.e. camphor laurel).
- Reconstruction of a defined channel in lower floodplain sections to provide better connection with upstream reaches and downstream estuarine habitat.
- Reconstruction of riparian zones along the lower floodplain reach.

Refer **Attachment 10** for further detail on the aquatic habitat assessments.

### 6.4 Artificial Drainage Channels

Water quality throughout the site waterways and drainage channels has been monitored during several site inspections in 2023 and 2024 and results indicate highly acidic to moderately acidic conditions at freshwater and intertidal sites located on the lower floodplain. pH values recorded are lower than local water quality objectives relevant to both moderately disturbed and high ecological value (HEV) wetlands. It is highly likely that several of the artificial drainage canals have exposed acid sulphate soils generating low pH runoff, under certain conditions, into the waterways.

To minimise acid drainage from surface waters within the site, it is recommended that several of the artificial drainage channels are filled/re-levelled. Consideration needs to be given to the need for some drainage within the lower floodplain and the disturbance of acid sulphate soils during the earthworks.



## 6.5 Existing Weir

The presence of the weir (**Figure 1-5**) and other culverts along the unnamed creek, is restricting fish passage along the creek system. This is particularly evident at the weir at low tide when the base of the weir is higher than the water level below the weir. Increased flow velocities at the other culverts, generated from the restriction of creek flows, will also impact movement of aquatic fauna in a number of ways, including increased water velocity through the small culverts during flow, impacting species with reduced swimming ability (i.e. small diadromous gudgeon moving back upstream). Large bodied species would tend to not move through dark elongated tunnels reducing the likelihood of other species such as sea mullet and bass moving further upstream. As such the removal of these restrictions would have a positive impact on the fish communities of the creek system, by assisting with breeding, higher diversity of food habitats, increased shelter, and the ability to utilise waterholes for drought refuge.

The removal and replacement of necessary culverts will need to include safe fish passage in the design and to meet the Acceptable Design Requirements for Waterway Barrier Works.

Through the development of a decommissioning plan, short-term impact from earthworks associated with the weir removal and bank stabilisation will be addressed.

## 6.6 Fire Treatment

A Fire Plan will be compiled by others who are experts in the field, and we welcome their collaboration. In the interim, however, we are able to offer initial comments and advice with regard to the ecological aspects of fire.

Determining where and when to undertake an ecological burn at the CEP is complex, with diverse landscapes, vegetation types, levels of modification, and little-known fire history. Notwithstanding safety to people and property (as identified in the Fire Plan), many sclerophyll forests on the site, particularly in mid to higher portions, require intermittent fire to enable natural succession.

Anecdotally, and with further confirmation from plot studies, there appears to have been no fire in bushland areas for several decades. This is evident in tall open forest areas where fire scars are almost entirely absent, and there is poor recruitment of canopy trees. To enhance their ecological health, some of these areas would benefit from a cool burn at the appropriate time. In all cases, care must be taken to avoid damage to older trees or known habitat trees from fire.

However, many areas of the site are sensitive to fire and contain a range of fire intolerant species. These areas include mid-portions with steep gullies forming, and graduate into lower foothills ranging from sections of wet sclerophyll to lowland rainforest. These wet/moist/gully areas should be left long unburnt.



With regard to the impact of fire to threatened plant species, to our knowledge there has been no specific study undertaken to determine fire impact on the life cycle of any of the 16 known threatened species on site. Anecdotally, many of these occur in the ecotone between wet and dry vegetation types, and some have a degree of tolerance to fire (e.g. by root sucker, or seed reintroduction).

In relation to the current Fire Management Guidelines associated with Regional Ecosystem Short Descriptions, these are generic guidelines across the Bioregion and should not be taken at face value with regard to fire intervals and/or intensity. Notwithstanding the consideration of fire risks to any in-situ infrastructure or to adjoining properties, fire planning will require a customised approach to suit the vagaries of the site.

The existing tracks throughout the site are being kept for long term access which will require repair to bring them up to a standard. These tracks are not necessarily well placed to act as fire lines between vegetation types. To prevent any prescribed fire burning into unwanted areas, it is likely that, in preparation for a burn, fire lines will need to be strategically placed and cut to the perimeter of no-burn areas.

The fire risk from seasonally dry pasture grasses must also be considered with regard to the minimum width of slashing or edge herbicide treatments.

In relation to currently proposed revegetation, these areas are either in lower portions dominated by rainforest and/or wetland species or are part of amenity landscaping for visitor facilities. It is unlikely these areas would be affected by prescribed burns.

Fire weed management is a critical factor in ensuring medium and long term weed control in these areas. Depending on seasonal conditions after the fire (e.g. time of year, rainfall patterns, plant growth etc.), weed maintenance should commence +/- 3 months from the fire and, depending on the regrowth scenario, continue with numerous return visits over a two-year period.

**NOTE:** costing for this ERP has not included any pre-fire preparation or post-fire weed maintenance.



## 6.7 Cat's Claw Biological Control

While eradication of the vine at the Currumbin Eco-Parkland is the necessary final outcome, in the interim (i.e. until this vine has been properly treated), as the vine continues to grow, suppression by biological control using the Leaf-mining Jewel Beetle (*Hylaeogena jureceki*) is recommended.

Following release into the *Dolichandra unguis-cati* infestation, regular reintroduction of the Jewel Beetle may be required seasonally to maintain sufficient populations and assist Land Management Contractor activities to achieve eradication of *Dolichandra unguis-cati* from the site.



Damaged Leaf from Jewel Beetle.  
Photo: Watergum

Photos of *Dolichandra unguis-cati*:  
DPI NSW WeedWise.





## 7.0 IMPLEMENTATION STRATEGIES

Section 7.0 contains the following Implementation Strategies

**Section 7.0  
IMPLEMENTATION STRATEGIES**

**Section 7.1  
Land Management Personnel  
Requirements**

**Section 7.2  
Restoration Plan  
Review**

**Section 7.3  
Implementation Costs**

**Section 7.3  
Rationale for on-going Management**



Ecosystem restoration requires land managers to choose from a range of potential interventions which differ in cost, and time required to achieve outcomes of varying quality.

Managers have different preferences for timeframes, certainty, and quality of outcomes, which can influence the choice of investment strategy. The best strategy depends on the desired forest attributes and the time required for outcomes to be achieved<sup>24</sup>.

The Currumbin Eco-Parkland presents a range of restoration challenges due to the variety of vegetation types and conditions as discussed in Sections 3.0 and 5.0.

Expectations for a minimum or desirable level of restoration will be different according to the current condition state of each sub-zone, and outcomes will be proportionate to the restoration actions, timeframes and budget allocations.

A realistic expectation is that initial restoration works as set out in this ERP will achieve a high-quality condition state in canopy areas where weed infestation is no longer restricting natural processes and where, in part and where appropriate, ecological burns have been carried out to assist with ecosystem health. Non-canopy areas will be reduced as forest edges increase and problematic weeds will be controlled

The minimum desired time frame determined to achieve a high-quality condition state is five (5) years, which includes an initial two (2) years of intensive restoration, followed by three (3) years of follow-up restoration in the treated areas.

## 7.1 Land Management Personnel Requirements

Key to the success and cost-efficiency of any restoration project is the employment of appropriately trained and experienced personnel who have local working knowledge of both native and exotic plant species.

This is particularly important at a site such as the Currumbin Eco-Parkland which contains a very high plant species diversity including sixteen (16) threatened plant species scattered over >3500 locations throughout the site.

### 7.1.1 Site Induction

To assist with identification and awareness of these species, and all other site values, a site induction has been produced which provides site-specific threatened species details and indicative site locations. All land management personnel working on the property must complete the Currumbin Eco-Parkland Site Induction. A copy is provided in **Attachment 8**.

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<sup>24</sup> Shoo et. al. (2017) *Navigating Complex Decisions in Rainforest Investment*.

### 7.1.2 Land Management Contractor Requirements

**Table 40** provides details on land management contractor requirements to ensure appropriate personnel are working on the property and to decrease the risk of impacts to the restoration project.

Table 40: Land Management Contractor Requirements

<b>Preferred Team size</b>	Team of 3 with 1 supervisor and 2 workers. Preferably the same team from each contractor dedicated to this property long-term to ensure continuity of work.
<b>Hours of attendance</b>	Monday to Friday (excluding Public Holidays), 7.5 hours per person per day plus a half hour lunch break.
<b>Qualifications Required</b>	<ul style="list-style-type: none"> <li>• <u>Supervisor</u>: Minimum Certificate IV Conservation and Land Management (CaLM)*</li> <li>• First Aid Certificate</li> <li>• Minimum 5 years local experience</li> <li>• <u>Team</u>: Minimum Certificate III CaLM</li> <li>• Minimum 3 years local experience</li> </ul>
<b>Licences Required by all members</b>	<ul style="list-style-type: none"> <li>• Chemical Operators Licence (ACDC)</li> <li>• Ground Distribution Contractors Licence</li> <li>• Manual drivers licence (unrestricted)</li> <li>• WH&amp;S White Card CITC (Construction Induction Training Card)</li> <li>• <b>NOTE</b>: chainsaw use is only permitted (e.g. for emergency track clearing) if user is qualified in chainsaw operations</li> </ul>
<b>Personal Protective Equipment (PPE) Required</b>	<ul style="list-style-type: none"> <li>• Long-sleeved shirt</li> <li>• Long trousers</li> <li>• Steel-capped boots</li> <li>• Hat &amp; sun protection</li> <li>• Gloves</li> <li>• Eye protection</li> <li>• Snake gaiters (optional)</li> </ul>
<b>WH&amp;S/ Risk Assessment</b>	Contractor to provide their own Safe Work Method Statement (or similar) in accordance with Qld Work health and safety laws
<b>Document Retention</b>	As required (whether digitally or in paper form) to enable an auditable trail of the project delivery – see Section 10.
<b>Site Induction</b>	Provide evidence of completion to the Project Manager
<b>Introductory on-site information session</b>	Provide evidence of attendance to the Project Manager
<b>Implementation of restoration methods in the ERP – in particular</b>	<ul style="list-style-type: none"> <li>• Restoration Approach Section 5.1</li> <li>• Restoration Methods for Canopy and Non-Canopy areas Section 5.2</li> <li>• Consistent Restoration Treatments 5.3</li> </ul>

	<ul style="list-style-type: none"> <li>• Specific Restoration Treatments in Sections 5.4.4 (Zone 4), 5.4.6 (Zone 6), 5.4.7.1 (Zone 7.1) and 5.4.9.2 (Zone 9.2);</li> <li>• Camphor Laurel Treatment in Section 6.1;</li> <li>• Land Management Personnel Requirements in Section 7.1.</li> </ul>
<b>Daily Record Sheets</b>	<ul style="list-style-type: none"> <li>• To be submitted daily on the preferred cloud-based platform.</li> </ul>

\*Also known as Conservation and Ecosystem Management

### 7.1.3 Plant & Equipment

For assisted natural regeneration works (weed control only), plant and equipment requirements that apply to land management activities are shown in Table 41.

Table 41: Plant and Equipment Requirements

<b>Machinery</b>	Brush cutter Chainsaw (if qualified) No other machinery required (or permitted)
<b>Consumables</b>	Herbicides
<b>Equipment</b>	4WD vehicle appropriate for the task Hand tools (secateurs, pruning saws, loppers, weed knives, herbicide applicator bottles) Tool belt Cordless drill 15L knapsack and 5L hand-spray units
<b>Not permitted</b>	The following are not permitted for use on site for safety reasons: <ul style="list-style-type: none"> <li>• Machetes</li> <li>• Cane knives</li> </ul>



#### **7.1.4 Land Management Contractor Key Performance Indicators**

The following Key Performance Indicators (KPI's) will be validated by the Project Manager using a KPI Compliance Sheet which will include as a minimum:

##### 1.0 Site & Personnel Matters

- 1.1 Consistency of staff and team size
- 1.2 Scheduling of works
- 1.3 Staff qualifications and licences held
- 1.4 PPE implemented
- 1.5 Daily Record Sheet management

##### 2.0 Techniques

- 2.1 Appropriate treatment techniques (cut & paste, spray, chemical usage etc.)
- 2.2 Proper handling and management of weed debris (where applicable)
- 2.3 Correct equipment being used
- 2.4 Accuracy of target weeds and identify if any off-target damage to native species
- 2.5 Ensure no excessive wear & tear or damage to tracks and access points

##### 3.0 Progress

- 3.1 Time management towards allocated number of days
- 3.2 Extent of work output versus resources/time provided
- 3.3 Adherence to Restoration Table requirements

Validation of KPI's is important to ensure efficient implementation of the ERP, as well as proper contractor interpretation of this plan and to ensure the use of appropriate restoration methods and long-term continuity.



### 7.1.5 Biosecurity (Myrtle Rust & Fire Ants)

#### **Myrtle Rust**

While most species in the Myrtaceae locally are not affected by Myrtle Rust, four site species have been severely impacted and their conservation status is now '*Critically endangered*'. One of these (*Gossia hillii*) was added to the list since the delivery of the Ecological Assessment in 2023, and some may be added in the future (e.g. *Archirhodomyrtus beckleri*). All four of these are affected to the degree that that can no longer reproduce. The species are:

- *Gossia hillii*
- *Rhodamnia argentea*
- *Rhodamnia rubescens*
- *Rhodomyrtus psidioides*.

Refer Section 4.3.2 Threatened Species Affected by Myrtle Rust of the Ecological Site Assessment 2024 for further details.

To assist in preventing the spread of Myrtle Rust (& other plant diseases), all site contractors should follow the Federal guidelines 'Arrive Clean, Leave Clean'<sup>25</sup> i.e.:

To help to prevent the spread of myrtle rust – arrive clean, leave clean:

- Wash all clothing, hats and gloves between site visits—using warm or hot machine wash with detergent.
- Ensure all clothing, hats, footwear, tools, equipment, machinery and vehicles are free of mud, soil and organic matter before entering and exiting bushland.
- Use a solution of 70% ethanol or methylated spirits in 30% water to disinfect items that may be contaminated (including hats, footwear, tools, equipment, machinery, vehicles, walking sticks, tent pegs, phones, glasses, watches, wallets and other personal items).

#### **Imported Red Fire Ants**

Imported Red Fire Ants pose an imminent risk to invading the Currumbin Eco-Parkland. Fire ant-safe practices must be followed with regard to the movement of any plant, equipment or materials that may bring the ants to the site. It is recommended that all contractors are aware of and follow the recommendations in the '*Material movement advice tool*' as provided by the National Fire Ant Eradication Program: <https://www.fireants.org.au/fact/mat-check>

Similarly, if any sightings are suspected, follow the Reporting process as stated: <https://www.fireants.org.au/look/reporting-process>

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<sup>25</sup> <https://www.dcceew.gov.au/sites/default/files/documents/arrive-clean-leave-clean.pdf>



## 7.2 Review of Restoration Plan

The ERP is only relevant for 5 years, however, it will need to be reviewed annually to consider monitoring results, data evaluation and the need for adaptive management as discussed in **Section 9.0**.

## 7.3 Rationale for Ongoing Management

There is a strong recommendation that a sufficient degree of restoration is continued in perpetuity to ensure the gains from initial works are not lost. Following the Year 3 Annual Maintenance round, maintenance effort will need to be established and arrangements made for ongoing maintenance of the site to ensure that the site does not regress into a degraded state.

The on-going management intensity will be guided by restoration monitoring results (Section 8.0) and the evaluation and adaptive management processes described in Section 9.0.

## 8.0 RESTORATION MONITORING

To identify if the Currumbin Eco-Parkland site is being managed to increase habitat quality and achieve the goals set out in **Section 5.4** Restoration Tables, the Ecological Restoration Plan includes a program of suggested monitoring and reporting. The monitoring program measures the performance of the restoration works against the goals in the **Section 5.4** and the reporting component (**Section 10.0**) provides details on the reporting necessary to maintain records for the site and assess the success or otherwise of the Ecological Restoration Plan.

Monitoring that is suggested for measuring the performance of the restoration works is outlined in **Sections 8.1 to 8.7**, and some optional monitoring strategies are provided in **Section 8.8**.

Suggested monitoring includes:

- Photo Monitoring
- Daily Record Sheets
- Quaternary Plot Surveys
- BioCondition Monitoring
- Fauna Monitoring
- Aquatic Habitat Surveys
- DESI Values Based Management Framework

Optional Monitoring Suggestions include:

- Lidar



Photo monitoring and daily record sheets are generally considered informal monitoring and conducted at most ecological restoration sites by the Land Management Contractors and/or restoration ecologists. These are quick and easy ways to demonstrate change overtime. More formal monitoring using quantitative data from plots and transects is more time-consuming and better undertaken by restoration ecologists and not Land Management Contractor. This type of monitoring provides additional information on whether performance indicators are being achieved and if the project is heading in the right direction to achieve project goals.

## 8.1 Photo Monitoring

One of the best ways to observe change overtime as a result of ecological restoration works is to undertake photo monitoring. A permanent photo point has been set up in the centre of each of the flora survey plots (**Figure 2-1**) and is marked with a permanent aluminium tree tag and numbered with the corresponding plot number.

Each time a photo assessment is required, two photo types are recommended as per Appendix 4: Taking Photos in the BioCondition assessment manual<sup>26</sup>. Take a copy of the previous or original photos to the site when you are undertaking photo monitoring to compare the field of view and to ensure consistency.

### Spot Photo

Take from head height looking nearly vertical down to the centre marker of the flora survey plots to ensure the photo is taken from the same spot each time. Photo to be taken facing south.



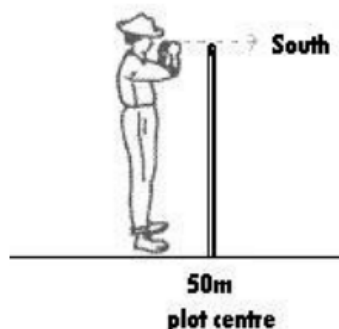
### Landscape Photos

Landscape photos are taken of features in the intermediate distance to provide an overview of the site and surrounds. Four (4) photos will be taken from the aluminium tree tag in a North, East, South, and West direction in that order. A photo monitoring point template is to be established that will record photos overtime, commencing from the initial, and sometimes

<sup>26</sup> Eyre, T.J., Kelly, A.L., Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2015). BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.



degraded site in 2024 through time and will be a powerful reminder of change that has occurred overtime. The photos can record large scale change from events such as fire and floods, as well as small scale changes in weed and native plant densities.



### ***Proposed Photo Monitoring Summary***

<u>Frequency:</u>	Quarterly for Years 1 & 2 Twice a year for Years 3 & onwards Restoration Ecologist to establish baseline photo run and thereafter to be undertaken when completing the Quaternary Plot Surveys.
<u>Objective:</u>	Take photos to provide an informal measure of change overtime.
<u>Record:</u>	Complete Photo Point Monitoring Sheet and download photos clearly labelling each photo with the Zone #, Plot # and date photo taken. Insert photos into Photo Monitoring Template ( <b>Attachment 9</b> ) and comment on any observable change.
<u>Performance Indicator:</u>	Spot Photo (x1) and Landscape Photos (x4) taken in accordance with the frequency description and downloaded in accordance with the Record description.
<u>Data Analysis:</u>	Restoration Ecologist to provide brief summary review of changes observed in Photos and submit to EDQ within 2 weeks of monitoring.
<u>Responsibility:</u>	EDQ Years 1 – 3 Future Land Manager Years 4 onwards



## 8.2 Daily Record Sheets

Daily record sheets are another monitoring tool and land management contractors will be responsible for completing daily record sheets, using a cloud sharing program and *Avenza* maps for every day they are active on-site. Essentially, daily record sheets enable tracking of projects costs, personnel hours, areas worked, activities undertaken and chemical use throughout the project.

An example of a daily record sheet (including parameters to be entered into a digital platform) is provided in **Attachment 9**. This data is automatically linked to a Daily Monitoring Spreadsheet where statistics on data entry across Sub-Zones, Zones or the whole site can be easily extracted, analysed and presented to landowners or custodians. This information could be further processed and mapped on other sharing platforms.

### *Proposed Daily Record Sheets Summary*

<u>Frequency:</u>	Daily when working in active areas of the site
<u>Objective:</u>	Record daily work sub-zones, activities and chemicals used
<u>Record:</u>	Complete the digital record sheet on phone or tablet at the end of each workday.
<u>Performance Indicator:</u>	Digital record sheet is completed with all relevant records included and submitted daily.
<u>Data Analysis:</u>	On an as required basis by the Restoration Ecologist.
<u>Responsibility:</u>	Data entry: Land Management Contractor Data analysis: EDQ Years 1-3 Future Land Manager Years 4 onwards

## 8.3 Quaternary Plots

Quantitative monitoring can be more time consuming than photo monitoring and require field survey, data entry and analysis. The rewards can also be high with detailed results available on restoration success or otherwise, that may not be apparent from more informal observations. This can be important when determining if goals and objectives are being achieved and whether the project is heading in the right directions.



There are several monitoring options available from basic plots such as quaternary, through to very detailed plots when using the 'BioCondition' tool. BioCondition is discussed in Section 8.4.

Quaternary plots, which focus on weed dominance, have been undertaken at 49 sites (**Figure 2-1**) throughout Currumbin Eco-Parkland to determine baseline weed data. Ongoing monitoring of these sites will ideally occur quarterly to monitor the trend in weed dominance across the restoration zones. A Weed Dominance Survey Template has been established (**Attachment 9**), although survey data can be entered directly in the field via a cloud sharing platform and results graphed over time to identify trends.

Secondary Plots, used for classification and detailed descriptions of REs were carried out in 7 locations across the range of RE's (**Figure 2-1**) and were undertaken generally in 'best-on-offer' sites to gain an indication of the target reference condition state for each property specific RE as it occurs on the site. These plots will be 'upgraded' to BioCondition Plots and used as property benchmarks against which restoration goals can be measured.

### ***Quaternary Plot Monitoring Summary***

<u>Frequency:</u>	Quarterly
<u>Objective:</u>	To establish trends in weed dominance from the commencement of land restoration works
<u>Record:</u>	Complete the Weed Dominance Record Sheet
<u>Performance</u>	
<u>Indicator:</u>	<ol style="list-style-type: none"><li>1. Weed dominance record sheet is completed with all relevant records included and submitted quarterly.</li><li>2. Weed dominance records show a decline in percentage of weed dominance within and within the vicinity of the plot centre taking into consideration seasonal and climatic conditions.</li></ol>
<u>Data Analysis:</u>	Restoration Ecologist to graph and comment on weed dominance per plot within 2 weeks of survey.
<u>Responsibility:</u>	Data entry: EDQ Years 1-3 Data analysis: EDQ Years 1-3 Future Land Manager Years 4 onwards



## 8.4 BioCondition

BioCondition is a terrestrial vegetation condition assessment used in Queensland to compare biodiversity condition between Regional Ecosystems and against the Regional Ecosystem Reference State for a particular RE. This method measures a given sample against a norm (Reference State) that is an average over the entire Bioregion.

When assessing and monitoring for restoration outcomes, the Reference State is not necessarily representative of the specific assemblage or variation of the RE that is being restored on the site. However, BioCondition is a relevant method of assessment on a regional scale.

Of note, BioCondition has been identified as an education option for long term monitoring of the restoration project in **Section 11.2**.

### *BioCondition Monitoring Summary*

Frequency: Every two years at the Secondary Plot Locations on Figure 2-1.

Objective: Assess condition of plot against site target reference state

Record: Complete the BioCondition Field Assessment Sheet

#### Performance

Indicator:

1. BioCondition monitoring is completed every two years.
2. Data analysis shows positive changes overtime

Data Analysis: Restoration Ecologist to comment on survey results per plot within 4 weeks of survey.

Responsibility:

Data entry: EDQ Years 1-3  
Data analysis: EDQ Years 1-3  
Future Land Manager Years 4 onwards



## 8.5 Fauna Monitoring

Ecological restoration focuses on the restoration of vegetation communities and in doing so increases habitat condition for fauna. To understand how the restoration project is influencing fauna habitat, and if fauna assemblages are changing overtime in response to improved fauna habitat condition, fauna surveys should be undertaken.

Specifically, the aim of the monitoring would be to determine if fauna species persist, decline or increase prior to, during and following the implementation of the Ecological Restoration Plan, i.e. detect any change in fauna species richness, composition and potentially distribution.

To do this would require the following fauna parameters to be surveyed at 12 to 20 locations throughout the Currumbin Eco-Parkland (potentially aligning with flora survey sites if habitat is suitable):

- Baited (non-lethal attractant) infrared terrestrial remote sensing cameras – sampling for small/medium ground mammals, some frogs, reptiles and birds.
- Baited (non-lethal attractant) infrared arboreal remote sensing cameras – sampling for arboreal mammals and some other non-target vertebrates.
- Acoustic recorders – sampling for cicadas, frogs, birds, mammals.
- Microbat recorders – sampling for insectivorous bats.
- Point count bird surveys – sampling for birds.
- Diurnal observation and general search – sampling for various vertebrates (reptiles, mammals) and select invertebrates.
- Nocturnal spotlighting – sampling for various vertebrates and select invertebrates.
- Nocturnal call playback – sampling for frogs, nocturnal birds and mammals.
- Scat/tracks and signs – sampling for various vertebrates.

Habitat assessment – summary of measured habitat/vegetation variables known to influence fauna diversity including groundcover, understory, subcanopy, etc.

In addition to the above sampling methods, it is also suggested that biannual surveys (diurnal and nocturnal observation for various species groups, wetland bird call playback and frog surveys) be undertaken at the three permanent dams present to sample for wetland birds, frogs and select invertebrates, in order to monitor any changes in diversity which may occur as a consequence of either visitation or ecological restoration activities.

Depending on the final monitoring plan the data collected may be robust enough to allow (if required) statistical analysis of the results. This could then be used to track any changes in species richness and composition between similar sites and/or within sites over time.



### ***Proposed Fauna Monitoring Summary***

Frequency: Biannually (spring/summer and autumn/winter) for length of project (initially three years) to account for seasonal variation in species diversity.

Objective: To monitor fauna assemblages in response to habitat changes over time

Record: Fauna Consultant to undertake survey and submit results

#### Performance

Indicator:

1. Fauna Surveys are conducted Biannually in accordance with the Frequency description.
2. Positive change in species richness and composition between similar sites and/or within sites over time.

Data Analysis: Fauna Consultant to undertake statistical analysis, where sufficient and robust data is available.

Responsibility: EDQ Years 1-3  
Future Land Manager Years 4 onwards

### **8.6 Aquatic Habitat Monitoring**

The aquatic habitat assessment undertaken in January 2024 recorded physical attributes, water quality and habitat condition for each natural wetland type and recorded these as site profiles (**Attachment 10**). Repeat assessments in natural wetlands plus one additional assessment in the artificial wetland should be conducted annually to monitoring the condition of the wetlands overtime. Additionally, water quality assessments within waterways and drainage channels should be undertaken with respect to identified acid sulfate soil drainage impacts, particularly during infrastructure construction, to monitoring potential impacts from soil disturbing activities.



### ***Proposed Aquatic Habitat Monitoring Summary***

<b><u>Frequency:</u></b>	Annually for Years 1 – 3 Once every 2 Years for Years 4 on-wards.
<b><u>Objective:</u></b>	To monitor aquatic habitats over time for changes to physical attributes, water quality and habitat condition.
<b><u>Record:</u></b>	Aquatic Ecologist to undertake survey and submit results.
<b><u>Performance</u></b>	
<b><u>Indicator:</u></b>	<ol style="list-style-type: none"><li>1. Aquatic Habitat Surveys are conducted Annually in accordance with the Frequency description.</li><li>2. Positive change in habitat conditions such as physical attributes, water quality and habitat condition are demonstrated over time.</li></ol>
<b><u>Data Analysis:</u></b>	Aquatic Ecologist to undertake survey assessment and comment on results.
<b><u>Responsibility:</u></b>	EDQ Years 1-3 Future Land Manager Years 4 onwards



### ***Proposed Water Quality Monitoring Summary***

**Frequency:** Monthly for 9 months

**Objective:** To monitor surface water and groundwater quality to initially provide input into the project design and thereafter to monitor any potential impacts from construction work on the natural aquatic habitats.

**Record:** Water Monitoring Consultant to monitor surface water and groundwater and provide EDQ a monthly water quality report.

**Performance**

**Indicator:**

1. Water monitoring surveys are conducted monthly in accordance with the Frequency description.
2. Sampling is conducted in accordance with the QLD Monitoring and Sampling Manual 2018
3. Monitoring Reports are provided to EDQ monthly.

**Data Analysis:** Water Monitoring Consultant to undertake an assessment of the water monitoring results, identify any unexpected results, compare the data to the QLD *Environmental Protection (Water and Wetland Biodiversity) Policy* Water Quality Objectives.

**Responsibility:** EDQ Years 1-3  
Future Land Manager Years 4 onwards



## 8.7 DESI Values Based Management Framework

The VBMF is described in section 2.3.2 and measures the condition of key values (i.e. and how effectively they are being managed over time by DESI. Baseline VBMF monitoring was conducted between 10 March 2024 to 24 April 24 and it is understood this will be re-assessed annually. Baseline results are provided in **Attachment 9**. Assessment locations were positioned in threatened vegetation communities, and as such will not provide on-going assessment of the lower more degraded sections of the site.

### *Proposed VBMF Monitoring Summary*

<u>Frequency:</u>	Annually for Years 1 – 3 Once every 2 Years for Years 4 on-wards.
<u>Objective:</u>	Efficiently and routinely assess the condition of key park values.
<u>Record:</u>	Department of Environment, Science and Innovation
<u>Performance</u>	
<u>Indicator:</u>	1. VBMF assessments are conducted annually in accordance with the Frequency description. 2. Trend in condition, and alignment with the stated desired condition for the key value, to help determine whether the current management approach is appropriate.
<u>Data Analysis:</u>	In accordance with the VBMF
<u>Responsibility:</u>	DESI Years 1-3 Future Land Manager Years 4



## 8.8 Alternative Monitoring Methods

Monitoring methods other than those recommended in section 8.1 – 8.7 would provide value and input in understanding changes to the Currumbin Eco-Parkland as a result of restoration activities, however they are not essential to understanding or measuring the effectiveness of proposed restoration practices.

### 8.8.1 Lidar

New and emerging technologies are being developed to monitor environmental attributes, and Lidar is an exciting new tool which can assess biomass changes over time. Current research is being undertaken by various bodies in New South Wales and Queensland and methods are being evaluated and improved, with one specific purpose being the ability to rapidly assess biomass in large areas, often in sites difficult or impossible to assess through ground monitoring and compare this data over time. Lidar presents a very accurate and rapid form of assessment and could be considered as one way to assess regenerative change over time within the Currumbin Eco-Parkland.



## 9.0 EVALUATION & ADAPTIVE MANAGEMENT

Evaluation helps determine if project goals and objectives have been met and provides the opportunity to analyse what has worked really well, and what may have gone wrong. Carrying out restoration works without taking the time to assess on a regular basis, the progress that has been made may result in costly mistakes being made both ecologically and financially.

Adaptive management involves learning from previous management actions in order to improve future management.

A biannual evaluation process should be designed and implemented that looks at the site monitoring data holistically, against the project targets, goals and objectives and inform on-going management of restoration and monitoring programs, including the ability to implement adaptive management and contingency planning as required.

### 9.1 Biannual Evaluation

Environmental Monitoring Sheets could be developed for individual sub-zones that capture and compare the results of all monitoring programs twice a year against the performance indicators listing in the monitoring section and overall targets, goals and objectives of the project. The sheets should also recommend adaptive management as required:

- Comparative photo monitoring essays
- Summary of Daily Record Sheet showing hours works, herbicide usage etc and actual time for primary and follow up against predicted data.
- Weed dominance graphs showing weed trends
- BioCondition results against benchmark data
- Fauna monitoring against benchmark data
- DESI VBMS
- Review of threats
- Recommendations

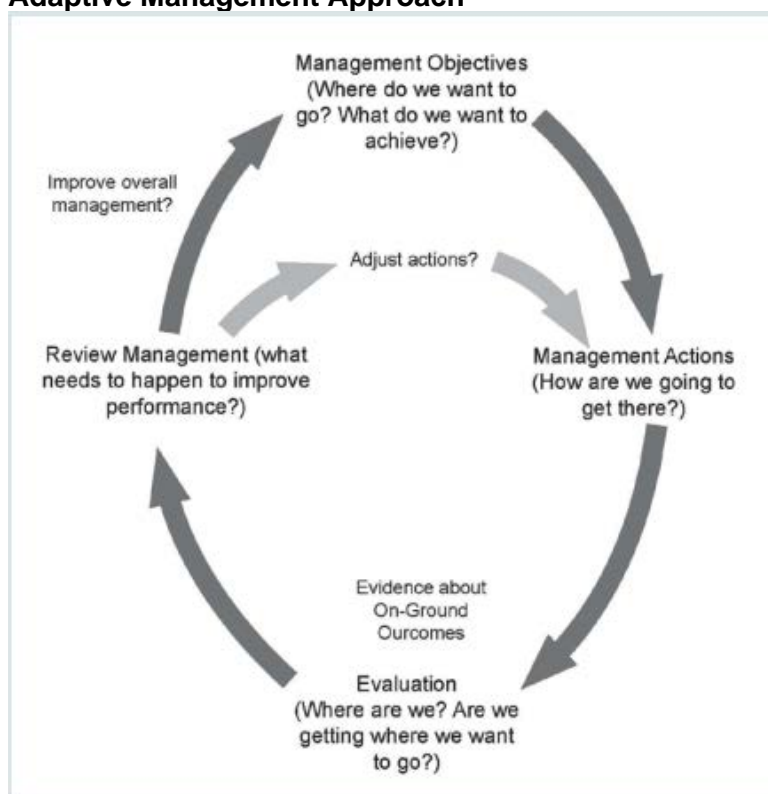
Sheets could contain specific targets, goals and objectives as indicated in Section 5 Restoration Tables. An evaluation of the data against these parameters will provide an opportunity to assess what is working and what may not have worked. It is important to identify if strategies and methods are not achieving outcomes so adaptive management actions can be implemented in a timely manner and budgets adjusted accordingly.



## 9.2 Adaptive Management

Adaptive management involves learning from previous management actions in order to improve future management<sup>27</sup>. This is a key factor in the success of projects as the person/team implementing the Ecological Restoration Plan can respond to changing site conditions. Regular monitoring conducted for the restoration project will inform progress on the project but will also provide feedback if the project is failing and allow adaptation of the restoration techniques to achieve positive outcomes. The Adaptive Management Approach presented in the SEQ Restoration Framework is applicable to the Currumbin Eco-Parkland project:

### Adaptive Management Approach



<sup>27</sup> SEQ Restoration Framework

## 10.0 REPORTING

It is common to expect restoration projects to have a requirement for regular reporting. Landowners and other stakeholders will want details about the work undertaken, funds expended, and whether the objectives of the project are being met.

Another important aspect of reporting is to share information about the project (successful or not) with other landowners or restoration practitioners. Sharing could include data being published in a journal (e.g. Ecological Management and Restoration), newsletter (e.g. Land for Wildlife) or a presentation at a relevant conference or meeting. Knowledge gained, through both successes and failures, is of great value to landowners and restoration workers, by assisting them to refine techniques and gain new understandings of how to influence ecological processes to bring about restoration.

Based on the monitoring and evaluation suggestions in Sections 8.0 and 9.0, there is likely to be a number of environmental and ecological monitoring and assessment reports provided to the project manager. This section provides a summary of the recommended reports, the content and timing of the reports and who is responsible for delivering the reports.

Suggested Report	Timing	Content	Responsibility
Daily Record Sheets	Daily submission to cloud portal	As per the cloud portal (example included in <b>Attachment 9</b> )	LMC*
	Data to be analysed six monthly	Statistics on LMC hours, weeds treated, sub-zones treated, chemicals used, evaluation on predicted hours against actual hours.	Restoration Ecologist/Project Manager
Photo Monitoring	Quarterly	Photo monitoring sheets with brief discussion on changes overtime.	Restoration Ecologist
Quaternary Surveys	Quarterly	Weed dominance data	Restoration Ecologist
BioCondition	Every Two Years	Brief report on changes detected (Positive and or negative)	Restoration Ecologist
Fauna Monitoring	Six Monthly	Data analysis on change in species richness and composition between similar sites and/or within sites over time.	Fauna Consultant



Suggested Report	Timing	Content	Responsibility
Aquatic Habitat	Annually	Report changes in habitat conditions such as physical attributes, water quality and habitat condition.	Aquatic Ecologist
Water Quality Report	Monthly	Water quality results for surface water and groundwater monitoring for water level, pH, conductivity, redox potential and dissolved oxygen. Results to be assessed against the water quality objectives in the QLD <i>Environmental Protection (Water and Wetland Biodiversity) Policy</i> , and previous monthly results.	Water Quality Consultant
Biannual Summary	Six Monthly	Summary of all monitoring results, commentary on the outcomes, results and recommendations for on-going management.	Restoration Ecologist



## 11.0 OPPORTUNITIES

Opportunities to assist and enhance restoration and provide interpretation of the Currumbin Eco-Parkland site should be considered beyond what is proposed in this Restoration Plan. For example, these may include, but are not limited to, community activities, educational activities, offsets or funding.

### 11.1 Community Engagement

The Currumbin Eco-Parkland Activation Plan identifies opportunities for site restoration, rehabilitation and appreciation of the natural environment, amongst other things. Community contribution to these elements is encouraged and the following suggestions are provided:

- Implementation of the Naturally GC Volunteer Landcare Program in Sub-Zones 6.1, 6.2 and potentially 7.1 to support revegetation and amenity landscaping. This could include the potential for revegetation of 12.3.20 Swamp Oak in the lower sections.
- Connection with National Parks Association of Queensland and/or Friends of Parks Queensland both of which are associated with Queensland Parks and Wildlife Service and partner with the community to achieve conservation and education outcomes.
- Establishment of, or support for existing local community group(s) at the Parklands to maintain/generate ownership and nurturing.
- Instigate science-led walks throughout the Parklands to inform the community of restoration activities and site attributes and hear from the community on their knowledge of the site.
- Establish a Parkland reporting mechanism for community reporting of incidents such as vandalism and pest species etc. as well as suggestions to improve community interaction with the Parkland.
- Host a creek naming event for the main creek that traverses the property from the west to the east.



## 11.2 Educational Activities

Currumbin Eco-Parkland is a unique property containing special natural environments that offer opportunities for environmental education. The site is central to highly populated areas containing schools, universities and other educational institutions, and will be easily accessible by locals and visitors by private vehicle, bus or bikeway.

Opportunities could include:

- Development of walkways through different landscapes where remnant, degraded and restoration patches of vegetation can be observed. The walkways may include interpretive signage, active participation activities or QR Code messaging.
- Establish educational activities and worksheets in-line with the QLD Educational Curriculum from years 1 – 12.
- University research plots could be developed to monitor long-term success or otherwise of restoration or habitat changes. This could include alternative monitoring methods such as BioCondition and Light Detection and Ranging (LiDAR) as discussed in **Section 8.8**. Local Universities include Griffith University, Southern Cross University and Bond University.
- Indigenous education hub for learning about country and indigenous culture. This could incorporate learning activities for local indigenous people to extend their knowledge of culture and country or provide educational opportunities for non-indigenous people to learn more about local indigenous culture.
- Development of site pamphlets, website information, or the development of a site app that shows walking trails and points of interest or ecologically significant features that the track user is likely to encounter. An app has the ability to provide a significant amount of information and can be kept up to date and relevant.

## 11.3 Offsets

Whilst federal and state laws are in place to protect our animals, plants, habitats and places, some human actions result in a residual impact to our environment that is not avoidable or may occur following mitigation. Environmental offsets are available in some cases to compensate for this residual impact. The most common offset type are land-based offsets which improve the habitat of a protected matter, for example a threatened species or habitat.

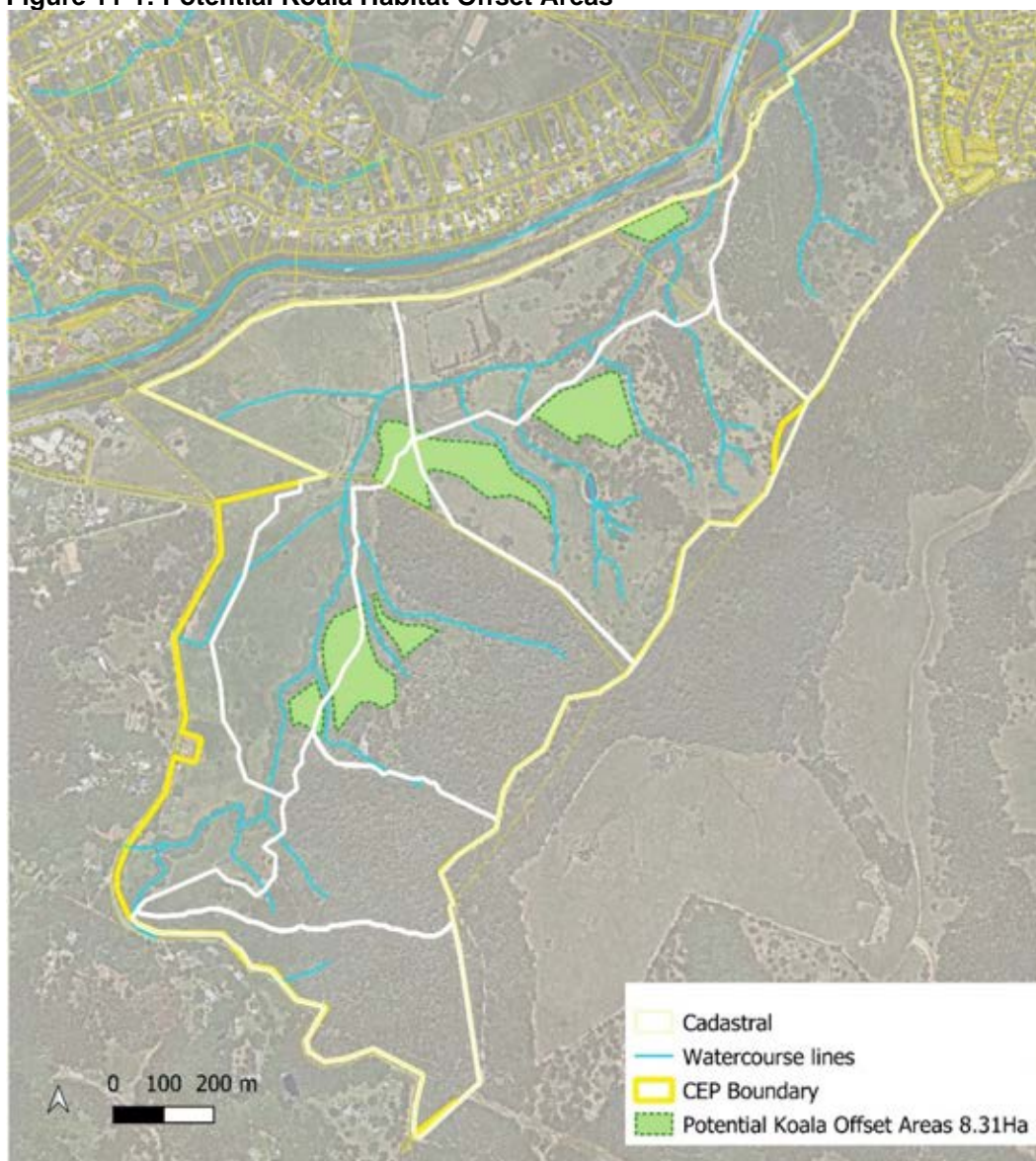
The Currumbin Eco-Parkland contains areas of the site that could deliver conservation outcomes for environmental matters, in particular for koalas. Large areas of the site contain degraded or cleared Eucalypt Forest that could be restored to not only support koala populations on-site, but to strengthen connectivity for koalas across the landscape.



The site is mapped as containing a Koala Priority Area, sections of Core Koala Habitat, High and Medium Value Rehabilitation areas under the State Government Supported Infrastructure – Koala Conservation Policy. This policy 2023 outlines how Queensland public sector entities will consider koala conservation outcomes in the planning and delivery of Government Supported Infrastructure in Southeast Queensland.

A preliminary assessment of potential suitable areas for koala habitat offsetting suggests approximately 8.31Ha (Figure 11-1) could be available across the site for koala tree planting. These areas include RE12.3.20, RE12.11.3 and RE12.11.23 on accessible and reasonably accessible slopes.

**Figure 11-1: Potential Koala Habitat Offset Areas**





#### **11.4 Government Grants and Funding**

The Australian Federal Government and the Queensland State Government regularly offer grants for on-ground activities that generate conservation outcomes for the environment. Examples include the Federal Government Environment Restoration Fund and the Queensland Government Threatened Species Grants. Potentially, community grants such as the Queensland Government Community Sustainability Action Grant may also offer opportunities for community groups working at the Currumbin Eco-Parkland to obtain funding to undertaken on-ground works.

Grant offers change continually, and this is an opportunity that will require on-going commitment to identify when grants are available and prepare grant applications. Often Community groups will undertake these tasks.

#### **11.5 Other Studies**

The current study did not extend into soil health, and the importance of soil microbes for successful restoration. An opportunity exists for an assessment of soil health within the restoration areas to understand the soil microbe population across the Parkland. Soil hosts biological diversity and is made up animals such as worms, termites, ants, mites as well as uncommon species of fungi, bacteria and other microorganisms. They all play a part in healthy soils and can provide reduced pathogens that cause plant and animal disease.

Additionally, the study did not investigate lower order plants in the division Bryophyta (mosses, liverworts and hornworts), or other life forms such as lichen, fungi and algae. Supplementary study of these life forms would add to the already known rich biodiversity that occurs at the Currumbin Eco-Parkland.



## 12.0 GLOSSARY

- **Adaptive management** - Using the best currently available knowledge, skills and technology an action is implemented, and outcomes recorded including success, failures and potential for improvement. These learnings form the basis of the next round of decision making and trialling in a process of continuous improvement.
- **Assisted Natural Regeneration** - a specific method mainly focused on facilitating natural regeneration of plant species, particularly in cleared agricultural lands in tropical forest regions. Some enrichment planting can be included in this method as distinct from a strictly 'facilitated regeneration' approach that does not include reintroductions.
- **Assisted Regeneration** - the practice of fostering natural regeneration (in situ) and recolonisation after actively removing ecological impediments (e.g. invasive species, fish barriers) and reinstating appropriate abiotic and biotic states (e.g. environmental flows, fire regimes). While generally this approach is typical of sites of low to intermediate degradation, even some very highly degraded sites have proven capable of natural recovery given appropriate treatment (including high levels of substrate engineering) and sufficient time frames.
- **Biodiversity** - the variety of life and its processes, including diversity of organisms, genetic diversity, and the communities and ecosystems in which they occur.
- **Construction** - methods involved in engineering permanent or temporary components that did not occur previously at that site-as distinct from 'reconstruction'
- **Currumbin Eco-Parkland** - project that will see the protection of an important and unique 148-hectare parcel of land at Currumbin and transform it into the one of the largest eco-parks in Australia. Will feature sporting and recreational elements, nature based recreational trails, protections for local koala habitats, including fodder eucalypt plantation, provide opportunities for rehabilitation, eco-tourism destination while protecting local flora and fauna for future generations.
- **Cultural ecosystem** - an ecosystem shaped to at least some extent by human utilization, to provide food, fibre, medicines and/or culturally important artefacts.
- **Degradation (of an ecosystem)** - a persistent decline in the structure, function and composition of an ecosystem compared to its former state, generally from frequent or persistent impacts.
- **Ecological restoration** - the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed. (Note: Single species restoration can be considered complementary and an important component of ecological restoration.)
- **Ecosystem** - small- or large-scale assemblage of biotic and abiotic components in oceans, rivers and on land in which the components interact to form complex food webs, nutrient cycles and energy flows. The term 'ecosystem'; is used in the Standards to describe an ecological community of any size or scale.
- **Ecosystem services** - are the benefits to humans
- **Full recovery** - the state whereby all ecosystem attributes closely resemble those of the reference ecosystem.



- **Natural regeneration** - recovery or recruitment of species from in-situ propagules or propagules that have colonised a site without human intervention. Natural regeneration from these propagules can occur spontaneously or after facilitation other than direct human reintroduction of propagules.
- **Primary treatment** - the first treatment of a site (e.g. removal of standing weed biomass), after which there will be subsequent follow-up treatments referred to as 'secondary treatments'.)
- **Reconstruction** - a restoration approach where the appropriate biota needs to be entirely or almost entirely reintroduced as they cannot regenerate or recolonise within feasible timeframes, even after expert facilitated regeneration interventions. Site earthworks may or may not be needed. An example of reconstruction is the mass revegetation of trees, shrubs and groundcovers on previously cropped agricultural lands (including mature successional phase species) or the complete rebuilding of a coral reef (including mature successional phase species).
- **Recovery** - the process of an ecosystem regaining its composition, structure and function relative to the levels identified for the reference ecosystem. In restoration, recovery is assisted by restoration activity—and recovery can be described as partial or full.
- **Recruitment** - production of a subsequent generation of organisms. This is measured not by numbers of new organisms alone (e.g. germinant of plants or birth of animal young) but by the number that establish to adulthood in the population.
- **Reference ecosystem** - a real or notional community of organisms able to act as a model or benchmark for restoration. A reference ecosystem usually represents a non- degraded version of the ecosystem complete with its flora, fauna (and other biota), functions, processes and successional states that would have existed on the restoration site had degradation, damage or destruction not occurred—but should be adjusted to accommodate changed or predicted environmental conditions.
- **Regional Ecosystem (REs)** - Communities of vegetation that is consistently associated with a particular combination of geology, landform and soil in a bioregion. The Queensland Herbarium has mapped the remnant extent of regional ecosystems for much of the state using a combination of satellite imagery, aerial photography and on-ground studies.
- **Rehabilitation** - the process of reinstating a level of ecosystem functionality (but not substantial native biota) on degraded sites where ecological restoration is not the aspiration, as a means of enabling ongoing provision of ecosystem goods and services. An example would be a non-native carbon planting, a riparian nutrient filter or use of non-native invertebrates to decompose waste.
- **Reintroduction** - the returning of missing species to an ecosystem through human agency, whether by direct seeding, planting, translocation or release.
- **Resilience** - the degree, manner and pace of recovery of species after a disturbance or stress, or the potential or capacity for such recovery. This property is developed by natural selection under conditions of exposure of the species to disturbance over evolutionary time scales and enables a species or population to persist despite disturbance.
- **Resilience (of an ecosystem)** - the capacity of a system to absorb disturbance and reorganize while still retaining similar function, structure, and feedback. Highly dependent on the long-adapted resilience of the species within the ecosystem.



- **Restoration** - see also ecological restoration. The term 'restoration' is in common usage and can be used singly and in combination with other words to convey an intent to return something to a prior condition (e.g. restoring a species, a population or a particular ecosystem function such as carbon sequestration). Single species restoration can be considered complementary and an important component of ecological restoration.
- **Revegetation** - establishment, by any means, of plants on sites (including terrestrial, freshwater and marine areas) that may or may not involve local or indigenous species.
- **Secondary treatment** - repeated follow-up treatments, e.g. to control weed, required during the restoration phase after primary treatment has triggered an ecological response.
- **Threat** - a factor potentially or already causing degradation, damage or destruction.
- **Threatened Species** - plants or animals which have been listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable, rare or conservation dependent under either federal or state legislation.
- **Treatment** - interventions or actions undertaken to achieve restoration, such as substrate *amendment*, exotics control, habitat conditioning, reintroductions.
- **Vegetation Community** - an assemblage of particular populations of different plant species within a specified location in space and time.
- **Weed** - A weed is considered to be a plant that requires some form of action to reduce its negative effects on the economy, the environment and human health or amenity. For the purpose of this report, weed species are both exotic species from overseas, and alien native species from other parts of Australia.