

120 NORTH CREEK RD, BALLINA

Vegetation Management Plan

For:

Palm Lake Works

June 2019

Final



**PO Box 2474
Carlingford Court 2118**

Report No. 18187RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

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Introduction

1.1 Purpose

Cumberland Ecology has been commissioned by Palm Lake Works to develop a Vegetation Management Plan (VMP) to prescribe the management measures to be implemented on 120 North Creek Road, Ballina (Lot 11 DP 1245510) (the subject land). The subject land is proposed for development for seniors housing, as an extension to the existing Palm Lake Resort, Ballina.

The purpose of this VMP is to guide the management of the vegetation to be retained and enhanced within the subject land, located outside of the seniors housing development footprint, and referred to as the 'VMP area', as shown in **Figure 1.1**. The primary focus of the VMP is the revegetation and ongoing management of the riparian area in association with North Creek and the buffer zone to the Coastal Wetlands vegetation present in the subject land in order to increase the ecological values of the subject land over time. This VMP also provides detailed specifications for management actions to be undertaken in the development site to minimise the impacts of vegetation clearance. This includes specifications for fencing of clearing areas, pre-clearance surveys and clearance supervision.

1.2 Background

In 2018, a development application (DA) for the Project was submitted for approval by Ballina Shire Council ('Council') on 29 March 2018. An ecological assessment of the project was prepared in 2017 by JWA Ecological Consultants (JWA) (JWA 2018b) and lodged with the DA. Council issued a Request for Information (RFI) in relation to the DA, and a package of documentation responding to the RFI was lodged by Palm Lake Works on 3 August 2018. The RFI included a Biodiversity Development Assessment Report (BDAR) prepared by JWA (JWA 2018a), which formally assessed the proposal under the *Biodiversity Conservation Act 2016* (BC Act).

Due to ongoing unresolved issues with the DA, Palm Lake Works Class 1 appeal is before the NSW Land and Environment Court (LEC) (Case No. 2018/00326045). A Statement of Facts and Contentions (SoFC) was filed with the LEC by Ballina Council on 17 December 2018. In order to respond to the issues outlined in the SoFC, an amended DA submission has been prepared, and includes an updated BDAR (Cumberland Ecology 2019), which incorporates the ecological data from James Warren and Associates (JWA) (2018a, b) and supplementary surveys conducted by Cumberland Ecology in 2018. The amended DA also included an earlier draft version of this VMP.

In response to the amended DA, Amended SoFC were filed with the LEC by Council on 24 May 2019, which included several issues relating to the draft VMP, and lack of consistency with the existing Creek and Vegetation Plan of Management (CVPM) that was prepared in 2008 (King and Campbell 2008).

This revised VMP has been prepared in response to the SoFC to address the requirements of Council and has been prepared according to the Guidelines for Vegetation Management Plans on Waterfront Land produced by the NSW Department of Primary Industries (DPI) Office of Water (DPI 2012). The focus of the VMP is on protecting and restoring riparian and wetland habitats in the subject land, in particular areas mapped as Coastal Wetlands by the *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP).

This VMP replaces the existing CVPM that was prepared in 2008 (King and Campbell 2008) as a condition of consent for the existing Palm Lake Resort, when the DA was approved by Council in 2004 (DA2004/328). The existing CVPM is still active but some works specified in the plan have not been maintained since the commencement of the CVPM, in particular the requirement to continually slash identified areas of grassland for bushfire protection purposes. This new VMP will replace the existing CVMP, once it is adopted by Council.

It is acknowledged that native vegetation has regrown in a number of areas that are required to be managed for bushfire protection purposes (slashed) under the CVMP, in order to comply with the approval for the existing Palm Lake Resort (DA 2004/328). It is therefore recommended that remedial works (under DA 2004/328) are carried out as a priority to ensure the safety of existing residents.

Remedial work in order to comply with the bushfire protection requirements of DA 2004/328, is not required by reason of the new seniors housing development proposed by the pending DA. The remedial work is therefore not required to be authorised by any development consent granted in relation to the proposed Palm Lake Resort Ballina North extension.

The proponent, Palm Lake Works, intends to either carry out rectification works under DA 2004/328 or, if necessary, make a modification application for that consent to carry out the works. It is recommended that a Site Specific Fuel Management Plan is prepared that addresses the ongoing fuel management of the subject land as required under the existing and proposed DA's.

1.3 Proposed Development Layout

The proposed development will occur over the undeveloped portion of 120 North Creek Road, Ballina (Lot 11 DP 1245510) to the north-east of the existing seniors housing development 'Palm Lake Resort Ballina' (developed portion of Lot 2 DP1155600 – also known as 12 Corks Lane) (see **Figure 1.1**).

The proposed development is for the staged erection of a seniors housing development under the State Environmental Planning Policy (Housing for Seniors or People with a Disability 2004) – comprising self-care dwellings, associated car parking, infrastructure works and

site filling. Four (4) bio-basins are proposed to be constructed to manage stormwater in the site; two along the eastern boundary, one on the northern boundary and one in the southern corner of the development site.

Areas mapped as Coastal Wetlands by the Coastal Management SEPP occur adjacent to the eastern site boundary, and an approximate 100 m setback to these wetlands has been provided along the eastern boundary of the subject land. Within portions of this set-back, a 50m Asset Protection Zone (APZ) is provided as part of the proposed development, which includes a mosquito management buffer area. A minor watercourse, that is a tributary of North Creek, is located in the centre of the subject land, and includes a riparian corridor of between 12-20m from each bank. An APZ adjoins the riparian corridor and provides an approximate 30m setback from the development. The layout of the proposed development is shown in **Figure 1.2**.

It should be noted that the development site will be predominantly filled, and batters will be located within the APZ areas. Complete tree removal is to occur throughout the proposed development site, and includes the APZ, to accommodate the battering for development site fill.

The development site includes clearing of native vegetation, located in two patches in the centre of the site, with a total area of 1 ha, that were identified for retention under the existing approval (DA 2004/328). Some compensatory planting is proposed within the VMP area to compensate for the loss of this vegetation, although it will be formally offset under the Biodiversity Offsets Scheme (BOS) as part of the pending development application. The removal of this vegetation was anticipated in the site compatibility certificate (SCC) which is of relevance to the development site.

1.4 Site Description

The subject land is located in 120 North Creek Road, Ballina (Lot 11 DP 1245510) and covers an area of approximately 42 ha. It is bounded by Corks Lane to the west, North Creek and North Creek Road to the east, residential properties to the south, and partially vegetated land and wetlands to the north (**Figure 1.1**).

The subject land is located within the Ballina Shire Council Local Government Area (LGA) and is therefore subject to the Ballina Local Environment Plan (LEP) 2012 (the Ballina LEP) and associated plans, policies and controls. The proposed development is contained within areas zoned as RU2 Rural Landscape under the Ballina LEP.

The subject land is located east of an existing unnamed creek which runs from north to south. The existing Palm Lake Resort is situated east of this unnamed creek. The area east of the creek was previously used for cane farming from the early 1920's, for a period of approximately 20 years (King and Campbell 2008). It has been vacant for the past fifteen years, and contains grasslands and pockets of vegetative regrowth.

The proposed development site contains mostly exotic grassland, with small patches of highly degraded Swamp Oak forest and a small area of tall shrubland dominated by *Melaleuca*

quinquenervia. Large tracts of tall closed forest dominated by *Casuarina glauca* (Swamp Oak) and Blackwood (*Acacia melanoxylon*) are present to the north of the proposed development site that is contiguous with vegetation occurring on adjacent lots. This vegetation is considered to comprise an Endangered Ecological Community (EEC) listed under the BC Act; Swamp Oak Floodplain Forest of the NSW North Coast Bioregion. This community also partly conforms to the listing under the EPBC Act. Further details of the vegetation communities in the subject land are provided in **Section 2.3**.

An unnamed tidal creek and a small number of modified drainage channels traverse the subject land and drain to North Creek, which occurs to the south and east of the site. North Creek is classified as a 4th order stream according to Strahler (1952) and is a tributary of the Richmond River. Waterways occurring on and adjacent to the development site can be seen in **Figure 1.3**.

Parts of the subject land have been mapped by the Coastal Management SEPP as Coastal Wetlands or Proximity Area to Coastal Wetlands including parts of the VMP area (see **Figure 1.3**). No area mapped as Coastal Wetlands occur in the proposed development site, however some areas mapped as Proximity Area to Coastal Wetlands do occur in the proposed development site.

1.5 Document Structure

The remainder of this document is structured as follows.

- Methodology (**Chapter 2**)
- Management Zones (**Chapter 3**);
- Management Measures during Construction (**Chapter 4**);
- Weed Management Strategy (**Chapter 5**);
- Revegetation Plan (**Chapter 6**);
- Monitoring and Reporting (**Chapter 7**); and
- Timing and Responsibilities (**Chapter 8**).



- Legend**
- VMP Area
 - Subject Land
 - APZ
 - Development Footprint

Image Source:
Image © Neamap 2019
Dated: 11/3/2019

Coordinate System: MGA Zone 56 (GDA 94)



Figure 1.1. Location Map

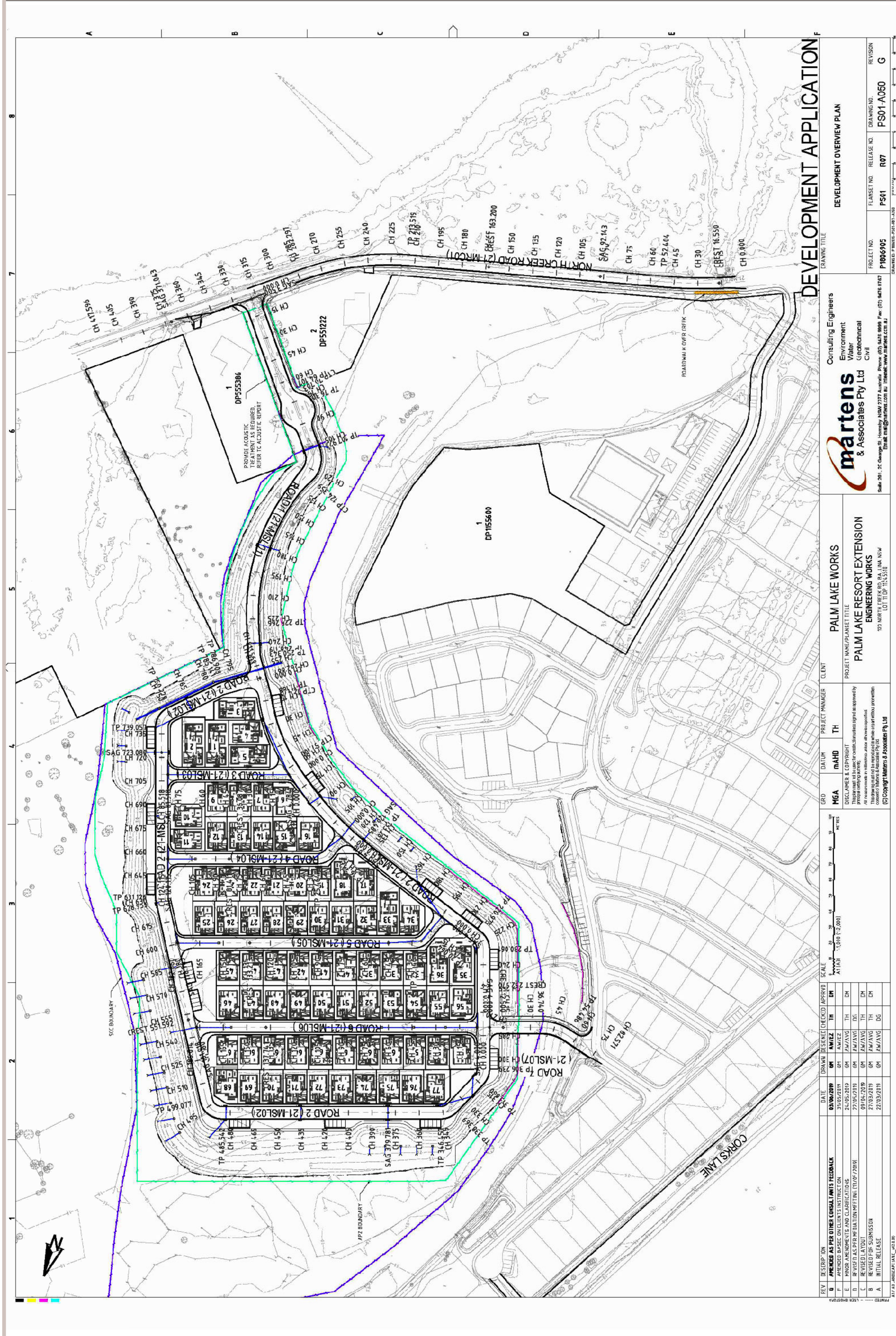


Figure 1.2. Layout of the Project



- Legend**
- VMP Area
 - Subject Land
 - APZ
 - Development Footprint
 - Coastal Management SEPP 2018
 - Coastal Wetlands
 - Proximity Area for Coastal Wetlands
 - Watercourse
 - 1st Order Stream
 - 2nd Order Stream
 - 3rd Order Stream
 - 6th Order Stream or Above

Image Source:
Image © Nearmap 2019
Dated: 11/3/2019

Data Source:
Coastal Management SEPP
© State Government of NSW
and Department of Planning
and Environment (DPE) 2018

Spatial Services (2018)
NSW Department of
Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)



Figure 1.3. Zones mapped under the Coastal Management SEPP 2018 within the subject land

Methodology and Site Description

2.1 Literature Review

The preparation of this VMP involved a literature review that included review of previously prepared ecological reports, government mapping and guidelines for the preparation of vegetation management plans. The literature review also identified the most up to date methods of weed control for exotic species that are present in the subject land and included a review of government fact sheets and websites. Cumberland Ecology staff with expertise in bushland regeneration were also consulted on current best practice methods and techniques. In order to prepare species planting lists for revegetation, and determine revegetation strategies, relevant documents were reviewed in conjunction with a review of field survey data.

The literature review included but was not limited to review of the following documents:

- Atlas of NSW Wildlife (OEH 2019);
- Cumberland Ecology (2019) Biodiversity Development Assessment Report; 120 North Creek Road, Ballina;
- King and Campbell (2008) Creek and Vegetation Plan of Management (CVPM) for No.6 DP 565132, North Creek Road, Ballina;
- JWA Ecological Consultants (JWA 2018b) Ecological Assessment, Lot 2 on DP1155600 12 Corks Lane, Ballina;
- JWA Ecological Consultants (JWA 2018a) Biodiversity Development Assessment Report (BDAR), Lot 2 on DP1155600 12 Corks Lane, Ballina;
- NPWS (1999). Vegetation Map for the Northern Rivers CMA; and
- NSW Office of Water (DPI 2012) Guidelines for Vegetation Management Plans on Waterfront Land.

The species list prepared for revegetation areas within the subject land not only includes species listed as diagnostic for the appropriate vegetation communities, but also includes additional species that were recorded as naturally occurring local endemics, as well as species listed under final determinations for endangered ecological communities in riparian/wetland areas.

2.2 Field Surveys

The vegetation within the subject land was recently surveyed by Cumberland Ecology on 12 and 13 December 2018 for the purposes of preparing an updated BDAR and this VMP. The combined dataset has been used in the preparation of this VMP. Methods used by Cumberland Ecology are described below.

General flora surveys involved undertaking detailed meander surveys across the subject land) to ground-truth the extent and condition of vegetation. Photographs were taken at several locations to record condition of the vegetation. The locations of these photo points are shown in **Figure 2.1**. All plant species encountered were recorded and notes were made regarding whether plants were indigenous, planted natives or exotic.

All vascular plants recorded were identified using keys and nomenclature provided in Harden (1990-1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET (Botanic Gardens Trust 2018).

Previous surveys conducted in 2018 by JWA Ecological Consultants included detailed flora and fauna surveys, and the data collected during these surveys has been utilised within this VMP.

2.3 Vegetation of the Subject Land

A total of 10 vegetation communities have been mapped as occurring on the subject land; these are listed below:

- Tall closed forest to 18 m (*Casuarina glauca* +/- *Acacia melanoxylon*);
- Tall closed forest to 16 m (*Acacia melanoxylon* +/- *Casuarina glauca*);
- Tall closed forest (*Casuarina glauca* +/- *Avicennia marina*);
- Tall shrubland to 6 m (*Melaleuca quinquenervia*);
- Tall closed grassland to 2.5 m (*Phragmites australis*);
- Tall closed exotic grassland to 2 m (*Setaria* sp.);
- Highly degraded Swamp Oak;
- Mangrove closed forest (*Avicennia marina*/*Aegiceras corniculatum*);
- Singapore daisy exotic herbfield (*Sphagneticola trilobata*); and
- Coastal saltmarsh (*Juncus kraussii*/*Sporobolus virginicus*)

The proposed development site contains mostly tall closed grassland to 2 m (exotic grassland), with small patches of Highly Degraded Swamp Oak and tall shrubland to 6 m (*Melaleuca quinquenervia*).

Large tracts of tall closed forest to 18 m (*Casuarina glauca* +/- *Acacia melanoxylon*) are present to the north of the proposed development site that is contiguous with vegetation occurring on adjacent Lots. Additional areas of Swamp Oak dominated forest types include; Tall closed forest (*Casuarina glauca* +/- *Avicennia marina*), tall closed forest to 16 m (*Acacia melanoxylon* +/- *Casuarina glauca*), and Tall closed grassland to 2.5 m (*Phragmites australis*) in association with the creekline located in the centre of the subject land and drainage depressions in the centre of the subject land. All Swamp Oak dominated forest types are considered to correspond to Plant Community Type (PCT) 1235 – Swamp Oak Swamp forest of the coastal lowlands of the North Coast. This is consistent with the description of the Endangered Ecological Community (EEC) listed under the BC Act as Swamp Oak Floodplain Forest of the NSW North Coast Bioregion.

Coastal Saltmarsh is present within the riparian corridor in the centre of the subject land, and intergrades with Swamp Oak swamp forest. Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (PCT 1125) is listed as an Endangered Ecological Community (EEC) under the BC Act and is also listed as Vulnerable under the EPBC Act.

Mangrove Closed Forest is present within the southern parts of the riparian corridor through the centre of the subject land. Mangrove - Grey Mangrove low closed forest of the NSW Coastal Bioregion (PCT 916) is neither listed under the BC Act nor the EPBC Act.

Swamp Oak Swamp Forest, Coastal Saltmarsh and Mangrove Closed Forest will be retained and managed under this VMP, and is described further below:

2.3.1 Swamp Oak Swamp Forest of the Coastal Lowlands of the NSW North Coast Bioregion

Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (PCT 1235) is found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which *Casuarina glauca* (Swamp Oak) is the dominant species. The community is associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. It generally occurs below 20m in elevation. The structure of the community may vary from open forests to low woodlands, scrubs or reedlands with scattered trees. Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (PCT 1235) is listed as an Endangered Ecological Community (EEC) under the BC Act and is also listed as Endangered under the EPBC Act.

This plant community type is the dominant native plant community type on the subject land, as shown in **Photograph 2.1**. The dominant canopy species within this community is *Casuarina glauca* (Swamp Oak). Other tree species include *Melaleuca quinquenervia* (Broad-leaved Paperbark) *Cupaniopsis anacardioides* (Tuckeroo) and *Acacia melanoxylon* (Blackwood). The shrub layer is sparse and includes natives; *Duboisia myoporoides* (Corkwood) and *Wikstroemia indica*. The groundcover is characterised grasses including native species; *Imperata cylindrica* (Blady Grass), *Leersia hexandra* (Swamp Ricegrass) and *Microlaena stipoides* (Weeping Grass), and exotic species; *Paspalum mandiocanum* (Broadleaf Paspalum) and *Paspalum dilatatum* (Paspalum), and forbs including natives;

Dianella caerulea (Blue Flax-Lilly) and *Lobelia stenophylla* and exotics; *Ageratum houstonianum*, *Solanum mauritianum* (Wild Tobacco) and *Crotalaria* spp. In some locations *Phragmites australis* (Common Reed) dominates the ground layer. Saltmarsh species such as *Juncus kraussii* (Sea Rush) and *Sporobolus virginicus* (Saltwater Couch) may dominate the ground layer in waterlogged areas on estuarine fringes. Some exotic sedges are also present in wet areas, including *Cyperus eragrostis* (Umbrella Sedge) and *Cyperus brevifolius*.



Photograph 2.1 Swamp Oak Swamp Forest on the subject land

Other variants on the subject land include the following low condition examples of Swamp Oak Swamp Forest occur on the subject land, and those areas to be retained and managed under the VMP are described below.

i. Phragmites Wetland

Phragmites Wetland corresponds to the mapped area of Tall Closed Grassland to 2.5m (*Phragmites australis*) (**Figure 2.1**) and is a component of Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (PCT 1235). It is characterised by dense swards of *Phragmites australis* (Common Reed). It is located in environments inundated by saline and brackish water where the canopy of *Casuarina glauca* has been removed or partially removed. These include low-lying swamps on riverbanks, river flat depressions, and banks on coastal lagoons that are open to tidal influence. This community is commonly encountered on the landward side of Swamp Oak forest and coastal saltmarsh flats. Phragmites Wetland is associated with Swamp Oak swamp forest of the coastal lowlands of

the NSW North Coast Bioregion (PCT 1235) which is listed as an Endangered Ecological Community (EEC) under the BC Act and is also listed as Endangered under the EPBC Act.

This PCT is located in patches along the unnamed creek close to the western boundary of the development site, as shown in **Photograph 2.2**. The total area that this plant community occupies is 0.38 ha. The dominant species are the native grass; *Phragmites australis* (Common Reed) and the exotic grass; *Setaria sphacelata* (South African Pigeon Grass). Twelve of the 24 species present are exotic. The canopy species present are found as shrubs and include *Casuarina glauca* (Swamp Oak), *Avicennia marina* (Grey Mangrove) and *Melaleuca quinquenervia* (Broad-leaved Paperbark). Sparse shrubs are present, and include the native species; *Hibiscus diversifolius* (Swamp Hibiscus) and the exotic species; *Gomphocarpus physocarpus* (Balloon Cottonbush). Forb species present include natives; *Persicaria decipiens* (Slender Knotweed) and *Ranunculus inundatus* (River Buttercup), and exotics; *Solanum mauritianum* (Wild Tobacco Bush). Other native species present in the ground layer include *Sporobolus virginicus* and *Cyperus polystachyos*.



Photograph 2.2 Phragmites Wetland on the subject land

2.3.2 Coastal Saltmarsh

Coastal Saltmarsh occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (PCT 1125) is listed as an Endangered Ecological Community (EEC) under the BC Act and is also listed as Vulnerable under the EPBC Act.

This PCT is located southwest of the drainage line that runs along the centre of the subject land, but located outside of the south western boundary of the development site, as shown in **Photograph 2.3**. The total area that this plant community occupies is 0.24 ha. Two of the 19 species present are exotic. It is closely associated with the tall closed forest of *Casuarina glauca* (Swamp Oak) and *Avicennia marina* (Grey Mangrove). The dominant species in this community are *Juncus kraussii* subsp. *australiensis* (Sea Rush) and *Sporobolus virginicus*. Typical coastal saltmarsh species present include *Suaeda australis* (Seablite), *Triglochin striata* (Streaked Arrowgrass) and *Sarcocornia quinqueflora* (Samphire). The canopy species present are only represented by seedlings and saplings colonising from adjacent communities such as *Casuarina glauca* (Swamp Oak), *Acacia melanoxylon* (Blackwood) and *Avicennia marina* (Grey Mangrove). Other species present include *Phragmites australis* (Common Reed), *Aegiceras corniculatum* (River Mangrove) and *Apium prostratum* (Sea Celery).



Photograph 2.3 Saltmarsh present on the subject land, located to the west of the development site

2.3.3 Mangrove - Grey Mangrove low closed forest of the NSW Coastal Bioregion

Stands of mangroves form a low closed forest on mudflats along the foreshore of saltwater estuaries. Stands of *Avicennia marina* (Grey Mangrove) are often encountered in pure stands and contain very few species other than the canopy, with the understorey mostly an open mudflat sometimes with scattered saltmarsh herbs. This community protects foreshores from erosive forces of the ocean and provides a valuable ecological role in

providing breeding habitat for many threatened birds, fish and crustaceans. Mangrove - Grey Mangrove low closed forest of the NSW Coastal Bioregion (PCT 916) is neither listed under the BC Act nor the EPBC Act.

This community is located in the south east of the subject land, outside of the development site, at the head waters of the drainage line that runs along the south west of the subject land. The total area that this plant community occupies is 0.18 ha and is shown in **Photograph 2.4**. The dominant canopy species within this community is *Avicennia marina* (Grey Mangrove) and to a lesser extent *Aegiceras corniculatum* (River Mangrove). *Aegiceras corniculatum* (River Mangrove) is a small tree /shrub and occurs where freshwater influences from runoff or rivers cause lower salinity levels. The understorey of this community is open mudflats or water (depending in the tide) and is occupied by seedlings of the canopy species together with root pneumatophores with sparse occurrences of *Suaeda australis* (Seablite) and *Triglochin striata* (Streaked Arrowgrass).



Photograph 2.4 Mangroves on the subject land, located to the south west of the development site

2.3.4 Endangered Ecological Communities

As described in the native vegetation descriptions in **Section 2.3**, three TECs have been identified on the subject land, as follows:

- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions Endangered Ecological Community (EEC);

- Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions Endangered Ecological Community (EEC); and
- Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

A discussion of the extent of each TEC on the subject land is provided below:

i. Swamp Oak Floodplain Forest

All forms of PCT 1235 conform to the TEC Swamp Oak Floodplain Forest, although the low condition variants are considered to be highly degraded forms of the community. This PCT conforms to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listing for Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community. However, only the high quality variant of 1235, meets the minimum condition class for the EPBC Act listing, being a large patch (>5ha) with a mostly native understorey and is therefore classified as 'Good Quality', while the low condition variants do not. The low condition variants of PCT 1235 are small patches (between 0.5 ha and 2 ha) that are contiguous to larger patches of native vegetation, however, they do not contain a predominantly native understorey, as required to meet the minimum of 'moderate condition' under the EPBC Act listing.

ii. Swamp Sclerophyll Forest

The small strip of PCT 1064 present on the subject land conforms to the TEC Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions. The example present on the subject land is degraded and present in a simplified form, due to a complete lack of canopy species, and dominated by a low diversity of native midstorey and understorey species, including the characteristic shrub species; *Melaleuca quinquenervia* (Broad-leaved Paperbark). There is no minimum condition for listing under the BC Act, and the PCT does not conform to any community listed under the EPBC Act.

iii. Coastal Saltmarsh

Small patches form a mosaic of Coastal Saltmarsh - PCT 1125, on the subject land, which conforms to the TEC Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. The patches grade into Swamp Oak Floodplain Forest. The collective area of the mosaic of Coastal Saltmarsh is 0.23 ha within the subject land.

The entire area of Coastal Saltmarsh conforms to the EPBC Act listing for Subtropical and Temperate Coastal Saltmarsh TEC, as it meets the minimum collective area of patches within the mosaic of ≥ 0.1 ha, with a distance between individual patches ≤ 30 m.

2.4 Fauna Habitat

Fauna habitats vary across the subject land in relation to vegetation density, structure and floristics, as well as the presence of specific features such as hollow-bearing trees and wetlands. The quality of habitat within the subject land has been reduced by historic land clearing and weed invasion.

Habitats within the subject land provide limited potential roosting or breeding habitat for native vertebrate fauna species as the majority of the trees are species that either generally do not form hollows (e.g. Casuarinas) or are too young to form hollows. However, the native and exotic species provide a variety of foraging resources for native fauna.

Moderately dense shrubs provide appropriate cover for ground-dwelling fauna species and foraging habitat for birds, bats and arboreal mammals. Fallen timber and leaf litter provide habitat for invertebrates, amphibians, reptiles and small ground-dwelling mammals as well as foraging habitat for ground foraging birds.

The creek and wetland areas provide suitable habitat for common, disturbance tolerant amphibian species such as *Crinia signifera* (Eastern Froglet) and potentially for migratory waders such as Black Bittern (*Ixobrychus flavicollis*).



- Legend**
- VMP Area
 - Subject Land
 - APZ
 - Development Footprint
 - Survey Locations (CE)



Coordinate System: MGA Zone 56 (GDA 94)

Image Source:
Image © Nearmap 2019
Dated: 11/3/2019

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Figure 2.1. Survey locations



Legend

- VMP Area
- Subject Land
- APZ
- Development Footprint
- Vegetation Type
- Native
- Exotic

Image Source:
Image © Neamap 2019
Dated: 11/3/2019

Coordinate System: MGA Zone 56 (GDA 94)



Figure 2.2. Native vegetation extent



Vegetation Management Zones

This chapter identifies the management zones in the subject land and outlines the management objectives of each.

3.1 Management Zones

Five management zones have been identified within the subject land that will undergo revegetation and management in accordance with this VMP:

- Zone 1 – Retained Vegetation. Includes Swamp Oak Forest outside the proposed development site to the north, south and east;
- Zone 2 – Riparian Corridor;
- Zone 3 – APZ/Landscaped;
- Zone 4 – Planting; and
- Zone 5 - Slashed/Cleared areas

The management zones within the subject land are shown in **Figure 3.1** and are discussed in more detail below.

3.1.1 Zone 1 – Retained Vegetation

Zone 1 comprises predominately Swamp Oak Forest to the north, south and east of the development site, and has a total area of 4.99 ha. The majority of this area was mapped as SEPP 14 Buffer Regeneration in the CVMP (King and Campbell 2008) with the intention being to allow this area to regenerate into a higher quality example of Swamp Oak Forest, using natural regeneration and weed control. Zone 1 as mapped in this VMP corresponds closely to the extent of the SEPP 14 Buffer Regeneration in the CVMP.

This community is dominated by Swamp Oak (*Casuarina glauca*) with minor occurrences of Blackwood (*Acacia melanoxylon*) to a height of 18 m. This community contains predominately native canopy species with a mixture of native and exotic understorey species. A portion of Zone 1 is mapped as Coastal Wetlands under the Coastal Management SEPP, and the remainder is mapped as Proximity Area to Coastal Wetlands. The remaining area is not mapped under the SEPP, as shown in **Figure 1.3**.

The goal for management of Zone 1 is to improve the ecological condition of this area by removing weed species and revegetating the gaps within areas of Swamp oak Forest. The long term aim is to create an area of high quality Swamp oak Forest that will persist in the long term.

As this vegetation community is in reasonably good condition it is expected that management actions will reduce over time. Initial actions within this management zone will be clearing of exotic shrubs and ground cover species present. All of the existing native canopy and shrub species will be retained. Following the removal of any exotic species, it is likely that native species will recolonise the ground cover, however if necessary characteristic Swamp Oak Forest species will be planted. A species list for Swamp Oak Forest planting is provided in **Appendix B**.

The objectives for management of this zone include the following:

- Retain native species present in all strata;
- Control environmental weeds; and
- Revegetate where required with a diversity of native canopy, understorey and ground cover species

3.1.2 Zone 2 - Riparian Corridor

Zone 2 comprises an area extending approximately 10-20 m either side of the centre line of the un-named Creek that flows along the western boundary of the proposed development site (see **Figure 3.1**). Zone 2 has a total area of approximately 4.17 ha. It also includes an area either side of a small tributary of the un-named Creek that enters the Creek on the western side. This area corresponds to the area identified as “Drain rehabilitation area” in the CVMP (King and Campbell 2008), with the exception of the tributary to the un-named Creek.

Tidal water penetrates the un-named creek from North Creek via a pipe under North Creek Road at the far southern boundary of the subject land. Vegetation in this area includes Swamp Oak (*Casuarina glauca*), Grey Mangrove (*Avicennia marina*) and Saltmarsh vegetation including *Sporobolus virginicus*, Beaded samphire (*Sarcocornia quinqueflora*), Sea Blite (*Suaeda australis*) and Sea Rush (*Juncus kraussii*) occur in the drainage line to a point mid-way along the un-named creek.

Zone 2 is currently degraded and comprised of a mix of exotic and native understorey species with a native canopy. Accordingly, it is expected that broad-scale weed control and subsequent revegetation will be required in this area to establish a functioning wetland ecosystem. This zone will be planted and managed as per the specifications in the CVMP (King and Campbell 2008).

Although revegetation will be undertaken, it will be managed and thinned if required to ensure that the creek does not become choked with vegetation with subsequent impacts to flow regime and water quality. The vegetation in Zone 2 will also be managed so that it is at

densities appropriate to protect existing development from bushfire hazard. Dense undergrowth in this area will be removed in order to maintain the riparian zone as a low risk area for mosquito breeding, as specified by the CVMP (King and Campbell 2008) and the Mosquito Management Plan (Mosquito Consulting Services 2019). The objectives for management of this zone include:

- Retain native species in all strata, at a density to conform to the requirements of the existing development;
- Control environmental weeds;
- Revegetate with a diversity of native canopy, riparian, understorey and ground cover species to form a high-quality native riparian corridor;
- Maintain appropriate density of native species (thin as required) to protect existing development from bushfire hazard;
- Maintain the area as a low risk for mosquito breeding;
- Manage the riparian corridor (thin as required) to control vegetation regrowth to maintain water flow, and meet water quality objectives; and
- Establish native species along the bank to enhance erosion control.

3.1.3 Zone 3 – APZ/Landscaped

Zone 3 comprises an APZ to the proposed development, to be established at the perimeter of the development site, and extends to approximately 30m from the edge of each lot to the south and west, and 50m from the edge of each lot in the north and east. The APZ will be required in order to comply with the requirements for bushfire protection.

The landscaped areas of the APZ have the added benefit of acting as a buffer to the riparian corridor (to the west) and to the Coastal Wetlands (to the east) of the development site.

The entire area of the APZ will be within the 'development site', with a total area of 3.09 ha and will include some areas of battering adjacent to the proposed lots and internal roads, which will be filled for the construction of the proposed development, and will include ancillary works. All existing vegetation will be removed from the APZ to accommodate the battering for development site fill. Additionally, the APZ will include four bioretention basins, which will be planted with native species, including some wetland species that are likely to thrive with periodical inundation. Following construction and the creation of batters, the APZ will be planted to the specifications of an APZ, and will therefore comprise a constructed/landscaped vegetation community, as identified in the Landscape Plan (Site Design Studios 2019) the location of the APZ is shown in **Figure 1.2**.

The objectives for management of this zone include the following:

- Removal of vegetation to accommodate the battering for development site fill and for the purposes of bushfire mitigation;

- Planting of native species where appropriate after construction, to the specifications of an APZ, as shown in the Landscape Plan;
- Maintenance of ground fuel to a minimum level (as per the Bushfire Report); and
- Control environmental weeds

3.1.4 Zone 4 - Plantings

Zone 4 comprises several discrete areas of land dominated by exotic grassland vegetation within existing areas of Swamp Oak Forest to the east and north of the proposed development, with a total area of approximately 0.57 ha. These patches will be replanted with native species characteristic of Swamp Oak Forest.

Weed control will initially be undertaken in this zone to remove the dominant exotic grass species, and subsequently a diverse assemblage of species characteristic of Swamp Oak Forest will be planted. The goal for this zone is to rehabilitate these areas back to high quality Swamp Oak Forest that is contiguous with the surrounding areas of this community.

The objectives for management of this zone include the following:

- Replacement of canopy, understorey and ground layer vegetation characteristic of Swamp oak Forest; and
- Control of environmental weeds

3.1.5 Zone 5 – Slashed/Cleared Areas

Zone 5 comprises several areas of land currently dominated by regrowth Swamp Oak vegetation to the south, east and north of the proposed development and has a total area of 3.20 ha. These areas will be cleared of any existing canopy and shrubs and will be maintained as low grassland through periodic slashing in order to comply with the conditions of consent for the previous development and the CVPM (King and Campbell 2008).

The CVPM (King and Campbell 2008) specified that large areas of the subject site designated as “Grazed and or Slashed Grassland Vegetation” be managed in a low fuel state for the purposes of bushfire protection. These areas were and were not designated as APZs however they were required to be fenced and used for grazing, with slashing conducted as required to prevent grass overgrowth (King and Campbell 2008).

Over 10 years has elapsed since the preparation of the CVPM and these areas have not been maintained as specified in the CVPM and currently comprise regrowth Swamp Oak Forest. This vegetation is described in more detail in **Section 3.1.1**. As the fencing, grazing and slashing of this area are requirements of the conditions of consent for the previous development, these areas of regenerating Swamp Oak Forest will be cleared and maintained in a slashed condition in order to comply with the previous conditions of consent. These areas comprise Zone 5 and are shown on **Figure 3.1**.

Initially, all canopy and shrub layer vegetation within Zone 5 will be removed, and the entire area will be slashed using a tractor and slasher. Slashing will be undertaken periodically, at no less than six-monthly intervals in order to prevent regrowth of vegetation and to prevent overabundant growth of grass.

No plantings will be conducted in this zone and the focus will be on managing the existing vegetation in a low fuel state. Weed control is not a significant priority for this zone, however any notable environmental weeds will be controlled as specified in **Chapter 5**.



- Legend**
- VMP Area
 - Subject Land
 - Development Footprint
 - Management Zone**
 - Zone 1 - Retained Vegetation
 - Zone 2 - Riparian Corridor
 - Zone 3 - APZ/Landscaped
 - Zone 4 - Planting
 - Zone 5 - Cleared/Slashed

Image Source:
Image © Neamap 2019
Dated: 11/3/2019

Coordinate System: MGA Zone 56 (GDA 94)

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Figure 3.1. Management zones within the subject land

Management Measures During Construction

This chapter outlines the protocols to be followed during clearing and construction in the development site to minimise the impacts on native flora and fauna occurring in the development site and in the areas of retained native vegetation in the subject land.

4.1 Marking Limits of Clearing

Disturbance will be limited to the minimum necessary for clearing during each stage of the development. Prior to clearing being undertaken, the edge of the vegetation to be cleared will be clearly identified and delineated. Clearing limits can be marked with high visibility tape, fencing, or other appropriate boundary markers. To avoid unnecessary damage to vegetation or inadvertent habitat removal, disturbance will be restricted to the delineated area. No stockpiling of equipment, soils, or machinery will occur beyond the boundary.

Temporary signage will be provided along all temporary fencing during the construction phase stating “*Environmental Protection Zone – No Unauthorised Entry*”.

No machinery, rubbish or spoil will be stored within retained vegetation during the construction phase of the development. Vehicle/equipment wash-down areas or access tracks will not be located in or immediately adjacent to retained vegetation.

4.2 Fauna Pre-clearing Surveys

A pre-clearance survey will be undertaken prior to clearing of any vegetation in the subject land. This will be undertaken by an experienced ecological consultant and during this time, all flora and fauna habitat to be impacted will be identified.

Habitat features that have high ecological value and which have potential to support native fauna species will be identified prior to clearing. Such habitat features includes areas of mature vegetation and wetland vegetation. Habitat features will be clearly marked prior to clearing with high visibility pink flagging tape and a large “H” will be spray painted on both sides of the trunk/log/bushrock. Where feasible, the habitat features identified above will be salvaged for the purpose of habitat rehabilitation. These habitat features will be stockpiled in designated areas until they can be placed within the areas of retained native vegetation in the subject site to provide additional habitat for native species.

If parts of the Swamp Oak Forest are used for an APZ, pre-clearance surveys will identify habitat features, in particular any trees containing nests, and older trees that are a priority for

retention to inform the final APZ design. It is noted that no hollow-bearing trees have been previously identified on the subject land, although pre-clearance surveys will confirm this.

4.3 Aquatic Fauna - Hygiene Protocols

Amphibian Chytrid Fungus is a disease known to occur in over 40 species of native amphibians in Australia. Infection with Chytrid fungus is believed to be a major cause in the decline and local extinction of many frog populations. In accordance with the NSW Office of Environment and Heritage (OEH) recommendations and protocol, hygiene procedures for control of disease in frogs must, therefore, be followed to prevent spread of the fungus to local frog populations. These include:

- Disinfection of footwear and equipment prior to entering areas with frog habitat on site (i.e. areas of riparian and wetland habitat);
- Removal of large pieces of mud from vehicles, especially tyres; and
- Conduction of disinfection process well away from frog sensitive areas such as ponds or drainage lines.

Further details of necessary protocols to be followed are provided in the *Threatened Species Management Information Circular No. 6: Hygiene protocol for the control of diseases in frogs* (DECC (NSW) 2008).

4.4 Weed Management during Construction

Prior to clearing, all plant equipment entering the subject land will be washed down in designated wash down areas to ensure weed material from off-site locations do not establish or spread into native vegetation within the subject land. Machinery involved in weed management will also be washed down prior to removal from site to prevent weeds from spreading into off site areas.

Any weed materials will need to be carefully removed off site in a manner appropriate to the species or at the direction of the ecologist and Ballina Council guidelines so as to prevent the spread of propagules to undisturbed areas of native vegetation, both on and off site.

4.5 Sediment and Erosion Control

Erosion and migration of sediment from the subject land into adjacent vegetation has the potential to facilitate weed invasion through the introduction of weed seeds and nutrients that favour weed species. As weed species are removed from the subject land, the soil may become susceptible to erosion during periods of rain. As such erosion control measures will be installed where appropriate following weed removal, in particular in riparian areas in Zone 2.

Potential impacts of sedimentation will be avoided through the implementation of appropriate erosion and sediment control measures that includes measures such as:

- Stabilisation of areas of bare soil using jute matting or mulch;
- Stabilisation of areas of bare soil by re-vegetating immediately with appropriate local native plants;
- Covering soil stockpiles; and
- Control of sediment by installation of erosion fences around all construction works prior to commencement of any earthworks to avoid potentially nutrient and seed rich run-off entering neighbouring areas of vegetation.

On sloping land, logs should be used in combination with wooden stakes to stabilise soils following weed control. The logs can be left on site indefinitely, as they will break down after native plants have re-established. In steep areas in which natural regeneration is not occurring, logs should be used in addition to planting native species to stabilise the soil surface.

In areas that channel water with no native regeneration following weed control, biodegradable jute matting should be used to stabilise the soil surface, with native species planted through the matting.

It is also recognised that Potential Acid Sulphate Soils are present, and therefore an Acid Sulphate Soils Management Plan is required.

Weed Management Plan

5.1 Introduction

This Weed Management Plan applies to all management zones identified in the subject land. It provides an overview of legislation relevant to weed control, identifies the weed species present in the subject land, and then identifies appropriate weed control methods and the stages of weed control to be implemented.

It is expected that Zone 1 – Swamp Oak Forest will require the least amount of weed control, as it has lower levels of weed invasion, however Zones 2, 3 and 4 are moderately impacted by weeds and their control will form a significant component of the rehabilitation of these areas. Zone 5 contains variable numbers of weeds, however it will be managed as a grassland by removal of the existing regrowth vegetation and subsequent slashing, and therefore significant weed control is not expected to be required in this zone. However, if significant weeds listed under the NSW Biosecurity Act are recorded, then these will be controlled as detailed in subsequent sections of this chapter.

5.2 Relevant Legislation

5.2.1 Biosecurity Act 2015

The NSW *Noxious Weeds Act 1993* was repealed on the 1st July 2017 and problematic weeds are now managed under the NSW *Biosecurity Act 2015* (Biosecurity Act). Under the Biosecurity Act the state has been divided into 11 regions with weed management in each directed by a regional weed committee. Each committee has prepared a Regional Strategic Weed Management Plan.

Under the Biosecurity Act there are weeds which have legislated management requirements under controls and regulations of the act. These are known as State Priority Weeds. All 32 Weeds of National Significance (WoNS) are now listed as State Priority Weeds. WoNS are species that have been identified by Australian governments based on their invasiveness, potential for spread, and environmental, social and economic impacts and are priorities for control.

A further two sets of weeds are detailed within the management plan for each region. Regional Priority weeds are required to be managed as per the proposed objectives in the management plan to fulfil a General Biosecurity Duty which applies to all land owners and managers under the act. “Other weeds of regional concern” is the second category weeds

have been assigned to. These weeds may have legal management requirements by a managing authority to be controlled as part of the General Biosecurity Duty in circumstances where they may impact upon an asset such as the environment or human health.

The subject land is located within the North Coast Management Region and as such weeds are required to be managed as directed by the North Coast Regional Strategic Weed Management Plan 2017 – 2022 (LLS: North Coast 2017).

5.2.2 *Pesticides Act 1999*

The *Pesticides Act 1999* controls the use of herbicides within NSW. Under the Act is illegal to use herbicides for species not listed on a particular herbicides' label, or in a concentration or manner not outlined on the label. Off-label use of a particular herbicide is permitted only upon obtaining a specific permit.

5.3 Weed Species in the Subject Land

Weeds identified by Cumberland Ecology are occurring within the subject land make up the weed species list used for the basis of this VMP. A full list of weed species recorded within the subject land and the control methods for the weed species identified is provided in **Appendix B**. The priority weed species for control identified within the subject land are listed in **Table 5.1**.

Table 5.1 Priority weeds for control within the Subject Site

Family	Scientific Name	Common Name	Status
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern	SP/RP
Asteraceae	<i>Baccharis halimifolia</i>	Groundsel Bush	OWC
Verbenaceae	<i>Lantana camara</i>	Lantana	SP

Notes: *SP = State Priority Weed, RP = Regional Priority Weed, OWC = Other Weed of Regional Concern

5.4 Best Management Practice

Contractors for weed removal within the subject land will have regard to the following, to minimise impacts upon existing vegetation and habitats:

- The main principles of the Bradley Method of bush regeneration, i.e. not over clearing (remove only targeted species), employment of minimal disturbance techniques to avoid soil and surrounding vegetation disturbance, and replacement of disturbed mulch/leaf-litter;
- Removal of fruiting/seeding parts of weeds carefully, to minimise spread of plant propagules;

- Avoid chemical use in Zones 1 and 2, and not within the watercourse (saltmarsh or mangrove communities);
- Use of chemicals and sprays only when hand-removal cannot be used, and only during suitable weather conditions (i.e. not during wet or windy conditions), and only during appropriate seasons;
- All equipment should be thoroughly cleaned prior to entering the site to minimise contamination; and
- Presence of native fauna or nesting/breeding sites.

Any weed materials will need to be carefully removed off site in a manner appropriate to the species or at the direction of the ecologist or requirements of the Ballina Council so as to prevent the spread of propagules to uncleared areas of native vegetation, both on and off site.

In addition to weed control, a 1m high sediment fence should be installed temporarily outside of revegetation areas in which works are to be undertaken. This will prevent run-off of soil erosion during weed control works, and prevent wind dispersed seeds of exotic species blowing into the revegetation area during weed control works.

Machinery and tools involved in weed management will also be washed down prior to entry to the site and following activities on site to prevent new weed infestations on site and on site weeds from spreading to offsite areas.

5.5 Weed Control Methods

Bush regeneration weed control is to be implemented throughout the subject land using the strategies outlined below.

5.5.1 *Manual Weed Removal*

Manual removal, or hand weeding, is an effective form of weed control when all viable parts of the plant are removed from the soil (roots, fruiting material and rhizomes) where practical. All weeds removed by hand will be handled according to best practice bush regeneration techniques to prevent subsequent seed set from the removed weeds.

The bushland regenerator can manually clear small plants with mattocks, brushcutters or other suitable equipment. The root structures of exotic shrubs can be retained in order to stabilise the soil if required, and if the plant has been killed with herbicide to avoid re-sprouting.

Larger woody weed species such as *Lantana camara* will need other methods of removal besides spraying with herbicide, such as by cutting and painting cut stems with herbicide. Areas of occurrence of these weeds should be controlled prior to the spraying of the groundcover species. Exotic vine species at are climbing into native vegetation to be

retained should also be removed by hand so as to prevent damage to native vegetation by herbicides.

5.5.2 Use of Herbicides

Herbicide use should be limited to the greatest extent possible, due to the location of the Project in a floodplain and highly sensitive Coastal Wetlands adjoining the subject land. Herbicide use should be completely avoided in the watercourse, and any areas of inundation. All herbicides should be used according to recommendations on the herbicide label.

Some herbaceous weeds such as *Lantana camara* (Lantana) reach heights that make control with herbicide impractical as spraying at these heights can be dangerous, and will result in a higher instance of herbicide drift which can harm non-target native shrubs and trees. In these instances mechanical means such as use of a brush cutter can be used, followed by spraying with herbicide when plant remnants at the ground level re-sprout leaves.

In order to minimise instances of vegetation damage through herbicide drift during spraying, the site should be searched thoroughly prior to herbicide use for native plants in the understorey/ground layer. Native species in the ground layer that occur on the subject land should have plastic tree guards installed around them to prevent the native plants from being harmed by herbicide drift. Some species may be too large for installation of tree guards. In these cases individuals should be flagged with flagging tape and care taken to spray around these with a hand operated backpack sprayer on a non-windy day.

Appropriate Personal Protective Equipment (PPE) should be worn and consideration given to time of day, likelihood of rainfall, wind direction and speed and likely impact on native species as per guidelines on the label. Use of Glyphosate will be appropriate for most species. Glyphosate is the preferred herbicide for use in environmentally sensitive areas as it is rapidly broken down by microbes in the soil so residue is short lived and will not affect remnant and planted native individuals in the long term following application. It is important to note that there can be legal restrictions and permit requirements for use of specific herbicides for specific plants, and chemical labels and permit requirements always need to be researched prior to herbicide application. While the recommended methods for weed treatment detailed in **Appendix B** are effective, some will require a permit to be undertaken. The relevant permit number is PER9907. Herbicide permits need to be obtained from the Federal Government body, the Australian Pesticides and Veterinary Management Authority.

5.6 Stages of Weed Control

5.6.1 Priority Weeds

The first priority for weed treatment in the subject land will be targeting mature individuals of the priority weed species and weeds of regional concern. These species are perennial and take several years to reach reproductive maturity so are easily controlled providing juveniles are continuously eradicated before reaching maturity.

It is recommended that all priority woody exotic shrubs/ midstorey be cut at the base with a chainsaw, brush cutters or other suitable equipment. Immediately after cutting, the base of the stump should be sprayed with Glyphosate. A marker dye should be used in the herbicide solution to ensure areas are not missed. This and other methods to be used to treat exotic species are outlined in detail in **Appendix B**. Knapsack sprayers with a spray cone to direct the spray towards the ground should be used to prevent herbicide drift into adjacent vegetated areas.

5.6.2 Primary Weeding

Following control of mature individuals of the main priority and regional concern weed species, primary weeding will be undertaken throughout the subject land. Primary weeding is the first stage of bushland regeneration and may involve techniques such as:

- The selective spraying of weeds, with selective and non-selective herbicides;
- Cutting/scraping and painting deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters and painting cut stumps with herbicides containing Glyphosate or Picloram; and
- Selective hand removal of weeds and wicker wiping of tall herbaceous weeds in situations where damage to proximate, low growing native plants can be avoided.

The aims of primary weeding are to eliminate woody weed species and any large, dominant infestations of exotic herbs and grasses. Prior to chemical treatment any seed on mature exotic plants should be bagged to prevent seed fall and addition to the exotic soil seed bank of propagules.

5.6.3 Maintenance Weeding

Follow-up or maintenance weeding will be undertaken throughout the subject land in areas that have received past primary weeding treatments in the preceding months, to treat any regrowth of weeds.

Follow-up weeding involves the selective removal or treatment of weeds, whilst allowing regenerating or planted native plants to increase in size, abundance and percentage cover. All weeds should be targeted during the follow-up weeding phase, although it is recommended that woody weeds, climbers, and key herbaceous weeds are subject to a programme of intense follow up weeding around any patches of regenerating native herbaceous plants to encourage the spread of the native plant species. During site visits for weed control, priority weeds and WoNS will be prioritised for control. Individual plants of these species on site should not be allowed to achieve a reproductive stage in their life cycles. In order to eliminate the occurrence of these species they need to be controlled before they have a chance to set seed, otherwise progress on the site will not be made.

The most cost and time effective method of controlling weed regrowth in a revegetation area or weedy bushland area is by spraying a non-selective Glyphosate herbicide. The following

sequential steps are recommended to manage each area of the site effectively for each site visit:

1. Initially the bushland regeneration team visiting the subject land should sweep from one end to the other. During this sweep regrowth individuals of harder to manage weeds that require other techniques such as sawing, digging, drilling etc. should be targeted.
2. A member of the team should then sweep the entire area, spraying or manually removing all regrowth weeds

It is important during site visits for ongoing weed maintenance that as many weeds as possible are controlled so individuals are not able to achieve maturity and set seed between site visits.

Ongoing maintenance of the subject land will occur for a five year period, and the site should be covered in its entirety once every three months for the first two years and then once every six months for years 3 -5 , to diminish the soil seed bank of exotic weed species present on site until weeds are at negligible levels. Site visits may be more frequent if it is determined necessary. After the five-year follow-up and maintenance period has been completed, a review should be conducted to determine further on-site maintenance requirements.

Revegetation Plan

6.1 Introduction

Revegetation will be undertaken in the subject land where required to increase the ecological value of the subject land and to re-establish native vegetation communities. In particular, this will occur **as required where large gaps occur** between groups of canopy trees in Zone 1 (Swamp Oak Forest).

Zone 2 has experienced a moderate degree of weed invasion along the unnamed Creek, Management Zone 2, and currently contains a low diversity of native plant species. Following weed control (see **Chapter 5**), some replanting will be required on the banks of the stream in order to create self-sustaining riparian community.

Zone 1 (Swamp Oak Forest) is likely to require little replanting due to the low levels of weed invasion and dominance of native species. If required, supplementary planting of native plant species (infill planting) may be undertaken in Zone 1 where gaps currently exist in the canopy or understorey, or if large gaps are created by weed removal and restoration of absent stratum elements (canopy, mid-storey or groundcover) are required to re-establish a fully structured vegetation community.

Zone 3 (the APZ) will initially be completely cleared of vegetation but subsequently, strategic planting of native species will take place to comply with the bushfire protection requirements. Planting within the APZ is to be undertaken in accordance with the Landscape Master Plan.

No plantings will occur in Zone 5 as this area will be cleared of existing native regrowth vegetation and maintained in a low fuel state through slashing as required.

Appropriate plant species to be used for revegetation of each zone are provided in **Appendix C**, and plants from the appropriate list are to be used for selection for revegetation of the management zones in the subject land.

6.2 Revegetation Species

Species to be planted in the subject land should be selected from the appropriate lists for each management zone in the subject land that are provided in **Appendix C**. Management Zone 1 and Zone 4 will be planted with species characteristic of Swamp Oak Forest where required, Zone 2 will be planted with species characteristic of riparian vegetation

communities (Mangroves, Coastal Salt Marsh and Swamp Oak Forest) and Zone 3 will be planted where required with species characteristic of the adjacent vegetation community. As discussed previously, Zone 3 will be managed as an APZ, which will limit the spacing and types of species planted in this area to ensure compliance with bushfire regulations. **Planting in Zone 3 will also include planting wetland species in bioretention basins.**

All tubestock to be planted should be of local provenance, ideally from not more than 10 km from the subject land, and sourced from nurseries that specialise in growing seedlings of native plants with seed sourced from local bushland, to avoid planting of horticultural cultivars. If sufficient locally sourced plants are not available, it may be necessary to collect or source suitable quantities of local provenance native seed for propagation to ensure suitable numbers of plants are available for the proposed revegetation programme. Local native plants should be grown in "Hiko" tube, maxi cell or viro-tube, or Forestry Tube-type containers. It is likely that not all species will be available, but as many species as are available from the lists should be planted, to maximise the floral biodiversity of the subject land.

6.3 Planting Density Guide

This section provides an approximate guide on appropriate planting densities for areas to be revegetated in each Management Zone following weed control (see **Table 6.1**). Management Zone 1 comprises the Swamp Oak Forest and will be planted as required to achieve higher densities of native plants for biodiversity value purposes, while Management Zone 3 is the APZ area, and will be maintained to comply with bushfire protection objectives. **This will be planted as per the densities specified in the Landscape Plan. The bioretention basins in Zone 3 will be planted with native species, including some wetland species that are likely to thrive with periodical inundation. As these areas are likely to periodically inundated and naturally fire retardant, no wider spacing for bushfire requirements is necessary.** Management Zone 2 is in the riparian zone of the unnamed Creek and will be planted with a canopy of Mangrove and Swamp Oak (where required to fill large gaps, and to the specifications of an APZ), as well as a range of sedges, rushes and other wetland plants typical of riparian zones including Coastal Saltmarsh.

In areas where the ground cover, shrub, small tree, and canopy strata contain intact, remnant occurrences of native species, supplementary planting should only take place in areas that do not already contain native vegetation in particular strata, or in areas where the density of native plants is too low. In areas that are currently devoid of native vegetation, complete reconstruction of bushland will occur and plantings will follow the density guidelines in below.

In areas where juvenile shrub or canopy species are present regrowing on site, planting of shrub and canopy species is not needed. Groundcover individuals can be planted clumped within each square metre if considered appropriate to allow ease of access for weed control of the site.

Table 6.1 Planting Density Guide

Stratum	Zone 1 & 4 density	Zone 2 density	Zone 3 density
Canopy	3 unit/10m ²	1 unit/20m ²	as per the landscape plan
Shrubs and vines	5 unit/5m ²	1 unit/10m ²	as per the landscape plan
Groundcovers/sedges/rushes	10 units/m ²	5 units/m ²	as per the landscape plan

6.3.1 Characteristic Planting Units

It is advised that species should be planted in characteristic planting units to correspond with the topology, aspect, soil type and proximity to water.

Grasses may be planted in clumps of 3+ (spaced 15–20 cm apart within clumps) to generate physical / structural support for each other and microclimates. Wind pollinated grasses such as *Microlaena stipoides* (Weeping Grass) may be particularly planted in clumps to aid fertilisation and to create a natural grassland understorey within Swamp Oak Forest.

6.4 Planting Guide

The following is a guide to ensure success of tube stock plantings.

- Mulch needs to be scraped back to expose soil surface;
- Holes for tube stock should be dug deep enough that at least a few centimetres of the plant are below the soil surface;
- Soil should be filled back in surrounding the tube stock;
- Mulch should be spread back to surround the new planting, but not smother it;
- Plants need to be watered once immediately following planting; and
- A plastic tree guard should be installed around each plant (or clump of planted groundcovers) following planting and watering to protect them from herbivory, and herbicide drift during site visits for weed control.

6.5 Maintenance of Plantings

During site visits for weed control of the subject land, the contracted bushland regeneration team should monitor the plantings for death of individual plants. These should be replaced with another individual of the same vegetation form during subsequent site visits to ensure at

the end of the initial two year period there are not gaps in vegetation cover. Although native plants generally only need to be watered once upon planting, drought periods or hot, dry weeks in warmer months of the year can result in death of plantings. The contracted bushland regeneration team should water plantings during site visits or more frequently if required in these periods to prevent the loss of plantings from dehydration.

Monitoring and Reporting

It is recommended that a project manager/supervisor with a bushland regeneration contractor be assigned to coordinate, supervise and manage all works and correspondence with respect to the management of the subject land. The project manager must be available for the duration of the project and become familiar with the site and progress of all aspects of works undertaken.

The project manager will be responsible for allocation of maintenance tasks to personnel in response to establishment issues and other factors as monitoring results are reported (e.g.: plant losses/re-planting, weed control, irrigation). Regular monitoring and feedback from personnel will assist in the allocation of labour relative to available funds.

7.1 Monitoring Program

A qualified bushland management or ecological consultant will carry out a program of regular monitoring of the implementation of the VMP in each management zone. The consultant will be responsible for ensuring the measures outlined in this VMP are implemented and that plant stock is replaced, as needed.

The monitoring program will be carried out for the duration of the VMP and a monitoring survey will be completed every six months in Year 1 and 2 and then annually for the remainder of the five year management period of the VMP.

General observations of the nature and condition of the vegetation in each management zone will be undertaken along with the collection of quantitative data during monitoring including:

- Establishment of a series of fixed monitoring points in each management zone of the subject land.
- Take photographs annually from each monitoring point in a north, south, east, and west direction. Compare photographs to previous years;
- Use the photograph point to form a corner of a 20m x 20 m quadrat at each monitoring point. Note any weeds occurring in the quadrat and state relative abundance of weed species (using Braun-Blanquet scale), as well as projective foliage cover of native species in each strata. Record numbers of failed plantings in each quadrat;

- Estimates of the success rate of plantings and natural regeneration, and assessment of plant replacement requirements;
- Weed abundance and locations of woody weeds and priority weeds in each management zone;
- Note areas where erosion control is inadequate and needed; and
- Recommendations for corrective measures and/or vegetation management.

Monitoring will be conducted before weed control commences to document the baseline condition of the subject land, then every six months for the life of the VMP (5 years). During the period of six-monthly monitoring, if maintenance weeding is conducted, each patch of land where weed control has occurred should be checked approximately a month afterwards, or after rain, in order to determine whether more weeding is required.

The monitoring program will be used to measure the following performance indicators for weed control and plantings.

Table 7.1 Performance Indicators

Performance Indicator	1-Year Performance Criteria	3-Year Performance Criteria	5-Year Performance Criteria
Weed density and distribution	Weed cover not increased above baseline	50% reduction in baseline value	75% reduction in baseline value
Weed diversity	Weed diversity not increased above baseline	Downward trend in weed diversity	Weed diversity to minimal levels that do not cause measureable impacts to native vegetation
Significant target weed infestations	Significant target weed infestations not increased above baseline	Downward trend in abundance and distribution of significant target weed infestations	No records of new significant infestations of target weed species
Native plant cover	Identified gaps in native plant cover have been planted	85% survivorship of planted plants. Evidence of natural regeneration of native species	Native plant cover in Zones 1, 2 and 4 approximately 75% of equivalent native vegetation communities. Canopy cover in Zone 2 maintained at no greater than 20%
Native plant diversity	No decrease in diversity since baseline	Upward trend in plant diversity	Plant diversity in Zones 1, 2 and 4 equivalent to equivalent remnant native communities

7.2 Reporting

Based on the results of six monthly/annual inspections the monitoring inspections a brief and concise annual report will be prepared and submitted to Ballina Council. This report will document the progress of works and provide recommendations for the next year's works. The report will include the following:

- Describe the reconstruction works undertaken;
- State the findings of the monitoring activities;
- Discuss any problems encountered in implementing the VMP; and
- Recommend any adaptations or additions to the VMP.

The report should contain the photographs, as well as a short description of weeds in each quadrat and a short comparison of the photographs to the previous years. Any other notable occurrences of weeds should also be reported. The report should also recommend and prioritise areas where weed control should be targeted.

A final report will be prepared at the end of the five year maintenance period documenting the success of the works against performance criteria.

Following the completion of works under this five-year VMP, vegetation management and maintenance within the subject land is required in perpetuity. Long-term management should include ongoing weed control, assisted regeneration (if required) in areas where natural regeneration does not occur and monitoring. The frequency for each of these actions should be determined based on vegetation condition at the end of the life of this VMP and a new ongoing management plan should be prepared accordingly.

Timing and Responsibilities

The subject land is to be managed in a series of phases as follows:

- Phase 1 – Site preparation;
- Phase 2 – Vegetation management works;
- Phase 3 – Maintenance; and
- Phase 4 – Monitoring and reporting.

Timing and responsibilities at each phase of management within the management zones are shown within **Table 8.1** below.

Table 8.1 **Timing and responsibilities**

Action	Responsibility	Performance Criteria	Timing
Phase 1 Site Preparation			
Delineation of clearing boundary	Property Owner or Subcontractor	Marking using GPS and high visibility flagging tape and boundary markers.	Before construction works commence
Establish fixed monitoring points	Bush Regeneration Contractor or Ecologist	Using star pickets and GPS establish a series of monitoring sites that can be used for photograph comparison, measuring weed and plant retention.	Prior to commencement of vegetation management works
Pre-clearance surveys	Ecologist	Survey for fauna to be conducted prior to clearing. All habitat items marked with an X	Prior to clearing
Clearance supervision	Ecologist	Supervision of clearing and rescue of any	During clearing

Table 8.1 Timing and responsibilities

Action	Responsibility	Performance Criteria	Timing
fauna species present in the clearing area			
Phase 2 – Vegetation Management			
Clearing of regrowth vegetation in Zone 5	Bush Regeneration Contractor	All regrowth canopy and shrub species removed	After commencement of vegetation management works
Slashing grass in Zone 5	Bush Regeneration Contractor	Grass slashed to less than 20 cm in height	After removal of regrowth vegetation
Baseline vegetation monitoring	Bush Regeneration Contractor	Photographs of monitoring points before initial weeding.	Prior to commencement of vegetation management in Zone 1 and Zone 2
Primary weeding	Bush Regeneration Contractor	Main weed infestations and noxious weeds removed - Reproductively mature plants absent from site.	First two months of vegetation management works
Revegetation	Bush Regeneration Contractor	Native plants have been planted (species from Appendix C) as appropriate for the goals of each zone.	Following primary weeding
Vegetation monitoring	Bush Regeneration Contractor	Photographs of fixed monitoring sites to compare the survival and retention of plantings.	Every 6 months for Year 1&2 then annually for the life of the VMP.
Secondary weeding	Bush Regeneration Contractor	Weed regrowth following primary weeding removed. Work has commenced on control of annual weed species.	Following primary weeding, site visits monthly for year 1 and 2, then every two months for year 3 -5
Phase 3 – Maintenance			

Table 8.1 Timing and responsibilities

Action	Responsibility	Performance Criteria	Timing
Maintenance weeding throughout vegetation zones.	Bush Regeneration Contractor	Existing weed growth minimised or controlled. Regrowth following secondary weeding controlled. No new weed species or infestations.	monthly for year 1 and 2, then every two months for year 3 -5
Maintenance of plantings	Bush Regeneration Contractor	Any dead plantings replaced. Plants watered when drought stressed. Additional plantings where required due to observed gaps in any strata.	monthly for year 1 and 2, then every two months for year 3 -5
Phase 4 - Monitoring and reporting			
Inspection of site.	Bushland Manager or Ecologist	Site inspection completed as outlined in Chapter 6.	Every 6 months for Year 1&2, then annually over 5 year maintenance period of VMP
Progress report preparation	Bushland Manager or Ecologist	Annual Report prepared on progress of restoration works.	Annually for the 5 year maintenance period of VMP
Final inspection of subject land	Bushland Manager or Ecologist	Final Inspection carried out at completion of VMP.	After 5 years of maintenance under VMP
Final Report	Bushland Manager or Ecologist	Final report detailing success of restoration or outlining further works needed.	After 5 years of maintenance under VMP

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Appendix A

Flora Species List

Table A.1 Flora species recorded on the subject land

Family		Scientific Name	Common Name
Acanthaceae		<i>Avicennia marina</i> subsp. <i>australasica</i>	Grey Mangrove
Apiaceae		<i>Centella asiatica</i>	Indian Pennywort
Apiaceae		<i>Hydrocotyle verticillata</i>	Shield Pennywort
Apiaceae		<i>Apium prostratum</i>	Sea Celery
Apocynaceae		<i>Parsonsia straminea</i>	Common Silkpod
Apocynaceae	*	<i>Gomphocarpus physocarpus</i>	Balloon Cotton Bush
Apocynaceae		<i>Marsdenia rostrata</i>	Milk Vine
Asteliaceae		<i>Cordyline stricta</i>	Narrow-leaved Palm Lily
Asteraceae	*	<i>Ageratum houstonianum</i>	
Asteraceae	*	<i>Bidens pilosa</i>	Cobbler's Pegs
Asteraceae	*	<i>Baccharis halimifolia</i>	Groundsel Bush
Asteraceae	*	<i>Conyza sumatrensis</i>	Tall fleabane
Casuarinaceae		<i>Casuarina glauca</i>	Swamp Oak
		<i>Sarcocornia quinqueflora</i> subsp. <i>quinqueflora</i>	
Chenopodiaceae			Beaded Samphire
Chenopodiaceae		<i>Suaeda australis</i>	Sea Blite
Chenopodiaceae		<i>Atriplex australasica</i>	
Commelinaceae		<i>Commelina cyanea</i>	Native Wandering Jew
Convolvulaceae	*	<i>Ipomoea cairica</i>	Coastal Morning Glory
Cyperaceae		<i>Eleocharis equisetina</i>	
Cyperaceae	*	<i>Cyperus eragrostis</i>	Umbrella Sedge
Cyperaceae		<i>Fimbristylis dichotoma</i>	Common Fringe-sedge
Cyperaceae	*	<i>Cyperus brevifolius</i>	
Cyperaceae		<i>Cyperus polystachyos</i>	
Cyperaceae		<i>Bolboschoenus</i> spp.	
Dennstaedtiaceae		<i>Hypolepis muelleri</i>	Harsh Ground Fern
Fabaceae (Faboideae)	*	<i>Crotalaria</i> spp.	
Fabaceae (Mimosoideae)		<i>Acacia melanoxylon</i>	Blackwood
Juncaceae		<i>Juncus usitatus</i>	Common Rush
Juncaceae		<i>Juncus laevisculus</i>	
Juncaceae		<i>Juncus kraussii</i> subsp. <i>australiensis</i>	Sea Rush
Juncaginaceae		<i>Triglochin striata</i>	Streaked Arrowgrass
Lobeliaceae		<i>Pratia purpurascens</i>	Whiteroot
Lobeliaceae		<i>Lobelia stenophylla</i>	

Table A.1 Flora species recorded on the subject land

Family		Scientific Name	Common Name
Luzuriagaceae		<i>Eustrephus latifolius</i>	Wombat Berry
Lythraceae	*	<i>Cuphea carthagenensis</i>	
Menispermaceae		<i>Stephania japonica</i>	Snake vine
Myrsinaceae		<i>Aegiceras corniculatum</i>	River Mangrove
Myrtaceae		<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark
Onagraceae		<i>Ludwigia octovalvis</i>	Willow Primrose
Passifloraceae	*	<i>Passiflora subpeltata</i>	White Passionflower
Passifloraceae	*	<i>Passiflora suberosa</i>	Cork Passionfruit
Phyllanthaceae		<i>Glochidion ferdinandi</i>	Cheese Tree
Plantaginaceae		<i>Limnophila aromatica</i>	
Poaceae	*	<i>Setaria sphacelata</i>	South African Pigeon Grass
Poaceae	*	<i>Paspalum mandiocanum</i>	Broadleaf Paspalum
Poaceae		<i>Leersia hexandra</i>	Swamp Ricegrass
Poaceae		<i>Ottolochloa gracillima</i>	
Poaceae	*	<i>Paspalum dilatatum</i>	Paspalum
Poaceae		<i>Sporobolus virginicus</i>	
Poaceae		<i>Phragmites australis</i>	Common Reed
Polygalaceae	*	<i>Polygala paniculata</i>	
Polygonaceae		<i>Persicaria decipiens</i>	Slender Knotweed
Pteridaceae		<i>Acrostichum speciosum</i>	Mangrove Fern
Sapindaceae		<i>Cupaniopsis anacardioides</i>	Tuckeroo
Solanaceae	*	<i>Solanum mauritianum</i>	Wild Tobacco Bush
Verbenaceae	*	<i>Lantana camara</i>	Lantana

Note: * denotes exotic species

Appendix B

Weed Control Methods

Table B.1 Weed control methods

Family	Scientific Name	Common Name	Status	Control Methods
Apocynaceae	<i>Gomphocarpus physocarpus</i>	Cotton Bush	-	Spot Spray Glyphosate F10/1L, Cut and Paint Glyphosate 50mL/100mL, Hand Weed Juveniles.
Asparagaceae	<i>Asparagus aethiopicus</i>	Asparagus Fern	SP	Dig out with hand tools - Care needs to be taken to remove all tuberous masses and rhizomes. Tuberous masses need soil excavation around and careful levering with hand tools to remove without leaving plant material behind to resprout.
Asteraceae	<i>Ageratina adenophora</i>	Crofton Weed	OWOC	Hand Weed, Spot Spray with Glyphosate 5mL/1L, Slash large individuals with brushcutter and spray regrowth foliage with Glyphosate 5mL/1L
Asteraceae	<i>Ageratina riparia</i>	Mistflower	-	Hand Weed, Spot Spray with Glyphosate 5mL/1L, Slash large individuals with brushcutter and spray regrowth foliage with Glyphosate 5mL/1L
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Asteraceae	<i>Conyza sumatrensis</i>	Tall fleabane	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory	OWOC	Hand pull taking care to remove root system and stem - plant will resprout from stem segments not removed from site, Cut vine at 1m or less above ground height and pull remaining plant out of the ground at the roots, Spray any ground hugging vines with Glyphosate 10mL/1L (will require follow up spraying of regrowth over several months as plant will resprout).
Fabaceae	<i>Senna pendula</i> var.	-	-	Hand weed juveniles, spray juvenile individuals with glyphosphate

Table B.1 Weed control methods

Family	Scientific Name	Common Name	Status	Control Methods
(Caesalpinioideae)	<i>glabrata</i>			'10mL/1L, Cut and paint mature individuals with undiluted glyphosate.
Lauraceae	<i>Cinnamomum camphora</i>	Camphor Laurel	-	Hand weed juveniles, spray juvenile individuals with glyphosate '10mL/1L, Cut and paint mature individuals with undiluted glyphosate, Cut shrub and mature individuals as close to ground as possible with loppers or Hand saw and treat stump with undiluted glyphosate, Drill holes with power Drill with thick Drill bit into mature trees, around base of trunk and fill holes with undiluted glyphosphate.
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	-	Hand Weed, Spot Spray with Glyphosate 10mL/1, Cut large, firmly rooted individuals at the base with secateurs and paint with undiluted Glyphosate
Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant	-	Stems of all juvenile and mature plants should be scraped and painted with undiluted glyphosphate - follow up treatment may be needed on regrowth stems around base of plant in following monthly site visits.
Oxalidaceae	<i>Oxalis corniculata</i>	Creeping Oxalis	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Passifloraceae	<i>Passiflora suberosa</i>	Cork Passionfruit	-	Hand pull taking care to remove root system and stem - plant will resprout from stem segments not removed from site, Cut vine at 1m or less above ground height and pull remaining plant out of the ground at the roots, Spray any ground hugging vines with Glyphosate 10mL/1L (will require follow up spraying of regrowth over several months as plant will resprout).

Table B.1 Weed control methods

Family	Scientific Name	Common Name	Status	Control Methods
Poaceae	<i>Andropogon virginicus</i>	Whisky Grass		Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Eleusine indica</i>	Crowsfoot Grass	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Setaria sphacelata</i>	-	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Poaceae	<i>Stenotaphrum secundatum</i>	Buffalo Grass	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Rosaceae	<i>Rubus fruticosus</i> sp. agg.	Blackberry complex	SP	It is possible to spray with 10mL/1L Glyphosate however it will leave dangerous thorned stems. Wearing thick clothing and leather glove uses loppers to cut close to base and apply undiluted Glyphosate to cut stems (remove cut foliage and stems cautiously), Spray regrowth foliage with Glyphosate 10mL/1L
Scrophulariaceae	<i>Verbascum virgatum</i>	Twiggy Mullein	-	Hand Weed, Spot Spray with Glyphosate 10mL/1
Solanaceae	<i>Solanum mauritianum</i>	Wild Tobacco Bush	-	When working with this plant additional PPE may be required as some individuals are sensitive to the shedding fine hairs of the species - Recommended PPE is a dust mask, long sleeve shirt and pants + gloves, Hand weed juveniles. Mature individuals can be cut and painted with Glyphosate 10mL/1L.
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nighthshade	-	Hand Weed, Spot Spray with Glyphosate 10mL/1

Table B.1 Weed control methods

Family	Scientific Name	Common Name	Status	Control Methods
Verbenaceae	<i>Lantana camara</i>	Lantana	SP	Hand weed juveniles and regrowth from small pieces, Cut near ground level and paint with undiluted glyphosate, Some individuals will have stumps which will still regrow foliage, spray regrowth foliage with glyphosate 10mL/1L, Slash using brushcutter, or hand cut with loppers, and spray regrowth foliage with glyphosate 10mL/1L.
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	-	Hand Weed, Spot Spray with Glyphosate 10mL/1, cut large individuals and paint with undiluted Glyphosate
Zingiberaceae	<i>Hedychium gardnerianum</i>	Ginger Lily	-	Cut, bag, and remove mature seed heads from plants, Dig up with mattock or hand pull mature plants, taking care to remove all fleshy rhizomes. Rhizomes need to be removed from site, or crushed and piled on site to rot (monitor for regrowth)Cut plant as close to rhizome as possible and treat with undiluted metsulfuron methyl at 6g/1 L (winter) or 1g/1 L (summer).

Appendix C

Species Planting List

Table C.1 Proposed Planting List

	Scientific Name	Common Name
Wetlands / bioretention basins	<i>Baumea articulata</i>	Jointed Twig Rush
	<i>Baumea juncea</i>	
	<i>Carex appressa</i>	Tussock Sedge
	<i>Eleocharis sphacelata</i>	
	<i>Isolepis inundata</i>	Club-rush
	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	Sea Rush
	<i>Juncus planifolius</i>	
	<i>Juncus usitatus</i>	Common Rush
	<i>Phragmites australis</i>	Common Reed
	<i>Schoenoplectus mucronatus</i>	Sedge
	<i>Tetragonia tetragonioides</i>	Warragul Greens
	<i>Typha orientalis</i>	Cumbungi
Swamp Oak Floodplain Forest	<i>Acacia melanoxylon</i>	Blackwood
	<i>Acmena smithii</i>	Lilly Pilly
	<i>Alphitonia excelsa</i>	Red Ash
	<i>Alternanthera denticulata</i>	Lesser Joyweed
	<i>Apium prostratum</i>	Sea Celery
	<i>Atriplex australasica</i>	
	<i>Baumea juncea</i>	
	<i>Blechnum indicum</i>	Swamp Water Fern
	<i>Callistemon salignus</i>	Willow Bottlebrush
	<i>Calystegia sepium</i>	
	<i>Carex appressa</i>	Tall Sedge
	<i>Casuarina glauca</i>	Swamp Oak
	<i>Centella asiatica</i>	Indian Pennywort
	<i>Commelina cyanea</i>	Native Wandering Jew
	<i>Crinum pedunculatum</i>	Swamp Lily
	<i>Cupaniopsis anacardioides</i>	Tuckeroo
	<i>Dianella caerulea</i>	Blue Flax-lily
	<i>Entolasia marginata</i>	Bordered Panic
	<i>Enydra fluctuans</i>	

Table C.1 Proposed Planting List

Scientific Name	Common Name
<i>Eustrephus latifolius</i>	Wombat Berry
<i>Gahnia clarkei</i>	Tall Saw-sedge
<i>Geitonoplesium cymosum</i>	Scrambling Lily
<i>Glochidion ferdinandi</i>	Cheese Tree
<i>Hypolepis muelleri</i>	Harsh Ground Fern
<i>Imperata cylindrica</i>	Blady Grass
<i>Isolepis inundata</i>	Club-rush
<i>Juncus kraussii</i> subsp. <i>australiensis</i>	Sea Rush
<i>Juncus planifolius</i>	
<i>Juncus usitatus</i>	
<i>Lobelia anceps</i>	
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush
<i>Lophostemon suaveolens</i>	Swamp Mahogany
<i>Marsdenia rostrata</i>	Milk Vine
<i>Maundia triglochinoides</i>	
<i>Myoporum acuminatum</i>	Boobialla
<i>Notelaea venosa</i>	Veined Mock-olive
<i>Oplismenus imbecillis</i>	
<i>Pandorea pandorana</i> subsp. <i>pandorana</i>	Wonga Wonga Vine
<i>Parsonsia straminea</i>	Common Silkpod
<i>Persicaria decipiens</i>	Slender Knotweed
<i>Persicaria strigosa</i>	
<i>Phragmites australis</i>	Common Reed
<i>Pseuderanthemum variabile</i>	Pastel Flower
<i>Samolus repens</i>	Creeping Brookweed
<i>Selliera radicans</i>	Swamp Weed
<i>Smilax australis</i>	Lawyer Vine
<i>Sporobolus virginicus</i>	
<i>Stephania japonica</i> var. <i>discolor</i>	Snake Vine
<i>Tetragonia tetragonioides</i>	New Zealand Spinach
<i>Viola banksii</i>	