Subdivision and Urban Development at Fishermans Bay

Habitat Rehabilitation Plan

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
A	Draft Habitat Rehabilitation Plan	LV	MD	11-11-2014
B	Final Draft for Submission	LV	MD	18-11-2014
C	Final for Submission	LV	MD	22-1-2015

Approval for Issue

Name	Signature	Date
Matt Doherty		22-1-2015

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Tables

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Appendices

1.0 Background

1.1 Introduction

RPS has been engaged by UrbanGrowth NSW Pty Ltd to prepare a Habitat Rehabilitation Plan (HRP) for a residential subdivision at Fishermans Bay, NSW (the Project). The Project occurs within the Port Stephens Local Government Area (LGA), on the New South Wales North Coast, approximately 34 kilometres northeast of Newcastle. The Fishermans Bay site is bounded by Tomaree National Park to the north and east, residential development to the west and Fishermans Bay Road and vegetation to the south (**Figure 1**). It contains the development footprint for the subdivision, the proposed Environmental Protection Area and land dedicated to National Parks which both comprise retained vegetation.

1.2 Project Description

The site covers 23 hectares and involves the subdivision of land and construction of 104 dwellings. The purpose of the subdivision is to subdivide Lot 4561 and 4562 into 4 separate lots (proposed lots 1 to 4) which will create one residential lot and three lots zoned 7(f1) Environment Protection (Coastal Lands). The proposed residential subdivision will be on the residential zoned lot (proposed Lot 1), while two lots zoned 7(f1) Environment Protection (Coastal Lands) will be dedicated to National Parks and a third dedicated to Port Stephens Council following minor works associated with the residential subdivision. A raised pedestrian boardwalk will be established within the Environmental Protection Area to allow pedestrian access through the conservation areas. The proposed development will occur within the Development Area and is displayed in **Figure 2**.

The Project involves clearing of the Development Area in a single stage within a 6 month period, including required Asset Protection Zones (APZ). Permanent APZs are required to the south and east of the Development Area at the interface of the retained bushland and NPWS lands. Within the 35m APZ, retention of reduced canopy vegetation in the form of an Outer Protection Area will be achieved. Larger southern lots with the capacity for tree retention will be selected to retain any mature and/or hollow bearing trees where possible. A development concept is displayed in **Figure 2**.

A Construction Flora and Fauna Management Plan (RPS 2014) has been prepared as a CMP sub-plan for the protection of flora and fauna within the site during the construction phase of the Project. Additional measures for the protection of flora and fauna within the site will be detailed within this HRP, in conjunction with comprehensive Rehabilitation measures for designated areas of vegetation retention within the site.

WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle.

Legend

Study Area

National Park

N

Tomaree National Park

0 500

metres

Scale: 1:10,000

TITLE:	FIGURE 1: SITE LOCATION	LOCATION:	FISHERMANS BAY	DATUM:	(GDA 94)	DATE:	27/11/2014
				PROJECTION:	MGA ZONE 56	PURPOSE:	HRP

LAYOUT REF: J:\JOBS\26k\26370 Fishermans Bay\10- Drafting\Workspaces\Management Plans
VERSION (PLAN BY): A A4 (LV -NW)

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Legend

Study Area

Proposed Lot Layout

Proposed Road

N

WARNING
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ESSINGTON WY

CLONMEEN CCT

HANSON AV

FISHERMANS BAY RD

0 100

metres

Scale: 1:3,000

TITLE: FIGURE 2: DEVELOPMENT CONCEPT	LOCATION: FISHERMANS BAY	DATUM: (GDA 94)	PROJECTION: MGA ZONE 56	DATE: 27/11/2014	PURPOSE: HRP	LAYOUT REF: J:\JOBS\26k\26370 Fishermans Bay\10- Drafting\Workspaces\Management Plans	VERSION (PLAN BY): A A4 (LV -NW)

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1.3 Definitions

A number of terms used throughout this report require defining as to eliminate any discrepancies as to the recommended management requirements as detailed in **Table 1**.

Table 1 Relevant Definitions

Term	Definition
Conservation Lands	The Conservation Lands include all three areas of land associated with the Project that are being retained for conservation purposes within the site.
Contractor's Environmental Manager	On site Contractor
Environmental Protection Area (EPA)	The area of vegetation in the south west corner of the site being dedicated to Port Stephens Council retained and rehabilitated for conservation purposes.
Local Provence	Refers to seed collected from natural populations growing in the same vegetation community and position in the landscape within a reasonable (closest possible) distance of the area being restored.
Native Vegetation	Native vegetation includes all the vegetation that is indigenous to Australia, covering individuals as well as communities that existed prior to European Settlement.
Project	The residential subdivision and development at Fishermans Bay.
Development Area	The up to 15.08 hectare development footprint in which residential subdivision and development will occur.
Regeneration	Describes the Rehabilitation of natural ecosystems through the natural cyclic processes of renewal and self maintenance of species and their populations
Rehabilitation	Any attempt to restore elements of structure or function to an ecological system without necessarily attempting complete Rehabilitation to any specific prior condition
Revegetation	Replanting of native vegetation
Site	The overall area encompassing the development footprint (Development Area) and retained conservation lands.
Stage	The Project comprises multiple stages, with works commencing in Stage One. Management actions described in this place are relevant to all stages unless otherwise specified.
Threatened Species	A plant or animal species listed under the *Threatened Species Conservation Act 1995* and/or the *Environment Protection and Biodiversity Conservation Act 1999.*
Vegetation Management Contractor	The contractor hired to implement the rehabilitation tasks outlined in this HRP.
Weed	Non native plant species that have moved into areas of native vegetation.

1.4 Aims and Objectives

This HRP has been developed to protect areas of habitat to be retained for the Project, outline Rehabilitation and revegetation requirements, and detail mitigation measures that will be adopted to minimise impacts of the Project on wildlife.

The objectives of the Plan are:

- Identify the legislative requirements, Conditions of Consent as outlined by Port Stephens Council and any other guidelines that have been considered in the development of this Plan;
- Identify measure to protect habitat to be retained within the site;
- Identify measures to restore habitat in the site;
- Prescribe maintenance activities for areas of restored habitat.

This HRP is based on a two year active rehabilitation and management phase and a 12 month monitoring and maintenance phase, totalling three years for the life of the plan.

1.5 Structure of this Plan

The structure of this HRP is outlined in **Table 2**.

Table 2 Structure of this Flora and Fauna Management Plan

Chapter	Content
1	Provides an overview of the Project, previous environmental assessments of the Project, and the purpose and scope of this plan.
2	Details the statutory requirements for the Plan and other legislative requirements.
3	Identifies measures to protect habitat to be retained in the Development Area.
4	Identifies measures to restore habitat in the Development Area.
5	Describes the maintenance requirements relating rehabilitation activities.
6	Describes the reporting and monitoring requirements relating rehabilitation activities.

2.0 Statutory Requirements

2.1 Conditions of Consent

Rehabilitation of the land being dedicated to Council as shown on Figure 3 will be undertaken in accordance with the approved Habitat Rehabilitation Plan dated 22 January 2015.Relevant Legislation

Key environmental legislation relating to flora and fauna management includes*:*

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- *NSW Threatened Species Conservation Act 1995* (TSC Act).
- *NSW Fisheries Management Act 1994* (FM Act).
- *NSW Environment Planning and Assessment Act 1979* (EP&A Act).
- *NSW National Parks and Wildlife Act 1974* (NPW Act).
- *Noxious Weeds Act 1993* (NW Act).
- *Pesticides Act 1999.*

2.2 Guidelines and Standards

- *Florabank Native Seed Collection Code of Practice* (Greening Australia NSW 1999).
- *Noxious Weed Declarations for Port Stephens LGA* (DPI 2014).
- *Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations* (DPI 2011).
- *National Heritage Trust Introductory Weed Management Manual* (CRC for Australian Weed Management, 2004).

2.3 Approvals, Licences and Permits

The Project Ecologist must conduct all works under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence.
- Animal Research Authority issued by NSW Agriculture.
- Certificate of Accreditation of a Corporation as an Animal Research Establishment issued by NSW Agriculture.
- Animal Care and Ethics Committee Certificate of Approval issued by NSW Agriculture.

The minimum qualification and experience required for the bush regeneration contractor are a TAFE Certificate 2 in Bushland Regeneration and two years demonstrated experience (for site supervisor) and a TAFE Certificate 2 in Bushland Regeneration and one year demonstrated experience (for other personnel). In addition the site supervisor is to be eligible for full professional membership of the Australia Association of Bush Regenerators (AABR).

2.4 Related Documents

This Habitat Rehabilitation Plan has been developed to support the management of conservation areas within the Site.

Other relevant and supporting plans include the Bushfire Threat Assessment, Construction Management Plan, Construction Flora and Fauna Management Plan and Sediment and Erosion Plan prepared for the Fishermans Bay Project.

This document should be used in conjunction with the CMP to ensure compliance with Project environmental objectives and goals, and to ensure consistency in approach to monitoring and reporting.

3.0 Habitat Protection Measures

3.1 Objectives

The main objectives of this HRP are as follows:

- Protect habitat features to be retained within the site during the construction.
- To protect all vegetation outside of the Development Area from disturbance during construction.
- To provide procedures for the protection of vegetation to be retained.
- To facilitate agreed rehabilitation targets.
- To manage weeds within the site and to minimise their establishment in uninfested areas.
- To recover and reuse existing natural resources such as cleared vegetation, bush rock, topsoil, leaf litter and tree hollows where beneficial and practical.

3.2 Protection Measures

3.2.1 Vegetation to be retained

A total of 15.08 hectares of native vegetation will be removed from within the Development Area with 7.61 hectares being retained. Vegetation to be retained includes an individual parcel of land to the south of the Development Area within the site, that is being dedicated to Port Stephens Council as well as two smaller parcels of land being dedicated to National Parks. Land being dedicated to Port Stephens is referred to as the Environmental Protection Area and is subject to Rehabilitation measures in this HRP. Land dedicated to National Parks is not subject to rehabilitation under this HRP.

A summary of vegetation within the site and proposed for retention is detailed in **Table 3**. The conservation lands and vegetation within the site are displayed in **Figure 3**.

Table 3 Vegetation Summary

Vegetation Community	Area within Site (hectares)	Area (hectares) within the EPA	Area (hectares) within NPWS Lands	Area (hectares) to be retained within all conservation lands
Coastal Sand Wallum-Woodland Heath	14.11	1.64	2.0	3.64
Coastal Sand Apple Blackbutt Forest	7.34	2.17	0.91	3.09
Paperbark Swamp Forest (EEC)	0.88	0.88	0	0.88
Nerong Smooth-barked Apple Woodland	0.35	0	0	0
TOTAL	**22.68**	**4.69**	**2.92**	**7.61**

Legend

Study Area

Environmental ProtectionArea

Vegetation

1 - Paperbark Swamp Forest

2 - Coastal Sand Wallum - Woodland Heath

3 - Coastal Sand Apple Blackbutt Forest

4 - Nerong Smooth-barked Apple Woodland

N

WARNING
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Environmental Protection Area

National Parks and Wildlife Service Lands

0 100

metres

Scale: 1:3,200

TITLE: FIGURE 3: VEGETATION MAP AND ENVIRONMENTAL PROTECTION AREA

LOCATION: FISHERMANS BAY

DATUM: (GDA 94)

PROJECTION: MGA ZONE 56

DATE: 27/11/2014

PURPOSE: HRP

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Protection measures for habitat features within the Development Area are outlined in **Table 4**.

Table 4 Protection measures for habitat to be retained

Action	Timing	Responsibility
The extent of clearing, Tomaree National Park Boundary and the EEC buffer zone must be clearly identified on all design, construction and operational drawings. Prior to the commencement of clearing, the clearing limits for the development area are to be clearly defined on the ground by the civil contractor to ensure no accidental plant machinery or other incursions into the conserved areas. Methods include highly visible pegs/ flagging at regular intervals or a fence consisting of para-webbing and star pickets. No barbed wire is to be used for any purpose on the site.	Define clearing area prior to the commencement of clearing. Maintain fencing during construction.	Civil Contractor

3.2.2 Protection of Swamp Paperbark Forest EEC

As displayed in **Figure 3** and **Table 3** approximately 0.88 ha of Swamp Paperbark Forest occurs within the EPA. This vegetation community is commensurate with the TSC Act listed Endangered Ecological Community (EEC) *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*.

This vegetation community requires particular attention regarding protection and rehabilitation due to its current status, and because site specific disturbances including weed encroachment, the establishment of unauthorised pedestrian tracks and invasive species continue to threaten the condition of this sensitive EEC.

A minimum 20m buffer has been incorporated into the development design surrounding the EEC to provide protection against potential indirect and direct impacts.

Measures to protect and rehabilitate select areas within the EEC in the Environmental Protection Area include the clear definition of the development area and retained area interface along with drainage and sediment and erosions controls (refer to Construction Flora and Fauna Management Plan). Rehabilitation measures are detailed in **Section 4**.

3.2.3 Protection of hollow-bearing trees to be retained

A total of 85 hollow-bearing trees supporting 213 tree hollows will be retained in the conservation lands with additional potential hollow-bearing tree retention within the 35m APZ area directly north of the retained lands. An estimated total of 207 hollows will be removed to accommodate the proposed development. Tree hollows provide habitat for a range of fauna species known from the region including a range of woodland birds, owl species, mammals such as possums and gliders, reptiles and frogs. Threatened fauna species that potentially utilise hollows within the Fishermans Bay site include:

- Forest Owls including Masked Owl (*Tyto novaehollandiae*) and Powerful Owl (*Ninox strenua*);
- Threatened hollow-roosting microchiropteran bat species such as Little Bentwing-bat (*Miniopterus australis*), East Coast Freetail Bat (*Mormopterus norfolkensis*), Yellow-bellied Sheathtail Bat (*Saccolaimus flaviventris*), Eastern False Pipstrelle (*Falsistrellus tasmaniensis*) and Greater Broadnosed Bat (*Scoteanax rueppellii*); and
- Squirrel Glider (*Petaurus norfolcensis*).

The location of hollow-bearing trees to be retained within the conservation lands is shown in **Figure 4**.

Legend

Study Area

Conservation Lands

Swamp Sclerophyll Forest EEC

Retained Hollow Bearing Trees

N

WARNING
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Environmental Protection Area

National Parks and Wildlife Service Lands

0 100

metres

Scale: 1:3,200

TITLE: FIGURE 4: LOCATION OF RETAINED HOLLOW BEARING TREE MAP

LOCATION: FISHERMANS BAY

DATUM: (GDA 94)

PROJECTION: MGA ZONE 56

DATE: 27/11/2014

PURPOSE: HRP

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3.3 Salvage of fauna habitat features

Measures to salvage habitat features from within the Development Area are listed in **Table 5**.

Table 5 Measures to salvage habitat features

Action	Timing	Responsibility
Natural hollows that are less than 150mm in diameter, as their condition allows, will be subject for reuse as arboreal tree hollows in the retained habitats. Natural hollows greater than 150mm will be assessed on site by an ecologist to determine the suitability and safety of reuse as arboreal replacement hollows. If a hollow is deemed unsatisfactory for reuse due to excessive size, safety issues, damage or other appropriate reasons, it will be used as terrestrial habitat within the retained habitats. In accordance with the council's technical specification, supplementary habitat in the form or nest boxes will be installed to compensate for natural hollow loss at a ratio of one box for one hollow.	Prior to the commencement of and/or during clearing	Project Ecologist
Where possible natural hollows from hollow-bearing trees deemed unsatisfactory to erect as arboreal hollows should be harvested and set aside for reuse as ground habitat within the sites retained areas. Hollow suitability will be governed by the Project Ecologist. Existing tracks must be used by vehicles/machinery to relocate salvaged hollows, to avoid damaging the conservation areas in the process.	During construction	Contractor's Environmental Manager

3.4 Weed control measures

General weed management measures to limit the spread of weeds to weed-free areas are listed in **Table 6**.

Table 6 Weed management measures

Action	Timing	Responsibility
All contractors and site personnel are to be inducted on the existence of noxious weeds in the Development Area and EPA during the Project induction and as required in toolbox talks and the controls they are required to implement to minimise weed spread.	During construction and during Rehabilitation works	Contractor's Environmental Manager
All construction machinery used within the Development Area to remove weeds is to be thoroughly cleaned by removing all plant material and soil (potentially containing weed seeds and propagules).	During construction and during Rehabilitation works	Contractor's Environmental Manager
Equipment used for treating weed infestation will be cleaned prior to moving to a new area within the Development Area and EPA to minimise the likelihood of transferring any plant material and soil.	During construction and during Rehabilitation works	Contractor's Environmental Manager

3.5 Plant pathogen protection measures

Any activities that involve movement of soil and plant material are high risk for spreading *Phytophthora*.

It is assumed that the Development Area and conservation areas are currently free from *Phytophthora*. Hygiene protocols to prevent the introduction of this pathogen into the Development Area and Conservation Area require all footwear, tools, machinery and vehicles to be clean prior to entering the construction footprint to prevent contamination by *Phytophthora*.

4.0 Habitat Rehabilitation Measures

4.1 Habitat Rehabilitation Areas

As shown in **Figure 3**, a parcel of land will be dedicated to Port Stephens Council and will be subject to Rehabilitation activities under this HRP. Active rehabilitation measures will aid in the connection of existing habitats across the site to Tomaree National Park enhancing wildlife corridors, as well as improving habitat condition throughout the retained vegetation. Specific rehabilitation measures for the EPA have been detailed in **Table 7** and **Figure 5**.

Table 7 EPA Management Actions

Conservation Area	Management Action	Responsibility
Environmental Protection Area	▪ Topsoil placement on all dedicated disused tracks and lightly ripped in to release existing soil compaction and assist translocated soil retention.	Vegetation Management Contractor
	▪ Mulching where topsoil has been applied	Vegetation Management Contractor
	▪ Revegetation of disused tracks if topsoil use fails to produce natural regeneration following an 18 months observation period.	Vegetation Management Contractor
	▪ Weed Management	Vegetation Management Contractor

Legend

- Study Area
- Conservation Lands
- Development Area
- Weed Management
- Swamp Sclerophyll Forest EEC
- 20m Vegetation Buffer
- Track to be rehabilitated
- Existing walking trails to be maintained

N

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Environmental Protection Area

National Parks and Wildlife Service Lands

0 100

metres

Scale: 1:3,200

TITLE: FIGURE 5: SPECIFIC REHABILITATION ACTIONS

LOCATION: FISHERMANS BAY

DATUM: (GDA 94)
PROJECTION: MGA ZONE 56

DATE: 27/11/2014
PURPOSE: HRP

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4.2 Weed Management

4.2.1 Weeds of National Significance

Weeds of National Significance (WoNS) are the highest priority species targeted for sustained nationally coordinated action under the Australian Weeds Strategy. This strategy provides for national management to eradicate WoNS species from parts of the country where Australia's productive capacity & natural ecosystems are affected.

Each WoNS has a strategic plan that outlines strategies and an action required to control the weed, and identifies those responsible for each action. Individual landowners and managers are ultimately responsible for managing WoNS species. State and territory governments are responsible for overall legislation and administration.

WoNS identified on site (RPS 2012) include:

- *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush);
- *Lantana camara* (Lantana);
- *Protasparagus aethiopicus* (Ground Asparagus);
- *Rubus ulmifolius* (Blackberry); and
- *Senecio madagascariensis* (Fireweed).

4.2.2 Listed Noxious Weeds

The NSW Department of Industry & Investment under the *Noxious Weeds Act 1993* (NW Act) lists Noxious Weed declarations for all Local Government Areas. Similarly to WoNS, these weeds must be identified for the locality and considered under the weed management activities carried out within the EPAs.

4.2.2.1 Weed control classes

The following weed control classes may be applied to a plant by a weed control order:

(1) Class 1 - State Prohibited Weeds.

(2) Class 2 - Regionally Prohibited Weeds.

(3) Class 3 - Regionally Controlled Weeds.

(4) Class 4 - Locally Controlled Weeds.

(5) Class 5 - Restricted Plants.

The characteristics of each class are as follows:

(a) Class 1 noxious weeds are plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.

(b) Class 2 noxious weeds are plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.

(c) Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.

(d) Class 4 noxious weeds are plants that pose a threat to primary production, the environment or human

health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

(e) Class 5 noxious weeds are plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

Noxious weed declarations for Port Stephens Council identified on site include:

- *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) C4;
- *Bryophyllum delagoense* (Mother of Millions) C3;
- *Protasparagus aethiopicus* (Ground Asparagus) C4;
- *Rubus ulmifolius* (Blackberry); and
- *Senecio madagascariensis* (Fireweed) C4.

Source: http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/noxious-app-application?sq_content_src=%252BdXJsPWh0dHAlM0ElMkYlMkZ3ZWVkcy5kcGkubnN3Lmdvdi5hdSUyRndlZWRzUHVibGljJTJGQ291bmNpbCUyRkRldGFpbHMmYWxsPTE%253D&id=94&search=go

4.2.3 Weed Control Methods

Weed control requires an integrated approach and a single method of treatment should not be relied upon. Bush regeneration principles (Bradley 2006) designed for use in bushland settings, in combination with designated plantings should be employed. The systematic removal of weeds will allow native plants to establish themselves naturally (Buchanan 1989) in designated regeneration areas. Furthermore, the retained vegetation will be managed as part of a long-term maintenance program.

The Bradley Method of bush regeneration employs four basic principles:

(1) Work outwards from good bush areas towards areas of weed;

(2) Make minimal disturbance to the environment;

(3) Weed control will involve primary, consolidation and long term maintenance; and

(4) Do not over-clear; where possible let native plant regeneration dictate the rate of weed removal.

Manual removal of herbaceous weeds, regrowth and seedlings is preferred where possible, with minimal disturbance to soil stability and existing native species. Ecologically sensitive areas where weeds are removed manually should be stabilised or planted by the end of each working day. Removal work will be undertaken outside the seeding period of weeds, especially those weeds that produce large quantities of seed. If any work is undertaken within these periods, seed will be collected, bagged and disposed of off-site, ensuring that no seed remains.

4.2.4 Use of Herbicides

Chemical removal is only considered appropriate for larger weeds and areas of large infestation or in areas containing few natives. In regards to larger woody weed species and infestations, felling and digging up the roots can be dangerous, expensive, time consuming and could potentially increase erosion. Where practical the application of herbicides should only be carried out by qualified personnel and the use of chemicals should be kept to a minimum. Care should also be taken when implementing chemical spraying techniques near waterways and environmentally sensitive areas.

The use of more environmentally-friendly herbicides such as “Roundup Biactive ®” should be used when working within or adjacent to riparian areas. Herbicides should not be applied immediately prior to rain

occurring. This reduces the effectiveness of the herbicide and poses the risk that the herbicide could be transported by runoff into local creeklines and waterways.

An advantage of herbicide use is the shorter time it takes to spray weeds as compared to physically removing them, particularly for large infestations of weeds.

The use of herbicides should be considered when:

- There are small areas of dense weeds with few or no native plants to protect;
- There are large areas of weeds; and
- The weeds are growing too rapidly for physical removal.

It is important to plan herbicide control of target species according to a weeding calendar that recognises the weed's life form and seasonality (i.e. flowering, fruiting and seed set).

The success of each treatment must be evaluated by the operator after a set period of time and re-applied (if necessary) according to the labelled effectiveness for each herbicide. The herbicide of choice for bush regeneration work is Glyphosate.

Herbicide application shall be limited to the following techniques. Always remember to read the product label and any relevant permit before using any herbicide.

- Cut-stump and poison (cut and dab);
- Stem injection;
- Stem-scrape or frilling and poison;
- Basal bark painting; and
- Selective spot-spraying.

4.3 Revegetation

The aim of the revegetation and rehabilitation program is to restore the natural ecosystems within the EPA, utilising native plant species from local nurseries for revegetation purposes. The Environmental Protection Area contains three vegetation communities as previously discussed. Accordingly, locally occurring species typical of these vegetation communities have been selected for revegetation, to maximise plant survival and provide habitat resources to local wildlife. Species for consideration when formulating a planting schedule are listed in **Table 8**.

Assisted rehabilitation with revegetation is only to occur following an 18 month period of monitoring of soil and mulch translocation, if natural regrowth of native plants has not occurred. During this time active weed management will occur to ensure the greatest opportunity for rehabilitation success.

Table 8 Recommended species for replanting

Scientific Name	Common name	Planting density	Paperbark Swamp Forest	Coastal Sand Wallum-Woodland Heath	Coastal Sands Apple Blackbutt Forest
Canopy species					
Allocasuarina distyla		1 tree/10m^2		x	
Angophora costata	Smooth-barked Apple				x

Scientific Name	Common name	Planting density	Paperbark Swamp Forest	Coastal Sand Wallum-Woodland Heath	Coastal Sands Apple Blackbutt Forest
Banksia serrata	Old Man Banksia			x	x
Corymbia gummifera	Red Bloodwood			x	x
Eucalyptus pilularis	Blackbutt				x
Eucalyptus piperita	Sydney Peppermint			x	
Melaleuca quinquenervia	Broad-leaved paperbark		x		
Sub Canopy					
Acacia binervia	Coast Myall				
Acacia irrorata	Sydney Green Wattle	1 tree/10m^2	x		
Glochidion ferdinandi	Cheese Tree		x		x
Shrubs					
Acacia longifolia	Sydney Golden Wattle				x
Banksia spinulosa	Hairpin Banksia			x	
Breynia oblongifolia	Coffee Bush				x
Dodonaea triquetra	Hop-bush		x	x	
Gahnia clarkei	Tall Saw-sedge		x		
Hakea sericea	Needlebush			x	x
Isopogon anemonifolius	Flat-leaved Drumsticks			x	
Leptospermum polygalifolium	Tantoon			x	
Leptospermum. trinervium	Slender Tea-tree	1 shrub/6m^2		x	
Melaleuca linariifolia	Snow in Summer)				x
Melaleuca thymifolia	Thyme Honey Myrtle)		x		
Monotoca elliptica	Tree Broom-heath			x	
Persoonia lanceolata	Lance-leaved Geebung			x	x
Persoonia linearis	Narrow-leaved Geebung			x	x
Ricinocarpos pinifolius	Wedding Bush			x	
Xanthorrhoea latifolia				x	
Ferns					
Pteridium esculentum	Bracken Fern	2 ferns/m^2		x	x
Groundcovers					
Baloskion tetraphyllum	Plume Rush	EPA 1: 3	x		

Scientific Name	Common name	Planting density	Paperbark Swamp Forest	Coastal Sand Wallum-Woodland Heath	Coastal Sands Apple Blackbutt Forest
Baumea rubiginosa	Twig Rush	grasses/m^2 EPA 2 and 3: 2 grasses/m^2	x		
Bossiaea obcordata	Spiny Bossiaea				x
Cynodon dactylon	Common Couch		x		
Dianella caerulea	Blue Flax Lily				x
Digitaria parviflora	Small-flowered Finger Grass		x		
Entolasia marginata	Bordered Panic		x	x	
Entolasia stricta	Wiry Panic				x
Gonocarpus teucroides	Raspwort			x	
Hibbertia aspera	Rough Guinea Flower			x	
Hydrocotyle laxiflora	Stinking Pennywort		x		
Imperata cylindrica	Blady Grass				x
Juncus usitatus	Common Rush		x		
Lachnagrostis filiformis	Blown Grass				
Lepidosperma laterale	Variable Sword Sedge			x	
Lepidosperma longitudinale	Pithy Sword Sedge		x		
Lomandra longifolia	Spiny-headed Mat-rush			x	x
Macrozamia communis	Burrawang			x	x
Patersonia glabrata	Leafy Purple-flag			x	
Pimelea linifolia	Slender Rice Flower			x	
Poa poiformis	Coast Tussock Grass				x
Schoenus brevifolius	Bog Rush		x		

4.3.2 Seed Provenance

Wherever possible all plants and/or seeds sourced for Rehabilitation measures must be of local provenance (usually collected by local nurseries) and collected from within the Port Stephens catchment area.

Prior to revegetation within the EPA, stockpiled topsoil sourced from the Development Area should be spread across areas of disturbance, primarily disused tracks. Topsoil contains a natural seedbank that will regenerate unaided, ultimately reducing the requirement of replanting efforts if undertaken successfully, whilst satisfying the requirements for local seed use. If natural regeneration from the seedbank in the topsoil is unsuccessful, or weed management fails to suppress weeds and native plants cease to germinate, revegetation using tubestock will be required.

Local provenance seeds and plants are often better adapted to local environmental conditions and have a greater capacity to provide habitat, food and other resources for local wildlife.

4.3.3 Site Preparation

Ground preparation techniques are used to soften the soil and increase water infiltration, root area and soil aeration. Any damage to the soils' biological and chemical properties is most likely to happen through inappropriate stockpiling. The physical properties of the soil can be damaged through excessive compaction, over working or working the soil at the wrong moisture content.

Light ripping of existing tracks designated for rehabilitation is to be undertaken ensure the surface is suitable for topsoil placement and the regeneration of its natural seedbank.

4.3.4 Planting of tubestock

Planting of tubestock is required if natural regeneration from topsoil in conjunction with weed management is unsuccessful following an 18 month monitoring period. The spatial arrangement of plantings should emulate a natural vegetation formation; plants should be planted in a random arrangement. Some species may be planted in small groups while others larger species may be planted as individuals in order to create maximum diversity.

Planting density is a major factor determining planting success. Typically, the greater the planting density, the less competition from weeds and the faster the system becomes fully commissioned and operational maintenance can be reduced. In addition, higher planting densities will provide more soil stability, minimising potential of impacts from erosion. As a result, a higher density of plantings is recommended in EPA following weed control works.

Ideally, planting should be undertaken during wetter and milder conditions during the year (spring/autumn and late winter). If the upper soil horizon is not moist at the time of planting, it may be appropriate to water seedlings.

4.3.5 Establishment

The most important factors for plant establishment are:

- The surrounding soil is moist at the time of planting; Mulch is a safe and effective way of ameliorating soil conditions. It helps control soil water loss, soil temperature fluctuations and weed invasion (Buchanan 1989);
- Sufficient rain occurs and / or watering is provided in the following months; and
- The plants are free of weed competition. Weeds around planted vegetation shall be controlled during regular associated maintenance works.

4.3.6 Plant Protection

Stakes and ties should be used if necessary to assist in plant growth and protection. The use of fertiliser may be considered to promote healthy and rapid plant growth if required. Any fertilisers used would need to be applied in accordance with best practice guidelines and regulations.

4.3.7 Planting Locations

Planting locations will be determined by the vegetation management contractor. These areas are likely to be sites where targeted woody weed management / removal has occurred and track rehabilitation (as discussed previously).

4.4 Track Consolidation and Rehabilitation

Multiple unsealed pedestrian access tracks have been established by uncontrolled pedestrians traversing through the EPA. Rehabilitation measures including topsoil placement, mulching, weed management and replanting of native vegetation will be required to re-establish this disturbed area back to a natural state. The tracks dissect three vegetation communities and will require species specific planting to represent those communities. A proposed raised walking trail / boardwalk will be constructed through the EPA, however active management will ensure weed encroachment and establishment will not occur. Disused tracks are to be consolidated and rehabilitated.

Topsoil from the development area within areas of similar vegetation communities will be translocated into the EPA. In doing so the soil seed bank resource is not lost and, if handled correctly, should greatly assist in the proposed Rehabilitation ecology works along tracks (and areas of large woody weed infestation as required) scheduled for rehabilitation. In order to maximise potential for translocated soil retention, light ripping of the rehabilitation sites is to occur prior to spreading of topsoil.

Translocation should occur as soon as possible following vegetation clearing works in order to avoid loss of the seed stock resource via composting and other natural processes.

4.5 Mulching

Soil moisture loss is a major contributor to failed plantings. Mulching can help to prevent this loss. Mulching also aids in the suppression of weeds and helps create a microclimate that is conducive to seedling survival. Mulch and tubgrindings generated from the removal and thinning of native trees associated with the development are to be re-used in restoring the EPA as required. Similar to translocated top soil, mulch from like areas of vegetation within the development area are to be used on the tracks (and areas of large woody weed infestation) as required.

Mulching should occur as soon as possible following vegetation clearing works in order to avoid loss of any native propogative material via composting and other natural processes.

4.6 Erosion Control and Stabilisation Works

All removal and rehabilitation works will be undertaken in accordance with the CMP Sub-plan for Erosion and Sediment Control Plan. Sensitive areas will be fenced off and rehabilitation undertaken on a progressive basis so as to reduce sediment mobilisation by enabling vegetated areas to stabilise soils and trap sediment from runoff. Strategically placed sediment traps and water diversion structures should also be used to minimise sediment and storm water runoff and further erosion particularly in close proximity to the creeks on site.

Care should be taken when removing weeds and all bare soils should be covered using jute matting as required, seeded biodegradable sprayed cover material or mulch and replanted as soon as possible. This will assist in retention of the existing soil structure and lessen the likelihood of water and bank erosion. The matting will require planting of locally occurring species for long term bank stability.

4.7 Rehabilitation of fauna habitat features

Fauna habitat features salvaged prior to clearing activities within the Development Area (see Section 3.3) are to be relocated to areas of retained habitat where practical.

Natural hollows that are less than 150mm in diameter, as their condition allows, will be subject for reuse as arboreal tree hollows in the retained habitats. Natural hollows greater than 150mm will be assessed on site

by an ecologist to determine the suitability and safety of reuse as arboreal replacement hollows. If a hollow is deemed unsatisfactory for reuse due to excessive size, safety issues, damage or other appropriate reasons, it will be used as terrestrial habitat within the retained habitats. In accordance with the council's technical specification, supplementary habitat in the form or nest boxes will be installed to compensate for natural hollow loss at a ratio of one box for one hollow. Additionally, other natural habitat features such as hollow logs, felled branches and bush rocks should also be salvaged for reuse within the retained lands.

A site rehabilitation plan including all management actions and timings is outlined in **Table 9**.

Table 9 Proposed Actions and Monitoring Timetable

Action	Responsibility	Performance Criteria	Timing	Corrective Actions
Site Preparation				
OH&S Hazard & risk assessment for vegetation management crews. Prepare Safe Work Method Statement. Conduct internal safety and environmental induction.	Vegetation Management Contractor	Safe Work Method Statement (or equivalent) submitted and approved	Prior to commencement of any site works under this HRP	
Ripping of disused tracks targeted for rehabilitation within the EPA.	Vegetation Management Contractor	All dedicated tracks are ripped suitable for commencement of rehabilitation activities	At the commencement of HRP	
Topsoil Placement				
Top soil Translocation	Vegetation Management Contractor	Topsoil is to be spread over all ripped tracks within the EPA.	At the commencement of the HRP prior to primary control phase weed control. Translocation should occur as soon as possible following vegetation clearing works in order to avoid loss of the seed stock resource via composting and other natural processes.	
Weed Control				
Map densities of key weeds	Vegetation Management Contractor	Large infestations of key weeds are to be mapped to ensure the appropriate management benchmarks (reduced by 70%) are achieved from the original coverage.	Prior to the commencement of the Primary Control Phase Weed Control.	
Primary Control Phase Weed Control				
Removal of woody weeds, particularly noxious weeds from the EPA, particularly	Vegetation Management Contractor	Weed cover of large infestations to be reduced by 70% within 1 year of commencement of weed control	During periods of active growth At least twice a year until	Continue Control Phase weed control

Action	Responsibility	Performance Criteria	Timing	Corrective Actions
Noxious and WoNS species.		program	performance targets are met Completed within 12 months of commencement of the Action	
Removal of non-woody weeds from the EPAs	Vegetation Management Contractor	Weed cover of large infestations to be reduced by 70% within 1 year of commencement of weed control program	During periods of active growth At least twice a year until performance targets are met Completed within 12 months of commencement of the Action	Continue Control Phase weed control
Removal of canopy species (non endemic) particularly Camphor Laurel and Willow trees from the EPA	Vegetation Management Contractor	All Camphor Laurel and Willow Trees to be removed from EPA as part of site preparation works. Weed cover of large infestations to be reduced by 70% within 1 year of commencement of weed control program	During periods of active growth At least twice a year until performance targets are met Completed within 12 months of commencement of the Action	Continue Control Phase weed control
Secondary Consolidation Phase Weed Control				
Consolidation woody weeds, particularly noxious weeds from the EPA, particularly Noxious and WoNS species	Vegetation Management Contractor	Weed cover, weed regrowth, and mature or flowering/fruiting plants maintained at 70% or below achieved during Primary Control Phase.	During periods of active growth At least twice a year until performance targets are met	Revert back to primary control phase
Consolidation of non-woody weed control from the EPA	Vegetation Management Contractor	Weed cover, weed regrowth, and mature or flowering/fruiting plants maintained at 70% or below achieved during Primary Control Phase.	During periods of active growth At least twice a year until performance targets are met	Revert back to primary control phase
Consolidation of canopy species control (non endemic) within the EPA	Vegetation Management Contractor	Weed cover, weed regrowth, and mature or flowering/fruiting plants maintained at 70% or below achieved during Primary Control Phase.	During periods of active growth At least twice a year until performance targets are met	Revert back to primary control phase
Maintenance Phase Weed Control				
Benchmark Establishment	Vegetation Management Contractor	Monitor the progress of successful weed reduction in line with the allocated benchmarks.		
Removal of woody weeds from the EPA	Vegetation Management Contractor	Maintain Secondary Control Phase levels.	Every 10 weeks (maximum), once secondary phase has been met, then	Revert to secondary control phase targets and

Action	Responsibility	Performance Criteria	Timing	Corrective Actions
			every 4 months for 2 years (during non-flowering periods)	frequency of control
Removal of non-woody weeds from the EPA	Vegetation Management Contractor	Maintain Secondary Control Phase levels. Weed growth should not persist within areas treated with topsoil.	Every 10 weeks (maximum), once secondary phase has been met, then every 4 months for 2 years (during non-flowering periods)	Revert to secondary control phase targets and frequency of control
Removal of canopy species (non endemic) from the EPA	Vegetation Management Contractor	Maintain Secondary Control Phase levels.	Every 10 weeks (maximum), once secondary phase has been met, then every 4 months for 2 years (during non-flowering periods)	Revert to secondary control phase targets and frequency of control
Revegetation				
Revegetation of cleared and disturbed areas; only locally indigenous plant stock to be planted within EPA	Vegetation Management Contractor	Tubestock comprise locally indigenous species wherever possible	Revegetation should only occur if natural regeneration from topsoil placement has not successfully achieved natural recruitment of native plants following an 18 month monitoring period. Planting should occur in the cooler months (late Spring, Winter and early Autumn).	Revegetation works in following year to compensate for what was not completed in the preceding year.
		Survival of at least 90% of tubestock plantings	Within 4 months of plantings (this leaves 2 months until the end of the HRP works time frame to replace any lost tubestock).	Watering, mulching to occur as required or tree guards to be installed where appropriate Replacement of the plants lost at a suitable time of year.
Tree Protection Measures				
Apply protective fencing or tree shielding to existing trees	Vegetation Management Contractor	Applied in accordance with Australian Standards 4970-2009 ‘Protection Of Trees On Development Sites’	Prior to the commencement of site works	
Mulching				

Action	Responsibility	Performance Criteria	Timing	Corrective Actions
Applying mulch to dedicated areas and areas requiring further weed suppression	Vegetation Management Contractor	Mulch applied to the same areas where topsoil has been used; Further mulching to be used where determined by Vegetation Management Contractor;	Following topsoil application and primary and secondary weeding	
Illegal Access				
Ensure illegal access prevention measures are implemented	Vegetation Management Contractor	Tracks and other likely points of illegal vehicle entry into the conservation lands will be subject to the placement of suitably sized logs, derived from the Development Area, along the edges to prevent unauthorised vehicle access. At some locations, but only if logs are not suitable due to the grade of the site or other reasons, alternative methods will be utilised.	During all other site visits involving management actions	Ensure any accessible areas are reported and barriers are reinstated immediately
Monitoring and Reporting				
Regular inspections of topsoil/replanting areas to check levels of weed regrowth	Vegetation Management Contractor	Levels of weed regrowth reported to Vegetation Management Consultant	Maximum biannually for the duration of 1 year in which the monitoring period applies.	
Site inspections to ensure compliance with HRP and to record progress of works. Feedback and contingency plans as required	Vegetation Management Consultant	Inspection checklist completed and included in monitoring reports	Following topsoil placement and then twice per year for twelve months for 3 years.	
Prepare and submit Monitoring Report on implementation of HRP	Vegetation Management Consultant	Monitoring reports completed & submitted	Maximum biannually for the duration of 1 year in which the monitoring period applies..	Ensure preparation for annual report is being undertaken.

5.0 Maintenance

5.1 Description of Tasks

5.1.1 Consolidation and Weed Removal

The site will require several visits to remove weeds that are regenerating and/or have grown in response to the disturbance and are competing with regenerating native plants. A system of weed removal must be undertaken to remove weed seedlings and regrowth.

These visits are essential; otherwise the weeds will dominate and out-compete the regenerating / replanted natives.

Weed species without seeds attached or that do not have the potential to regenerate vegetatively can be left on site and mounded to act as habitat for invertebrates, small birds and small reptiles. Weeds that can regenerate vegetatively if detected on the site should be bagged and disposed of offsite.

5.1.2 Plant Replacement

In areas where plants have been completely removed (i.e. as a result of vandalism or accidental damage) or where rehabilitation has failed, been damaged or is suffering from pests and/or disease replanting should be undertaken within four months of initial plantings. Plants are only being planted if topsoil placement fails after 18 months, leaving a 6 month window for revegetation. If plants have been damaged or died during the first 4 months, this leaves adequate time (two months) to replace them.

Plants lost or damaged should be replaced to maintain a minimum of 90% survival rate of the original planted stock and recommended plant densities. Initial and careful consideration of the health of tube stock prior to its purchase should negate stock losses. Where weeds are removed, plantings should be undertaken at the Vegetation Management Contractor's (or other qualified persons) discretion. Plants should be replaced at the size originally specified and in accordance with all planting methods as previously described.

5.1.3 Irrigation

Watering of seedlings should be continued as required until all plants are established. Weather and site conditions will determine the frequency of watering for plants over the maintenance period to ensure they do not perish. Moisture levels and plant health should be monitored weekly during drier periods.

Watering should be undertaken early morning or late afternoon to avoid the hottest part of the day and minimise water loss.

5.1.4 Pests and Diseases

All plants must be monitored for pests and disease during the HRP works and monitoring periods. Plants significantly affected by pests or disease must be removed, disposed of offsite and replaced.

To ensure a thorough approach to pest and disease management, this management plan must be co-ordinated with any other pest and disease controls that may be taking place in the local landscape.

6.0 Monitoring and Reporting

Qualified Vegetation Management Consultants are to carry out a program of regular monitoring and inspection work required for the HRP. The Consultant will be responsible for ensuring the measures outlined in this HRP are implemented and that performance criteria are satisfied.

A monitoring report on the progress of the HRP implementation will be prepared annually and submitted to the Developer within three months of each annual period. A final report shall also be prepared by the contractor and submitted to the Developer upon completion of the 12 month monitoring period (after the 2 year rehabilitation period) for submission to Port Stephens Council. Annual reports will be required to be submitted to Port Stephens Council so that any issues can be resolved in an ongoing manner rather than at the end of the monitoring period.

The monitoring reports will:

- Report on the progress of the monitoring activities; and
- Discuss any problems encountered in implementing the HRP.

Maintenance activities within the areas to be replanted will include:

- Estimates of weed cover / abundance present in the replanting and weed management areas;
- Depth and condition of mulch, if used; and
- Recommendations regarding timing and responsibility for corrective measures and/or vegetation management.

A final inspection with Urban Growth and Port Stephens Council is to occur approximately 6 months prior to hand over of the subject lands to identify any outstanding matters to be resolved prior to dedication. Photo Monitoring

Designated permanent photo monitoring locations are to be established by the contractor within the EPA. The progressive photo monitoring will provide an indication of the success or failure of any areas of rehabilitation conducted in accordance with this HRP. They will enable contractors to adjust rehabilitation works accordingly to enhance the quality of retained vegetation further and provide required information for ongoing monitoring reports.

Monitoring points should be marked with steel star-pickets to ensure consistent replication of monitoring. Details on the direction the photo was taken, date, and height to camera should be recorded to allow for adequate comparisons between monitoring events. Photo monitoring can be conducted by vegetation management contractor prior to the submission of the annual report.

7.0 References

Auld, B.A. and Medd, R.W. (1992) *Weeds- An illustrated guide to the weeds of Australia*. Inkata Press.

Bradley, J. (1971) *Bush Regeneration: The Practical Way to Eliminate Exotic Plants from Natural Reserves*. Sydney, New South Wales: The Mosman Parklands and Ashton Park Association.

Bradley, J. (2006) *Bringing back the Bush: the Bradley Method of Bush Regeneration*. Reed New Holland. *Sydney.*

Buchanan, R.A. (1989) *Bush Regeneration - Recovering Australian Landscapes*. TAFE NSW.

Cropper, S. (1993) *Management of Endangered Plants*. CSIRO Publications, East Melbourne, Victoria.

DPI (2014) Noxious weed declarations for Port Stephens Council. Available: http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/noxweed/noxious-app-application?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZ3ZWVkcy5kcGkubnN3Lmdvdi5hdSUyRndlZWRzUHVibGljJTJGQ291bmNpbCUyRkRldGFpbHMlMkY5NCZhbGw9MQ%3D%3D

Ensbey, R. (2005) *Noxious and Environmental Weed Control Handbook*.

Harden, G. (ed) (2000) *Flora of New South Wales, Volume 1. Revised edition*. New South Wales University Press, NSW.

Harden, G. (ed) (2002) *Flora of New South Wales, Volume 2. Revised edition*. New South Wales University Press, NSW.

Harden, G. (ed) (1992) *Flora of New South Wales, Volume 3.* New South Wales University Press, NSW.

Harden, G. (ed) (1993) *Flora of New South Wales, Volume 4*. New South Wales University Press, NSW.

Lamp, C. and Collett, F. (2004) *Field Guide to the weeds of Australia*. Inkata Press, Melbourne.

Mortlock, W. (1998) *Florabank Guide 5: Seed Collection from Woody Plants for Local Revegetation.*

NPWS (2000a). *Vegetation Survey, Classification and Mapping, Lower Hunter and Central Coast Region, Version 1.2.* Lower Hunter and Central Coast Regional Environmental Management Strategy, Thornton, NSW.

NPWS (2006) *Tomaree National Park Plan of Management*. DEC, NSW.

Richardson, F.J., Richardson, R.S. and Shepherd, R.C.H. (2006) *Weeds of the South-east – An Identification Guide for Australia.* RG and FJ Richardson, PO Box 42, Meredith VIC 3333.

Robinson, L. (1997) *Field Guide to the Native Plants of Sydney, 3rd Edition*. Kangaroo Press, Sydney.

RPS (2012) *Flora and Fauna Assessment Fishermans Bay, NSW*. Broadmeadow, NSW.

RPS (2012b) *Bushfire Threat Assessment: Residential Subdivision at Fishermans Bay, NSW*. Hamilton, NSW.

RPS (2013) *Revised Masterplan – Fishermans Bay Bushfire Threat Assessment*, Addendum Letter. Broadmeadow, NSW.

RPS (2015) *Subdivision and Urban Development at Fishermans Bay: Construction Flora and Fauna Management Plan*. Broadmeadow, NSW.

Appendix 1

Fauna Species Inventory

The following Family sequencing and taxonomy follow for each fauna class:

Appendix Key:

** = Introduced species*
(E) = Species listed as Endangered on the TSC Act.
(V) = Species listed as Vulnerable on the TSC Act.
(E) = Species listed as Endangered on the EPBC Act.*
(V) = Species listed as Vulnerable on the EPBC Act.*
(M) = Species listed as Migratory on the EPBC Act.*
X = recorded from sighting or characteristic call.
D = 'Definite' identification during Anabat analysis.

Family Name	Scientific Name	Common Name	Record Type
Frogs			
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	X
Reptiles			
Scincidae	*Lampropholis delicata*	Garden Skink	X
Birds			
Pelecanide	*Pelecanus conspicillatus*	Australian Pelican	X
Ardeidae	***Ardea ibis***	**Cattle Egret (M*)**	X
	Egretta novaehollandiae	White-faced Heron	X
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	X
Accipitridae	***Haliaeetus leucogaster***	**White-bellied Sea-Eagle (M***	X
Falconidae	*Falco cenchroides*	Nankeen Kestrel (	X
Charadriidae	*Vanellus miles*	Masked Lapwing	X
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	X
	Ocyphaps lophotes	Crested Pigeon	X
	Streptopelia chinensis	Spotted Turtle-Dove *	X
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	X
Psittacidae	*Platycercus eximius*	Eastern Rosella	X
	Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	X
	Trichoglossus haematodus	Rainbow Lorikeet	X
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze-Cuckoo	X
	Cuculus pallidus	Pallid Cuckoo	X
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra	X
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	X
	Malurus lamberti	Variegated Fairy-wren	X
Pardalotidae	*Sericornis frontalis*	White-browed Scrubwren	X
	Acanthiza pusilla	Brown Thornbill	X
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	X
	Anthochaera chrysoptera	Brush Wattlebird	X
	Philemon corniculatus	Noisy Friarbird	X

Family Name	Scientific Name	Common Name	Record Type
	Manorina melanocephala	Noisy Miner	X
	Lichenostomus chrysops	Yellow-faced Honeyeater	X
	Melithreptus lunatus	White-naped Honeyeater	X
	Lichmera indistincta	Brown Honeyeater	X
	Phylidonyris nigra	White-cheeked Honeyeater	X
	Acanthorhynchus tenuirostris	Eastern Spinebill	X
Eopsaltriidae	*Eopsaltria australis*	Eastern Yellow Robin	X
Cinclosomidae	*Psophodes olivaceus*	Eastern Whipbird	X
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	X
	Colluricincla harmonica	Grey Shrike-thrush	X
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	X
	Rhipidura fuliginosa	Grey Fantail	X
	Rhipidura leucophyrs	Willie Wagtail	X
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	X
Artamidae	*Cracticus torquatus*	Grey Butcherbird	X
	Cracticus nigrogularis	Pied Butcherbird	X
	Gymnorhina tibicen	Australian Magpie	X
	Strepera graculina	Pied Currawong	X
Corvidae	*Corvus coronoides*	Australian Raven	X
Passeridae	*Neochmia temporalis*	Red-browed Finch	X
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	X
Zosteropidae	*Zosterops lateralis*	Silvereye	X
Mammals			
Dasyuridae	*Antechinus stuartii*	Brown Antechinus	X
Molossidae	*Tadarida australis*	White-striped Freetail-bat	D
Muridae	*Rattus rattus**	Black Rat	X
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	X
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	X
Vespertilionidae	***Miniopterus australis***	**Little Bentwing-bat (V)**	**D**
	Falsistrellus tasmaniensis	**Eastern False Pipistrelle(V)**	**D**
	Chalinolobus gouldii	Gould's Wattled Bat	D
	Vespadelus pumilus	Eastern Forest Bat	D
	Vespadelus vulturnus	Little Forest Bat	D

Comments:

- Wallaby Scats were observed throughout the study area; and
- Bandicoot diggings across the study area.

Appendix 2

Flora Species Inventory

Family/Subfamily	Scientific Name	Common Name
Trees		
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Eleocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Euphorbiaceae	*Glochidion ferdinandii*	Cheese Tree
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Mimosoideae	*Acacia irrorata* subsp. *irrorata*	Sydney Green Wattle
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Proteaceae	*Banksia serrata*	Old Man Banksia
Salicaceae	*Salix babylonica**	Weeping Willow
Santalaceae	*Exocarpos cupressiformis*	Native Cherry
Shrubs		
Apiaceae	*Platysace lanceolata*	Lance-leaf Platysace
Apiaceae	*Xanthosia tridentata*	Rock Xanthosia
Apocynaceae	*Nerium oleander**	Oleander Bush
Apocynaceae	*Plumeria obtusa** (Cultivar)	Frangipani
Araceae	*Monstera deliciosa**	Fruit-salad Plant
Asteraceae	*Chrysanthemoides monilifera* subsp. *rotundata**	Bitou Bush
Casuarinaceae	*Allocasuarina distyla*	-
Cesalpinioideae	*Senna pendula* var. *glabrata**	-
Epacridaceae	*Epacris pulchella*	Wallum Heath
Epacridaceae	*Monotoca elliptica*	Tree Broom-heath
Epacridaceae	*Monotoca scoparia*	Prickly Broom-heath
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Ricinocarpus pinifolius*	Wedding Bush
Faboideae	*Aotus ericoides*	-
Faboideae	*Bossiaea ensata*	Small Leafless Bossiaea
Faboideae	*Bossiaea heterophylla*	Variable Bossiaea
Faboideae	*Bossiaea obcordata*	Spiny Bossiaea
Faboideae	*Bossiaea rhombifolia*	-
Faboideae	*Dillwynia floribunda* var. *floribunda*	Parrot Pea
Faboideae	*Dillwynia retorta*	Eggs and Bacon

Family/Subfamily	Scientific Name	Common Name
Faboideae	*Gompholobium latifolium*	Broad-leaf Wedge-pea
Magnoliaceae	*Magnolia* sp.* (Cultivar)	Magnolia
Mimosoideae	*Acacia binervia*	Coast Myall
Mimosoideae	*Acacia longifolia* var. *longifolia*	Sydney Golden Wattle
Mimosoideae	*Acacia longifolia* var. *sophorae*	Coastal Wattle
Mimosoideae	*Acacia myrtifolia*	Red Stem Wattle
Mimosoideae	*Acacia suaveolens*	Sweet Scented Wattle
Mimosoideae	*Acacia ulicifolia*	Prickly Moses
Myrtaceae	*Callistemon rigidus*	Stiff Bottlebrush
Myrtaceae	*Leptospermum polygalifolium* subsp. *polygalifolium*	Tantoon
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree
Myrtaceae	*Melaleuca thymifolia*	Thyme Honey Myrtle
Polygalaceae	*Comesperma ericinum*	Pyramid Flower
Proteaceae	*Banksia aemula*	Wallum Banksia
Proteaceae	*Banksia spinulosa* var. *spinulosa*	Hairpin Banksia
Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea
Proteaceae	*Hakea sericea*	Needlebush
Proteaceae	*Isopogon anemonifolius*	Flat-leaved Drumsticks
Proteaceae	*Lambertia formosa*	Mountain Devil
Proteaceae	*Lomatia silaifolia*	Crinkle Bush
Proteaceae	*Persoonia lanceolata*	Lance-leaved Geebung
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung
Rosaceae	*Rubus ulmifolius**	Blackberry
Rutaceae	*Crowea exalata*	-
Rutaceae	*Eriostemon australasius*	Pink Wax Flower
Sapindaceae	*Dodonaea triquetra*	Hop-bush
Sterculiaceae	*Lasiopetalum ferrugineum* var. *ferrugineum*	Rusty Velvet-bush
Verbenaceae	*Lantana camara**	Lantana
Zamiaceae	*Macrozamia communis*	Burrawang
Groundcovers		
Acanthaceae	*Thunbergia alata**	Black-eyed Susan
Apiaceae	*Centella asiatica*	Swamp Pennywort
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort
Apiaceae	*Xanthosia pilosa*	Woolly Xanthosia
Apocynaceae	*Vinca minor**	Blue Periwinkel
Araceae	*Dieffenbachia* sp. (cultivar)	Dumb Cane
Asparagaceae	*Protasparagus aethiopicus**	Asparagus Fern
Asteraceae	*Actinotus helianthi*	Flannel Flower
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Taraxacum officinale**	Dandelion

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Asteraceae	*Tragopogon porrifolius**	Salsify
Clusiaceae	*Hypericum gramineum*	Small St Johns Wort
Commelinaceae	*Commelina cyanea*	Scurvy Weed
Convolvulaceae	*Dichondra repens*	Kidney Weed
Crassulaceae	*Bryophyllum delagoense**	Mother of Millions
Cyperaceae	*Baumea rubiginosa*	Twig Rush
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Caustis flexuosa*	Curly Wig
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Cyperaceae	*Cyperus papyrus**	Papyrus
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Cyperaceae	*Lepidosperma limicola*	-
Cyperaceae	*Lepidosperma longitudinale*	Pithy Sword Sedge
Cyperaceae	*Ptilothrix deusta*	-
Cyperaceae	*Schoenus brevifolius*	Bog-rush
Davalliaceae	*Nephrolepis cordifolia**	Fish-bone Fern
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia linearis*	-
Doryanthaceae	*Doryanthes excelsa*	Gymea Lily
Euphorbiaceae	*Euphorbia peplus**	Spurge
Gentianaceae	*Centaurium erythraea**	Common Centaury
Goodeniaceae	*Dampiera stricta*	Blue Dampiera
Goodeniaceae	*Scaevola ramosissima*	Purple Fan Flower
Haemodoraceae	*Haemodorum planifolium*	Bloodroot
Haloragaceae	*Gonocarpus teucroides*	Raspwort
Iridaceae	*Patersonia glabrata*	Leafy Purple-flag
Iridaceae	*Romulea rosea* var. *australis**	Onion Grass
Juncaceae	*Juncus usitatus*	Common Rush
Liliaceae	*Chlorophytum comosum**	Spider Plant
Liliaceae	*Lilium formosanum**	Formosan Lily
Lobeliaceae	*Pratia purpurascens*	Whiteroot
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	Wattle Mat-rush
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Lomandraceae	*Lomandra obliqua*	Twisted Mat-rush
Orchidaceae	*Dipodium variegatum*	Blotched Hyacinth Orchid
Phormiaceae	*Dianella caerulea* var. *producta*	Blue Flax Lily

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Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Anisopogon avenaceus*	Oat Speargrass
Poaceae	*Cymbopogon refractus*	Barbwire Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Lachnagrostis filiformis*	Blown Grass
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Poaceae	*Poa affinis*	-
Poaceae	*Poa poiformis*	Coast Tussock Grass
Poaceae	*Setaria gracilis**	Slender Pigeon Grass
Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Poaceae	*Themeda australis*	Kangaroo Grass
Polygonaceae	*Rumex bidens*	Mud Dock
Polygonaceae	*Rumex crispus**	Curled Dock
Primulaceae	*Anagallis arvensis**	Scarlet Pimpernel
Restionaceae	*Baloskion tetraphyllum* subsp. *tetraphyllum*	Plume Rush
Restionaceae	*Empodisma minus*	-
Restionaceae	*Leptocarpus tenax*	Slender Twine-rush
Rubiaceae	*Pomax umbellata*	Pomax
Rubiaceae	*Richardia brasiliensis**	White Eye
Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*	Slender Rice Flower
Tremandraceae	*Tetratheca ericifolia*	Black-eyed Susan
Xanthorrhoaceae	*Xanthorrhoea latifolia* subsp. *latifolia*	-
Zingiberaceae	*Hedychium gardnerianum**	Ginger Lily
Epiphytes		
Aspleniaceae	*Asplenium australasicum*	Birds Nest Fern
Orchidaceae	*Cymbidium suave*	Snake Orchid
Climbers		
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Faboideae	*Hardenbergia violacea*	False Sarsparilla
Faboideae	*Kennedia prostrata*	Running Postman
Lauraceae	*Cassytha glabella* forma *glabella*	Slender Devil's Twine
Menispermiaceae	*Sarcopetalum harveyanum*	Pearl Vine

Family/Subfamily	Scientific Name	Common Name
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Vitaceae	*Cayratia clematidea*	Native Grape