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VEGETATION MANAGEMENT PLAN

FOR

EXTRACTION AREA & CORRIDOR REHABILITATION

AT

4473 NELSON BAY ROAD, ANNA BAY, NSW

Prepared for: **INA latitude One Pty Ltd**
C/- AdW Johnson

July 2017

AEP ref 1496

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Glossary of Terms

AEP	Anderson Environment and Planning.
BRC	A suitably qualified and experienced bush regeneration contractor.
CSABF	Coastal Sand Apple – Blackbutt Forest (as per MU33 - Lower Hunter & Central Coast Regional Environmental Management Strategy [LHCCREMS]).
Council	Port Stephens Council.
Earthworks	Civil works associated with Earthworks –Dune Regrade – the removal of native vegetation and extraction of approx. 80,000m^3 of sand in the north-western section of the study area.
Extraction Area	Area approved for earthworks
KPoM	Port Stephens Comprehensive Koala Plan of Management (2002).
PKFT	Preferred Koala food trees as listed in KPoM
PKHT	Preferred Koala habitat trees, as listed in KPoM.
PMP	Photo Monitoring Point
Project Ecologist	Field ecologist Suitably qualified and experienced in preparation and implementation of VMPs.
Proponent	INA latitude One Pty Ltd.
SSF EEC	Swamp Mahogany – Paperbark Forest (MU 37 – LHCCREMS), within the study area, which constitutes Swamp Sclerophyll Forest Endangered Ecological Community as described in NSW OEH (2007).
Study Area	The entirety of Lot 25 DP 852410, subject to the proposed earthworks, VMP lands and the remainder of the lands within the lot. The study area is shown in **Figure 1.**
VMA	There are five designated Vegetated Management Areas which have different management regimes within this VMP.
VMP Lands	The extent of the VMAs and accompanying VMP works areas within the study area (minus the Extraction Area). VMP lands are shown in **Figure 2**.

1.0 Introduction

At the request of INA latitude One Pty Ltd (the client), Anderson Environment & Planning (AEP) have prepared a Vegetation Management Plan (VMP) to fulfil the Conditions of the Notice of Determination for proposed Earthworks –Dune Regrade at Lot 25, DP 852410, or 4473 Nelson Bay Road, Anna Bay, NSW. The site location within the general locality is shown in **Figure 1**.

The VMP has been prepared to guide actions to protect, enhance and manage the ecological values of the site, including rehabilitation and management of Swamp Sclerophyll Forest Endangered Ecological Community (SSF EEC) and bushland vegetation, koala habitat, waterbodies, weed management and bushfire hazard management. For the purpose of the VMP, the site has been divided into Vegetation Management Areas (VMAs). Details of the VMAs are provided in **Section 4**, and the VMAs are shown in **Figure 2**.

The VMAs and the management measures detailed in following sections are:

- **VMA1** - Approx. 1.6 hectares (ha) of Koala Habitat Corridor to be rehabilitated, consisting of mostly cleared and managed pasturelands with a small patch of disturbed SSF EEC vegetation currently exhibiting weed invasion. Actions include selected weed treatment, immediate planting of pioneering SSF EEC species and Preferred Koala food trees (PKFTs), and follow up rehabilitation works to supplement initial treatment;

- **VMA2** – Approx. 0.6ha of remnant Gahnia Sedgeland infested with stands of mature Lantana. Actions include selected weed treatment, immediate planting of SSF EEC species PKFTs, and follow up rehabilitation works;

- **VMA3** - Approx. 0.5ha of remnant SSF EEC infested with stands of mature Monteray Pine, Lantana and Bitou Bush. Actions include weed treatment and planting of SSF EEC species and Preferred Koala food trees (PKFTs) where gaps in native vegetation cover occur, and follow up rehabilitation works;

- **VMA4** – Approx. 0.9ha of Coastal Sand Apple – Blackbutt Forest (CSABF) vegetation currently exhibiting varying levels of disturbance, key species occurrence and weed invasion especially around the edges of patches; and

- **VMA5** – Approx. 2ha of lands after the earthworks are completed will have topsoil won from the earthworks re-spread over the extraction area to encourage recruitment from the native seed bank within. Follow-up treatment may be required to eliminate recruiting weeds from the disturbed soil.

For the purposes of referencing, this document should be referred to as:

> Anderson Environment & Planning (2017). *Vegetation Management Plan for Retained Vegetation Areas at 4473 Nelson Bay Road, Anna Bay, NSW.* Unpublished report for AdW Johnson, July 17.

1.1 Land Title Details

The earthworks are located at 4473 Nelson Bay Road, Anna Bay, NSW, and is identified as Lot 25 DP 852410.

The study area location is identified in **Figure 1**.

1.2 Land Ownership

At present, all lands subject to this VMP are owned by INA latitude One Pty Ltd (the proponent). AEP understands that all lands will be retained by the proponent following the proposed development.

1.3 Administrative Details

The VMP has been structured to address Condition 2 of Council's conditions of consent in *Notice of Determination: Earthworks-Dune Regrade DA 16-2017-282-1.*

> *Prior to the commencement of works, a Vegetation Management Plan (VMP) must be submitted to Council for approval.*
>
> *VMP shall be prepared by a suitably qualified and experienced bush regeneration company or equivalent and cover a timeframe of 5 years. The VMP must be prepared in accordance with the Technical Specification: Vegetation Version 1.0 May 2014.*
>
> *The VMP must include measures to protect, enhance and manage the ecological values including management of retained vegetation, koala habitat, waterbodies, weed management and bushfire hazard management.*

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

- Lot 25 DP 852410 (Study Area)
- Approved Extraction Area
- Proposed VMP Lands (Indicative)
- Cadastre

N

B63

0 200

metres

Scale: 1:2,000

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Note
1. Boundaries are not survey accurate
2. Do not scale off this plan

Title: Figure 1 - VMP Lands

Date: 13.7.17

Location: Anna Bay

Client: INA latitude One Pty Ltd

Our Ref: 1496

2.0 Background Information

2.1 Planning and Landscape Context

2.1.1 Site Particulars

- **Address** – 4473 Nelson Bay Road, Anna Bay
- **LGA** – Port Stephens.
- **Study Area** –all of Lot 25 DP 852410, totalling approx. 13ha.
- **VMP Area** – Approx. 3.6ha
- **Zoning** – As per Port Stephens Council LEP 2013, the study area is zoned RU2 – Rural Landscape.
- **Current Land Use** – The study area includes an existing residence with associated buildings near Nelson Bay Road, cleared areas and disturbed remnant (predominantly shrubland) vegetation. The eastern portion of the lot is currently subject to grazing by horses.
- **Surrounding Land Use** - The study area is bounded by:
    - Rural/residential properties to the east, north-east and south-east fronting Nelson Bay Road;
    - An area to the north zoned E2 – Environmental Conservation and a native vegetation buffer between the residential property and the access road to the north-east approx. 50m wide;
    - The area west and north-west generally comprises cleared lands and are the site of a proposed retirement village development; and
    - A rural residence abuts the south-eastern boundary, the proximity of which need to be considered with regards to bushfire hazard with the VMP lands assessed herewith, and there is remnant native vegetation including some areas of Swamp Mahogany – Paperbark Forest adjoining the western half of the southern boundary.

Figure 1 depicts the extent of the study area along with the VMP lands overlain on an aerial photograph of the locality.

2.1.2 Proposed Land Use

The earthworks will remove vegetation within the north-west portion of the site, and approx. 80,000m^3 of sand will be extracted to be used as fill within low-lying areas of Part Lots 2 and 4 DP 398888 to the west, to allow the development of an approved retirement village (Council Development Consent No. 16-2009-257).

There are no current plans to re-develop the study area after the completion of earthworks. The existing residence in the east of the study area will be retained with lands adjoining the residence near the southern boundary managed as APZ, while the VMP lands will be managed for a period of five (5) years.

Approx. 3.6ha of the study area will be set aside as VMP Lands.

The location of proposed earthworks, VMAs and relevant features of note are shown in **Figure 2.**

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

N

Legend

- Lot 25 DP 852410 (Study Area)
- Proposed VMP Lands (Indicative)

Vegetation Management Areas

- VMA 1
- VMA 2
- VMA 3
- VMA 4
- VMA 5

Targeted Weed Removal Areas

- Pinus radiata
- Lantana infestation
- Bitou Bush / Lantana infestation

- Photo Point Location (Indicative)

0 200

metres

Scale: 1:1,693

Note
1. Boundaries are not survey accurate
2. Do not scale off this plan

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Title: Figure 2 - Management Area Locations

Date: 13.7.17

Location: Anna Bay

Client: INA latitude One Pty Ltd

Our Ref: 1496

2.2 Existing Native Vegetation and Weeds

Reference to LHCCREMS (2002) mapping indicates that the vegetation within the study area is mapped as Map Unit (MU) 33 - Coastal Sand Apple – Blackbutt Forest (CSABF), MU37 - Swamp Mahogany and Paperbark Forest and large areas of cleared land and Pine Forest. The Swamp Mahogany and Paperbark Forest constitutes Swamp Sclerophyll Forest Endangered Ecological Community (SSF EEC), as described in NSW OEH (2007).

Field surveys identified that the majority of the site occurs as regrowth shrubland dominated by species such as *Leptospermum laevigatum* (Coastal Tea-tree), *Acacia longifolia* (Sydney Golden Wattle) and *Dodonaea triquetra* (Common Hop Bush). Such species are colonisers and typical of regrowth vegetation, however larger specimens of slower-growing species such as *Banksia serrata* (Old Man Banksia) indicates that at least some areas of regrowth have been established for several decades (Google Earth imagery shows the majority of the site including these areas as vegetated in 2002).

While the shrublands were largely devoid of canopy species, Floristics carried out suggest that some of these patches may have constituted the CSABF mapped by LHCCREMS in 2000. A swampline runs through the VMP lands lower-lying areas and fieldwork confirmed they consist of highly disturbed SSF EEC.

Although predominantly native, areas including much of the VMP lands were infested with extensive stands of *Lantana camara* (Lantana) *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush), *Pinus radiata* (Monterey Pine), *Andropogon virginicus* (Whisky Grass), *Melinis repens* (Red Natal Grass) and other exotics. Lantana and Bitou Bush presented as dense walls in some areas.

Areas where earthworks will occur contains disturbed Pine Forest, managed exotic grassland and CSABF, hence no EEC vegetation will be removed by the earthworks.

The current state of VMP lands and surrounding vegetation is shown in **Photo Plates 1 -4** below.

Photo Plate 1 - Emergent *Angophora costata* within Coastal Sand Apple – Blackbutt Forest Shrublands.

Photo Plate 2 - The VMP lands are largely devoid of mature canopy trees. A single emergent *A. costata* on the left, while the eucalypts in the background lie outside the study area.

Photo Plate 3 - Remnant Freshwater Gahnia Sedgeland within the VMP lands along the swampline, is dominated by Lantana.

Photo Plate 4 - The VMP lands contain large tracts of managed pasture, with highly disturbed remnant Freshwater Gahnia Sedgeland along the swampline in the background.

2.3 Natural Values

The study area, although highly disturbed, contains remnant native vegetation including SSF EEC vegetation. Patchy regeneration of native species in unmanaged areas indicated the presence of at least some viable seed bank. The eastern half of the study area lies within a tenuous corridor of remnant native vegetation that is recognised by the KPoM as a Koala Corridor.

The Gahnia Sedgeland is likely to provide suitable habitat for amphibian species that use such habitat.

2.4 Relationships to Other Plans, Approvals And Legislation

The production of this VMP and the works outlined are required as a condition of consent of the Notice of Determination - Application No: 16-2017-282-1.

This VMP has also been informed by relevant NSW and Commonwealth legislation and industry best practice guidelines for bush regeneration, bushfire stormwater and soil management and are referenced accordingly herewith.

3.0 VMP Objectives

This VMP aims to guide habitat rehabilitation and revegetation works to restore canopy species and community integrity to approx. 3.6ha of Coastal Apple – Blackbutt Forest and Swamp Mahogany – Paperbark Forest currently presenting as pasture and highly disturbed remnant native vegetation patches in the south of the study area. The VMP aims to meet the guidelines, requirements and objectives of the Notice of Determination, the NV Act and the KPoM by providing for the long-term management and protection of existing and restored Koala, Squirrel Glider and other threatened species habitat over the designated 5 year period, and to establish self-managing communities requiring minimal intervention thereafter. The VMP also details steps to aid the regeneration of native cover of the earthworks site on completion of those works.

The proposed VMP program aims to restore approximately 3.2ha of SSF EEC vegetation, and will provide connecting habitat including SMPF EEC (and Primary Koala Habitat) both within the study area and to adjoining similar areas of offsite vegetation.

The site is currently tentatively connected with areas of intact vegetation to the north, north-east and south-west. This includes the areas of Preferred Koala Habitat. The VMP not only aims to provide approx. 3.6ha of CSABF and SSF EEC vegetation, including PKHTs, it also aims to create viable connections to off-site habitat to the south, east and north, effectively creating a minimum 50m PKH corridor over previously cleared lands.

The VMP also aims to improve geomorphological stability of the swampline to maintain riparian integrity, function and water quality; and increase recruitment opportunities for native flora and fauna, particularly SSF EEC flora species.

4.0 Management Issues

Rehabilitation and management of the VMP lands poses many management issues. To effectively allocate resources to obtain maximum reach toward the VMP objectives, different management regimes are recommended for different areas of VMP Lands (Vegetation Management Areas; VMAs).

Each VMA will require a specific approach, as part of an overall holistic program aimed at achieving VMP objectives.

Management issues relating to VMAs are outlined in **Table 1** below.

Table 1 – Management Issues

Area	Actions
VMA1 – Koala Habitat Corridor	Weed treatment, immediate planting of pioneering SSF EEC species and PKFTs and follow up works
VMA2 – Sedgeland	Weed treatment, immediate planting of SSF EEC species PKFTs, and follow up works
VMA3 – SSF EEC	Weed treatment, planting of PKFTs where gaps in native vegetation cover occur, and follow up rehabilitation works
VMA4 – CSABF	Weed control, edge planting of pioneer native species and follow-up to deter incursion by weeds.
VMA5 – Earthworks area rehabilitation	Topsoil won from the earthworks to be re-spread over the extraction area to encourage recruitment from the native seed bank within. Follow-up treatment may be required to eliminate recruiting weeds from the disturbed soil.

The key management issues identified as requiring action to achieve the VMP objectives are outlined below.

4.1 Access to VMP Lands

It will be necessary to prevent unauthorised incursion into the VMP lands. The following steps are to be taken prior to commencement of earthworks:

- Livestock should be excluded from the VMP Lands by installation of plain wire stock-proof fencing;
- Fencing should have clearly visible signage erected at at least three key entry points to VMAs 1 to 4 lands, indicating the area is not to be accessed without the permission of the VMP management entity. Signage should be maintained for the life of the project. A general sign specification is included as **Appendix B**;

- Fencing and signage to be inspected as part of the monitoring program to inform any maintenance actions required to maintain efficacy of signage; position of signs should be changed if required so they are visible at key entry points for the life of the project;
- Barbed wire is not to be used in either permanent or temporary fencing works given the inherent danger of barbed wire to resident fauna, particularly Koalas and Squirrel Gliders; and
- Any existing barbed-wire fencing on the boundary of or within the VMP Lands is to be removed before commencement of earthworks and replaced with plain wire stock-proof fence that will delineate VMP lands and preclude cattle intrusion but not pose a danger to native wildlife utilising the VMP Lands.

4.2 Recruitment of an Endemic Native Flora Ecotone

The challenge with any time-limited VMP is to attempt to create what takes decades or longer to achieve in nature. The VMP will attempt to fast-track the establishment of a self-sustaining ecological community.

This VMP places priority on re-establishing connectivity within the Anna Bay ecotone for Koala and other flora and fauna by ensuring the establishment of canopy trees and associated shrub and understorey layers in the VMP lands.

Spreading of stored topsoil following earthworks within VMA5 will assist in regeneration of the area by restoring the seed bank contained in the topsoil. It should be noted that this area will require weeding maintenance and some pioneer species planting following topsoil spread, as the topsoil is likely to contain a viable seed bank of noxious weeds which will have a deleterious effect on native flora recruitment.

4.3 Timber and Logs

Timber and logs associated with the clearing of VMA5 are to be conserved and placed as habitat and/or erosion and sediment control in VMA1. Any logs over a diameter of 100mm should be used.

4.4 Threatened Species

During the assessment process, threatened fauna species recorded were typical of those expected in this locality in a disturbed edge remnant and regrowth area. Threatened species recorded within the study area were limited to the Little Bentwing-bat (*Miniopterus australis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). The works associated with the VMP aim to improve long term viable habitat for these species along with Koalas and other potentially occurring threatened species.

Rehabilitation of the VMP lands will incrementally increase opportunities for Koala and other native flora and fauna, including many threatened species, to utilise the habitat and connectivity created.

4.5 Weeds

The VMP lands contain significant weed infestation, particularly *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush), *Lantana camara* (Lantana) and *Pinus radiata* (Monterey Pine). Targeted eradication programs will be required to control weeds as the first stage of VMP works. Physical and chemical control of dominant weed species should be a priority to allow regeneration of the VMP lands through selected planting and the opportunity for any existing native seed bank to be activated by available light and nutrients. Regeneration of CSABF and SSF EEC species (including emerging PKHT canopy trees *Angophora costata*, *Eucalyptus robusta*, *Melaleuca quinquenervia* and *Casuarina glauca*), was observed within VMP lands and adjoining areas, which indicates the presence, at least in part, of a viable native seed bank.

Recruitment of endemic specimens from this seed bank will be greatly enhanced by effective retardation of regenerating noxious weeds. The regeneration of the VMP Lands will be best achieved by early activation of a primary treatment, timely planting, care for plantings and weed prevention program as outlined in later sections.

Regular monitoring will inform the requirement for alterations to on-going weed control methodologies for the VMP Lands.

4.6 Erosion and Sediment Control

A required function of swamp and drainage lines in the developed landscape relates to the long-term drainage function of the catchment. The VMP Lands require sensitive management to ensure drainage function and water quality measures are optimised. Appropriately designed best practice erosion and sediment control structures should be implemented prior to commencement of earthworks and construction activities in the adjoining lots to protect downslope and VMP Lands.

4.7 Edge Effects

The VMP lands have a high perimeter to area ratio, meaning the VMP lands are highly susceptible to "edge effects" that will require ongoing management at all stages of the VMP works.

Methodologies detailed in later sections seek to overcome the influence of edge effects via intensive regeneration works around the perimeter of the VMP lands, the use of "native

forest blend" type mulch and by planting greater densities of pioneer and dominant native species in these areas.

4.8 Feral Animals

Rabbits have the potential to have substantial adverse impacts upon revegetation efforts within the VMP lands, as a result of their grazing pressure on plantings, and watercourse geomorphology as a result of burrow creation. However, noting the inherent issue of re-colonisation from adjacent unmanaged lands, a realistic goal would be to control pest species on the site to levels that do not pose notable impediments to achieving the aims of the VMP, and protect juvenile plantings from herbivory.

Chemical and physical control of vermin should only take place in compliance with legislated guidelines.

4.9 Acid Sulphate Soils

There are minimal civil works required by this VMP that would result in significant soil disturbance and exposure; hence the risk of Potential or actual Acid Sulphate Soils from the VMP works is considered low. If suspected Acid Sulphate Soils are encountered, works must cease immediately and can only recommence with the implementation of an Acid Sulphate Soils Management Plan approved by Council.

4.10 Bushfire

Bushfires are a natural and periodic event in the Australian landscape. Many Australian plants and animals have adapted to fire over thousands of years and require fire as part of their life cycle. However, development adjacent to bushland areas has increased the risk of fire impacting on people and their assets. Fire management needs to strike a balance between the protection of life and property and the maintenance of ecological processes and systems.

Two residences, one within the study area and another in the lot immediately south of the VMP lands, could be threatened in the event of a bushfire within VMP lands. Bushfire hazard should be managed in accordance with Asset Protection Zones (APZs) detailed in NSW RFS - Planning for Bushfire Protection (2006), particularly Appendix 5 – Bushfire Provisions – Landscaping and Property Maintenance.

Plantings within VMP lands within the zones abutting residential areas should be restricted to groundcover and scrambling types with canopy to be maintained in a discontinuous nature. This will still allow for wildlife thoroughfare while ensuring risks of bushfire to adjoining properties is not heightened as a result of VMP works.

4.11 Hygiene - Potential Pathogens / Disease

As with any civil construction site, there will be potential for flora and fauna pathogens and diseases to be introduced to the site during construction. The BRC should document and implement appropriate hygiene controls and formulate appropriate response plans to minimise the chances of such an event occurring.

5.0 Management Strategies

5.1 Management Objectives and Strategies

Goals of ecological restoration (which can include both assisted natural regeneration and reconstruction through revegetation) is ultimately the self-perpetuation of a plant community, in this case one which approximates the available understanding of the pre 1788 structure (NSW Department of Infrastructure, Planning and Natural Resources, 2003).

The strategies outlined in following sections are designed to encourage a self-sustaining community, within the constraints of the degraded present state of the VMP lands, the small scale of the rehabilitated areas in the wider study area, and significant challenges arising from edge effects given the lineal nature of the VMP lands.

Complete recreation of ecological communities is difficult, and takes many years, and frequently is beyond the scope of a VMP. This is particularly the case for more disturbed and/or pasture dominated areas. As such, focus should be on a trajectory of performance over an extended period rather than any specific numerical goals.

To measure progress towards this objective, vegetation monitoring will be implemented to track the performance of the management areas towards the end goal of a self-sustaining native vegetation corridor. Monitoring will also inform adjustments to management strategies in the VMP.

5.2 Management Priorities

In regards to setting priorities, it is important to consider the key objectives, and particularly timeframes, that relate to development activity surrounding the VMP lands. Also, the general principles of minimal intervention, maximising use of existing natural assets, cost control and realistic outcome expectations need to be applied.

In that vein, the following priorities have been set for tasks associated with the works. Works should occur concurrently or consequentially wherever possible:

Highest Priority (before commencement of construction works for project)

- Implement erosion and sediment controls for earthworks in accordance with *Managing Urban Stormwater: Soils and Construction* (the "Blue Book") to protect VMP lands; and
- Installation of fencing and signage to prevent incursion into VMP Lands; and
- Primary treatment of mature woody weeds and pasture in VMP lands.

<u>High Priority, (immediately on commencement of works in VMP lands)</u>

- Collection of logs associated with the clearing of VMA5;
- Placement of logs within VMA1;
- Planting pioneering SSF EEC species and Preferred Koala food trees (PKFTs) in bare pockets across VMP lands(VMA1).
- Hand control of Lantana and other weeds in remnant Freshwater Gahnia Sedgeland VMA2;
- Planting SSF EEC species and PKFTs in VMA2 and VMA3;
- Planting of CSABF canopy species along cleared fringes of VMA4;
- Weekly follow-up watering and monitoring of all new plantings for 3 months (especially through the first summer after planting) to minimise plant loss;

<u>Lowest Priority, (following completion of works);</u>

- Monitoring and annual reporting to Council; and
- Actions triggered by monitoring.

Management actions must be responsive to any identified notable events or relevant matters arising that may affect the desired outcomes of the VMP.

Management strategies and priorities are shown in **Table 2** below.

6.0 VMP Implementation

All physical rehabilitation work is to be supervised by an appropriately qualified and experienced bush regeneration contractor (BRC) in consultation with the Project Ecologist. Works are broadly sequential, but some overlap in time is appropriate.

6.1 Management Guidelines

Detailed explanations of works are presented below in **Table 2**.

Table 2 – Management Guidelines

Management Issue	Priority / Timing	Relevant Action	Responsibility / Covered by
Control Access	Before commencement of earthworks	Remove barbed wire around and within VMP Lands and remove from site	Civil Contractor
		Erect fencing to prevent stock incursion and deter public access and maintain	Civil Contractor guided by current land usage layout Project Ecologist to oversee placement and report in monitoring events
		Erect and maintain signage at three key entry points	Civil Contractor
	Maintenance	Maintenance of signage and fencing as required	Proponent to maintain Annual Report to inform of efficacy
Monitoring	Before commencement of earthworks	Set up and take baseline photos at photo monitoring points for reporting	Project Ecologist
	Completion of initial VMP works	Reporting to council to inform maintenance	
	Ongoing for life of VMP	Ongoing Annual reporting	

Management Issue	Priority / Timing	Relevant Action	Responsibility / Covered by
Erosion and Sediment Control	Before commencement of earthworks Constant inspection and maintenance as required by storm events and "wear and tear" Monitoring	Appropriately designed best practice erosion and sediment control structures should be implemented to protect VMP lands from the earthworks activities prior to commencement	Civil Contractor All contractors to be aware of need for maintenance Monitoring by Project Ecologist
Collection and placement of Logs	Prior to clearing of VMA5	Logs with a diameter of greater than 100mm should be collected from VMA5 and placed in VMA1.	Civil Contractor
Commence Recruitment of Endemic Native Flora – Ecotones by Planting	Immediately on commencement of VMP works	Plant tubestock (especially PKHT canopy species) in small clearings in the ground ASAP	BRC in consultation with Project Ecologist
	Primary Plantings Maintenance	Weekly watering for first 3 months and replacement if required	BRC
Weed Control Primary	Immediately on commencement of VMP works (subject to treatment seasonality – consult Project Ecologist / BRC)	Hand treat mature weeds, Lantana, Bitou, Pine and any other mature woody weeds - poison and leave standing for temporary habitat and to decrease fire hazard Hand remove immature weeds	BRC in consultation with Project Ecologist
		Remove potential revegetative weed parts from VMP lands and dispose of	
		Grasses and herbs - spray where necessary (selective methods to ensure protection of native species and EECs)	

Management Issue	Priority / Timing	Relevant Action	Responsibility / Covered by
Endemic Native Flora – Ecotones; Progress Habitat Improvement	After Primary weeding	Planting of endemic SSF EEC species, canopy species for habitat connectivity and Koala food and habitat trees (PKHTs) in particular	AEP species selection BRC to source local provenance suitable flora species
	Maintenance	Weekly watering for first 3 months and monitoring	BRC
	Replanting to cover plant losses as required with PKHTs	As required when noticed during weekly watering events	BRC in consultation with Project Ecologist
	Monitoring	To inform required further actions	Project Ecologist
Follow up Weed Control	Ongoing to end of VMP	Prevent establishment of noxious weed preventing recruitment of native vegetation	As observed or informed by reporting by Project Ecologist
Control of Feral Animals	Ongoing	Limited effectiveness of any program due to edge effects and access from surrounding properties Trapping / baiting where suitable	Proponent
Acid Sulphate Soils		Unlikely to occur. If suspected Acid Sulphate Soils are encountered, work to cease immediately and only recommence with an Acid Sulphate Soils Management Plan approved by Council.	Proponent and all contractors
Bushfire Hazard	Ongoing	No green waste piles within VMP Lands	BRC and proponent.
	Planting works	Plant shrubs and trees <1 per 25m^2 where mature plants could pose bushfire hazard to property	BRC in consultation with Project Ecologist
	Ongoing	Manage hazard areas as APZs	BRC, Proponent

Management Issue	Priority / Timing	Relevant Action	Responsibility / Covered by
Edge Effects	On commencement of VMP works	Intensive weeding works around the perimeter of the VMP lands Greater density of pioneer and dominant native species in these areas Mulching after planting works Post works reporting to inform follow-up action	BRC in consultation with Project Ecologist
	Ongoing	Spot weeding, planting native species and mulching	BRC Annual monitoring to inform actions
Injury to Threatened Species	Ongoing	Possible encounters to be aware, stop work and contact Project Ecologist	BRC and contractors
Site Hygiene - Potential Pathogens & Disease	Before commencement of earthwork and Ongoing	Exclude access to authorised personnel only Implement appropriate hygiene controls and formulate appropriate response plans	BRC and all contractors

6.2 Implementation Details

6.2.1 VMP Areas Preparation

Physical Protection

Prior to the commencement of construction works, rural style fencing is to be erected by the civil construction contractor around the VMP lands, primarily to exclude livestock from the areas, but also to indicate the areas to be managed under this VMP.

Signage is to be erected along installed fencing to inform persons on site of the ecological value of the VMP lands, and highlight the importance of rehabilitation works being conducted. Signage detail is shown in **Appendix B.**

All native trees in the VMP lands are to be retained, and physically protected during works if required.

Any accumulated rubbish should be removed from VMP Lands prior to construction works. Machinery and vehicles coming on to site should be appropriately cleaned to prevent downslope spread of weeds and disease into VMP lands and adjacent bushland.

Erosion/Sedimentation Controls

Current best practice erosion and sedimentation controls are to be implemented by the construction contractor prior to construction works, and maintained for the life of the project. Erosion and sediment controls for all the project should be implemented in accordance with the *Blue Book* to protect the downslope VMP lands and adjacent bushland. Measures including silt fencing, sediment filters and temporary flow diversion systems should be installed within demarcated construction areas.

Collection and placement of Logs

Prior to and following the clearing of VMA 5, logs with a diameter of greater than 100mm are to be collected, trimmed and placed in VMA1 as supplementary ground habitat. The number and length of logs placed are to be recorded and noted in the monitoring report.

Construction

Stockpiling of or mixing of materials (including soil, vehicle parking, solid or liquid disposal, machinery repairs and refuelling) should not occur within the VMP lands.

Ongoing rubbish removal should be conducted whenever rubbish is observed during works, and thorough checks made as part of the maintenance and monitoring program for the site. Erosion and sedimentation controls must be applied to all stockpiles.

Disease and Pathogen Prevention

Protocols for the prevention of disease and pathogen spread particularly *Phytophthora cinnamomi* (Root-rot Fungus), into the VMP lands are to be established by the BRC prior to any works on the site. This would include such measures as vehicle wash-down areas, tool sterilisation points and appropriate certification/sterilisation of imported soil. The BRC should be experienced with these protocols and understand the importance of their implementation.

Post construction

VMP lands fencing and signage is to be maintained on the fencing surrounding the VMP lands.

The Project Ecologist or BRC should be consulted to ensure erosion and sedimentation control measures are no longer required prior to their removal from the VMP lands.

Weed suppression materials

The BRC should oversee all weed control operations and choice of measures, considering location of the risk, the effect on soil aeration, water penetration and soil temperature, and its weed suppressing and native plant germination properties (Buchanan, 1989).

All replanted areas within the VMP lands are to be covered with "native forest blend" mulch to stabilise soil, inhibit weed regrowth and retain soil moisture.

Monitoring

PMPs are to be established by the Project Ecologist prior to construction works. The PMPs should be located at regular intervals within the VMP Lands, and adequately represent vegetation type to monitor the progress of rehabilitation works. Initial photos are to be taken at each PMP, and appropriate notes taken prior to works to provide a baseline reference going forward.

6.2.2 Weed Control

Within bushland in the VMP Lands, the major woody weeds of concern present are *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush), *Lantana camara* (Lantana) and *Pinus radiata* (Monterey Pine). Within grasslands *Andropogon virginicus* (Whiskey Grass), *Chloris gayana* (Rhodes Grass) and *Melinis repens* (Red Natal Grass) are prevalent.

Weed Control for VMP lands requires an integrated approach to be designed and implemented by the BRC, in consultation with the Project Ecologist.

Primary weed management should include the following:

- Manually treat (remove or cut/scrape and paint) mature woody weeds in remnant vegetation areas prior to revegetation works (use herbicides as directed on the product information);
- Installation of weed control matting, such as jute mat, jute mesh, eco-cell, coir fibre logs and brush matting prior to planting; and
- After planting, a native forest blend type mulch should be applied to suppress weed regrowth. A one to two metre diameter area around each plant should be mulched.

It is not possible to weed a site just once as the disturbance caused by the initial weeding, no matter how carefully carried out, will have disturbed some soil. It is therefore important to revisit the rehabilitation area for follow up weeding, as cleared areas containing even moderately disturbed soil are highly conducive to weed invasion.

Consolidation of weed management should include the following actions:

- Physical removal;
- Spot treatment within mulched areas to control any regenerating weeds; and
- Top up mulch where required.

Ongoing weed management should be limited to the removal of any woody weeds or listed noxious weeds. As the trees and shrubs within the revegetation areas mature, pasture and other weeds should naturally be suppressed.

Mulch applied around plants also helps to control water loss and soil temperature fluctuation. Weed control and grass root control is essential around plantings as many weeds and grasses can compete with seedlings for nutrients and water. An area of 1-2 metres diameter around each plant should be maintained weed free (Buchanan, 1989).

6.2.3 Herbicides

If any herbicides are proposed to be used, the following factors are to be taken into consideration when selecting the herbicide:

- The safety of the particular herbicide to users, desirable plants, soil micro-organisms, amphibians, birds and mammals; and
- The economics and time constraints of using herbicides over other methods.

Directions must be strictly followed and all precautions followed over time. For example, Glyphosate herbicides are systemic and non-selective. They are commonly used in bush

regeneration as they are regarded as being comparatively safe for the operator and native fauna, in addition to which they become inactive immediately on contact with the soil. Therefore, it is considered relatively safe if used carefully in native communities, as there is little chance of it moving through the soil (Buchanan, 1989). Glyphosate and other chemicals can be applied using various methods including drilling, cut stumping and direct foliage spray. Up-to-date local regulatory authority, supplier and manufacturer information will be used to determine the most appropriate method.

If spraying is necessary, it must be undertaken in suitable conditions and left for the recommended period. The best time to apply systemic poisons is when water and sugars are being rapidly moved (translocated) around the plant. This is usually in the growing season, when the plant is not stressed, and at a time of the day when transpiration is rapid. Plants which sucker easily from roots in addition to plants with underground reproductive organs must be treated just after flowering to ensure sugars (and hence herbicides) are moving down to the bulbs, or tuber. Treatment when sugars are moving upward from the underground organ to form the new seasons shoot will be of little effect (Buchanan, 1989).

Appropriate occupational health and safety practices must be in place to ensure accidents or herbicide spillages do not occur. These must also include the preparation of contingency plans in the event of any accidents.

Ongoing monitoring as to the effectiveness of the noxious weed removal will be reported during monitoring periods by the Project Ecologist.

6.2.4 Revegetation

The large-scale planting works within VMP Lands have the overall aim of revegetating each VMA with relevant species over the long term, providing habitat and connectivity for Koala and other native fauna.

The BRC should design and undertake all planting activities. Planting techniques will depend on species type, location, number and density, and the BRC should direct the approach to such works to respond to site conditions. Planting densities will aim to achieve quick vegetative cover and root mass to maximise VMP lands stability and reduce recruitment and regeneration of weeds.

As a general guide, the plantings should comprise 20% trees, 30% shrubs and 50% groundcovers; allowing 10m to 15m between trees, with clumps of 5 to 20 shrubs between trees. Canopy species plantings should be concentrated in the identified KPoM corridor of VMP lands (VMA1) and preference should be given to PKHTs (e.g. *Eucalyptus robusta, Melaleuca quinquenervia, Casuarina glauca* and *Angophora costata),* and pioneering and dominant native species (e.g. *Lomandra longifolia, Acacia longifolia* and *Leptospermum laevigatum*) should be used along the "edges" of the VMP lands to assist in deterrence of weed invasion.

Sedges and grasses should be planted among shrubs and trees, inside the pioneering species to avoid competition from regrowth weeds.

The proposed mix of plant species relates to the actual community to be emulated (see below). Where available, use of native plants and seed sources of local provenance will be preferenced.

Pioneer species should be utilised to provide short-term channel and bank stabilisation.

Minimum density of initial planting should be a minimum of:

- Canopy and small trees– 1/20m^2 ,;
- Small trees– 1/10m^2 ,;
- Shrubs – 1/m^2 (use pioneering shrubs on the outer edge of VMP lands as a protection line against weed regrowth; and
- Understorey– 2/m^2, throughout VMP lands inside the line of pioneering species.

Species distribution and abundance within the VMP lands should be confirmed and/or amended by an appropriately qualified and experienced bush regenerator, ideally with minimum qualifications of TAFE Certificate IV in Bush Regeneration or Conservation and Land Management, and 3 years of experience in the field (the BRC), and be guided by industry accepted guides e.g.: *Bringing back the Bush: the Bradley Method of Bush Regeneration Recovering Bushland on the Cumberland Plain,* (Bradley, 2002) and *Best practice guidelines for the management and restoration of bushland* , (DEC, 2005).

Suitable shrub and tree species are listed in **Table 3**.

NB: Any other species proposed by the bush regeneration team or specialist plant nursery should be commensurate with relevant vegetation communities and approved by the project ecologist.

The plants used for revegetation works should be tubestock in size, sourced from a local native specialist nursery and be of local provenance.

Timing of planting is important. Ideally, planting will occur in spring after frost occurrence has abated and before intense summer heat arrives. This will reduce plant mortality and costs associated with replacement.

All physical vegetation rehabilitation work is to be supervised by the BRC.

All revegetation works in the VMP lands should be suitably protected from grazing by stock by installation of rural style fencing prior to commencement of works.

Plant Provenance

Where practical, plants should be of local provenance, sourced from a member of a recognised industry association. As a contingency, additional plants will be propagated for replacement plantings, of a volume appropriate to attain 80% survival of plants in rehabilitated areas at the end of the revegetation program.

Plants will be provided to site as tubestock. They will have well developed root systems but not be pot-bound, consist of one main stem, be vigorous, pest and disease free, have been hardened for at least two weeks prior to site delivery and be stored in trays of similar species which are easily identifiable.

Table 3 shows species commensurate with SSF EEC that are suitable for the revegetation works. **PKHTs are shown in bold**, while pioneer species for concentrated use on VMP land edges are underlined.

Table 3 – VMP Lands Species List

Scientific Name	Common Name
Tree Canopy Species (>6m)	
Allocasuarina littoralis	Black She-Oak
Casuarina glauca	Swamp Oak
Eucalyptus pilularis	Blackbutt
Eucalyptus resinifera spp. *hemilampra*	Red Mahogany
Eucalyptus robusta	**Swamp Mahogany**
Eucalyptus tereticornis	**Forest Red Gum**
Ficus coronata	Sandpaper Fig
Livistona australis	Cabbage Tree Palm
Lophostemon suaveolens	Swamp Turpentine
Melaleuca ericifolia	Swamp Paperbark
Melaleuca linariifolia	Flax-leaved Paperbark
Melaleuca quinquenervia	**Broad-leaved Paperbark**
Melaleuca styphelioides	Prickly-leaved Tea Tree
Shrub Species (~1.5-6m)	
Acacia irrorata	Green Wattle
Acacia longifolia	Coastal Wattle
Acmena smithii	Lilly Pilly
Banksia oblongifolia	Fern leaved Banksia

Scientific Name	Common Name
Banksia spinulosa	Hairpin Banksia
Breynia oblongifolia	Coffee Bush
Callistemon salignus	Crimson Bottlebrush
Dodonaea triquetra	Large leaf Hop-bush
Elaeocarpus reticulatus	Blueberry Ash
Glochidion ferdinandi	Cheese Tree
Homalanthus populifolius	Bleeding Heart
Leptospermum polygalifolium subsp. *polygalifolium*	Tantoon
Melaleuca sieberi	Sieber's Paperbark
Morinda jasminoides	Sweet Morinda
Polyscias sambucifolia	Elderberry Ash
Groundcover Species (~0-1.5m) & Vines/Scramblers	
Adiantum aethiopicum	Maiden Hair Fern
Baumea articulata	Jointed Twig Rush
Baumea juncea	Bare Twig Rush
Blechnum camfieldii	Lance Water-fern
Blechnum indicum	Swamp Water-fern
Calochlaena dubia	False Bracken
Carex appressa	Tall Sedge
Centella asiatica	Indian Pennywort +
Dianella caerulea	Blue Flax Lily +
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Gahnia clarkei	Tall Saw-sedge
Gahnia sieberiana	Red-fruit Saw-sedge

Scientific Name	Common Name
Glycine clandestina	Twining Glycine
Gonocarpus tetragynus	A Raspwort
Hydrocotyle peduncularis	A Pennywort
Hypolepis muelleri	Harsh Ground Fern
Imperata cylindrica var. major	Blady Grass
Isachne globosa	Swamp Millet
Lomandra longifolia	Ribbon Grass
Oplismenus aemulus	Basket Grass
Oplismenus imbecillis	Basket Grass
Pteridium esculentum	Bracken
Parsonsia straminea	Common Silkpod
Phragmites australis	Common Reed
Pratia purpurascens	Whiteroot
Stephania japonica var. *discolor*	Snake Vine
Themeda australis	Kangaroo Grass
Villarsia exaltata	Yellow Marsh Flower
Viola banksii	A Violet
Viola hederacea	Ivy-leaved Violet

Bold denotes PKFT

7.0 Monitoring, Maintenance and Reporting

7.1 Monitoring Maintenance

Maintenance requirements should extend after the completion of works with an objective of achieving 80% survival of plantings and <10% weed cover.

It will be necessary to implement Monitoring and Maintenance and resulting actions to achieve the aims of this VMP. Regular maintenance will assist to improve the vegetation community structure and habitat potential within the VMP lands.

Ongoing rubbish removal should be conducted as part of the maintenance and monitoring program for the site. Any non-biodegradable materials remaining from the regeneration works such as virocells, pots and tree guards at the approval of the Project Ecologist or BRC to ensure the measures are no longer required prior to their removal from the VMP lands.

In areas where rehabilitation has failed, been damaged or is suffering from herbivory or disease, replanting should occur at suitable times (spring, when the risk of frost and heat stress is reduced).

Plants lost or damaged should be replaced. Where weeds are controlled, plantings should be undertaken at the BRC's discretion. Plants should be replaced at the size originally specified and in accordance with all planting methods described herein.

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 kept to a minimum so as not to alter the structure of the soil. Thus, watering should only be performed to establish plants. Watering should be undertaken early morning or late afternoon to avoid the hottest part of the day and minimise water loss. The timing of the watering will depend upon the establishment of the plants and watering requirements will be left to the BRC's discretion.

All plants must be monitored for pests and disease. Plants affected badly by pests and disease must be removed, disposed of offsite and replaced.

Maintenance works would be carried out by an appropriately qualified and experienced BRC. Following the primary twelve month maintenance period, it is envisaged that minimal maintenance will occur or be required within the site, however periodic maintenance may be required up to the life of the VMP.

7.2 Reporting

Annual compliance and monitoring reports should be prepared and submitted to Council. The Project Ecologist will be required to compile the monitoring reports and it will be the responsibility of the proponent to ensure that the reports are completed and submitted to the relevant authorities, and that recommendations from the reporting are adhered to. The following reporting procedures are recommended as suitable for this project:

- Reports will be submitted within six months of completion of revegetation works, and biannually thereafter ;
- Photos from the photo monitoring points (PMPs) will be included to assess progress of the works; and
- Reports will include a summary of works carried out, any problems encountered with implementing this VMP as well as how these problems were overcome. Regular reporting on the implementation and status of works covering progress, success or failures and completion will be provided.

Ten (10) GPS located PMPs are to be established prior to commencement of VMP works, with two occurring in each respective VMA. An indicative location for the PMPs is provided in **Figure 2**.

8.0 Work Schedule Summary

The recommended implementation timeline for the various management actions described in this VMP are shown in **Table 4** below.

Table 4 – Works Schedule

Action	Timing of Actions									Responsibility
	Initial Works	Year 1				Year 2				On-going*	
		W	M	Q	B	M	Q	B	A	B	
Fencing and signage	Before commencement of Earthworks										Civil Contractor
Primary manual weeding	Before commencement of VMA1 works										BRC
Primary weed spraying	Before commencement of VMA1 works										BRC
Initial tree planting within VMP lands	Within 12 months of DA approval, following weed control										BRC in consultation with Project Ecologist
Collect photographic records at PMPs	Immediately following completion of planting works in VMP lands									*	Project Ecologist
Water plantings (if necessary)	Weekly for first month following planting										BRC
Weed regrowth control	As required									*	BRC
Replacement plantings	As required									*	BRC
Inspect fencing	Quarterly following installation									*	Landowner
Monitoring Report (AMR)	First report within 3 months after Completion of Works, then annual									*	Project Ecologist

W – Weekly; M – Monthly; Q – quarterly; B – Biannually A - Annually;
Tasks are "one-off" if not otherwise indicated.
*** Ongoing until the end of the VMP program.**

9.0 References

Alt, S, et. al. (2009). *Saving Soil – A landholder's guide to preventing and repairing soil erosion.* Published by Northern Rivers Catchment Management Authority for NSW DPI.

Auld, B.A. & Medd, R.W. (1992). *Weeds, An Illustrated Botanical Guide to the Weeds of Australia.* Inkata Press, Sydney.

Bradley, J (2002). *Bringing back the Bush: the Bradley Method of Bush Regeneration*. Lansdowne Publishing, Sydney.

Buchanan, R. (1989). *Bush Regeneration, Recovering Australian Landscapes.* Macarthur Press Pty. Limited, Australia.

Burgman, M.A. & Lindenmayer, D. B. (1998). *Conservation Biology for the Australian Environment.* Surrey Beatty& Sons, Chipping Norton, NSW

Cropper, S (1993). *Management of Endangered Plants*. CSIRO Publishing, Collingwood, Victoria.

Davies, P & Dixon, P (2003). *Bush Regeneration: A Practical Guide to Contract Management*. Environment Protection Authority (NSW).

DECC (2007). *Threatened Species Assessment Guidelines – The assessment of significance*. NSW Department of Environment and Climate Change.

DEC (2005). *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland.* Department of Environment and Conservation (NSW), Sydney.

DoEE (2016). *Protected Matters Search.* Accessed April 2017. NSW Department of Environment, Canberra, ACT.

Gleeson, J & Gleeson, D. (2012). Reducing the Impacts of Development on Wildlife. CSIRO Publishing, Collingwood, Victoria. Harden, G. (ed) (2000). *Flora of New South Wales, Volume 1*. Revised edition. UNSW, Kensington, NSW.

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

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

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

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

Landcom (2004). *Managing Urban Stormwater: Soils and Construction*. (4th ed.). New South Wales Government, Sydney.

Mortlock, W (1998). *Florabank Guideline 5: Seed Collection from Woody Plants for Local Revegetation.* Accessed December 2016 at http://www.florabank.org.au

NPWS (2003). *Lower Hunter & Central Coast Regional Environmental Management Strategy Extant Vegetation Map*. Lower Hunter & Central Coast Regional Environmental Management Strategy.

NSW OEH (2004). *Managing Urban Stormwater: Soils and Construction*, Volume 1, Landcom, www.environment.nsw.gov.au

PSC (2014). *Technical Specification: Vegetation Version 1.0*. Port Stephens Council, Raymond Terrrace, NSW.

PSC, (2016). *Notice of Determination, DA 16-2017-282-1.* Port Stephens Council, Raymond Terrrace, NSW.

Rural Fire Service NSW (2006). *Planning for Bushfire Protection.* NSW RFS / NSW Department of Planning.

Standards Australia (2009). *Protection of Trees on Development Sites.* Standards Australia, Sydney NSW

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Appendix A – Baseline Vegetation Condition of VMAs

Above - VMA1 Managed Gahnia Sedge community area to be planted.
Below - VMA2 Gahnia Sedge community

Above - VMA3 Disturbed remnant native vegetation near southern boundary
Below - VMA4 Shrubland

Above - VMA5 Extraction area

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Appendix B – VMP Lands Signage

NO UNAUTHORISED ENTRY

This is a Vegetation Rehabilitation Area

- **NO DUMPING or WASTE DISPOSAL**
- **NO ANIMALS, VEHICLES or MACHINERY**

For information – contact _____ on _____

AEP VMP SIGNAGE 1496 Anna Bay – permanent sign, minimum size 600mm x 400mm erected and maintained at key access points to VMP lands for the life of the project

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Appendix C – Author CVs

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JOEL STIBBARD
Curriculum Vitae

Joel is an environmental professional with a diverse background of research and monitoring experience in both terrestrial and aquatic environments. He has focussed over the past 6 years in providing terrestrial ecological consultancy services to a range of clients in the public and private sector, and is highly proficient in flora and fauna survey methodologies, environmental reporting and GIS systems.

Personal Details

Full Name:	Joel Ryan Stibbard
Date of Birth:	20 October 1981
Postal Address:	PO Box 210, ADAMSTOWN NSW 2289
Email:	joel@andersonep.com.au
Phone Mobile:	0417 282 685

Qualifications

- Bachelor of Science (Ecology and Zoology) University of Queensland (2004).
- Currently completing a Masters in Environmental Management through University of Queensland (two subjects to complete).

Licencing

- NSW Scientific Investigation Licence SL101313.
- NSW Animal Research Authority.

Further Education & Training (select summary)

- NSW Driver's Licence: Car and Motorcycle (Class "C" and "R"). Experienced 4WD operator.
- Occupational Health & Safety Training.
- Mapinfo Professional Training.
- PADI Divemaster (now expired) and current Rescue Diver.
- PADI recognised Coral Reef Monitoring Training.
- + various other vocational environmental and computer based training sessions.

Fields of Special Competence

- Production of detailed environmental impact assessment documentation. Author of multiple ecological / environmental documents over 6+ years of consultancy work.
- High proficiency in the interpretation, manipulation and presentation (mapping) of spatial data through the utilisation of Geographic Information Systems (GIS).
- Detailed ecological field survey, covering all aspects of terrestrial and aquatic flora and fauna.

- Ecological Management Planning.

Professional Affiliations / Memberships (past / present)

- Hunter Bird Observers Club (HBOC).
- Birdlife Australia.
- Ecological Consultants Association of NSW (ECA).

Relevant Employment History

2015-present **Ecology / GIS Manager**

Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2012-2015 **Ecologist**

RPS, Newcastle

Employed as an ecological consultant at a well-established consultancy during high demand periods of mine expansion works, and maintained employment following the mining downturn as a result of efficiency, versatility and professionalism. Was involved in and was Team Leader of a wide range of ecological surveys, and was responsible for the provision of various documentation including Ecological Assessment Reports, Management Plans and Strategic Assessments. Was responsible for managing and maintaining all GIS data for the ecology and bushfire team, and the production of report-quality maps for all projects.

2011-2012 **Ecologist**

Australasian Resource Consultants (AARC), Brisbane

Employed by local consultancy to undertake flora and fauna surveys for the burgeoning mine expansion sector. Responsible for conducting and reporting on environmental assessments as part of the Environmental Impact Assessment (EIA) process. Gained valuable experience in flora and fauna survey and identification, and utilising GIS at a professional level.

2010 – 2011 **Casual Ecologist**

Environmental Ground Water and Air Consultants (EGC), Brisbane

Employed as a casual ecologist during Masters' studies to assist in flora and fauna surveys on Curtis Island, off Gladstone in Queensland. Works included fauna habitat mapping and threatened flora surveys to inform the development proposal of two large LNG plants on the island. These works provided valuable experience in fieldwork techniques, along with an insight into the professional reality of ecological consultancy.

Relevant Ecological Experience

2007 - 2008 **Researcher**

Global Vision International (GVI), Mexico and Reef Check Australia, Townsville

Volunteer Coral Reef Monitoring Researcher on both the Meso-American Barrier Reef in Mexico (4 months) and the Great Barrier Reef in Queensland (6 months). Responsible for running and implementing dive trips to various reefs and managing teams of volunteers to ensure rigorous data was collected within tight timeframes and testing weather conditions.

2006 – 2007 **Researcher**

Kalahari Meerkat Project, South Africa

Volunteer Behavioural Researcher on a collaborative project between Cambridge University, England and the University of Zurich in Switzerland for 12 months. Involved collecting large amounts of behavioural data for several Meerkat groups in a small group of researchers for a variety of backgrounds and in isolated environments.

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IAN BENSON
Curriculum Vitae

Ian works with AEP in the role of ecologist. He is an experienced bird watcher and a regular participant in wader surveys. Ian has previously had a successful career as a project manager with a local geotechnical engineering firm. His background in project management and soil sciences combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Graduate Diploma in Science (Ecology) University of New England (2014).
- Bachelor Engineering (Civil) University of Newcastle (2008).

Further Education & Training (select summary)

- NSW Class C Driver's Licence. Experienced 4WD operator.
- Occupational Health & Safety Training.
- Rail Industry Worker.
- ARTC Safety Induction for Contractors (NSW).
- ARTC Hunter Bulk Terminal Induction.

Fields of Special Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna.
- Highly proficient at avifauna surveys, including challenging wetland and shorebird environs.
- Project Management.
- Soil science.

Professional Affiliations / Memberships (past / present)

- Hunter Bird Observers Club (HBOC).
- Graduate Member of The Institution of Engineers Australia in the Civil College.

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Relevant Employment History

2016-present **Ecologist**

Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2012-2016 **Project Manager**

Douglas Partners, Newcastle

As a project manager with Douglas Partners I was responsible for proposal and tender preparation, planning, implementation and reporting of geotechnical and geo-environmental investigations for a broad range of projects including site classification, foundations, pavements, bridges and slope stability. I was required to liaise with clients regarding project requirements, project goals and deadlines. I was responsible for the development and implementation of Work Health and Safety Plans as well as Environmental Plans and documentation. This included the development of safe work procedures, safety inspections on site and implementing improved safety procedures with staff. I was responsible for ensuring projects were completed on time and on budget whilst meeting the clients' expectations and achieving quality assurance standards.

2008-2012 **Geotechnical Engineer**

Douglas Partners, Newcastle

AS a geotechnical engineer for Douglas Partners I was involved in the planning and implementation of geotechnical investigations for a wide range of development in the Hunter Valley area. I was primarily involved in site supervision of geotechnical investigations using drilling rigs for boreholes, truck mounted cone penetration testing and test pit excavations using excavators and backhoes. My role also included site inspections involving the assessment of conditions for piles, piers and shallow footings. I also undertook site walkovers for assessment of mine subsidence and slope stability.

2007-2008 **Undergraduate Geotechnical Engineer**

Douglas Partners, Newcastle

Whilst an undergraduate engineer with Douglas Partners I experienced a broad range of practice areas and developed a diverse range of engineering skills.

Relevant Ecological Experience

2013 - Current **Bird Surveyor**

Hunter Bird Observers Club

Volunteer survey work for Hunter Bird Observers Club for regular wader and water bird counts and Tomago and Kooragang Island.

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DENNIS NEADER
Curriculum Vitae

Dennis works with AEP in the role of ecologist. He is an experienced bird watcher and a regular participant in the Stepping Stone Program Bird Surveys in the Upper Hunter Valley. Dennis has previously had a varied career as an environmental scientist, contaminated land consultant and bush regenerator with local firms. His background in project management and bush regeneration, combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Bachelor of Science (Environmental Geoscience) University of Newcastle (2011).
- Graduate Diploma in Environmental Management University of Newcastle (2 subjects to complete) (2014).

Further Education & Training (select summary)

- NSW Class HR Driver's Licence.
- Experienced 4WD operator.
- Senior First Aid.
- Occupational Health & Safety Training.
- High Risk NSW Elevated Work Platform, Dogging and Light Forklift Truck.
- Open Water PADI Dive Certificate.
- Bush Regeneration and Seed Collection.
- Non-Friable Asbestos Removal.

Fields of Special Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna.
- Avifauna surveys, including challenging wetland and bushland environs.
- Project Management.
- Bush Regeneration.
- Contaminated Land – Asbestos Identification and Removal.

Professional Affiliations / Memberships (past / present)

- Hunter Bird Observers Club (HBOC).
- Birdlife Australian.
- Society for Growing Australian Plants.

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Relevant Employment History

2016-present **Ecologist**

Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2014-2016 **Environmental Scientist**

JM Environments, Newcastle

As an environmental scientist with JM Environments, I was responsible for ecological surveys and reporting, water and air quality monitoring, calibration and maintenance of monitoring equipment, contaminated land Phase 1, 2 and 3 assessments, Remediation Action Plan preparation and project management, development of safe work procedures and safety inspections on site. I was responsible for ensuring projects were completed on time and on budget whilst meeting clients' expectations and achieving quality assurance standards.

2010 – 2014 **Environmental Technician**

AECOM, Newcastle

Landscape Function Analysis surveys and reporting, water quality monitoring air quality monitoring.

2010 – 2014 **Contract GIS Technician**

Geodata, Newcastle

Data entry and interpretation of cadastral survey information into GeoCadastre and MapInfo software.

2006 – 2010 **Coal Superintending**

ALS & SGS Newcastle

Coal sampling, superintending and testing, sampling and data entry. Accurate, timely product processing and data entry of coal quality and analysis.

Pre 2006- **Rigging, crane dogman, including outages and construction at major mine and building sites, self-employed in print industry.**

Relevant Ecological Experience

2011 – Current	**Bird Surveys** Hunter Bird Observers Club, Avifauna Baseline Surveys on Broughton Island. CVA Newcastle and Trees in Newcastle – Bird surveys in Hunter Valley for Hunter Valley Stepping Stones Project Great Eastern Ranges 2014-2017. NPWS - Endangered population survey and banding of Gould's Petrel on Cabbage Tree Island off Port Stephens.
2008 – Current	**Bush Regeneration, Plant ID and Seed Collection** CVA Newcastle and Trees in Newcastle. Blueys Beach DuneCare – Mid Coast Council Bush Regeneration.
2010	**Volunteer Coral Reef Research** University of Newcastle on Lady Elliot Island Queensland.