Vegetation Management Plan

including Asset Protection Zone Management

113 Orchard Street, Warriewood

Prepared by Ecological Consultants Australia Pty Ltd TA Kingfisher Urban Ecology and Wetlands

May and updated July 2024

About this document

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Statement of Authorship

This study and report were undertaken by Ecological Consultants Australia for the Client. The author of the report is Elaway (Elaway) Dalby-Ball whose qualifications are BSc. majoring in Ecology and Botany with over 25 years' experience in this field and specialising in projects within Sydney urban areas and Brooke Thompson whose qualifications are BSc. majoring in Conservation Biology. Both also have Sydney area on-ground Bush regeneration experience.

Limitations Statement

Information presented in this report is based on an objective study undertaken in response to the brief provided by the client. Any opinions expressed in this report are the professional, objective opinions of the authors and are not intended to advocate any particular proposal or pre-determined position – they are to fulfil the DA condition requirements.

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Table of Contents

Tables

1.1 Aims of this VMP

The aim for this VMP is to provide a working document that will successfully protect, maintain and enhance the native vegetation at 113 Orchard Street Warriewood, both for immediate rehabilitation purposes and for maintenance into the future. This VMP details management actions relating to the restoration of the original plant community including the management of Asset Protection Zones (APZs).

The VMP has two management zones. The APZ and outside the APZ. See Figure A

Figure A Management Zones. Red APZ (including development area) and Green Conservation area of VMP. Yellow – location of fence (or further East). NB see Figure 1.4a for dimensions of APZ in order to mark on-site. Distance of 18m for all but South West (36m) from residential dwelling

Figure B

Orange = footprint of development and activities (horses).

VMP covers:

Yellow hatch red = APZ outside built upon area.

Remaining land VMP conservation area.

The objectives of the VMP are to ensure that biodiversity values are improved and maintained. The overarching objectives of this VMP include but are not limited to:

- Sensitive creation and management of APZ in a way that maximises Biodiversity
- Conservation and protection of the existing native vegetation and habitats (hollows etc)
- Undertaken restoration and rehabilitation works outside of the development footprint
- Undertaken native vegetation protection measures – western portion in particular
- Retain and re-create areas of fauna habitat – including habitat hollows
- Clear management requirements for the APZ – as per APZ and this VMP.
- Have a framework for monitoring and reporting that can be passed to future owners as well as current.

The information in the report, when implemented, will result in the objectives of the VMP being achieved.

1.2 Duration of this VMP

This VMP is to operate for a minimum period of 5 years under the current plan. After 5 years the plan can continue to be implemented or if needed can be updated then implemented in line with legislation.

APZ requirements and appropriate species for, long term sustainability of native species and assisting the ecology of the site while reducing possibly impacts of weeds on the surrounding native vegetation.

Benchmark –

- Year 1 – APZ sensitively implemented, demarcation of APZ and remained VMP area in place, fencing of western portion of site – beyond APZ, signage about the conservation management zones in place. No bio security weeds on site, no invasive species in VMAP area.
- Year 2 - APZ sensitively maintained, demarcation of APZ and remained VMP area in place, fencing of western portion intact and functioning to keep domestic animals out of far western area. Native ground covers increase in cover outside APZ. Native shrubs to 20% cover outside APZ. No invasive species in VMAP area.
- Year 3 APZ sensitively maintained, demarcation of APZ and remained VMP area in place, fencing of western portion intact and functioning to keep domestic animals out of far western area. Native ground covers increase in cover outside APZ. Native shrubs to 20% cover outside APZ and 10% inside APZ. No invasive species in VMAP area.
- Year 4 onwards repeat year 3 and ensure no encroachment into the conservation areas of VMP (that is VMP outside APZ). APZ to have a diversity of native species and fauna habitat and be compliant with APZ requirements.

1.3 Legislation and policy

The implications for the project were assessed in relation to key biodiversity legislation, policy and guidelines including;

- *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act);
- *Environmental Planning and Assessment Act, 1979* (EP&A Act),
- *Biodiversity Conservation Act, 2016* (BC Act),
- *National Parks and Wildlife Act, 1974* (NP&W Act),
- *Local Land Services* Act, 2013 (LLS Act),
- *Biosecurity* Act, 2015
- *Planning for Bush Fire Protection*, 2019. NSW RFS (PBP, 2019) and updates since then.

1.4 Information sources

The following sources of information were used for this assessment:

Records from the following databases were collated and reviewed:

- BioNet Vegetation Classification
- NSW BioNet Atlas
- NSW Planning Portal Spatial Viewer
- Water Management (General) Regulation 2018 Hydro Line spatial data
- SEED
- Biodiversity Values Map and Threshold tool
- Protected Matters Search Tool
- PlantNET

Site specific documents used in this VMP include:

- Site Plan (Rev J) prepared by Tony McLain Architect dated 11/05/2023.
- Landscape Concept Plan (Rev J) prepared by Tony McLain Architect dated May 2023.
- Arboricultural Impact Assessment and Tree Protection Specification (Ver 3) prepared by Laurence & Co dated 07/04/2023.
- Bushfire Risk Assessment prepared by Bushfire Planning Services dated 13/04/2022.

And relevant updates including tree canopy separation works in the APZ.

Other documentation:

- RFS General Terms of Approval (NSW Rural Fire Service, 4 Oct 2023).

1.5 Scope and Summary

The Vegetation Management Plan (VMP) covers all requirements of a BMP (as per the original Pittwater Councils BMP requirements) it also includes the management of the Bushfire Asset Protection Zone (APZ).

The VMP has been commissioned for this site prior to DA approval / conditions and will need to be reviewed and updated post DA conditions to add relevant ecological conditions to this VMP particularly

those that relate to the management of the site for the life of the development. The updated VMP will be provided to Council at CC stage where it can be reviewed with the added DA conditions. The VMP covers on-going on the VMP area management (life of the development).

The VMP area is all non-built upon areas including the APZ.

THE VMP is required because the Development application (# to be added) included clearing of native vegetation on land identified as containing high biodiversity values on the NSW Biodiversity Values (BV Map). The required studies and report (BDAR) required works to minimise and mitigate impacts on the sites ecology. This plan provides for the implementation and monitoring of requirements.

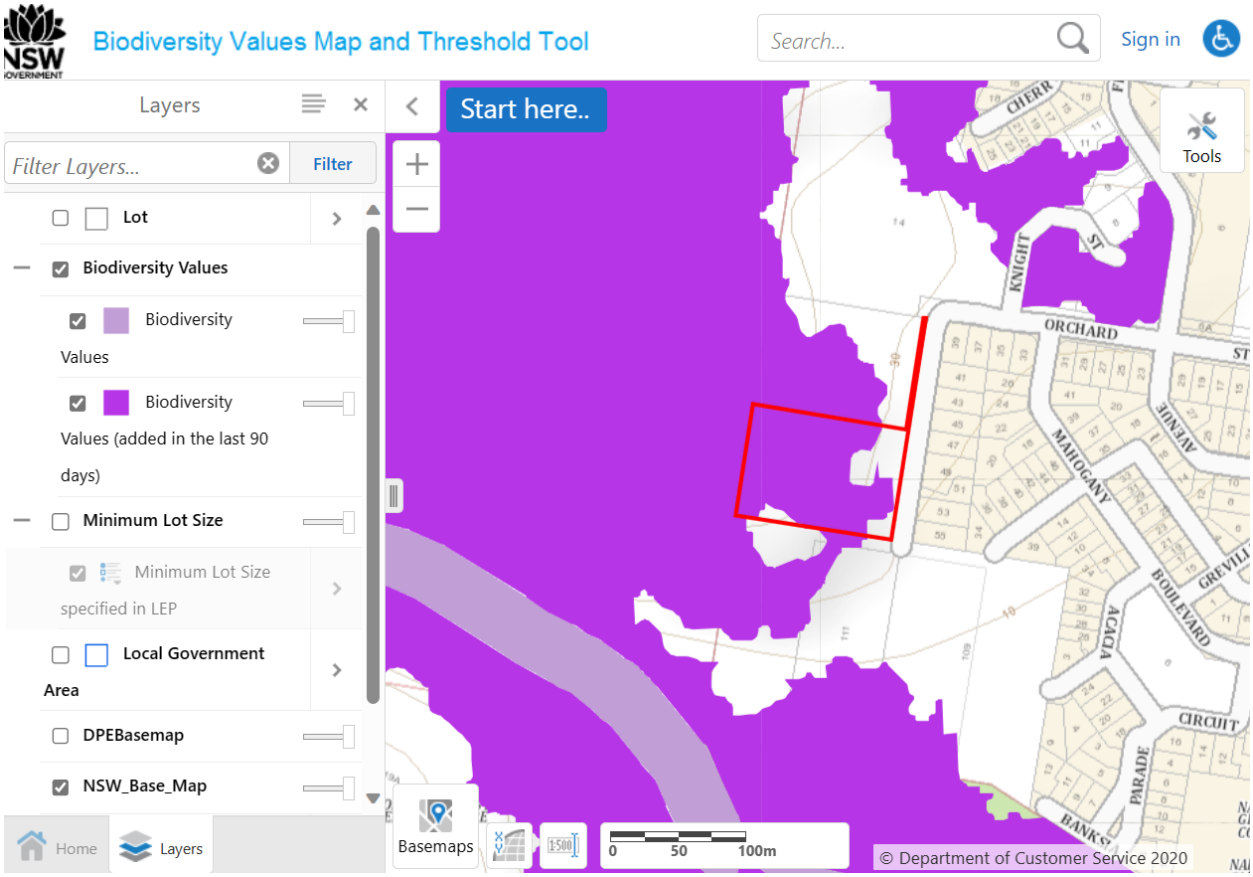


Figure 2.1. Biodiversity Values Map July 2024.

1.6 Summary Actions

Weeds – The site has few weed species and low abundance of priority weeds.

Vegetation Management Plan - This VMP is to operate for a 5-year period then either be updated after 5 years or continue in current form.

Before construction:

- Toolbox talks and site inductions used to educate personnel on the presence of the protected habitat and areas.
- All arborist requirements for trees protection to be in place.
- Habitat trees to have extra bunting and signage.
- Environment protection signage to be installed.
- Primary weeding to be conducted by a bush regeneration contractor.
- Sediment control measures to be implemented where required.

During construction:

- Secondary weeding to be conducted by a qualified bush regeneration contractor.
- Quarterly maintenance inspections undertaken by the project ecologist or bush regeneration contractor. Summary report with photos, comparison to VMP requirements and recommendations to be provided.
- Annual reports (the quarterly reports combined) to be provided to Council's Environmental Officer.
- Nest boxes (x3) designed for microbats to be installed. Nest box installation prior to tree removals
- APZ creation and marking of boundary with permanent markers. Ecologist and Fire consultant to direct implementation. Report on outcomes to be provided to council with phots and this VMP to be updated if required to reflect the APZ area.
- Habitat relocation and additional nest box additions if required (if any lost during APZ creation 2 new to one lost).

Post construction:

- Secondary/maintenance weeding to be conducted quarterly by a bush regeneration contractor.
- Annual maintenance inspections undertaken by the project ecologist or bush regeneration contractor. Summary report with photos, comparison to VMP requirements and recommendations to be provided
- Domestic animal management (keeping outside of the conservation area of the VMP.
- Horse manure/poo and any high nutrient water to be manged. Noting the existing plan of contract removal and management every 2 weeks and more often if required.
- APZ management, retaining native species while keep ground fuels reduced and canopy disconnected and not over hanging dwelling.
- Annual reports to be provided to Council's Environmental Officer.

1.6.1 Subject land and Proposed development

The subject land is a panhandle shaped parcel of land legally identified as Lot 6 of DP 749791 (refer to site details in Table 1.1). Figure 1.1 shows the subject land boundary and proposed development footprint.

Table 2.1. Site details.

Title Reference (Lot/DP)	Lot 6 Lot 6 DP 749791 DP 749791
Area (ha)	0.97
Address	113 Orchard St, Warriewood NSW 2102
LGA	Northern Beaches Council
Land Zoning	RU2 – Rural Landscape
Local Environmental Plan	Pittwater Local Environmental Plan 2014

The development on the site is a dwelling house, horse arena, stables and paddocks and screening landscaping as shown on Figure 1.2 and 1.3 close up. The proposal requires the establishment of an asset protection zone (APZ) as identified in the Bushfire Risk Assessment Report (BPS 2022).

The proposal requires vegetation management in the APZ = 0.29 ha. Removal of vegetation with direct impacts from new structures = 0.04 ha. A total area of 0.45ha of native vegetation will be retained as conservation area. Figure 1.4 shows the APZ identified by BPS (2022). See DA for full details. The Landscape Plan applies only to areas outside of this VMP. See original for full details.

Any plant substitutes are to be approved by Council Environmental area or the project ecologist prior to implementation

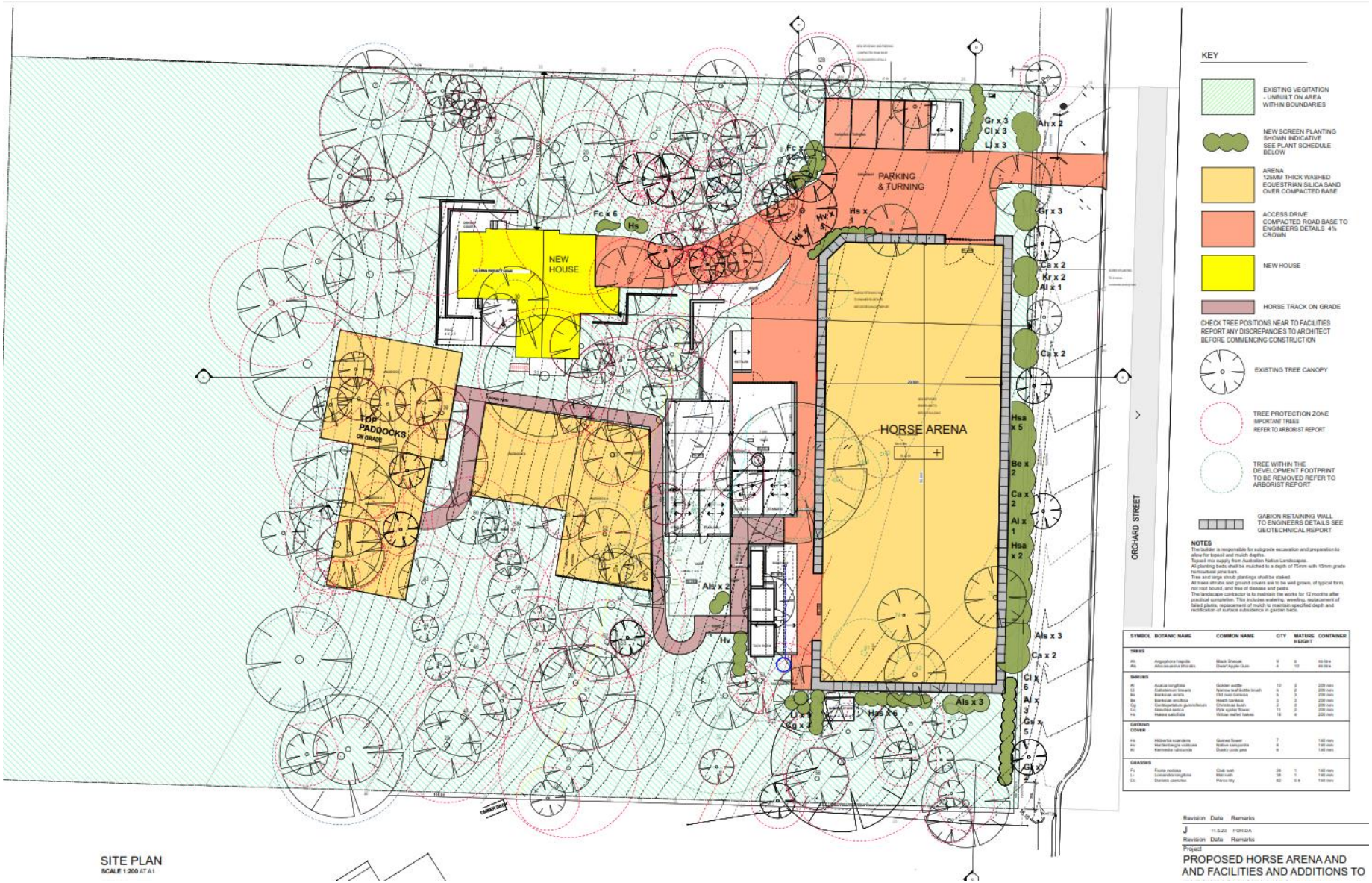


Figure 2.1. Site Plan and landscape (screening) areas (see next for details)

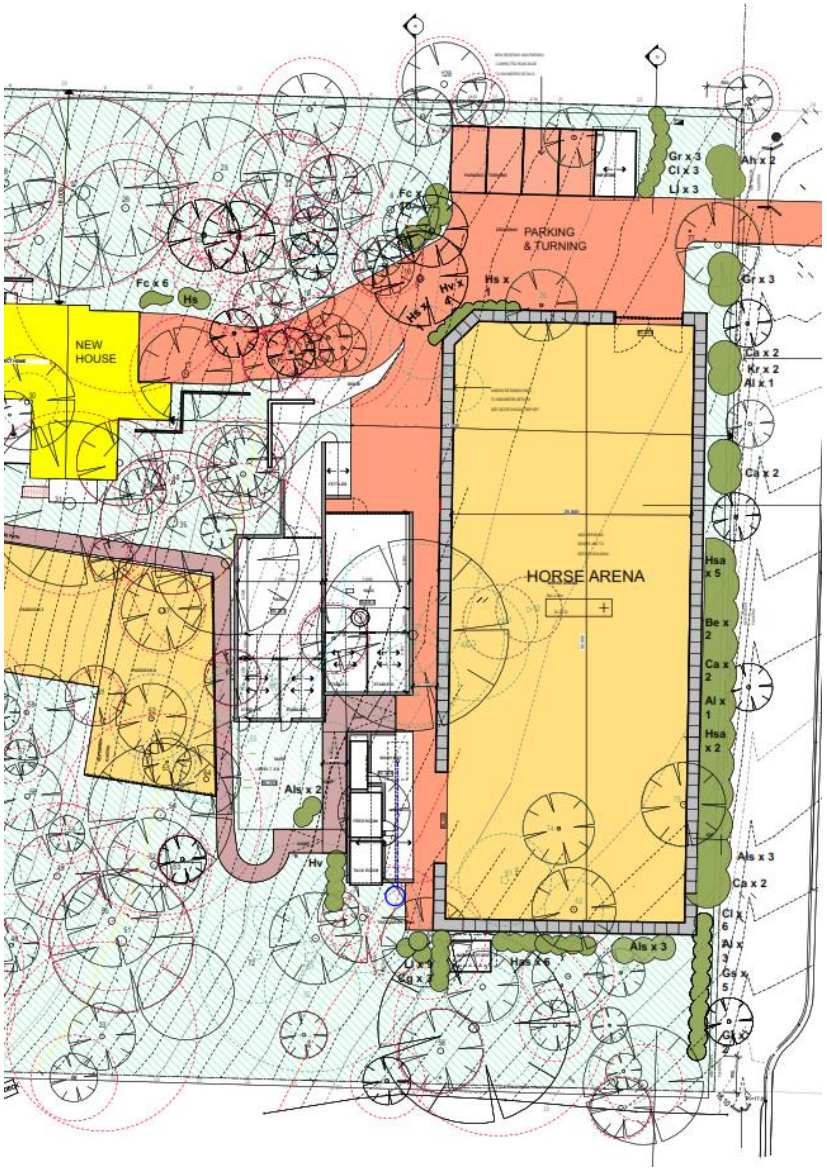


Figure 2.2. Landscape Plan - details.

SYMBOL	BOTANIC NAME	COMMON NAME	QTY	MATURE HEIGHT	CONTAINER
TREES					
Ah	Angophora hispida	Black Sheoak	9	5	45 litre
Als	Allocasuarina littoralis	Dwarf Apple Gum	4	10	45 litre
SHRUBS					
Al	Acacia longifolia	Golden wattle	10	3	200 mm
Cl	Callistemon linearis	Narrow leaf Bottle brush	5	2	200 mm
Bs	Banksias errata	Old man banksia	5	3	200 mm
Be	Banksias ericifolia	Heath banksia	3	3	200 mm
Cg	Ceratopetalum gummiferum	Christmas bush	2	3	200 mm
Gc	Grevillea serica	Pink spider flower	11	2	200 mm
Hs	Hakea salicifolia	Willow leafed hakea	18	4	200 mm
GROUND COVER					
Hs	Hibbertia scandens	Guinea flower	7		150 mm
Hv	Hardenbergia violacea	Native sarsparilla	8		150 mm
Kr	Kennedia rubicunda	Dusky coral pea	6		150 mm
GRASSES					
Fc	Ficina nodosa	Club rush	34	1	150 mm
Li	Lomandra longifolia	Mat rush	34	1	150 mm
Dc	Daniela caerulea	Paroo lilly	82	0.6	150 mm

1.6.2 Bushfire Mitigation = APZ

The area determined as an Asset Protection Zone (inner Protection Zone) Figure 1.4 is to be managed in accordance with RFS General Terms of Agreement (see Appendix 1) and extract below.

Figure 1.4a APZ~ 3000m2 of area. Distance of 18m for all but South West (36m) from residential dwelling.

DA20220130002154-CL55-1

Asset Protection Zones

Intent of measures: to provide sufficient space and maintain reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and prevent direct flame contact.

1. *All residential-zoned lots must be entirely managed in perpetuity as an inner protection area (IPA) in accordance with the requirements of Appendix 4 of Planning for Bush Fire Protection 2019. When establishing and maintaining an IPA, the following requirements apply:*

- *Tree canopy cover should be less than 15% at maturity;*
- *Trees at maturity should not touch or overhang the building;*
- *Lower limbs should be removed up to a height of 2 m above the ground;*
- *Tree canopies tod be separated by 2 to 5 m;*
- *Large discontinuities or gaps in the shrubs layer should be provided to slow down or break the progress of fire towards buildings;*
- *Shrubs not be located under trees; Shrubs should not form more than 10% ground cover;*
- *Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation;*
- *Grass / Ferns should be kept low (as a guide, grass should be kept to no more than 100mm in height); and*
- *Leaves and vegetation debris to be removed regularly.*

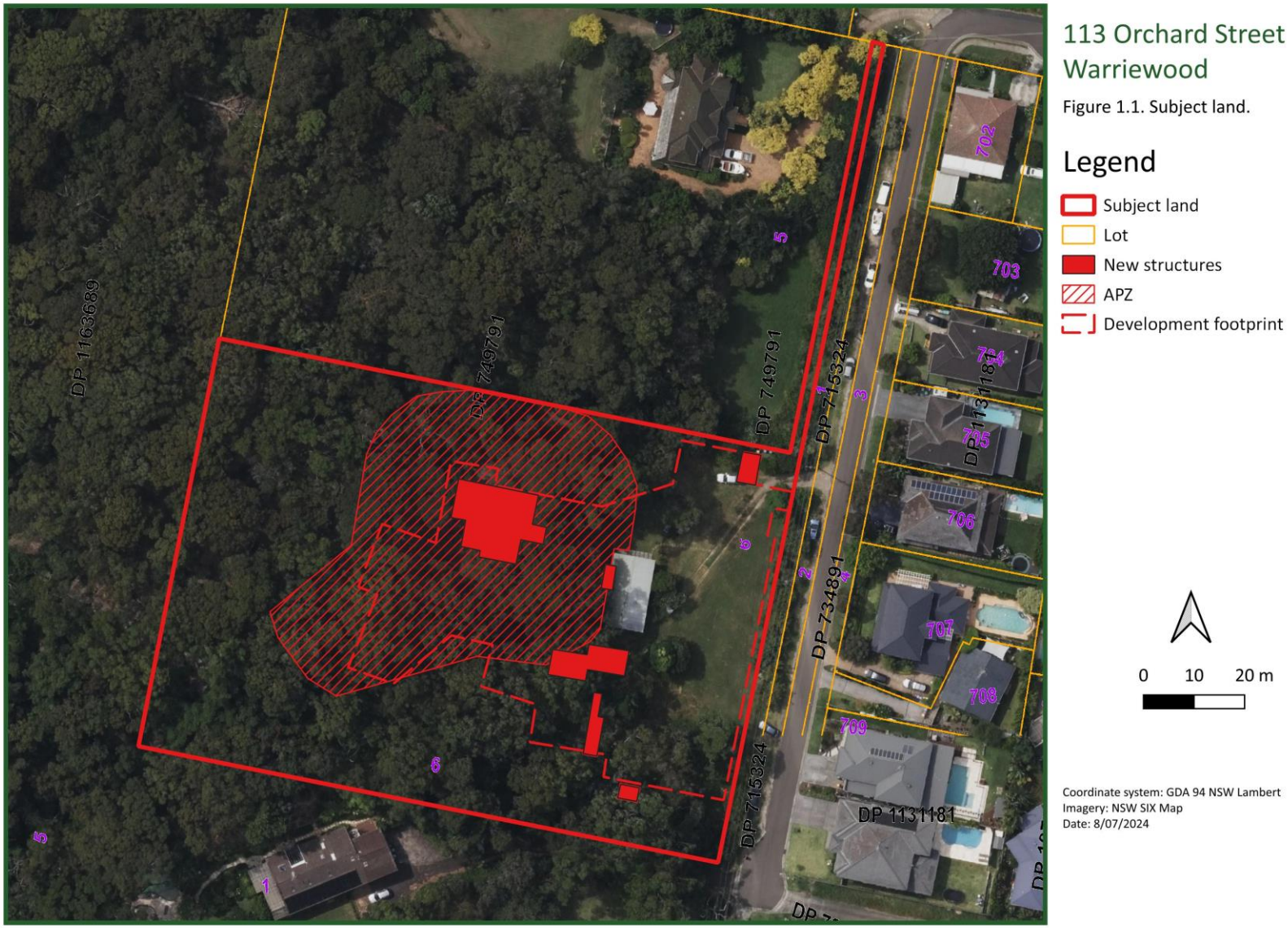


Figure 1.4b APZ and buildings requiring APZ~ 3000m2 of area.

2 Native vegetation

Twp Plant Community Types (PCTs) are growing on the site. Vegetation is mostly Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region (PCT 3136) and a small area of Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion (PCT 3595) is in the south west corner. See Figure 2.1

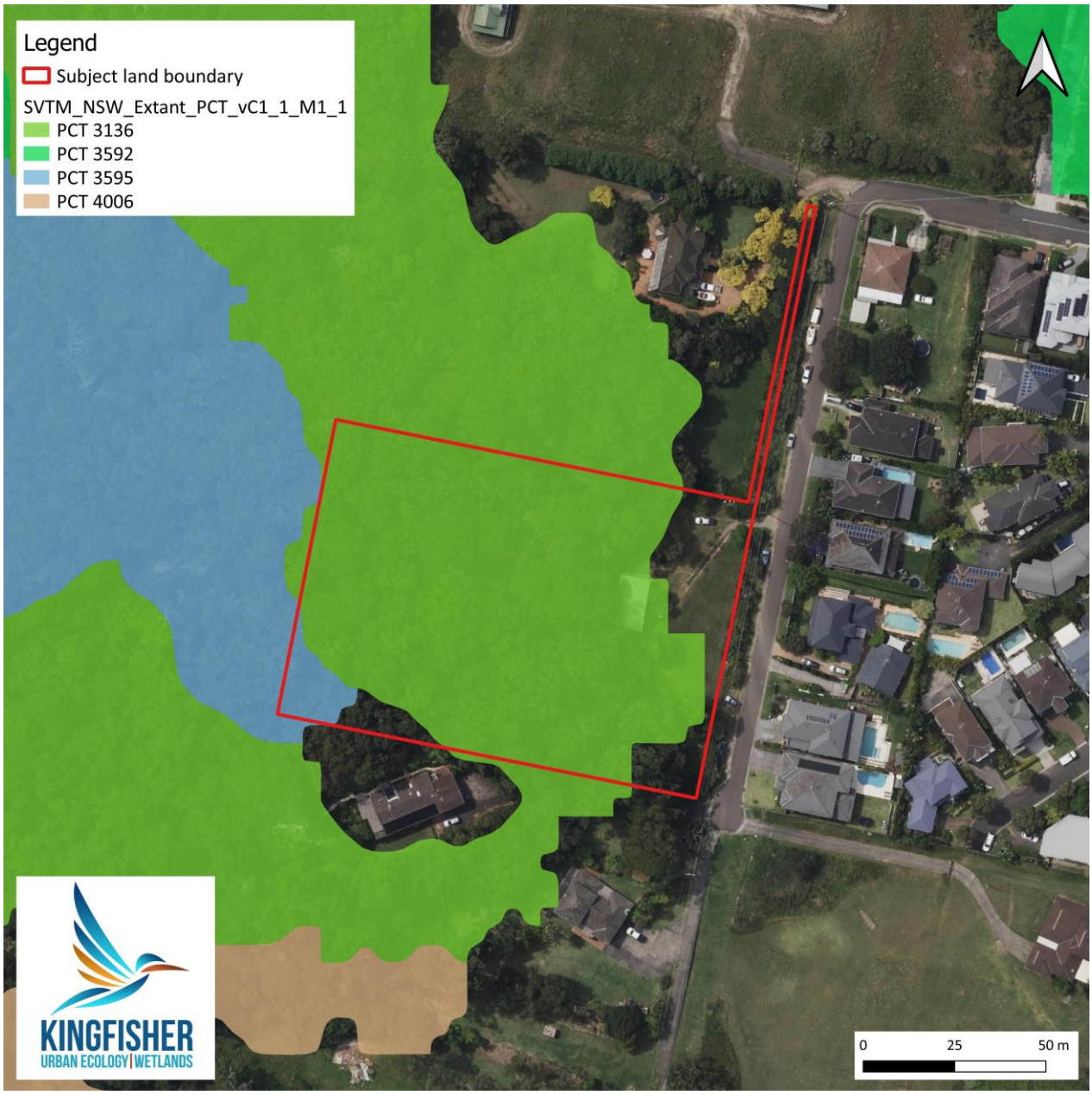


Figure 2.1. PCTs mapped within the subject land via NSW State Vegetation Type Map (DPE 2022).

Species existing on site and vegetation types have been used to determine suitable outcomes and species for planting if needed. Plants recorded on stie and immediate surrounds, and suitable the site, include the following:

Trees: *Angophora costata* (Sydney red gum), *Syncarpia glomulifera* (Turpentine), *Allocasuarina torulosa* (Forest oak), *Glochidion ferdinandi* (Cheese tree), *Eucalyptus piperita* (Sydney peppermint), *Allocasuarina*

littoralis (Black she oak), *Corymbia gummifera* (Red bloodwood), *Eucalyptus resinifera* (Red mahogany), *Angophora floribunda* (Rough barked apple), *Banksia integrifolia* (Coast banksia), *Banksia serrata* (Old man banksia) and *Eucalyptus robusta* (Swamp mahogany) and the Cabbage Tree Palm *Livistona australis.*

Shrubs: *Elaeocarpus reticulatus, Breynia oblongifolia, Hibbertia aspera, Hibbertia dentata*

Grasses: *Lomandra longifolia, Entolasia stricta, Microlaena stipoides, Entolasia marginata, Lomandra filiformis, Imperata cylindrica, Oplismenus aemulus, Lomandra obliqua, Themeda australis, Echinopogon caespitosu,s Xanthorrhoea arborea (grass tree)*

	
***Themeda australis* on-site**	*Xanthorrhoea arborea* on-site

Forbs: *Dianella caerulea, Xanthosia pilosa, Commelina cyanea, Pomax umbellata, Centella asiatica, Poranthera microphylla, Geranium homenium,*

Ferns: *Pteridium esculentum, Adiantum aethiopicum, Asplenium flabellifolium, Calochlaena dubia*

Vines: *Eustrephus latifolius, Stephania japonica, Cayratia clematidea, Hibbertia scandens, Glycine clandestina.*

Example of ground cover with Maiden Hair Fern *Adiantum aethiopicum,* native grasses and the vine *Stephania japonica.* All this is currently in accordance with Planning for Bushfire Protection and APZ requirements. Noting the leaf litter is less than 1cm deep (mostly 1 leaf think only).

2.1 Vegetation Condition and Management Summary

2.1.1 Sandstone area

The western side of the site has a continuous sandstone rocky outcrop area. Above this rock line the vegetation has full vegetation strata present. This area is all in the conservation area.

Action Required

Only weed removal is permitted / required in this area.

Important plants in this area, not to be damaged include Forest She Oaks (Glossy Black Cockatoo Food), Burrawang Palms (Macrozamias), Grass Trees, and Persoonia (Gee Bungs).

Gee Bung growing on-site.

Forest She Oaks for retention. Young She-Oaks in the APZ can be under pruned (lower branches) to keep separation from ground. Seedling and native tree natural recruitment is required for long-term sustainability of canopy cover. Selective thinning / pruning is required to keep the mature canopy with the required separations.

Habitat and areas for natural regeneration outside of the APZ and within the VMP area

Areas outside the APZ are the conservation zones of the APZ. These areas have a high diversity of native ground species. Weed management (currently low weed abundance) and facilitated natural regeneration is the only action needed in this area. Othe actions include excluding domestic animals from the conservation areas.

2.1.2 Central Area

The large central area is native canopy and native ground covers, albeit sparse in areas. Shrubs in this area are very sparse (less than 2%) and none greater than 2x2m in area.

This area includes VMP area and APZ area.

The VMP will require weed and habitat management.

The APZ will require fuel management to keep fuel low and canopy disconnected while retaining habitat values and species diversity.

Action Required

Ground and Shrub Cover

1. Currently there is no ground or shrub management needed in the APZ as the area already meets the requirements of an APZ IPA as per Appendix 4 for the Planning for Bushfire Protection (NSW RFS 2019).

2024 – think leaf litter (<1cm deep) is compliant. When thicker this can be thinned with a heavy duty leaf blower. Leaving plants and larger logs in-situ.

Currently no ground/shrub canopy connection. Shrub cover can be increase to 10% and not joining tree trunks.

2. Logs over 150mm diameter can be retained in the APZ. If close to the dwelling these can be moved into the VMP Conservation area out of the APZ.
3. **The future requirement is to keep leaf litter and fine fuel less than 5cm thick on the ground (or as per latest RFS requirements approved for the site).** Reduction methods are provide in the VMP with leaf blowing favourable as it will not impact soil surface or 'scratch/rake' desirable plants.
4. **Ground plants, native grasses and forbs and ferns to be kept at under 10cm in the fire period (sept to April).**
5. **Shrubs in the APZ will need to be at less than 20% and not linking ground and canopy or linking patches of shrubs greater than 4m^2**
6. **Bracken Fern is growing in areas within the APZ and will need to be brush cut and dead / dry material removed in around September each year and kept in a low fuel state until after fire season (~April).**

Canopy

7. **Initial works canopy cover in the APZ area required thinning to achieve the 15-20% cover and the discontinuity of canopy from source (west) to dwelling and no tree branches etc over hanging dwelling. This will be implemented by arborist under direction from ecology and fire consultants on-site during works to achieve APZ and biodiversity outcomes. Principles to be followed include:**
    - Pruning of connecting canopy will be preferential to removals.
    - If additional tree removals are needed (eg 5 expected on north side) this will be wholly within APZ.
    - Trees / branches selected for removal will be a joint decision by ecologist/ bushfire consultant.
    - Priority retention will be to habitat trees (hollows), Bloodwoods (for Gliders) and Forest She Oaks (for Glossy Blacks), tree species with low abundance on-site, trees of high SULE rating. Only minimum needed to meet the APZ requirements will be impacted.

The Fire and Vegetation Mgt Plan outlines how the APZ is to be managed to maximise biodiversity while being complaint.

Area of APZ to the North of existing and prposed dwellign where there will be tree pruning and possibly up to 5 tree removals. NB some in driveway route so removed by direct impact.

Existing canopy in APZ. Some areas dense and will need pruning to separate. Two meters is typcial seperation. Clumps of small trees can be seperated form surronding canopy.

Habitat to be retained examples from site

Trees with hollows (this one out of APZ)

Dead Tree – habitat to be retained (out of APZ)

Grass Trees to be retained in situ. Or translocated on-site into VMP area by a person with proven experience in this

Cabbage Tree Palms in APZ to have dead fronds removed.

APZ post creation is to be compliant with the bushfire Management Plan (2022) and RFS as referenced within. Following is a summary of actions specific for this site.

Trees

- tree canopy cover less than 15% at maturity,
- trees at maturity not touch or overhand the habitable building,
- lower limbs can be removed up to a height of 2 m above the ground to separate from ground fuels,
- tree canopies should be separated by 2 to 5 m from most likely source of fire and to separate clumps of trees so the canopy is discontinuous (this can be by pruning)

Shrubs

- vegetation to slow down or break the progress of fire towards buildings can be provided,
- shrubs not to be located under trees such that they could be a passage for fire into the tree,
- shrubs not form more than 10-20% ground cover, and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- grass / ferns to be kept low (as a guide grass should be kept to no more than 100mm in height), and

  dead leaves and vegetation debris to be removed prior to fire seasons (Sept/Oct) and kept low until after fire season ~April.

2.1.3 Front roadside, house and approved horse arenas and paddocks and stables.

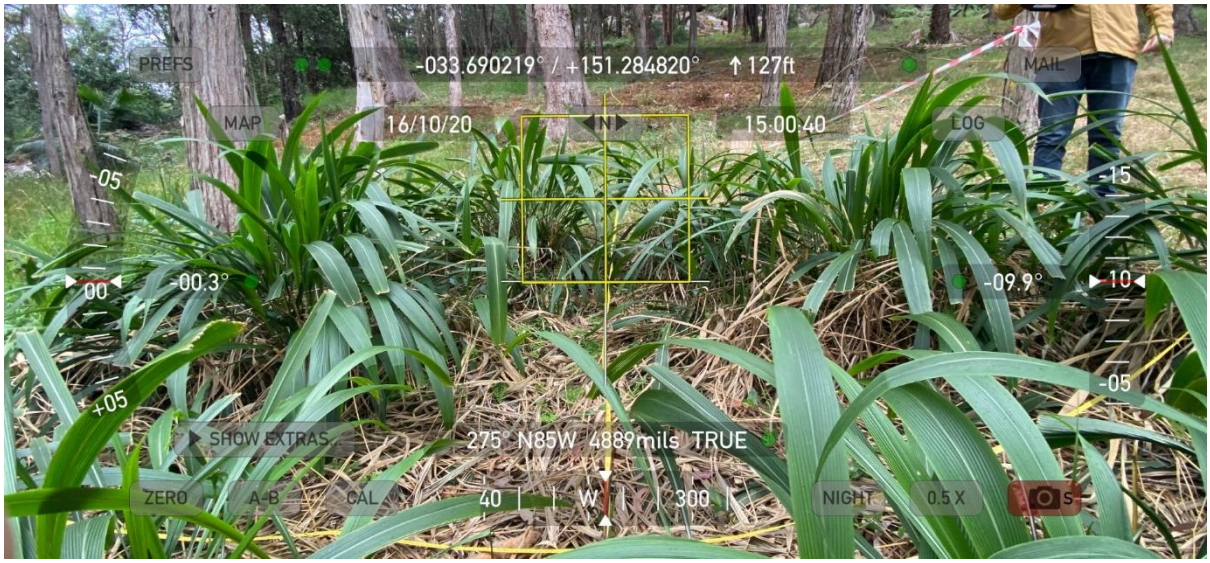
Front roadside, house and approved horse arenas and paddocks and stables are outside the VMP area. Requirements relating to the VMP are that domestic animals do not impact the VMP (e.g. horses, dogs, cats not in the VMP area).

Environmental weeds (exotics that spread by seed or piece) are not planted on site and if grow as weeds that they are removed..

2.2 Weeds

The *Biosecurity Act 2015* provides specific legal requirements for priority weeds. Under the Act, all landholders have a *General Biosecurity Duty* to management any *Biosecurity Risk* posed or likely to be posed by priority weeds. Any person who deals with a plant, who knows (or ought to know) of any Biosecurity Risk, has a duty to ensure the risk is prevented, eliminated or minimised.

Table 2.1 lists weeds recorded within the subject site, including their requirements under the Act and whether they are Weeds of National Significance (WoNS).



Weeds on site in 2020 and still present (Palm Grass). This is in the proposed impact area.

Grass weeds spreading in Sydney include African Love Grass and Serrated Tussock. Both have similar looking native species so get advice. Free advice from Council or Local Land Services. It's highly important to remove effectively if any establish.

Table 2.2. Weeds.

Scientific Name	Common Name	WoNS	Duty
Ligustrum sinense	**Narrow-leaf privet**	**N**	**Regional priority weed**
Ageratina adenophora	Crofton weed	N	Regional priority weed
Senecio madagascariensis	Fireweed	Y	State priority weed
Tradescantia fluminensis	Trad	N	General Biosecurity Duty
Cirsium vulgare	Spear thistle	N	General Biosecurity Duty

Weeds to look out for include African Love Grass and Serrated Tussock.

Scientific Name	Common Name	WoNS	Duty
Eragrostis curvula	African Love Grass NB: Dark purple seed heads – large clumping grass. https://www.youtube.com/watch?v=EaEsZ161dh0 	**Y**	*A very invasive weed - kill if present*
Nassella trichotoma	Serrated Tussock. Clumping gras can look like native Poa grass. ID pre-treating. https://www.youtube.com/watch?v=xIrcG1LdvAM 	Y	*A very invasive weed - kill if present*

2.3 Photos

Photos are included here to show the differ existing areas, before implementation of the re-vegetation plan.

Add in aerial the GDB add zones of zones (GBD)

Figure 2.1. VMP Management Zones.

3 Management Actions

3.1.1 Toolbox Talks

Toolbox talks and/or site inductions are to be given by the principal contractor to all personnel and visitors prior to the commencement of works to raise awareness and educate personnel on ecological issues associated with the site.

3.1.2 Access

Access shall be restricted, as far as practicable, to the development footprint to reduce impacts to native vegetation. Access paths through the property shall not impact native vegetation. Permeable materials are to be used for pathways. Ground crews shall minimise trampling and/or soil compaction whilst carrying out rehabilitation/revegetation works.

3.1.3 Environment Protection and Fauna Friendly Fencing

Fencing can be used to contain domestic animals in approved areas.

The minimum of fencing required is along the western boundary. Fencing is to run from the furthest extent of the APZ across the site parallel to the road and sandstone scarp. Signage on the fence is to indicate the Vegetation Protection are and all domestic animals to stay on other parts of the site.

Fencing ideally will be open mesh or bar type structure to continuity with adjacent vegetation and there must be openings underneath the barrier to all for small fauna movements. see Koala Friendly Fencing Guide https://www.ipswich.qld.gov.au/__data/assets/pdf_file/0011/86276/Koala-Friendly-Fencing-Guide.pdf

3.1.4 Environment Protection Signage during works

The boundary between the development footprint and the management zones (APZ and Conservation Area) are to have A4 size signs every 20 metres along the fence. The signs are to read “Restricted Access. Environmental Restoration Area.”.

3.1.5 Weed control

Table 2.2 identifies the appropriate control method for several different weed types.

Secondary weed removal is to occur quarterly, considering the life cycles of targeted weed species, with greater effort required in the warmer months when weed growth will be greater. Secondary weed removal will focus on controlling new growth in their early stages to prevent future release of propagules.

All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW *Pesticides Act 1999.* Herbicides must not be applied whilst exotic plants are setting seeds. The weed removal program aims to be broad in approach and sustained in application to provide the best possible conditions for natural regeneration and to control weeds.

3.2 Weed removal methods

Table 3.1 identifies weed types including control methods and disposal requirements.

Table 3.1. Weed removal methods.

Weed type	Primary control treatment	Follow-up control	Maintenance weeding post-planting (revegetation)	Disposal
Woody weeds (e.g., shrubs and trees) E.g., Privet	Cut/scrape and paint with herbicide for small shrubs[1]. Large trees > 4 metres high and diameter > 10 cm drill and inject with herbicide[2].	Cut/scrape and paint remaining weeds. Monitor monthly and control as required (and within a minimum of 3 months) and up until date of final plantings.	Cut/scrape and paint germinating weeds. Monitored and carried out regularly for a period of 5 years from the date of final planting.	Raft and pile non-reproductive parts on site (for later pile burns or left as habitat) and bag flower heads, berries and seeds (unless burning).
Climbing weeds (e.g., vines and scramblers)	Hand pull/ Dig juvenile growths and bag. Bag seeds, pods and flowers then skirt vines out of the canopy and scrape and paint for established growths. Scrape from the base up the stem covering 1 m length. Large infestations foliar spray using registered herbicides.	Scrape and paint and bag reproductive parts. Monitored monthly and controlled as required (and within a minimum of three months) and up until the date of final plantings.	Scrape and paint and bag reproductive parts. Monitored and carried out regularly for a period of five years from the date of final planting.	Bag and take off-site (or compost in a secure area from where they can not spread)..
Herbaceous weeds Eg	Hand remove or have a person with Chem Cert Certificate apply the appropriate herbicides where damage to adjoining native vegetation will not occur.	Hand pull seedlings, thermal weed or chemical if required. Monitored monthly and controlled as required	Hand pull seedlings, thermal weed or chemical if required.. Monitored and carried out regularly for a period of five years from the date of final planting.	Bag and take off-site (or compost in a secure area from where they can not spread)...
Exotic grasses and broadleaf annuals	Hand pull, thermal weed or chemical if requried. Spray prep around native grasses. Low volume	Continue prep and spot spraying for re-established growths. Hand pull and bag weeds in amongst	Hand weed isolated patches. Monitored and carried out	Bag and take off-site (or compost in a secure area from where they can not spread)...

Weed type	Primary control treatment	Follow-up control	Maintenance weeding post-planting (revegetation)	Disposal
around native grasses	spot spraying of broadleaf using selective and non-selective herbicides. Flame (thermal) weed in areas of large infestation of grasses and annuals.	natives. Monitored monthly and controlled as required (and within a minimum of three months) and up until the date of final plantings.	regularly for a period of five years from the date of final planting.	
Weeds and seedlings in close proximity to protected native vegetation	Spray prep (hand weed) around natives and Spot spray. Hand weeding.	Spray prep around natives and Spot spray. Where possible hand weed. Monitored monthly and controlled as required (and within a minimum of three months)	Ongoing Monitored and carried out regularly for a period of five years from the date of final planting.	Bag and take off-site (or compost in a secure area from where they can not spread)....
Bulbous and succulent weeds	Hand pull/dig, bagging all plant parts and removing from site[3].	Foliar spray and/or Cut and Paint.	Monitored and carried out regularly for a period of five years from the date of final planting.	Bag and take off-site (or compost in a secure area from where they can not spread)....

Note: [1]Some weeds require different treatment i.e., *Ochna serrulata* requires scrape and paint on one side with stem width less than 2 cm thick, scrape and paint both sides from root to 2/3 up the stem >2 cm thick. *Ligustrum* spp. and Lantana are treated with cut and paint.

[2]After drill and inject treatment, the plant usually will drop its leaves within six weeks and dies within a few months. Monitor the plant and if it re-sprouts, the process will need to be repeated. Drill around the base of the tree and on exposed lignotubers less than 20 mm apart and as deep as possible.

[3]If hand pulling/dig, ensure all reproductive parts of the plant e.g., corms, tubers and rhizomes are removed.

Locally Native: Locally native (local provenance stock) refers to the area the stock is collected from, i.e., being within the area that the natural pollinators and natural dispersal agents would be expected to move in usual circumstances.

Stock: Nurseries supplying locally native plants have been included in Appendix III.

Diversity: Plants recommended here include a wider diversity than expected. A wide range has been provided to ensure a diversity of locally native plants is available and then established in the restoration area. Appendix VI summarises the minimum diversity (number of different species) of each plant type (ground, vines, shrubs, & trees).

Size: All plants can be Hikos (50 mm) and / or Forestry tubes (75 mm). An alternative to planting is having clean soil with good seed bank brough from a near-by area of the same community type (such as along some parts of Mona Vale Road widening).

Bushfire Protection: Planting densities will adhere to Bushfire Protection requirements for the site. This may result in lower planting densities or modified planting schedules in areas which are adjoining the identified Asset Protection Zones.

3.2.1.1 Natural Regeneration

Natural regeneration is to be encouraged in areas where vegetation is displaying medium to high resilience – this is most of the VMP (conservation and APZ area).

3.2.2 Sediment Controls

Sediment and erosion control measures must ensure that no settlement of sediment or silt is to occur within areas of vegetation to be retained. All sediment fences should be retained for as long as practical. If removed, then monitoring is required to ensure flows do not concentrate and cause further erosion. If concentrated flows do occur and /or erosion gullies develop then coir logs are required.

3.2.3 Habitat Supplementation

Habitat Logs and Large Woody debris

Existing habitat, such as this log, is to be retained or relocated to conservation areas of the VMP.

Habitat Hollows

As per the Biodiversity Development Assessment Report prepared by Kingfisher Urban Ecology and Wetlands (July 2024) the installation of a minimum of two (2) nest boxes designed for microbats are to be installed. Location of nest boxes to be advised by the Project Ecologist. Additional nest boxes (relocated habitat hollows) will be required at a ratio of 2 new to any 1 lost for any habitat lost as a result of works. Noting that all trees with hollows have been allocated for retention (one to go in the dwelling footprint) others will be retained and do not need removal for APZ. If a hollow is found post pruning / felling this is to be relocated and or replaced. Replacement must be with boxes of equivalent or better dimensions and have a life of at least 10 years. The height of replacement must be the same or higher than any removed.

This publication by Greater Sydney Local Land Services has designs for arboreal mammals and small birds, including microbats:

https://www.lls.nsw.gov.au/__data/assets/pdf_file/0006/656610/GS-LLS-Wildlife-Nest-Box-10-2017-Accessible.pdf

Figure 3.1. Example microbat nest box. Source: Build your own Wildlife Nest Box. A guide for Western Sydney. Greater Sydney Local Land Services. October 2017.

3.2.4 Pathogen Prevention

To prevent the introduction of pathogens, Bushland Hygiene Protocols outlined in Appendix II should be followed. The site is considered to be an area that may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants). It is recommended that Bushland Hygiene Protocols be followed closely.

Phytophthora infected vegetation. (Image by Rasbak, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.)

Myrtle Rust generally infects new leaf growth. (Image by John Tann, licensed under the Creative Commons Attribution 2.0 Generic license.)

Figure 3.2. Examples of Phytophthora and Myrtle Rust.

3.2.5 Maintenance Inspections

Maintenance inspections are to take place to gauge how the site is responding to management actions, and whether the site is meeting performance criteria. Maintenance inspections are to be performed by comparing the objectives of the VMP to the maintenance information recorded by the property owner and/or bush regeneration contractor. Maintenance inspections are to be performed quarterly during the construction phase, reduced to bi-annually during the post-construction phase, then annually.

Quarterly maintenance inspections at the time of monitoring are to include the following:

Fencing and Signage

- Ensure all fencing and signage retained and notify any damages or updates needed.

Weeds

- Assess weeds in terms of total weed cover (noting a reduction in weed density to <10% by the end of year 1).

Sediment Controls

- Monitor sediment control effectiveness and record any damages.

Next Boxes

- Record any inhabitants of nest boxes.
- Record nest box damage and requirements for replacement.

Pests and Pathogens

- Monitor for herbivory and the presence of disease or infection.
- Record species impacted including type of pest or disease, number of individuals affected and treatment requirements.

3.2.6 Management and mitigation measures

All managed areas should be maintained and monitored for at least 5 years after last planting completed. Table 5.3 provides a summary of mitigation measures to be implemented with each year of operation of the VMP. Mitigation measures or other activities have been divided into three broad phases:

- Before construction
- During construction
- After construction

3.1. Summary of management actions.

Management actions	Timing			Frequency	Zone		Responsibility
	Before	During	After		1	2	
Biodiversity management							
Access – define access paths and access to construction zones	✓			Before construction and maintained for the duration of construction	✓	✓	Project Manager
Fencing – enclose management zones with fencing	✓				✓	✓	Project Manager
Signage – install signs on fencing	✓				✓	✓	Project Manager
APZ – creation and maintenance of APZ	✓	✓	✓	Before and during construction and maintained after construction	✓	✓	Project Manager and/or Property Owner
Nest boxes	✓			Replaced every 5 years	✓	✓	Project Ecologist and Arborist
Weed control							

Management actions	Timing			Frequency	Zone		Responsibility
	Before	During	After		1	2	
Primary weeding	✓	✓			✓	✓	Bush Regeneration Contractor
Secondary weeding		✓	✓		✓	✓	Bush Regeneration Contractor
Erosion control							
Sediment and erosion control measures implemented where required – sediment fencing, coir baffles, sandstone, jute mat	✓	✓	✓	Installed before construction and continually maintained	✓	✓	
Revegetation actions							
Natural Regeneration expected to be sufficient – not planting unless monitoring shows no natural recruitment.		✓	✓		✓	✓	Bush Regeneration Contractor
Maintenance actions							
Pest and disease monitoring	✓	✓	✓	Quarterly	✓	✓	Project Ecologist
Follow up (secondary) maintenance weeding		✓	✓	Quarterly	✓	✓	Project Landscaper and/or Bush Regeneration Contractor
Maintenance inspections		✓	✓	Quarterly	✓	✓	Project Ecologist and/or Project Landscaper and/or Bush Regeneration Contractor
Reporting		✓	✓	Annually	✓	✓	Project Ecologist and/or Project Landscaper and/or Bush Regeneration Contractor

Management actions	Timing			Frequency	Zone		Responsibility
	Before	During	After		1	2	
Letter to confirm completion of key performance indicators			✓	Once all performance criteria have been met	✓	✓	Project Ecologist

4 Performance Criteria

Performance targets are provided to objectively measure the progress of the VMP, and the achievement of its objectives. Performance targets are specific, realistic and measurable, and expressed quantitatively wherever it is possible to do so.

Table 4.1. Performance criteria.

Management actions	Within 6 months of commencement	Year 1	Year 2	Year 3	Year 4	Year 5
Initial site works						
Fencing/gate installation	Fencing and gates installed around native regeneration areas.	Fencing/gate maintained as installed and kept free of damage.				
Rubbish/debris removal	All rubbish and debris removed from site.	All rubbish and debris removed from site.				
Installation of signage	Signage installed at entrances to native regeneration areas.	Signage maintained and easily readable.				
Installation of nest boxes	2 nest boxes installed (location TBC by Project Ecologist).	Next boxes kept free of damage and checked to ensure functional (or replaced) every 5 years.				
Installation of APZ identification boundary	Permanent markers securely in ground to mark boundary of APZ and delineation of the 2 Mgt Zone.	Permanent markers securely in ground to mark boundary of APZ and delineation of the 2 Mgt Zone.				
Erosion control	Sediment fencing and jute matting installed.	Sediment mgt to be effective for the life of the development.				

Management actions	Within 6 months of commencement	Year 1	Year 2	Year 3	Year 4	Year 5
Weed control						
Primary weeding	Removal of *Priority Weeds* – Narrow-leaf Privet, Crofton Weed, Fireweed	<10% Priority Weed cover	<5% Priority Weed cover	<5% Priority Weed cover	<2% Priority Weed cover	<2% Priority Weed cover
Secondary weeding	After 6 months	<50% total weed cover	<40% total weed cover	<30% total weed cover	<20% total weed cover	<10% total weed cover

Management actions	Year 1	Year 2	Year 3	Year 4	Year 5
Revegetation (natural)					
	Plant density and height meeting APZ IPA and biodiversity requirements	Plant density and height meeting APZ IPA and biodiversity requirements	Plant density and height meeting APZ IPA and biodiversity requirements	>60% of plantings healthy and intact	
	VMP outside APZ Maximum native biodiversity and cover in all strata. Such that it is not increase APZ requirements.	VMP outside APZ Maximum native biodiversity and cover in all strata. Such that it is not increase APZ requirements.			

*Planting only to take place if natural recruitment is <10% across native regeneration areas

Management actions	Within 6 months of commencement	Year 1	Year 2	Year 3	Year 4	Year 5
Pest control						
Pest control	Pest and disease monitoring undertaken, and control plan developed.	Pest control undertaken as identified.				

Management actions	Within 6 months of commencement	Year 1	Year 2	Year 3	Year 4	Year 5
Monitoring						
Photo points	Photo points established using natural markers (eg trees)	Photo monitoring points photographed and general site photos.				
	Photos taken to be included in annual report.	Photos taken to be included in annual reports.				
Vegetation	Ground strata over 50% over 5 years	10%	25%	35%	40%	50%

Management actions	Within 6 months of commencement	Year 1	Year 2	Year 3	Year 4	Year 5
Reporting						
Annual report	6-month report submitted to Council post initial site works.	Annual report submitted to Council detailing performance criteria results in relation to monitoring data.				

5 Monitoring and Reporting

5.1 Monitoring

A qualified and experienced Ecologist must monitor and report on the condition of the subject land on an annual basis. Initial monitoring report to be completed at end of 6 months following completion of planning for the Koaa area (Zone 1) commencement to ensure performance criteria are met. Subsequent annual monitoring reports are to be completed by the Project Ecologist and provided to Council.

5.2 Reporting

To assess the success of the VMP against the established performance criteria, reporting will be required. This is to include:

- Initial monitoring report to confirm the installation of fencing, signage, next boxes and monitoring points, rubbish and debris removal, and primary weeding.
- Subsequent annual reports to note the condition of fencing, signage, next boxes and monitoring points, and assess management actions against performance criteria.
- Demonstrated compliance with performance criteria,
- Bushfire Consultants to confirm APZ compliance,

- Identification of deficiencies and corrective actions taken to ensure criteria are met,
- A photographic record before, during and after works is to be provided with final compliance certification,
- Copies of annual reports are to be provided to Council's Environmental Compliance Officer.
- Reporting at the completion of the first year should be provided to Council to enable a review and consideration in the development of actions and objectives for the following year. This first year report also enables an early assessment of the works and suitability of performance criteria.
- Monitoring to be performed by a suitably experienced ecologist on an annual basis, in consultation and collaboration with the project bush regeneration contractor. Reporting must be performed in association with maintenance inspections to form the primary source of information for monitoring and review reports. Monitoring by the project bush regeneration contractor must occur quarterly during the construction phase and bi-annually in the post-construction phase if adequate progress towards performance criteria is achieved. A primary goal of monitoring and reporting will be to provide recommendations to improve compliance.

6 Schedule of Works

The VMP is to be implemented for a period of 5 years including 3 years of primary and secondary restoration works and 2 years of maintenance then maintenance on-going with a 5 yr check in, each 5 yrs.. The schedule of works is to commence on the day of approval from the consent authority. Table 6.1 identifies timeframes for the completion of each task to be implemented over a 5 year period.

Table 6.1. VMP schedule of works.

Management actions	Year 1				Year 2				Year 3				Year 4				Year 5			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Initial site works																				
Fencing and Signage																				
Erosion controls																				
APZ Creation																				
Pathogen prevention																				
Nest boxes																				
Management zones																				
Primary weeding																				
Secondary weeding																				
APZ Management																				
Other																				
Vegetation monitoring																				
Annual reporting																				

7 Estimated Costs

The following estimated costs are based on the implementation of the VMP for a period of 5 years. Estimates are indicative only and final costs should be expected to vary. A formal quote from a bush regeneration company would be required to refine these estimates. Table 7.1 provides a breakdown of estimated costs.

Table 7.1. Estimated costs.

Management actions	Management details	Estimated cost (ex GST)
Initial site works		
APZ creation -direction	Direction from Consultants (ecology and Fire)	$1600
APZ creation - works	Arborist – pruning and tree works include habitat salvage and relocation	$6550
Fencing	Fencing (approx. 80 m) @ $15/m	$1200
Signage – core flute	2 x signs @ $40 each	$80
Nest boxes	2 x nest boxes and installation @ $250 each	$500
Management zones		
APZ and Primary weeding	Team of 2 @ $700 per visit 2 visits for 12 months	$1400
APZ and Secondary weeding	Team of 2 @ $700 per visit 4 visits for 12 months	$2800
Planting (contingency)	Plant supply and planting	$4,473
Irrigation	Irrigation system for 6 weeks	Owners Labor
Other		
Vegetation monitoring	$1685 inc site time and report / per visit	1685
	One years Total	**20,288**

*No plants will be needed if there is adequate natural regeneration to move to benchmark condition within the time frame given.

8 Appendices

8.1 APPENDIX I – Management Zones

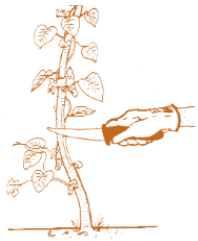
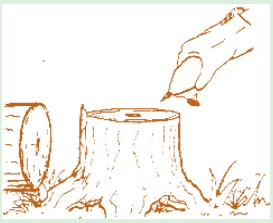
Areas covered by the VMP in yellow. Development area 6000m2 and VMP 1ha. See close ups below.

Proposed development area.

VMP area 1ha. See separate VMP for on-going management of this zone.

APPENDIX II – KEY WEED REMOVAL METHODS

Technique	Method
Hand Removal 	Seedlings and smaller weed species where appropriate will be pulled out by hand, without ris workers. The size that this can occur varies throughout the treatment area. Generally, it rang seed to approximately 300mm in height. Rolling and raking is suitable for larger infestations of Wandering Jew. The weed can be raked and plants parts rolled. The clump of weed material can then be bagged and removed from s
Crowning 	Plants that possess rhizomes or bulbs might not respond to various removal techniques and r be treated with crowning. A knife, mattock or trowel is to be driven into the soil surrounding the bulb or rhizome at an a approximately 45 degrees with surrounding soil, so as to cut any roots that may be running o occur in 360 degrees around the bulb/rhizome. The rhizome or bulb is to be bagged and remo site and disposed of at an appropriate waste recycling facility. Soil disturbance is to be kept to a minimum when using this technique.
Cut and Paint Stems 	Weed species deemed unsuitable for hand removal shall be cut. Those that have persistent growth will be cut and painted with Roundup® Biactive Herbicide or equivalent. Juvenile and smaller weed species will be cut with secateurs at base of plant, and herbicide a applicator bottle. Stem to be cut horizontally as close to the ground as possible, using secate or a pruning saw. Horizontal cuts to be made on top of stem to prevent the herbicide running stump. Apply herbicide to the cut stem immediately, within 10-20 seconds, before the plant cells clos translocation of the herbicide is limited. Herbicide is not to reach sediment or surrounding no plants.
Scrape and Painting	More resilient weed species, where other techniques are less reliable are to be scraped with chisel and painted with undiluted Roundup® Biactive Herbicide. Works to be carried out by a c with a current herbicide license.

Technique	Method
	Weed species will be scraped with a knife or chisel up the length of the trunk, and herbicide a applicator bottle. Scrape the trunk from as close to the ground as possible to approximately height. Where trunk diameters exceed approximately 5 cm a second scrape shall be made or side of the trunk. Apply undiluted herbicide to the cut trunk immediately, within 10-20 seconds, before the pla and the translocation of the herbicide is limited. All care must be taken by the contractor no herbicide onto sediment or surrounding non-targeting plants. Follow up treatment may be required. If plants resprout, scrape and paint the shoots using t method after sufficient regrowth has occurred.
Cut with a Chainsaw and Paint 	Larger size weed species, too large for cutting with hand tools, shall be cut with a chainsaw ar with undiluted Roundup® Biactive Herbicide. Works to be carried out by a contractor with a cu chainsaw and herbicide license. Larger weed species will be cut with a chainsaw at base of plant, and herbicide applied via app Cut the stem horizontally as close to the ground as possible, using the chainsaw. Remove upp to reduce bulk of plant. If cutting at the base is impractical, cut higher to get rid of the bulk of the weed, then cut agai and apply herbicide. Make cuts horizontal to prevent the herbicide running off the stump. Ap herbicide to the cut trunk immediately, within 10-20 seconds, before the plant cells close and translocation of the herbicide is limited. Ensure there is no runoff of poison. All care must be t contractor not to spill herbicide into water, onto sediment, or surrounding non-targeting pla Follow up treatment will be required. If plants resprout, cut and paint the shoots using the sa
Spot Spraying	Spot spraying involves spraying non-seeding annuals and grasses, and for regrowth of weeds a has been cleared or brushcut. Works to be carried out by a contractor with a current herbici Herbicide will be mixed up according to the manufacturer's directions for the particular weed targeted. Mixed herbicide shall be applied to the targeted weed species with a backpack spra must be taken by the contractor not to spill herbicide onto sediment or surrounding non-targ

Flame Weeding

Thermal (flame) weeding is a method where high temperatures are applied to weeds, causing the plant to die. Thermal weeding is particularly useful in situations where conservation or health considerations are high and weed density is low such as waterways where herbicide use is not permitted.

Also for native vegetation areas thermal weeding, with a flame weeder, has been shown to stimulate germination of native plants while killing the seeds of annual weeds such as Devils Pitchfork, *Bidens pilosa*. Flame weeding is also effective in killing persistent weeds like Mother of Millions.

Best results are obtained when follow up weed control is undertaken 4-6 weeks after treatment. In addition, weed control should be conducted periodically after that for example to control weeds over a period of a year it is likely that between 3-5 applications will be necessary, depending on rainfall and the extent of the

weed seed bank. This method is most effective on young annual weeds and least effective on older perennial weeds. In some cases, control of perennial weeds will be ineffective however this depends on the species present and its age.

Images provided Environmental

Flame weeding should be undertaken outside of the fire seasons. Flame weeding allows for the mimicking of a burn in areas where a control burn could not be undertaken. See native plants regenerating after flame weeding.

8.2 APPENDIX III Extract of Mitigation Measures from BDAR

Mitigation measures

The impacts of the proposal are to be mitigated through the implementation of the following mitigation measures.

Delineation of work areas

During the development, impacts to the site and the vegetation to be retained should be minimised by the delineation of work areas. Access to the site would be best restricted to the development footprint only. An exclusion zone will be established for the vegetation outside the work areas.

Vegetation clearing protocols

Prior to removing any vegetation or other habitat that has been approved for removal, the applicant must engage a qualified and experienced Ecologist to:

- undertake a pre-clearing survey to delineate, map, and mark habitat-bearing trees and shrubs to be retained/removed and other fauna habitat features and determine the presence of any resident native fauna using nests, dreys, hollows, logs, etc.,
- supervise the clearance of trees and shrubs (native and exotic) and other habitat to capture, treat and/or relocate any displaced native fauna to an appropriate nearby location,
- remove sections of a tree containing a hollow or habitat prior to clearing and felling the tree.

Erosion and sediment controls

Where required, sediment controls will be put in place. These will include but are not limited to sediment fencing, jute mating, crushed sandstone, and coir logs. Sediment controls will be revised during the site inspection and/or after significant rainfall (more than 10 mm in 24 hours resulting in site runoff). Sediment and erosion control measures must ensure that no settlement of sediment or silt is to occur within areas of vegetation to be retained. All sediment fences should be retained for as long as practical. If removed, then monitoring is required to ensure flows do not concentrate and cause further erosion. If concentrated flows do occur and/or erosion gullies develop then coir logs baffles are required.

Tree protection

Tree protection as per the Arboricultural Impact Assessment.

Tree replacement ratio

Any trees removed should be replaced at a ratio greater than 1:1 (for trees not covered by a biodiversity offset) and consider that a tree replacement ratio of 2:1 is preferable to enhance habitat.

Weed management

Weeds are present on site and must be appropriately managed to ensure they do not spread. There must be continuous maintenance of the vegetation on site otherwise increased weed growth may result, exacerbated by the high abundance of weeds present pre-works. Weeds will colonize and pioneer on any cleared grounds, therefore must be managed during works as well as ongoing post-works.

All bush regeneration activities requiring the use of chemicals must be performed in accordance with the NSW Pesticides Act 1999. Herbicides must not be applied whilst exotic plants are setting seed. The weed removal program aims to be broad in approach and sustained in application to provide the best possible conditions for natural regeneration and to control weeds within the site.

Although soil-borne pathogens have not been identified as a Key Threatening Process, the accidental spread of pathogens can occur at any time. Hydrological conditions may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to moist soil and proximity to water. It is recommended that Bushland Hygiene Protocols be followed closely.

Nest boxes

Nest boxes designed for microbats (x2) and gliders (x1) (hard-wood or marine-ply with stainless steel fixtures) will be installed on-site to increase habitat opportunities for native fauna within the subject land. Boxes are to be secured by hanging and not rely on nailing into trees. Boxes to be installed in trees to be retained and at least 3 m above ground.

Pathogen prevention

The site is considered to be an area that may promote the spread of Phytophthora (a group of fungus-like diseases affecting plants) due to its moist soil and proximity to the drainage channel. It is recommended that bushland hygiene protocols outlined in the BMP be followed closely.

Phytophthora infected vegetation. (Image by Rasbak, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported, 2.5 Generic, 2.0 Generic and 1.0 Generic license.)

Myrtle Rust generally infects new leaf growth. (Image by John Tann, licensed under the Creative Commons Attribution 2.0 Generic license.)

BDAR Table 0.1. Measures to be implemented before, during and after construction to avoid and minimise impacts of the proposal.

Action	Stage	Timing	Responsibility	Outcome
Delineate site access routes and environmental exclusion zones	Before construction	Installed before construction and retained during construction	Project Manager to organise fencing to delineate works area from areas of vegetation to be retained	Protect native vegetation and fauna habitat
Vegetation clearing controls	Before and during tree felling	Once	Arborist and Ecologist	Fauna protection
Fencing and tree protection	Before construction	Installed before construction and retained during construction	Arborist	Tree protection
Revegetation	Before, during or after construction	Ongoing	Ecologist to prepare a BMP detailing revegetation within the subject land Revegetation undertaken by Bush Regenerators	Habitat enhancement (birds, micro-bats)
Native species landscaping	Before, during or after construction	Ongoing	Landscape Architect	Habitat enhancement (birds, micro-bats)
Tree replacement	Before, during or after construction	Ongoing	Landscape Architect	Offset tree removal/habitat enhancement (birds, micro-bats)
Erosion and sediment controls	Before construction	Installed before construction and maintained during construction	Project Manager	Native vegetation/creek protection

Weed management	Before, during and after construction	Ongoing	Bush Regenerator	Protect and enhance native vegetation and fauna habitat
Nest box installation	Before construction	Installed once and replaced every 5 years	Arborist and Ecologist	Habitat enhancement (micro-bats)
Reuse of removed trees and hollows	During tree felling	Once	Arborist and Ecologist	Habitat enhancement (reptiles)
Pathogen prevention	Before, during and after construction	Ongoing	All personnel	Habitat protection

APPENDIX IV – BUSHLAND HYGIENE PROTOCOLS

- Always assume that the area you are about to work in is free of the disease and therefore needs to be protected against infection.
- Always assume that the activity you are about to undertake has the potential to introduce the disease.
- Arrive at site with clean shoes, i.e.: no dirt encrusted on them.
- If you arrive with shoes that are encrusted with dirt, they will have to be completely soaked in metho or disinfectant and allow a few minutes to completely soak in. NEVER scrape untreated dirt off your shoes onto the ground.
- Before you move onto the site spray the bottom of your shoes with 70 % metho. Bleach solution (1% strength) or household/commercial disinfectant (as per label) are also suitable.
- Check all tools and equipment that comes in contact with soil are clean before entering the area (they should have been cleaned on site at the end of the previous work session). If there is any dirt on them, spray them with 70% metho.
- Clean all tools at the end of each work session while still on site ensuring this is done away from drainage lines and adjacent work areas. Knock or brush off encrusted dirt and completely spray with 70 % metho. Replace in storage/transport containers.
- Preferably compost all weed material on site.
- Never drag vegetation with exposed roots and soil through bushland.
- When removing weeds from site, remove as much soil as possible from them in the immediate work area and carefully place vegetative material into plastic bags.
- Try not to get the bag itself dirty; don't put it on/in a muddy area.
- Always work from the lower part of a slope to the upper part.
- Always work in areas known to be free of the pathogen before working in infected areas.
- Minimise activities wherever possible when the soil is very wet.
- Vehicles should not be driven off track or into reserves (unless vehicle decontamination is carried out before and after entering a single work site)
- Only accredited supplies of plants/mulch to be used.

Kit should contain: 1 bucket, 1 scrubbing brush, 1 spray bottle (metho 70% solution), 1 bottle tap water, 1 bottle methylated spirits.

Facts about Phytophthora

Phytophthora cinnamomi (Phytophthora) is a microscopic, soil borne, water-mould that has been implicated in the death of remnant trees and other plants in Australian bushland. Phytophthora is not native to Australia. It is believed to have been introduced sometime after European settlement. Phytophthora is a national problem and is listed as a key threatening process under the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999.

Symptoms including Dieback

"Dieback" simply means dying or dead plants. There are many causes of dieback; Phytophthora is just one of them. Often dieback is the result of a combination of factors such as changed drainage patterns and nutrient loads (e.g.: increased stormwater run-off) or changed soil conditions (e.g.: dumped fill or excavation of/near root zone). Plants that are stressed are more vulnerable to Phytophthora.

Initial symptoms of Phytophthora include wilting, yellowing and retention of dried foliage, loss of canopy and dieback. Infected roots blacken and rot and are therefore unable to take-up water and nutrients. Severely infected plants will eventually die. Symptoms can be more obvious in summer when plants may be stressed by drought. If you suspect that Phytophthora is on your site, please contact the Bushcare team to collect a soil sample to be lab tested. This is usually done in the warmer months where conditions are optimum for the disease.

Infection

There is no way of visually telling if Phytophthora is present in the soil as its structures and spores are microscopic (invisible to the naked eye). Phytophthora requires moist soil conditions and warm temperatures for infection, growth, and reproduction. Spores travel through moist soil and attach to plant roots. Once Phytophthora has infected a host plant it can grow inside plant root tissue independent of external soil moisture conditions. After infection, Phytophthora grows through the root destroying the tissue which is then unable to absorb water and nutrients.

APPENDIX V – NATIVE PLANT NURSERIES

Indigo Native Plant Nursery
Harvest Seeds and Native Plants

9 Expertise of the Authors

Brooke Thompson
ECOLOGIST

Brooke is a passionate and dedicated ecologist with valuable on ground experience working on bush regeneration projects throughout the Sydney Region. She has worked with various stakeholders across both public and private sectors to deliver sustainable and achievable environmental outcomes. She has worked on major construction contractors as well as smaller contractors to deliver tailored environmental solutions on time and within budget.

Brooke completed her Bachelor of Science at the University of Wollongong and is currently expanding her skills and knowledge undertaking Cert III in Conservation and Ecosystem Management at TAFE.

Brooke has experience conducting fieldwork and preparing a range of reports including the Flora and Fauna Assessment, Vegetation Management Plan (VMP), Biodiversity Development Assessment Report (BDAR), Certification, Construction Environmental Management Plan (CEMP), Review of Environmental Factors (REF), and Environmental Impact Assessment (EIA).

Brooke has exceptional communication and customer service skills and can deliver professional ecological assessments.

Key Projects:

- Threatened species surveys.
- Flora and fauna surveys.
- Fauna spotter and handler.
- Aquatic fauna relocation.

SPECIALISATIONS

- GIS mapping
- Fauna spotting
- Aquatic fauna relocation and handling
- Habitat tree assessment, marking and mapping
- Floristic plot surveys
- Flora and fauna field surveys

CAREER SUMMARY

- **Ecologist**, Ecological Consultants Australia. June 2022-*present*
- **Natural Area Specialist**, Dragonfly Environmental. January 2022-*present*
- **Volunteer**, Microplastic Surveying, University of Wollongong 2021
- **Volunteer**, Frog Surveying, Chad Beranek B EnvSc (Hons) UTS 2016

QUALIFICATIONS AND MEMBERSHIPS

- **BSc Conservation Biology**, University of Wollongong.
- **Early Career Ecological Consultant**, Ecological Consultants Association of NSW.
- Currently undertaking Cert III Conservation and Ecosystem Management.
- WHS General Induction of Construction Industry NSW White Card.

Elaway (Geraldene Dalby-Ball) DIRECTOR

With over 25 years wetland and urban ecology experience, a great passion for what she does, and extensive technical and on-ground knowledge make Elaway a valuable contribution to any project.

Elaway has over 8 years local government experience as manager of environment and education for Pittwater Council. Elaway presented papers on the topic at the NSW Coastal Conference, Sydney CMA and Hawkesbury Nepean forums. Elaway is a Technical Advisor Sydney Olympic Park Wetland Education and Training (WET) panel.

Elaway has up to date knowledge of environmental policies and frequently provides input to such works. Elaway was a key contributor to the recent set of Guidelines commissioned by Southeast Queensland Healthy Waterways Water Sensitive Urban Design Guidelines. Elaway's role included significant contributions and review of the Guideline for Maintaining WSUD Assets and the Guideline for Rectifying WSUD Assets.

Elaway is a frequent contributor to many community and professional workshops on ecological matters particularly relating to environmental management. She is an excellent Project Manager.

Elaway is a joint author on the popular book Burnum Burnum's Wildthings published by Sainty and Associates. Author of the Saltmarsh Restoration Chapter Estuary Plants of East Coast Australia published by Sainty and Associates (2013). Elaway's early work included 5 years with Wetland Expert Geoff Sainty of Sainty and Associates. Elaway is an expert in creating and enhancing urban biodiversity habitat and linking People with Place.

SPECIALISATIONS

- Urban Ecology – and habitat rehabilitation an re-creation.
- Urban waterway management – assessing, designing and supervising rehabilitation works
- Saltmarsh and Wetland re-creation and restoration – assessment, design and monitoring
- Engaging others in the area of environmental care and connection
- Technical Advisor – environmental design, guidelines and policies
- Sound knowledge and practical application of experimental design and statistics
- Project management and supervision
- Grant writing and grant assessment
- Budget estimates and tender selection
- Expert witness in the Land and Environment Court

CAREER SUMMARY

- **Director and Ecologist**, Ecological Consultants Australia. 2014-*present*
- **Director and Ecologist**, Dragonfly Environmental. 1998-*present*
- **Manager** Natural Resources and Education, Pittwater Council 2002-2010
- **Wetland Ecologist** Sainty and Associates 1995-2002

QUALIFICATIONS AND MEMBERSHIPS

- **Bachelor of Science with 1st Class Honors**, Sydney University
- WorkCover WHS General Induction of Construction Industry NSW White Card.
- Accredited Biobank Assessor (in renewal)
- Senior First Aid Certificate.
- **Practicing member** Ecological Consultants Association of NSW