

Vegetation Management Plan

for a proposed Caravan Park at

Lot 105 DP 260058

247 Mungo Brush Road

HAWKS NEST NSW






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Project Name	Vegetation Management Plan for a proposed Caravan Park at Lot 105 DP 260058 247 Mungo Brush Road, HAWKS NEST NSW	
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Acronyms and Abbreviations used in this report

BC Act	Biodiversity Conservation Act 2016
DCCEEW	Department of Climate Change, Energy, Environment and Water
DPE	Department of Planning and Environment
EEC	Endangered Ecological Community
EPBC Act	Environmental Protection & Biodiversity Conservation Act 1999
EP&A Act	Environmental Planning & Assessment Act 1979
IBRA	Interim Biogeographic Regionalisation for Australia
LLS Act	Local Land Services Act 2013
NPW Act	National Parks & Wildlife Act 1974
OEH	Office of Environment & Heritage (now DPE)
PCT	Plant Community Type
TEC	Threatened Ecological Community
VMP	Vegetation Management Plan

1.0 INTRODUCTION

Wildthing Environmental Consultants has prepared this Vegetation Management Plan (VMP) for the proposed development within Lot 105 DP 260058 (No. 247) Mungo Brush Road, Hawks Nest NSW (Figure 1.1). The VMP has been as a component of the Development Application alongside a Biodiversity Development Assessment Report (BDAR) (Wildthing Environmental Consultants 2024a). The VMP provides a description of native vegetation on site; a breakdown of the site into management zones; a schedule of works detailing the sequence and duration of works necessary for revegetation and maintenance works for each management zone.

1.1 OBJECTIVE OF THE VEGETATION MANAGEMENT PLAN (VMP)

This VMP has been prepared based on current best practice guidelines to minimise and manage the potential impacts of the proposal. This VMP aims to protect existing adjoining vegetation and minimise disturbances to this habitat. The management measures proposed address relevant actions and mitigation measures documented in the BDAR, particularly pertaining to the management of threatened species and their habitats.

The objectives of the VMP:

- To ensure the ongoing ecological viability of the retained areas of vegetation by protecting the ecological biodiversity and habitat values of the land;
- To protect and enhance areas of retained and planted native vegetation;
- Specify the ongoing management of any edge impacts of the development footprint;
- To improve and increase the quality of habitat for threatened species known to utilise the subject land and maintain the east west movement corridor for native fauna species such as Koalas;
- To remove and manage weed species within retained vegetation;
- To create an east-west connection with the planting of a wildlife movement corridor in the north of the study area.
- To provide compensatory vegetation planting to retain and improve the quality of the vegetation corridor in the north of the study area.
- To provide compensatory habitat with the installation of nest boxes;
- Specify the appropriate timing of works, including site preparation, resource recovery (extraction of timber, top soil etc), planting, weed management, and also providing a schedule of works;

- Ensure that the proposal is planned, designed and implemented by informed and experienced contractors in order to avoid harm to the quality, stability and natural functions of the retained vegetation.

1.2 FRAMEWORK OF VMP

This Plan seeks to provide a framework for the protection and enhancement of native vegetation and fauna within the subject land. The VMP will address the following criteria:

- The condition of the existing vegetation;
- Description of proposed environment;
- Protection of native vegetation;
- Weed management techniques;
- Site preparation;
- Vegetation removal;
- Revegetation plantings;
- Nest box installation;
- Vegetation corridor fencing and signage;
- Maintenance, Monitoring and reporting.

1.3 DOCUMENTATION USED IN VMP

The VMP has considered the information contained within the following documentation:

- Biolink (2005). *North Hawks Nest Koala Plan of Management. Working Draft No. 1.* February 2005.
- Great Lakes Council (2002). *Public Inquiry into the Ecological Significance of Land Covered by the North Hawks Nest Draft Local Environment Study.* Report to Great Lakes Council.
- Mid Coast Council (2018) *Raingarden Plants Fact Sheet.* July 2018.
- Scotts, (2003) *Key Habitats and Corridors for Forest Fauna A Landscape Framework for Conservation in North-east New South Wales.*
- Wildthing Environmental Consultants (2024a) *Biodiversity Development Assessment Report for a proposed Caravan Park at Lot 105 DP 260058 247 Mungo Brush Road HAWKS NEST NSW.* July 2024
- Wildthing Environmental Consultants (2024b) *Updated Koala Plan of Management for a proposed caravan park at Lot 105 DP 260058 (No. 247) Mungo Brush Road, Hawks Nest NSW.*

The VMP has been prepared in accordance with the above documentation. Most recent site visits were conducted by suitably qualified ecologists in July 2024 to assess the condition of the native vegetation present on site.

Figure 1.1: Study Area and Subject Land.



Figure 1.2: Plans of the proposal.



2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The VMP covers the project footprint (Subject Land) at Lot 105 DP 260058 (No. 247) Mungo Brush Road, Hawks Nest NSW (Study Area).

2.2 DESCRIPTION OF THE DEVELOPMENT

The proposal is for a caravan park with 148 long term dwelling sites and 27 long term camping sites. The proposal also includes community facilities for use by the occupants of the park, roads and several drainage areas. During the construction phase of the development, stormwater infiltration areas will be shaped into the ground to the north and west of the caravan park. These areas will be surrounded by berms / bunds (300mm high) to hold the water in this area to infiltrate. These areas are designed to control mounding of excess water from heavy rain events during the operational phase of the proposal. Overall, there will be 'some' flow entering around twice a year on average, but the 300mm maximum storage depth will be sufficient to capture and hold water from a 100yr storm. During the construction of the stormwater infiltration areas, topsoil containing the seedbank will be stripped and saved aside while the ground is shaped. Once shaping has been completed the saved topsoil with seedbank will be spread back over the infiltration area and tree species will be planted as outlined in the VMP (Wildthing Environmental Consultants 2024). Biofiltration raingardens will be installed along the western and northern perimeter of the caravan park. These areas will also be planted with native species as outlined in the VMP (Wildthing Environmental Consultants 2024). The landscaping plan includes an east west movement corridor for native fauna species such as Koalas located to the north of the caravan park (overlapping with the northern stormwater infiltration area). Details of the planting and maintenance of this corridor has been outlined in the VMP (Wildthing Environmental Consultants 2024). A combination of koala grids, koala friendly and koala excluding fencing has been designed to aid koala movement safely through and around the proposal. The proposal also includes a perimeter road and two entrance ways. The proposal will be positioned predominantly on a highly modified area which has been subject to previous sand mining.

2.3 TOPOGRAPHY AND HYDROLOGY

The study area is located on the Port Stephens soil landscape and is composed of undulating to rolling low hills on mudstones and minor interbeds of lithic sandstones of the Wootton Beds. There are no karst, caves, cliffs or other areas of geological significance within the study area or within the surrounding assessment area.

The subject land occurs within the greater Hunter River Catchment. The study area is located within the Hunter Central Rivers Catchment. According to the NSW Government SEED mapping no streams were present within the study area. The estuarine Myall River formed the western boundary of the study area. The study area is located in close proximity (approximately 500m to the west) to

Myall River, this area is mapped as part of the greater Port Stephens Estuary, which is included in the Directory of Important Wetlands of Australia (DIWA) (DoEE 2018c).

The Port Stephens Estuary is 30 253 hectares in area and was listed on the DIWA for the following reasons:

- It is a good example of a wetland type occurring within a biogeographic region in Australia.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.

The study area is also located to the south of the Ramsar listed wetland Myall Lakes. Ramsar wetlands are representative, rare or unique wetlands, or are important for conserving biological diversity.

2.4 VEGETATION WITHIN STUDY AREA

The entire 47.25ha study area contained native vegetation. A total of five PCT's were identified within the study area and are shown in Table 2.1.

Table 2.1 PCTs identified and extent within the study area

PCT ID	PCT name	Subject Land (ha)	Study Area (ha)
3544	Coastal Sands Apple-Blackbutt Forest	10.30	18.97
4006	Northern Paperbark-Swamp Mahogany Saw-sedge Forest	0	16.08
4000	Northern Estuarine Paperbark Sedge Forest	0	7.24
4026	Estuarine Swamp Oak Twig-rush Forest	0	1.88
4091	Grey Mangrove-River Mangrove Forest	0	2.63
Total area		10.30	46.80

2.4.1 PCT 3544 - COASTAL SANDS APPLE-BLACKBUTT FOREST

Table 2.2 contains a description of PCT 3544.

Table 2.2 PCT 3544 – Coastal Sands Apple-Blackbutt Forest

PCT 3544 – Coastal Sands Apple-Blackbutt Forest	
PCT ID	PCT 3544
PCT name	Coastal Sands Apple-Blackbutt Forest
Equivalent Old PCT ID & Name	PCT 1648 – Smooth-barked Apple – Blackbutt heathy open forest of the Tomaree Peninsula
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Coastal Dune Dry Sclerophyll Forests
Per cent cleared value (%)	21.67

PCT 3544 – Coastal Sands Apple-Blackbutt Forest											
Extent within the Study Area (ha)	18.97ha										
Extent within subject land (ha)	10.30ha										
Justification of PCT selection	<p>Potential PCTs were identified by filtering through the BioNet Vegetation Classification Bulk Export Data of all PCTs (DPE 2024c). The following filters were applied:</p> <table border="1"> <thead> <tr> <th>Filter</th><th>Selection</th></tr> </thead> <tbody> <tr> <td>IBRA Region</td><td>NSW North Coast</td></tr> <tr> <td>IBRA Subregion</td><td>Karuah Manning</td></tr> <tr> <td>Vegetation Formation</td><td>Dry Sclerophyll Forests (Shrubby sub-formation)</td></tr> <tr> <td>Upper Stratum</td><td>Eucalyptus pilularis</td></tr> </tbody> </table> <p>The following PCTs remained: 3544, 3545, 3546, 3549, 3581, 3582.</p> <p>Of these PCTs, 3544 was the most consistent as a result of the high cover of <i>Eucalyptus pilularis</i> (Blackbutt) and mid-story of <i>Banksia serrata</i> (Old Man Banksia).</p>	Filter	Selection	IBRA Region	NSW North Coast	IBRA Subregion	Karuah Manning	Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	Upper Stratum	Eucalyptus pilularis
Filter	Selection										
IBRA Region	NSW North Coast										
IBRA Subregion	Karuah Manning										
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)										
Upper Stratum	Eucalyptus pilularis										
Description of PCT 3544 within the subject land	<p>PCT 3544 was present within the eastern portion of the study area and occurred over the entirety of the subject site (impact area) in various degrees of disturbance. The most common canopy species were <i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple) and <i>Corymbia gummifera</i> (Red Bloodwood). <i>Eucalyptus piperita</i> (Sydney Peppermint) was also present in lower numbers. Common mid-storey species were <i>Banksia serrata</i> (Old Man Banksia) and <i>Nematolepis squamea</i> (Satinwood). The shrub layer was diverse and included species such as <i>Bossiaea rhombifolia</i>, <i>Leucopogon lanceolatus</i> (Lance Beard Heath), <i>Monotoca elliptica</i> (Tree Broom Heath) and <i>Leptospermum polygalifolium</i> subsp. <i>polygalifolium</i> (Teatree).</p> <p>Common groundcovers included <i>Pteridium esculentum</i> (Bracken Fern), <i>Lomandra longifolia</i> (Spiny Mat Rush), <i>Pomax mbellate</i> (Pomax) and <i>Themeda australis</i> (Kangaroo Grass).</p> <p><i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> (Bitou Bush) was a common introduced plant species within this PCT. Other weed species recorded included <i>Lantana camara</i> (Lantana).</p>										
Condition States	Three condition states were present; Good, Moderate, and Derived.										
BC Act Status	Does not align with any TEC's.										
EPBC Act Status	Does not align with any TEC's.										
Photos examples of PCT 3544 within the subject land are shown in Plates 2.1 – 2.4.											

PCT 3544 – Coastal Sands Apple-Blackbutt Forest



Plate 2.1: PCT 3544 – Coastal Sands Apple-Blackbutt Forest (Good Condition)



Plate 2.2: PCT 3544 – Coastal Sands Apple-Blackbutt Forest (Moderate Condition)

PCT 3544 – Coastal Sands Apple-Blackbutt Forest



Plate 2.3: PCT 3544 – Coastal Sands Apple-Blackbutt Forest (Moderate Condition)



Plate 2.4: PCT 3544 – Coastal Sands Apple-Blackbutt Forest (Derived Condition)

2.4.2 PCT 4006 – NORTHERN PAPERBARK-SWAMP MAHOGANY SAW-SEDGE FOREST

Table 2.3 contains a description of PCT 4006.

Table 2.3 PCT 4006 - Northern Paperbark-Swamp Mahogany Saw-sedge Forest

PCT 4006 - Northern Paperbark-Swamp Mahogany Saw-sedge Forest	
PCT ID	PCT 4006
PCT name	Northern Paperbark-Swamp Mahogany Saw-sedge Forest
Equivalent Old PCT ID & Name	PCT 1725 - Swamp Mahogany - Broad-leaved Paperbark - Swamp Water Fern - Plume Rush swamp forest on coastal lowlands of the Central Coast and Lower North Coast.
Vegetation Formation	Forested Wetlands
Vegetation Class	Coastal Swamp Forests
Per cent cleared value (%)	22.61
Extent within the Study Area (ha)	16.08ha
Extent within the Subject Land (ha)	0ha
Description of PCT 4006 within the subject land	<p>PCT 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest was present within the central area of the study area to the west of the subject land. The dominant canopy species were <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) and <i>Eucalyptus robusta</i> (Swamp Mahogany). The composition of these two canopy species varied across this PCT. Other canopy species present included <i>Casuarina glauca</i> (Swamp Oak). Common mid-stratum trees were <i>Glochidion ferdinandi</i> (Cheese Tree) and <i>Livistona australis</i> (Cabbage Tree Palm). Shrub species were <i>Breynia oblongifolia</i> (Breynia), <i>Homalanthus populifolius</i> (Bleeding Heart) and <i>Elaeocarpus reticulatus</i> (Blueberry Ash).</p> <p>The ground layer also varied across the PCT. Common groundcovers were <i>Gahnia clarkei</i> (Tall Saw-sedge) <i>Baloskion tetraphyllum</i>, and fern species <i>Telmatoblechnum indicum</i> (Swamp Water Fern), <i>Hypolepis muelleri</i> (Harsh Ground Fern) and <i>Pteridium esculentum</i> (Bracken Fern).</p> <p><i>Parsonsia straminea</i> (Common Silkpod) was a common climber. Other climbers recorded included <i>Hibbertia scandens</i> (Climbing Guinea Flower).</p> <p>Common weed species included <i>Lantana camara</i> (Lantana) and <i>Pinus elliotii</i> (Slash Pine).</p>
Condition States	Good Condition
BC Act Status	Endangered Ecological Community - Swamp Sclerophyll Forest on

PCT 4006 - Northern Paperbark-Swamp Mahogany Saw-sedge Forest

Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

EPBC Act Status

Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

Photos examples of PCT 4006 within the study area are shown in Plates 2.5 – 2.6.



Plate 2.5: PCT 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest

PCT 4006 - Northern Paperbark-Swamp Mahogany Saw-sedge Forest



Plate 2.6: PCT 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest

2.4.3 PCT 4000 - NORTHERN ESTUARINE PAPERBARK SEDGE FOREST

Table 2.4 contains a description of PCT 4000.

Table 2.4 PCT 4000 - Northern Estuarine Paperbark Sedge Forest

PCT 4000 - Northern Estuarine Paperbark Sedge Forest	
PCT ID	PCT 4000
PCT name	Northern Estuarine Paperbark Sedge Forest
Equivalent Old PCT ID & Name	PCT 1724 - Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast
Vegetation Formation	Forested Wetlands
Vegetation Class	Coastal Swamp Forests
Per cent cleared value (%)	34.89
Extent within study area (ha)	7.24ha
Extent within subject land (ha)	0ha
Description of PCT 4000 within the subject land	PCT 4000 Northern Estuarine Paperbark Sedge Forest was present within the west of the study area. The dominant canopy species were <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) and <i>Casuarina glauca</i> (Swamp Oak).

PCT 4000 - Northern Estuarine Paperbark Sedge Forest

	<p>Common groundcovers were <i>Machaerina juncea</i> (Bare Twig-rush) and <i>Juncus kraussii</i> subsp. <i>australiensis</i> (Sea Rush). Other groundcovers included <i>Phragmites australis</i> (Australian Reed) and <i>Gahnia clarkei</i> (Tall Saw-sedge)</p> <p><i>Parsonsia straminea</i> (Common Silkpod) was a common climber.</p> <p>Common weed species included <i>Lantana camara</i> (Lantana), <i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> (Bitou Bush), <i>Pinus elliotii</i> (Slash Pine) and <i>Asparagus aethiopicus</i> (Ground Asparagus).</p>
Condition States	Good Condition
BC Act Status	Endangered Ecological Community - Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
EPBC Act Status	Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

Photos examples of PCT 4000 within the subject land are shown in Plates 2.7 – 2.8.



Plate 2.7: PCT 4000 - Northern Estuarine Paperbark Sedge Forest

PCT 4000 - Northern Estuarine Paperbark Sedge Forest



Plate 2.8: PCT 4000 - Northern Estuarine Paperbark Sedge Forest

2.4.4 PCT 4026 - ESTUARINE SEA NRUSH SWAMP OAK FOREST

Table 2.5 contains a description of PCT 4026.

Table 2.5 PCT 4026 - Estuarine Sea Rush Swamp Oak Forest

PCT 4026 - Estuarine Sea Rush Swamp Oak Forest	
PCT ID	PCT 4026
PCT name	Estuarine Sea Rush Swamp Oak Forest
Equivalent Old PCT ID & Name	PCT 1808 - Estuarine Reedland
Vegetation Formation	Forested Wetlands
Vegetation Class	Coastal Floodplain Wetlands
Per cent cleared value (%)	69.74
Extent within study area (ha)	1.88ha
Extent within the subject land (ha)	0ha
Description of PCT 4026 within the subject land	PCT 4026 - Estuarine Sea Rush Swamp Oak Forest was located in the far west of the study area. The majority of the PCT was characterised by a dense ground layer of <i>Machaerina juncea</i> (Bare Twig-rush), <i>Juncus kraussii</i> subsp. <i>australiensis</i> (Sea Rush) and <i>Sporobolus virginicus</i> (Sand Couch). Other ground covers included <i>Phragmites australis</i> (Australian Reed) and <i>Samolus repens</i> (Creeping Brookweed). This PCT contained a sparse tree layer of <i>Casuarina glauca</i> (Swamp Oak).

PCT 4026 - Estuarine Sea Rush Swamp Oak Forest

Condition States	Good Condition
BC Act Status	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
EPBC Act Status	Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland ecological community

Photos examples of PCT 4026 within the subject land are shown in Plates 2.9 – 2.10.



Plate 2.9: PCT 4026 Estuarine Sea Rush Swamp Oak Forest

PCT 4026 - Estuarine Sea Rush Swamp Oak Forest



Plate 2.10: PCT 4026 Estuarine Sea Rush Swamp Oak Forest

2.4.5 PCT 4091 - GREY MANGROVE-RIVER MANGROVE FOREST

Table 2.6 contains a description of PCT 4091.

Table 2.6 PCT 4091 - Grey Mangrove-River Mangrove Forest

PCT 4091 - Grey Mangrove-River Mangrove Forest	
PCT ID	PCT 4091
PCT name	Grey Mangrove-River Mangrove Forest
Equivalent Old PCT ID & Name	PCT 1747 - Grey Mangrove low closed forest
Vegetation Formation	Saline Wetlands
Vegetation Class	Mangrove Swamps
Per cent cleared value (%)	52.96
Extent within the study area (ha)	2.63ha
Extent within the subject land (ha)	0ha
Description of PCT 4091 within the subject land	<p><i>Avicennia marina</i> subsp. <i>australasica</i> (Grey Mangrove)</p> <p><i>Juncus kraussii</i> subsp. <i>australiensis</i></p>
Condition States	Good Condition
BC Act Status	No associated TEC

PCT 4091 - Grey Mangrove-River Mangrove Forest

EPBC Act Status

No associated TEC

Photos examples of PCT 4091 within the subject land are shown in Plates 2.11 – 2.12.



Plate 2.11: PCT 4026 Estuarine Sea Rush Swamp Oak Forest






Plate 2.12: PCT 4026 Estuarine Sea Rush Swamp Oak Forest


Figure 2.1: PCTs within the study area.






Legend

-  Subject Land

 Study Area
-  PCT 3544 Coastal Sands Apple-Blackbutt Forest (18.97ha)

 PCT 4006 Northern Paperbark-Swamp Mahogany Saw-sedge Forest (16.08ha)

 PCT 4000 Northern Estuarine Paperbark Sedge Forest (7.24ha)
-  PCT 4026 Estuarine Sea Rush Swamp Oak Forest (1.88ha)

 PCT 4091 Grey Mangrove-River Mangrove Forest (2.63ha)

Job Ref	12399	 0 100 200 m Map Projection GDA2020 MGA Zone 56 Data Sources: Nearmap (29/02/2024)	Figure 2.1 Plant Community Types	 (a Division of Tattersall Lander Pty Ltd) ABN 41 003 509 215			
A4 Scale	1:5,000						
Disclaimer: While all reasonable care has been taken to ensure the information contained on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. In addition the spatial accuracy of the map is wholly dependant on source data. Please verify the accuracy of all information prior to use. Development footprint areas should be used for indicative areas only.							
247 Mungo Brush Road Hawks Nest, NSW 21 October 2024							

2.4.6 ENDANGERED ECOLOGICAL COMMUNITIES AND THREATENED FLORA

Based on the vegetation assessment (Wildthing Environmental Consultants, 2024a), two Endangered Ecological Communities were present within the western portion of the study area, there were:

- Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
- Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.

Areas of Swamp Oak Floodplain Forest were consistent with the nationally listed Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community.

Areas of Swamp Sclerophyll Forest were consistent with the nationally listed Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.

There were no Threatened Ecological Communities (TEC's) identified within the subject land.

2.4.7 THREATENED FAUNA

During targeted surveys (Wildthing Environmental Consultants, 2024a) the Species Credit Species recorded within the Study Area included:

- *Ninox strenua* (Powerful Owl);
- *Petaurus norfolcensis* (Squirrel Glider);
- *Phascolarctos cinereus* (Koala); and
- *Potorous tridactylus* (Long-nosed Potoroo).

During targeted surveys (Wildthing Environmental Consultants, 2024a) the Ecosystem Credit Species recorded within the Study Area included:

- *Glossopsitta pusilla* (Little Lorikeet);
- *Haliaeetus leucogaster* (White-breasted Sea-Eagle);
- *Falsistrellus tasmaniensis* (Eastern Falsistrelle);
- *Pteropus poliocephalus* (Grey-headed Flying-fox); and
- *Miniopterus australis* (Little Bentwing-bat).

2.5 PRIORITY WEEDS AND WEEDS OF STATE AND NATIONAL SIGNIFICANCE

The impact of weeds on site is considered to be a threat to the long-term survival of the area of native vegetation within the project footprint. Five Priority Weeds for NSW North Coast which includes the Mid Coast Council LGA that have been recorded in the study area are listed in Table 2.7.

Table 2.7: Priority Weed species found within the subject land.

WEED SPECIES	LEGAL REQUIREMENTS	ADDITIONAL SIGNIFICANCE
<i>Senecio madagascariensis</i> Fireweed	General Biosecurity Duty Prohibition on dealings	N
<i>Lantana camara</i> Lantana	General Biosecurity Duty Prohibition on dealings	T, N
<i>Nephrolepis cordifolia</i> Fishbone Fern	General Biosecurity Duty Prohibition on dealings	
<i>Conyza species</i> Fleabane	General Biosecurity Duty Prohibition on dealings	
<i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> Bitou bush	General Biosecurity Duty Prohibition on dealings Biosecurity Zone	T N
<i>Stenotaphrum secundatum</i> Buffalo Grass	General Biosecurity Duty	
<i>Asparagus aethiopicus</i> Ground Asparagus	General Biosecurity Duty Regional Recommended Measure	
<i>Andropogon virginicus</i> Whisky Grass	General Biosecurity Duty	
<i>Axonopus fissifolius</i> Narrow-leaved Carpet Grass	General Biosecurity Duty	

T – Listed as a Threatening Process under the NSW BC Act 2016.

N – Weed of National Significance.

***Priorities under the Biosecurity Act 2015**

General Biosecurity Duty - any person dealing with plant matter must take measures to prevent, minimise or eliminate the biosecurity risk (as far as is reasonably practicable).

Prohibition on certain dealings - Must not be imported into the state, sold, bartered, exchanged or offered for sale.

Regional Recommended Measure - Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

Biosecurity Zone - Within the Biosecurity Zone (all of NSW) this weed must be eradicated where practicable, or as much of the weed destroyed as practicable, and any remaining weed suppressed. The local control authority must be notified of any new infestations of this weed within the Biosecurity Zone.

Information on the control of these species is located in Appendix A and also contained within the NSW DPI *Noxious and environmental weed control handbook* (2018). Other weed species recorded in the study area included:

* <i>Pinus elliotii</i>	Slash Pine
* <i>Tradescantia fluminensis</i>	Wandering Jew
* <i>Hydrocotyle bonariensis</i>	Largeleaf Pennywort
* <i>Aira cupaniana</i>	Silvery Grass
* <i>Avena fatua</i>	Wild Oats
* <i>Briza maxima</i>	Quaking Grass
* <i>Briza minor</i>	Shivery Grass
* <i>Cenchrus clandestinus</i>	Kikuyu
* <i>Cortaderia selloana</i>	Pampas Grass
* <i>Ehrhartia erecta</i>	Panic Veldt Grass
* <i>Paspalum dilatatum</i>	Paspalum
* <i>Gomphocarpus fruticosus</i>	Narrow-leaved Cottonbush
* <i>Bidens pilosa</i>	Cobblers Pegs
* <i>Conyza parva</i>	Whorled Fleabane
* <i>Hypochaeris radicata</i>	Flatweed
* <i>Sonchus oleraceus</i>	Common Sow Thistle
* <i>Trifolium campestre</i>	Hop Clover
* <i>Trifolium repens</i>	White Clover
* <i>Cinnamomum camphora</i>	Camphor Laurel
* <i>Linum trigynum</i>	French Flax
* <i>Modiola carliniana</i>	Red-flowered Mallow

* <i>Sida rhombifolia</i>	Paddys Lucerne
* <i>Plantago lanceolata</i>	Plantain
* <i>Anagallis arvensis</i> var. <i>arvensis</i>	Scarlet Pimpernel
* <i>Richardia humistrata</i>	
* <i>Verbascum virgatum</i>	Twiggy Mullein
* <i>Solanum nigrum</i>	Blackberry Nightshade
* <i>Verbena bonariensis</i>	Purple Top

These species should be controlled during primary weed control to assist natural regeneration and revegetation works.

3.0 DESCRIPTION OF PROPOSED ENVIRONMENT

All vegetation within the impact area will be removed for a proposed subdivision, leaving an 82m – 165m vegetation corridor within the east of the site, all vegetation within the west of the site and a planted wildlife movement corridor in the north of the site. All retained vegetation is to be kept in-perpetuity. Due to the nature of the retained vegetation in the east and west, natural regeneration of the understorey would be feasible after weed control is undertaken. The wildlife movement corridor in the north will be revegetated with plantings of preferred koala feed tree species *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus microcorys* (Tallowwood). The western stormwater infiltration area will be revegetated with plantings consistent with PCT 3544, including *Eucalyptus pilularis* (Blackbutt), *Angophora costata* (Smooth-barked Apple), and *Corymbia gummifera* (Red Bloodwood). Once weeding within the movement corridor and western stormwater infiltration area is undertaken, natural regeneration of shrubs and midstory species will be allowed to occur. The plantings of canopy species and natural regeneration of shrub and midstory species will create a structurally intact wildlife corridor to facilitate the movement of ground dwelling and arboreal fauna from east to west within the study area and create additional habitat in the west. Weeding and rubbish removal will be undertaken across the site. The development will require the removal of approximately 10.30ha of Smooth-barked Apple - Blackbutt heathy open forest of the Tomaree Peninsula. Six hollow-bearing trees will also be removed. Nest boxes and any harvested hollows from the development footprint will be installed within the vegetation corridor away from artificial lighting to compensate for hollows removed for the proposed development.

3.1 VEGETATION REHABILITATION AND ENHANCEMENT

Three main approaches to vegetation rehabilitation to be used are:

- Natural Regeneration
- Assisted natural regeneration;
- Revegetation.

3.2 NATURAL REGENERATION

Natural regeneration involves recovery purely through natural processes on the site. Management Zone 3 will utilise the *in-situ* resilience of the remnant vegetation by allowing the existing native seed bank and propagules to establish.

3.3 ASSITED NATURAL REGENERATION

Assisted Natural Regeneration will involve the following stages to control weeds and facilitate native regeneration:

- **Weed control** – targeting the removal of invasive species. Species to target include priority weeds, *Lantana camara* (Lantana), *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou bush), *Conyza bonariensis* (Flax-leaved Fleabane), and *Nephrolepis cordifolia* (Fishbone Fern). This will involve the use of mechanical and/or chemical approaches as discussed in Section 4.3.

3.4 REVEGETATION

Revegetation of canopy species will be undertaken in Management Zone 2. This will involve planting of Koala Feed Tree Species *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus microcorys* (Tallowwood) within the wildlife movement corridor in the north to create a wildlife corridor to facilitate the movement of fauna from east to west within the study area. Suitable species and techniques have been suggested in Section 4.5.

4.0 VMP IMPLEMENTATION

The implementation of the VMP will include:

- Management Zones;
- Site Protection;
- Weed Control;
- Vegetation Removal;
- Revegetation and Compensatory Plantings;
- Fencing and signage;
- Nest Box Installation;
- Maintenance, including Nest Boxes;
- Monitoring and Reporting.

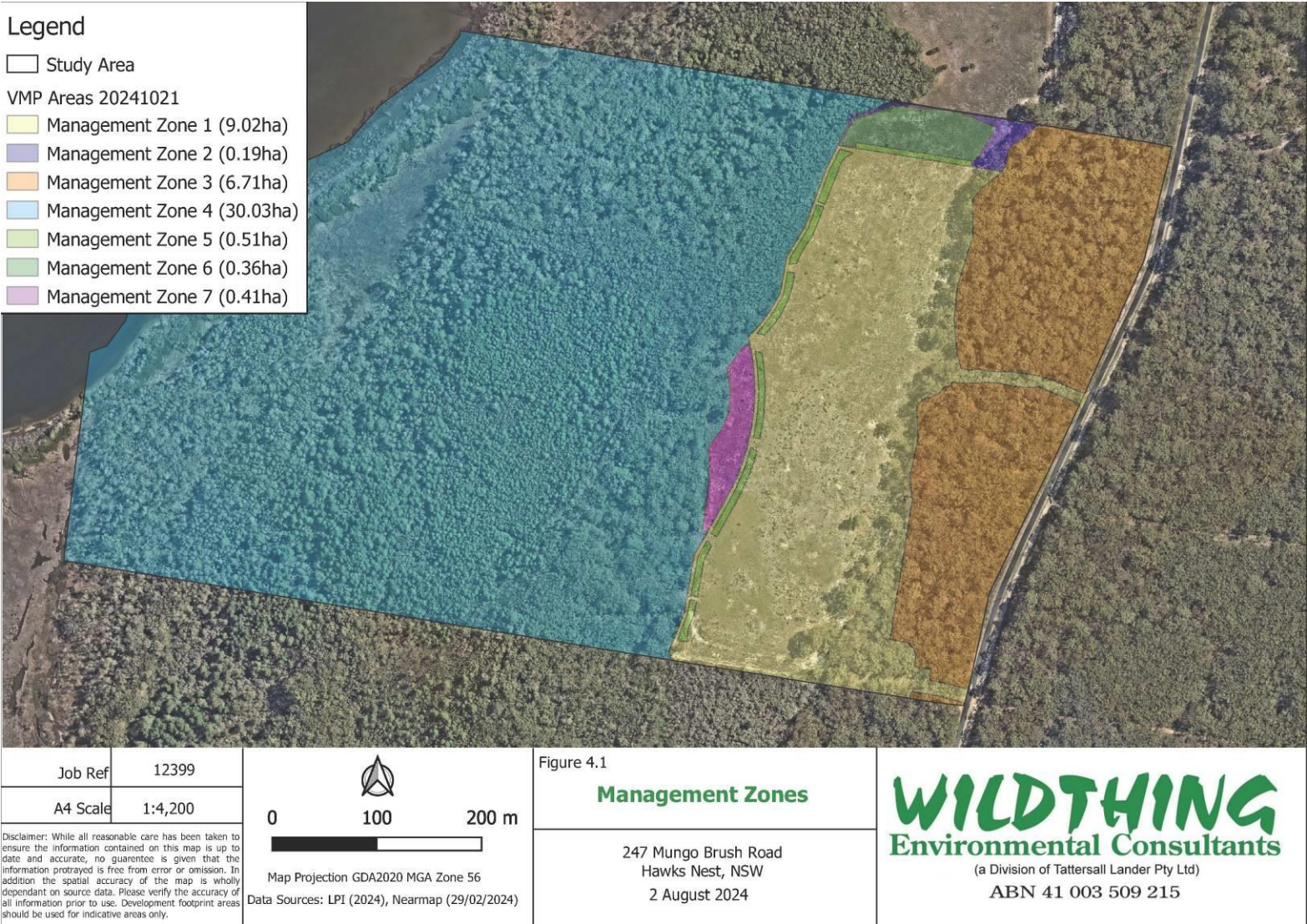
4.1 MANAGEMENT ZONES

To ensure the success of the VMP and to protect and enhance the native vegetation that is already present, the site has been broken down into seven Management Zones (Figure 4.1). These zones include:

- Management Zone 1: Development Footprint (9.02ha);
- Management Zone 2: Planted Wildlife Movement Corridor in the North (0.19ha);
- Management Zone 3: Retained Vegetation in the East (6.71ha).
- Management Zone 4: Retained Vegetation in the West (30.03ha)
- Management Zone 5: Biofilter Raingardens (0.51ha);
- Management Zone 6: Northern Stormwater Infiltration Area (0.36ha);
- Management Zone 7: Western Stormwater Infiltration Area (0.36ha);

Sections 4.1.1 – 4.1.7 provide a description of the management activities to be undertaken in each of the Management Zones.

Figure 4.1: Management Zones.



4.1.1 MANAGEMENT ZONE 1 – DEVELOPMENT FOOTPRINT

The 9.02ha development area is located in the centre of the study area with two access roads in the east. This includes the footprint of the caravan park with 148 long-term sites and 27 caravan sites. The proposal also includes community facilities for use by the occupants of the park and road and drainage. Vegetation will require total removal within this zone.

Required actions:

- Removal of all vegetation;
- Removal of six Hollow-bearing Trees;
- Relocation of dead wood and harvested hollows to Management Zones 3 & 4;
- Fencing of boundary between development footprint and retained vegetation and educational signage.

4.1.2 MANAGEMENT ZONE 2 – PLANTED WILDLIFE MOVEMENT CORRIDOR IN THE NORTH

A 0.19ha, 50m wide wildlife movement corridor will be planted in the north of the subject land. This zone includes the section of corridor outside of the stormwater inundation area (Management Zone 6). Management actions within this area will largely be in the form of revegetation, assisted regeneration and weed control.

Required actions:

- Retention of existing native groundcovers;
- Control of weeds;
- Assisted regeneration of native shrubs and midstory species;
- Planting of preferred Koala Food Tree species *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus microcorys* (Tallowwood).

4.1.3 MANAGEMENT ZONE 3 – RETAINED VEGETATION IN THE EAST

The 6.71ha of vegetation will be retained within the east of the subject land. Management actions within this area will largely be in the form of natural regeneration and assisted regeneration including weed control, dead wood relocation from Management Zone 1 and nest box installation.

Required actions:

- Retention and protection of existing native trees, shrubs and groundcovers;
- Control of weeds;
- Assisted and natural regeneration;
- Relocation of suitable dead wood and any harvested hollows from Management Zone 1;
- Installation of nest boxes;
- Fencing of boundary between development footprint and retained vegetation and educational signage.

4.1.4 MANAGEMENT ZONE 4 – RETAINED VEGETATION IN THE WEST

The 30.03ha of vegetation will be retained within the west of the subject land. Management actions within this area will largely be in the form of natural regeneration and assisted regeneration including weed control.

Required actions:

- Retention and protection of existing native trees, shrubs and groundcovers;
- Control of weeds;
- Assisted and natural regeneration;
- Relocation of suitable dead wood from Management Zone 1;
- Fencing of boundary between development footprint and retained vegetation and educational signage.

4.1.5 MANAGEMENT ZONE 5 – BIOFILTER RAINGARDEN

A total of 0.51ha of Biofilters will be planted in sections within the north of the subject land and along the western development area. Management actions within this management zone will largely be in the form of revegetation, assisted regeneration and weed control.

Required actions:

- Control of weeds;
- Planting of 3 species of accepted Mid Coast Council Raingarden Plants Factsheet (2018) *Carex appressa* (Tall Sedge), *Juncus kraussii* (Sea Rush) and *Lomandra longifolia* x *confertifolia* subsp. *pallida* (Lime Tuff).
- Fencing of boundary between development footprint and retained vegetation and educational signage.

4.1.6 MANAGEMENT ZONE 6 – NORTHERN STORMWATER INUNDATION AREA

A 0.36ha, 50m wide wildlife movement corridor will be planted in the north of the subject land. This zone includes the section of corridor within the stormwater inundation area. Management actions within this area will largely be in the form of earthwork (stripping topsoil, reprofiling and respreading topsoils), construction of berms / bunds (300mm high), revegetation, assisted regeneration and weed control.

Required actions:

- Stripping and stockpiling topsoil;
- Reprofiling area;
- Respreding topsoil;
- Control of weeds;

- Assisted regeneration of native groundcovers, shrubs and midstory species;
- Planting of preferred Koala Food Tree species *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus microcorys* (Tallowwood).

4.1.7 MANAGEMENT ZONE 7 – WESTERN STORMWATER INNUNDATION AREA

A 0.41ha stormwater inundation area that will be restored to PCT 3544. Management actions within this area will largely be in the form of earthwork (stripping topsoil, reprofiling and resspreading topsoils), construction of berms / bunds (300mm high), revegetation, assisted regeneration and weed control.

Required actions:

- Stripping and stockpiling topsoil;
- Reprofiling area;
- Resspreading topsoil;
- Control of weeds;
- Assisted regeneration of native groundcovers, shrubs and midstory species;
- Planting of canopy species consistent with PCT 3544.

4.2 MANAGEMENT ACTIONS

4.2.1 SITE PREPARATION AND PROTECTION

The following site protection measures are to be implemented:

- Prior to the commencement of vegetation clearing, a defined clearance zone is to be clearly marked using demarcating tape. A clearance line boundary is also to be clearly marked along the two entrance routes within the vegetation corridor ensuring no machinery can enter into the retained areas of the vegetation corridor. Vegetation to be removed must be limited to the identified vegetation within the project footprint. No other native remnant vegetation is to be removed as a result of the proposed project.
- Prior to the removal of topsoil from Management Zones 6 and 7, the removal area is to be clearly marked using demarcation tape.
- Prior to any earthworks occurring, silt fencing is to be erected along the boundary of the clearance zone and retained vegetation corridor so that no excess sediment will enter this habitat.
- Trees requiring removal are to be clearly marked with surveyors tape so no unnecessary tree removal occurs.
- Hollow-bearing trees requiring removal are to be clearly marked with an 'H' using spray paint and preferred koala feed trees requiring removal are to be marked with a 'K'.
- Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection.

- Implement hygiene protocols for machinery to prevent the spread of weeds outside the development site. This includes appropriate cleaning of all construction equipment to limit the risk of weed seed and fragments to adjacent retained areas.
- Appropriate handling of mulch created from the removal of exotic vegetation.
- Topsoil, materials and equipment stored on site should be located in Management Zone 1
- Topsoil removed from Management Zones 6 and 7 is to be stockpiled separately and clearly marked to indicate which zone the stockpile is to be returned to;
- Chemical and manual treatment of weeds (see Section 4.4).
- Removal of any barbed wire and rubbish located within the study area.

4.2.2 KOALA GRIDS, FENCING AND SIGNAGE

Koala grids are to be installed at the end of each access road leading into the development. Koala fencing is to be installed within the designated areas in accordance with the KPoM (Wildthing, 2024). Rural fencing (i.e. post and rail or 5 strand plain wire) is to be installed within the designated areas in accordance with the KPoM (Wildthing, 2024). The fencing is to be installed and maintained in perpetuity. Signage is to be installed at key locations along the installed fencing with the primary aim to alert residents of the environmental significance of the retained vegetation and activities that are prohibited in this area. The text, design and location of the signs are to be identified in consultation with Council.

4.2.3 VEGETATION REMOVAL

Vegetation within the development footprint is required to be removed within the scope of the proposal, with 10.30ha requiring removal. Six hollow-bearing trees will require removal.

The following Clearing Protocols are to be undertaken:

- Clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development footprint. Tree clearing and disturbance will be limited to the development site;
- Hollow-bearing trees and trees containing evidence of fauna such as nests requiring removal are to be clearly marked with an 'H' prior to any vegetation removal;
- Where a tree must be disturbed the priority should be given to pruning rather than clearing;
- The clearing of any trees is to be undertaken in a manner that avoids damaging adjacent and retained vegetation;
- An ecologist is to conduct a pre-clearance survey every day clearance works are being undertaken to search for the presence of koalas and any other fauna within the site. If a koala is located no clearance works are to be undertaken until the koala moves on under its own free will.
- A suitably qualified ecologist is required to supervise the removal of all hollow-bearing and habitat trees to ensure any fauna present is safely relocated.

- In the event fauna are identified within vegetation and/or habitat trees the fauna ecologist must take appropriate action to safely collect and relocate fauna to nearby bushland. Any nocturnal fauna should be kept in a suitable cage in a shaded location until dusk, and then released into nearby bushland. If juvenile fauna are discovered in hollows after a tree is felled, they are to be taken into the care of an organisation such as Wildlife In Need of Care (WINC) (Rescue Hotline 1300 946 295) or The Myall Koala & Environment Group Inc. (Wildlife rescue 041806280483). The fauna ecologist must have the appropriate skills and equipment to perform euthanasia if necessary. Injured fauna should be assessed by the ecologist, and euthanised if their injuries are such that the ecologist considers that they are unlikely to survive. If injured fauna are likely to survive, they should be taken to a vet for treatment. After treatment, fauna should be taken to an organisation such as Wildlife In Need of Care (WINC) (Rescue Hotline 1300 946 295) or The Myall Koala & Environment Group Inc. (Wildlife rescue 041806280483) for care until they can be released.
- Written confirmation of tree removal must be provided to council confirming any fauna species detected during tree removal activities and any relocation actions and injuries that occurred.

4.2.4 TOPSOIL REMOVAL, STOCKPILE AND RESPREADING

Topsoil from within Management Zones 6 and 7 is to be removed and stockpiled within the development footprint. The topsoil is not to be removed from the site. Topsoil removed from Management Zones 6 and 7 is to be stockpiled separately and not mixed together due to the different seed bank contained within each zone. It is imperative that the topsoil removed from Management Zone 6 is returned to Management Zone 6 once reprofiling is completed and that topsoil removed from Management Zone 7 is returned to Management Zone 7 once reprofiling is complete.

4.2.5 WEED CONTROL

For the perpetuity of the subject land any weed infestations are to be treated within all Management Zones. Control of weeds will give established and planted native vegetation the best chance of survival and enhancement. Weed locations to target is shown in Figure 4.2.

Weed control will involve the following stages:

- **Primary weed control** - target removal of Priority Weeds and other most invasive flora species;
- **Follow-up weed control** - following on from primary weed control to treat regenerating weed species. To be carried out during general maintenance visits for six-month periods over the first two years:
- **Maintenance weeding (tertiary)** – To be undertaken annually within the subject land for perpetuity after two years of follow-up weeding.

The control of weeds within the site will use the first principle of the Bradley Method, which involves the removal of weeds from areas of least infestation prior to removal from areas of most infestation.

Weeds are to be controlled by manual methods within areas of better-quality native vegetation, if possible, to minimise use of chemicals. However, in most instances, depending on the species and size of infestation, application of a registered herbicide to a specific plant species may be required. Methods of weed eradication include:

- Physical removal with minimum disturbance to the surrounding environment;
- Herbicide applied by injection, cut and paint application or controlled spraying used in accordance with the registered label;
- Biological controls that are approved by the Commonwealth Scientific & Industrial Research Organisation (CSIRO). Biological Control is presently limited in application but may be considered in future weed management within the remnant.

Herbicide Control

- The use of herbicides may only be undertaken by suitably trained and licensed maintenance staff or contractors (Minimum - AQF3 Chemical Accreditation course);
- When spraying in or near waterbodies, ensure herbicides registered for use in or near waterways are used;
- Consider alternative eradication techniques before spraying with herbicides;
- Ensure environmentally friendly herbicides are used;
- Notify adjacent residences and interest groups as to the intention to spray herbicides nearby.

4.2.6 REVEGETATION PLANTINGS

Koala Food Tree plantings to facilitate the movement of fauna species will be implemented within Management Zone 2 and Raingarden appropriate planting in accordance with the Mid Coast Council Raingarden Plants Factsheet (2018) will be planted within the Biofilter footprint within Management Zone 5. The plantings are to be implemented following the completion of the site protection, rubbish removal and primary weed control activities.

4.2.6.1 SPECIES COMPOSITION

The recommended species composition for Management Zone 2 is shown below in Table 4.1, the recommended species composition for Management Zone 5 is shown below in Table 4.2 and the recommended species composition for Management Zone 7 is shown below in Table 4.3.

Table 4.1: Management Zone 2 and 6: Recommended species list for the planting works and the source of plant material

Plant Species	Source of plant material
<i>Eucalyptus robusta</i> (Swamp Mahogany) (planted only in the west)	Tubestock
<i>Eucalyptus microcorys</i> (Tallowwood)	Tubestock

Table 4.2: Management Zone 5: Recommended species list for the planting works and the source of plant material

Plant Species	Source of plant material
<i>Carex appressa</i> (Tall Sedge)	Tubestock
<i>Juncus krausii</i> (Sea Rush)	Tubestock
<i>Lomandra longifolia</i> x <i>confertifolia</i> subsp. <i>pallida</i> (Lime Tuff)	Tubestock

Table 4.3: Management Zone 7: Recommended species list for the planting works and the source of plant material

Plant Species	Source of plant material
<i>Eucalyptus pilularis</i> (Blackbutt)	Tubestock
<i>Angophora costata</i> (Smooth-barked Apple)	Tubestock
<i>Corymbia gummifera</i> (Red Bloodwood).	Tubestock

4.2.6.2 SOURCE NATIVE TUBESTOCK

The required plants should be sourced from a suitably experienced plant production nursery. Specimens will be required to be of local providence, and will likely involve seed collection and propagation. Plants will be planted as Tubestock.

4.2.6.3 PLANTING METHODS

It is recommended that manual planting be carried out within Management Zones 2, 5, 6 and 7. Planting will involve preparing the ground by such means of auger holes. All tubestock will be required to be suitably guarded to prevent herbivory. Plantings are to be well watered on installation. Follow-up watering is also to be undertaken.

4.2.6.4 ESTIMATED COSTINGS AND PLANTING DENSITIES

The cost per plant is estimated at:

- Tubestock - \$3.50 (GST included)

MANAGEMENT ZONE 2 AND 6 – WILDLIFE MOVEMENT CORRIDOR AND NORTHERN STORMWATER INNUNDATION AREA

Planting densities was determined by calculating the total area of the corridor and the planting density for canopy species. It is recommended that species be planted at the following densities:

- Canopy species - 1 plant per 4m x 4m.

Eucalyptus robusta (Swamp Mahogany) is to only be planted in lower lying areas, which is generally within the west of the corridor and *Eucalyptus microcorys* (Tallowwood) within the higher/better drained areas of the corridor.

See Table 4.5 for the number of plants required and the estimated costing for Management Zone 2 and 6.

Table 4.5: Management Zone 2 and 6: Recommended species list for the revegetation works and the source of plant material

Plant Species	Number required	Estimated Total Cost
Canopy Species		
<i>Eucalyptus robusta</i> (Swamp Mahogany)	100	\$350.00
<i>Eucalyptus microcorys</i> (Tallowwood)	244	\$854.00

MANAGEMENT ZONE 5 – BIOFILTER RAINGARDEN

Planting densities was determined by calculating the total area of the corridor and the density required for the chosen species in accordance with the Mid Coast Council Raingarden Factsheet (2018). It is recommended that species be planted at the following densities:

- *Carex appressa* (Tall Sedge) (10 per m²),
- *Juncus krausii* (Sea Rush) (8 per m²);
- *Lomandra longifolia* x *confertifolia* subsp. *pallida* (Lime Tuff) (6 per m²).

See Table 4.6 for the number of plants required and the estimated costing for Management Zone 5.

Table 4.6: Management Zone 5: Recommended species list for the revegetation works and the source of plant material

Plant Species	Number required	Estimated Total Cost
Canopy Species		
<i>Carex appressa</i> (Tall Sedge)	17,000	\$59,500.00
<i>Juncus krausii</i> (Sea Rush)	13,600	\$47,600.00
<i>Lomandra longifolia</i> x <i>confertifolia</i> subsp. <i>pallida</i> (Lime Tuff)	10,200	\$35,700.00

MANAGEMENT ZONE 7 – WESTERN STORMWATER INNUNDATION AREA

Planting densities was determined by calculating the total area of the corridor and the planting density for canopy species. It is recommended that species be planted at the following densities:

- Canopy species - 1 plant per 4m x 4m.

See Table 4.7 for the number of plants required and the estimated costing for Management Zone 7.

Table 4.7: Management Zone 7: Recommended species list for the revegetation works and the source of plant material

Plant Species	Number required	Estimated Total Cost
Canopy Species		
<i>Eucalyptus pilularis</i> (Blackbutt)	86	\$301.00
<i>Angophora costata</i> (Smooth-barked Apple)	85	\$297.50
<i>Corymbia gummifera</i> (Red Bloodwood).	85	\$297.50

4.2.7 PERFORMANCE TARGETS

Quantifiable performance targets for native species cover (canopy, mid-storey and groundcover) and exotic cover for the primary, secondary and maintenance phases of the VMP have been given in Table 4.8.

Table 4.8: Quantifiable performance targets for native species cover and exotic cover.

Management Zones 2, 5, 6 and 7	Primary Weed Control			Follow-up Weed Control			Maintenance		
	Proportion of exotic canopy species no greater than 5%	Proportion of exotic mid-story species no greater than 60%	Proportion of exotic groundcover species no greater than 80%	Proportion of exotic canopy species no greater than 2%	Proportion of exotic mid-story species no greater than 30%	Proportion of exotic groundcover species no greater than 40%	Proportion of exotic canopy species no greater than 0%	Proportion of exotic mid-story species no greater than 5%	Proportion of exotic groundcover species no greater than 5%
	A demonstrated increase in native cover and diversity and a demonstrated decrease in exotic cover and diversity by the end of year 5								
	A minimum of 85% survival rate of all plantings								
	A minimum of 90% survival rate of all plantings								
Management Zone 2, 5, 6 and 7	A minimum of 90% survival rate of all plantings								

4.2.8 NEST BOX INSTALLATION AND MONITORING PROGRAM

A total of 6 hollow-bearing trees containing a total of 7 hollows are required to be removed within the scope of the proposed development. These habitat trees were considered to be significant as a result of their large size, variety and number of hollows they contained and visible scratch marks.

Where hollows are felled, they will be recovered and reinstalled into suitable adjacent bushland where possible. Compensatory nest boxes at a ratio of 2:1 (2 nest boxes per hollow removed) are also required to be installed, giving a total of 14 nest boxes required. Nest boxes will be installed at least one month before the start of any clearing to provide alternative shelter for hollow-dependant fauna displaced during clearing. Nest boxes will be installed within Management Zone 3. Nest boxes are to be designed to accommodate locally occurring fauna species such as the threatened *Petaurus norfolcensis* (Squirrel Glider) and Microchiropteran Bats.

The following 14 nest boxes are to be installed within the site:

- 2 Powerful Owl Boxes;
- 8 Squirrel Glider Boxes; and
- 4 Microbat Boxes.

Nest boxes are to be constructed out of 18mm CD plywood (or higher grade), galvanised screws and exterior grade acrylic paint. The inside faces of the artificial nest boxes will have slots cut into it, to assist with internal access to the exit hole. The nest boxes will be installed into suitable trees at least 5m off the ground. This is a safe height from terrestrial predators and will enable easy access for monitoring/servicing by pole camera. They will be positioned to avoid extreme conditions such as mid-day summer heat, prevailing weather and to minimise visibility, noise and light sources from outside. Each nest box will be clearly numbered using non-toxic paint and located on a map. The location of each installed nest box will be documented and mapped with their individual GPS coordinates given. A compensatory nesting offsets report (including GIS map) will be provided to Mid Coast Council outlining the number, type, location and orientation of compensatory nesting offsets to be provided. It must be noted that nest boxes are not to be installed into any koala food tree species within preferred koala habitat, including *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus microcorys* (Tallowwood).

Monitoring of the nest boxes will be conducted to determine the usage of the nest boxes. Maintenance, including any repairs or replacement of nest boxes will also be undertaken during the monitoring period. If an artificial nest box needs to be removed from the site for repair, then an alternative nest box will be installed in the same location upon removal of the damaged nest box. Appropriate temporary signage will be installed while installation, monitoring and maintenance operations are being carried out. Monitoring and maintenance are to be carried out once a year in Spring for a period of five years then reviewed at the end of the five-year period. The review for the

ongoing maintenance and monitoring of the nest boxes will take into consideration the condition of the nest boxes and occupation rates. A letter will be provided to council detailing the findings of the nest box inspection and any maintenance carried out after the completion of each inspection and any maintenance required.

5.0 MAINTENANCE PROGRAM

5.1 GENERAL MAINTENANCE

The maintenance program will commence after completion of initial works, which includes site preparation works, primary weed control, and follow-up weeding, plantings of the fauna movement corridor, nest box installation and installation of the fauna friendly fencing and signage as specified in the Implementation Plan provided in Table 7.1. The General maintenance program will then commence and will consist of a six-monthly maintenance program for a period of two years then annually for a further three years. General maintenance will involve monitoring survival rates of plantings, installing replacement plants, guards and continued follow-up weeding.

5.1.1 WATERING

All plantings are to be well watered on installation. They will then receive a further two applications of water during the first two months to assist in establishment. Depending on the soil moisture at the time a further watering may be required.

5.1.2 MAINTENANCE WEEDING

Follow-up weed control will be carried out. Noxious weeds and other problem weeds present at the time should be targeted.

5.1.3 INSTALLING REPLACEMENT PLANTS

Plant losses discovered during maintenance visits are to be replaced at the cost of the applicant.

5.2 INAPPROPRIATE PRACTICES

It is recommended that the following practices are observed to ensure the continued viability of the VMP:

- No lawn clippings or other non-native vegetation is to be discarded within Management Zones 2, 3, 4, 5, 6 & 7;
- No livestock is to be allowed to access Management Zones 2, 3, 4, 5, 6 & 7;
- No rubbish is to be retained/stored within Management Zones 2, 3, 4, 5, 6 & 7;
- The use of barbed-wire shall be avoided within all Management Zones given the recorded presence of koalas, gliders and bats in the local area;
- Dogs should be controlled from entering Management Zones 2, 3, 4, 5, 6 & 7.

5.3 VEGETATION CORRIDOR FENCING AND SIGNAGE

Koala fencing is to be installed within the designated areas in accordance with the KPoM (Wildthing, 2024). Rural fencing (i.e. post and rail or 5 strand plain wire) is to be installed within the designated areas in accordance with the KPoM (Wildthing, 2024). Signage is to be installed at key locations along this boundary fencing with the primary aim to alert residents of the environmental significance of

the retained vegetation and activities that are prohibited in this area. The text, design and location of the signs are to be identified in consultation with Council.

6.0 MONITORING AND REPORTING

Monitoring for a period of 5 years will be conducted to accurately evaluate the success of the works. A report is to be submitted to Mid Coast Council by a suitably qualified ecologist or bush regenerator. The first monitoring report is to be provided to Council after the initial 6-month implementation period, then annually thereafter for 5 years.

Monitoring should address the following issues:

- Average plant growth;
- Plant losses;
- Plant replacement;
- Weed regrowth and control measures;
- Nest Box occupation rates and maintenance;
- Fencing and signage maintenance.

At the end of the 5-year period a final report certifying completion of the VMP is to be submitted to Mid Coast Council detailing whether the specific objectives of the plan have been met. Where objectives of the VMP have not been met, a revised VMP shall be required to be prepared and implemented to ensure compliance with the objectives and performance targets specified in this VMP.

6.1 PHOTO POINT MONITORING

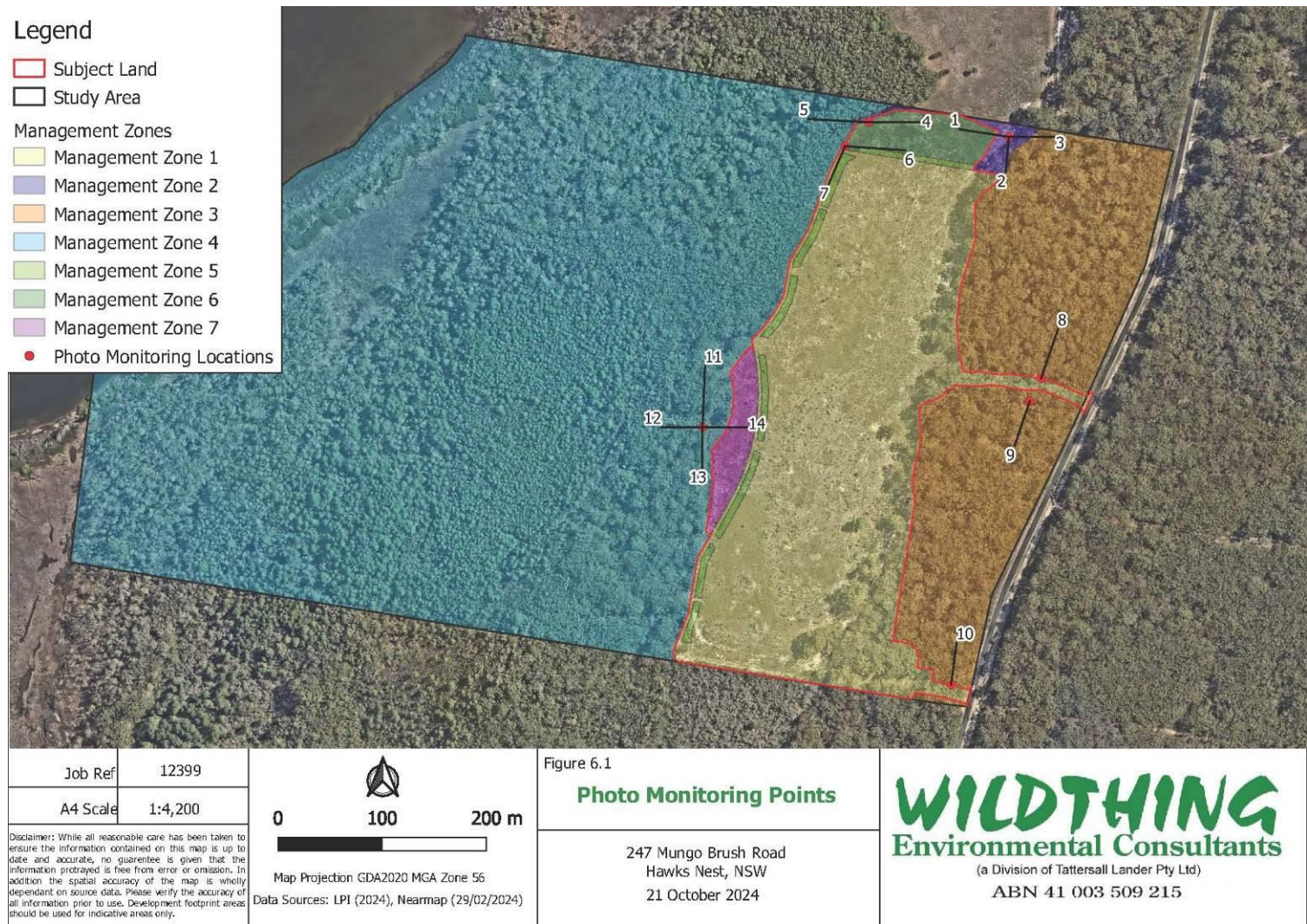
Seven fixed photo points have been set up to monitor the progress of restoration works within Management Zones 2 and 5 and to monitor retained vegetation in the east and west. Photo point details such as GPS location and aspect can be found in Table 6.1 and their locations are shown in Figure 6.1. Star pickets should be placed at each photo point for future reference.

Table 6.1: Location and direction of each photo monitoring point.

Photo Number	Management Zone	Photo Point GPS Location		Direction
		Easting	Northing	
1	6	423333	6387249	West
2	2			South
3	3			East
4	6	423199	6387270	East
5	4			West
6	5	423177	6387247	East
7	5			South
8	3	423364	6387017	North
9	3	423358	6387005	South
10	3	423278	6386723	North
11	4	423039	6386970	North
12	4			West

Photo Number	Management Zone	Photo Point GPS Location		Direction
		Easting	Northing	
13	4			South
14	7			East

Figure 6.1: Photo Monitoring Point Locations.



7.0 IMPLEMENTATION PLAN

The VMP program is detailed in Table 7.1 and will guide the site's management. The landowner will be responsible for weeding and maintenance of the retained vegetation. The site manager and construction staff engaged by the landowner will be responsible to vegetation removal. The project ecologist engaged by the landowner will be responsible for supervising habitat removal, and conducting monitoring and reporting. Anyone using herbicides will require a minimum - AQF3 Chemical Accreditation course. Technical advice and educational information pertaining to the ongoing management of the vegetation on site can be obtained from a number of agencies and organisations. These providers would include:

- Mid Coast Council;
- Hunter Local Land Services Paterson (02) 301030 www.hunter.lls.gov.au;
- Australian Association of Bush Regenerators;
- Landcare Australia: 1800 151 105

Table 7.1: – VMP Implementation Plan

IMPLEMENTATION PLAN - VMP			
Strategy	Action	Performance Criteria	Responsibility
Plant procurement	Seed Collection/Propagation	Plant production nursery/owner	Tubestock ready to plant.
Site Protection	A defined clearance zone is to be clearly marked using demarcating tape.	Clearance zone marking is in place.	Clearance contractor, construction staff and project ecologist
	Implement hygiene protocols for machinery	Hygiene protocol for machinery implemented	
	Appropriate handling of mulch created from the removal of exotic vegetation.	Mulch is handled appropriately	
	Habitat trees for removal clearly marked with a large spray paint 'H'.	Trees for removal clearly marked. Habitat trees clearly marked.	
Vegetation removal	Pre-clearance surveys are undertaken to look for Koalas and other fauna species.		Clearance contractor and project ecologist
	Supervision of the removal of hollow-bearing trees and any fauna present is safely relocated.	Removal of hollow-bearing trees was supervised and any fauna present safely relocated.	
	A staged approach to clearing is to be undertaken. Staging is to include: - Phase 1 Clearing: Removal of non-habitat trees, and - Phase 2 Clearing: Removal of habitat and connecting trees	A staged approach to clearing was undertaken	
	Clearing is to occur in a direction from previously disturbed lands towards retained lands.	Clearing occurred in a direction from previously disturbed lands towards retained lands.	
	All hollow bearing features will be sectionally lowered by tree climbers (where safe to do so).	All hollow bearing features were sectionally lowered by tree climbers (where safe to do so).	
	Suitable hollows recovered during clearing works should be installed as nesting hollows	Suitable hollows were recovered	
	Fallen timber and hollow logs within clearance area relocated into the retained lands.	Fallen timber and hollow logs within clearance area were relocated into the retained lands.	
Primary weed control	Priority weeds, other weed/infestations/occurrences.	70% eradication of priority weeds by 6 months	Landowner or Weeding Contractor

IMPLEMENTATION PLAN - VMP			
Strategy	Action	Performance Criteria	Responsibility
Follow-up weed control	To be conducted every six months for two years.	90% eradication of priority weeds by end of year 2	Landowner or Weeding Contractor
Planting	Planting of Tubestock Water all plantings	Planting and plant protection in ground.	Revegetation Contractor/owner
Nest Box/harvested hollow Installation	Nest boxes are installed on site at a minimum ratio of 2 nest boxes per hollow-bearing tree removed.		Contractor/owner and project ecologist
Fencing and signage	Install fencing and signage	Fencing and signage installed	Contractor/owner
Site maintenance	Maintain nest boxes Follow-up weed control Replacement of planting losses. Watering if required. Maintain fencing and signage	95% eradication of priority weeds Plant losses replaced. Nest boxes maintained Fencing and signage maintained	Contractor/owner and project ecologist
Monitoring	Monitor for <ul style="list-style-type: none"> - Plant losses - Growth of Plantings - Weed regrowth - Plant replacement - Nest Box monitoring and maintenance 	Report sent to Port Stephens Council	Contractor/owner and project ecologist

Table 7.2: Estimate program of works.

Task	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Year 1	Year 1.5	Year 2	Year 2.5	Year 3	Year 4	Year 5
Plant procurement														
Nest Box Installation														
Primary Weed Control														
Installation of silt fencing														
Vegetation removal														
Planting														
Install fencing and signage														
Maintenance visit and secondary weed control														
Nest Box Monitoring and Maintenance														
Reporting														
Final report														

8.0 CONCLUSION

Monitoring is important to ensure the plan runs effectively and to highlight any changes such as weed control techniques which are required to be made to the plan. Given the implementation of the recommendations in this VMP are adhered to, it is considered that the VMP will ensure native vegetation within the subject land will be improved and maintained in the future.

9.0 BIBLIOGRAPHY

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APPENDIX A WEED CONTROL INFORMATION



Table A1: Weed Control Information



SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Nephrolepis cordifolia</i> Fishbone Fern LOMARIOPSIDACEAE</p>	<p><u>Description</u> Fern with upright or drooping fronds of 50-75 cm tall. Plants grow in thick clumps. Above ground stems (stolons) creep along the ground and can form dense mats. Rhizomes (underground stems) often have a small (15 mm) fleshy, round tuber attached.</p> <p><u>Habitat</u> Grows in moist, rocky areas, rainforests and in trees in its native range. Found in urban bushland in disturbed areas such as roadsides along waterways in parks and gardens.</p> <p><u>Comments</u> Spread by spores or plant parts. Spores are spread by:</p> <ul style="list-style-type: none"> wind water contaminated soil, including through earthworks, shoes, and tyres. <p>Plants also spread through rhizomes when garden waste is dumped. Tubers do not gr</p>	Native plant that occurs naturally from northeast Queensland to north east New South Wales	General Duty Biosecurity	<p><u>Physical</u> Removal of isolated, small seedlings and larger plants can be attempted by hand pulling or digging them up. This is only practical for a small number of plants. Ensure to remove root crown. Tubers do not require removal.</p> <p><u>Chemical</u> Fishbone fern can be spot sprayed. Plants are often hard to kill with herbicides so follow up with inspections and re-treat if necessary.</p>
 <p><i>Asparagus aethiopicus</i> Asparagus Fern, Ground Asparagus. ASPARAGACEAE</p>	<p><u>Description</u> Perennial, low growing herb with sprawling or stems arising from a crown. Stems up to 2 m long; green to brown with many small branches and short sharp spines. Flowers-creamy white</p> <p>Fruit is initially green turning bright red when mature; containing a single black seed. Roots - mat of underground stems (rhizomes) and fleshy tubers scattered along roots; stems arise from a central crown.</p> <p><u>Habitat</u> Occurs in warm coastal regions with rainfall from 500-1000mm. Creates vigorous thickets of foliage that forms dense spiny mats.</p>	<p>Cape Province of South Africa.</p> <p>Cultivated extensively as an ornamental plant.</p>	General Duty Biosecurity Prohibition on dealings Weed of National Significance (WONS).	<p><u>Physical</u> Hand remove or crown rhizome using "crowning" treatment method. The tuberous roots can be left in the ground. Small plants can be treated using a knife blade. Larger plants may be removed using a mattock or peter lever. Remove seed from site. Leave rhizomes to dry, and regularly inspect for resprouting.</p> <p><u>Chemical</u> Spot spray (requiring repeated applications) using glyphosate. Use of surfactant is recommended.</p> <p><u>Fire</u> <u>Biological</u></p>


SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Tradescantia fluminensis</i> Trad. Wandering Jew COMMELINACEAE</p>	<p><u>Description</u> Perennial, succulent herb with fibrous roots; stems branching, rooting at the nodes, rostrate or slightly ascending at the tips. Flowers; white.</p> <p><u>Habitat</u> Damp Locations. Widespread in higher rainfall areas. It prefers moist, shady sites and is sensitive to frosts.</p> <p><u>Comments</u> Difficult to eradicate as it grows readily from fragments of stems. Smothers other plants by forming a dense mat.</p>	<p>Native of South America.</p> <p>NSW, Qld and Vic.</p>	<p>General Biosecurity Duty</p>	<p><u>Physical</u> Hand weeding, repeat weeding will be required. It is possible to rake the weed into piles that can be picked up and removed.</p> <p>Smothering with black plastic.</p> <p><u>Chemical</u> Herbicides are a preferred method for controlling larger areas.</p> <p>Because of the waxy glossy foliage, it is resistant to sprays. A surfactant will likely be required to be added to the spray. Consult manufactures directions.</p> <p><u>Biological</u> The leaf smut fungus (Kordyana brasiliensis).</p>
 <p><i>Andropogon virginicus</i> Whisky Grass POACEAE</p>	<p><u>Description</u> A long-lived tufted grass usually growing 0.5-1 m tall the older stems and leaves turn reddish-brown or brownish-orange in colour during summer.</p> <p><u>Habitat</u> A weed of roadsides, disturbed sites, waste areas, pastures, wetlands, grasslands and open woodlands in sub-tropical and warmer temperate regions. Known to invade native plant communities that are extremely deficient in nutrients.</p> <p><u>Comments</u> Regarded as an environmental weed in New South Wales and Queensland. Is highly flammable at certain times of the year and can significantly alter the fire regime in areas where it invades.</p> <p>This species reproduces mainly by seed. These light seeds may be easily spread by wind and water and can also adhere to animals, clothing, and vehicles. They are also commonly dispersed to new areas when seeding plants are slashed or mown and can also move longer distances in contaminated soil and agricultural produce.</p>	<p>Native to North & Central America.</p>	<p>Key Threatening Process under the Biodiversity Conservation Act 2016 - the "invasion of native plant communities by exotic perennial grasses". Whisky Grass is one of the species specifically mentioned in this listing.</p>	<p><u>Physical</u> Younger plants can be controlled manually by cutting the fibrous roots off below the crown. Mature plants, cut off the seed-heads and bag them, then cut out the plant as above.</p> <p><u>Chemical</u> Broadacre spraying using a boom spray can efficiently kill large areas of this weed, but if this method is to be employed use caution as it can also kill large areas of desirable species. Individual plants can be spot-sprayed with herbicides when they are actively growing. This is best done when they are beginning to produce their upright stems, but prior to seed production (Autumn). Herbicide control is usually not effective once the plant turns brownish-orange and stops growing.</p> <p><u>Biological</u> Currently there are no biological control options.</p>



SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Eragrostis curvula</i> African Lovegrass POACEAE</p>	<p><u>Description</u> African lovegrass is a perennial grass that grows in clumps up to 1.2 m tall.</p> <p><u>Habitat</u> Thrives on acidic, sandy soils with low fertility. It is heat and drought tolerant. Frost can damage it, but it regrows in warmer weather</p> <p><u>Comments</u> African lovegrass takes over pastures and disturbed areas. Spread by seeds. Each seedhead can produce 300 to 1000 seeds. Seeds have high viability in the first year and after 5 years, more than half of the seeds are still viable. Some seed can remain viable for up to 17 years.</p>	<p>Native to southern Africa.</p> <p>Grows throughout NSW</p>	<p>General Biosecurity Duty</p> <p><u>Regional Recommended Measure* (Hunter)</u> (for Regional Priority - Asset Protection) Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.</p>	<p><u>Control Measures:</u> control mature plants year-round, with extra effort in spring before flowering look for flushes of seedlings after rain when temperatures are over 10°C (most seeds germinate in autumn and spring) and kill the seedlings before they are six weeks old keep looking for new plants each year as some seed remains viable for up to 17 years.</p> <p><u>Physical</u> Remove isolated plants by hand. Carefully bag seed heads. Dig up plant with fibrous roots with minimal soil disturbance.</p> <p><u>Chemical</u> Several herbicides provide effective control. Spot spray isolated occurrences.</p> <p><u>Fire</u> When: Winter, with dry cool conditions and low fire danger. Follow up: With chemical control when regrowth appears.</p> <p><u>Biological</u> Unknown.</p>
<p><i>Melinis repens</i> Red Natal Grass POACEAE</p>	<p><u>Description</u> Upright flowering stems up to 1 m tall. Its open seed-heads are usually a distinctive reddish colour when young.</p> <p><u>Habitat</u> A very common weed of roadsides, railways, parks, gardens, footpaths, disturbed sites, waste areas, pastures and crops in tropical and sub-tropical regions. Also present in temperate, semi-arid and arid areas.</p> <p><u>Comments</u> Reproduces mainly by seed. These light and fluffy seeds are often wind-dispersed and may also become lodged in clothing, vehicles and animals.</p>	<p>Native to the Canary Islands, Africa, the Seychelles, the Arabian Peninsula and India.</p> <p>Very widely naturalised in Australia, and most abundant in the northern and eastern parts of the country.</p>		<p><u>Physical</u> Remove isolated plants by hand. Carefully bag seed heads. Dig up plant with fibrous roots with minimal soil disturbance.</p> <p><u>Chemical</u> Several herbicides provide effective control. Spot spray isolated occurrences.</p> <p><u>Biological</u> Unknown.</p>



SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Hyparrhenia hirta</i> Coolatai Grass POACEAE</p>	<p><u>Description</u> Tussock forming long lived summer active perennial grass. Grows to 1.5 m and has greyish-green leaves that turn orangey-red in winter. The leaves are harsh to touch. Leaf sheaths are usually hairless and keeled.</p> <p><u>Habitat</u> Grows in a range of soils but is most active on light to medium textured soils and will grow and increase on heavy clay soils if not waterlogged.</p> <p><u>Comments</u> Drought tolerant, it has the ability to rapidly respond to rain. It is well adapted to fire, with tussocks surviving hot burns.</p> <p>Will readily invade disturbed areas such as roadsides and pastures, forming monocultures and out-competing most other species. It also has the ability to invade relatively pristine remnant native vegetation, making it a significant threat to the conservation of these areas.</p> <p>Road maintenance and construction along with slashing grass with mature seed, stock, water and wind all move the seed to new areas.</p>	<p>Native of tropical and temperate Africa, the Mediterranean & Middle East region.</p> <p>Common in Northern NSW and increasing infestations in southern NSW especially on roadsides.</p>	<p>General Biosecurity Duty</p> <p>Regional Recommended Measure* (for Regional Priority - Asset Protection-Hunter)</p> <p>The plant should not be bought, sold, grown, carried or released into the environment. Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread from their land. Land managers to reduce impacts from the plant on priority assets.</p>	<p>Early detection and management is very important. Plants should be identified and removed before viable seed has been set. Control of this highly invasive grass requires a very concerted effort as it is able to produce a seed head in as little as three or four weeks after slashing.</p> <p><u>Physical</u> Remove plants, bag and burn seed heads, try to stop seed being dropped in the process.</p> <p><u>Chemical</u> Is tolerant of most used herbicides and suppression of growth is the most likely outcome.</p> <p>Spot spraying with knockdown herbicides will require 2-3 applications for complete control.</p> <p>Pre-treatments of burning and slashing can reduce control as it suppresses the active growth which should have sufficient green leaf and be actively growing for the highest levels of control. Regardless of application method, up to three applications of glyphosate in the same growing season will be required.</p> <p>Wick wiping is performed with a machine towed behind a farm vehicle.</p> <p><u>Biological</u> Currently biocontrol is not a control technique for eradication.</p>
	<p><u>Description</u> Flat growing stoloniferous perennial grass up to 30cm high. Leaves short and rigid, flat or strongly folded, tips blunt. The distinctive flattened seedhead, easily separates buffalo grass from all other species.</p> <p><u>Habitat</u> Grows chiefly on the coast but cultivated elsewhere.</p> <p><u>Comments</u> Will readily invade the edges of bushland areas as a result. Smothering growth form is similar to kikuyu. Flowers in summer.</p>	<p>Native of America and Africa.</p>		<p><u>Physical</u> Hand removal of all runners (Stolons) will provide long term control. Will require a number of visits.</p> <p><u>Chemical</u> Use 100 mL glyphosate plus 25 mL Pulse® in 10 L of water in autumn and spring when the grass is actively growing provides high levels of control. Repeat if necessary.</p> <p><u>Biological</u> Currently biocontrol is not a control technique for eradication.</p>



SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Stenotaphrum secundatum</i> Buffalo Grass POACEAE</p>				<p><u>Fire</u> Burn the grass to reduce thatch and encourage young growth ready for spraying.</p>
 <p><i>Hydrocotyle bonariensis</i> Largeleaf Pennywort ARALIACEAE</p>	<p><u>Description</u> Perennial herb, glabrous; with rhizomes, stems creeping and rooting at the nodes.</p> <p><u>Habitat</u> Colonizer of coastal dunes and on sandy soil on cliff faces, along creeks and swamps near the coast, weed of coastal lawns.</p>	Native of South America	General Biosecurity Duty	<p>Physical and chemical control measures may be combined. Isolated plants or patches of periwinkle in or near bushland need to be identified and removed before they spread.</p> <p><u>Physical</u> Small and light infestations can be manually. Disposal of plant parts appropriately.</p> <p><u>Chemical</u> Uptake of herbicide may be reduced due to the waxy cuticle. Spray with registered herbicide.</p> <p><u>Biological</u> No known biological control agents for this species in Australia.</p>


SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
 <p><i>Bidens pilosa</i> Cobber's Pegs ASTERACEAE</p>	<p><u>Description</u> An annual plant with opposite, petioled, pinnate, with 3–5 sharply serrated ovate leaflets, and are slightly hairy</p> <p><u>Habitat</u> Any disturbed or waste ground, roadsides and areas that are dry and infertile.</p> <p><u>Comments</u> Traditionally used for a wide range of ailments in many countries.</p>	<p>Temperate and tropical America.</p> <p>Widely naturalised species that is particularly common in the eastern and northern parts of Australia.</p>		<p><u>Physical</u> Small areas and isolated plants chipped or pulled out. Bag seed heads for disposal.</p> <p><u>Chemical</u> When practicable, spraying should be completed before flower and seed production.</p> <p><u>Biological</u> No known biological agents.</p>
 <p><i>Chrysanthemoides monilifera</i> subsp. <i>rotundata</i> Bitou Bush ASTERACEAE</p>	<p><u>Description</u> Bitou bush is a perennial evergreen shrub in the daisy (Asteraceae) family that grows to 3 m high and 6 m or more wide. The semi-succulent leaves are arranged alternately along the stem. They are broadly oval to rounded in shape. New growth, especially at branch tips, is covered with white downy hairs. Has yellow daisy composite flowers with the main flowering period between May & June. However, flowers may be present all year round. A second smaller peak can also occur in November or December.</p> <p>The egg-shaped, fleshy fruits turn from green to black when mature and each fruit contains a single seed. The tiny seed is contained within a hard, rough, and egg-shaped endocarp. Peak fruiting is between June and September, with a second smaller peak in December/January.</p> <p><u>Seed dispersal</u> Produces fleshy fruits which are consumed by a wide range of animals that in turn spread the seeds. For example, many birds feed on bitou bush fruits including silvereyes, currawongs, bowerbirds, and emus. Foxes can also disperse bitou bush seed, with seedlings able to germinate directly from fox scats.</p>	<p>Native range, coastal regions in southern Africa.</p> <p>Restricted to coastal regions of eastern Australia, from southern Queensland, along the coast of NSW to Mallacoota in Victoria.</p>	<p>General Biosecurity Duty</p> <p>Prohibition on certain dealings</p> <p>Biosecurity Zone</p> <p><u>Regional Recommended Measure*</u> (for Regional Priority - Containment) Entire Hunter Local Land Services region: A person must not, import into the State or sell. Within the biosecurity zone: If the weed is part of a new infestation of the weed on the land, notify the local control authority for the land as soon as practicable. Eradicate the weed or, if that is not practicable, destroy</p>	<p><u>Prevention</u> It is important to keep uninfested areas clear of bitou bush. Once an infestation is established, preventing its spread into surrounding areas should be a priority. Management to reduce seed production and the control of undesirable dispersal vectors, notably foxes.</p> <p><u>Physical</u> Mature bitou bush plants can be slashed, whilst seedlings can be hand-pulled to remove the entire root system. Applying herbicide to slashed stems immediately after cutting should prevent regrowth.</p> <p><u>Chemical</u> Herbicides registered for bitou bush (Glyphosate and metsulfuron methyl) can be applied in winter at low rates that effectively kill the weed, yet have minimal impacts on coastal vegetation. Herbicides can be applied from the air, from the ground or by a cut-and-paste method.</p> <p><u>Biological</u></p>

SPECIES	DESCRIPTION & BIOLOGY	DISTRIBUTION	BIOSECURITY DUTY (HUNTER)	CONTROL MEASURES
	<p>Seeds can remain dormant in the soil and persist for at least five years.</p> <p><u>Comments</u> Grows in a range of environments from open exposed dunes to shaded forests. Occurs on a range of soil types but the majority of infestations are found on sandy or medium-textured, low fertility</p> <p>Ecosystems particularly susceptible to invasion by bitou bush are coastal sand dunes (specifically beach foredunes and hind dunes), coastal grasslands, heaths, woodlands and rainforests, as well as headlands, wetlands and riparian areas along tidal rivers.</p> <p>soils. I</p>		<p>as much of the weed as is practicable and suppress the spread of any remaining weed. Outside the biosecurity zone: Land managers should mitigate spread of the plant from their land. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.</p> <p>Weed of National Significance (WONS).</p> <p>Key Threatening Process to Biodiversity in NSW</p>	<p>Two insects that attack bitou bush in South Africa have been released and are very well established in Australia. These are the bitou tip moth (<i>Comptosolopsis germana</i>) which destroys the growing tips, and the bitou seed fly (<i>Mesoclanis polana</i>) that destroys developing seeds. A leaf-roller moth (<i>Tortix</i> sp.) is also established.</p> <p><u>Fire</u> Fire can be useful in reducing the large numbers of bitou bush seeds present in the soil but much depends on the intensity of the fire which is determined in part by fuel load, season and fire history.</p> <p>Objectives for integrated management: remove existing plants, run down the amount of weed seeds in the soil, (Winkler et. Al, 2008)</p>
 <p><i>Senecio madagascariensis</i> Fireweed ASTERACEAE</p>	<p><u>Description</u> Fireweed is an annual or biennial herb 10–60 cm tall. It is erect with many branches. The leaves are smooth, toothed or lobed on the edges. The yellow flowers are small and daisy-like with up to 15 petals.</p> <p><u>Habitat</u> Thrives in overgrazed pastures, disturbed or cultivated soil and most soil types.</p> <p><u>Comments</u> Fireweed contains chemicals called pyrrolizidine alkaloids. Livestock that eat it get liver damage. The damage is irreversible and gets worse the more fireweed an animal eats.</p>	<p>From southeast Africa</p> <p>Grows along the Australian east coast from Victoria to Central Queensland.</p>	<p>General Biosecurity Duty</p> <p>Prohibition on certain dealings (all of NSW)</p> <p>Weed of National Significance (WONS).</p>	<p><u>Physical</u> Pull out individual plants in small, isolated patches or sensitive environmental areas. Wear gloves to protect skin from the plant's poisons. Bag and dispose of the removed plants.</p> <p><u>Chemical</u> The best time to treat fireweed with herbicide is late autumn. This controls the peak numbers of seedlings and young plants. Flowering plants can be spot sprayed with herbicides containing aminopyralid or metsulfuron-methyl.</p> <p><u>Biological</u> There are no effective biological control agents available for fireweed.</p>

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 <p><i>Sonchus oleraceus</i> Common Sowthistle ASTERACEAE</p>	<p><u>Description</u> Common Sowthistle is an erect, hairless, branched annual or biennial herb about 1 m tall with hollow stems which have a milky sap. The basal leaves are up to 30 cm long, form a rosette and are soft and lobed or toothed. The stem leaves are somewhat smaller and stem clasping. The yellow dandelion-like flower heads are clustered, each about 2 cm in diameter, with all the florets having a radiating petal-like blade.</p> <p><u>Habitat</u> They are common weeds of pasture and waste land, but also invade bushland, particularly in damp areas.</p> <p><u>Comments</u> A single plant may produce up to 8,000 seeds.</p>	Native to Europe, Asia and North Africa.		<p><u>Physical</u> <u>Remove small and/or isolated populations manually prior to seed set. Slashing is often ineffective as flowers continue to be produced.</u></p> <p><u>Chemical</u> <u>Spot spray + wetting agent preferably at the rosette stage.</u></p> <p><u>Biological</u> <u>Preliminary surveys for suitable control agents found two potential organisms: a rust fungus <i>Miyagia pseudosphaeria</i> and an undescribed species of eriophyid mite (<i>Aceria</i> sp.) causing extensive leaf-rolling damage.</u></p>
 <p><i>Ipomoea cairica</i> Coastal Morning Glory CONVOLVULACEAE</p>	<p><u>Description</u> A perennial vine with twining stems. It can generate very long, running underground stems that will also creep along the ground in the absence of any supporting vegetation. It has deeply divided leaves with 5-7 lobes, up to 9 cm long and wide. The flowers are tubular, violet to purple and up to 6 cm long.</p> <p><u>Habitat</u></p>	<p>Native of tropical Africa & Asia.</p> <p>Widespread along the coast of NSW in the North Coast, Hunter, Greater Sydney and South East regions</p>	<p>General Biosecurity Duty</p> <p>Key Threatening Process under the Biodiversity Conservation Act 2016 - Invasion and establishment of exotic vines and scramblers.</p>	<p><u>Physical</u> Small plants and seedlings can be hand pulled. Some larger plants may be pulled out in soft sandy soils. Climbing stems can be cut and left above ground to dry out and die. Rooted stems will need to be pulled out or treated with herbicide.</p> <p><u>Chemical</u> Spot spray plants if the foliage is not covering desirable plants.</p> <p>Cut the stem less than 1 m from where it is rooted. Use a sharp knife to scrape a very thin layer of bark from a 15–30 cm section of the stem. Apply the herbicide to the exposed soft underlying green tissue within 15 seconds of making the scrape.</p> <p><u>Biological</u></p>

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 <p><i>Ipomoea indica</i> Purple Morning Glory CONVOLVULACEAE</p>	<p><u>Description</u> A vigorous perennial climber that can form either a dense ground cover or climb high into the canopy smothering native vegetation. The leaves are hairy, up to 17 cm long and 15 cm wide with a pointed tip and heart shaped base. They may be broadly oval shaped or with 3 deep lobes. Flowers are funnel-shaped, violet-blue with paler lines on the petals and up to 8 cm in diameter. Flowering is from spring to autumn.</p> <p><u>Habitat</u> grows in a wide variety of soils and situations. However, it prefers moist areas - particularly nutrient rich sites. It grows in urban areas, wasteland, along roadsides and on rainforest margins.</p> <p><u>Comments</u> Purple morning glory is toxic to humans, causing discomfort and irritation but is not life-threatening. The seeds are poisonous if ingested, causing visual distortion, restlessness and nausea.</p>		<p>General Biosecurity Duty</p> <p>Key Threatening Process under the Biodiversity Conservation Act 2016 - Invasion and establishment of exotic vines and scramblers.</p>	<p><u>Physical</u> Small plants and seedlings can be hand pulled. Some larger plants may be pulled out in soft sandy soils. Climbing stems can be cut and left above ground to dry out and die. Rooted stems will need to be pulled out or treated with herbicide.</p> <p><u>Chemical</u> Spot spray plants if the foliage is not covering desirable plants.</p> <p>Cut the stem less than 1 m from where it is rooted. Use a sharp knife to scrape a very thin layer of bark from a 15–30 cm section of the stem. Apply the herbicide to the exposed soft underlying green tissue within 15 seconds of making the scrape.</p> <p><u>Biological</u></p>
 <p><i>Ochna serrulata</i> Mickey Mouse Plant OCHNACEAE</p>	<p><u>Description</u> Shrub 2–3 m high, branches with numerous lenticels. Has yellow flowers and distinctive black berries surrounded by red sepals. The red sepals look like Mickey Mouse's face.</p> <p><u>Habitat</u> Grows well in shade or full sun on a wide range of soil types from sand to clay. It tolerates extended dry spells but is sensitive to frost. Ochna often invades disturbed sites but can also grow in native vegetation that has had no disturbance.</p> <p><u>Comments</u> It invades bushland and can dominate the understory. Is a very hardy plant that can, outcompete native plants, reduce food and habitat for native animals and form dense infestations that restrict movement of people and animals. Birds eat the fruit and spread the seeds, often from garden plantings into nearby bushland.</p>	<p>Native of South Africa</p> <p>Grows in coastal regions from Illawarra in the South East region to the Queensland border.</p>	<p>General Biosecurity Duty</p>	<p>Successful weed control relies on follow up after the initial efforts.</p> <p><u>Physical</u> Do not try to pull out plants as they will break off where the root kinks and the plant will regrow. Dig out small plants and seedlings (under 20 cm tall) if the soil is sandy or soft enough. Remove as much of the roots as possible.</p> <p><u>Chemical</u> Spraying is best for plants below knee high. Apply to all foliage to the point of visible wetness.</p> <p>Gas guns - method (also known as the 'splatter gun' technique) for plants up to 1 m tall. Apply a small amount of concentrated herbicide and a marker dye.</p> <p>Scrape and paint method This method is suitable for small plants with thin stems. Scrape the stem gently to expose the green layer under the bark. Start at the base of the plant and scrape as high as possible. Apply herbicide within 15 seconds of scraping.</p>

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				<p><u>Biological</u> There are no introduced biological control agents.</p>
 <p><i>Ligustrum lucidum</i> Large-leaved Privet OLEACEAE</p>	<p><u>Description</u> An evergreen shrub or small tree to a height of 4–10 m. The brown bark is covered in small white lenticels. Oval-shaped leaves occur in opposite pairs and are 4–13 cm long and 3–6 cm wide.</p> <p>Cream or white tubular flowers with four petal-like lobes occur in branched clusters. Flowers have a sickly-sweet fragrance.</p> <p><u>Habitat</u> Prefer warm, humid environments with moderate to high soil moisture throughout the year. Creeks, gullies and drainage lines are preferred. Can grow in a range of soil types.</p> <p><u>Comments</u> Infestations threaten biodiversity, including endangered plant and animal species and ecological communities. Seeds are commonly spread by fruit-eating birds. Birds such as Pied Currawongs and Rosellas. Able to regenerate vigorously from root and stem suckers.</p>	<p>Originates from eastern Asia.</p> <p>Widespread weed in coastal and tableland areas of New South Wales.</p>	<p>General Biosecurity Duty</p>	<p>Successful weed control requires follow up after the initial efforts. This means looking for and killing regrowth or new seedlings.</p> <p><u>Physical</u> Hand-weeding of small and medium-sized privet plants, particularly when the soil is moist.</p> <p><u>Chemical</u> Foliar treatments can be made to flushes of seedlings and groups of plants up to 3 m high. Herbicide treatment of the cut stumps should be carried out to prevent regrowth from stumps.</p> <p>Earth-moving machinery may be suitable for removal of dense stands of privet if high levels of soil disturbance can be tolerated. Large areas of seedlings or regrowth can be slashed.</p> <p><u>Biological</u> There are no introduced biological control agents.</p>
 <p><i>Ligustrum sinense</i> Small-leaved Privet OLEACEAE</p>	<p><u>Description</u> A dense evergreen shrub (about 3–5m) that produces clusters of strongly perfumed white flowers. shrub about 3–5 m</p> <p><u>Habitat</u> Invades forests, woodlands, orchards, plantation forests, gardens and areas along waterways. It grows well along creeks, gullies, and drainage lines. can tolerate very low light levels and grow under dense forests.</p> <p><u>Comments</u> Able to regenerate vigorously from root and stem suckers.</p>	<p>Native to China.</p> <p>Mostly grows in the coastal and tableland areas of New South Wales.</p>	<p>General Biosecurity Duty</p>	<p>Successful weed control requires follow up after the initial efforts. This means looking for and killing regrowth or new seedlings.</p> <p><u>Physical</u> Pull or dig out small to medium sized plants by hand.</p> <p><u>Chemical</u> Foliar treatments can be made to flushes of seedlings and groups of plants up to 3 m high. Herbicide treatment of the cut stumps should be carried out to prevent regrowth from stumps.</p> <p>Earth-moving machinery may be suitable for removal of dense stands of privet if high levels of soil disturbance can be tolerated. Large areas of seedlings or regrowth can be slashed.</p> <p><u>Biological</u> There are no introduced biological control agents.</p>

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 <p><i>Lantana camara</i> Lantana VERBENACEAE</p>	<p><u>Description</u> Scrambling shrub with square stems with short, curved prickles. Leaves are rough with serrated edges and fragrant when crushed. Flowers are borne in clusters all year round and can be pink, red, orange, white and pink-edged red in colour. Fruit is shiny, dark purple-black when ripe and 6-8mm in diameter with one seed.</p> <p><u>Habitat</u> Prefers warm weather with more than 900 mm annual rainfall, well-drained, fertile soils, coastal areas and altitudes up to 1000m.</p> <p><u>Comments</u> Spread by seed by birds and other animals. that eat the fruit. Seeds are also spread by water, in soil, on machinery and garden waste. Seeds remain viable for 2-5 years depending on conditions. .</p>	<p>From the tropical and subtropical regions of Central and South America.</p> <p>Range extends from Bega Shire in southern NSW to Cape Melville in north Queensland.</p>	<p>General Biosecurity Duty</p> <p>Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale</p> <p>Regional Recommended Measure* (for Regional Priority - Asset Protection) Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.</p> <p>Weed of National Significance (WONS).</p>	<p><u>Physical</u> Hand pulling can work on small infestations, isolated plants and in steep areas that machinery cannot access. The best time is after rain when soil is moist. Bulldozing or slashing can remove large bushes, and help access through infestations. Avoid disturbing large areas at any one time to avoid leaving large areas of bare ground, risking soil erosion. Revegetate and monitor bare areas for regrowth.</p> <p><u>Chemical</u> Spraying leaves-Small plants less than 2 m can be sprayed at any time of the year as long as they are actively growing.</p> <p>Splatter-guns use small amounts of highly concentrated herbicide. A five-litre bottle of mixed herbicide should cover about 0.2 hectares of lantana.</p> <p>Cut & Paint-Cut stems off at about 15 cm from the ground. Apply herbicide to the cut surface of the stump within 15 seconds. Treat every cut stem because lantana regrows vigorously from untreated stems.</p> <p><u>Fire</u> Fire can reduce the height and density of lantana. Fire rarely kills lantana, and plants soon recover. Risks of using fire include:</p> <ul style="list-style-type: none"> destroying desirable vegetation exposing soil and causing erosion. <p><u>Biological</u> The lantana rust (<i>Prospodium tuberculatum</i>) attacks the pink-flowering Lantana.</p> <p>Leaf mining beetles <i>Uroplata girardi</i> and <i>Octotoma scabripennis</i> are most effective.</p> <p>The leaf sucking bug <i>Teleonemia scrupulosa</i> also feeds on leaves.</p> <p>The lantana seed fly, <i>Ophiomyia lantanae</i>, attacks flowers, fruit and seed.</p>