

Yiribana Logistics Estate

Vegetation Management Plan

GPT Group Pty Ltd

25 May 2021

Final



Report No. 19200RP2

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Glossary

Abbreviation	Definition
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BDAR	Biodiversity Development Assessment Report
Biosecurity Act	NSW <i>Biosecurity Act 2015</i>
BRC	Bush Regeneration Company
CBD	Central Business District
CEEC	Critically Endangered Ecological Community
DAWE	Commonwealth Department of Agriculture, Water and Environment
DBH	Diameter at breast height over bark
DoEE	Former Commonwealth Department of the Environment and Energy
DPIE	Department of Planning, Industry and Environment
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographic Information System
GPS	Global Positioning System
LGA	Local Government Area
Locality	The area within a 5 km radius of the centre of the VMP area
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OWRC	Other Weeds of Regional Concern
RP	Regional Priority weeds
SP	State Priority weeds
subject land	Lots 59-60 within DP 259135 (see Figure 1)
TEC	Threatened Ecological Community
The project	Demolition of existing structures and removal of vegetation to allow for the construction of five warehouses and associated infrastructure.
VMP	Vegetation Management Plan
VMP area	The area within the subject land to which this VMP applies
WM Act	<i>Water Management Act 2000</i>
WoNS	Weed of National Significance
WSEA	Western Sydney Employment Area

1. Introduction

1.1. Introduction

Cumberland Ecology has been commissioned by GPT Group Pty Ltd to prepare a Vegetation Management Plan (VMP) to support an Environmental Impact Statement (EIS) being prepared for the proposed development (the 'project') of the Mamre Road Precinct located at Kemps Creek, NSW (hereafter referred to as the 'subject land') (**Figure 1**).

The Secretary's Environmental Assessment Requirements (SEARs) issued for the project require the preparation of a VMP, which will primarily outline how the creek systems and patches of native vegetation within the re-aligned E2 Environmental Conservation zoned area of the subject land are to be revegetated and managed in perpetuity. The area subject to this VMP is hereafter referred to as the VMP area (**Figure 1**).

1.2. Purpose

The purpose of this VMP is to provide guidelines for the conservation, management and revegetation of the VMP area, in particular for the re-establishment of a vegetated riparian zone for a watercourse that is to be re-aligned.

The aims of the plan are as follows:

- To improve the biodiversity values of the VMP area;
- To re-establish native vegetation that is broadly representative of the original plant communities pre-existing in the VMP area;
- To establish and enhance habitat for local fauna species with the potential to occur or known to occur at the VMP area; and
- To prevent the establishment of weeds in the re-established vegetated riparian zone.

1.3. Background

1.3.1. Site Description and Location

The subject land is located along Mamre Road, Kemps Creek, and comprises Lots 59-60 DP 259135 within the Western Sydney Employment Area (WSEA), approximately 40 km west of the Sydney Central Business District (CBD) and 12 km southeast of the Penrith CBD. It is also located within the Western Sydney Aerotropolis, approximately 6 km northeast of the Aerotropolis Core Precinct. The subject land is located entirely within the Penrith Local Government Area and covers an area of approximately 32.19 ha. Although located near the Western Sydney Growth Centres, the subject land is not biocertified under the *State Environmental Planning Policy (Sydney Region Growth Centres) 2006*.

The subject land falls within land mapped under the Draft Cumberland Plain Conservation Plan (CPCP) and has been identified for future biodiversity certification. However, as the CPCP is still in draft stages, it does not currently apply to the project.

The subject land has recently been rezoned under the WSEA State Environmental Planning Policy (SEPP), whereby much of the land has been zoned IN1 General Industrial, with the creek systems and patches of native vegetation zoned E2 Environmental Conservation. It is understood that consultation is currently underway with the NSW Natural Resource Access Regulator and the NSW Department of Planning, Industry and Environment (DPIE) in order to re-align the E2 corridor within the centre of the subject land to better service the industrial land zoning whilst ensuring a suitable biodiversity corridor is established across the subject land and into adjoining lands.

1.3.2. Project Description

The project comprises the development of the land and includes the following:

- Demolition of existing dwellings;
- Removal of all vegetation;
- Dewatering of existing dams;
- Bulk earthworks;
- Re-alignment of existing unnamed watercourse and riparian corridor;
- Reconstruction and revegetation of riparian corridor;
- Construction of five warehouses and associated access roads; and
- Associated landscaping.

1.3.3. VMP Area

The VMP area covers the portion of the subject land to be managed under this VMP. The VMP will apply to the proposed riparian zone which is roughly a 25m corridor on the eastern portion of the subject land and is approximately 1.13 ha.

The VMP area and subject land are shown in **Figure 1**.

1.4. Relevant Legislation

Legislation relevant to this VMP includes:

1.4.1. Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the overarching planning legislation in NSW. This Act provides for the creation of planning instruments that guide land use. The EP&A Act also provides for the consideration of environmental and biodiversity values, which is addressed in Section 5A (Significant effect on species, populations or ecological communities or their habitats) should a land use change be proposed. This includes threatened species, communities, habitat and processes as listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and *Fisheries Management Act 1994*.

1.4.2. Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as Matters of National Environmental Significance (MNES). Under the EPBC Act, any action (which includes a development, project or activity) that is considered likely to have a significant impact on MNES (including nationally listed threatened ecological communities, species, and listed migratory species) must be referred to the Australian Government Minister for the Environment (the Minister). The purpose of the referral is to allow a decision to be made about whether an action requires approval on a Commonwealth level. If an action is declared a "controlled action", then Commonwealth approval is required.

1.4.3. NSW Biodiversity Conservation Act 2016

The *NSW Biodiversity Conservation Act 2016* (BC Act) is the key piece of legislation in NSW relating to the protection and management of biodiversity and threatened species. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. The BC Act is supported by a number of regulations, including the *Biodiversity Conservation Regulation 2017*.

1.4.4. NSW Biosecurity Act 2015

Priority Weeds are weeds prioritised for control under the *NSW Biosecurity Act 2015* (Biosecurity Act). State Level Priority Weeds have specific legal requirements for management written into the Biosecurity Act under regulations and controls, while Regional Priority Weeds have recommended management actions and strategic regional responses under the Greater Sydney Strategic Weed Management Plan (Local Land Services 2019).

1.4.4.1. Weeds of National Significance

Weeds of National Significance (WoNS) are weed species occurring on a list created under the framework of the National Weeds Strategy (Australian Weeds Committee 2006). Thirty-two WoNS have been agreed upon by Australian governments as the worst weeds in the country based on an assessment process that prioritised weeds based on their invasiveness, potential for spread and environmental, social and economic impacts. No Federal legislation has been created which is applicable to WoNS, and legislative control for these species is currently expected to occur under state and territory legislation pertaining to weeds.

1.4.5. Pesticides Act 1999

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

1.4.6. NSW Water Management Act 2000

The objectives of the *Water Management Act 2000* (WM Act) are to provide for the sustainable and integrated management of the water systems of NSW and to protect, enhance and restore water sources, associated ecosystems and ecological processes.

Under the WM Act, approval is required for carrying out a 'controlled activity' that takes place on 'waterfront land' to ensure that the activity to ensure negative impacts upon waterfront land and other water users are avoided or minimised. In this instance, the relevant definition of waterfront land per the WM Act is: *"the bed of any river, together with any land lying between the bed of the river and a line drawn parallel to, and the prescribed distance inland of, the highest bank of the river...where the prescribed distance is 40m or (if the regulations prescribe a lesser distance...) that lesser distance"*.

Controlled activity means:

- Erection of a building;
- Carrying out a work;
- Removing material from waterfront land, such as vegetation or extractive material;
- Depositing material on waterfront land, such as extractive material; and
- Carrying out an activity which affects the quantity or flow of water in a water source.

An application for a 'controlled activity approval' will be refused if the Minister is not satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any waterfront land as a consequence of the carrying out of the proposed controlled activity.

2. Methodology

2.1. Desktop Assessment

The preparation of this VMP involved a literature review that included review of previously prepared ecological reports, government mapping and guidelines for the preparation of VMPs. The literature review also identified the most up to date methods of weed control for exotic species that are present in the study area and included a review of government fact sheets and websites. Cumberland Ecology staff with expertise in bushland regeneration were also consulted on current best practice methods and techniques. To prepare species planting lists for revegetation, and determine revegetation strategies, relevant documents were reviewed in conjunction with a review of findings of a site inspection.

As part of the desktop assessment a literature review of the following documents was undertaken:

- The Biodiversity Development Assessment Report prepared by Cumberland Ecology for the subject land (Cumberland Ecology 2021);
- Aspect Industrial Estate State Significant Development Application – Riparian Assessment, Mirvac Projects (Eco Logical Australia 2020);
- Final Determinations for Threatened Ecological Communities (TECs) prepared by the NSW Scientific Committee; and
- The NSW BioNet VIS Vegetation Classification Database (NSW Government 2020b).

2.2. Database Analysis

A number of databases were utilised during the preparation of this VMP. Key databases reviewed included:

- NSW Environment, Energy and Science (EES) BioNet Atlas (EES 2021a)
- Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (DAWE 2021),
- EES Threatened Species Profile Database; and
- DAWE Species Profile and Threat Database.

Database analysis was conducted for the locality using the EES BioNet Atlas (EES 2021a) and the DAWE Protected Matters Search Tool (DAWE 2021). The locality is defined as the area within a 5 km radius of the subject land. The BioNet Atlas search facility was used to generate records of threatened flora and fauna species and populations listed under the BC Act and/or EPBC Act within the locality. The abundance, distribution and age of records generated within the search areas provided supplementary information for the assessment of likelihood of occurrence of those threatened species within the subject land. The Protected Matters Search Tool generated a list of potentially occurring MNES listed under the EPBC Act within the locality of the subject land.

Field survey data collected by Cumberland Ecology for the Biodiversity Development Assessment Report (BDAR) for the subject land (Cumberland Ecology 2021) was reviewed and incorporated into this VMP were relevant.

2.3. Flora Surveys

Flora surveys were undertaken by Cumberland Ecology on 25 June 2020 (vegetation mapping) and again on 9 March 2020 (plot-based surveys). Surveys included vegetation mapping, plot-based vegetation survey and threatened flora surveys (undertaken on both survey dates). The survey design consisted of random meander searches as well as plot-based surveys, and was guided by the following:

- NSW Government (2020a) Biodiversity Assessment Method (BAM); and
- NSW Government (2020c): Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method .

The area covered by flora surveys, including parallel traverses and the location of plots is shown in **Figure 2**.

2.3.1. Vegetation Mapping

The vegetation within the subject land was ground-truthed by Cumberland Ecology to examine and verify the existing mapping including the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the existing mapping, records were made of new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs. The data collected was analysed and the resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database to produce a vegetation map of the subject land.

2.3.2. Plot-based Floristic Survey

A plot-based floristic survey was undertaken within the subject land. The survey was conducted in accordance with the BAM and included establishment of a 20 m x 50 m plot within which the following data was collected:

- Composition for each growth form group by counting the number of native plant species recorded for each growth form group within a 20 m x 20 m plot;
- Structure of each growth form group as the sum of all the individual projected foliage cover estimates of all native plant species recorded within each growth form group within a 20 m x 20m plot;
- Cover of 'High Threat Exotic' weed species;
- Assessment of function attributes within a 20 m x 50 m plot, including:
 - Count of number of large trees;
 - Tree stem size classes, measured as 'diameter at breast height over bark' (DBH);
 - Regeneration based on the presence of living trees with stems <5 cm DBH;
 - The total length in metres of fallen logs over 10 cm in diameter;

- Assessment of litter cover within five 1 m x 1 m plots evenly spread within the 20 m x 50 m plot; and
- Number of trees with hollows that are visible from the ground within the 20 m x 50 m plot.

All vascular plants recorded or collected were identified using keys and nomenclature provided in PlantNET (Botanic Gardens Trust 2021)

2.3.3. Threatened Flora Species Searches

Targeted threatened flora surveys were undertaken in conjunction with collection of floristic plot data as well as vegetation mapping surveys. Surveys were targeted towards threatened species known to occur in the locality of the subject land and were conducted in areas considered to provide potential habitat for these species. Surveys involved foot traverses, and where threatened flora species were observed, the location was recorded with a handheld GPS.

2.3.4. Data Analysis

2.3.4.1. Plant Community Types

The primary nomenclature used within this report is locally defined map units that were determined following field investigations within the subject land. Where relevant, the locally defined map units were matched with the equivalent Plant Community Types (PCTs).

Identification of the PCTs occurring within the subject land was guided by the findings of the floristic surveys. The data collected during surveys of the subject land was analysed in conjunction with a review of the PCTs held within the VIS Classification Database (EES 2021b). Consideration was given to the following:

- Occurrence within the Sydney Basin Interim Biogeographic Regionalisation for Australia subregion and Hawkesbury Nepean management area;
- Vegetation formation;
- Alignment with TECs;
- Landscape position;
- Associated upper stratum species; and
- Upper, mid and ground strata species.

Where locally defined map units were not readily able to be matched to PCTs, best-fit communities were selected, or noted as unassigned if comprised of planted or exotic vegetation.

2.3.4.2. Classification of Threatened Ecological Communities

Following review of potentially occurring TECs, the vegetation communities identified within the subject land were examined against the listings of TECs under the BC Act and EPBC Act.

For TECs listed under the BC Act, vegetation communities were examined against the final determinations for potentially occurring TECs. A component of this analysis was to compare the species recorded during the field

surveys with the species lists provided in the final determinations. Additional information such as the location, geology and landform detailed in the final determinations were also considered in the assessment.

For TECs listed under the EPBC Act, vegetation communities were examined against the DoEE Species Profile and Threats Database and any associated documentation, such as listing advice and policy statements.

2.4. Fauna Surveys and Habitat Assessment

Fauna surveys were undertaken by Cumberland Ecology on 9 March 2021 and between the 25 March and 1 April 2021. Surveys included habitat assessment, diurnal active searches, microchiropteran bat surveys, koala spot assessment technique (SAT) surveys, arboreal infrared camera surveys, nocturnal surveys, amphibian surveys, and incidental observations. The locations of fauna surveys are shown in **Figure 3**.

2.4.1. Habitat Assessment

A habitat assessment was carried out on the 9 March 2021 throughout the subject land. This survey specifically focused on assessing the fauna habitat value of the hollow-bearing trees present within the subject land and details regarding the tree species, size of tree (DHB and height) and size (diameter) of hollows were recorded for each hollow-bearing tree identified within the subject land. An assessment of the structural complexity of the vegetation, the age structure of the remnant vegetation and the nature and extent of human disturbance was also undertaken. Notes were taken on specific habitat features that may be utilised by threatened fauna species known to occur in the locality.

Furthermore, a visual observation of all trees within the subject land was completed throughout the survey period and any nests present were recorded. The presence of other habitat features such as logs and rocks was also recorded.

2.4.2. Targeted Fauna Surveys

Targeted fauna surveys were undertaken by Cumberland Ecology between 9 March and 1 April 2021, for the preparation of the BDAR. These targeted a range of threatened snail, amphibian, bird and mammal species (including arboreal species and microchiropteran bats). The species targeted, and methods used are outlined in detail in the BDAR (Cumberland Ecology 2021).

2.4.3. Incidental Observations

Any incidental fauna species, particularly avifauna species, that were observed, heard calling, or otherwise detected based on tracks or signs, were recorded and listed in the total species list for the subject land. Furthermore, the locations of any specific habitat features, in particular hollow-bearing trees and raptor nests, incidentally sighted outside of the habitat assessment locations were also recorded.

3. Existing Biodiversity Values

3.1. Topography, Geology and Soils

The subject land occurs in an undulating to hilly landscape with small areas of steeply sloping land. The subject land falls within the Luddenham and Blacktown soil landscapes. Luddenham soil landscapes are characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Blacktown soil landscapes are characterised by gently undulating rises on Wianamatta Group shales (DPIE 2021).

3.1.1.1. Hydrology

The subject land contains one unnamed 2nd order stream (as per the Strahler System of ordering watercourses), which is to be re-aligned as part of the project. This stream flows into Kemps Creek which flows into South Creek. These creeks form part of the Hawkesbury-Nepean catchment.

3.2. Vegetation Communities

Previous broad-scale vegetation mapping conducted by the former Office of Environment and Heritage (OEH) identifies two vegetation communities within the subject land; Shale Plains Woodland and Shale Hills Woodland. Both of these communities conform to the Critically Endangered Ecological Community (CEEC) of Cumberland Plain Woodland, listed under both the BC Act and EPBC Act. The surveys by Cumberland Ecology for this assessment refined the existing vegetation mapping of the subject land and identified two native vegetation communities assigned to PCTs which includes two condition states for each, in addition to planted native and exotic vegetation. The subject land also includes some cleared land as well as farm dams.

The vegetation communities recorded by Cumberland Ecology within the subject land are provided within **Table 1**, as well as their associated PCT, listing status and extent. The distribution of PCTs within the subject land and the VMP area is provided in **Figure 4**. A description of each PCT is provided in the following sections, while additional justification for PCTs and association with TECs can be found in the BDAR (Cumberland Ecology 2021).

Table 1 Vegetation communities found within the subject land and VMP area

Vegetation Community	Best-fit PCT	Condition	BC Act Status	EPBC Status	Act	Area in subject land (ha)
Cumberland Plain Woodland	PCT 850	Moderate	CEEC	CEEC		0.97
Cumberland Plain Woodland	PCT 850	Low	CEEC	Does not meet listing criteria		0.19
Swamp Oak Floodplain Forest	PCT 1800	Moderate	CEEC	Does not meet listing criteria		0.31
Swamp Oak Floodplain Forest	PCT 1800	Low	Does not meet listing criteria	Does not meet listing criteria		0.68
Planted Native	-	-	-	-		0.06
Exotic Vegetation	-	-	-	-		24.28

Vegetation Community	Best-fit PCT	Condition	BC Act Status	EPBC Status	Act	Area in subject land (ha)
Dams	-	-	-			1.71
Cleared Land	-	-	-	-		4.97

3.2.1. PCT 850: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion

Vegetation Formation: Grassy Woodlands

Vegetation Class: Coastal Valley Grassy Woodlands

Percent Cleared Value: 88%

TEC Status of PCT: Critically Endangered Ecological Community (CEEC)

TEC Status of onsite vegetation: CEEC

3.2.1.1. General Description

This PCT occurs as a two condition classes within the subject land as detailed below.

i. Moderate Condition

This condition class includes a large patch of woodland in the south-east of the subject land and represents the occurrences of the community within the subject land in woodland formation.

The large patch is dominated by *Eucalyptus moluccana* (Grey Box), and several *Eucalyptus tereticornis* (Forest Red Gum) trees also occur. A native shrub layer is entirely absent from the community.

The ground layer is dominated by exotic grass species, with common to dominant species including *Nassella neesiana* (Chilean Needle Grass), *Setaria parviflora* (Pigeon Grass), and *Paspalum dilatatum* (Paspalum). Exotic forbs are common and include *Solanum sisymbriifolium* (Apple of Sodom), *Lepidium africanum*, *Conyza sumatrensis* (Tall Fleabane), and *Senecio madagascariensis* (Fireweed).

Some native grass species are sub-dominant, or common, and these species include *Chloris ventricosa* (Plump Windmill Grass), *Microlaena stipoides* var. *stipoides* (Weeping Grass), *Sporobolus creber* (Slender Rat's Tail Grass), and *Bothriochloa decipiens* var. *decipiens* (Redleg Grass). Native forbs are uncommon and scattered in the ground layer and include *Brunoniella australis* (Blue Trumpet) and *Einadia polygonoides*.

An example of the moderate condition form of PCT 850 is shown in **Photograph 1**.

Photograph 1 Large patch of PCT 850 Moderate Condition within the subject land



ii. Low Condition

The occurrences of PCT 850 Low Condition comprise scattered trees only and consist of predominately *Eucalyptus moluccana* trees, and several *Eucalyptus tereticornis* trees are also present, along with a single *Eucalyptus amplifolia* subsp. *amplifolia* in the west of the subject land. In each instance trees occur over a ground layer nearly exclusively dominated by exotic grass species such as the grasses *Paspalum dilatatum*, *Cenchrus clandestinus*, and *Chloris gayana*.

An example of low condition form of PCT 850 is shown in **Photograph 2**.

Photograph 2 Scattered trees that form PCT 850 Low Condition within the subject land



3.2.2. PCT 1800: Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter valley

Vegetation Formation: Forested Wetlands

Vegetation Class: Coastal Floodplain Wetlands

Percent Cleared Value: 60%

TEC Status of PCT: Endangered Ecological Community (EEC)

TEC Status of onsite vegetation: EEC

3.2.2.1. General Description

Swamp oak open forest on riverflats of the Cumberland Plain and Hunter valley occurs in two condition states within the subject land as detailed in the subsequent sections.

i. Moderate Condition - EEC

This community occurs within the floodplains of drainage lines and dams within the subject land. The canopy is dominated by *Casuarina glauca* (Swamp Oak), which also occurs in the sub-canopy and shrub layers. The community occurs as a large patch to the north of the dam, as a small patch on the north-west bank of the

dam, and as a small patch on the drainage line draining the dam. The small patches have a sparse ground cover of predominately exotic species along with the native rush *Juncus usitatus*.

The large patch of the community has a shrub layer dominated by juvenile *Casuarina glauca* individuals. The exotic species *Dovyalis caffra* (Kei Apple) and *Lycium ferocissimum* also occur.

The ground layer is dominated by the native grass *Microlaena stipoides* var. *stipoides*. Other native species present include the grasses *Chloris ventricosa* and *Sporobolus creber*, and the forbs *Alternanthera nana*, *Cyperus gracilis*, and *Oxalis perennans*.

The exotic grass *Nassella neesiana* is sub-dominant in the ground layer. Other common exotic species include the grass *Setaria parviflora* and the forbs *Conyza sumatrensis*, *Solanum sisymbriifolium*, and *Modiola caroliniana* (Red-flowered Mallow).

An example of the moderate condition form of PCT 1800 is shown in **Photograph 3**.

Photograph 3 Moderate form of PCT 1800 at lower elevations within the subject land



ii. Low Condition – Non EEC

This community consists of patches of *Casuarina glauca* trees in areas not associated with flood plains within the site. Two patches in the east of the property occur at an elevation that would place them above the floodplain of the dam in the subject land – these occurrences have likely spread upslope from distribution of seed from individuals further downslope where they would have historically occurred in association with

floodplains. The trees at this location are colonising areas which would likely have been cleared paddocks dominated by exotic grass species. The patch in the west is likely derived from planted trees or placement of soil with *Casuarina glauca* seed at this location from elsewhere within the subject land or locality.

The patch in the west has a ground layer consisting of exotic weed species only and bare earth. The occurrences in the west have a ground layer dominated by the exotic grass *Nassella neesiana*. Other exotic grass species such as *Paspalum dilatatum* and *Setaria parviflora* are common, as are exotic forbs such as *Solanum sisymbriifolium*, *Senecio madagascariensis*, and *Conyza bonariensis* (Flax-leaved Fleabane).

The ground layer is sub-dominated by the native grass *Microlaena stipoides* var. *stipoides* in some areas. Other native species with a more scattered distribution include the grasses *Austrostipa verticillata* (Slender Bamboo Grass) and *Bothriochloa decipiens* var. *decipiens* and forbs including *Brunoniella australis* and *Oxalis perennans*.

An example of the low condition form of PCT 1800 is shown in **Photograph 4**.

Photograph 4 Low form of PCT 1800 at higher elevations within the subject land



3.3. Other Vegetation Types

3.3.1. Planted Native Vegetation

BC Act Status: Not listed

EPBC Act Status: Listed

3.3.1.1. General Description

This community is associated with dwellings and structures within the subject land and consists of garden plantings of native trees and shrubs. The majority of trees are of the species *Grevillea robusta* (Silky Oak), and two individuals of *Corymbia maculata* (Spotted Gum) are planted near a dwelling in the centre of the subject land. Shrub species include *Callistemon viminalis* (Weeping Bottlebrush) and *Leptospermum petersonii* (Lemon-scented Tea-tree). All planted vegetation occurs either over exotic grasses or garden beds.

An example of this community is shown in **Photograph 5**.

Photograph 5 Planted Native vegetation within the subject land



3.3.2. Exotic Vegetation

Areas around dwellings and structures within the subject land have plantings of a variety of exotic species, either as trees in lawns or as trees, shrubs, and herbaceous species in garden beds. Exotic trees include *Jacaranda mimosifolia* (Jacaranda) and *Syagrus romanzoffiana* (Cocos Palm), shrubs include *Strelitzia reginae* (Bird of Paradise) and *Plumbago auriculata* (Blue Plumbago), and herbs include *Clivia miniata* (Natal Lily) and the climber *Jasminum polyanthum* (Many-flowered Jasmine).

Extensive areas of the site consist of grasslands highly dominated by exotic species. These includes paddocks and lawns. Lawn areas are dominated by species such as *Cenchrus clandestinus*.

Paddocks are generally dominated or co-dominated by *Cenchrus clandestinus*, *Nassella neesiana*, *Paspalum dilatatum*, and/or *Setaria parviflora*. Exotic forbs are common throughout these areas and include *Conyza bonariensis*, *Senecio madagascariensis*, and *Cyclospermum leptophyllum* (Slender Celery).

Native grasses and forbs are present in paddocks however in all BAM plots surveyed comprised less than 10% of cover. Species include the grasses *Sporobolus creber* and *Bothriochloa decipiens* var. *decipiens*.

An example of this community is shown in **Photographs 6**.

Photograph 6 Exotic vegetation within the subject land



3.3.3. Dams

The subject land contains three farm dams. The largest dam contains little to no fringing or emergent aquatic/semi-aquatic vegetation and is surrounded predominantly by exotic vegetation. The two smaller farm dams do contain fringing and emergent vegetation including *Typha orientalis* (Broadleaf Cumbungi) and *Cycnogeton microtuberosum*. This community does not conform to any known PCT or community listed under the BC Act or EPBC Act.

The example of dams within the subject land are shown in **Photographs 7 and 8**.

Photograph 7 Large farm dam within the subject land



Photograph 8 Smaller farm dam within the subject land



3.3.4. Cleared Land

The subject land contains some areas completely devoid of vegetation within the northern portion of the subject land. Additionally, areas containing driveways and other structures are considered as cleared land.

3.4. Flora Species

3.4.1. General Species

A total of 83 flora species were recorded within plots within the subject land during field surveys, including just 26 native species and 57 exotic species. Of the native species recorded in the plots, the most frequently recorded were grasses (family Poaceae) with 13 species. Additional planted native and exotic species are present in the subject land but were not recorded in the plots. As such, the full species list for the subject land would be greater than that detected in plots. A total species list for the subject land from plot surveys is provided in **Appendix A**.

The floral assemblage across the subject land is a reflection of previous clearing for semi-rural development and current land uses which have resulted in the subject land being dominated by exotic ground cover and understorey, combined with native canopy species.

3.4.2. Priority Weeds and Weeds of National Significance

Priority Weeds are weeds prioritised for control under the Biosecurity Act. State Level Priority Weeds have specific legal requirements for management written into the Biosecurity Act under regulations and controls, while Regional Priority Weeds have recommended management actions and strategic regional responses under the Greater Sydney Strategic Weed Management Plan (LLS: Greater Sydney 2019) and are given a status based on the risk they pose to the environment and the particular region in which they are found and include State Priority (SP) weeds, Regional Priority (RP) weeds and Other Weeds of Regional Concern (OWRC).

A total of ten weeds recorded within the subject land are listed as SP weeds, RP weeds or OWRC under the Biosecurity Act and the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022 (Local Land Services 2019) These are identified in **Table 2**. Three State Priority weeds are also WoNS.

Table 2 Priority Weeds and WoNS recorded within the subject land

Species Name	Common Name	Biosecurity Act Status	WoNS
<i>Araujia sericiflora</i>	Moth Vine	OWRC	-
<i>Cenchrus clandestinus</i>	Kikuyu	OWRC	-
<i>Chloris gayana</i>	Rhodes Grass	OWRC	-
<i>Dovyalis caffra</i>	Kei Apple	RP	-
<i>Eragrostis curvula</i>	African Love Grass	OWRC	-
<i>Lycium ferocissimum</i>	Boxthorn	SP	Yes
<i>Nassella neesiana</i>	Chilean Needle Grass	SP	Yes
<i>Senecio madagascariensis</i>	Fireweed	SP	Yes

Species Name	Common Name	Biosecurity Act Status	WoNS
<i>Solanum linnaeanum</i>	Apple of Sodom	OWRC	-
<i>Syagrus romanzoffiana</i>	Cocos Palm	OWRC	-

SP: State Priority Weed, RP: Regional Priority Weed, OWRC: Other Weed of Regional Concern

3.4.3. Threatened Flora Species

No threatened flora species have been recorded within the subject land or are considered likely to occur. The understorey vegetation in the subject land is too disturbed and is comprised mostly of previously cleared areas and exotic grasses and weeds. An analysis of the potential for threatened flora species recorded within the locality to occur due to the presence of suitable habitat is provided in the BDAR for the project (Cumberland Ecology 2021). This identified that seven threatened flora species have potential to be present based on the PCTs present, however none of these were detected during flora surveys.

3.5. Fauna Species and Habitat

3.5.1. Fauna Habitat

The majority of the subject land, especially the understorey and ground cover, is comprised of a mixture of exotic and native vegetation which has limited value for native fauna. The canopy consists of mature trees including planted vegetation which may provide foraging habitat for microchiropteran bats (microbats) and native birds.

Hollow-bearing trees are also present within the subject land which provide potential roosting and nesting habitat for fauna species such as arboreal mammals, microbats, birds and amphibians.

3.5.2. General Species

A total of 36 vertebrate fauna species have been recorded from the subject land during surveys. A total species list for the subject land is provided in **Table 3**.

Table 3 Fauna species recorded within the subject land

Scientific Name	Common Name
Amphibians	
<i>Crinia signifera</i>	Common Eastern Froglet
<i>Limnodynastes peronii</i>	Striped Marsh Frog
Birds	
<i>Gymnorhina tibicen</i>	Australian Magpie
<i>Corvus coronoides</i>	Australian Raven
<i>Threskiornis moluccus</i>	Australian White Ibis
<i>Synoicus ypsilophora</i>	Brown Quail
<i>Bubulcus ibis</i>	Cattle Egret
<i>Acridotheres tristis</i>	Common Myna

Scientific Name	Common Name
<i>Ocyphaps lophotes</i>	Crested Pigeon
<i>Dacelo novaeguineae</i>	Laughing Kookaburra
<i>Grallina cyanoleuca</i>	Magpie-lark
<i>Vanellus miles</i>	Masked Lapwing
<i>Manorina melanocephala</i>	Noisy Miner
<i>Anas superciliosa</i>	Pacific Black Duck
<i>Strepera graculina</i>	Pied Currawong
<i>Porphyrio porphyrio</i>	Purple Swamphen
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet
<i>Psephotus haematonotus</i>	Red-rumped Parrot
<i>Threskiornis spinicollis</i>	Straw-necked Ibis
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo
<i>Egretta novaehollandiae</i>	White-faced heron
<i>Ardea pacifica</i>	White-necked Heron
<i>Rhipidura leucophrys</i>	Willie Wagtail
Gastropods	
<i>Cornu aspersum</i>	Common Garden Snail
Mammals	
<i>Rattus norvegicus</i>	Brown Rat
<i>Chalinolobus morio</i>	Chocolate Wattle Bat
<i>Bos taurus</i>	Domestic Cattle
<i>Scotorepens orion</i>	Eastern Broad-nosed Bat
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat
<i>Ozimops ridei</i>	Eastern Free-tailed Bat
<i>Macropus giganteus</i>	Eastern Grey Kangaroo
<i>Chalinolobus gouldii</i>	Gould's Wattle Bat
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Miniopterus orianae oceanensis</i>	Large Bentwing-bat
<i>Myotis macropus</i>	Southern Myotis
<i>Austronomus australis</i>	White-striped Freetail-bat

3.5.3. Threatened Fauna Species

A total of two threatened species listed under the BC Act were detected within the subject land in surveys by Cumberland Ecology. These include:

- Large Bent-winged Bat (*Miniopterus orianae oceanensis*); and

- Southern Myotis (*Myotis macropus*).

None of the above species are listed under the EPBC Act.

4. Vegetation Management Zones

Under this VMP, all vegetation within the VMP area will be revegetated and managed by the future landowners for weed invasion, monitored and revegetated with endemic plant species. The VMP area will be managed as a single Management Zone, as shown in **Figure 5**.

4.1. Management Zone 1

Management Zone 1 covers an area where an unnamed second order stream is to be re-aligned. This area includes the stream channel re-alignment, re-created stream banks, adjacent riparian area to be revegetated and two adjacent bio-retention basins.

4.1.1.1. Management Zone Objectives

Objectives for this management zone are:

- Recreation of stable stream banks;
- Revegetation of the riparian zone with local native species;
- To minimise sediment and nutrient inputs into the second order stream; and
- To control exotic weeds species and minimise their spread.

4.2. Landscaping Areas

Other landscaping areas within the subject land are not covered by this VMP and are located outside the VMP area. These areas should be revegetated with local native plant species consistent with Cumberland Plain Woodland. Introduced species should not be used in landscaping, due to the potential for species to escape and become environmental weeds within the VMP area. Maintenance weeding within landscaping areas should be undertaken as detailed in **Chapter 6** of this VMP.

4.3. Management Period

4.3.1. Management Zone 1

Revegetation works within Management Zone 1 will commence as soon as works for the re-alignment of the stream channel are completed.

4.3.2. Overall VMP Period

This VMP will commence on approval of the DA and remain in force during clearing, construction and revegetation works. The VMP will then cover over a five-year maintenance period following the completion of revegetation works within Management Zone 1. The long-term strategy for ongoing maintenance of the vegetation will be dependent on the condition of the vegetation at the end of this five-year period and should be developed based on vegetation conditions towards the end of the life of this VMP.

5. Vegetation Clearing and Construction Plan

This chapter outlines the protocols to be followed during clearing to minimise the impacts on native flora and fauna and the watercourse, and during clearing and construction, and should be applied to the entire subject land.

5.1. Hygiene Protocols

To avoid the spread of *Phytophthora cinnamomi* (Phytophthora), *Austropuccinia psidii* (Myrtle Rust) and Chytrid fungus, appropriate hygiene procedures and guidelines described in Best Practice Management Guidelines for *Phytophthora cinnamomi* within the Sydney Metropolitan Catchment Management Authority Area (Botanic Gardens Trust 2008), as well as the Hygiene Guidelines: Protocols to Protect Priority Biodiversity Areas in NSW from *Phytophthora cinnamomi* and Myrtle Rust (EES 2020) will be followed.

This will involve all machinery, clothing (such as boots and gloves), and tools, which will have contact with soil being disinfected with a spray prior to entering and leaving the subject land. Clothing should be laundered every day using detergent and warm machine wash to kill residual spores.

Recommended disinfectant products include:

- Non-corrosive disinfectants including Coolacide®, Phytoclean®, or Biogram® which can be for cleaning footwear, tools, tyres, machinery and other items in contact with soil;
- 70% Methylated spirits solution in a spray bottle which is suitable for personal use (clothing and car interior);
- Sodium Hypochlorite 1%, which is effective, but can damage clothing and degrades rapidly in light; and
- Chloramine and chlorhexadine- based products including Halamid®, Halasept® and Hexifoam® which can be used to disinfect hands, footwear and equipment.

Additionally, a simple hygiene kit should be kept in each field vehicle to allow staff to implement hygiene measures as required. At a minimum, hygiene kits should contain a stiff brush (for removing soil from boots, bags, etc.), a spray bottle and a container of disinfectant solution (with enough volume for several refills of the spray bottle).

5.2. Weed Management during Clearing

As vegetation will be cleared in close proximity to a watercourse there is potential for erosion and the spread of weeds propagules if appropriate measures are not implemented. As such the amount of bare soil exposed at any one time should be minimised, and sediment fencing should be installed along the boundary of the VMP area, and downslope of any activities involving earthworks to prevent the spread of weeds.

Any weed materials will need to be carefully removed off site in a manner appropriate to the species or at the direction of the ecologist (used for pre-clearing surveys), so as to prevent the spread of propagules to uncleared areas of native vegetation, both on- and off-site.

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

5.3. Pre-clearance Surveys

Prior to the commencement of any vegetation clearing, a pre-clearance survey must be undertaken by a fauna ecologist within one week of any clearing activities. During the survey native fauna and habitat that have the potential to be disturbed during clearing will be identified, and any habitat features marked with flagging tape and/or spray paint.

5.4. Clearance Supervision

The need for clearance supervision for the removal of vegetation and habitat will be determined and documented in the pre-clearance report. If deemed necessary, the fauna ecologist will be present while clearing to rescue animals injured during the clearance operation. Furthermore, a fauna ecologist is to be present during dam decommissioning to ensure the safe capture and relocation of aquatic fauna species. Due to the size of the dams to be decommissioned and their potential to be utilised by native aquatic species, it is recommended that a Dam Decommissioning Plan be prepared to minimise impacts on aquatic fauna. Detailed requirements for the Dam Decommissioning Plan are outlined in **Section 5.5**.

Any fauna found will be captured and relocated to nearby remnant vegetation and released. Any animals that are inadvertently injured will be taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, humanely euthanised. All fauna handling will be carried out by licensed wildlife carers and/or ecologists.

5.5. Dam Decommissioning Plan

A Dam Decommissioning Plan is to be prepared for the decommissioning of three farm dams within the subject land. It outlines the processes that are to be undertaken when decommissioning dams to ensure minimal harm to aquatic fauna species. The Dam Decommissioning Plan will outline the licences required to capture and relocate aquatic fauna species, details for pre-clearance assessments of the dams, requirements for dewatering, protocols for fauna handling and suitable locations for release of captured aquatic species.

5.6. Salvage

Any timber that would be suitable to create instream habitat should be salvaged during clearing. These should be identified by the ecologist during clearance supervision and should be separated from remaining material that could be mulched on site. Timber suitable for salvage should include larger logs and branches that are unlikely to decompose between clearing and revegetation. Salvaged features should be stockpiled away from areas impacted by earthworks to ensure the features do not become mixed with soil.

5.7. Erosion and Sediment Control

During construction works adequate erosion control measures, such as silt fencing, are to be installed to prevent movement of weed seeds and nutrient-enriched soils during rain events. In particular measures are required to prevent sediment entering the watercourse. This will prevent nutrient enrichment and weed spread within the VMP area and downstream of the subject land. Other specific measures to minimise erosion and sediment impacts are detailed further in the sections below.

5.8. Timing of Clearing

Clearing should not take place during periods of heavy rain in order to minimise erosion and sediment run-off.

5.9. Soil Stockpiling

Following clearing, topsoil should be stripped and stockpiled for later use in revegetation. When stripping and stockpiling topsoil, the following should be considered:

- Topsoil should be stripped and stockpiled separately to subsoil;
- Soil should not be stockpiled within the riparian zone or other area where run-off is channelled; and
- Soil stockpiles should be covered to prevent soil loss to wind or water erosion.

6. Weed Management Plan

6.1. Introduction

This chapter details how weeds within the VMP area will be managed and controlled.

6.2. Weed Control Objectives

The objective of weed management is to prevent the establishment of weeds within the recreated vegetated riparian zone. This will in particular focus on preventing the establishment of priority weeds listed under the Biosecurity Act such as *Lycium ferocissimum*, *Nassella neesiana* and other exotic grasses. Weeds identified within the subject land are listed with their respective control measures in **Appendix B**, which form the basis of this Weed Management Plan. Priority weeds for the Greater Sydney Region recorded on the subject land are listed in **Table 2**.

6.3. Weed Control Measures

Weed control is to be implemented across the VMP area, and also where relevant during clearing within other parts of the subject land. Weed control works within the VMP area will be undertaken using the strategies outlined below.

6.3.1. Manual Weed Removal

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

6.3.2. Use of Herbicides

All herbicides should be used according to recommendations on the herbicide label. Appropriate Personal Protective Equipment should be worn and consideration given to time of day, likelihood of rainfall, wind direction and likely impact on native species as per guidelines on the label. Use of glyphosate will be appropriate for most species. Glyphosate is the preferred herbicide for use in environmentally sensitive areas as it is rapidly broken down by microbes in the soil so residue is short lived and will not affect remnant and planted native individuals in the long-term following application. In areas near watercourses, an appropriate form of the herbicide should be used to minimise impact to aquatic life and amphibians. Herbicide use should be avoided within 2m of the riparian edges. Examples of appropriate herbicide forms are Roundup Biactive and Clearup Bio 360 which have surfactants that are formulated to minimise harm to amphibians. As runoff is a likely means of herbicide residue entering watercourses, chemical treatment should be avoided prior to or directly after rains.

It is important to note that there can be legal restrictions and permit requirements for use of specific herbicides for specific plants, and chemical labels and permit requirements always need to be read prior to herbicide application. While the recommended methods for weed treatment detailed in **Appendix B** are effective, some will require a permit. Some relevant permit numbers are PER9907, and PER11916. These permits need to be obtained from the Federal Government body, the Australian Pesticides and Veterinary Management Authority.

Manual removal will be an appropriate form of control for some species, and all chemical treatment should be carried out according to best practice guidelines. Planting should not be undertaken within 10 days of herbicide application.

6.4. Stages of Weed Control

Typically within areas of vegetation that are to be managed and revegetated, weed control involves a primary weeding phase in order to reduce weed cover prior to planting, followed by maintenance weeding. However for the VMP area, no existing vegetation is to be managed, and revegetation will take place following the removal of all existing vegetation and the re-alignment of a watercourse. As such, other than clearing of weeds prior to construction, the only stage of weed control will be maintenance weeding.

6.4.1. Maintenance Weeding

Weed suppression methods such as jute matting will suppress mass regrowth of weeds in revegetation areas initially, but not entirely prevent regrowth of weeds. The most cost and time effective method of controlling weed regrowth in a revegetation area or weedy bushland area is by spraying a non-selective glyphosate herbicide. A list of effective methods for control of weeds on site is found in **Appendix B**. Undertaking a spray-prep by first hand-weeding around natives and de-seeding exotics prior to spraying also removes the need for tree guards.

Follow-up weeding should be undertaken in within Management Zone 1 that have received past primary weeding treatments in the following months, to treat any regrowth of weeds. Ongoing maintenance of the revegetation and natural regeneration areas should occur for a five year period by the contracted bushland regeneration company, and each area should be covered in its entirety once every month, to diminish the soil seed bank of exotic weed species present on site. In order to eliminate the occurrence of these species they need to be controlled before they have a chance to set seed.

It is important during site visits for ongoing weed maintenance that as many weeds as possible are controlled so individuals are not able to achieve maturity and set seed between site visits. Some weed species are prolific seeders, and many exotic plants can have seed that remains viable in the soil for long periods of time. In order to effectively diminish the soil seed bank occurrences of exotic species it is important that individuals are not allowed to set seed.

During site visits for weed control, Priority Weeds, other weeds of regional concern, and WoNS (**Table 2**) should be prioritised for control. Individual plants of these species on site should not be allowed to achieve a reproductive stage in their life cycles.

Temporary sediment fencing should be retained until it is determined plants have established enough to prevent surface soil runoff.

Follow-up weeding should be implemented under this VMP for a minimum period of five continuous years, after revegetation works have been completed. After the initial two-year revegetation and weed management has been implemented, resources required for ongoing maintenance weeding should be reviewed and identified on an annual basis from year 3 – 5 based on the annual assessment of site conditions and response to prior works completed.

7. Revegetation Plan

7.1. Introduction

This Revegetation Plan applies to the VMP area. It provides specifications for site preparation, plant sourcing and details of planting techniques and maintenance requirements.

7.2. Plant Sourcing

7.2.1. Target Communities

The dominant vegetation community along the floodplain and drainage lines within the subject land is PCT 1800 Swamp Oak open forest on riverflats of the Cumberland Plain and Hunter Valley. However, anecdotal observations by Cumberland Ecology suggest that a second community may have been present in such areas, namely PCT 835 Cumberland Riverflat Forest. Cumberland Riverflat Forest corresponds to River-flat Eucalypt Forest which is listed as endangered under both the EPBC Act and BC Act.

As soil salinity increases, River-Flat Eucalypt Forest (RFEF) may adjoin or intergrade with Swamp Oak Floodplain Forest (SOFF) (TSSC 2011). The boundaries between these communities are dynamic and may shift in response to changes in hydrological regimes, fire regimes or land management practices (TSSC 2011). Given that the boundaries between these communities are transitional the proposed planting list (**Appendix C**) is a mixture of suitable species from both communities, including local native species detected from within the subject land.

As parts of the VMP area will be used for bio-retention basins and for the watercourse realignment, the planting list also includes additional sedges, rushes and other aquatic plant species tolerant of inundation.

7.2.2. Genetic Provenance

Plants are to be from genetic stock sourced within a 15 km radius of the subject land where possible. Plantings are to be sourced from one of the following methods:

- A plant nursery which supplies species endemic to RFEF or SOFF vegetation, cultivated using seed or cuttings sourced from within a 15 km radius;
- Plants propagated from cuttings or seed sourced from within the subject land; and/or
- Plants propagated from cuttings or seed sourced within a nearby area of RFEF or SOFF.

A qualified and experienced bushland regenerator is to be engaged for any native plant propagation works required. Appropriate permissions for any collections undertaken and appropriate licensing under the BC Act will need to be obtained for any seed collected from offsite areas; this will be the responsibility of the bushland regenerator engaged to undertake the works.

7.2.3. Final Plant Selection

All plants will be disease and pest-free, hardened off and well-watered at the time of planting. All plants are to be provided in a healthy condition. They must have good root development and a sturdy shoot system.

Final species selection will be based upon:

- Availability of seed/plant material;

- Exclusion of plants likely to naturally regenerate on the site; and
- Previous experience with species performance in re-vegetation.

7.3. Site Preparation

7.3.1. Watercourse Reinstatement

The re-aligned watercourse is to be recreated, with the banks and the stream channel stabilised with rock to form a gently sloping bank profile. Rocks will be placed so as to recreate the natural appearance of a creek-bed with sufficient space between rocks for planting with riparian/aquatic plant species. The watercourse channel will also incorporate instream woody debris to create instream aquatic habitat, have a range of different surfaces along the bed and banks of the channel to create different geomorphic features such as pools and riffles during high flow events.

7.3.2. Site Preparation

Site preparation is to take place following primary weed control in the VMP area to remove exotic grasses and other weeds and following watercourse re-instatement.

As extensive earthworks are likely to take place prior to the re-instatement of the re-aligned watercourse, some topsoil will need to be respread prior to planting.

Following weed removal and topsoil spreading, the VMP area is to be mulched prior to planting with a well-decomposed wood chip or native leaf litter type mulch. Mulch should be applied to a depth of at least 75 mm. Mulch is only to be used within the VMP area adjacent to the re-aligned watercourse and it not to be spread below the top of banks on either side of the channel to reduce the risk of mulch being washed downstream during heavy rainfall.

Supplementary erosion and sediment controls are to be installed where necessary. This will mitigate erosion of the exposed topsoil. Weed removal prior to planting is to be undertaken in a manner which does not cause excessive disturbance to the existing topsoil.

Temporary silt sediment fencing will be installed around the area to be revegetated, to prevent soil loss during rainfall.

7.4. Planting Densities

Typically, planting is undertaken at a low density for canopy trees, with higher densities for understory shrubs and groundcovers. Planting of trees and shrubs will be limited to higher areas on the bank of the re-aligned stream to recreate riparian vegetation. In these areas, grasses should be planted in clumps with other groundcover species interspaced between the clumps.

As the VMP area include the stream channel, planting will include higher densities of aquatic plants, sedges and rushes tolerant of waterlogging. These should be planted into all suitable gaps in the stream channel substrate.

An indicative planting density is provided in **Table 4**.

Table 4 Indicative planting density

Species	Planting Density	Suitable area
Canopy trees	1 unit per 10m ²	Higher bank areas
Subcanopy trees/large shrubs	4 units per 10m ²	Higher bank areas
Shrub layer	5 units per 10m ²	Higher bank areas
sedges, rushes and aquatic plants	5 units per m ²	Bio-retention basin and recreated stream channel
Ground layer (grasses and forbs)	2 units per m ² in clumps	Higher bank areas

7.5. Planting Technique

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

- Mulch needs to be scraped back to expose soil surface;
- Holes for tube stock should be dug deep enough that at least a few centimetres of the plant are below the soil surface;
- Where tree roots are present, a hole should be dug in an alternate location;
- Soil should be filled back in surrounding the tube stock;
- Mulch should be spread back to surround the new planting, but not smother it; and
- Plants need to be watered immediately following planting.

7.6. Protection Measures

7.6.1. Tree Protection

A plastic tree guard should be installed around each plant (or clump of plants) following planting and watering to protect them from herbivory, trampling by visitors; and herbicide drift during site visits for weed control.

7.6.2. Installation of Protective Fencing

Following the completion of the initial planting works, protective fencing will be installed in order to restrict access into the VMP area. The fencing should be chain-link, a minimum of 2.7 m high, and painted black or green to improve aesthetics.

Fencing should also include permanent educational signage that will identify the importance of the vegetation being recreated.

7.7. Maintenance

7.7.1. Maintenance of Plantings

After planting works have been completed, treated areas should be maintained by appropriately by qualified personnel, selectively spot spraying and hand weeding around native plants, watering plants and replacing deceased plants as needed.

Provision should be made to irrigate plantings, as required, in the first three months after planting, (on at least four to five occasions, depending on rainfall).

Re-growing weeds will be treated following planting as detailed in **Section 6.4.2**.

Plants that have died should be replaced as required. Plants that a have died should be replaced by the bushland maintenance team with a planting of the same form during the next site visit by the team.

During maintenance inspections, all rubbish should be removed from the VMP area.

Maintenance of plantings will also be guided by regular monitoring of revegetation works as discussed in **Chapter 8. Table 6** in **Chapter 9** provides a maintenance monitoring and reporting schedule including monitoring of revegetation, proposed monitoring timing and reporting.

7.7.2. Maintenance of Watercourse and Bio-retention Basins

Additional inspection and maintenance will be required for the re-aligned watercourse and bio-retention basins. These are detailed in **Table 5** within **Section 8.1.4**.

8. Monitoring and Reporting

8.1. Monitoring Inspections

8.1.1. Management Zone 1

Monitoring inspections of the VMP area are to be completed every six months following the completion of construction. The monitoring inspections must determine:

- The weeds to be targeted during secondary weed control works;
- The success of plantings;
- Any requirements for additional native plantings;
- Progress against all management targets in the VMP; and
- Any other matters of relevance to the implementation of this VMP.

The monitoring must also identify the condition of the re-instated watercourse.

Monitoring must include taking photographs from fixed monitoring points. The fixed monitoring points will be located where the realigned watercourse enters and leaves the VMP area. At these locations photographs are to be taken in both an upstream and downstream direction.

Due to the narrow area of the watercourse re-alignment, no plot-based monitoring is proposed.

8.1.2. Photograph Monitoring Points

The indicative location of the photograph monitoring points is shown in **Figure 6**.

8.1.3. Timing

Monitoring is to be undertaken at six monthly intervals following the completion of revegetation works within each Zone, and continue until five years following the completion of works within Management Zone 1.

8.1.4. Monitoring Inspections of Watercourse and Bio-retention Basins

The watercourse and bio-retention basins within the VMP area have additional inspection and maintenance requirements. These inspections should be undertaken by a maintenance contractor. These inspections and the required maintenance are detailed in **Table 5** below.

Table 5 Inspection requirements for the watercourse and bio-retention basins

Inspection	Frequency	Maintenance Response
Inspect for excessive litter and sediment build-up	Six-monthly	Remove sediment and litter and dispose of in accordance with Council requirements
Check for any evidence of erosion	Six-monthly, after major rain event	Reinstate eroded areas so that original, designed profile is maintained

8.2. Reporting

A brief and concise report should be submitted every 12 months for the life of the VMP. This report will be forwarded to Council and will provide a record of the implementation of the VMP. The report will:

- Describe any rehabilitation and revegetation works undertaken;
- State the findings of the monitoring activities;
- Discuss any problems encountered in implementing the VMP; and
- Recommend any adaptations or additions to the VMP for the next year's works.

Each annual report should contain a description of weed infestations and weed treatment works, and a comparison of the photographs to the previous years. Any other notable occurrences of weeds should also be reported. The reports should also recommend and prioritise areas where weed control should be targeted.

A final report should be prepared at the end of the five-years following the completion of revegetation within Management Zone 1, documenting the success of the works against performance criteria. This report should also provide recommendations for ongoing and in-perpetuity management and monitoring strategies based on the vegetation condition at the end of the duration of this VMP.

8.3. Review

This VMP is to be reviewed five years after the completion of revegetation works within Management Zone 1 to determine if further works, and extension and/or updates to this VMP are required.

9. Timing and Responsibilities

9.1. Responsibilities

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

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

9.2. Timing

The VMP works will be broken down into phases, although some phases may overlap. Some maintenance, and monitoring and reporting (if targets are not met) will be required in perpetuity after the five year period from the completion of revegetation in Zone 1. The phases are:

- Phase 1 – Vegetation clearing prior to construction;
- Phase 2 – Construction (limited VMP works during this period);
- Phase 3 – Revegetation;
- Phase 4 – Maintenance;
- Phase 5 – Monitoring and reporting;
- Phase 6 – In-perpetuity maintenance.

These phases are detailed further in **Table 6** below.

Table 6 Timing and Responsibilities

Management Area	Action	Responsibility	Performance Criteria	Timing
Phase 1: Vegetation clearing				
Subject land	Installation of sediment/erosion controls	Site superintendent	Sediment/erosion controls have been installed	Prior to commencement of clearing works.
Development footprint	Soil stockpiling	Site superintendent	Soil stockpiles and covered to prevent erosion	Prior to construction
Development Footprint	Clearance and preclearance surveys	Ecologist to supervise	Preclearance surveys completed and fauna (if present) relocated	Prior to construction

Management Area	Action	Responsibility	Performance Criteria	Timing
Salvage	Salvage suitable logs and branches	Site superintendent	Suitable features stockpiled for later use	Prior to construction
Phase 3: Revegetation				
VMP area	Reconstruction of aligned watercourse and banks	Site superintendent	Watercourse channel re-constructed as per detailed designs	
VMP area	Salvaged features placed along watercourse	Site superintendent	All salvaged features placed to create in-stream habitat	Following reconstruction
VMP area	Bio-retention basins created	Site superintendent	Bio-retention basins constructed as per detailed designs	Following removal of temporary road
VMP area	Revegetation of VMP Management Zone	Bush Regeneration Contractor	VMP area has been planted, using the species in Appendix C .	On completion of reconstruction
Phase 4: Maintenance				
VMP area	Carry out maintenance weeding	Bush Regeneration Contractor	Ensure no new weeds establish, reduce weed cover to 10% for ground layer and 0% for other layers	Site visits 6 monthly for the 5 year maintenance period
VMP area	Maintain plantings	Bush Regeneration Contractor	Replace all deceased plants	Site visits 6 monthly for the 5 year maintenance period
VMP area	Rubbish removal	Bush Regeneration Contractor	All rubbish removed	Site visits 6 monthly for the 5 year maintenance period
VMP area	Maintenance of watercourse and bio-retention basins	Site superintendent	Built up litter and sediment removed, erosion repaired	Site visits 6 monthly for the 5 year maintenance period, and after heavy rainfall
Phase 5: Monitoring and Reporting				
VMP area	Biannual inspection of site	Bush Regeneration Contractor or Ecologist	Site inspection completed as outlined in Chapter 8	Biannually for the 5 year maintenance period

Management Area	Action	Responsibility	Performance Criteria	Timing
VMP area	Progress report preparation	Bush Regeneration Contractor or Ecologist	Annual Report prepared on progress of VMP.	Annually for the 5 year maintenance period
VMP area	Inspections of watercourse and bio-retention basins	Site Superintendent	Built up litter removed, erosion repaired	Site visits 6 monthly for the 5 year maintenance period, and after heavy rainfall
Phase 6: In perpetuity maintenance				
VMP area	Inspection and maintenance of watercourse channel and bio-retention basins	Maintenance contractor	Built up litter removed, erosion repaired	Site visits 6 monthly for the 5 year maintenance period, and after heavy rainfall
VMP area	Rubbish removal	Maintenance contractor	All rubbish removed	6 monthly for life of project
VMP area	Maintenance weeding	Bush Regeneration Contractor	Ensure no new weeds establish, maintain weed cover at or below 10% for ground layer and 0% for other layers	6 monthly for life of project

10. References

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APPENDIX A :

Flora Species List from BAM Plot Surveys

Table 7 Flora species detected within BAM plots surveys within the subject land

Scientific Name	Common Name	Family	Origin
<i>Alternanthera nana</i>	Hairy Joyweed	Amaranthaceae	Native
<i>Araujia sericiflora</i>	Moth Vine	Apocynaceae	Introduced
<i>Austrostipa verticillata</i>	Slender Bamboo Grass	Poaceae	Native
<i>Axonopus fissifolius</i>	Narrow-leafed Carpet Grass	Poaceae	Introduced
<i>Bidens pilosa</i>	Cobbler's Pegs	Asteraceae	Introduced
<i>Bothriochloa decipiens</i> var. <i>decipiens</i>	Pitted Bluegrass	Poaceae	Native
<i>Brassica rapa</i>	Turnip	Brassicaceae	Introduced
<i>Briza subaristata</i>	-	Poaceae	Introduced
<i>Bromus catharticus</i>	Praire Grass	Poaceae	Introduced
<i>Bromus molliformis</i>	Soft Brome	Poaceae	Introduced
<i>Brunonia australis</i>	Blue Pincushion	Goodeniaceae	Native
<i>Carex inversa</i>	Knob Sedge	Cyperaceae	Native
<i>Casuarina glauca</i>	Swamp Oak	Casuarinaceae	Native
<i>Cenchrus clandestinus</i>	Kikuyu Grass	Poaceae	Introduced
<i>Centaurium tenuiflorum</i>	Branched Centaury	Gentianaceae	Introduced
<i>Chenopodium album</i>	Fat Hen	Chenopodiaceae	Introduced
<i>Chloris gayana</i>	Rhodes Grass	Poaceae	Introduced
<i>Chloris ventricosa</i>	Tall Chloris	Poaceae	Native
<i>Chloris virgata</i>	Feathertop Rhodes Grass	Poaceae	Introduced
<i>Cirsium vulgare</i>	Spear Thistle	Asteraceae	Introduced
<i>Citrus x taitensis</i>	Rough Lemon	Rutaceae	Introduced
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Asteraceae	Introduced

Scientific Name	Common Name	Family	Origin
<i>Conyza sumatrensis</i>	Tall fleabane	Asteraceae	Introduced
<i>Cotula australis</i>	Common Cotula	Asteraceae	Native
<i>Cyclospermum leptophyllum</i>	Slender Celery	Apiaceae	Introduced
<i>Cynodon dactylon</i>	Common Couch	Poaceae	Native
<i>Cyperus gracilis</i>	Slender Flat-sedge	Cyperaceae	Native
<i>Cyperus rotundus</i>	Nutgrass	Cyperaceae	Introduced
<i>Cyperus sesquiflorus</i>	-	Cyperaceae	Introduced
<i>Datura stramonium</i>	Common Thornapple	Solanaceae	Introduced
<i>Dichondra repens</i>	Kidney Weed	Convolvulaceae	Native
<i>Digitaria sanguinalis</i>	Crab Grass	Poaceae	Introduced
<i>Dovyalis caffra</i>	Kei Apple	Flacourtiaceae	Introduced
<i>Echinochloa crus-galli</i>	Barnyard Grass	Poaceae	Introduced
<i>Einadia polygonoides</i>	Knotweed Goosefoot	Chenopodiaceae	Native
<i>Einadia trigonos</i>	Fishweed	Chenopodiaceae	Native
<i>Eleusine indica</i>	Crowsfoot Grass	Poaceae	Introduced
<i>Enteropogon acicularis</i>	Curly Windmill Grass	Poaceae	Native
<i>Eragrostis curvula</i>	African Lovegrass	Poaceae	Introduced
<i>Eragrostis leptostachya</i>	Paddock Lovegrass	Poaceae	Native
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	Poaceae	Native
<i>Eucalyptus amplifolia</i>	Cabbage Gum	Myrtaceae	Native
<i>Eucalyptus moluccana</i>	Grey Box	Myrtaceae	Native
<i>Gamochaeta americana</i>	Purple Cudweed	Asteraceae	Introduced
<i>Gnaphalium americanum</i>	Purple Cudweed	Asteraceae	Introduced
<i>Grevillea robusta</i>	Silky Oak	Proteaceae	Native
<i>Juncus usitatus</i>	Common Rush	Juncaceae	Native
<i>Lactuca saligna</i>	Willow-leaved Lettuce	Asteraceae	Introduced

Scientific Name	Common Name	Family	Origin
<i>Lepidium africanum</i>	Common Peppergrass	Brassicaceae	Introduced
<i>Lycium ferocissimum</i>	African Boxthorn	Solanaceae	Introduced
<i>Malva parviflora</i>	Small-flowered Mallow	Malvaceae	Introduced
<i>Medicago polymorpha</i>	Burr Medic	Fabaceae (Faboideae)	Introduced
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	Poaceae	Native
<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	Introduced
<i>Nassella neesiana</i>	Chilean Needle Grass	Poaceae	Introduced
<i>Oxalis corniculata</i>	Creeping Oxalis	Oxalidaceae	Introduced
<i>Oxalis perennans</i>	-	Oxalidaceae	Native
<i>Paronychia brasiliensis</i>	Chilean Whitlow Wort, Brazilian Whitlow	Caryophyllaceae	Introduced
<i>Paspalum dilatatum</i>	Paspalum	Poaceae	Introduced
<i>Paspalum distichum</i>	Water Couch	Poaceae	Native
<i>Plantago lanceolata</i>	Lamb's Tongues	Plantaginaceae	Introduced
<i>Plantago myosuroides</i>	-	Plantaginaceae	Introduced
<i>Portulaca oleracea</i>	Pigweed	Portulacaceae	Native
<i>Rumex crispus</i>	Curled Dock	Polygonaceae	Introduced
<i>Senecio madagascariensis</i>	Fireweed	Asteraceae	Introduced
<i>Senecio pterophorus</i>	-	Asteraceae	Introduced
<i>Senecio pterophorus</i>	-	Asteraceae	Introduced
<i>Setaria parviflora</i>	-	Poaceae	Introduced
<i>Sida rhombifolia</i>	Paddy's Lucerne	Malvaceae	Introduced
<i>Sisymbrium officinale</i>	Hedge Mustard	Brassicaceae	Introduced
<i>Solanum linnaeanum</i>	Apple of Sodom	Solanaceae	Introduced
<i>Solanum nigrum</i>	Black-berry Nightshade	Solanaceae	Introduced
<i>Solanum prinophyllum</i>	Forest Nightshade	Solanaceae	Native

Scientific Name	Common Name	Family	Origin
<i>Solanum pseudocapsicum</i>	Madeira Winter Cherry	Solanaceae	Introduced
<i>Solanum radicans</i>	Cusmayllo	Solanaceae	Introduced
<i>Solanum sisymbriifolium</i>	-	Solanaceae	Introduced
<i>Sonchus oleraceus</i>	Common Sowthistle	Asteraceae	Introduced
<i>Sporobolus creber</i>	Slender Rat's Tail Grass	Poaceae	Native
<i>Taraxacum officinale</i>	Dandelion	Asteraceae	Introduced
<i>Trifolium repens</i>	White Clover	Fabaceae (Faboideae)	Introduced
<i>Verbena bonariensis</i>	Purpletop	Verbenaceae	Introduced
<i>Verbena quadrangularis</i>	-	Verbenaceae	Introduced
<i>Vulpia bromoides</i>	Squirrel Tail Fesque	Poaceae	Introduced

APPENDIX B :

Weed Control Measures



Table 8 Weed control measures for weed species present, or likely to be present in the subject land

Family	Species	Common Name	Treatment Methods
Amaryllidaceae	<i>Clivia miniata</i>	Clivia	- Hand Weed - Spot Spray suckers - Glyphosate 10mL/1L
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Apocynaceae	<i>Araujia sericifera</i>	Moth Vine	- Hand Weed Juveniles - Spray juveniles with glyphosate 10mL/1L - Skirt mature vines (cut through plant close to root) and then pull root manually or apply undiluted glyphosate to cut surface - Scrape and paint vine with undiluted glyphosate
Arecaceae	<i>Syagrus romanzoffiana</i>	Cocos Palm	- Hand Weed - Spot Spray - Glyphosate 50% v/v for spot treatment into drill holes. Undiluted for cut stump treatments.
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	Fluroxypyr 140 g/L + Aminopyralid 10 g/L (Hot Shot™); 500 mL in 100 L of water, Hand gun application to actively growing plants
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Conyza sumatrensis</i>	Tall Fleabane	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Gamochaeta americana</i>	Cudweed	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Lactuca saligna</i>	Willow-leaved Lettuce	- Hand Weed - Spot Spray - Glyphosate 10mL/1L

Family	Species	Common Name	Treatment Methods
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Sonchus oleraceus</i>	Milk Thistle	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Bignoniaceae	<i>Jacaranda mimosifolia</i>	Jacaranda	Large trees must be ring-barked or cut down below ground level and any regrowth treated with Glyphosate 50% v/v herbicide.
Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Brassicaceae	<i>Lepidium africanum</i>	-	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Caryophyllaceae	<i>Cerastium glomeratum</i>	Mouse-ear Chickweed	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Malvaceae	<i>Malva parviflora</i>	Small Flowered Mallow	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	- Hand weed - Spray with glyphosate 10mL/1L - Cut large, firmly rooted individuals at the base with secateurs and paint with undiluted glyphosate
Oleaceae	<i>Olea europaea subsp. cuspidata</i>	African Olive	- Spray juveniles with glyphosate 10mL/1L - Cut mature individuals with saw or loppers near ground level and paint stump with undiluted glyphosate or Triclopyr (600g/L formulation)/diesel at 4L/60L

Family	Species	Common Name	Treatment Methods
			<p>concentration (as per Garlon 600 label)</p> <ul style="list-style-type: none"> - Use a power drill (9mm drill bit with dowelling tip) to drill holes less than 20 mm apart throughout lignotuber of mature trees and fill holes with glyphosate a 1:5 mixture with water. After all holes have been filled with herbicide mixture refill holes with herbicide mixture a second time (plant will have absorbed herbicide by this time). Check trees monthly for regrowth and repeat treatment if resprouting foliage is observed
Oxalidaceae	<i>Oxalis corniculata</i>	Yellow Wood Sorrel	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Axonopus fissifolius</i>	Carpet Grass	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Briza subaristata</i>	Chilean Quaking Grass	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Bromus catharticus</i>	Brome Grass	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Cenchrus clandestinus</i>	Kikuyu Grass	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	<ul style="list-style-type: none"> - Hand weed juveniles - Remove carefully with secateurs and bag seed plumes of mature plants - Dig mature plants out of the ground with a mattock; or - Brushcut mature plants to near ground level and spray with glyphosate 10mL/1L - During subsequent site visits spray regrowth foliage with glyphosate 10mL/1L
Poaceae	<i>Digitaria sanguinalis</i>	Summer Grass	<ul style="list-style-type: none"> - This species is present above ground generally only during the warmer months of the year when it grows densely, in large abundances, after seedlings germinate from soil seed. It seeds profusely and it is important to prevent seed from being deposited in the soil to prevent dense infestations the following year. It is important to control juveniles before they are able to produce and set seed. On any

Family	Species	Common Name	Treatment Methods
			<p>plant that is seeding the seed head needs to be cut off and bagged, with secateurs for individual plants, or use of shears in areas with large amounts of the grass seeding.</p> <p>- The most effective control methods is to spray all patches of juvenile plants with glyphosate 10mL/1L before they reach maturity. This needs to be repeated during every site visit during the warmer months as germination of new plants will occur throughout this period.</p>
Poaceae	<i>Echinochloa crus-galli</i>	Barnyard Grass	<p>- Hand Weed</p> <p>- Spot Spray - Glyphosate 10mL/1L</p>
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	<p>- Hand Weed</p> <p>- Spot Spray - Glyphosate 10mL/1L</p>
Poaceae	<i>Eleusine indica</i>	Crow's Foot	<p>- Hand Weed</p> <p>- Spot Spray - Glyphosate 10mL/1L</p>
Poaceae	<i>Eleusine tristachya</i>	Crab Grass	<p>- Hand Weed</p> <p>- Spot Spray - Glyphosate 10mL/1L</p>
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	<p>- Any seed heads present on mature individuals should be cut from plants with secateurs and bagged and removed from site</p> <p>- Dig large individuals out with a mattock</p> <p>- Juvenile individuals can be dug out using hand tools or spot sprayed using glyphosate 10mL/1L</p> <p>- Spot spraying with glyphosate 10mL/1L is effective during the growth period during Spring and Summer - During this period large individuals can be mown or brushcut to the ground level and regrowth foliage sprayed with glyphosate</p> <p>- Spot spraying the herbicide Fluproponate (745g/L formulation) at 3mL/1L concentration (as per label) is effective at eradicating African Lovegrass and will kill any seedling regrowth for up to 4 years as the herbicide may remain active in the soil for this time period.</p>
Poaceae	<i>Nassella neesiana</i> ,	Chilean Grass	<p>Needle</p> <p>Any seed heads present on mature individuals should be cut from plants with secateurs and bagged and removed from site</p> <p>Dig large individuals out with a mattock</p> <p>Spot Spray - Glyphosate 10mL/1L in spring before seed is set</p>

Family	Species	Common Name	Treatment Methods
Poaceae	<i>Panicum maximum</i>	Guinea Grass	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Paspalum dilatatum</i>	Dallisgrass	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Setaria parviflora</i>	Pigeon Grass	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Poaceae	<i>Vulpia bromoides</i>	Squirrel Tail Fescue	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Polygonaceae	<i>Rumex crispus</i>	Curled Dock	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Proteaceae	<i>Grevillea robusta</i>	Silky Oak	Large trees must be ring-barked or cut down below ground level and any regrowth treated with Glyphosate 50% v/v herbicide.
Rutaceae	<i>Citrus × taigensis</i>	Lemon	Hand weed or if not possible cut-back to stump and paint stem with undiluted Glyphosate
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	- Heavy PPE such as leather gloves, and caution should be used when working with this plant due to the presence of large thorns - Juvenile individuals can be hand weeded - Mature individuals should be cut at the base with a hand saw and undiluted glyphosate painted on to the cut stump surface - Alternatively for large individuals a power drill can be used to drill holes 5 cm apart which should be filled with undiluted glyphosate
Solanaceae	<i>Solanum chenopodioides</i>	Whitetip Nightshade	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Solanaceae	<i>Solanum linnaeanum</i>	Apple of Sodom	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Solanaceae	<i>Solanum nigrum</i>	Blackberry Nightshade	- Hand Weed - Spot Spray - Glyphosate 10mL/1L
Solanaceae	<i>Solanum pseudocapsicum</i>	Jerusalem Cherry	- Hand Weed - Spot Spray - Glyphosate 10mL/1L

Family	Species	Common Name	Treatment Methods
Solanaceae	<i>Solanum sisymbriifolium</i>	Sticky Nightshade	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L
Strelitziaceae	<i>Strelitzia reginae</i>	Bird of Paradise	<ul style="list-style-type: none"> - Saw plant off at base and apply undiluted glyphosate to the cut stump. Glyphosate should be applied to the stump immediately after cutting - To improve efficacy of herbicide application, dig around the base to expose roots which can be pierced with a knife or trowel and glyphosate applied - The plant may reshoot from the centre. The new shoot should be sawn off and glyphosate applied to freshly cut surface monthly until the plant is dead
Verbenaceae	<i>Verbena bonariensis</i>	Purple Top	<ul style="list-style-type: none"> - Hand Weed - Spot Spray - Glyphosate 10mL/1L

APPENDIX C :

Species Planting List



Table 9 Proposed planting list for revegetation of the VMP area

Family	Species Name	Common Name
Canopy trees		
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple
Myrtaceae	<i>Eucalyptus amplifolia</i>	Cabbage Gum
Myrtaceae	<i>Eucalyptus moluccana</i>	Coastal Grey Box
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Sub-canopy trees / tall shrubs		
Casuarinaceae	<i>Casuarina glauca</i>	Swamp Oak
Celastraceae	<i>Denhamia silvestris</i>	Orange Bark
Fabaceae (Mimosoideae)	<i>Acacia parramattensis</i>	Parramatta Wattle
Myrtaceae	<i>Acmena smithii</i>	Lilly Pilly
Myrtaceae	<i>Melaleuca decora</i>	-
Myrtaceae	<i>Melaleuca nodosa</i>	Prickly-leaved Paperbark
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Cheese Tree
Pittosporaceae	<i>Bursaria spinosa</i>	Blackthorn
Rhamnaceae	<i>Alphitonia excelsa</i>	Red Ash
Small shrubs		
Asteraceae	<i>Ozothamnus diosmifolius</i>	Sago Bush
Araliaceae	<i>Polyscias sambucifolia</i>	Elderberry Panax
Sedges, sedges and aquatic species for bio-retention basins and stream channel		
Alismataceae	<i>Alisma plantago-aquatica</i>	Water Plantain
Cyperaceae	<i>Baumea articulata</i>	Bare Twig-rush
Cyperaceae	<i>Baumea juncea</i>	Bare Twig-rush
Cyperaceae	<i>Bolboschoenus fluviatilis</i>	Marsh Club-rush
Cyperaceae	<i>Carex appressa</i>	Tall Sedge
Cyperaceae	<i>Cyperus difformis</i>	Variable Flat-sedge
Cyperaceae	<i>Cyperus exaltatus</i>	Tall Flat-sedge
Cyperaceae	<i>Cyperus laevis</i>	Flat-sedge
Cyperaceae	<i>Eleocharis sphacelata</i>	Tall Spike-rush
Cyperaceae	<i>Fimbristylis velata</i>	Fringe-rush
Cyperaceae	<i>Isolepis inudata</i>	-

Family	Species Name	Common Name
Cyperaceae	<i>Schoenoplectus mucronatus</i>	Club-rush
Cyperaceae	<i>Schoenoplectus validus</i>	River Club-rush
Juncaceae	<i>Juncus kraussii</i> subsp. <i>australiensis</i>	Sea Rush
Juncaceae	<i>Juncus planifolius</i>	Broad Rush
Juncaceae	<i>Juncus usitatus</i>	Common Rush
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat Rush
Onagraceae	<i>Ludwigia peploides</i>	Water Primrose
Poaceae	<i>Paspalum distichum</i>	Freshwater Couch
Poaceae	<i>Phragmites australis</i>	Common Reed
Grasses		
Poaceae	<i>Austrostipa verticillata</i>	Slender Bamboo Grass
Poaceae	<i>Bothriochloa decipiens</i> var. <i>decipiens</i>	Pitted Blue Grass
Poaceae	<i>Chloris truncata</i>	Windmill Grass
Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass
Poaceae	<i>Entolasia marginata</i>	Bordered Panic
Poaceae	<i>Entolasia stricta</i>	Wiry Panic
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Love Grass
Poaceae	<i>Imperata cylindrica</i>	Blady Grass
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass
Poaceae	<i>Oplismenus aemulus</i>	Basket Grass
Poaceae	<i>Oplismenus imbecillis</i>	-
Poaceae	<i>Panicum effusum</i>	Hairy Panic
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass
Forbs		
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpets
Acanthaceae	<i>Brunoniella pumillo</i>	Dwarf Blue Trumpets
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
Chenopodiaceae	<i>Einadia hastata</i>	-
Chenopodiaceae	<i>Einadia nutans</i> ssp. <i>linifolia</i>	Climbing Saltbush

Family	Species Name	Common Name
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed
Chenopodiaceae	<i>Enadia polygonoides</i>	Knotweed Goosefoot
Commelinaceae	<i>Commelina cyanea</i>	-
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Fabaceae (Faboideae)	<i>Desmodium gunnii</i>	-
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining Glycine
Goodeniaceae	<i>Brunonia australis</i>	Blue Pincushions
Lobeliaceae	<i>Pratia purpurescens</i>	White Root
Oxalidaceae	<i>Oxalis perennans</i>	-
Phormiaceae	<i>Dianella caerulea</i>	Blue Flax-lily
Plantaginaceae	<i>Veronica plebia</i>	Creeping Speedwell
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade
Violaceae	<i>Viola hederacea</i>	Native Violet

FIGURES

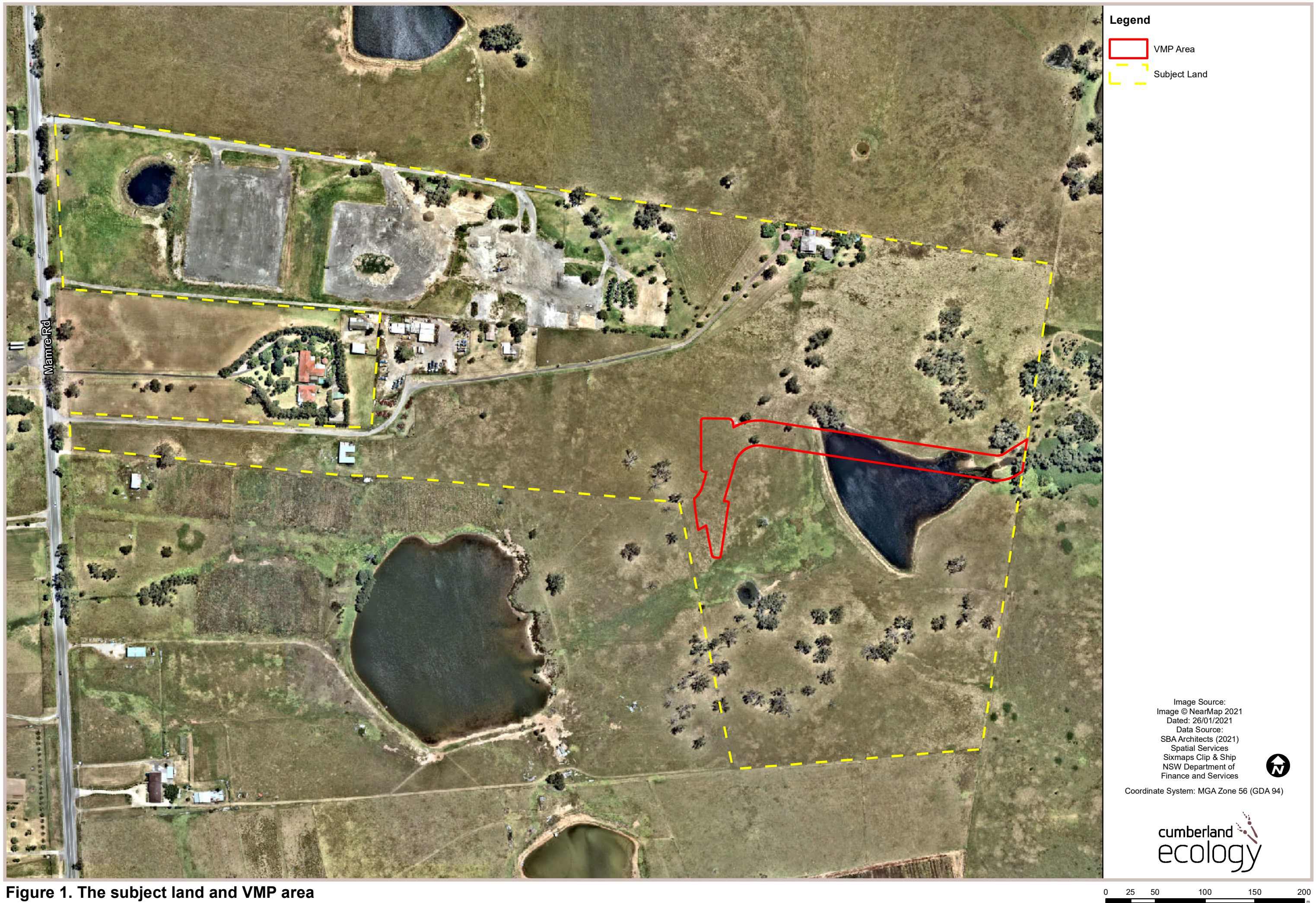
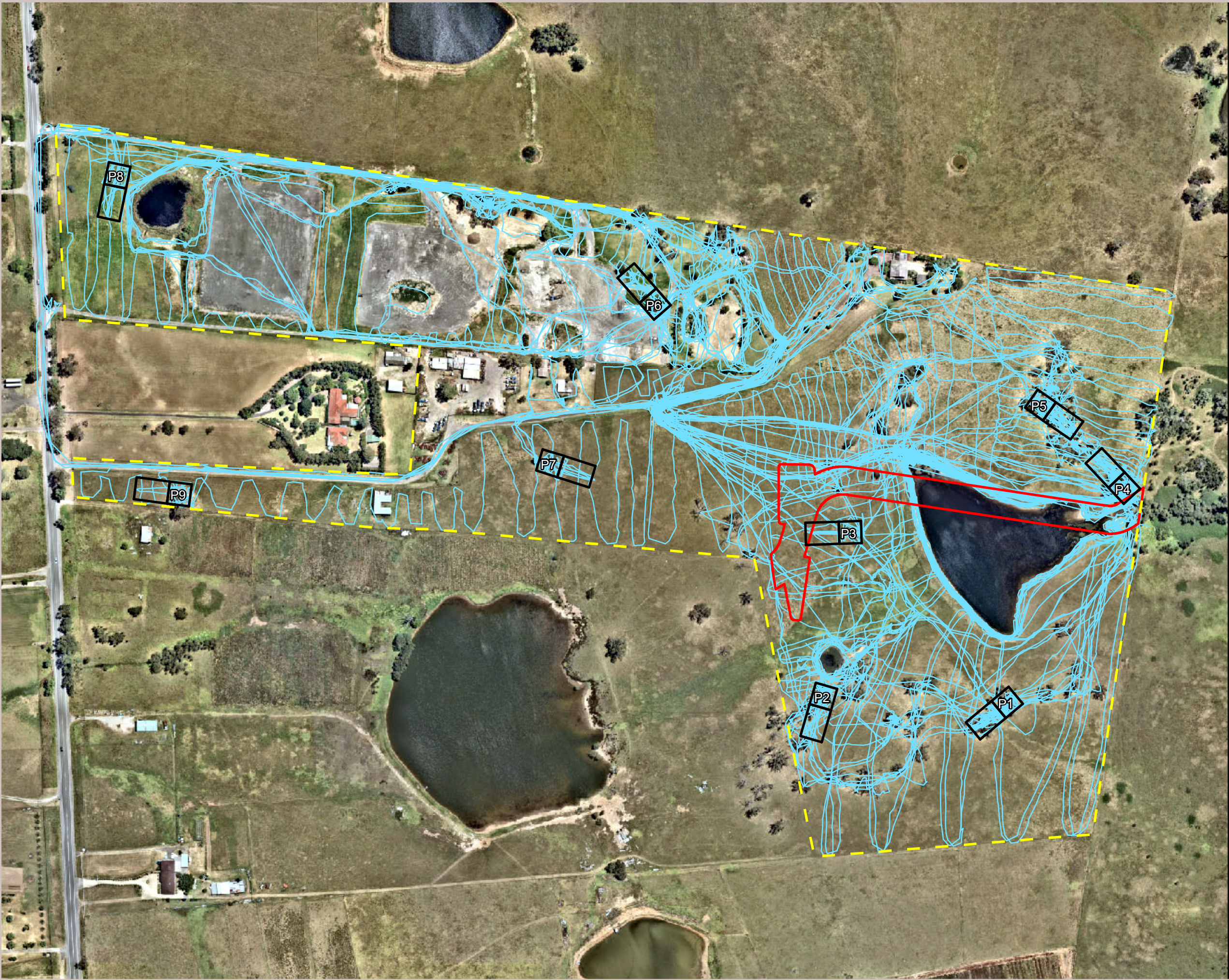


Figure 1. The subject land and VMP area



Legend

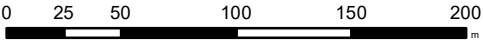
- VMP Area
- Subject Land
- BAM Plot
- Parallel Traverses

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Finance and Services

Coordinate System: MGA Zone 56 (GDA 94)



Figure 2. Flora survey locations





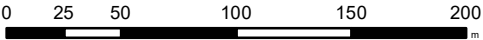
- Legend**
- VMP Area
 - Subject Land
 - Habitat Assessment
 - Diurnal/Nocturnal Survey
 - Arboreal IR Camera
 - SAT Survey
 - Harp Trap
 - Ultrasonic Call Detector

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Figure 3. Fauna survey locations



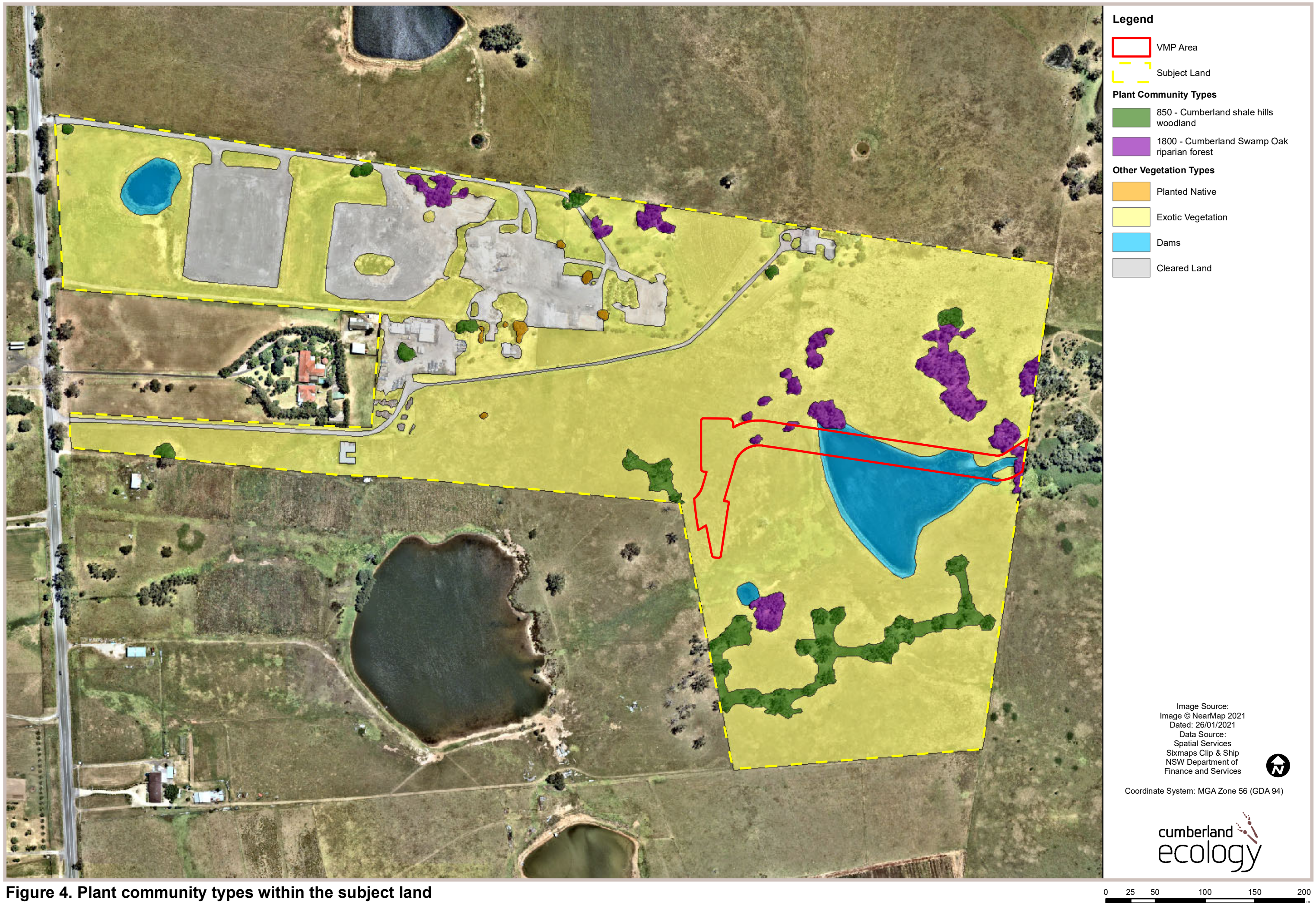


Figure 4. Plant community types within the subject land

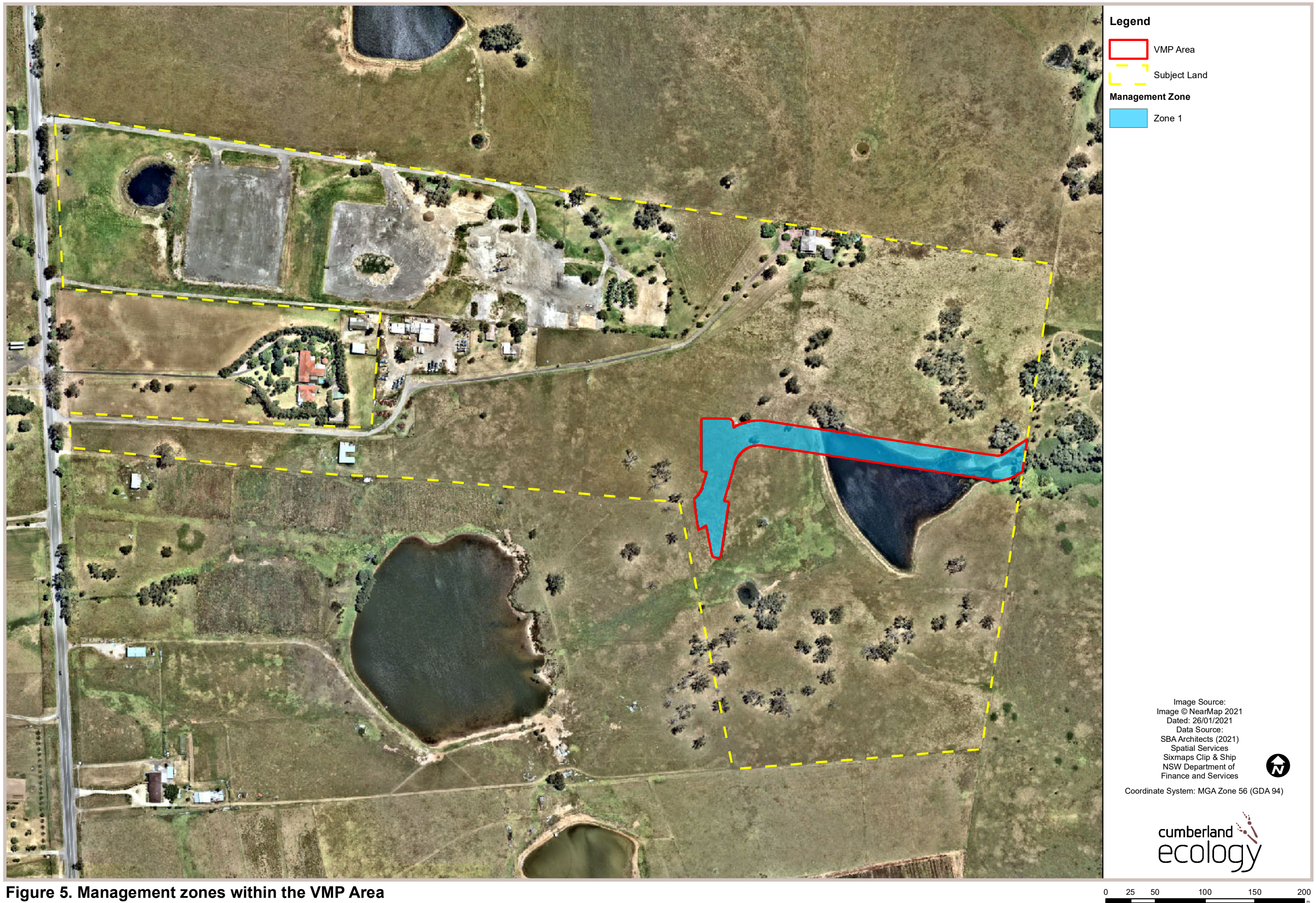


Figure 5. Management zones within the VMP Area



Legend

VMP Area

Subject Land

Photograph Monitoring Point

Management Zone

Zone 1

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SBA Architects (2021)
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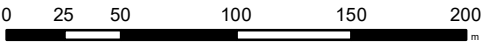


Figure 6. Location of photograph monitoring points