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Lot 1 DP1226122
Vegetation Management Plan

Werrington

Prepared for Lendlease | 22 January 2020

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Document control

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Executive summary

Project outline

Niche Environment and Heritage Pty Ltd (Niche) were commissioned by Lendlease to develop a Vegetation Management Plan (VMP) for Lot 1 DP1226122 (site) at 16 Chapman Street, Werrington, NSW 2747.

The Management Plans are to provide details of the works and management actions required to maintain or improve the biodiversity values of the site over a maintenance period of two (2) years. After the maintenance period with timing subject to the approval of a Voluntary Planning Agreement, the ecological and open space areas of the site are to be dedicated to Penrith City Council from which point Council will be the sole owner of the land.

The Site

The site to which this management plan applies is 2.92 hectares (ha)and the following Plant Community Types (PCTs):

- PCT849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

PCT849 is commensurate with the *Cumberland Plain Woodland in the Sydney Basin Bioregion*, listed as a critically endangered ecological community (CEEC), on the *NSW Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act* 1999.

The Study has the potential to provide habitat for a number of flora and fauna species. Threatened species with the potential to occur were determined from the NSW BioNet database using a 10 kilometre search area. BioNet database records indicate eleven (11) threatened flora and thirty-four (34) threatened fauna species have been previously recorded in or in close proximity to the site.

Management issues

The site has varying degrees of disturbance and weed infestation. The main disturbances are past land use including agriculture (i.e. farming), clearing of native vegetation, fragmentation, encroachment of weeds and degradation of the quality of remaining native vegetation remnants, unauthorised vehicle access and illegal dumping. The areas affected by this disturbance are the boundaries adjacent to public roads, where tracks and rubbish have impacted on the vegetation condition. Woody weed and exotic grass infestations were prevalent and severe along the edges and drainage lines of the site. Weeds are present in varying densities across all management zones within the site.

The site contains an ephemeral wetland along the eastern boundary of MZ4.

The main access to the VMP site within Lot 1 DP1226122 is currently via gate located off the corner of Walker Street and Landers Street. Pedestrian access is located at the eastern end of Chapman Street.

Goals and management actions

Section 4 outlines the overall goals of this management plan and provides details of the works and management actions required to maintain or improve the biodiversity values of the site over a maintenance period of two (2) years. Section 5 outlines the required management actions and associated recommendations made by Niche from findings during field investigations.

Glossary and list of abbreviations

Term or abbreviation	Definition
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CEEC	Critically Endangered Ecological Community
DEE	Department of Environment and Energy
DoE	Department of Environment (formerly), now Department of Environment and Energy.
EES	NSW Department to of Environment, Energy and Science.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
ha	Hectare/s
ha	Hectare/s
LEP	Local Environmental Plan
Maintenance Period	Period of time covering the management of vegetation in the site under the recommendations of this VMP. The maintenance period for this VMP is 2 years.
MZ	Management Zone
OEH	Office of Environment and Heritage (formerly DECCW, DECC, DEC, now Department of Planning, Industry and Environment)
PCT	Plant Community Type
Property	Land in Werrington - Lot 1 DP1226122
PW	Priority Weed
RFS	Rural Fire Service
Site	Area covered by the VMP
TEC	Threatened Ecological Community
Vegetation Management Plan	The plan setting out management actions for the conservation of the site located within Lot 1 DP1226122 during the Maintenance Period
WONS	Weed of National Significance

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1. Introduction

Niche Environment and Heritage Pty Ltd (Niche) were commissioned by Lendlease Communities (Lendlease) to develop a Vegetation Management Plan (VMP) for the site situated within Lot 1 DP1226122. The site includes a Conservation Reserve (1.15 ha) and Open Space/Recreation Area (1.77 ha).

The overall aim of this VMP are to conserve and regenerate/rehabilitate areas of remnant *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CPW), listed as a critically endangered ecological community (CEEC), on the *NSW Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (OEH 2019a, NSW Government 2019a, Commonwealth of Australia 2019) to improve habitat for native fauna including threatened species, and provide an educational resource for the local community.

1.1 Site location

The main access to the VMP site within Lot 1 DP1226122 is currently via a gate located off the corner of Walker Street and Landers Street, Werrington 2747. Pedestrian access is located at the eastern end of Chapman Street (Figure 1).

1.2 Administrative and legislative context

A portion of Lot 1 DP1226122 Werrington is covered by an existing DA approval under NSW state legislation. The development has been referred to the Commonwealth under the EPBC Act Referral process. Lendlease have proposed a staged development on the property.

This VMP provides details of the works and management actions required to maintain or improve the biodiversity values of the CPW remnants within the site over a maintenance period of two (2) years. After the maintenance period, the site covered by this VMP within Lot 1 DP1226122 is to be dedicated to Penrith City Council.

1.3 Land ownership

The site is owned by Lendlease. After the maintenance period (see Section 1.4) with timing subject to the approval of a Voluntary Planning Agreement, the ecological and open space areas of the site are to be dedicated to Penrith City Council from which point Council will be the sole owner of the land.

1.4 Definitions

Key terms used in this Management Plan are defined as follows:

Maintenance period: period of time that commences on the granting of any Development Consent for the Development or the removal of vegetation on the Land, whichever occurs first and ends 2 years from that time or at another date as agreed between the parties in writing, or otherwise determined in accordance with this agreement.

Vegetation Management Plan: the plan setting out management actions for the site within Lot 1 DP1226122.

2. Background Information

1.1 Planning and landscape context

The site to which this management plan applies is 2.92 ha in size. Surrounding land uses include residential areas, commercial or industrial properties and vegetated bushland. The Conservation Reserve (Proposed Lot 1000) and the Central Reserve Open Space/Recreation Area that are covered by the VMP are zoned as E2: Environmental Conservation and RE1: Public Recreation respectively, in the Penrith Local Environmental Plan 2010 (NSW Government 2019b). The Eastern Reserve is not subject to this VMP.

2.1 Existing native vegetation

Native vegetation on the site is in poor to moderate condition. Vegetation communities present in the site were mapped by Tozer *et. al* (2010) as part of regional vegetation mapping and verified by Niche (Figure 2).

The classification of vegetation in NSW has been subject to significant changes recently with the publication of the OEH BioNet Vegetation Classification database (OEH 2019a), which classifies all vegetation in NSW into Plant Community Types (PCTs). The PCTs are used to classify vegetation into NSW Vegetation Classes and subsequently NSW Vegetation Formations using the Keith (2004) classification system. The database provides floristic and structural data for PCTs and association of PCTs to Threatened Ecological Communities (TECs).

The vegetation on site was correlated and assigned with the most closely matching PCT present in the Sydney Basin Bioregion from the data collected in the site. The PCT was determined by assessing the flora species recorded in 2019 by Niche (Annex 2). The TEC listings and vegetation classifications were reviewed to associated TECs with the identified PCT. TECs have been identified with reference to the OEH's threatened species profiles (OEH 2019b), NSW Scientific Committee final determinations (NSW Government 2019c) and Species Profile and Threats (SPRAT) Database (Department of the Environment 2019). The existing vegetation communities in the site are described in Table 1.

Table 1: Vegetation on the site

Plant Community Type	PCT Common Name	Area (ha)	Vegetation Formation (Keith 2004)	Vegetation Class (Keith 2004)	TEC Status (OEH 2019b, NSW Government 2019c, DoE 2019)
PCT 849 - Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Shale Plains Woodland	1.57 (EPBC Listed)	Grassy Woodlands	Coastal Valley Grassy Woodlands	Critically Endangered under the BC Act (NSW) and EPBC Act (Commonwealth)

The CPW occurs on gentle topography associated with the shale plains of western Sydney carries an open grassy woodland dominated by Grey Box (*Eucalyptus moluccana*), Forest Red Gum (*Eucalyptus tereticornis*) and Ironbark (*Eucalyptus crebra*/*Eucalyptus fibrosa*). Cumberland Shale Plains Woodland is related to Cumberland Shale Hills Woodland (PCT850) which together comprise the Cumberland Plain Woodland in the Sydney Basin Bioregion. Cumberland Shale Plains Woodland is characterised by a sparse to moderate cover of shrubs and a high cover of grasses and forbs, and the primary habitat for the community is defined by Tozer *et al.* (2010) as occurring at elevations less than 150 meters above sea level with some sites occurring at higher elevations where the landscape remains gently inclined. Rainfall is restricted to a narrow band between 750 and 950 millimetres per annum. A list of species from surveys undertaken by Niche (2019) at the Werrington VMP site is included as Annex 2.

2.2 Natural values

2.2.1 Biodiversity values

The site is part of larger areas of surrounding vegetation, contributing to regional wildlife habitat and movement. The site supports a diversity of flora and fauna habitat. Native vegetation and habitat within the site appeared to be in poor to moderate condition, with scattered infestations of woody weeds, exotic perennial grasses and herbaceous weeds. These include weeds listed as Weeds of National Significance ('WoNS'), under the NSW *Biosecurity Act* 2015 or the *Biosecurity Regulation* 2017 and Priority weeds listed for the Greater Sydney (Table 3).

2.2.2 Threatened species

The site has the potential to provide habitat for a number of threatened flora and fauna species. Threatened species with the potential to occur were determined from the NSW BioNet database (OEH 2019b) using a 10 kilometre search area. Eleven (11) threatened flora and thirty-four (34) threatened fauna species considered to have potential habitat at the site are shown in Table 2. Threatened species have been previously recorded at the site, however it should be noted that targeted surveys have not been undertaken as a part of this management plan.

Table 2: Threatened species previously recorded within/close proximity to and with potential habitat at the site

Scientific Name	Common Name	NSW status	Comm. status	Records
Fauna				
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V,P		4
Burhinus grallarius	Bush Stone-curlew	E1,P		2
Callocephalon fimbriatum	Gang-gang Cockatoo	V,P,3		2
Calyptorhynchus lathami	Glossy Black-Cockatoo	V,P,2		6
Chthonicola sagittata	Speckled Warbler	V,P		12
Daphoenositta chrysoptera	Varied Sittella	V,P		8
Dasyurus maculatus	Spotted-tailed Quoll	V,P	E	4
Ephippiorhynchus asiaticus	Black-necked Stork	E1,P		2
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V,P		3
Glossopsitta pusilla	Little Lorikeet	V,P		2
Hieraaetus morphnoides	Little Eagle	V,P		2
Hoplocephalus bungaroides	Broad-headed Snake	E1,P,2	V	1
Ixobrychus flavicollis	Black Bittern	V,P		2
Lathamus discolor	Swift Parrot	E1,P,3	CE	9
Litoria aurea	Green and Golden Bell Frog	E1,P	V	8
Lophoictinia isura	Square-tailed Kite	V,P,3		5
Meridolum corneovirens	Cumberland Plain Land Snail	E1		155
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V,P		17

Miniopterus australis	Little Bent-winged Bat	V,P		3
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		24
Myotis macropus	Southern Myotis	V,P		10
Ninox connivens	Barking Owl	V,P,3		1
Ninox strenua	Powerful Owl	V,P,3		8
Petauroides volans	Greater Glider	P	V	1
Petaurus australis	Yellow-bellied Glider	V,P		2
Petaurus norfolcensis	Squirrel Glider	V,P		1
Petroica boodang	Scarlet Robin	V,P		1
Phascolarctos cinereus	Koala	V,P	V	3
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	169
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V,P		1
Scoteanax rueppellii	Greater Broad-nosed Bat	V,P		5
Stagonopleura guttata	Diamond Firetail	V,P		1
Tyto novaehollandiae	Masked Owl	V,P,3		1
Tyto tenebricosa	Sooty Owl	V,P,3		1
Flora				
Acacia pubescens	Downy Wattle	V	V	1
Allocasuarina glareicola		E1	E	1
Dillwynia tenuifolia		V		152
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	V		826
Hibbertia puberula		E1		3
Marsdenia viridiflora subsp. viridiflora	Marsdenia viridiflora R. Br. subsp. viridiflora population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas	E2		71
Micromyrtus minutiflora		E1	V	7
Persoonia nutans	Nodding Geebung	E1,P	E	18
Pimelea spicata	Spiked Rice-flower	E1	E	7
Pultenaea parviflora		E1	V	196
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	1

CE = critically endangered, E = endangered, V = vulnerable, P = protected

3. Management Issues

3.1 Habitat management / threatened species

The site supports potential habitat for numerous threatened species as described in Section 2.2.2 (Plate 1). These include species that rely on specific roosting/nesting/foraging resources (such as hollow-bearing trees for hollow-dependant arboreal fauna). Threats to biodiversity/habitat include weed incursion, illegal dumping and vertebrate pest/predators. These threats will be discussed further below and recommendations made for management actions.

Plate 1: Native vegetation and habitat in the Site

3.2 Feral animals

No specific surveys have been undertaken to determine the presence of feral animals on site. Whilst no direct evidence of feral animal activity was observed in the site, feral animals such as foxes (*Vulpes vulpes*) and rabbits (*Oryctolagus cuniculus*) are known to occur in the locality and control of feral animals requires consideration as they pose a threat to native fauna, including threatened species.

3.3 Weeds

The site has varying degrees of disturbance and weed infestation (Plate 2 and 3). Priority of weed control works is to be determined according to the status of weeds present. The following hierarchy is given to target weed infestations:

1. Weeds of National Significance ('WoNS') (Commonwealth of Australia 2019b);
2. Weeds listed under the NSW *Biosecurity Act* 2015 or the *Biosecurity Regulation* 2017 (NSW Government 2019d; 2019e);
3. Priority weeds listed for the Greater Sydney (NSW DPI 2019)

There were ten (10) weeds that are listed as Weeds of National Significance (WoNS), Biosecurity Matters, and/or Priority weeds in the Greater Sydney region recorded in the site (Niche 2019; Horticulture Management Services 2016).

Weed species recorded during in the site include a wide range of species (Table 3)

Table 3: Weeds species in the site

Scientific Name	Common Name	WoNS	Biosecurity Regulation	Priority
Araujia sericifera	Moth vine			
Asparagus aethiopicus	Asparagus Fern	✓	✓	✓
Asparagus asparagoides	Bridal Creeper	✓	✓	✓
Asparagus virgatus	Tall Asparagus Fern			✓
Bidens pilosa	Cobblers Pegs			
Briza maxima	Quaking grass			
Bromus catharticus	Prairie grass			
Cenchrus clandestinus	Kikuyu			
Cestrum parqui	Green Cestrum			✓
Chloris gayana	Rhodes grass			
Chlorophytum comosum	Spider Plant			
Cirsium vulgare	Spear thistle			
Conyza spp.	Fleabane			
Cynodon dactylon	Common Couch			
Dactylis glomerata	Cocksfoot			
Echium spp.	Paterson's Curse			
Ehrharta erecta	Panic Veldtgrass			
Ehrharta longiflora	Annual Veldtgrass			
Eragrostis curvula	African Lovegrass			
Foeniculum vulgare	Fennel			
Gleditsia triacanthos	Honey Locust			
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush			
Grevillea robusta	Silky Oak			
Hypericum perforatum	St John's Wort			
Ligustrum spp.	Large and Small Leafed Privet			
Lycium ferocissimum	African boxthorn	✓	✓	✓
Nassella neesiana	Chilean Needle Grass	✓	✓	✓
Olea europea ssp. cuspidata	African olive			✓
Onopordum acanthium ssp. acanthium	Scotch Thistle			
Opuntia spp	Prickly Pear	✓	✓	✓

Paspalum dilatatum	Paspalum			
Plantago lanceolata	Plantain			
Pyracantha crenulata	Nepalese Firethorne			
Rosa rubiginosa	Sweet Briar			
Rubus fruticosus spp. aggregate	Blackberry	✓	✓	✓
Rumex crispus	Curled Dock			
Salix spp.	Willow	✓	✓	✓
Schinus areira	Peppercorn Tree			
Senecio madagascariensis	Fireweed	✓	✓	✓
Sida rhombifolia	Paddy's Lucerne			
Solanum nigrum	Black nightshade			
Solanum seaforthianum	Climbing Nightshade			
Solanum sisymbriifolium	Sticky Nightshade			
Sonchus oleraceus	Common Sow thistle			
Sporobolus africanus	Parramatta Grass			
Tradescantia fluminensis	Trad			
Verbena bonariensis	Purple Top			

Woody weed and exotic grass infestations were present in scattered patches across the site, especially along the drainage lines. Thickets of *Olea europea ssp. cuspidata* and *Eragrostis curvula* were observed at several locations (Plate 2 and 3).

Plate 2: Native vegetation with *Eragrostis curvula* infestation

Plate 3: Native vegetation with *Olea europa spp. cuspidata* infestation

Weed density throughout the Site has been mapped according to the following broad cover classes:

- High (> 50% cover): areas observed supporting a high density of weeds including patches of dense woody weed infestations and areas supporting numerous woody weeds, climbers and herbaceous weeds
- Medium (10 – 49%): areas with scattered infestations of woody and herbaceous weeds
- Low (<10%): areas of native vegetation in good condition with only scattered weeds present.

Figure 3 shows weed density and key areas observed supporting weed infestations during the site inspection.

3.4 Hydrology

The site contains an ephemeral wetland along the eastern boundary of MZ4.

3.5 Fire management

A Bushfire Assessment Report has been prepared for the proposed development at Werrington by Building Code & Bushfire Hazard Solutions Pty Limited (BHS 2019). The recommendations of the Bushfire Assessment Report have been adopted into the VMP. In addition, a suitable bushfire and fuel management plan in line with the Bushfire Assessment Code would be developed for the site in accordance with a local Bush Fire Risk Management Plan and in liaison with the NSW Rural Fire Services (RFS) (NSW RFS 2019) and Council's Bush Fire Mitigation Officer. The bushfire and fuel management plan will be developed such that threatened species known to occur across the site are not significantly impacted by the fire regime.

Bushfire risk mitigation treatments, once determined, would be undertaken by Lendlease in liaison with the NSW RFS.

3.6 Disturbed areas

Disturbance is a significant issue on the site. The main disturbances are past land use including agriculture (i.e. farming), clearing of native vegetation, fragmentation, encroachment of weeds and degradation of the quality of remaining native vegetation remnants, unauthorised vehicle access and illegal dumping. The

areas affected by this disturbance are the boundaries adjacent to public roads, where tracks and rubbish have impacted on the vegetation condition. However, the overstorey vegetation is still present and showing good signs of regeneration (Plate 2). These areas would naturally regenerate following the removal of rubbish, strategic revegetation and prevention of unauthorised access.

3.6.1 Rubbish / illegal dumping

Rubbish and illegal dumping are an issue within the site. Rubbish removal needs to be undertaken on a regular basis. Where access to remove rubbish is not feasible by vehicle, the rubbish should be removed by hand. Access to the site will be restricted and all rubbish removed taken to an authorized waste disposal centre to avoid potential land contamination.

3.6.2 Unauthorised access / fencing

Unauthorised human access and associated disturbances such as track stability and illegal dumping are evident at the site. It is considered that fencing is only required to exclude unauthorised human access (particularly vehicles) and that the requirement for fencing should consider impacts to biodiversity (e.g. fencing of vegetated land onsite adjoining other vegetated land offsite will result in impacts to biodiversity but provide little or no ecological benefits).

Areas that require fencing include the southern and western boundary of the Conservation Reserve where the vegetation is easily accessed. Recommended fencing has been shown on Figure 3. The final fencing plan and fencing type will be discussed with and agreed upon by Council.

3.7 Track maintenance

Adequate access for maintenance of the vegetation zones shall be provided as a part of the landscape and subdivision design. The main access to the Conservation Reserve and Open space/recreational area has been mapped in Figure 2 and described in Table 4.

Erosion control will be required on all tracks to be maintained for access. Gates will be required to secure access. Indicative tracks to be retained and potential gate locations are shown in Figure 3.

3.8 Signage

Signage at the site will be required, including regulatory and informative signage. Locations of required signages are mapped in Figure 3 and information to be included in the signage is described in Table 4.

3.9 Annual monitoring and reporting

The site will be subject to annual monitoring and a report as required by the VPA. The annual report will include:

- Progress on achieving the objectives of the management plan
- Document condition of areas before and after rehabilitation and over time
- Photo records of progress and growth
- Works undertaken during the reporting period
- Weeding areas including extent and intensity of weed infestations, areas treated, type of treatment, monitoring over time
- Numbers and species of plantings and success
- Progress of any rehabilitation work including treatments, location, spatial extent area treated, and monitoring over time
- Any matters that affect the successful implementation of the management plan.

As a part of the annual monitoring the applicant or applicant's representative will initiate an annual joint inspection with Council's ecologist and vegetation management officer. This will provide the opportunity for feedback from Council during the maintenance period so that matters/issues can be addressed progressively throughout the maintenance period thus increasing the likelihood that the site will be in suitable condition for dedication after the maintenance period is complete.

An adaptive management approach should be adopted for the site allowing management to be more flexible and respond to emerging issues. Any issues or recommendation made in the annual monitoring report are to be appropriately addressed in the following year. This approach should also include where appropriate a review of the previous years' weed management and provide a detailed plan for the following year.

At the conclusion of the maintenance a final annual report will be prepared to include:

- Documents the final year implementation of the management plan
- Compile the results of all monitoring and works over the maintenance period for the matters included in each Annual Report
- Assess suitability for dedication to Council
    - Assess in detail the condition of the site at the end of the maintenance period and the degree to which the objectives of the management plan have been met.
    - Document any outstanding works i.e. works not completed or where progress has not been sufficient to meet objectives and reasons for this
    - Make recommendations for the management actions into the future (in perpetuity) for inclusion in the Revised Management Plan.

4. Management plan objectives and strategies

4.1 Objectives

The overall goal of this VMP is to provide details of the works and management actions required to maintain or improve the biodiversity values of the site over a maintenance period of two (2) years.

The objectives for this management plan are:

- Establish the Conservation Reserve and Open Space/recreational area prior to the end of the maintenance period;
- Restoration of Critically Endangered Remnant Community (CPW) vegetation;
- Re-instate/maintain natural ecosystem functioning;
- Rehabilitate any area of land disturbed by clearing or weed removal, using current bushland regeneration and vegetation management techniques, which compliments the existing vegetation on adjoining sites and wildlife habitat/corridors;
- Improve habitat for native fauna including threatened species;
- Implement a monitoring and review process;
- Liaise with relevant local and state bodies;
- Provide an educational resource for the local community.

This VMP has been prepared in accordance with *National Standards For The Practice Of Ecological Restoration In Australia* (second edition) by the Society for Ecological Restoration Australasia (SERA 2019). The Standards are applicable to any Australian ecosystem (whether terrestrial or aquatic) and any sector (whether private or public, mandatory or non-mandatory). They can be used by any person or organisation to help develop plans, contracts, consent conditions and closure criteria.

4.2 Strategies

The site has been divided into four management zones as shown in Figure 2 and described below.

Management Zone 1a (MZ1a) – 0.47 ha

Photo 1: Native grasses in central section of MZ1a

MZ1a is located within the Conservation Reserve and contains a moderate infestation of weeds, mainly in the ground layer. MZ1a has been previously disturbed/cleared of native vegetation and is currently dominated by range on weeds on the eastern and northern boundaries.

Weed control will be undertaken followed by planting of native *Cumberland Plain Woodland* canopy, shrub and groundcover species to improve the resilience of the disturbed edges of this management zone.

Management Zone 1b (MZ1b) – 0.31 ha

Photo 2: Eastern boundary of MZ1b to be revegetation

MZ1b is located within the Conservation Reserve. The native canopy and ground layer vegetation is generally intact and regenerating in this management zone, but the shrub layer is sparse. MZ1b contains areas of low, moderate to high weed infestation including woody and herbaceous weeds, mainly in the ground layer and mid-storey. Sections of MZ1b has been previously disturbed/cleared of native vegetation and currently contains scattered patches of weeds across the entire zone.

Weed control will be undertaken followed by planting of native *Cumberland Plain Woodland* shrub and groundcover species in the disturbed parts of the zone e.g. the eastern end of the MZ1b.

There are two existing tracks in MZ1b that will be decommissioned and rehabilitated via scarification of the soil and planting with native *Cumberland Plain Woodland* shrub and groundcover species. The planting of native trees is not required due to the already exiting regeneration observed but the groundcover diversity should be enhanced in disturbed parts of the site (i.e. the eastern end of the MZ1b and tracks that is to be revegetated). It is recommended that tracks be rehabilitated in Year 2 of the maintenance period so that they can be used for access for management actions in Year 1, e.g. revegetation of Management Zone 2.

Management Zone 2 (MZ2) – 0.37 ha

Photo 3: MZ2 to be revegetated with native CPW species

MZ2 is located between MZ1a and MZ1b within the Conservation Reserve. MZ2 is a previously cleared area that currently contains a row of planted *Corymbia maculata* and mostly exotic pasture grasses. The exotic grasses are currently managed through mowing. MZ2 will be revegetated to restore *Cumberland Plain Woodland* vegetation including all stratum (canopy, mid-storey and ground layer) with appropriate species (Annex 2) to create connectivity between native vegetation patches in the Conservation Reserve to enhance existing wildlife corridors and fauna habitat quality. Weed control work and mulching will be undertaken to prepare MZ2 for planting. Scarification of soil may also be required due to compaction issues that can affect the establishment and growth of plants.

Management Zone 3 (MZ3) – 0.52 ha

Photo 4: MZ3 dominated by *Melaleuca styphelioides*

MZ3 is situated on a lower part of the site and is dominated by *Melaleuca styphelioides,* indicating historically wetter conditions. This suggests that MZ3 is highly susceptible to weed establishment/ infestation due to nutrient rich soils and hydrology (i.e. water flows/urban runoff). MZ3 contains areas of low, moderate and high weed infestation. Management objectives in MZ3 are to maintain the vegetation communities/habitat as is, undertake weed control, and regular monitoring for weeds and illegal dumping.

Management Zone 4 (MZ4a and MZ4b) – 0.49 ha

Photo 4: MZ4 dominated by *Eragrostis curvula*

MZ4a has been previously disturbed/cleared of native vegetation and is currently contains patchy weed infestations of low moderate and high density across the whole zone. *Eragrostis curvula* and other exotic grasses are the main weeds in this zone. Control of *Eragrostis curvula* will be undertaken through hand removal to improve natural regeneration through triggering the germination of native seed in the seedbank. Other weeds will be managed through a combination of hand removal and spot spraying with appropriate herbicides in MZ4. Infill planting of native *Cumberland Plain Woodland* canopy, shrub and groundcover species will be undertaken to improve the resilience of the edges and more disturbed sections of this zone and where native canopy and mid-storey/shrub layer is sparse.

MZ4b is an 11m external Asset Protection Zone (APZ) is to be implemented on the eastern boundary of MZ4 (Figure 3). The APZ was recommended by BHS (2019) based on minimum required APZs determined from Table A2.4 of Planning for Bush Fire Protection (PBP). All proposed allotments excluding Conservation Reserve (proposed Lot 1000) and the retained CPW within Central Park (Lot 2269) will be maintained in accordance with an APZ (BHS 2019).

The strategies recommended in order to achieve the management objectives and address the management issues for the site comprise the following:

- Management of unauthorised access through installation of perimeter fencing, gates and signage. The final fencing plan and fencing type will be discussed with and agreed upon by Council.
- Removal of rubbish, unnecessary tracks and old internal fencing
- Development and implementation of a bush regeneration and weed control plan

- Development and implementation of a bushfire management plan for hazard reduction and asset protection
- Undertake control of pest animals
- Undertake erosion control works
- Undertake neighbour relations and community consultation
- Undertake annual monitoring and reporting

4.3 Implementation of Management Actions

4.3.1 Suitably Qualified and Licenced Contactors

Survey, research, or on-ground works that impact or potentially impact on a threatened species, population or ecological community or their habitats (listed under the *BC Act*) may only be carried out by suitably qualified practitioners holding a current Scientific Licence from the NSW Environment, Energy and Science ('EES'). Such works may include collecting, picking, or otherwise damaging native flora, bush regeneration, weed control and seed collection.

Only appropriately qualified and trained bush regenerators should be used to undertake work in environmentally sensitive areas where threatened species or remnant native vegetation could be harmed. A trained bush regenerator is one who has successfully completed the accredited Certificate II/III in Conservation Land Management offered by NSW TAFE or equivalent, and who has completed at least 350 hours in the field.

Other contactors may be required for completion of management actions. It is the responsibility of the landowner to ensure that the all contractors engaged to work in remnant bushland is suitably qualified and appropriately licensed.

4.3.2 Onsite Supervision

The appointment of a qualified supervising Project Manager to oversee the implementation of the VMP is strongly recommended. Ideally, this will be a trained Ecologist with experience in working in native plant communities. The Project Manager will be responsible for implementation of the VMP, for the review and assessment of methods, techniques employed, progress reports and will also be responsible for 'sign off' at each stage of the project during the maintenance period. The Project Manager will liaise between the landowner and the Council, as required.

5. Management Actions

Table 4 details the management actions required to achieve the management objectives at the Site.

Table 4: Management actions, timing and frequency

Required Management Actions	Area	Recommendations	Start Year	End Year	Recommended Frequency	Performance measures/indicators
Infrastructure						
Installation of perimeter fencing, access/ management gates and interpretive signage	MZ: all	Access to the vegetation management zones will be managed via perimeter fencing, and appropriate signage at all the access points (Figure 3). Adequate access for maintenance of the vegetation zones shall be provided as a part of the landscape and subdivision design. The final fencing strategy is to be prepared in consultation with and approved by Council. Fencing is required around the management zones. This is shown in Figure 3, however, is subject to further investigations in consultation with Council in order to avoid clearing of native vegetation. All fences, gates and signs are to be inspected/maintained annually. Five small signs to be installed in locations shown in Figure 3. Recommended information on signage to read: "Cumberland Plain Woodland - Conservation Area".	1	1	Start Year: 1 Frequency: all fencing to be undertaken within the first 3 months of Year 1 of the maintenance period.	Installation of perimeter fencing, access/ management gates and interpretive signage undertaken in the first year of the maintenance period (Figure 3). Gates and fencing will be maintained in working order such that unauthorized vehicular access is prevented. All fences, gates and signs are to be inspected/maintained annually.
Construction of roads and tracks, including walking and bushfire trails.	MZ: all zones except MZ3	The existing trail in the centre of MZ:1b is to be decommissioned and rehabilitated/revegetated. New access tracks are proposed to be constructed for access to the Conservation Reserve and Open Space/Recreation Zone. Construction of trails for access are recommended below:	1	2	Start Year: 1 Frequency: Ongoing from the first year of the maintenance period Track maintenance undertaken every year	Decommissioning of excess trails and construction of new trails (where required) to be undertaken in the Year 1 of maintenance period. Rehabilitation/revegetation to be undertaken in Year 1 following closure of exiting trail in the centre of MZ1b.

		Trail 1 (temporary management track): A temporary access management track is to be retained during the maintenance period for contractor access to undertake weed control and rehabilitation tracks. An asset protection zone (APZ) trail that currently exists on the northern boundary of the MZ1b will be extended east along the railway fence to the north-eastern corner of MZ2 and then directly south to the southern boundary (to be fenced) of the Conservation Area to form Trail 1 (Figure 3). No vegetation clearing is required for Trail 1 as it will be situated in an area of mainly pasture grasses and other weeds. The trail will provide access to all management zones in the Conservation Reserve during the maintenance period. This track is to be rehabilitated/revegetated in the second year of the maintenance period. Trail 2: A management access trail is to be constructed along the western boundary of MZ4 (Figure 3). This track will be maintained to allow vehicle access.			with management actions as required.	Rehabilitation/revegetation to be undertaken in Year 2 following closure of Trail 1. Ongoing track maintenance to be undertaken annually with management actions as required.
Bush Fire Hazard Reduction and Ecological Burning						
Develop Bushfire Management and Asset Protection Plan	MZ: all	It is proposed to engage a specialist bushfire consultant in the first year to undertake a detailed assessment of the site and prepare a Bushfire Management Plan (including Fuel Management Plan). The recommendations will consider the RFS' species specific conditions relating to the use of fire.	1	1	Start Year: 1 To be prepared at the start of Year 1	Bushfire Management Plan to be prepared in consultation with and approved by Council during the first year of the maintenance period.
Implement bushfire hazard reduction and ecological burns	MZ: all	The recommendations of the bushfire management plan developed by a qualified consultant would be followed.	1	2	Start Year: 2 Frequency: This will be dependent on bushfire management plan and burn approvals.	Monitoring showing increase in floristic diversity and reduction of exotic annual weeds and grasses (to be included in Fire Management Plan).
Management of MZ4b – 11m APZ	MZ4: APZ (11m)	To be managed as per Fuel Management Plan to be prepared for Eastern Park and the Asset Protection Zone within Central Park prior to the registration of the subdivision as per recommendations of BHS (2019).	1	1	Start Year: 1 Frequency: To be prepared at the start of Year 1	Fuel Management Plan prepared as part of to Bushfire Management Plan in consultation with and approved by Council during the first year of the maintenance period.
Bush Regeneration and Weed Control Plan						

Weed Management Year 1 (24 days)	MZ: all	The weed management plan in the first year of the maintenance period will prioritise control of listed Weeds of National Significance (WoNS), Biosecurity Matters, and/or Priority weeds in the Greater Sydney region. There are occurrences of other weeds within these areas, but these are not considered a major threat to the biodiversity of the site in the long term. These weeds would be targeted after high threat weeds species are under control. Given the number and distribution of weeds throughout the various vegetation zones, the long-term control and management of weeds and future weed incursions will include intensive (regular, at least monthly, and seasonal) control for the first year. Weed management will be reassessed at the end of Year 1 as part of the monitoring and to inform the weed management actions for Year 2 of the maintenance period.	1	1	Start Year: 1 Frequency: 24 days/768 hours annually (two session monthly in Year 1 of the maintenance)* *Based on a bush regeneration team of four working 8 hours per day (i.e. 32 hours per day for a team)	Reduction of weed cover to less than 20% at the end of the Year 1 of the maintenance period across all management zones.
Weed Management Year 2 (12 days)	MZ: all	The weed management plan in the second year of the maintenance period will prioritise control of listed Weeds of National Significance (WoNS), Biosecurity Matters, and/or Priority weeds in the Greater Sydney region. All other weeds will be targeted when listed WoNS, Biosecurity Matters, and/or Priority weeds in the Greater Sydney region are under control. Given the number and distribution of weeds throughout the various vegetation management zones, the long-term control and management of weeds and future weed incursions will include intensive (regular, at least monthly, and seasonal) control for the second year. Weed management will be reassessed at the end of Year 2 as part of the monitoring and to inform the weed management actions for ongoing future maintenance of the site.	2	2	Start Year: 2 Frequency: 12 days/384 hours annually (one session monthly in Year 1 of the maintenance)* *Based on a bush regeneration team of four working 8 hours per day (i.e. 32 hours per day for a team)	Reduction of weed cover to less than 10% at the end of the Year 1 of the maintenance period across all management zones.

Revegetation/supplementary planting trees/ shrubs/ground cover	MZ: all	1. Management Zone Specific Recommendations MZ1a – revegetation to be undertaken with appropriate *Cumberland Plain Woodland* species on the north-eastern boundary of the zone and the decommissioned trails where native vegetation is sparse or has been previously removed. Scarification of soils is highly recommended on trails before planting is undertaken. Only mid-storey and groundcover species are required for revegetation in this zone as the canopy is mostly intact and regenerating. MZ1b – revegetation to be undertaken with appropriate *Cumberland Plain Woodland* species on the eastern and northern boundary of the zone where native vegetation is sparse. A combination of canopy, mid-storey and groundcover species area required for revegetation in this zone. MZ2 – revegetation to be undertaken to restore *Cumberland Plain Woodland* vegetation including all stratum (canopy, mid-storey and ground layer) with appropriate species to create connectivity between native vegetation patches in the Conservation Reserve to enhance existing wildlife corridors and fauna habitat quality. Weed control work will be undertaken to prepare the MZ for planting by spraying all exotic grasses with appropriate herbicide/s followed by soil scarification and mulching. MZ3 – No planting recommended for this zone. Weed control only. MZ4 - revegetation to be undertaken with appropriate *Cumberland Plain Woodland* species on the northern boundary (see Monitoring Point 9 in Figure 3) and central vegetation patch (see Monitoring Point 8 in Figure 3) of the management zone where native vegetation is sparse and or structural layers are absent. A combination of canopy, mid-storey and groundcover species are required for revegetation in this zone. It should be noted that native canopy recruitment is event in the zone and should be considered when planting.	1	2	Start Year: 1 Frequency: planting undertaken annually.	Planting to be undertaken annually in the appropriate season (e.g. Autumn or Spring) during the maintenance period. Plantings: • 90%survival rate of plantings; • Less than 5% weed cover at the end of the maintenance period. • Increase in species diversity and % foliage cover consistent with local PCT benchmark data. Local benchmark data from good condition bushland would provide realistic species diversity and % foliage cover targets.

		MZ4 APZ (11m) – Strictly no planting to be undertaken in this zone as this is an APZ. 2. General Recommendations Planting of native trees, shrubs and groundcover species to be undertaken: - after weed control works have been undertaken and the area to be planted has been appropriately prepared - on slopes adjacent road or track edges where weed thickets are removed - in areas of sparse native vegetation - in areas that require erosion control - to rehabilitate any decommissioned tracks. It is highly recommended that coils on tracks should be scarified due to issues of soil compaction. The planted native shrubs and groundcover will assist in minimising intrusion of weeds into the good vegetation area from the roadside or track edges. Plantings to consist of plants grown from seed sourced from the site. If this is not feasible plants will be sourced that are grown from local seed. The plantings will match species listed in Annex 2 from surveys undertaken on the site by Niche (2019). A mosaic pattern/approach will be used for planting species selected within all identified area/zones. These planting densities should emulate the type of natural vegetation/communities found on site and adjoining properties. Trees are recommended to be planted in groups or clusters to maximise the diversity of habitat to benefit both flora and fauna and enhance visual and aesthetic amenity.				

		Site preparation activities for all rehabilitation/revegetation will include identification of habitat critical to the Cumberland Land Snail (*Meridolum corneovirens*). Consideration will be undertaken to integrate planting with the fire management plan as some species (e.g. canopy trees and mid-storey species) will require time without fire to establish or they will be killed off by the fire.				
Erosion control	MZ: all	Erosion control measures such as planting, will be required within the site where soil disturbance has occurred. Erosion control will be required on all tracks to be maintained for access and areas where weed thickets are removed through the site. Erosion control techniques to be used will include a combination of sediment fencing, coir logs, jute matting, planting and strategic bush regeneration as appropriate. Other erosion control measures would also be considered as they may be more appropriate or more effective options for management of erosion on the site.	1	2	Start Year: 1 Frequency: Ongoing from Year 1	Erosion control undertaken on an ongoing basis during the maintenance period using appropriate combination of techniques.
Other Recurring Costs						
Control of pest animals	MZ: all	A baseline feral animal survey is to be undertaken in the first year of the plan. A Feral Animal Control and Monitoring Program is to be developed based on the results, in consultation with Council.	1	1	Start Year: 1	Baseline monitoring survey to be undertaken before commencement of pest animal control, and used as reference in all subsequent reports, to report against for the life of the plan.
Control of pest animals	MZ: all	The Feral Animal Control and Monitoring Program will be implemented throughout the life of the Management Plan.	1	2	Start Year: 2 Frequency: in accordance with the Program to be developed	Reduction in number of individuals of each pest species present.
Rubbish removal	MZ: all	Existing rubbish and fencing material waste located throughout the site will be removed and disposed of offsite.	1	2	Start Year: 1 Frequency: Ongoing from Year 1	100% reduction of rubbish within the first two years.

		Additional rubbish dumping will continue to be monitored and removed quarterly during the maintenance period.				
Community Engagement						
Neighbour relations and community consultation	N/A	Letters will be delivered to the immediate neighbours of the site. The letter will comprise an overview of the establishment and management objectives of the site. Ongoing consultation will be undertaken with the immediate neighbours of the site regarding management actions that may affect them, such as perimeter fencing, feral animal control and fire. The signage for the site will include contact details for the land manager for general public enquiries.	1	2	Start Year: 1 Frequency: Once a year	Signage installed and initial consultation with neighbours undertaken in the first year.
Monitoring						
Monitoring surveys	MZ: all	Yearly monitoring and record keeping will be conducted by the Lendlease. Lendlease must complete reports of monitoring activities. The completed reports of monitoring activities relating to a reporting period must be submitted with the annual report. Monitoring Points that are recommended are shown in Figure 3. The nine monitoring locations are the minimum to be used for measuring the progress of vegetation management works undertaken on site.	1	2	Start Year: 1 Frequency: 2 (annually)	Monitoring of all management actions undertaken taking into consideration the required performance measures and noting if any non-permissible actions have been carried out at the site.
Annual joint inspection with Council	MZ: all	Before each 12 month anniversary after the commencement of the maintenance period, the applicant or applicant's representative will initiate an annual joint inspection with Councils ecologist and vegetation management officer. This will provide the opportunity for feedback from Council during the maintenance period so that matters/issues can be addressed progressively throughout the maintenance period.	1	2	Start Year: 1 Frequency: 2 (annually)	Joint inspection undertaken each year and feedback incorporated into annual report and addressed at the site where applicable.

Annual report	MZ: all	The annual report will include details of the following management actions/works undertaken at the site: - Native Vegetation Management - Integrated Weed Management - Threatened Species Habitat Management - Integrated Feral Pests Management - Fire for Hazard Reduction and Asset Protection The monitoring of each of the management actions above will help determine: -The physical condition of fencing and gates and whether they are maintained to an appropriate standard -If any human disturbance has occurred on the site -The physical condition of existing fire trails and access tracks within the site, their navigability and evidence of erosion -The presence of rubbish on the site -The effectiveness of threatened species habitat management actions. Baseline biodiversity monitoring will be conducted annually by a qualified ecologist. Monitoring include: - A discussion of each management action and outcomes - An assessment of the performance measures as outlined in the Management Plan - Photo monitoring points - Recommendations for ongoing management All monitoring and reporting will require a baseline survey on which all subsequent reports, use a reference to report against for the life of the plan. The management plan and management activities will be reviewed annually during the two-year monitoring period to ensure all performance measures are being meet. As a part of the adaptive management approach recommended the detailed weed plan is reviewed and a detailed plan for the following year included in the annual report.	1	2	Start Year: 1 Frequency: 2 (annually)	Monitoring report should outline if all management actions have been undertaken, improvement in the performance measures and if any non-permissible actions have been carried out at the site.

End of Maintenance Period						
Final Report	MZ: all	Prior to the end of the Maintenance Period, a Final Report will be provided to Council. The Final Report will be prepared by a suitably qualified person. The Final Report will confirm whether the management actions have been satisfactorily fulfilled in accordance with the management plan.	2	-	Once	Final report prepared by a suitably qualified person and provided to Council prior to the end of the maintenance period. Final report would trigger an onsite inspection to be carried out by /with council.
Draft Revised Management Plan	MZ: all	Prior to the end of the Maintenance Period, a draft Revised Management Plan will be provided to Council. The draft Revised Management Plan will be prepared by a suitably qualified person. The draft Revised Management Plan will set out the works and management actions required to be undertaken on the Site to maintain or improve the biodiversity values in perpetuity.	2	-	Once	Draft Revised Management Plan prepared by a suitably qualified person provided to Council prior to the end of the maintenance period. Draft annual report would trigger an onsite inspection to be carried out by /with council.

Table 5: Indicative Timetable of Works over a Two (2) Year Maintenance Period

Note*:* 6 monthly blocks are divided into 3 monthly increments. This program of works is indicative only and will depend on availability of resources for on-ground works.

ITEM / TASK	PRELIM.	MONTHS 0-6		MONTHS 7-12		MONTHS 13-18		MONTHS 19- 24		ON-GOING	
Planning & Administration											
VMP approved by Council & adopted by Lendlease											
Resources allocated for 2-year maintenance period											
Appoint Project Manager/Ecologist											
Prepare draft bush regeneration and pest management works plan											
Prepare tender for on-ground works											
Engage Bush Regeneration/Pest Managment Contractor											
Site Induction (project manager)											
Annual joint inspection with Council (annually)											
Neighbour relations and community consultation (as required)											
Other Preliminary Actions											
Mark out development area, roads and buffers: erect tree protection and exclusion fencing											

ITEM / TASK	PRELIM.	MONTHS 0-6		MONTHS 7-12		MONTHS 13-18		MONTHS 19- 24		ON-GOING	
Bushland Managment Program											
Primary Weeding											
Follow-up & Secondary Weeding											
Maintenance Weeding (all work sites)											
Rubbish Removal											
Erosion Control Works (frequency as required)											
Native CPW Planting Program											
Identify areas to be planted/linked: prepare working map for contractors											
Determine planting needs: organise propagation of tubestock											
Site Preparation (e.g. weed control, soil scarification and mulching, as appropriate)											
Planting Tubestock/Advanced stock											
Plant Maintenance (watering and weeding)											
Pest Management Program											
Implement Feral Animal Monitoring Program											
Implement Feral Animal Control Program											

ITEM / TASK	PRELIM.	MONTHS 0-6		MONTHS 7-12		MONTHS 13-18		MONTHS 19- 24		ON-GOING	
Monitoring Program & Reporting											
Bush Regeneration Contractor monitoring & progress reports to Lendlease and Council (6 monthly)			**1**		**2**		**3**		**4 (FINAL)**		
Review of VMP: Draft Management Plan											

References

Building Code & Bushfire Hazard Solutions Pty Limited (2019), Bushfire Assessment Report, Proposed: Staged Residential / Industrial Development at: 16 Chapman Street, Werrington NSW. Prepared For: GLN Planning.

Commonwealth of Australia (2019a). Environment Protection and Biodiversity Conservation Act 1999, https://www.legislation.gov.au/Details/C2014C00506. Accessed 10/12/19.

Commonwealth of Australia (2019b). Weeds of National Significance (WoNS), https://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html. Accessed 10/12/19.

Department of the Environment (2019). Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest in Community and Species Profile and Threats Database, Department of the Environment, Canberra. http://www.environment.gov.au/sprat. Accessed 10/12/19.

Horticultural Management Services (2016). Vegetation Management Plan. Proposed Residential subdivision development. South Werrington Urban Village, Penrith NSW. Prepared for Universal Property Group Pty Ltd.

Keith D.A. (Keith 2004). From ocean shores to desert dunes: the vegetation of New South Wales and the ACT (Department of Environment and Conservation NSW: Hurstville).

New South Wales Government (2019a). Biodiversity Conservation Act 2016 No 63, https://www.legislation.nsw.gov.au/#/view/act/2016/63. Accessed 10/12/19.

New South Wales Government (2019b). Penrith Local Environmental Plan 2010, https://legislation.nsw.gov.au/#/view/EPI/2010/540/full?autoquery=(Content%3D((%22re1%22)))&dq=Within%20Title%3D%22Penrith%20Local%20Environmental%20Plan%20201. Accessed 10/12/19.

New South Wales Government (2019c). Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing, https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened species-scientific-committee/determinations/final-determinations/2008-2010/cumberland-plain-woodland-critically-endangered-ecological-community-listing. Accessed 10/12/19.

New South Wales Government (2019d), Biosecurity Act 2015 No 24, https://www.legislation.nsw.gov.au/#/view/act/2015/24. Accessed 10/12/19.

New South Wales Government (2019e), Biosecurity Regulation 2017, https://legislation.nsw.gov.au/#/view/regulation/2017/232. Accessed 10/12/19.

New South Wales Government (2019f), NSW Weedwise, https://weeds.dpi.nsw.gov.au/. Accessed 10/12/19.

New South Wales Rural Fire Service (2019). Bush Fire Environmental Assessment Code, https://www.rfs.nsw.gov.au/resources/publications/hazard-reduction/bush-fire-environmental-assessment-code. Accessed 10/12/19.

Niche Environment and Heritage (2019). 5111_Werrington_EPBCReferral_Memo_Rev2_20190822_4.2ha impact, Proposed Residential subdivision development. South Werrington Urban Village, Penrith NSW. Prepared for Lendlease.

Office of Environment and Heritage NSW (2019a), Threatened Biodiversity Profile Search, https://www.environment.nsw.gov.au/threatenedspeciesapp/. Accessed 10/12/19.

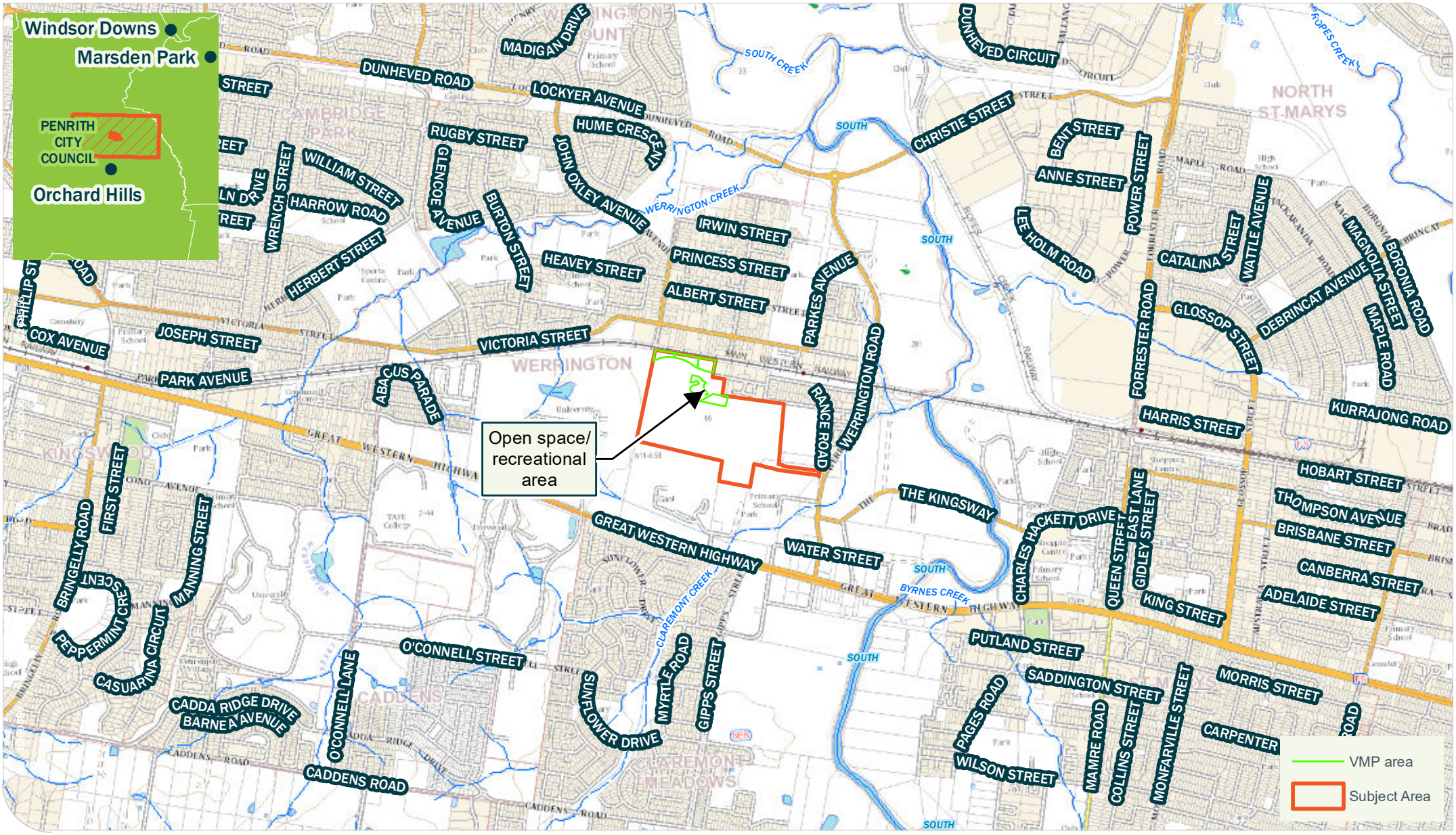
Office of Environment and Heritage NSW (2019b), BioNet Species Sightings Search, https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx. Accessed 10/12/19.

Office of Environment and Heritage NSW (2019b), BioNet Vegetation Classification, https://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx. Accessed 10/12/19.

Society of Ecological Restoration Australasia (2018), National standards for the practice of ecological restoration in Australia (2nd edition), http://seraustralasia.com/standards/National%20Restoration%20Standards%202nd%20Edition.pdf Accessed 10/12/19.

Tozer, M.G., Turner, K., Keith, D.A., Tindall, D., Pennay, C., Simpson, C., MacKenzie, B., Beukers, P. & Cox, S. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. *Cunninghamia* 11(3), 359-406.

Annex 1. Figures



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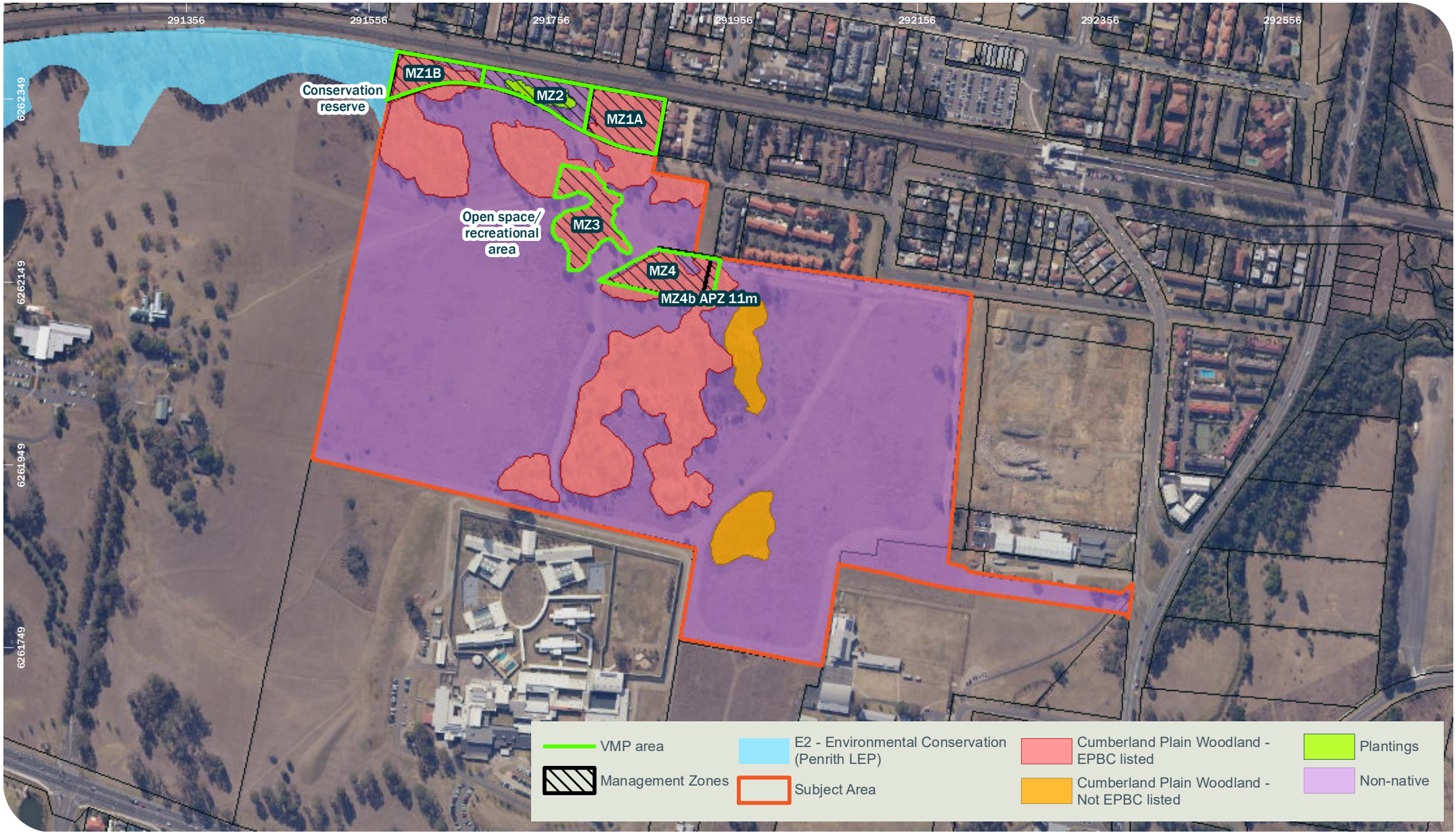
Niche PM: Amanda Griffith
Niche Proj. #: 5111
Client: Lend Lease

Location map
Werrington Vegetation management plan
Lot 1 DP1226122 Werrington

Figure 1



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VMP Area Lot 1/DP1226122 and Management Zones

Werrington Vegetation management plan
Lot 1 DP1226122 Werrington

Niche PM: Amanda Griffith
Niche Proj. #: 5111
Client: Lend Lease

Figure 2

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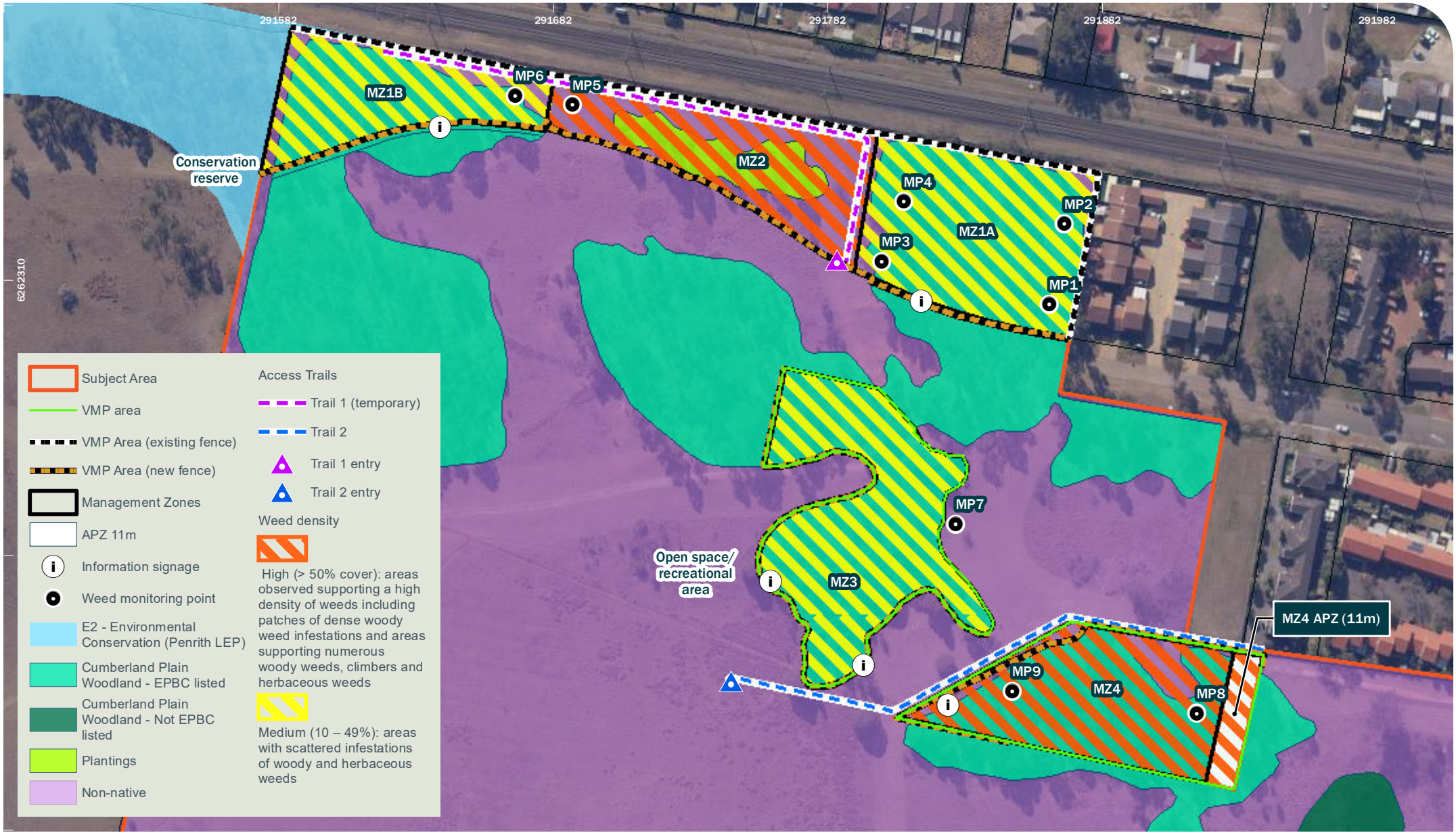

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Niche PM: Amanda Griffith
Niche Proj. #: 5111
Client: Lend Lease

Weed Mapping and Monitoring
Werrington Vegetation management plan
Lot 1 DP1226122 Werrington

Figure 3

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Annex 2. Werrington CPW Native Flora Species List (Niche 2019)

Scientific Name	Common Name
Acacia elongata	Swamp Wattle
Aristida ramosa	Purple Wiregrass
Aristida vagans	Three
Aristida warburgii	Threeawn Speargrass
Asperula conferta	Common Woodruff
Brunoniella australis	Blue Trumpet
Bursaria spinosa	Blackthorne
Centella asiatica	Indian Pennywort
Cheilanthes distans	Bristly cloak fern
Cheilanthes sieberi	Mulga fern
Cymbopogon refractus	Barbed Wire Grass
Cyperus gracilis	Slender Flat-sedge
Cyperus imbecillis	A Sedge
Dianella caerulea	Blue Flax-lily
Dichelachne micrantha	Shorthair Plumegrass
Dichondra repens	Kidney Weed
Einadia nutans	Climbing Saltbush
Entolasia stricta	Wiry Panic
Eragrostis brownii	Brown's Lovegrass
Eremophila debilis	Winter Apple
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Glycine tabacina	Glycine
Goodenia bellidifolia	Goodenia
Hakea sericea	Needlebush
Juncus usitatus	Juncus
Kunzea ambigua	Tick Bush
Lomandra filiformis	Wattle Mat-rush
Melaleuca styphelioides	Prickly-leaved Tea Tree
Microlaena stipoides	Weeping Grass

Scientific Name	Common Name
Oxalis perennans	Oxalis
Persicaria decipiens	Slender knotweed
Plantago debilis	Plantago
Pseuderanthemum variabile	Pastel Flower
Pultenaea spp.	Pultenaea
Rhytidosporum spp.	Rhytidosporum
Sporobolus creber	Slender Rat's Tail Grass
Thelymitra cyanea	Veined Sun Orchid
Themeda triandra	Kangaroo Grass
Wahlenbergia gracilis	Australian Bluebell

Annex 3. VMP implementation costings

Table 6. Management costings for VMP implementation

Stages	Project Manager/ Ecologist	Bush regenerator	Material cost	Subtotal
Preliminary works	$170.00	$50.00	$1.00	
Prepare draft bush regeneration and pest management works plan	6			$ 1,020.00
Prepare tender for on-ground works	3			$ 510.00
Site Induction (project manager)	4			$ 680.00
Mark out development area, roads and buffers: erect tree protection and exclusion fencing, install signage				$ 31,295.00
Subtotal				**$ 33,505.00**
Months 0-6				
Primary weeding		320		$ 16,000.00
Maintenance weeding		64		$ 3,200.00
Rubbish removal				$ 5,000.00
Erosion control works				$ 1,000.00
Identify planting areas and prepare map for contractors	8			$ 1,360.00
Determine planting needs and organise propagation of tubestock		6		$ 300.00
Baseline vertebrate pest survey	8			$ 1,360.00
Develop Feral Animal Control and Monitoring Program (in consultation with Council)	12			$ 2,040.00
Vertebrate pest control actions				$ 2,500.00
Develop bushfire management and asset protection plan				$ 5,000.00
Neighbour relations and community consultation	3			$ 510.00
Subtotal				**$ 38,270.00**
Months 7-12				
Follow-up and secondary weeding		320		$ 16,000.00
Maintenance weeding		64		$ 3,200.00
Rubbish removal				$ 2,000.00
Erosion control works				$ 1,000.00

Stages	Project Manager/ Ecologist	Bush regenerator	Material cost	Subtotal
Planting Preparation		16		$ 800.00
Planting tubestock/advanced stock				$ 34,234.80
Plant maintenance (watering and weeding)		64	$5,160.00	$ 8,360.00
Mulching		192	$10,000.00	$ 19,600.00
Vertebrate pest control actions				$ 2,500.00
Joint inspection with council	6			$ 1,020.00
Neighbour relations and community consultation	3			$ 510.00
Complete annual monitoring report	16			$ 2,720.00
Subtotal				**$ 91,944.80**
Months 13-18				
Follow-up and secondary weeding		256		$ 12,800.00
Maintenance weeding		64		$ 3,200.00
Planting preperation		16		$ 800.00
Planting tubestock/advanced stock				$ 8,558.70
Plant maintenance (watering and weeding)		64	$5,160.00	$ 8,360.00
Mulching		64	$5,000.00	$ 8,200.00
Vertebrate pest control actions				$ 2,500.00
				$ -
Erosion control works				$ -
Neighbour relations and community consultation	3			$ 510.00
Subtotal				**$ 44,928.70**
Months 19-24				
Maintenance weeding		64		$ 3,200.00
Vertebrate pest control actions				$ 2,500.00
Rubbish removal				$ -
Erosion control works				$ -
Joint inspection with council	8			$ 1,360.00

Stages	Project Manager/ Ecologist	Bush regenerator	Material cost	Subtotal
Neighbour relations and community consultation	3			$ 510.00
Complete annual monitoring report	16			$ 2,720.00
Complete final monitoring report	16			$ 2,720.00
Complete draft revised management plan	16			$ 2,720.00
Subtotal				$ 15,730.00
Management contingency				$ 10,000.00
Total				**$ 224,378.50**

Table 7. Costing for revegetation plantings

Trees		Qty	Size	Planting density (plants per hectare)	Cost per plant	Total cost
Eucalyptus tereticornis	Forest Red Gum	48	Forestry tube	30	7.1	340.8
Eucalyptus moluccana	Grey Box	48	Forestry tube	30	7.1	340.8
Acacia decurrens	Black Wattle	79	Forestry tube	50	7.1	560.9
Melaleuca stypheloides	Prickly-leaved Paperbark	79	Forestry tube	50	7.1	560.9
	Subtotal	**254**				**1803.4**
Shrubs And forbs						
Bursaria spinosa	Blackthorn	711	Grow cell	450	6.1	4337.1
Dianella longifolia var. longifolia	Smooth Flax-lily	474	Grow cell	300	6.1	2891.4
Dodonea viscosa subsp. cuneata	Sticky Hop Bush	711	Tree tube	450	7.1	5048.1
Indigofera australis	Native Indigo	711	Tube stock	450	7.1	5048.1
Lomandra longifolia	Spiny-headed Mat-rush	474	Grow cell	300	6.1	2891.4
Pratia purpurascens	Whiteroot	474	Tree tube	300	7.1	3365.4
Stypandra glauca	Nodding Blue Lily	474	Tube stock	300	7.1	3365.4
Wahlenbergia communis	Tufted Bluebell	474	Tube stock	300	7.1	3365.4
	Subtotal	**4503**				**30312.3**
Grasses		Qty (grams)		Density (grams per hectare)	Cost per gram (hand broadcast)	
Entolasia stricta	Wiry Panic	790	Seed	500	0.35	276.5
Imperata cylindrica	Blady Grass	790	Seed	500	0.35	276.5
Microlaena stipoides	Weeping Grass	790	Seed	500	0.35	276.5
Poa labillardieri	Common Tussock-grass	790	Seed	500	0.35	276.5
Themeda australis	Kangaroo Grass	790	Seed	500	0.35	276.5
		No. required			**Subtotal**	**1382.5**
Tree guards		254			2.9	736.6
					Total	**34234.8**

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Offset strategy and assessment (NSW, QLD, Commonwealth)
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Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)