Vegetation Management Plan

Riley's Creek Riparian Corridor

Prepared for
Sekisui House Camden Valley Pty Ltd & Corade Developments Pty Ltd

29 July 2015

DOCUMENT TRACKING

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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
AW	Alluvial Woodland and vegetation community (a component of RFEF)
CNAP	Conservation of Natural Assets Policy
CPW	Cumberland Plain Woodland
DA	Development Application
DCP	Development Control Plan
ELA	Eco Logical Australia
ECBG	El Caballo Blanco and Gledswood estates
EPBC	Commonwealth *Environmental Protection and Biodiversity Conservation 1999*
LGA	Local Government Area
NOW	NSW Office of Water
RFEF	River-Flat Eucalypt Forest vegetation community
SMP	Salinity Management Plan
TOB	Top of Bank
TSC Act	NSW *Threatened Species Conservation Act 1995*
VMP	Vegetation Management Plan
VMS	Vegetation Management Strategy
VRZ	Vegetated Riparian Zone
WM Act	NSW *Water Management Act 2000*

1 Introduction

This Vegetation Management Plan (VMP) has been prepared by Eco Logical Australia Pty Ltd (ELA) on behalf of SH Camden Valley (SHCV) Pty Ltd & Corade Developments Pty Ltd (Corade) for the restoration of Riley's Creek riparian corridor and adjacent lands within the El Caballo Blanco / Gledswood (ECBG) release area precincts. The site is located within the Camden Local Government Area (LGA).

1.1 Background

A Vegetation Management Strategy (VMS) was prepared by ELA in 2011 to accompany a Voluntary Planning Agreement as part of the rezoning for the ECBG site. The VMS objectives were formed around the Camden Council's Conservation of Natural Assets Policy (CNAP) which was in place at the time of rezoning but is no longer applied by Council. The VMS is predicated on offsetting and re-creation to mitigate vegetation losses from development. This strategy and its targets became embedded in the precinct vegetation management objectives and controls of the Camden Development Control Plan (DCP).

The VMS identifies a total requirement of 42.87 ha of retained and recreated vegetation for conservation within the ECBG area. This requirement has been revised to 36.46 ha after taking into account the revised development footprint and the DCP's required offset ratio for areas identified as loss in the VMS which are now being conserved (sC12.10.12).

The total area to be conserved in the ECBG area is 36.34 ha. The Riley's Creek VMP (ELA 2015) included 7.9 ha of offset, or approximately 22% of the revised VMS target. This VMP includes the remaining 28.44 ha of offset or approximately 78% of the revised VMS target.

The VMS includes generic requirements for riparian areas from Part B of the DCP. The VMS was later integrated into Part C of the DCP, which included a section of specific requirements for the ECBG release area. These specific requirements include that a 'works plan be submitted to Council as part of the residential subdivision DA for residential areas adjacent to a riparian corridor' (C12.8.7). This works plan must be consistent with NSW Office of Water (NOW) guidelines.

As such, this VMP has been prepared to include creekline management areas consistent with the current NOW guidelines under the NSW *Water Management Act 2000* (WM Act). Riley's Creek riparian corridor includes a Strahler second order stream, a first order stream and an unclassified stream. As per the guidelines, second order streams have been given a 20m buffer from top of bank (TOB), and first and unclassified streams have been given a 10m buffer from TOB. Further detail on hydrology is provided in **Section 2.3**.

It should be noted that as part of the VMS requirements, the remainder of the riparian corridor outside the riparian buffers will also be managed for conservation. The result is that the entire extent of the Riparian Conservation zone identified in the VMS and within the SHCV and Corade portion of the site will be managed for conservation, with the exception of where Asset Protection Zones (APZ) are required. These APZ have been offset using the standard guidelines provided by NOW. Further detail on APZ and offsets is provided in **Section 3.5**.

1.2 Objectives of the VMP

The objectives of this VMP are to provide a guide to bush regeneration contractors to:

- protect and regenerate remnant vegetation in the riparian area
- control noxious and environmental weeds on the subject land
- revegetate the riparian corridor with native species typical of Alluvial Woodland (AW) and Cumberland Plain Woodland (CPW) whilst providing a continuous riparian corridor for connectivity of wildlife habitats
- protect flora and fauna habitat
- provide bed and bank stability and reducing bank and channel erosion within the creek.

2 Description of the environment

2.1 Location

The subject site encompasses portion of Riley's Creek within the proposed SHCV and Corade development areas at ECBG estates in the suburb of Gledswood Hills. The VMP area is located south of Camden Valley Way, west of the Gledswood Homestead and Winery and south west of Raby Road as indicated in **Figure 1**. The remainder of the site will be developed by SHCV under subsequent DA's.

2.2 Regional context

The development is located largely on a large grazing property surrounding the Gledswood Homestead, to the west of the Camden Lakeside country Club and golf course. Some areas of native vegetation are present across the broader property, however significant areas have been extensively grazed presumably since early European settlement of the property.

2.3 Hydrology

Riley's Creek originates in the south western section of the site above the concrete-lined water supply channel at two places, flowing in a largely northward direction. The western stream is unclassified under the Strahler system whilst the eastern stream branch is a Strahler first order stream. These combine to the north east in a water body, with Riley's Creek continuing as a first order stream until it hits a fence boundary and meets a small ephemeral dam. From this point onwards Riley's Creek flows in a north, nor-easterly direction as a Strahler second order stream.

Two water treatment basins or 'rain gardens' are proposed to be constructed where Riley's Creek is a Strahler second order stream. These 'rain gardens' are outside of the riparian corridor, but are included in the conservation area managed by this VMP. Further detail is provided in **Appendix C**.

A shared pedestrian and cycle footpath is proposed to cross Riley's Creek with a culvert at a point where it is a second order stream. This action is allowed under the riparian corridor Matrix as per the NOW guidelines (**Table 1**).

Table 1: Riparian corridor matrix (NSW Office of Water)

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st	10m	•	•	•	•	•	•	•		
2nd	20m	•	•	•	•	•		•		
3rd	30m	•	•	•		•			•	•
4th +	40m	•	•	•		•			•	•

2.4 Salinity issues

A salinity investigation was undertaken and a Salinity Management Plan (SMP) prepared by Douglas Partners Pty Ltd in April 2015. Although the investigation was focused on the proposed development footprint areas, the soil in the areas surrounding the VMP area were mostly found to be 'Moderately Saline' as shown in Drawing 4 of the SMP (Douglas Partners 2015).

Based on the SMP, it is assumed that that there may be salinity issues in the lower lying areas of the site, along the creek banks where the water table lies closer to the surface. However, no salt crusts or other visible signs of sodic soils were apparent on the site inspection.

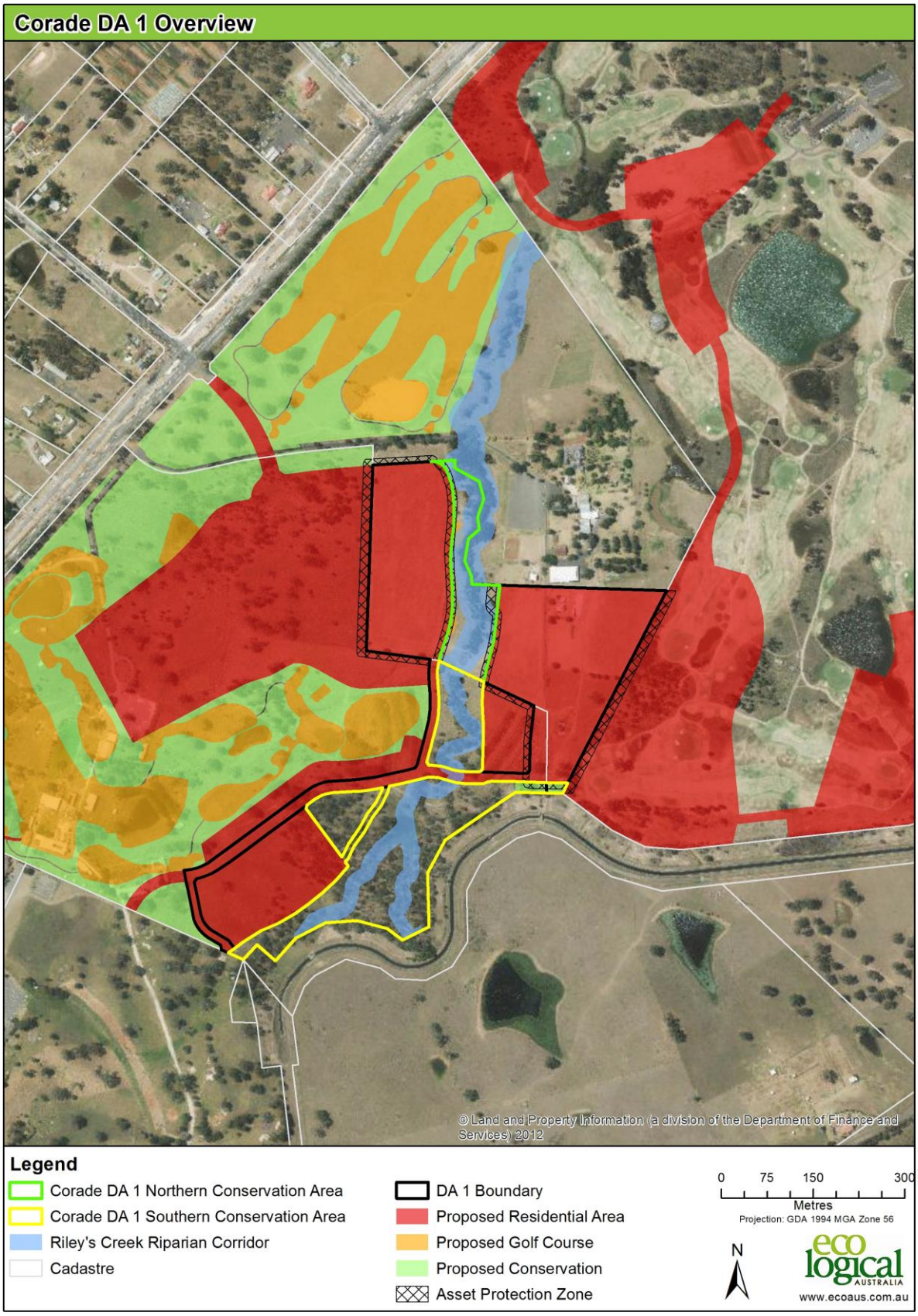

Figure 1: Corade DA 1 Overview map

2.5 Existing vegetation

A flora and fauna assessment of the Lot 1203 Gledswood has been undertaken by ELA (2015). The existing vegetation identified in this survey is shown in **Figure 2.**

2.5.1 Vegetation communities

Two native vegetation communities have been identified within Subject Site; Cumberland Plain Woodland (CPW) and Alluvial Woodland (AW) (**Figure 2)**. Both of these vegetation communities represent vegetation communities listed under the NSW *Threatened Species Act 1995* (TSC Act) and/or Commonwealth *Environmental Protection and Biodiversity Conservation 1999* (EPBC Act) as outlined in **Table 2**.

Table 2: Vegetation communities identified on site and their relevant listings under the EPBC Act and TSC Act

Current study (after NPWS 2002)	TSC Act	EPBC Act
Cumberland Plain Woodland (CPW)	CEEC – Cumberland Plain Woodland in the Sydney Basin Bioregion	CEEC – Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
Alluvial Woodland (AW)	EEC - *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (RFEF)*	Not Listed

CEEC = Critically Endangered Ecological Community
EEC = Endangered Ecological Community

Cumberland Plains Woodland occurs in the southern extent of the Subject Site as Shale Hills Woodland and Shale Plains Woodland (**Figure 2**). CPW onsite is characterised by a native canopy cover of mainly *Eucalyptus crebra, Eucalyptus moluccana* and *Eucalyptus tereticornis*. The shrub layer is largely denuded due to previous grazing onsite, however below the basin *Acacia implexa* and *Bursaria spinosa* can be observed. Similarly in the southern end of the site native groundcovers are present including *Aristata ramosa, Cheilanthes sieberi subsp. sieberi, Microlaena stipoides, Paspalidium distans, Solanum prinophyllum* and *Themeda australis.*

Alluvial Woodland (AW) comprises the vegetation across the majority of the site and of the VMP area and is characterised by a native canopy cover of mainly *Casuarina glauca* and *Casuarina cunninghamia subsp. Cunninghamiana.* No native shrub layer was present due to grazing activities. Native ground covers included *Commelina cyanea, Dichondra repens, Einadia trigonos, Glycine* spp. and *Microlaena stipoides.*

2.5.2 Weed species

A total of 22 weed species were recorded within the Riley's Creek Corridor. One class 3 weed namely *Cestrum parqui* (Green Cestrum) is found onsite, with four class 4 noxious weeds including *Araujia sericifera* (Moth Vine), *Lantana camara* (Lantana), *Lycium ferocissimum* (African Boxthorn) and *Senecio madagascariensis* (Fireweed). All five species are declared noxious weeds in the Camden Local Control Authority under the NSW *Noxious Weeds Act 1992* (**Table 3**).

Table 3: Weed species observed on the study site with noxious weeds indicated

Scientific name	Common name	Noxious weed category
Araujia sericifera	Moth Vine	4
Axonopus filiformis	Narrow-leafed carpet grass	
Bidens pilosa	Cobblers Peg	
Canna indica	Canna Lilly	
Cestrum parqui	Green Cestrum	3
Chloris gayana	Rhodes Grass	
Cirsium vulgare	Spear Thistle	
Cynodon dactylon	Couch Grass	
Ehrharta erecta	Panic Veldt grass	
Lantana camara	Lantana	4
Lycium ferocissimum	African Boxthorn	4
Olea europaea subsp. cuspidata	African Olive	
Onopordum acanthium	Scotch Thistle	
Paspalum dilatatum	Paspalum	
Pennisetum clandestinum	Kikuyu	
Plantago lanceolata	Ribbed Plantain	
Senecio madagascariensis	Fireweed	4
Setaria sp.	Pigeon grass	
Sida rhombifolia	Paddy's Lucerne	
Solanum pseudocapsicum	Winter Cherry	
Tradescantia fluminensis	Trad	
Verbena bonariensis	Purpletop	

Note - Noxious weed categories are shown in **Appendix A**

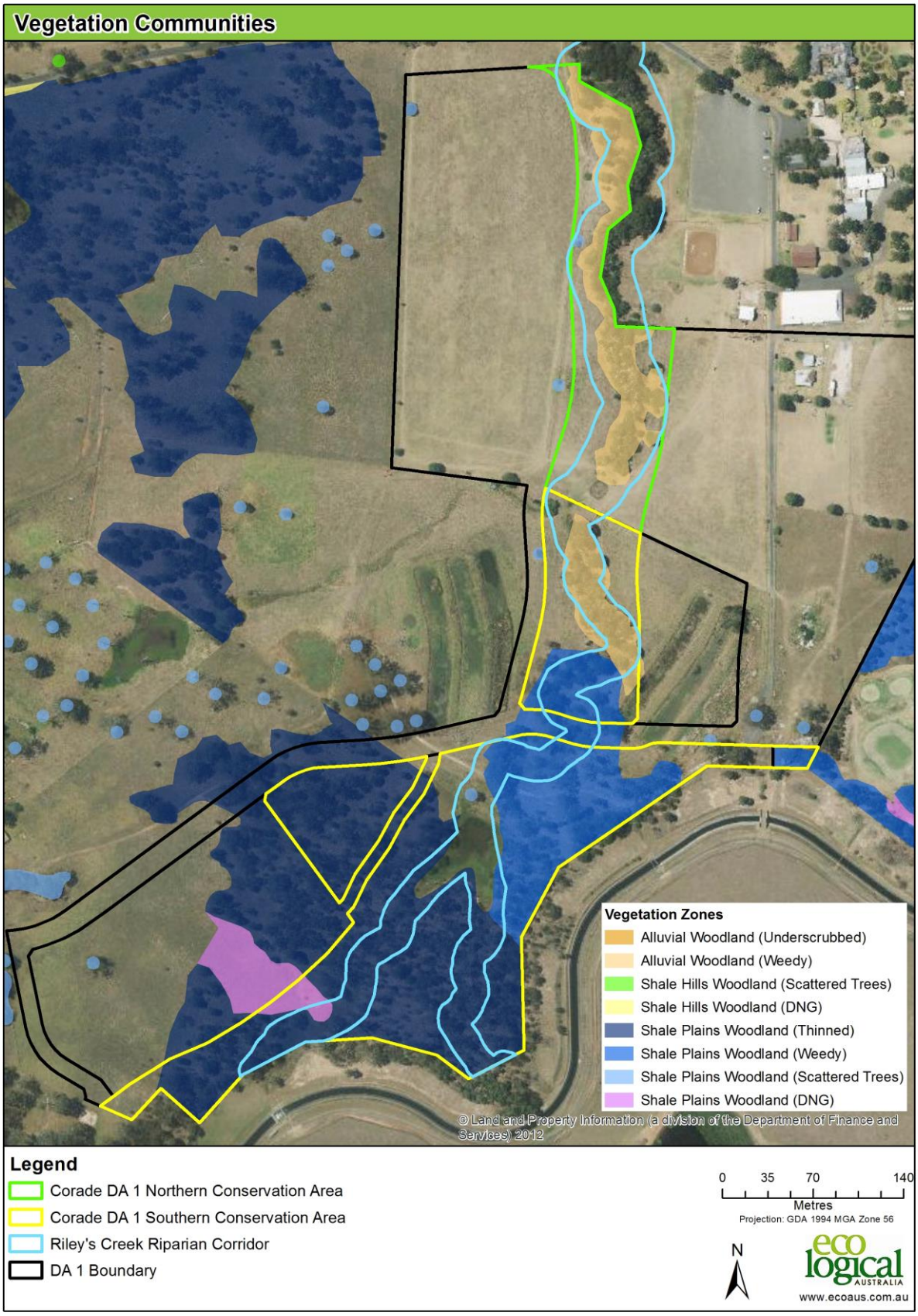

Figure 2: Vegetation Mapping (ELA 2015)

3 Preliminary works

Prior to construction the developer must organise for the following works to be undertaken.

3.1 Soil and water management

Sediment fencing will be required around the construction area to prevent sediment and water runoff entering Riley's Creek from the construction site. Sediment fencing will prevent sediment running into the VMP area and limit the spread of weed propagules in soil sediments during the construction period. Sediment fencing may be attached construction fencing described in **Section 3.2**.

3.2 Construction fencing

Construction fencing is required to identify the boundary between construction activities and vegetation management works and around trees to be retained in the construction area. The aim of this is to prevent unnecessary damage to native vegetation in the VMP area from construction activities and excludes all construction machinery, activities, materials and staff from the VMP area.

3.3 Pest control

Prior to and following the revegetation works, pest control must take place. Evidence of European rabbits (*Oryctolagus cuniculus*) including fresh diggings, faeces and burrows were observed onsite, particularly in the SCA. Control methods may include shooting, trapping, fumigation or fencing, but this will need to be determined following the creation of an index to assess rabbit numbers and in consultation with Camden City Council. The most appropriate method of control will need to be decided upon and enacted before plantings are installed to prevent plant losses.

3.4 Salinity Management

Where salinity is observed, management of the soil will be required to address this issue prior to VMPO works. Where sodic soils are identified, management should consist of capping the upper surfaces, as per the SMP (Douglas Partners 2015). However, in cases where this is not possible, management will consist of (Douglas Partners 2015):

> *Sodic soils can also be managed by maintaining vegetation where possible and planting new salt tolerant species. The addition of organic matter, gypsum and lime can also be considered where appropriate. After gypsum addition, reduction of sodicity levels may require some time for sufficient infiltration and leaching of sodium into the subsoils, however capping of exposed sodic material should remain the primary management method. Topsoil added at the completion of bulk earthworks is, in effect, also adding organic matter which may help infiltration and leaching sodium".*

Where plants replacement is required these will be be comprised of more salt tolerant species such as *Casuarina glauca* and other species identified in **Appendix C**.

3.5 Asset Protection Zone (APZ) installation

Asset Protection Zones (APZ) will need to be established within the conservation corridor as per guidelines established in ELA's 2015 'Bushfire Protection Assessment: Proposed subdivision – El Caballo Blanco' report.

APZ within the riparian land have been excluded from VMP area, including where these APZ overlap with the NOW riparian corridor. The extent of these APZ are compliant with NOW guidelines and they are offset by the extent of the management zones retained and recreated outside the riparian corridor. (**Table 4**).

Table 4: APZ offsetting

Treatment Zone	APZ exclusion (m^2)	Additional management area (m^2)
Northern conservation area	800	11,700
Southern conservation area	300	20,600
TOTALS	**1,100**	**38,000**

Management requirements for APZ maintenance have not been included in this VMP.

4 Vegetation management works

The area subject to the VMP includes the Vegetated Riparian Zone (VRZ) as per WM Act Guidelines identified in **Figure 3**.

Across the site, the VRZ has been divided into four vegetation management zones. Regeneration areas retain existing canopy and are expected to have a high natural resilience (ability to recover from disturbance events) and will require limited revegetation. Revegetation areas are expected to have limited resilience and they will require revegetation. Proposed revegetation along the creek banks will be from Alluvial Woodland (AW) community, with terrestrial areas comprised of Cumberland Plain Woodland (CPW). In stream areas will require only limited revegetation and weed control (**Table 5**).

Table 5: Revegetation densities

Treatment Zone	Planting densities			
	Tree	Shrub	Herbs / Scramblers	Sedge / Grass
1: Regeneration	1/100m2	1/40m2	1/m2	1/m2
2: Revegetation - AW	1/50m2	1/20m2	1/m2	5/m2
3: Revegetation - CPW	1/50m2	1/20m2	1/m2	3/m2
4: In stream	-	-	1/m2	7/m2
5: Rain Gardens	-		1/m2	7/m2

The VMP will be implemented by a suitably qualified bush regeneration contractor (see **Appendix B**). Weed control techniques are identified for each management zone and further details are provided in **Appendix B**.

The vegetation management zones are shown in **Figure 3**, with detail provided **Figure 4** and **Figure 5.**

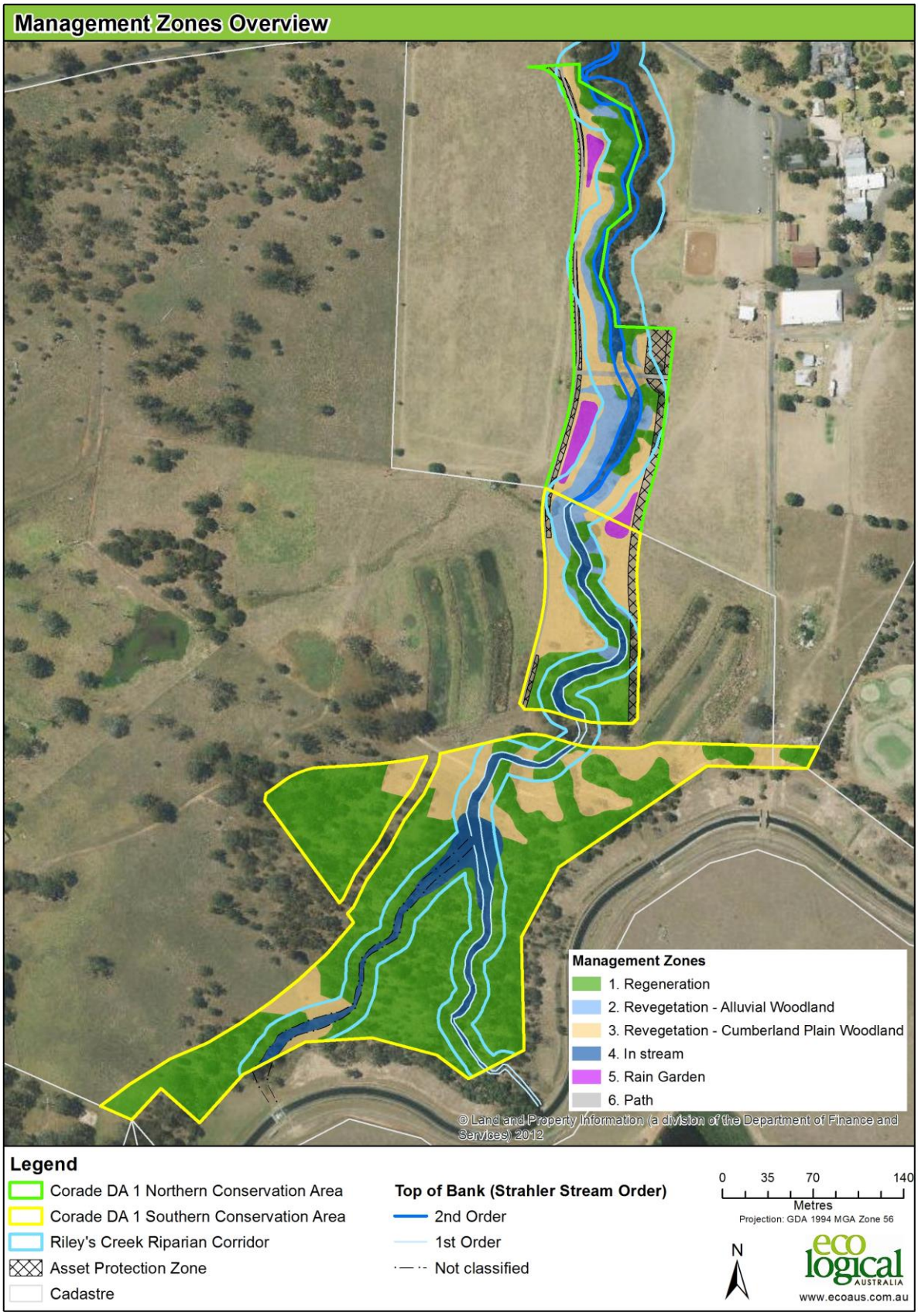

Figure 3: Management Zones - Overview

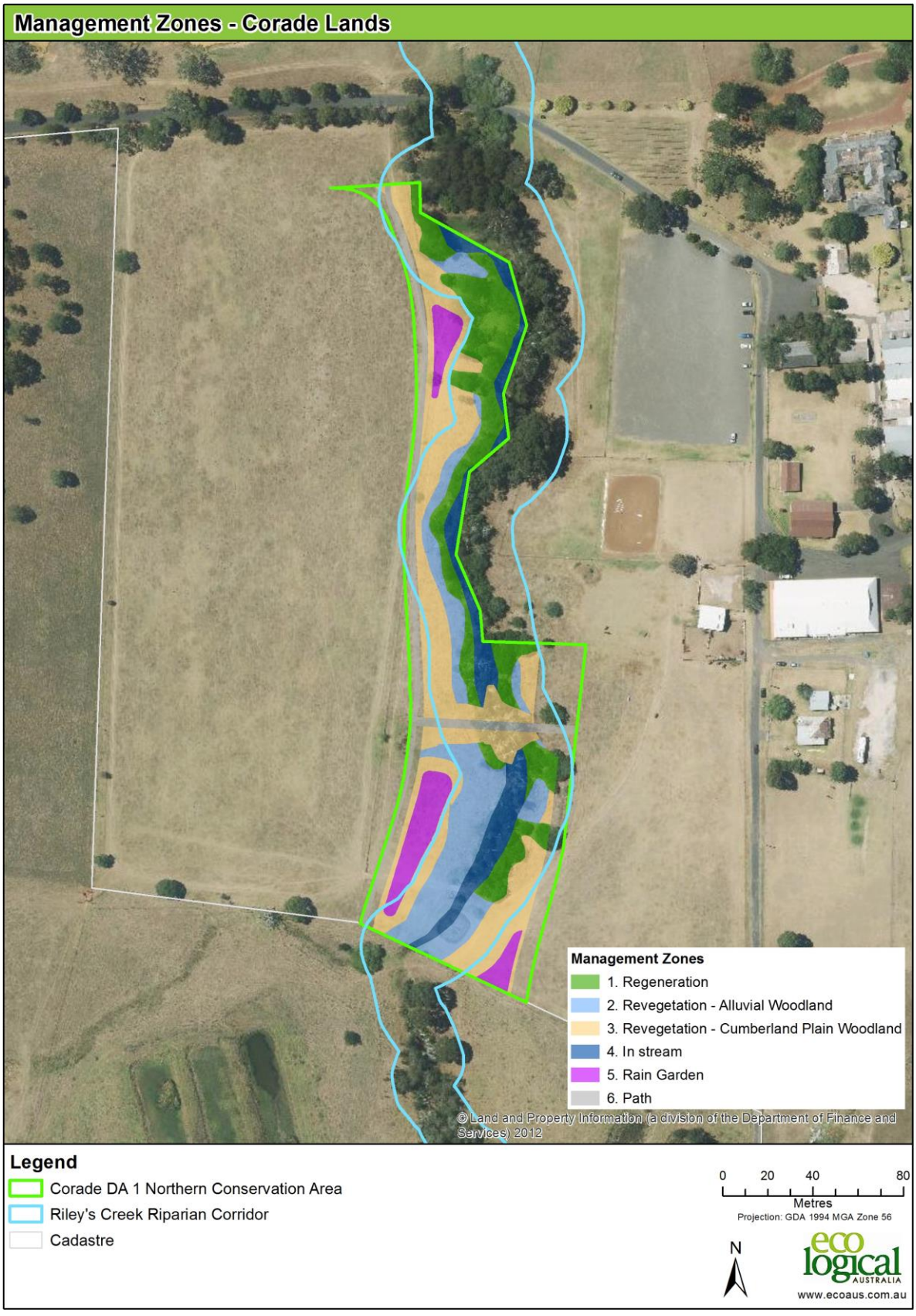

Figure 4: Management Zone – Northern Conservation Area

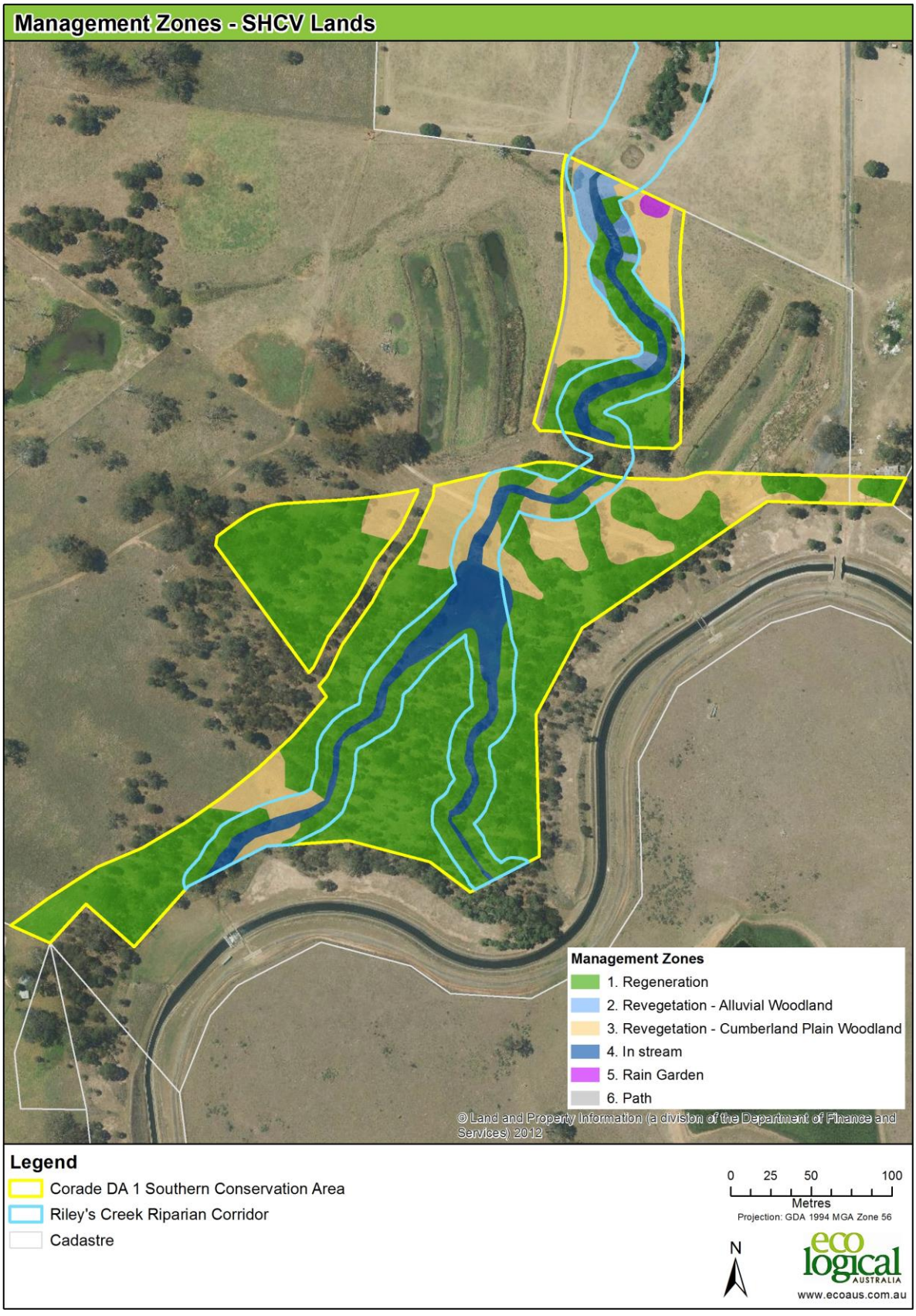

Figure 5: Management Zone – Southern Conservation Area

4.1 Management zones

The Riley's Creek Conservation Area has total area of 7.9 ha.

Within the Southern Conservation Area (SCA), Riley's Creek comprises a Strahler first order stream with a corridor of 10m either side of the top of bank. The vegetation encompasses Cumberland Plain Woodland (CPW) in moderate to good condition onsite with a good coverage of native canopy trees particularly *Eucalyptus Crebra, E. moluccana* and *E. tereticornis*. The shrub layer is relatively sparse and is dominated largely by weeds including *Lantana camara*. Generally the understorey contains native and exotic groundcovers. There are also several open areas, which have mainly exotic grasses that will require limited revegetation.

In the Northern Conservation Area (NCA), the creekline transitions to a Strahler second order stream with a corridor width of 20m either side of the top of bank. The remnant vegetation in this area is comprised of Alluvial Woodland in moderate condition.

At the north of the site, Riley's Creek forms a second order Strahler stream, with a corridor width of 20m either side of the top of bank. The vegetation is in poor condition with only a few highly fragmented remnant canopy trees along the creek banks, no native mid-storey, with no native groundcovers, only exotic pasture grass on either side of the creek with only a few isolated *Juncus usitatus* within the stream.

4.1.1 Zone 1: Regeneration

Zone 1, an area of 4.75 ha, comprises moderate to good condition bushland of both Alluvial Woodland and Cumberland Plains Woodland with largely remnant native tree canopy. Within this zone, weeds will be removed and native regeneration will be encouraged from underneath remnant canopy trees. Methods of bush regeneration are further outlined in **Appendix B.**

Primary

All Noxious weeds shall be treated. *Lycium ferocissimum* (African Boxthorn) and *Olea europaea* subsp. *cuspidata* (African Olive) in the mid-storey are to be cut and painted with neat Glyphosate.

All weed propagules to be required to be bagged and removed from site to a registered green waste facility in manner directed by noxious weed legislation. All woody waste to be either chipped and mulched onsite or left in small piles that do not obstruct other works in other zones.

Secondary / follow up

All re-emerging noxious weeds, woody weeds and vine weeds to be controlled. All emerging annual herbaceous and exotic grass species to be controlled using a combination of brush cutting prior to seed set, spot spraying and hand weeding.

Maintenance

Weed levels will need to be kept low across the zone to ensure native species can regenerate without competition from weed species. Maintenance to be conducted using a combination of brush cutting prior to seed set, spot spraying and hand weeding.

Infill planting

Once primary works have been completed, infill planting will be undertaken in bare areas where natural regeneration is not occurring which is estimated at approximately 25 % of the zone. Planting is to be

undertaken using the species identified in **Appendix C** at the densities shown in **Table 5**. If species are unavailable, others may be substituted but they must be typical species of Alluvial Woodland or Cumberland Plain Woodland and be a 'like-for-like' substitution, i.e. a tree can only be substituted for a tree.

Planting is to occur in a naturalistic manner, with grasses and groundcovers clumped together. Plants are to be installed with a native plant establisher such as Terracottem® or similar containing water crystals and native plant fertiliser. All planting are required to be watered in on the day of installation.

4.1.2 Zone 2: Revegetation – AW

Zone 2, an area of 0.4 ha, comprises poor condition riparian bushland to be revegetated to Alluvial Woodland (AW). There is little remnant riparian vegetation within the zone. Works will aim to restore riparian vegetation and to minimise erosion of creek banks.

Site preparation

To prepare the site, the lawn grasses shall be sprayed on two occasions. Once the grasses have adequately died off, the site will be mulched site using clean eucalypt mulch (not coarse tub-grind) to a depth of 100 mm. Mulch should be allowed to settle for at least three weeks to ensure environment is suitable to plant into.

Planting

Planting is to be undertaken using the species identified in **Appendix C** at the densities shown in **Table 5**. If species are unavailable, others may be substituted but they must be typical species of Alluvial Woodland and be a 'like-for-like' substitution, i.e. a tree can only be substituted for a tree.

Planting is to occur in a naturalistic manner, with grasses and groundcovers clumped together. Plants are to be installed with a native plant establisher such as Terracottem® or similar containing water crystals and native plant fertiliser. All planting are required to be watered in on the day of installation.

Maintenance

Once installed plants will need continual visual monitoring and re-watering as required to ensure survival.

Weed levels will need to be kept low across the zone to ensure plantings can establish without competition from weed species. Maintenance to be conducted is to include initial preparation works undertaken by hand to ensure weeds around plantings are removed so that follow up treatments do not damage plantings. Follow up works to be undertaken by either brush cutting prior to seed set, spot spraying or hand weeding.

4.1.3 Zone 3: Revegetation – CPW

Zone 3, an area of 1.80 ha, comprises largely grazed paddock land or poor condition bushland to be revegetated to CPW. The aim will be to revegetate the cleared areas into a continuous bushland corridor.

Site preparation

To prepare the site, the lawn grasses shall be sprayed on two occasions. Once the grasses have adequately died off, the site will be mulched site using clean eucalypt mulch (not coarse tub-grind) is to

occur to a depth of 100 mm. Mulch should be allowed to settle for at least three weeks to ensure environment is suitable to plant into.

Planting

Planting is to be undertaken using the species identified in **Appendix C** at the densities shown in **Table 5**. If species are unavailable, others may be substituted but they must be typical species of Cumberland Plain Woodland and be a 'like-for-like' substitution, i.e. a tree can only be substituted for a tree.

Planting is to occur in a naturalistic manner, with grasses and groundcovers clumped together. Plants are to be installed with a native plant establisher such as Terracottem® or similar, containing water crystals and native plant fertiliser. All planting are required to be watered in on the day of installation.

Maintenance

Once installed plants will need continual visual monitoring and re-watering as required to ensure survival.

Weed levels will need to be kept low across the zone to ensure plantings can establish without competition from weed species. Maintenance to be conducted is to include initial preparation works undertaken by hand to ensure weeds around plantings are removed so that follow up treatments do not damage plantings. Follow up works to be undertaken by either brush cutting prior to seed set, spot spraying or hand weeding.

4.1.4 Zone 4: In stream

Zone 4, an area of 0.81 ha, consists of the portion of the site within the creekline TOB.

Site preparation

To prepare the site all weeds within the stream and within the drainage basin will be controlled unless providing creek bank stability.

Planting

A small amount of plantings have been estimated to be installed into any areas where creek bank stability is required. Planting is to be undertaken using the species identified in **Appendix C** at the densities shown in **Table 5** over approximately 15 % of the zone. If species are unavailable, others may be substituted but they must be typical species of Alluvial Woodland/Freshwater Wetland and be a 'like-for-like' substitution, i.e. a tree can only be substituted for a tree.

Planting is to occur in a naturalistic manner, with grasses and groundcovers clumped together. Plants are to be installed with a native plant establisher such as Terracottem® or similar containing water crystals and native plant fertiliser. All planting are required to be watered in on the day of installation.

Maintenance

Once installed plants will need continual visual monitoring and re-watering as required to ensure survival.

Weed levels will need to be kept low across the zone to ensure plantings can establish without competition from weed species. Maintenance to be conducted is to include initial preparation works undertaken by hand to ensure weeds around plantings are removed so that follow up treatments do not

damage plantings. Follow up works to be undertaken by either brush cutting prior to seed set, spot spraying or hand weeding.

Incidents of creek bank erosion that may arise in the future will need to be assessed and dealt with using an adaptive management approach.

4.1.5 Zone 5: Rain gardens

Zone 5, a total area of 0.13 ha, includes the three proposed 'rain garden' bioretention basins to be installed and maintained in the Riparian Conservation area.

Site preparation

These will initially be used as sediment basins during the construction stage. Once the use as a sediment basin is complete and the biofiltration media has been installed, these basins will revegetated. As mulch or jute matt can compromise the effectiveness of the biofiltration media, neither will be installed. Intense weed control will therefore be required to prevent weed establishment in these areas. During the construction phase, weed control will be undertaken to ensure that no new vegetation species established. It is recommended that sediment fencing is installed and maintained at all inlets to the rain gardens until the native vegetation has established.

Planting

Revegetation will be undertaken using a modified RFEF/FW community focusing on hardy sedge and grass species. Planting is to be undertaken using the species identified in **Appendix C** at the densities shown in **Table 5**. .

Maintenance

Once installed plants will need continual visual monitoring and re-watering as required to ensure survival.

Weed levels will need to be kept low across the zone to ensure plantings can establish without competition from weed species. Maintenance to be conducted is to include initial preparation works undertaken by hand to ensure weeds around plantings are removed so that follow up treatments do not damage plantings. Follow up works to be undertaken by either brush cutting prior to seed set, spot spraying or hand weeding.

4.2 Management of weed waste

All woody weed material will be mulched on site, piled into unobtrusive piles or disposed of at a facility licensed to receive green waste. All weed propagules especially noxious weeds will be bagged and disposed of as directed by legislation at facility licensed to receive green waste. All weed waste without propagules will be composted onsite in small unobtrusive piles.

4.3 Adaptive management

As this is a long term project that will be implemented over a number of years, an adaptive management approach will be implemented that enables the successful contractor to learn from and respond to successful and unsuccessful techniques used on the site. In its simplest form this may include the substitution of species identified in the planting table for advanced direct seeding techniques in place of manual planting techniques.

The success of the works will be determined by meeting the performance criteria (**Table 6**). Contractors have the flexibility to implement different techniques to those specified here providing that performance criteria are met. Any major departures from the VMP or change to performance criteria must be approved in writing by Camden Council.

5 Monitoring and reporting

Monitoring and reporting are both extremely important. The bush regeneration contractor and the land manager will monitor the vegetation for changes over time. Information gained through the monitoring and reporting process will identify works that have and have not been successful, and the reasons for their success or failure.

The aim of monitoring is to measure the effectiveness of the control actions being undertaken to achieve the desired outcome. It will identify non-conformance and provide the land manager with the ability to implement corrective actions. Information derived from the results of monitoring will also be used in adaptive management (i.e. learning from past experience to inform future priorities and work plans). For example, as annual grass weeds are removed, herbaceous and perennial weeds may establish.

Finally, monitoring and reporting will help determine and quantify the costs related to weed management and the cost effectiveness of the VMP.

5.1 Monitoring

Monitoring will be undertaken by vegetation surveys and photo monitoring. Monitoring will need to be undertaken prior to works being commenced to establish a benchmark for performance, and to occur on a 6-monthly basis to be included in the Monitoring Report.

Photo monitoring points should be set-up using a permanent reference point to provide a visual reference of changes in the vegetation. Photo monitoring to include:

- set up one photopoint for each management zone. If the SHCV and Corade areas are managed separately (i.e. two reports are provided), then each landowner will be required to provide one photopoint for every management zone on their land.
- mark the photo point with a six foot star picket at the south-west corner and map the location of each photo point using GPS;
- take a digital photo of each photo point at each of the compass points with the the star picket visible in the photo to act as a reference point and towards the north-east corner;
- organise the digital photos logically with each image labelled with a unique reference number indicating the location of the photo point and the date the photo is taken.

At each photopoint, the following monitoring data will be gathered 6-monthly for the first five years (Autumn and Spring):

- One full floristic vegetation quadrat (20 m x 20 m). This shape can be modified given the limited width of some zones (e.g. Zone 4)
- One, 30 minute diurnal bird survey site (undertaken within two hours of sunrise, temperature range between 20ºC and 25ºC)
- One anabat recording site (one hour recording immediately after sunset. Temperature to be between 25ºC and 30ºC)

In addition, some zones will require further data to be gathered. Specifically:

- Zones 1, 2 and 3 will require:
  - One 50m x 20m plot to measure hollows and fallen logs
- Zone 4 will require:

- One 30 minute macro-invertebrate sweep (at a location within 100 metres of the vegetation survey sites)
- Water quality assessment at the macro-invertebrate site using a multi-meter

In addition to the above, a traverse of all reaches is to be undertaken annually, and after a one in five year rain event to identify any erosion points, weed infestations or other management issues. The temperature ranges provided above are indicative only and depending on seasonal conditions surveys may occur on cooler days.

5.2 Progress reports

Progress reporting will occur on a 6 monthly basis throughout the duration of the contract. This reporting includes the implementation of the monitoring actions specified in **Section 5.1**.. In addition to a description of the works that have been undertaken, this report should be structured to address the following questions:

- What environmental threats have been reduced?
- What environmental improvements have been achieved?
- What tasks have been successful?
- What has not been successful?
- What measures, if any, have been taken to rectify problems?
- What issues need to be addressed?
- What are the outcomes of the management activities?
- Recommendations for revising the task program, if necessary

An independent qualified environmental practitioner, appointed by the landowner, will audit the monitoring program every two years

5.3 Performance criteria

The performance criteria required for the site and to be assessed every 6 months are listed in **Table 6**. The performance criteria listed are compatible with the VMS requirements. If monitoring indicates that the VMP tasks are not resulting in achievement of the performance criteria, the task program will be revised. The bush regeneration contractor, in consultation with Camden Council, can adapt these criteria as required in response to the success of rehabilitation works.

Where non-performance occurs and is not immediately rectified a 'stop the clock' notice on the maintenance period will be issued by Camden Council until the non-performance is rectified.

Table 6: Performance criteria

Applicable to	End of Year 1	End of Year 2	End of Year 3	End of Year 4	End of Year 5
All zones	Commencement of all tasks outlined in the VMP or evidence of planning for their implementation. A demonstrated increase in native cover and diversity and a demonstrated decrease in exotic cover and diversity				
Control of noxious, vines and larger woody weeds	80% of all adult individuals to be controlled No plants allowed to set seed and all seeding individuals removed No establishment of new noxious species	All regrowth to be maintained to no greater than 30% coverage No plants allowed to set seed No establishment of new noxious species	All regrowth to be maintained to no greater than 15% coverage No plants allowed to set seed No establishment of new noxious species	All regrowth to be maintained to no greater than 5% coverage No plants allowed to set seed No establishment of new noxious species	Complete eradication from the site
Control of exotic groundcovers	Maximum exotic groundcover covers no greater than 70%	Maximum exotic groundcover covers no greater than 60%	Maximum exotic groundcover covers no greater than 40%	Maximum exotic groundcover covers no greater than 20%	Maximum exotic groundcover covers no greater than 10%
Natives	Minimum native vegetation groundcover no less than 20% of each zone	Minimum native vegetation groundcover no less than 30% of each zone	Minimum native vegetation groundcover no less than 50% of each zone	Minimum native vegetation groundcover no less than 60% of each zone	Minimum native vegetation groundcover no less than 70% of each zone
Revegetation areas	A minimum of 85% survival rate of all revegetation. Installation of all plants not including replacement plants to be undertaken by end of Year 1. If timing does not coincide with planting periods (Spring and Autumn) evidence to be supplied of planning for planting i.e. invoice for plants. Plants to be installed in mulched areas as per **Appendix B** Any localised plant failure within planting areas are addressed with no area larger than 2 m x 2 m without surviving plants Replanting is to replace plants by the same species, or where that species is not available, with the same growth form (i.e. tree for tree etc) and must not decrease species diversity. Any new species must be from the community being emulated and of local provenance.				

6 Implementation Schedule & Cost

For the purpose of the VMP costings, Riley's Creek Conservation Area, as identified in the VMS, has been divided into a northern and southern element. The proposed Corade DA within Lot 1203 affects the northern conservation area. Recommended management zones have been provided for both conservation areas. Performance criteria can be applied to both areas.

The cost to implement restoration works detailed in this VMP:

For the northern conservation area is estimated at approximately **$400,000** (ex GST) as outlined in **Table 7**. This includes the installation of revegetation numbers detailed in **Table 8.**

The cost to implement restoration works detailed in this VMP within the southern conservation area is estimated at approximately **$1,000,000** (ex GST) as outlined in **Table 9**. This includes the installation of revegetation numbers detailed in Table 10**.**

These costings have been provided to SH Camden Valley Pty Ltd and Corade Developments Pty Ltd in order for them to be able to quantify works required on this site using ELA's commercial rates. As such, ELA requests that these figures not be provided to a third party, e.g. tenderers, without the knowledge or approval of ELA.

6.1 Implementation

An indicative schedule is included **Table 11**. Note the timing of planting is indicative meant to show that initial plantings will be installed in the first year of the project and that replacement plantings will be installed over the four years following from the first year to ensure the aims of plant replacement, enhanced species diversity and erosion control are achieved.

6.2 Regeneration

Weed control and regeneration works have been calculated at $2,000 for a team of four bush regenerators per day. The cost of bush regeneration works includes travel and the costs of herbicide, vehicles and equipment which are required to implement the proposed works.

6.3 Revegetation

Revegetation costs have been calculated at $3.00 per plant including planting, water crystals, installation of plant guards and stakes, and initial watering for shrub and canopy species, and $1.75 per plant including planting, water crystals and initial watering for understorey species. It has been estimated that approximately 86,375 plants will be required for the NCA and 83,658 for the SCA, plus an additional 10% for replacement plantings, based on the densities and areas derived from the VMP and on-site inspections (**Table 8** & **Table 10**). Replacement plants will used to principally replace failed plantings, but can also be utilised to cover bare spots, reduce erosion within the stream and act to increase species diversity across the site.

6.4 Monitoring and reporting

All monitoring, mapping and reporting works have been calculated using the rate for a qualified and trained Restoration Ecologist of $150 / hr.

6.5 Bonds

Restoration works are typically subject to bonds under the *Water Management Act, 2000*. If the Office of Water requires bonds, it is recommended that a series of bonds are established that reflect the phases of works. It is also recommended that the bonds are limited to the extent of the riparian corridor associated with Riley's Creek, not the entire Riparian Conservation area identified in the VMS or the entire extent of the management are of this VMP.

For the northern conservation area the riparian corridor component of this VMP is 1.17 ha in area. Suggested bonds would be:

- Bond 1 (Year 1 - $176,000), released upon completion of year 1 tasks
- Bond 2 (Year 2 - $35,000), released upon completion of year 2 task
- Bond 3 (Year 3 - $24,000), released upon completion of year 3 tasks

For the southern conservation area the riparian corridor component of this VMP is 2.07 ha in area. Suggested bonds would be:

- Bond 1 (Year 1 - $170,000), released upon completion of year 1 tasks
- Bond 2 (Year 2 - $51,000), released upon completion of year 2 task
- Bond 3 (Year 3 - $36,000), released upon completion of year 3 tasks

Table 7: Implementation costs - Northern Conservation Area

Treatment Zone	Area (m^2)	Reveg Area (m^2)	Regeneration			Revegetation				Assoc. costs		TOTAL
			Primary	Secondary	Maintenance	Site prep / spray grasses	Mulch supply & spread	Tubestock & installation	Maintenance	Monit & reportin g	Waste	
			Year 1	Year 2	Years 3 - 5	Year 1		Year 1 & 2	Years 1 - 5			
1. Regeneration	3200	800	$9,600	$4,800	$9,600	$2,400		$6,252	$8,000	$5,596	$813	*$47,062*
2. Revegetation - AW	3000	3000				$9,000	$18,000	$35,343	$30,000	$12,871	$1,847	*$107,061*
3. Revegetation - CPW	5200	5200				$15,600	$31,200	$41,241	$52,000	$19,608	$2,801	*$162,450*
4. In stream	1800	270	$5,400	$2,700	$5,400	$810		$4,158	$2,700	$2,894	$423	*$24,485*
5. Rain Gardens	1800	1800				$5,400		$27,720	$18,000	$7,144	$1,022	*$59,287*
TOTALS	**15,000**	**11,070**	**$15,000**	**$7,500**	**$15,000**	**$33,210**	**$49,200**	**$114,715**	**$110,700**	**$48,113**	**$6,906**	**$400,344**

Table 8: Revegetation numbers and costs - Northern Conservation Area

Treatment Zone	Area (m2)	Reveg Area (m^2)	Number of plants					Cost	Replacement cost	TOTAL
			Tree	Shrub	Herbs / Scramblers	Sedge / Grass	Totals			
1. Regeneration	3200	800	8	20	800	2400	*3228*	$5,684	$568	*$6,252*
2. Revegetation - AW	3000	3000	60	150	3000	15000	*18210*	$32,130	$3,213	*$35,343*
3. Revegetation - CPW	5200	5200	104	260	5200	15600	*21164*	$37,492	$3,749	*$41,241*
4. In stream	1800	270			270	1890	*2160*	$3,780	$378	*$4,158*
5 - Rain Gardens	1800	1800			1800	12600	*14400*	$25,200	$2,520	*$27,720*
Total	**15000**	**11070**	**172**	**430**	**11070**	**47490**	**59162**	**$104,286**	**$10,429**	***$114,715***

Table 9: Implementation costs - Southern Conservation Area

Treatment Zone	Area (m^2)	Reveg Area (m^2)	Regeneration			Revegetation				Assoc. costs		TOTAL
			Primary	Secondary	Maintenance	Site prep / spray grasses	Mulch supply & spread	Tubestock & installation	Maintenance	Monitoring & reporting	Waste	
			Year 1	Year 2	Years 3 - 5	Year 1		Year 1 & 2	Years 1 - 5			
1 - Regeneration	44,300	11,075	$88,600	$55,375	$132,900	$33,225		$86,557	$110,750	$30,072	$10,148	*$547,627*
2 - Revegetation - AW	1,100	1,100				$3,300	$6,600	$12,959	$11,000	$2,028	$677	*$36,564*
3 - Revegetation - CPW	12,900	12,900				$38,700	$77,400	$102,310	$129,000	$20,898	$6,948	*$375,256*
4 - In stream	6,300	945	$18,900	$9,450	$18,900	$2,835		$14,553	$9,450	$4,352	$1,482	*$79,922*
5 - Rain Garden	200	200				$600		$3,080	$0	$225	$74	*$3,979*
TOTALS	**64,800**	**26,220**	**$107,500**	**$64,825**	**$151,800**	**$78,660**	**$84,000**	**$219,459**	**$260,200**	**$57,574**	**$19,329**	**$1,043,347**

Table 10: Revegetation numbers and costs - Southern Conservation Area

Treatment Zone	Area (m2)	Revege Area (m^2)	Number of plants					Cost	Replacement cost	TOTAL
			Tree	Shrub	Herbs / Scramblers	Sedge / Grass	Totals			
1. Regeneration	44,300	11,075	111	277	11075	33225	*44688*	$78,688	$7,869	*$86,557*
2. Revegetation - AW	1,100	1,100	22	55	1100	5500	*6677*	$11,781	$1,178	*$12,959*
3. Revegetation - CPW	12,900	12,900	258	645	12900	38700	*52503*	$93,009	$9,301	*$102,310*
4. In stream	6,300	945			945	6615	*7560*	$13,230	$1,323	*$14,553*
5 - Rain Gardens	200	200			200	1400	*1600*	$2,800	$280	*$3,080*
Total	**64,800**	**26,220**	**391**	**977**	**26220**	**85440**	**113028**	**$199,508**	**$19,951**	***$219,459***

Table 11: Implementation schedule

Riley's Creek Conservation Area		Year 1												Year 2												Year 3											
Management Zone	**Works**	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. Regeneration	Primary	■	■	■	■	■	■	■	■	■	■	■	■																								
	Secondary													■	■	■	■	■	■	■	■	■	■	■	■												
	Infill plant installation											■						■											■									
	Maintenance																									■	■	■	■	■	■	■	■	■	■	■	■
2. Revegetation - AW	Site preperation	■	■																																		
	Mulching				■																																
	Plant installation										■	■																									
	Replacement planting																	■											■								
	Maintenance										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3. Revegtation - CPW	Site preperation	■	■	■																																	
	Mulching				■	■																															
	Plant installation										■	■																									
	Replacement planting																	■											■								
	Maintenance										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4. In stream	Primary	■	■	■	■	■	■	■	■	■	■	■	■																								
	Secondary													■	■	■	■	■	■	■	■	■	■	■	■												
	Infill plant installation											■						■											■									
	Maintenance																									■	■	■	■	■	■	■	■	■	■	■	■
Six monthly reporting								■						■						■						■						■					

Riley's Creek Conservation Area		Year 4												Year 5											
Management Zone	**Works**	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1. Regeneration	Primary																								
	Secondary																								
	Infill plant installation								■									■							
	Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
2. Revegetation - AW	Site preperation																								
	Mulching																								
	Plant installation																								
	Replacement planting								■									■							
	Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3. Revegtation - CPW	Site preperation																								
	Mulching																								
	Plant installation																								
	Replacement planting								■									■							
	Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
4. In stream	Primary																								
	Secondary																								
	Infill plant installation								■									■							
	Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Six monthly reporting		■						■						■						■					■

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Appendix A Noxious Weed Categories

Management zone	Weed type	Example control requirements
Class 1	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.	The plant must be eradicated from the land and the land must be kept free of the plant.
Class 2	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.	The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 3	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.	The plant must be eradicated from the land and the land must be kept free of the plant.
Class 4	Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.	The weeds are also "notifiable" and a range of restrictions on their sale and movement exist.
Class 5	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.	The plant must be fully and continuously suppressed and destroyed.*

Appendix B Techniques and specifications

Weed control

Weed control involves a combination of mechanical, physical and chemical techniques to remove the weeds and prevent regrowth. Weed control will be undertaken in all management zones. A selection of the best suited weed control method within the site depends on a number of factors including:

- the species or combination of weeds being targeted
- the density of the weeds
- resources available (time, labour, equipment and finances)
- weather conditions of the day

Weed control techniques

Detail of specific weed control techniques to be used such as cut and paint, scrape and paint, herbicide spraying and hand weeding are given in Brodie (1999). The principles of bush regeneration and techniques to trigger natural regeneration are to be in accordance with the Bradley Method and other techniques described in Buchanan (2000). Management techniques for different types of weeds are provided below.

Annual grasses

Annual grasses, such as *Bromus catharticus* (Prairie Grass), should be hand removed or spot sprayed where isolated or in low concentrations. Larger patches of annual grasses may be slashed/brush cut in late spring to early summer, after flowering, but prior to seed set. For most species, slashing/brush cutting prior to late spring through to early summer will promote vigorous growth and should not occur. However, some annual grasses can grow and produce seed at any time of the year dependent on climatic conditions such as high rainfall and warm temperatures. Monitoring of annual species should be undertaken and if new growth occurs, the same treatment will be applied to the new growth to prevent seed production. Individual plants should be hand removed, bagged and disposed of appropriately offsite.

Perennial grasses

Perennial grasses, such as *Paspalum dilatatum* (Paspalum) and *Pennisetum clandestinum* (Kikuyu Grass), will be hand removed where isolated or in low concentrations. Larger patches may be slashed prior to seed production in spring or summer (depending on the growth cycle of the species) and the regrowth spot-sprayed 2-3 weeks later when it is actively growing and approximately 10 cm in length. Monitoring of these species will occur and if new seed production occurs, the same treatment will be applied again as required. However, slashing will not reduce the presence of exotic grasses on its own and must always be combined with targeted removal to reduce densities and allow for native regeneration. Individual plants should be hand removed, bagged and disposed of appropriately offsite.

Woody weeds

Woody weeds onsite in particular *Cestrum parqui* (Green Cestrum), *Lantana camara* (Lantana), *Lycium ferocissimum (Afircan Boxthorn)* and *Olea europaea* subsp. *cuspidata.* (African Olive) will be controlled by the cut and paint or drill and fill method using a non-selective herbicide. The most appropriate method to be used depends on the size of the individual to be removed and will be determined by the bush regeneration contractor. Primary weed control should use techniques that will not encourage

flushes of secondary weed growth. All seedlings of woody weeds will be hand pulled or spot-sprayed with a non-selective herbicide.

Creepers and climbers

The control of creepers, varies depending on the species. For the most part, seedlings will be hand pulled, while mature plants can be controlled by the stem-scrape method or spot spraying using a non-selective herbicide. The precise method to be used will be determined by the bush regeneration contractor depending on the species, size and reproductive status of the individual. All vegetative material removed should be bagged, removed from site and disposed of appropriately.

Herbaceous weeds

Where individual plants of other herbaceous weeds are found, they will be hand pulled or slashed prior to flowering. Where large swaths of these species occur they will be sprayed using a non-selective herbicide. If high densities of mature stands occur, weeds may be slashed first using a brush cutter and any subsequent regrowth sprayed. Regular monitoring of these species will be required to prevent seed production. *Cirsium vulgare* (Spear Thistle) will not be hand-pulled due to its thorns and instead will be spot sprayed using a non-selective herbicide. All vegetative material that is pulled out and has the potential to regrow if deposited on ground will be bagged and removed from site.

Herbicide use

The use of herbicide to control weeds should be carefully considered. Herbicide use should assess potential long-term impacts of the technique including whether the proposed works actually address the source of the weed infestation. However, herbicide application forms an important and useful component of an integrated weed management approach and can be the most appropriate method to control some weed species.

Herbicide use should occur during the active growing season for plants to encourage the chemical uptake into the plant. The selection of herbicides should also consider the type of weed and the location. Where non-selective herbicides are required for use, glyphosate is the most suitable. If herbicides are required to be used near waterways, a glyphosate-based herbicide formulated for use near waterways will be used (e.g. RoundUp© Biactive™).

Broad-leaf selective herbicide may be used as per the *Noxious and environmental weed control handbook* (DPI 2010). However, this type of herbicide is extremely toxic to aquatic life and must not be used in, or adjacent to, waterways. Registration and records must be kept in accordance with the NSW *Pesticide Regulation 2009*.

Revegetation works & provenance plan supply

Revegetation has the aims of re-establishing the original native vegetation community at the site, creating a continuous corridor for flora and fauna movement and reducing erosion along the length of the riparian corridor, which will carry greatly increased peak flows due the increased run-off from the hard surfaces created by the associated residential development.

Any plantings should consist of suitable provenance stock. Current research suggests that seed sourcing should concentrate less on 'local' collection and more on capturing high quality and genetically diverse seed in order to maximise the adaptive potential of restoration efforts to current and future environmental change. Florabank's collection guidelines reflect this emerging understanding and advise that, while seed should be collected as locally as possible, the matching of environmental

conditions at the planting site with those of the collection location is the most important consideration in establishing the collection range. Recommended species have been provided in **Appendix C**. A summary of the revegetation densities is shown in **Table 5**.

Planting of *Hiko* for trees and shrub species and *Hiko* or *Viro* cells for grasses and other groundcover species is the preferred method. Planting should be done via a low impact method such as hand digging or hand auger. The holes dug for each plant should be at least 1.5x the width and 2x the depth of the rootball. Fertiliser should be added to each hole dug as per the label specifications. Water crystals or wetting agents should be added to each plant hole. This will increase the water holding capacity of the soil and reduce watering schedules. Initial irrigation of the plantings is essential to ensure that the soil forms around the rootball and no air pockets are left. This will be required unless sufficient rainfall (approx 10mm) occurs on the day of planting.

Tree guards will need to be installed on each tree or shrub to protect seedlings from extreme weather (frosts and heat), herbivorous grazing and herbicide drift during maintenance. Bio-degradable tree guards are recommended to protect the seedlings. Following the revegetation works, irrigation needs to be undertaken for at least 8 weeks following planting to ensure the establishment of the plants. The level of irrigation will be determined by rainfall and temperature experienced at the planting site.

Mulch should be used where identified. The use of mulch is very important because it provides organic matter to the top soil, improves soil structure and aeration, water infiltration, nutrient availability, and is also useful in the suppression of weed growth (Buchanan 2009). Mulch should be sourced from within the local area. Mulch must be free of weed propagules and invasive woody species such as Coral Tree (*Erythrina x sykesii*). Mulching should not be undertaken within areas of high potential erosion. It is recommended jute matting is used in these areas prior to revegetation.

Plants should be installed in spring or autumn months, to take advantage of suitable weather conditions for planting. A maximum rate of attrition of 10% is to be tolerated, with any plant loss above this rate to be replaced at the contractor's expense.

Provenance plant / seed supply

Any plantings or native seed to be utilised should consist of suitable provenance stock. Current research suggests that seed sourcing should concentrate less on 'local' collection and more on capturing high quality and genetically diverse seed in order to maximise the adaptive potential of restoration efforts to current and future environmental change. Florabank's collection guidelines reflect this emerging understanding and advise that, while seed should be collected as locally as possible, the matching of environmental conditions at the planting site with those of the collection location is the most important consideration in establishing the collection range.

Bush regeneration contractors

All vegetation management works in the establishment phase will be undertaken by suitably qualified and experienced bush regeneration contractors who are members of the Australian Association of Bush Regenerators or fulfil the membership criteria. In addition to this, team leaders should have, as a minimum, a Certificate III in Conservation & Land Management or equivalent. The contractor will need to carry out best practice bush regeneration techniques as described by Buchanan (2009). A flexible approach to this site is recommended since techniques may need to be changed or modified to suit site conditions. This approach is consistent with adaptive management and allows the contractor to develop and build on site knowledge whilst implementing this VMP. Monitoring will assist in the development of the VMP actions in subsequent years.

Appendix C Recommended species list for revegetation

Type	Scientific name	Common name	Treatment Zone					
			1: AW & CPW	2: AW	3: CPW	4: FW	Rain Gardens	Saline areas
Tree Canopy Species (>6m)	*Angophora floribunda*	Rough-barked Apple	X	X				
	Angophora subvelutina	Broad-leaved Apple	X	X	X			
	Casuarina cunninghamiana subsp. cunninghamiana	River oak	X	X				
	Casuarina glauca	Swamp Oak	X	X				X
	Eucalyptus crebra	Narrow-leaved ironbark	X		X			
	Eucalyptus moluccana	Grey Box	X		X			
	Eucalyptus tereticornis	Forest Red Gum	X	X	X			
Small Trees / Shrub Species (1.5-6m)	*Acacia floribunda*	White Sally	X	X				
	Acacia parramattensis	Parramatta Wattle	X	X				
	Acacia implexa	Lightwood	X		X			
	Backhousia myrtifolia	Grey myrtle	X	X				
	Breynia oblongifolia	Coffee bush	X	X				
	Bursaria spinosa	Blackthorn	X	X	X			
	Daviesia ulicifolia	Gorse bitter pea	X		X			
	Dodonaea viscosa subsp. cuneata	Wedge-leaf Hop-bush	X		X			
	Indigofera australis	Australian Indigo	X		X			
	Melaleuca decora	-	X	X				
	Melaleuca nodosa	Prickly-leaf Paperbark						X
	Melaleuca styphelioides	Prickly-leaved Tea Tree	X	X				

Type	Scientific name	Common name	Treatment Zone					
			1: AW & CPW	2: AW	3: CPW	4: FW	Rain Gardens	Saline areas
Sedges, Rushes, Reeds & Grasses	*Aristida ramosa*	Purple Wiregrass	X		X			
	Aristida vagans	Threeawn Speargrass	X		X			
	Atriplex semibaccata	Creeping Saltbush						X
	Bolboschoenus caldwellii	Marsh clubrush				X	X	X
	Bolboschoenus fluviatilis	Marsh Club-sedge						X
	Carex appressa	Tall sedge				X	X	
	Carex pumila	Strand sedge						X
	Chloris truncata	Windmill Grass	X		X			
	Cymbopogon refractus	Barbed-wire Grass	X	X	X		X	
	Cyperus gracilis	Slender Flat-sedge	X		X	X	X	
	Dianella longifolia	Blueberry Lily	X		X	X	X	
	Dichelachne micrantha	Shorthair Plumegrass	X	X	X			
	Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass	X	X	X			
	Echinopogon ovatus	Forest Hedgehog Grass	X	X	X			
	Imperata cylindrica var. major	Blady Grass	X	X				
	Juncus usitatus	Common Rush	X		X	X	X	
	Lomandra filiformis	-	X	X	X			
	Lomandra longifolia	Spiny-head Mat-rush	X	X		X	X	
	Lomandra multiflora subsp. multiflora	-	X	X	X			
	Microlaena stipoides var. stipoides	Weeping Meadow Grass	X	X	X			
	Oplismenus imbecillis	Basket Grass	X	X				

Type	Scientific name	Common name	Treatment Zone					
			1: AW & CPW	2: AW	3: CPW	4: FW	Rain Gardens	Saline areas
	Poa labillardieri var. labillardieri	Tussock Grass	X		X		X	
	Themeda australis	Kangaroo Grass	X	X	X		X	
Groundcover Species (<1.5m) & Vines/ Scramblers	*Brunoniella australis*	Blue Trumpet	X		X			
	Centella asiatica	Indian Pennywort	X	X	X	X		
	Clematis glycinoides	Old Man's Beard	X	X	X			
	Commelina cyanea	Creeping Christian	X	X	X	X		
	Cotula coronopifolia	Water Buttons				X		X
	Desmodium varians	Slender Tick-trefoil	X		X			
	Dichondra repens	Kidney Weed	X	X	X	X		
	Einadia hastata	Berry Saltbush	X	X	X			?
	Einadia polygonoides	-	X		X			
	Einadia trigonos	Fishweed	X	X	X			
	Geranium solanderi	Native Geranium	X	X	X			
	Glycine clandestina	Twining Glycine	X		X			
	Hardenbergia violacea	Purple Coral Pea	X	X	X			
	Portulaca oleracea	Pigweed						X
	Pratia purpurascens	Whiteroot	X	X	X	X		
	Plectranthus parviflorus	Cockspur flower	X	X	X	X		
	Veronica plebia	Creeping Speedwell	X	X	X	X		
	Wahlenbergia gracilis	Sprawling Bluebell	X	X	X			

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