

June 2011

ENVIRONMENTAL MANAGEMENT STRATEGY (EMS)
LANDSCAPE AND VEGETATION MANAGEMENT PLAN

Former QUARRY SITE AT OLD WALLGROVE ROAD EASTERN CREEK
MATERIALS PROCESSING CENTRE (MPC)

WASTE TRANSFER FACILITY associated with an adjacent
PROPOSED SOLID WASTE LANDFILL

Document Control

For controlled copies of this EMS the copy number is shown below and initialled in Red by the Light Horse Business Centre and the ThaQuarry Unit Trust Project Manager.

Reference Documents:

Vegetation Management Plan by Abel Ecology - Consultant Danny Wotherspoon (**Abel**) attached in Annexure A.

Restoration of The Riparian Zone Management Plan by Site Image – Consultant Michael Phillips.

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Issued To:	Original Issue Date:

Issue 1	Authorised by: Christopher Biggs	Page 1
Date: June 2011	Position: Group General Counsel	Prepared by: LHBC

1 LANDSCAPE AND VEGETATION MANAGEMENT PLAN

1.1 PROJECT APPROVAL CONDITIONS

A Landscape and Vegetation Management Plan is required to be prepared and implemented in accordance with Condition 60 of Schedule 3 of the Project Approval. Condition 60 is as follows.

*The Proponent shall prepare and implement a **Landscape and Vegetation Management Plan** for the project to the satisfaction of the Director-General. The plan must:*

- a) *Be prepared in consultation with DWE and Council and be submitted to the Director-General for approval within three months of this approval (the Project Approval);*
- b) *Be prepared in accordance with the DWE's Guidelines for Controlled Activities – Vegetation Management Plans: and*
- c) *Include:*
 - *A Landscape Plan for the project, which identifies screen plantings to minimise visual impacts, particularly on the amenity berms;*
 - *Detailed plans and procedures to*
 - *Restore and maintain the waterways and riparian zones of the Ropes Creek Tributary on the site;*
 - *Manage weeds in the vicinity of the riparian zones;*
 - *Integrate works into the proposed landscaping for the rest of the site;*
 - *Manage impacts on fauna; and*
 - *Monitor the performance of the proposed restoration works.*
- d) *Provide details on how those areas identified as Conservation Areas in the Precinct Plan shall be actively managed for conservation purposes including;*
 - *Improving the quality of the vegetation in these areas;*
 - *Measures to control pests, vermin and noxious weeds; and*
 - *Measures to control access.*

In addition, Conditions 54 and 55 of Schedule 3 of the project Approval define specific planning and construction requirements for the amenity berms, visual screens and impervious barriers.

Issue 1	Authorised by: Christopher Biggs	Page 2
Date: June 2011	Position: Group General Counsel	Prepared by: LHBC

Condition 54 is as follows.

The proponent shall prepare design details for the visual screens, impervious barriers and amenity berms implemented for the facility, having regard to adjoining landowners. This design detail must be submitted to the Director-General for approval prior to the commencement of construction or regrading of the amenity berms, visual screens or impervious barriers.

Condition 55 is as follows.

Prior to the commencement of operations, the Proponent shall:

- a) Construct and maintain for the duration of operations, amenity berms, impervious barriers and visual screens around the perimeter of the operational area (as detailed in the EA, the site plan at Appendix 1 and Schedule 3, Condition 53 above);*
- b) Retain the existing amenity berm to the north east of the quarry void at the perimeter;*
- c) Vegetate the berms in accordance with the Landscape and Vegetation Management Plan at Schedule 3, condition 59;*
- d) Maintain the height of the amenity berms at no less than 10 metres; and*
- e) Conduct all earthworks required to reshape the amenity berms on site, without impacting on adjoining landowners.*

1.2 ACHIEVEMENT OF REQUIREMENTS

Table1.1 lists the consent conditions for the preparation of a Landscape and Vegetation Management Plan, provides a summary of the current compliance status and provides recommendations to achieve compliance and to improve the presentation of the Program.

Table1.1. Landscape and Vegetation Management Plan Compliance Review (Condition 52 of Schedule 3).

CONSENT REQUIREMENTS	COMPLIANCE STATUS
a) <i>Be prepared in consultation with DWE and Council and be submitted to the Director-</i>	Complies Refer Section 1.5.2 of Abel

CONSENT REQUIREMENTS	COMPLIANCE STATUS
<i>General for approval within three months of this approval (the Project Approval);</i>	
b) <i>Be prepared in accordance with the DWE's Guidelines for Controlled Activities – Vegetation Management Plans; and</i>	Complies Refer Section 1.5.2 of Abel
c) <i>Include A Landscape Plan for the project, which identifies screen plantings to minimise visual impacts, particularly on the amenity berms; Detailed plans and procedures to</i> <ul style="list-style-type: none"> a. <i>Restore and maintain the waterways and riparian zones of the Ropes Creek Tributary on the site;</i> b. <i>Manage weeds in the vicinity of the riparian zones;</i> c. <i>Integrate works into the proposed landscaping for the rest of the site;</i> d. <i>Manage impacts on fauna; and</i> e. <i>Monitor the performance of the proposed restoration works.</i> 	<p>Complies Refer Section 1.3 in this Management Plan</p> <p>Complies Refer Section 1.4 in this Management Plan, and Sections 2.2 & 5.2 of Abel.</p> <p>Complies Refer: Section 1.4 in this Management Plan; and Sections 2.2, 4.2 & 7 and Appendices 1-4 of Abel.</p> <p>Complies Refer Section 1.3 of this Management Plan; and Section 4 of Abel generally.</p> <p>Complies Refer 1.6 of this Management Plan, and Section 4.3 of Abel.</p> <p>Complies Refer 1.4 in this Management Plan, and Sections 6 & 7 of Abel.</p>

CONSENT REQUIREMENTS	COMPLIANCE STATUS
d) <i>Provide details on how those areas identified as Conservation Areas in the Precinct Plan shall be actively managed for conservation purposes including; Improving the quality of the vegetation in these areas; Measures to control pests, vermin and noxious weeds; and Measures to control access.</i>	Complies Refer: Section 1.5 and Schedule of Works in this Management Plan; and Sections 1.5.2, 4.2, 4.3, 4.8 & 7 of Abel.

The Project Approval also requires specific landscaping and management of the amenity berms. These requirements are included in Conditions 54 and 55 of Schedule 3 of the Project Approval.

Condition 58 of Development Consent MP 06_0239 dated 22 November 2009 provides relevant criteria in respect to the protection of the various Conservation Areas in the Precinct Plan identified and mapped in the EA.

Condition 59 of Development Consent MP 06_0239 dated 22 November 2009 provides relevant criteria in respect to creek rehabilitation and reinstatement work within Lot 2 DP 262213.

1.3 LANDSCAPING

Landscaping will be carried out to reduce the visual impacts of the Site, with all plantings referencing the Site's topography and using local species for rehabilitation / revegetation works, where possible. Exotic species will not be used.

Vegetation screening and visual management measures are to be put in place to reduce the visual impacts of the Site to surrounding receivers, including the rehabilitation and visually improvement all amenity bunds.

All visual bunds or vegetation screens will utilise native species and weed control will be undertaken as necessary, in accordance with Abel. Plants will be selected with reference to

the Blacktown Creek Regeneration and Revegetation Project as well as Blacktown Council's plans for the Cumberland Plain Woodland so as to keep the Site in harmony with its surrounds.

Native species suitable for rehabilitation works at the Site include:

TREES

Eucalyptus moluccana

Eucalyptus tereticornis

Eucalyptus crebra

Eucalyptus eugenioides

Corymbia maculata

Allocasuarina torulosa

Banksia menziesii

SHRUBS

Hardenbergia violacea

Marsdenia viridiflora subsp. *Viridiflora*

Macrozamia communis

Hypsela sessiliflora

Acacia implexa

Pimelea spicata

Lissanthe strigosa

Indigofera australis

Acacia pubescens, and

Grevillea juniperina subsp. *Juniperin*

Grevillea sericea

GROUNDCOVERS AND GRASSES

Patersonia occidentalis

Pennisetum alopecuroides

Kennedia prostrata

Hardenbergia violacea

Themeda australis

Microlaena stipoides

Lamandra filliformis

Issue 1	Authorised by: Christopher Biggs	Page 6
Date: June 2011	Position: Group General Counsel	Prepared by: LHBC

Dichondra repens

Wahlenbergia gracilis

WETLANDS (OSDs)

Juncus usitatus

Carex appressa

Carex polyantha

Persicaria attenuata

Plants will be sourced locally, with Sydney Wildflower Nursery West at Marsden Park being the preference.

Planting along roads will involve the seeding of native grasses by hydroseeding.



Microlaena stipoides



Lamandra filliformis

Planting on amenity berms will include native grasses and groundcover, in accordance with the Amenity Berms Management Plan, by a combination of hydroseeding and matrix planting. Matrix planting will include *Pennisetum alopecuroides*, *Lamandra filliformis*, and *Hardenbergia violacea*.

Planting in the OSDs will include the matrix planting of native aquatic emergent plants.



Pennisetum alopecuroides

The hydroseeding mixture is to contain a slurry of seed mixture, fertilizer, mulch and water, with application rates as follows:

- Location: as shown on the landscape drawings
- Seed mix: native grasses certified as local provenance only, at 5-10kg/Ha or to rate recommended by supplier,
- Mulch Type: defibrated pinus radiata fibre or approved equivalent at 1500-2000kg/Ha or to rate recommended by supplier,
- Fertiliser Type: to suit native grasses, at 250-500kg/Ha or to rate recommended by supplier,
- Binder: bituminous emulsion or approved equivalent, at 250-500kg/Ha or to rate recommended by supplier, and
- Water: at a rate, suitable to the site conditions, sufficient to assist in the distribution of the seed, fertilizer and mulch.

Tube stock for matrix planting will have the following characteristics:

- Large healthy root systems, with no evidence of root curl, restriction or damage,
- Vigorous, well established, free from disease and pests, of good form consistent with the species or variety,
- Hardened off, not soft or forced, and suitable for planting in the natural climatic conditions prevailing at the site, and in particular shade conditions,

- Grown in their final containers for not less than twelve weeks, and
- Containers shall be free from weeds and of appropriate size in relation to their container.

A visual assessment of the Site will be carried out annually from commencement of operation, to consider the effectiveness of planning and providing recommendations for any additional screening measures (if needed).

1.4 RIPARIAN ZONE: ROPES CREEK TRIBUTARY

The southern part of the Site contains a remnant of the River-Flat Eucalypt Forest. It contains an intermittent watercourse which runs to the west, and into Ropes Creek. The Blacktown Council Precinct Plan stipulates a 40 metre buffer from the top of the bank on each side of the watercourse. This riparian zone, during the boundary readjustment of the area, has been subdivided into its own area of approximately 10ha, being Lot 3 in DP 1145808. No development works are proposed for this Lot.

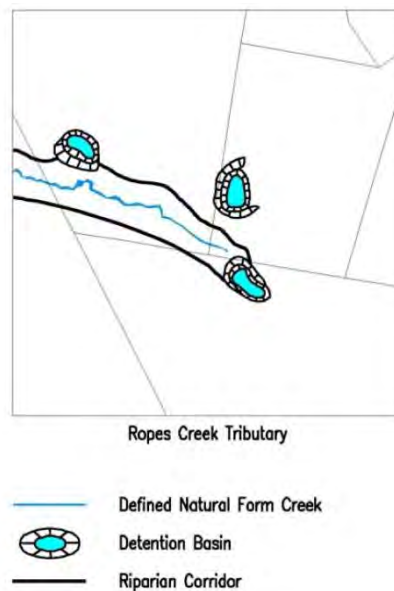
Figure 1.1: Lot 3 in DP 1145808



The area is fenced.



The Blacktown Council Precinct Plan also stipulates a 10 metre buffer from the Upper Angus Creek area. This riparian area is located on neighbouring land owned by Sumy Pty Ltd, adjacent to Lot 4 in DP 1145808, and is not affected by the Project.

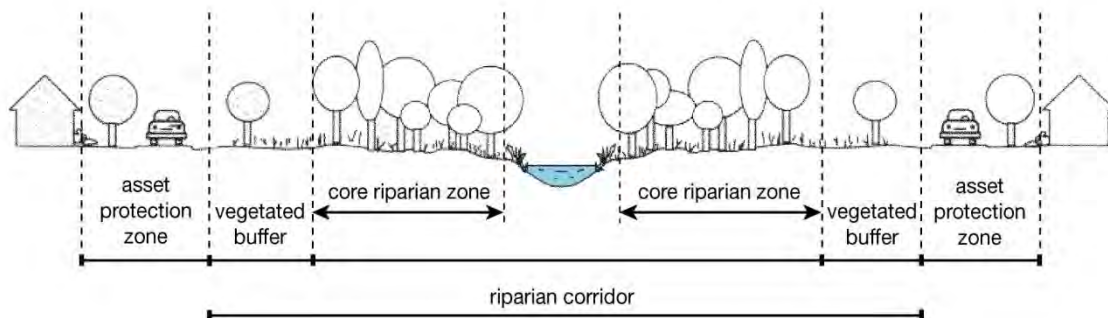


Having the Ropes Creek tributary in its own Lot, with no proposed development on either side of the buffer zone, will ensure that there will be no encroachment on the buffer zones.

Figure 1.2: shows approximate watercourse and buffer zone



Figure 1.3: Riparian corridor zones



In order to facilitate the establishment of a regional vegetation corridor along the Ropes Creek tributary, the Blacktown Council Precinct Plan identifies the following strategies:

- Retain quality stands of trees along the drainage corridor;
- Retain individual trees along the drainage corridor;
- Use native seedbanks for replanting;

- Retain pockets of understorey vegetation within the open space and drainage corridors. These pockets should be regenerated as required, to remove exotic species and enhance native shrub and ground covers;
- The native tree canopy must be retained and enhanced with the aim of developing a continuous canopy;
- Weed control measures must be implemented to remove noxious and environmental weeds from the creek corridor; and
- Only native species shall be used in any landscaping.

The tributary into Ropes Creek had been highly affected by erosion and sedimentation. The following works have been carried out:

- Trees requiring protection have been identified;
- Fill material and sediment within the watercourse has been removed and used to fill the diversion trench and reinstate the ground level in the area;
- The watercourse was reinstated to reflect its original channel form;
- The channel was lined with rocks and gravel to address future scouring and erosion;
- Topsoil was replaced, utilised material stockpiled onsite;
- The banks, restored watercourse and other areas affected by restoration works were revegetated by spray seeding of native grasses. This extends 10 metres on either side of the creek; and
- Regular weed control is being undertaken to identify and control weeds in accordance with the Noxious Weeds Act 1993.

The area has achieved significant improvement.



Whilst the toe of the riparian corridor has been sprayed with native grass seeds, further planting will be needed to achieve a continuous understory link, and continuous tree canopy.

Where possible, the following endangered and vulnerable species from the area will be sourced from local seedbanks for propagation and revegetation in the riparian area:

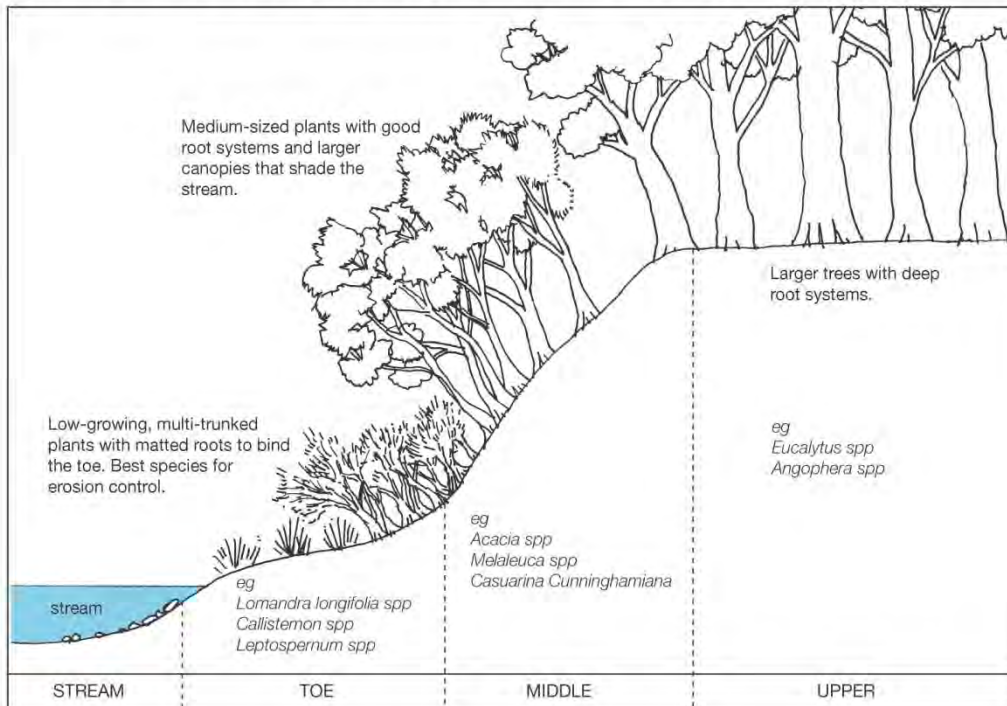
- *Marsdenia viridiflora* subsp. *viridiflora*
- *Hypsela sessiliflora*
- *Pimelea spicata*
- *Acacia pubescens*, and

Issue 1	Authorised by: Christopher Biggs	Page 13
Date: June 2011	Position: Group General Counsel	Prepared by: LHBC

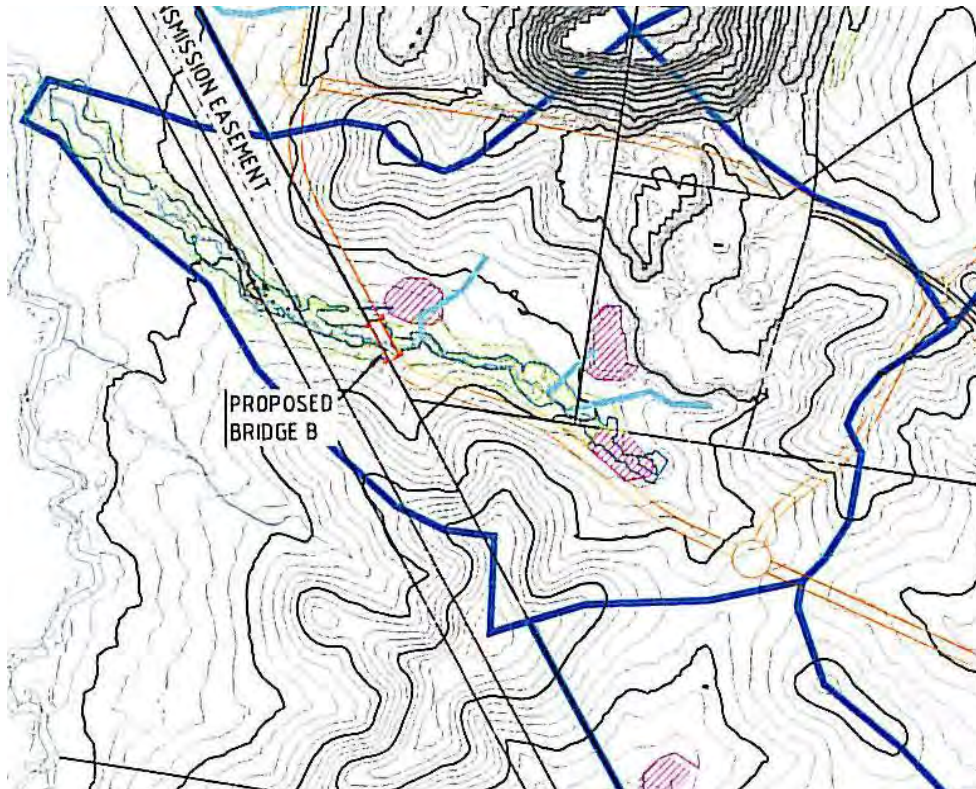
- *Grevillea juniperina* subsp. *juniperina*

Riparian habitat at the south of the site is to be maintained in accordance with Abel.

Figure 1. Typical riparian cross section - Adapted from *Rivercare: Guidelines for Ecological Sustainable Management of Rivers and Riparian Vegetation*: Raine, A.W & Gardiner, J.N, (1995), Land and Water Resources Research and Development Corporation, Canberra.



Until the precinct road is designed and constructed in the area, as shown in the figure below, the Proponent does not propose to establish a continuous canopy in the riparian area. During construction of the road, any planting will be significantly disturbed. Planting will ultimately conform with the toe, middle, and upper levels within the buffer zone as depicted in the figure above.



At the conclusion of the construction of the precinct road, the Proponent will consult with the landscape architect and review the next stage of planting in the riparian area.

1.5 CONSERVATION AREA

The vegetation remnant in the North West corner of the Site is described as representing Cumberland Plain Woodland (Shale Plains Woodland), and has been considered of high ecological importance.



Weed Control and Vegetation Management will be carried out in accordance with the Schedule of Works in the Vegetation Management Plan (VMP) attached in Appendix A, with immediate commencement.

Controlled access to be provided to the Conservation Area. The Conservation Area is shown in blue on Figures 13 and 14 below.

That existing fencing is to be maintained on the western and northern boundaries and dry stone walls (with Security gates at intervals to be constructed along the southern and eastern boundaries to prevent vehicular access while allowing native animal access).

Existing unmade roads in the Conservation Area are to be left untouched as fire and access trails.

Locked gates are to be installed at the perimeter of the Conservation Area to prevent public access.

Trail bike tracks are to be closed, covered with loose earth and leaf litter.

A specific work direction be issued by the Site Project Manager to all relevant Sub-Contractors (including relevant plans) prescribing that NO ACCESS be permitted at any time to the Conservation Area, except for those activities specifically permitted and supervised by the Site Project Manager.

Work practices implemented in respect to the Conservation Area include:

- No vegetation or trees are to be damaged or removed from the Conservation Area except for the removal of African Boxthorn and other Noxious weeds identified in the VMP or the Noxious Weeds Act NSW as specifically permitted and supervised by the Site Project Manager.
- Rocks may be recovered during the carrying out of earthworks on land adjacent to the Conservation Zone and these are to be stockpiled in the areas shown. Stockpiled rocks will later be placed as a perimeter bund or berm surrounding the Conservation Zone to inhibit access by non approved persons, since wire fencing tends to be cut.



Figure 13. Conservation Area - Monitoring Points



Figure 14. Riparian Habitat - Monitoring Points

Weed control techniques - weed control is to be carried out in a manner that minimises negative environmental impacts. Different techniques are required in varying situations, especially along watercourses, which are very sensitive to pollution impacts. See *Appendix 4 General Guidelines for Weed Control*.

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18

1.6 MONITORING AND COMPLIANCE REPORTING

- The Site Project Manager shall monitor the site daily and ensuring all Conservation Areas are secured, provide a weekly report to the Landowner.

Issue 1	Authorised by: Christopher Biggs	Page 18
Date: June 2011	Position: Group General Counsel	Prepared by: LHBC

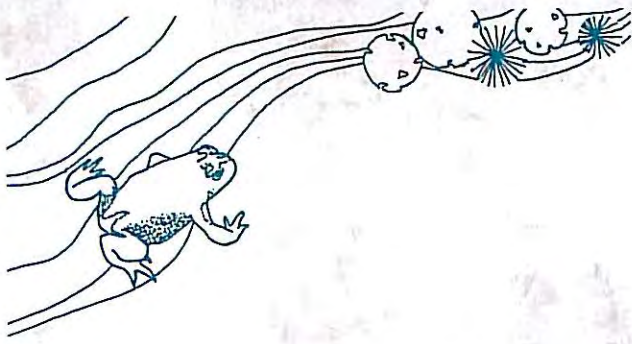
- Weed Monitoring and reporting is to be carried out in accordance with the VMP in the areas and at the points specified using the forms and checklists in “Guidelines for Monitoring a Bushcare Project”.
- Monitoring shall take place at the places shown by the arrow markings on the Figures 13 and 14 above and within the VMP.

1.7 CONTINGENCY MEASURES

- In the event that the perimeter of the Conservation Area is breached then the Site Project Manager will take immediate steps to reprimand the contractor and to require the contractor to make good so far as may be feasible any damage caused.
- The Site Project Manager shall monitor the site daily and provide a weekly report to the Landowner on the following:
 - The impacts and environmental performance of the Cut and Fill Bulk Earthworks.
 - Effectiveness of the management measures in relation to cut and fill works and compaction.
 - Any breaches in work directions or relevant activities (and performance) conducted within the Conservation Area.
 - Any recommendations of ways to improve the environmental performance of the works over time.
- The VMP prepared by Abel Ecology is to be reviewed within 5 years from November 2009.



ANNEXURE A



Abel Ecology

Vegetation Management Plan

for

**Light Horse Business Centre,
Archbold Road, Eastern Creek**

**Lot 2 DP 262213, Lot 1 DP 400697,
Lot 9 DP 241859 and Lot W DP 419612**

Proposed Resource Recovery and Landfill Facility



Date: 22 October 2009

Prepared for: Alexandria Landfill Pty Ltd

Prepared by: Abel Ecology

Abel Ecology is a trading name of

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TABLE OF CONTENTS

1.	General	6
1.1	Purpose of the Plan.....	6
1.2	Land to which the Plan applies.....	6
1.3	Management authority, tenure and ownership	6
1.4	Strategic context	6
1.5	Planning framework.....	6
1.5.1	SEPP 59.....	6
1.5.2	Consent Conditions	7
1.6	Management objectives.....	8
2.	Natural Resource Information and Site History	9
2.1	Conservation Area.....	9
2.2	Riparian Habitat.....	12
3.	Management issues.....	16
4.	Management guidelines	16
4.1	Biodiversity conservation	16
4.2	Vegetation Management and Weeds.....	16
4.3	Fauna	19
4.4	Bushfire.....	20
4.5	Streams and stormwater management.....	21
4.6	Activities and maintenance	22
4.7	Pollution control	22
4.8	Access and occupation.....	23
4.9	Administration.....	24
4.10	Other issues.....	24
5.	Management Zones	24
5.1	Conservation Area.....	24
5.2	Riparian Habitat.....	25
6.	Implementation	25
6.1	Application of management policies and guidelines	25
6.2	Action plan.....	25
6.3	Administration.....	25
6.4	Review of Plan	25
7.	Schedule of Works	27
8.	References.....	30
	Appendix 1. Noxious Weeds in the Blacktown LGA.....	31
	Appendix 2. Treatment of Cumberland Plain Weeds	34
	Herbaceous Weeds and Grasses	34
	Vines	35
	Woody Weeds.....	35
	Appendix 3. Notes on Specific Weed Control	38
	African Boxthorn.....	38
	Appendix 4. General Guidelines for Weed Control	39
	Appendix 5. Company Profile.....	41

TABLE OF FIGURES

Figure 1. Locality Map	4
Figure 2. Site Map	5
Figure 3. Conservation Area - open woodland.....	10
Figure 4. Conservation Area - dense tree regrowth	10
Figure 5. Conservation Area - grassy understorey	11
Figure 6. Conservation Area - Boxthorn thicket.....	11
Figure 7. Conservation Area - Dam	12
Figure 8. Riparian Habitat - remediation	13
Figure 9. Riparian Habitat - west boundary looking west.....	14
Figure 10. Riparian Habitat - centre looking east	14
Figure 11. Riparian Habitat - east boundary looking north.....	15
Figure 12. Riparian Habitat - <i>Juncus acutus</i> thicket on east boundary	15
Figure 13. Conservation Area - Monitoring Points.....	18
Figure 14. Riparian Habitat - Monitoring Points	18
Figure 15. Stormwater Basins	21

LIST OF ABBREVIATIONS

EEC	Endangered Ecological Community
LGA	Local Government Area

Note regarding maps in this report

The maps used in this report having aerial photography, cadastral and topographic information have been obtained from the NSW Department of Lands Spatial Information eXchange and are Copyright © Department of Lands, 2009.

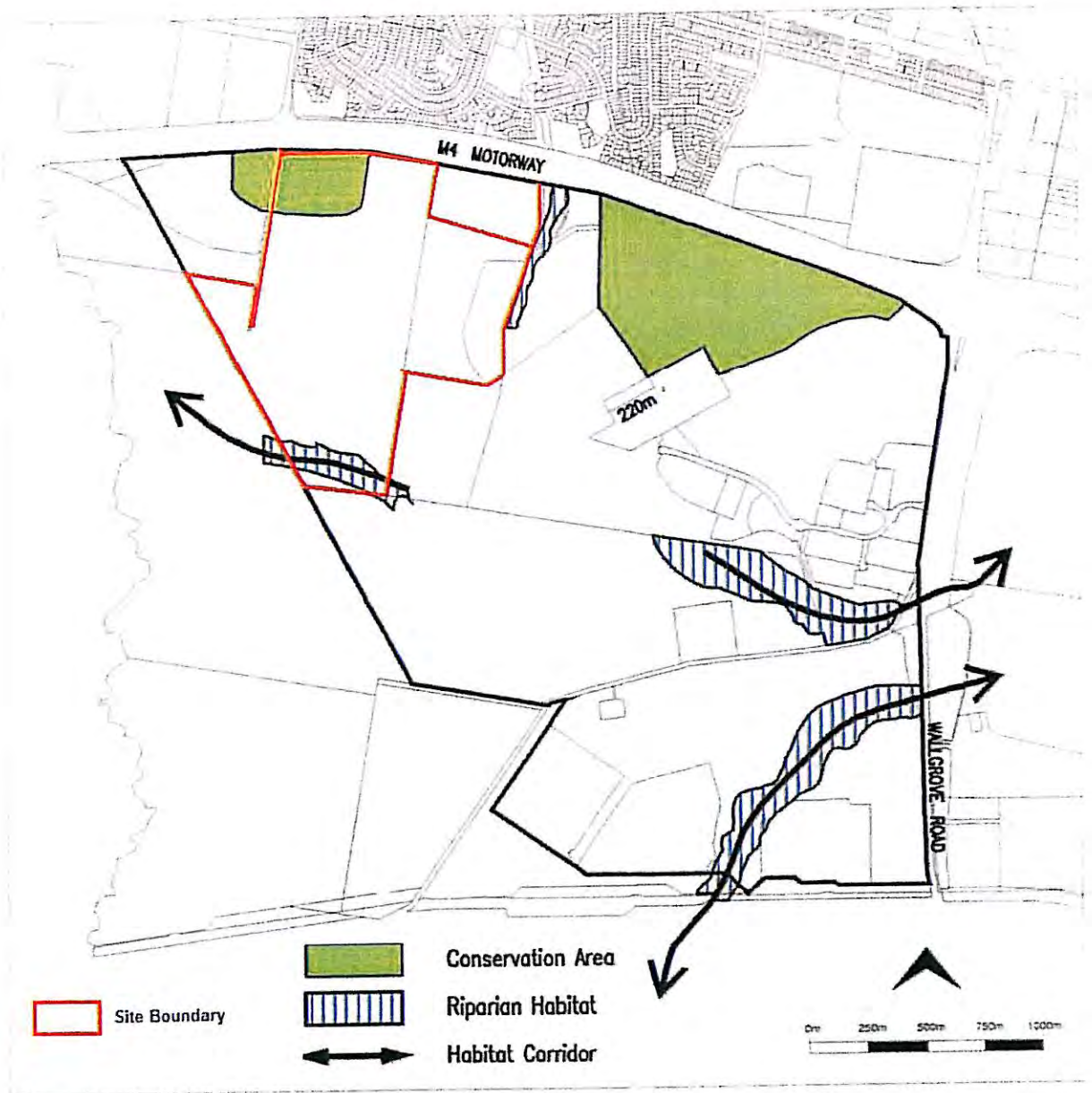
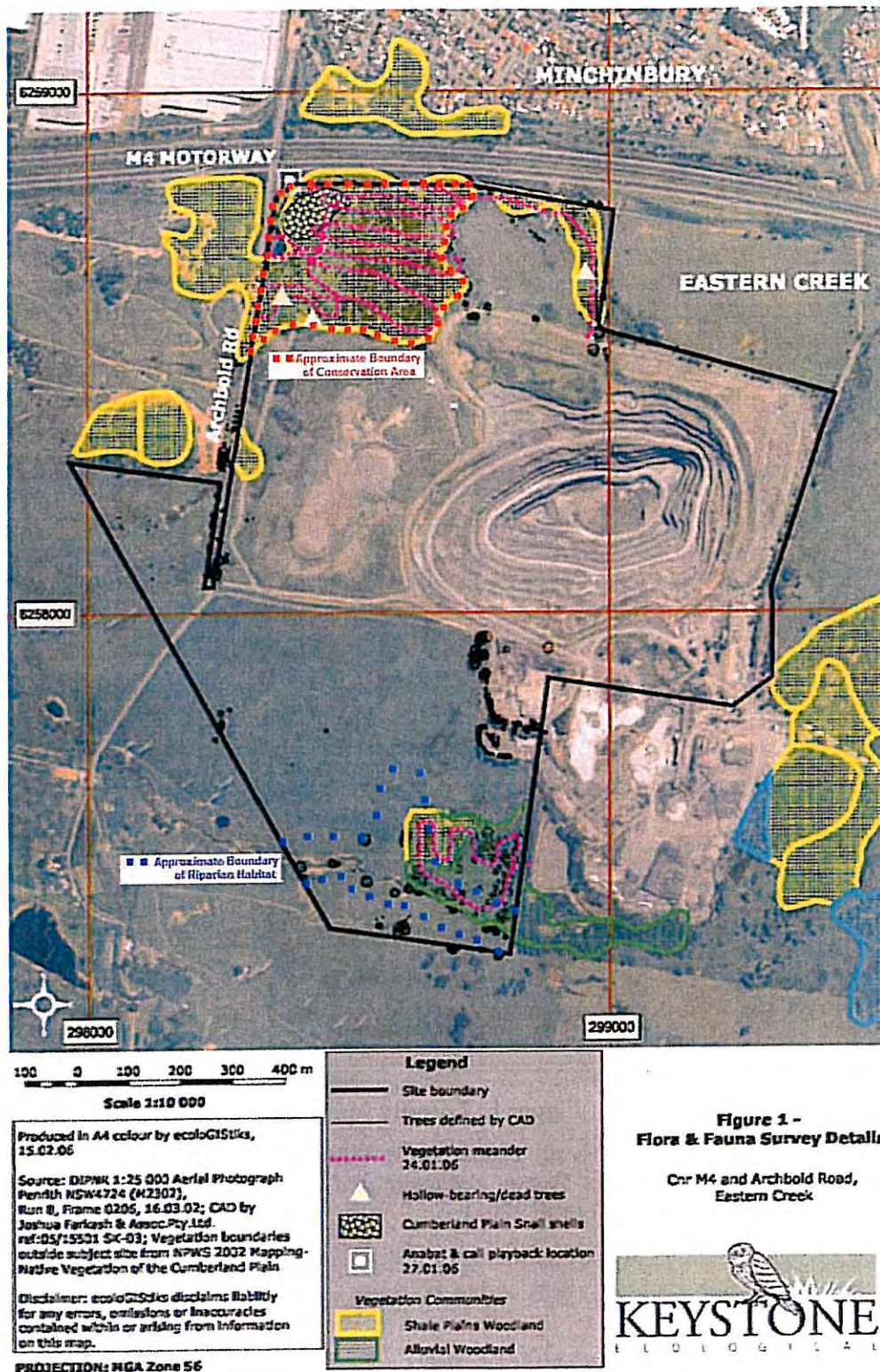


Figure 1. Locality Map

Base map from Figure 17, *Biodiversity Conservation Areas in State Environmental Planning Policy No. 59 – Central Western Sydney Economic and Employment Area, Eastern Creek Precinct Plan* (Blacktown City Council 2005)



1. General

1.1 Purpose of the Plan

This Management Plan specifies the manner in which the land to which it applies will be used and managed. It also specifies the objectives for that use and management. The Plan may also be used to determine priorities for the use of resources and funds and to guide the carrying out of works.

1.2 Land to which the Plan applies

This Plan applies only to the two areas of land identified in Figure 1 and Figure 2 as Conservation Area and Riparian Habitat within Lot 2 DP 262213. This Plan does not apply to all land within this Lot.

The boundaries of the two areas are defined as follows:

1 The Conservation Area

- a) The Conservation Area is bounded by the property boundary to the north and west and Shale Plains Woodland boundary to the south and east. The land is roughly a square of slightly less than 300m x 300m with an area of approximately 8.3ha (Ashby 2007).

2 The Riparian Habitat

- b) The Riparian Habitat according to Section 8.3.5b of SEPP 59 is defined as 40m either side of the bank of Ropes Creek tributary (Blacktown City Council 2005). The land is approximately 80m north-south x 400m east-west with an area of approximately 3.2ha. The locations of the watercourses on site is defined by the Prospect 9030-2N Third Edition Topographic & Orthophoto Map 1:25 000.

We note that there is differences between the areas as defined by the SEPP59 plan and the NPWS 2002 mapping. The maps in SEPP 59 are at coarse scale with no indication of spatial resolution or reference to survey points or other precise spatial data.

1.3 Management authority, tenure and ownership

For the purposes of this Plan, the management authority is the owner of the land, currently Alexandria Landfill Pty Ltd.

1.4 Strategic context

The strategic planning objectives (or vision) for the land to which the Plan applies are:

- a) to protect the remnant native vegetation within natural areas as self-sustaining ecological systems, retaining as far as possible locally indigenous plants and animals
- b) to maintain the scenic, scientific and heritage values of natural areas
- c) to prevent degradation of natural areas and minimise physical disturbance to land
- d) to maintain important habitat reserves

1.5 Planning framework

1.5.1 SEPP 59

The land to which this Plan applies is subject to *State Environmental Planning Policy No. 59 – Central Western Sydney Economic and Employment Area, Eastern Creek Precinct Plan* (Blacktown City Council 2005). This document is referred to as SEPP 59 in this document, and the *Precinct Plan* in the Consent Conditions.

The relevant parts of the SEPP applying to this development have been analysed in detail in the *Guiding Ecological Principles and Constraints* (Ashby 2006) and are included in this Plan.

1.5.2 Consent Conditions

Development consent has been granted in accordance with the conditions reproduced below from the *Eastern Creek Waste Project Final Draft Conditions for Application No 06_0239* (NSW Government Department of Planning 2009).

51. *The Propoeponent (sic) shall not disturb those areas identified as Conservation Areas in the Precinct Plan.*
52. *The Proponent must comply with Clean up notices issued by the Environment Protection Authority to the Proponent in relation to creek rehabilitation and restatement work within Lot 2 DP 262213.*

Landscape and Vegetation Management Plan

53. *The Proponent shall prepare and implement a Landscape and Vegetation Management Plan for the project to the satisfaction of the Director-General. This plan must:*
- a) be prepared in consultation with DWE and Council and be submitted to the Director-General for approval within prior to Construction;*
 - b) be prepared in accordance with DWE's Guidelines for Controlled Activities – Vegetation Management Plans; and*
 - c) include:*
 - a) a Landscape Plan for the project, which identifies screen plantings to minimise visual impacts, particularly on the amenity berms;*
 - b) detailed plans and procedures to:*
 - restore and maintain the waterways and riparian zones of the Ropes Creek Tributary on the site;*
 - manage weeds in the vicinity of the riparian zones;*
 - integrate works into the proposed landscaping for the rest of the site;*
 - manage impacts on fauna; and*
 - monitor the performance of the proposed restoration works.*
 - d) Provide details on how those areas identified as Conservation Areas in the Precinct Plan shall be actively managed for conservation purposes including;*
 - improving the quality of the vegetation in these areas*
 - measure to control pests vermin, and noxious weeds; and*
 - measures to control access.*

This Plan complies with these conditions/exceptions as outlined below.

- 51 This Plan specifies that conservation areas shall be protected from all pedestrian, vehicular, and domestic animal access except for land and vegetation management activities and emergency services.
- 52 This notice has already been complied with and is outside the scope of this Plan.
- 53b The Guidelines for controlled activities (DWE 2008) are specifically for riparian areas and not other terrestrial landscapes. Nevertheless, this Plan complies with the general principles in the Guidelines including measures for controlling access, defining a schedule of works, and using photo monitoring points.
- 53ca The reference to berms and screen plantings apply to the waste facility area, not the conservation areas, which is outside the scope of this Plan.
- 53cb This item has been largely covered by the *Light Horse Business Centre Restoration of the Riparian Zone Management Plan* (Site Image Landscape Architects), the works of which have been completed (See *Section 2.2 Riparian Habitat*). This Plan also specifies protection of the area and exclusion of domestic animals to minimise impacts on fauna, ongoing weed management activities, and performance monitoring.

53cd This Plan specifies active management of vegetation to promote regeneration and improve its quality, measures to control pests and noxious weeds, and measures to control access to the conservation areas.

Requirements under any of the above policies or plans made under the Environmental Planning and Assessment Act 1979, the Native Vegetation Management Act 1997 or the Threatened Species Conservation Act 1995 are independent of, and apply in addition to, the requirements specified by this Management Plan.

1.6 Management objectives

Management objectives for the two areas are informed by SEPP 59 as analysed by the *Guiding Ecological Principles and Constraints* (Ashby 2006), the Consent Conditions, and the *Best Practice Guidelines for the Management and Restoration of Cumberland Plain Bushland* (DEC 2005). DECCW is currently preparing the Cumberland Plain Endangered Ecological Communities Recovery Plan (DECCW 2009), which should be adopted in future vegetation management plans when it is finalised.

The key steps according to the Best Practice Guidelines (DEC 2005), and the way in which this Plan achieves these steps, are outlined below.

1. Retain all existing native vegetation

Both defined areas will be retained in accordance with the Consent Conditions.

2. Protect any retained native vegetation from further degradation by fencing. Consolidate areas of native vegetation by linking remnants

Both areas will be fenced or otherwise protected from further degradation in accordance with the Consent Conditions.

Since the two areas are distinct, widely separated by cleared land, and of different vegetation communities, they cannot be linked. However, since both areas are on the boundary of the property, any development of land adjoining the property should consider linking to these areas. For example, the Riparian Habitat on this land is part of a Riparian Corridor across adjoining properties including the Hanson site to the south east defined in Section 5.0 of SEPP 59 (Blacktown City Council 2005).

3. Actively manage all retained and protected native vegetation. Active management should include activities to suppress weeds, control feral animals and encourage regeneration of native plants. It may also include the linking of remnant vegetation by corridors, increasing the size of remnants through the planting of local native species or the planting of supplementary understorey and groundcover species.

This Plan specifies active management of weeds, feral animals and natural regeneration. Linking the two areas within the property is not possible as outlined above. Increasing the size of the areas is not required under the Consent Conditions.

Planting of supplementary species is not appropriate since it should only occur when natural regeneration is not expected or possible, and all attempts to trigger natural regeneration of soil-stored seed have failed (DEC 2005, NPWS 2004). This Plan outlines methods to encourage and stimulate natural regeneration.

The primary objective of the Plan is to manage the land in a way that protects its natural values. The dominant purpose of management is therefore to protect and maintain the natural ecosystems that are present on the land.

Subsidiary objectives of the Plan are:

- a) to inform Council and the Department of Planning of the way in which the land is to be managed
- b) to achieve the specific objectives and works identified in the Plan
- c) to provide for the Plan's periodic review
- d) to simplify the process of management as far as possible.

2. Natural Resource Information and Site History

The two management areas have been the subject of previous surveys (AMBS 2002) which have informed SEPP 59, and more recent detailed Flora and Fauna Study (Ashby 2007).

2.1 Conservation Area

This area contains Cumberland Plain Woodland (Shale Plains Woodland) which is an endangered ecological community (EEC) listed under the TSC Act (1995) and EPBC Act (1999). Cumberland Plain Woodland has also had a preliminary determination to be listed as Critically Endangered, which was gazetted and exhibited from 21/11/08 to 23/1/09 (DECCW 2008).

Although it was earlier assessed as having high ecological importance due to its size, connectivity with other remnants, structural diversity and the potential or realised habitat for threatened species, it has been cleared and disturbed, it has very few large mature trees with hollows, has many young trees, little understorey, many weed species and a canopy of almost exclusively *Eucalyptus moluccana* (Grey Box). While several threatened plant species were expected to occur in this area, only potential habitat, not the actual species, were found during the recent survey (Ashby 2007).

At the time of the site visit for this report, the vegetation in this area was observed to range from open grassy woodland (Figure 3) to woodland with dense young tree regrowth (Figure 4). Few middle layer shrubs were observed (Figure 1) but this may not be a deficiency as this community is characterised by a grassy and herbaceous understorey (DEC 2005). While a variety of weeds were widespread and scattered throughout the area, the only dense infestation observed was a thicket of African Boxthorn (*Lycium ferocissimum*) in south east corner of the area (Figure 6). The dam in west of the area supported a range of native and exotic aquatic and wet area plants (Figure 7).



Figure 3. Conservation Area - open woodland



Figure 4. Conservation Area - dense tree regrowth



Figure 5. Conservation Area - grassy understorey



Figure 6. Conservation Area - Boxthorn thicket



Figure 7. Conservation Area - Dam

2.2 Riparian Habitat

This area is a shallow valley close to the southern boundary of the property directing water from east to west into Ropes Creek, which is identified in SEPP 59 (Blacktown City Council 2005) under Section 5.2.3 as the Ropes Creek Tributary Catchment, and in Figure 11 and 12 as a Riparian Corridor (Figure 15).

Some water collects from the surrounding land from rainfall, but water is also intermittently discharged from the Overflow Dam on the Hanson site on the eastern boundary (Figure 8), which is pumped from the bottom of the quarry, and for which Hanson have an EPA licence. This discharge will cease when the quarry becomes landfill.



Figure 8. Riparian Habitat - remediation

The south east part of this area contains River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (formerly known as Sydney Coastal River-flat Forest) which is an endangered ecological communities listed under the TSC Act (1995). It was earlier assessed as having moderate ecological importance because of its connectivity to other remnants to the east and connectivity to Ropes Creek in the west.

At the time of the flora survey (Ashby 2007) the main tree species was *Casuarina glauca* (Swamp Oak) with occasional *Eucalyptus moluccana* (Grey Box), the rest of the vegetation was dominated by noxious and other weeds, and the creek line was eroded and sedimented.

In about 2007 Hanson cleared vegetation and constructed an unauthorised dam on their site, causing sludge to discharge into the Riparian Habitat. Works were therefore undertaken in the Riparian Habitat to create a temporary diversion trench on the south boundary of the property (Figure 8), correct scour and erosion, and remove noxious weeds in accordance with the Noxious Weeds Act (1993).

Following a notice to remediate and reinstate the creek being issued by DEECW, a Remediation Plan was prepared and executed to restore the watercourse to its original location, fill in the diversion trench, and re-instate groundcover by spray seeding (Site Image Landscape Architects). Native vegetation was not removed, and the riparian zone was restored to its previous state to the satisfaction of a subsequent DECCW inspection.

At the time of the site visit for this report, the vegetation in this area was observed to range from a rocky creek bed with minimal grass in the west (Figure 9), a shallow grass layer with some reeds and sedges in the centre (Figure 10), through to a *Casuarina* forest with grassy understorey in the east (Figure 11).



Figure 9. Riparian Habitat - west boundary looking west



Figure 10. Riparian Habitat - centre looking east



Figure 11. Riparian Habitat - east boundary looking north

A dense growth of the weed *Juncus acutus* was observed on the upstream end of creek on the east boundary of the property shared with the adjacent Hanson site (Figure 12). This thicket spread into the adjacent Hanson site, on which other weed species were also observed growing. Therefore until the upstream source of weeds is eliminated, ongoing management will be required to remove weeds spread from upstream onto this and other downstream sites.



Figure 12. Riparian Habitat - *Juncus acutus* thicket on east boundary

3. Management issues

Management of the land must take into account the Plan's primary objective, that is, to manage the land in a way that protects its natural values. This entails consideration of the following specific issues:

- a) biodiversity conservation
- b) vegetation management and weeds
- c) fauna
- d) bushfire
- e) streams and stormwater management
- f) activities and maintenance
- g) pollution control
- h) access and occupation
- i) administration
- j) other issues

Section 4 describes, in relation to each management issue, management guidelines that are to be applied and desired outcomes that must be achieved.

The management issues addressed by this Plan can be grouped into three categories relating to:

- a) **protection of natural ecosystems** on the land and their ability to be self-sustaining
- b) **activities carried out on the land** which may adversely affect natural ecosystems on the land
- c) **activities carried out on nearby land** which may adversely affect natural ecosystems on the land.

Some issues may fall into more than one category.

This Plan primarily relates to the first two categories. Issues relating to the latter category are primarily regulated through the process of assessment and determination of development applications under the Environmental Planning and Assessment Act 1979.

4. Management guidelines

4.1 Biodiversity conservation

Biodiversity - refers to the considerable variety of native flora and fauna that occurs in the area. This is important for ecological reasons and also has cultural and social significance.

Diversity - refers to the variety of species and vegetation communities present. An objective of management is to retain the diversity of natural areas.

Rare and threatened plants - no threatened plant species were found on the site in the latest flora survey (Ashby 2007), so no special measures beyond protection of both areas of land is required.

Fragmentation of natural areas - since both portions of land are intact areas to be preserved, and no roads are planned within either area, no extra measures are required to prevent further fragmentation.

4.2 Vegetation Management and Weeds

The aim of vegetation management is to retain the distribution, abundance and diversity of native species and communities presently existing on the land, and to improve the quality of existing vegetation where possible.

The Riparian Habitat is to be periodically inspected and noxious weeds removed. Since weeds in the Conservation Area are widespread and scattered throughout the area at a relatively low density apart from the Boxthorn thicket, the aim should be to progressively control all weeds, not just noxious weeds, to improve the quality of the Cumberland Plain Woodland vegetation.

Dominant species - management is to retain dominant native species and allow natural processes to continue. Natural vegetation communities, whilst self-sustaining, vary over time in response to changes in factors such as climate, bushfire or other disturbances. Communities are generally described in terms of dominant species (especially trees).

Fire sensitivity of plant species - different species have varying sensitivity to fire and may require varying fire frequencies and intensities for survival. This is to be considered in undertaking any management activities involving the use of fire.

Weeds - for the purpose of vegetation management in natural areas, a weed is regarded as any non-indigenous plant.

Weed control - refers to control of non-indigenous native plants in natural areas. Measures are to be implemented to control and manage existing and future processes leading to weed invasion and sources of weeds which are invasive of natural areas. An important element of weed control is an understanding the causes of weed invasion and taking measures to minimise these causes.

Weed monitoring

Monitoring is to be undertaken to identify and respond to the occurrence of plant species which pose a potential threat to natural areas, and to measure the success of weed control measures. The checklists and forms in *Guidelines For Monitoring A Bushcare Project* (HNCMT 2000) may be a useful resource for monitoring.

The following monitoring locations are to be defined (Figure 13 and Figure 14):

- The boundaries of the Conservation Area.
- Two diagonal transects across the width of the Conservation Area, one from the north west to south east corner, and one from the south west to north east corner.
- The perimeter of the dam in the Conservation Area.
- A 20 x 20m quadrat in the boxthorn thicket in south east corner of Conservation Area
- Transects following the approximate line of the watercourses in the Riparian Habitat

All transects are to be visually inspected at the intervals specified in the Activity Schedule, and a record made of the abundance and distribution of weeds along each transect checked against the Flora List and added to the periodic report. The property boundary should also be inspected to monitor rubbish dumping.

The following photo monitoring points are to be set up:

- 1 points at the dam in the Conservation Area
- 1 points in the quadrat in the boxthorn thicket in south east corner of Conservation Area
- 1 point in the middle of the Conservation Area.
- 1 point in the middle of each of the perimeter transects (4 photo points).
- 6 points along the length of the Riparian Habitat

All monitoring points are to be photographed at the intervals specified in the Activity Schedule, and added to the periodic report.

The periodic report is to be prepared and presented to the relevant stakeholders.

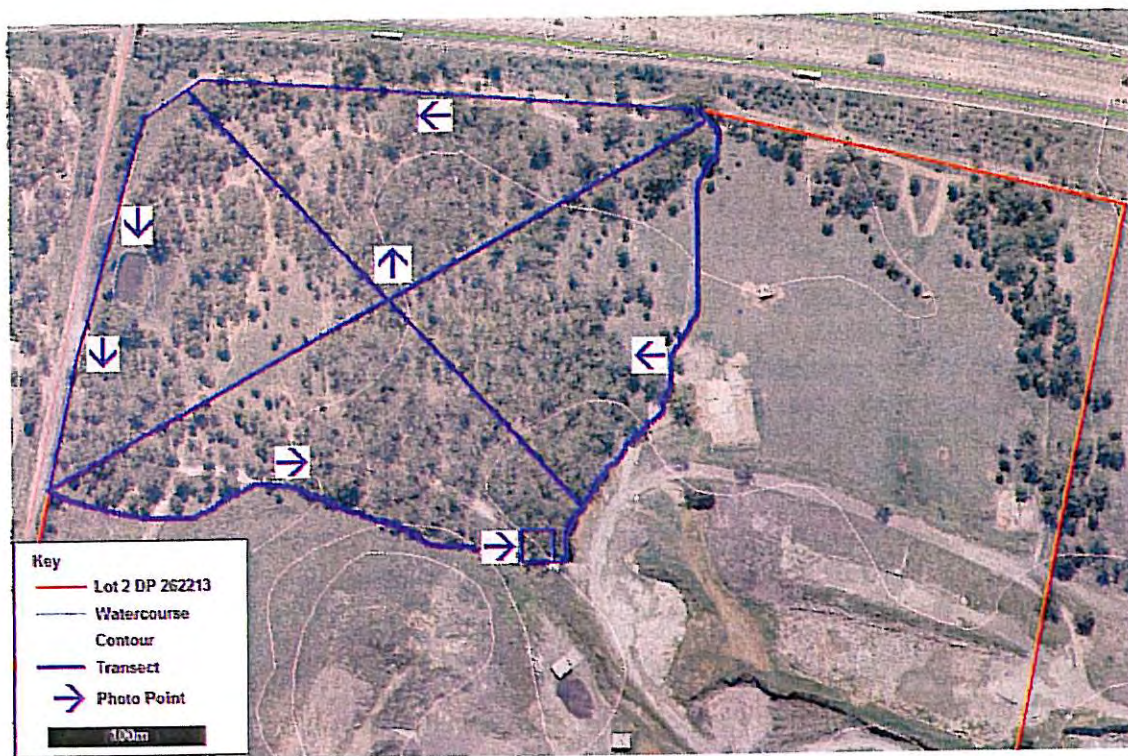


Figure 13. Conservation Area - Monitoring Points

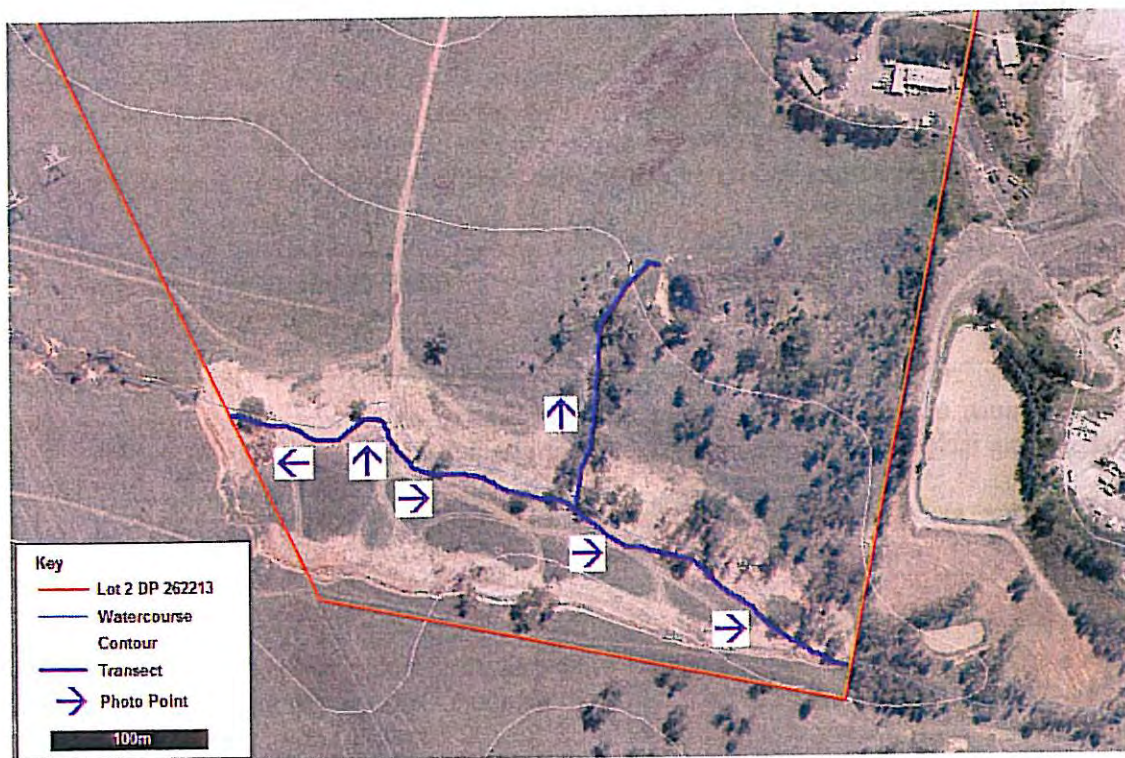


Figure 14. Riparian Habitat - Monitoring Points

Weed control techniques - weed control is to be carried out in a manner that minimises negative environmental impacts. Different techniques are required in varying situations, especially along watercourses, which are very sensitive to pollution impacts. See *Appendix 4 General Guidelines for Weed Control*.

Weed invasion - occurs in natural areas mainly as a result of the following factors:

- a) physical disturbance due to construction activity, clearing, or mowing
- b) increased soil moisture due to runoff
- c) increased nutrients from runoff or waste dumping
- d) increased light levels due to clearing or dieback
- e) increase in weed propagules and seed dispersal agents.

Measures are to be taken to prevent the occurrence of factors leading to weed invasion. Typically, weeds move into bushland from adjoining urban or other modified areas. The main entry locations are stormwater drains, roads and tracks and from over the back fences of individual residential properties. Weeds tend to spread most rapidly downslope along watercourses, roads and tracks, and then move slowly into adjacent bushland.

Noxious weeds - these are plants posing a threat to agriculture, the environment or the community, and are formally declared under the Noxious Weeds Act 1993. Some categories of noxious weeds are legally required to be removed as soon as possible. See *Appendix 1 Noxious Weeds in the Blacktown LGA*.

Regeneration and rehabilitation - where land disturbance occurs, bush regeneration is the preferred method of rehabilitation.

Fauna habitat - vegetation management is to have regard to the value of the vegetation as fauna habitat. In particular, old trees (both living and dead) and a diverse vegetation structure maintaining understorey species is to be retained.

Hollow-bearing trees should not be removed from anywhere on the site unless there is a safety imperative that has been determined by a qualified arborist. If such a tree must be removed for reasons of safety, then it must be felled in the presence of and under the advice of a suitably-qualified experienced zoologist or animal handler to minimise harm to any fauna that may use the hollow (Ashby 2007).

Vegetation removal - native vegetation must not be removed from the site. Any non-native vegetation which is removed is to be disposed of away from bushland to avoid spread of seed or nutrients.

Disturbance to vegetation - measures are to be taken to prevent disturbance to existing vegetation, including roots, water regime, and surrounding soil.

Vegetation along watercourses - vegetation and natural hydrological processes is to be retained along watercourses as far as possible.

4.3 Fauna

Native fauna populations and habitats are to be protected, maintained and enhanced. Impacts on wildlife and habitat are to be taken into consideration whenever any management activity is proposed (such as bushland regeneration, weed control, bushfire hazard reduction, recreation activities, etc.).

Threatened fauna - the only threatened species of native fauna found on the site was the Cumberland Plain Large Land Snail in the Conservation Area (Ashby 2007). Any activities undertaken on the land shall be carried out in a manner that ensures that such animals are not adversely affected by the activity.

Other native fauna - the presence of any native fauna is to be taken into account in the management of the land.

Introduced fauna - control of feral animals (foxes, wild dogs, feral cats, rabbits, etc.) can be undertaken as required in conjunction with wider regional programs. Note that such control measures and fencing will not completely or permanently exclude feral animals from either area.

Domestic animals - the use of the land for exercising, training or grazing of domestic animals (e.g. horses, sheep, goats, dogs, cats, etc.) is incompatible with the protection and management of native fauna and habitat, and must not be permitted or carried out. Stray domestic animals are to be excluded from both areas by appropriate fencing (See *Section 4.8 Access and occupation*).

4.4 Bushfire

The site has been subject to a detailed bushfire hazard assessment (Holmes Fire & Safety 2008) from which the following information and recommendations are taken:

- a. The Conservation Area was classified as Woodland vegetation on the basis of percentage foliage cover, growth form and height, and sparse understorey, and assessed to have a Low to Moderate level of threat. A total Asset Protection Zone of 20m (20m IPA and 0m OPA) was recommended due to the small size and isolated nature of this remnant, non-habitable nature of the proposed development, and the future proposed presence of the 20m wide Precinct Road around the south and east perimeter.
- b. The Riparian Habitat was assessed to have a Low bushfire threat even after replanting due to its narrow width and linear nature. A total Asset Protection Zone of 20m (20m IPA and 0m OPA) was recommended.

Neither area is Bushfire Prone Land according to Section 8.4.3 of SEPP 59 (Blacktown City Council 2005).

Management of both areas is to take reasonable measures to prevent damage to life and property from bushfires and to ensure that as far as possible, bushfire management is compatible with the other objectives of this Plan of Management.

Bushfire hazard reduction - is to be undertaken where there is an identified high hazard to buildings or other improvements on the land or on surrounding land. As far as possible, bushfire hazard reduction is to be by mechanical means, and is to be undertaken along property boundaries. Hazard reduction programs are to be implemented in a manner that protects biodiversity.

Fire trails - the existing fire trails in the Conservation Area are to be left untouched. No new trails are to be constructed.

Emergencies - this Plan authorises any necessary activities to be carried out during declared bushfire emergencies. Following the carrying out of any works, periodic monitoring will be undertaken, and rehabilitation works undertaken if necessary.

4.5 Streams and stormwater management

The prime objective is to promote the protection of stream habitats, ecosystems and amenity.

Note that both areas may be impacted by the following possible future stormwater detention basins:

- a. As defined in Figure 11 of SEPP 59 (Blacktown City Council 2005):
 - a. On the east end (upstream source) and north edge of the Riparian Habitat (Ropes Creek Tributary Catchment).
 - b. On the northern boundary of the Conservation Area.
- b. As planned for the development, on the east side of the Conservation Area to collect water from the regraded berm (ERMA 2008).

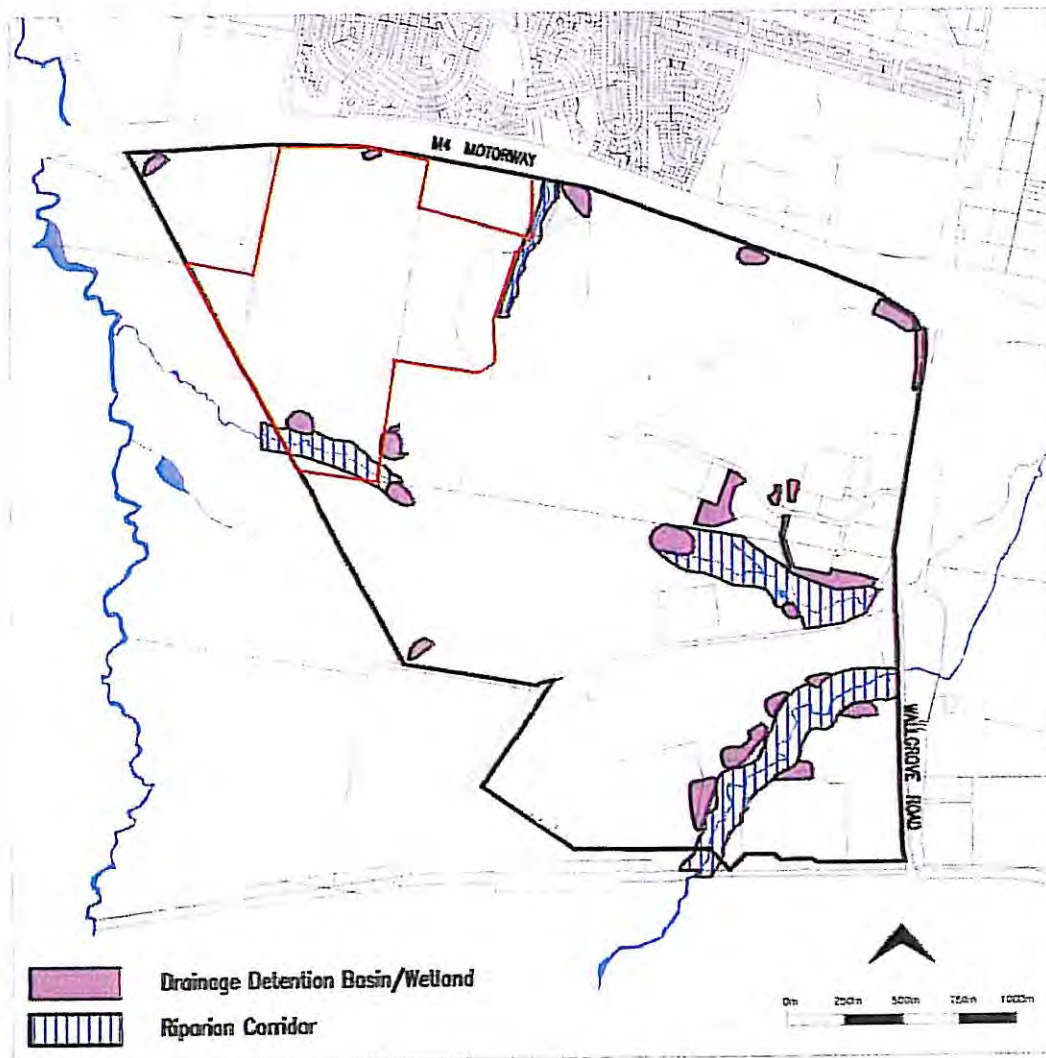


Figure 15. Stormwater Basins

Map from Figure 11 *Stormwater Management Plan* in *State Environmental Planning Policy No. 59 – Central Western Sydney Economic and Employment Area, Eastern Creek Precinct Plan* (Blacktown City Council 2005)

The following general principles apply in addition to the details specified and complied with in the *Light Horse Business Centre Restoration of the Riparian Zone Management Plan* (Site Image Landscape Architects).

Note however, we have defined the watercourses on site according to the Prospect 9030-2N Third Edition Topographic & Orthophoto Map rather than as described in Figure 15 above.

Watercourses - natural hydrological processes are to be maintained where possible, including natural vegetation and the flow regimes to maintain creek line stability and health of terrestrial and aquatic plant communities.

Drainage, runoff and stormwater - water quality entering natural areas is to be maintained at a level which is acceptable for sustainable natural area management, and as far as possible, is to maintain pre-development conditions. Additional runoff is not to discharge into bushland areas. Permeable ground surfaces are to be maintained as far as possible and on-site disposal of stormwater is to occur.

Habitat protection - existing natural habitats are to be maintained.

Water quality - activities along streams are to be strictly controlled with the objective of maintaining a level of water quality suitable for fish and other aquatic life.

Stream bank erosion - measures are to be taken to prevent stream bank erosion.

Watercourses - natural vegetation, and aquatic communities are to be retained along watercourses as far as possible.

Filling and draining - reclamation, filling, draining or other works that results in any loss of, or disturbance to wetlands or other associated natural habitat must not be carried out. The fauna habitat value of wetlands and associated surrounding natural areas is to be maintained, and where possible, enhanced.

4.6 Activities and maintenance

Acceptable activities - This Plan of management authorises the activities as listed below, in cases where the activities do not compromise the identified dominant use of the land as a natural area:

- a) Weed management

Unacceptable activities - Activities interfering with the peace and ecological diversity of natural areas are generally discouraged, unless specific provision has been made for them.

Activities which are not authorised include:

- a) general recreation
- b) use of powered vehicles (other than essential service vehicles)
- c) horse riding
- d) hunting or interference with fauna
- e) the presence of pets and domestic animals
- f) collection of flora, rocks, soil, timber (alive or dead) or leaf litter

4.7 Pollution control

Pollution is a major factor in weed invasion and in the degradation of natural areas. Management must seek to ensure that no pollution is generated on the land, and that adequate measures are taken to prevent adverse impacts from adjoining land.

Environment protection (noise control, dust, chemicals, etc.) - measures are to be taken during any bush regeneration activities to ensure and comply with normal environmental protection, pollution control and health guidelines.

Rubbish dumping - is a risk on the external perimeter of the Conservation Area. Any garden waste dumped on the site or at its edges should be periodically collected and disposed off-site to prevent invasion by any non-native plant. Fencing the Conservation Area should help prevent rubbish dumping (See Section 4.8 Access and occupation).

4.8 Access and occupation

The Plan seeks to ensure that essential pedestrian and vehicular access through or into natural areas minimises the impact on the area. Non-essential pedestrian and vehicular access shall be prevented.

Existing Roads

The existing unmade roads in the Conservation Area are to be left untouched as fire and general access trails, but are to be closed with locked gates at the perimeter of the area to prevent any public access.

There are no roads in the Riparian Habitat. The existing stony creek crossing is to be retained to permit inspection and maintenance vehicular access to the south boundary of the property.

Track closure

All existing narrow trail bike tracks in the Conservation Area are to be closed and covered with loose earth, brush matting, or leaf litter to inhibit motor bike and pedestrian use.

Illegal and Public Access

Measures are to be taken to cease or prevent unauthorised or public access across the land.

Fencing

Fencing is to be constructed to restrict access in accordance with any adopted standards or guidelines and as provided for in the Dividing Fences Act 1991.

The location of the Conservation Area in a relatively deserted location on the north west boundary of the property adjacent to the closed section of Archbold Road present current and historical problems of trail bike access, with regular damage to existing fences. The aims of enabling native animal access while restricting access of pedestrians, trail bikes and domestic animals lead to the following options:

- a) High security fence, for example, 2m high chain link with barbed wire top. This would restrict human, domestic, and native animal access. Such a fence is less vulnerable to cutting.
- b) Low barbed/wire fence with or without rabbit mesh. This would limit bike but not pedestrian access, permit native animal access, and exclude domestic and feral animals. Such a fence is vulnerable to cutting.
- c) Rock barrier. This would inhibit but not prevent bike access and have little effect on human or animal access.
- d) Vegetative barrier. This would inhibit pedestrian and bike access but have little effect on domestic or native animals. Since the aim is to preserve and improve the quality of vegetation within the areas, use of anything except indigenous local vegetation for this purpose would not be recommended.

If the overall intention is to completely exclude the public from the entire site, the perimeter fence will extend to protect the external (north and west boundary) of the Conservation Area, while a lower security fence such as low wire could be used on the internal perimeter (south and east boundary adjacent to future Precinct Road). In the interim, repair or replacement of the existing low barbed wire fence around the entire Conservation Area is recommended.

Note that no fence is completely impervious to determined cutting or damage, and that fencing and gating is unlikely to be able to completely exclude most feral animals.

The Riparian Area on the southern boundary of the site has limited public accessibility and is bounded by a considerable distance of open field to the north, so does not need fencing beyond inspection, maintenance and repair of the existing wire fence on the east, south and west boundaries to prevent stock wandering into the area.

4.9 Administration

Administrative issues have an important influence on the way in which the land is managed.

Staff resources - the management authority shall provide adequate staff resources for the management of the land in accordance with this Plan. Staff shall have appropriate qualifications and experience.

Environmental impact assessment of activities - the environmental impact of activities carried out on the land will be assessed having regard to the requirements of the *Environmental Planning and Assessment Act 1979*.

Other authorities - other government authorities (for example, National Parks and Wildlife Service, Dept Land and Water Conservation) may have responsibilities or involvement in the management of the land or of immediately adjacent land. Where appropriate, consultation is to be undertaken with relevant authorities.

Activities carried out by other authorities - where activities are carried out on the land by other authorities, the management authority is to make such authorities aware of the provisions of this Plan and, as far as possible, is to seek to ensure that any activities are compatible with the objectives and guidelines of this Plan.

Contract labour - in managing the land the management authority may use contract labour, but shall ensure that supervisors have appropriate qualifications and experience, and are made aware of the requirements of this Plan.

Delegation of management responsibilities - where responsibilities are delegated by the management authority, a requirement of the delegation shall be compliance with the provisions of this Management Plan.

4.10 Other issues

Adjoining development - the management authority is to take into account the effect of development and management activities carried out on adjoining land. Activities of concern include discharge of stormwater, clearing, unauthorised filling. As far as possible, adjoining development is to make provision for buffer zones on the adjoining land. Joint boundary management programs with adjacent landholders is encouraged.

These issues relate to the Riparian Habitat, future development of adjacent properties adjoining the south boundary, and Hanson site to the east (see *Section 2.2 Riparian Habitat*).

Emergencies - this Plan authorises any necessary activities to be carried out during an emergency.

5. Management Zones

Both management zones will be managed to protect existing vegetation, restrict human and vehicular access, and control animal and weed pests in accordance with the Consent Conditions. Differences in management objectives are outlined below.

5.1 Conservation Area

This area will be managed as a bush regeneration zone, which has the objective of returning bushland and its ecosystem processes to a natural condition.

Natural regeneration methods will be used, which rely on natural germination and resprouting of plants and focuses on weed removal, management of disturbance, the maintenance of natural processes, and the limited use of fire. It does not include replanting of vegetation.

5.2 Riparian Habitat

This Plan provides current measures to protect and conserve the existing Riparian Habitat pending any future development in this area, it therefore does not specify measures to reconstruct or revegetate the area.

As specified in the *Light Horse Business Centre Restoration of the Riparian Zone Management Plan* (Site Image Landscape Architects), silt fences will be maintained, water quality will be periodically tested and reported, and the creek line periodically inspected and treated to remediate any scour.

The following issues will impact the area, change environmental conditions and must be addressed in the future in any new management plans:

- a. Cessation of pumping from the Overflow Dam on the Hanson site and consequent changes in water flows
- b. Development of adjacent properties adjoining the south and east boundaries.

6. Implementation

6.1 Application of management policies and guidelines

The management policies and guidelines specified by this Plan:

- a) must be taken into consideration by the management authority when making management decisions, and
- b) must be complied with by the management authority when implementing those decisions.

6.2 Action plan

This Plan specifies performance targets and priorities for actions to be taken in relation to the land.

Evaluation of achievement of the objectives of the Plan is to be periodically undertaken. A summary of indicators and targets for major objectives is as outlined in the table below.

6.3 Administration

The management authority is responsible for implementing and reviewing the provisions of this Plan.

6.4 Review of Plan

The Plan applies for a period of five years commencing on 1 October 2009, after which period the Plan shall be reviewed.

The management authority is to commence a review of the Plan at least one year prior to the date on which it lapses. The review is to include all relevant background information, including updated ecological information and details of proposed works and expenditure.

Table 1. Indicators and Performance Targets

Objective	Indicators	Performance Target
Biodiversity conservation	Area of endangered ecological communities	No reduction in mapped reserve area or degradation of endangered ecological communities.
Vegetation management and weeds	Presence of weed species, regeneration of native species	Reduction of weed species by 5% each year.
Activities and maintenance	Regularity of inspection and cleaning, number of incidents of dumping	Compliance with Plan guidelines
Access and occupation	Construction of fencing on external boundaries to Conservation Area.	No dumping of refuse on site. No use of the Conservation Area by recreational users such as motorcycle riders or 4WDs.
Information, Monitoring and Research	Indicators to be monitored, documentation of areas and condition	Regular monitoring frequency.
Administration	Number of staff employed, qualified staff in bushland management	Compliance with Plan guidelines

7. Schedule of Works

Time Frame	Objective	Activity	Responsibility	Indicators	Performance target
Once-off Activities					
As required	Fence Riparian Habitat	Inspect, maintain and repair existing wire fence on the east, south and west boundaries.	Contractor		Boundary fence intact
As required	Fence and gate Conservation Area	Install new fence, or inspect, maintain and repair existing fence around Conservation Area. Install locked gates across all access roads.	Contractor		Conservation Area fenced and gated
As required	Close single file tracks in Conservation Area	Close and cover all existing single bike tracks. Scarify or cover with loose earth, brush matting, or leaf litter to inhibit motor bike and pedestrian use.	Contractor		Tracks closed and covered
As required	Secure boundaries of conservation area from trail bikes. Provide structural habitat for fauna.	Place felled trees from elsewhere into the conservation area.	Contractor	Physical barrier to trail bike riders. Logs on ground for fauna habitat.	Boundary secured from trespassers. Structural fauna habitat.
Scheduled Activities					
Month 1 (early spring)	Set up monitoring points and transects	Set up photo monitoring points and transects	Ecologist		Photo monitoring points and transects marked and recorded
Month 1 (early spring)	Primary weeding of boxthorn thicket in Conservation Area	Poison boxthorn in thicket in south east corner of Conservation Area. Leave any cut plants on site.	Certified contractor	Weeding as per best practice	All Boxthorn plants treated
Month 1 (early spring)	Primary weeding of rest of Conservation Area	Remove noxious weeds from rest of Conservation Area. Removal of exotic weeds	Certified contractor	Weeding as per best practice	No noxious weeds within Conservation Area. Twenty percent reduction in exotic weeds.
Month 1 (early spring)	Primary weeding of dam in Conservation Area	Remove exotic, noxious and non-local vegetation from dam in Conservation Area	Certified contractor	Weeding as per best practice	Dam clear of noxious weeds. Twenty percent reduction in exotic weeds and non-local vegetation.
Month 6	Secondary weeding of boxthorn thicket in Conservation Area	Kill remaining or regrowth boxthorn in thicket in south east corner of Conservation Area	Certified contractor	Weeding as per best practice	All Boxthorn plants treated

Time Frame	Objective	Activity	Responsibility	Indicators	Performance target
Month 6	Pile dead boxthorn in thicket in Conservation Area	Pile dead boxthorn plants in south east corner of Conservation Area ready for pile burn	Certified contractor		Dead boxthorn piled for burn
Month 6	Secondary weeding of rest of Conservation Area	Inspect areas already subject to primary weeding. Remove any exotic, noxious and non-local vegetation that has re-emerged using appropriate methods.	Certified contractor	Weeding as per best practice	No noxious weeds within Conservation Area. Twenty percent reduction in exotic weeds
Month 12	Follow up weeding of Riparian Habitat	Inspect and remove noxious weeds from Riparian Habitat	Certified contractor	Weeding as per best practice	Riparian Habitat clear of noxious weeds. Twenty percent reduction in exotic weeds. Note well the site to the East is a source of exotic weeds and these will continue to invade the site. Future developments of the easterly adjoining site should also undertake weed control.
Month 12	Follow up weeding of entire Conservation Area	Inspect areas already subject to secondary weeding. Remove, noxious any exotic and non-local vegetation that has re-emerged using appropriate methods.	Certified contractor	Weeding as per best practice	Conservation Area clear of noxious weeds. Twenty percent reduction in exotic weeds
Month 12	Pile burn boxthorn thicket	Burn dead piled boxthorn in thicket to stimulate native regeneration	Certified contractor / RFS		Dead boxthorn pile burnt
Month 18	Check regeneration at site of pile burn	Check if native plants, particularly shrubs, have been stimulated to regenerate by pile burn	Certified contractor		Native regeneration
Month 18	Follow up weeding of entire Conservation Area	Inspect areas already subject to secondary weeding. Remove any exotic, noxious and non-local vegetation that has re-emerged using appropriate methods.	Certified contractor	Weeding as per best practice	Conservation Area clear of Noxious weeds. Twenty percent reduction in exotic weeds
Regular Periodic Activities					
6 monthly intervals	Monitor transects	Record weeds, observations and take photos from monitoring points	Ecologist	Assessment and reporting of site condition	Presentation of report to stakeholders
6 monthly intervals	Follow up weeding of Riparian Habitat	Inspect and remove noxious weeds from Riparian Habitat	Certified contractor	Weeding as per best practice	Riparian Habitat clear of noxious weeds

Time Frame	Objective	Activity	Responsibility	Indicators	Performance target
6 monthly intervals	Check perimeter of Conservation Area for dumping	Check north and west perimeter of Conservation Area for evidence of rubbish and vegetative waste dumping and remove all waste or notify Council for removal.	Certified contractor	Removal of rubbish	Perimeter of Conservation Area clear of rubbish and waste
6 monthly intervals	Manage weed incursion on perimeter of Conservation Area	Check north and west perimeter of Conservation Area for evidence of weed incursion and control any weeds.	Certified contractor	Weeding as per best practice	Perimeter of Conservation Area clear of weeds
6 monthly intervals	Check property boundary fencing	Check and repair any damage to property boundary fencing.	Certified contractor		Boundary fence intact

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Appendix 1. Noxious Weeds in the Blacktown LGA

Note

- This list applies to **Baulkham Hills, Blacktown, Hawkesbury and Penrith LGA's**.
- It is the responsibility of a Local Council (Noxious Weeds Act 1993 (ss 10, 12-14, 35, 4) to issue a Weed Control Notice (Noxious Weeds Act 1993 (ss 18(1), (2) and 22(1)).

Extracted from Weed Control Orders No. 20, New South Wales Government Gazette No. 110, 31 August 2006 (as amended, Weed Control Orders Nos. 21 & 22, February 2007 and No. 23, October 2008).

* = Aquatic Weeds - = not noted on site

R = present in Riparian Habitat

C = present in Conservation Area (Ashby 2007)

Category	Species	Common Name	Status
Class 1	<i>Acacia karoo</i>	Karoo Thorn	-
	<i>Acacia nilotica</i>	Prickly Acacia	-
	<i>Annona glabra</i>	Pond Apple	-
	<i>Asystasia gangetica</i> subsp. <i>micrantha</i>	Chinese Violet	-
	<i>Bassia scoparia</i> except <i>B. scoparia</i> subsp. <i>trichophylla</i>	Kochia	-
	<i>Centaurea maculosa</i>	Spotted Knapweed	-
	<i>Centaurea nigra</i>	Black Knapweed	-
	<i>Chromolaena odorata</i>	Siam Weed	-
	<i>Cryptostegia grandiflora</i>	Rubber Vine	-
	<i>Eichhornia azurea</i> *	Anchored Water Hyacinth	-
	<i>Equisetum</i> spp.	Horsetail	-
	<i>Gymnocoronis spilanthoides</i>	Senegal Tea Plant	-
	<i>Hieracium</i> spp.	Hawkweed	-
	<i>Hygrophila polysperma</i> *	East Indian Hygrophila	-
	<i>Hymenachne amplexicaulis</i>	Hymenachne	-
	<i>Lagarosiphon major</i> *	Lagarosiphon	-
	<i>Limncharis flava</i>	Yellow Burrhead	-
	<i>Miconia</i> spp.	Miconia	-
	<i>Mimosa pigra</i>	Mimosa	-
	<i>Myriophyllum spicatum</i>	Eurasian Water Milfoil	-
	<i>Nassella tenuissima</i>	Mexican Feather Grass	-
	<i>Orobancha</i> spp. except <i>O. cernua</i> var. <i>australiana</i> and <i>O. minor</i>	Broomrapes	-
	<i>Parthenium hysterophorus</i>	Parthenium	-
	<i>Pistia stratiotes</i> *	Water Lettuce	-
	<i>Stratiotes aloides</i> *	Water Soldier	-
	<i>Striga</i> spp.	Witchweed	-
	<i>Trapa</i> spp. *	Water Caltrop	-
Class 2	<i>Hygrophila costata</i>	Hygrophila	-
Class 3	<i>Alternanthera philoxeroides</i>	Alligator Weed	-
	<i>Bryophyllum</i> sp. and hybrids	Mother-of-millions	-
	<i>Cestrum parqui</i>	Green Cestrum	-
	<i>Eichhornia crassipes</i> *	Water Hyacinth	-

Category	Species	Common Name	Status
	<i>Ludwigia peruviana</i> *	Water Primrose	C
	<i>Salvinia molesta</i> *	Salvinia	-
	<i>Sporobolus fertilis</i>	Giant Parramatta Grass	-
Class 4	<i>Ageratina adenophora</i>	Crofton Weed	R
	<i>Cenchrus incertus</i>	Spiny Burrgrass	-
	<i>Cenchrus longispinus</i>	Spiny Burrgrass	-
	<i>Cortaderia</i> spp.	Pampas Grass	R
	<i>Cuscuta campestris</i>	Golden Dodder	-
	<i>Cylindropuntia</i> spp.	Prickly Pear	-
	<i>Echium</i> spp.	Paterson's Curse, Vipers Bugloss, Italian Bugloss	-
	<i>Harrisia</i> spp.	Harrisia Cactus	-
	<i>Hypericum perforatum</i>	St John's Wort	C
	<i>Ligustrum lucidum</i>	Privet (Broad Leaf)	R
	<i>Ligustrum sinense</i>	Privet (Narrow-Leaf)	-
	<i>Ludwigia longifolia</i> (* moist areas)	Long-leaf Willow Primrose	-
	<i>Lycium ferocissimum</i>	African boxthorn	C, R
	<i>Nassella neesiana</i>	Chilean Needle Grass	-
	<i>Nassella trichotoma</i>	Serrated Tussock	-
	<i>Opuntia</i> spp. except <i>O. ficus-indica</i>	Prickly Pear	-
	<i>Parietaria judaica</i>	Pellitory	R
	<i>Rubus anglocandicans</i> (includes <i>R. fruticosus</i> agg. spp.)	Blackberry	-
	<i>Sorghum halepense</i>	Johnson Grass	-
	<i>Sorghum x alnum</i>	Columbus Grass	-
	<i>Toxicodendron succedaneum</i>	Rhus Tree	-
	<i>Xanthium</i> spp.	Bathurst/Noogoora/Californian/Cockle Burrs	-
Class 5	<i>Achnatherum brachychaetum</i>	Espartillo	-
	<i>Ambrosia artemisiifolia</i>	Annual Ragweed	C, R
	<i>Ambrosia confertifolia</i>	Burr Ragweed	-
	<i>Argemone mexicana</i>	Mexican Poppy	-
	<i>Asparagus asparagoides</i>	Bridal Creeper	R
	<i>Avena strigosa</i>	Sand Oat	-
	<i>Brassica barrelieri</i> subsp. <i>oxyrrhina</i>	Smooth-stemmed Turnip	-
	<i>Cabomba caroliniana</i> *	Cabomba	-
	<i>Carthamus glaucus</i>	Glaucous Star Thistle	-
	<i>Cenchrus biflorus</i>	Gallon's Curse	-
	<i>Cenchrus brownii</i>	Fine-bristled Burrgrass	-
	<i>Cenchrus echinatus</i>	Mosman River Grass	-
	<i>Cynara cardunculus</i>	Artichoke Thistle	-
	<i>Cyperus esculentus</i>	Yellow Nutgrass	-
	<i>Egeria densa</i> *	Leafy Elodea Dense Waterweed	-
	<i>Gaura parviflora</i>	Egeria	-
	<i>Helianthus ciliaris</i>	Clockweed	-
	<i>Lantana camara</i>	Texas Blueweed	-
	<i>Oryza rufipogon</i>	Lantana	-
	<i>Oxalis</i> spp. except <i>O. chnoodes</i> ,	Red Rice	-
		Oxalis	-

Category	Species	Common Name	Status
	<i>O. exilis</i> , <i>O. perennans</i> , <i>O. radicata</i> , <i>O. rubens</i> and <i>O. thompsoniae</i>		
	<i>Pennisetum macrourum</i>	African Feather Grass	-
	<i>Pennisetum setaceum</i>	Fountain Grass	-
	<i>Picnemon acarna</i>	Soldier Thistle	-
	<i>Romulea</i> spp.	Onion Grass	-
	<i>Sagittaria montevidensis</i> *	Arrowhead	-
	<i>Sagittaria platyphylla</i> *	Sagittaria	-
	<i>Salix</i> spp. (* moist areas)	Willow	-
	<i>Scolymus hispanicus</i>	Golden Thistle	-
	<i>Sisymbrium runcinatum</i>	African Turnip Weed	-
	<i>Sonchus arvensis</i>	Corn Sowthistle	-
	<i>Stachytarpheta cayennensis</i>	Cayenne Snakeweed	-
	<i>Tamarix aphylla</i>	Athel Tree/Pine	

Weed Control Classes

- Class 1** - State Prohibited Weeds. *"The plant must be eradicated from the land and the land must be kept free of the plant."*
- Class 2** - Regionally Prohibited Weeds. *"The plant must be eradicated from the land and the land must be kept free of the plant."*
- Class 3** - Regionally Controlled Weeds. *"The plant must be fully and continuously suppressed and destroyed."*
- Class 4** - Locally Controlled Weeds. *"The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority."*
- Class 5** - Restricted Plants. *"The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with."*

Control objectives

The control objectives for each class is as follows:

- Class 1** is to prevent the introduction and establishment of those plants in NSW.
- Class 2** is to prevent the introduction and establishment of those plants in parts of NSW.
- Class 3** is to reduce the area and the impact of those plants in parts of NSW.
- Class 4** is to minimise the negative impact of those plants on the economy, community or environment of NSW.
- Class 5** is to prevent the introduction of those plants into NSW, the spread of those plants within NSW or from NSW to another jurisdiction.

Class 5 weeds are predominately weeds listed under the old Seeds Act, which has been repealed. There is no obligation to control Class 5 weeds. However Class 5 weeds are notifiable weeds. This means that the plant, or any animal or thing, which has the weed on it or in it, cannot be sold, purchased or offered for sale in NSW. It cannot be removed from any land to another place and it cannot be scattered on land or water.

'Sell' includes:

- (a) barter, offer or attempt to sell, receive for sale, have in possession for sale, expose for sale, send, forward or deliver for sale or cause or permit to be sold or offered for sale, or
- (b) sell for resale.

Appendix 2. Treatment of Cumberland Plain Weeds

The tables below are reproduced from Appendix 4 of *Recovering Bushland on the Cumberland Plain: Best Practice Guidelines for the Management and Restoration of Bushland*. © Department of Environment and Conservation (NSW) 2005.

Method: H (hand remove) C (cut and paint) S (scrape and paint) I (stem injection)
Spray Rate: for Roundup Biactive®

Herbaceous Weeds and Grasses

Common name	Scientific name	Method	Spray Rate	Possible selective herbicide and other techniques
African Love Grass	<i>Eragrostis curvula</i>	H	1:100	Slash or mow, spray regrow with Roundup.® Spot-spray also possible.
Alligator Weed	<i>Alternanthera philoxeroides</i>		1:100	
Amaranth	<i>Amaranthus</i> sp.	H C	1:100	
Asparagus Fern	<i>Asparagus aethiopicus</i>	H	1:75	Brush-off
Asthma Weed	<i>Parietaria judaica</i>	H	1:100	
Black Thistle	<i>Cirsium vulgare</i>	H C	1:100	
Blackberry Nightshade	<i>Solanum nigrum</i>	H C	1:100	
Cobbler's Peg	<i>Bidens pilosa</i>	H C	1:100	
Common Couch	<i>Cynodon dactylon</i>	H	1:75	
Creeping Buttercup	<i>Ranunculus repens</i>	H	1:100	
Crofton Weed	<i>Ageratina adenophora</i>	H	1:100	
Drain Sedge	<i>Cyperus eragrostis</i>	H	1:100	
Ehrharta	<i>Ehrharta erecta</i>	H	1:100 - 1:500	
Fat Hen	<i>Chenopodium album</i>	H C	1:100	
Fennel	<i>Foeniculum vulgare</i>	H		
Fireweed	<i>Senecio madagascariensis</i>	H	1:100	
Flatweed	<i>Hypochaeris radicata</i>	H	1:100	
Fleabane	<i>Conyza</i> spp.	H C	1:100	
Giant Bamboo	<i>Bambusa</i> sp.	C		
Giant Reed	<i>Arundo donax</i>	C		
Guinea Grass	<i>Panicum maximum</i>	H	1:75	
Ink Weed	<i>Phytolacca octandra</i>	H C	1:100	
Johnson's Grass	<i>Sorghum halpense</i>	H		
Kikuyu	<i>Pennisetum clandestinum</i>	H	1:100	
Ludwigia	<i>Ludwigia peruviana</i>	H C	1:100	
Mist Flower	<i>Ageratina riparia</i>	H	1:100	
Needle Grass	<i>Nassella</i> sp.	H		
Paddy's Lucerne	<i>Sida rhombifolia</i>	H C	1:100	Grazon, Garlon®
Pampas Grass	<i>Cortaderia selloana</i>	H C	1:75	

Paspalum	<i>Paspalum dilatatum</i>	H	1:100	
Patterson's Curse	<i>Echium sp.</i>	H	1:100	
Plantain	<i>Plantago lanceolata</i>	H	1:100	
Prairie Grass	<i>Bromus catharticus</i>	H	1:100	
Prickly Lettuce	<i>Lactuca serriola</i>	H	1:100	
Quaking Grass	<i>Briza sp.</i>	H	1:100	
Rhodes Grass	<i>Chloris gayana</i>	H	1:100	
Ryegrass	<i>Lolium perenne</i>	H	1:100	
Salvinia	<i>Salvinia molesta</i>		1:100	
Sowthistle	<i>Sonchus oleraceus</i>	H	1:100	
Spider Plant	<i>Chlorophytum comosum</i>	H	1:75	
Spiny Rush	<i>Juncus acutus</i>	H	1:75	
St John's Wort	<i>Hypericum perforatum</i>	H		Garlon®, Grazon
Summer Grass	<i>Digitaria sanguinalis</i>	H	1:100	
Wandering Jew	<i>Tradescantia fluminensis</i>	H	1:75	Starane; other techniques include raking where no native groundcovers are present
Veldt Grass	<i>Ehrharta longiflora</i>	H	1:100	
Wild Oats	<i>Avena sp.</i>	H	1:100	
Water Hyacinth	<i>Eichhornia crassipes</i>	H		

Vines

Common name	Scientific name	Method	Spray Rate	Possible selective herbicide and other techniques
Turkey Rhubarb	<i>Acetosa sagittata</i>	H	1:100	Starane
Madiera Vine	<i>Anredera cordifolia</i>	H S	1:75	Starane
Moth Vine	<i>Araujia sericifera</i>	H S	1:50	
Balloon Vine	<i>Cardiospermum grandiflorum</i>	H C S	1:100	
Cape Ivy	<i>Delairea odorata</i>	H	1:75	
English Ivy	<i>Hedera helix</i>	H S	1:100	
Coastal Morning Glory	<i>Ipomoea cairica</i>	H S	1:100	
Morning Glory	<i>Ipomoea indica</i>	H S	1:100	Garlon®
Honeysuckle	<i>Lonicera japonica</i>	H S	1:75	
Bridal Creeper	<i>Asparagus asparagoides</i>	H	1:75	Brush-off used under permit is effective. Must apply herbicide at flowering. Note some natives, e.g. Bursaria, are sensitive to Brush-off. Spray in combination with hand removal.

Woody Weeds

Herbicide: Garlon® or Access preferred herbicide

Woody weed seedlings can often be treated by spot spraying with a Roundup Biactive® solution (check herbicide label for dilution rates). The addition of a surfactant can improve results. Additionally, several selective herbicides can also be used in this way.

Medium-sized woody weeds can be treated using a technique known as basal spraying. A prescribed solution of diesel and selective herbicide (often Garlon®) is applied to the leaves and stems. This can be an effective treatment but consideration must be given to the risk of off-target damage and the impacts on future regeneration. This method should not be used in areas where native regeneration is expected.

Common name	Scientific name	Method	Herbicide	Possible selective herbicide and other techniques
African Box Thorn	<i>Lycium ferocissimum</i>	H C I	Yes	The use of Garlon® and diesel is a very effective herbicide for this species.
African Olive	<i>Olea europaea subsp. Africana</i>	H C I	Yes	The use of Garlon® and diesel is a very effective herbicide for this species. Best techniques are cut and paint.
Boneseed	<i>Chrysanthemoides monilifera subsp. Monilifera</i>	H C I		
Blackberry	<i>Rubus fruticosus</i>	H C S	Yes	Hand prune or slash to encourage new growth, spray new growth with herbicide. Follow-up may be needed.
Briar Rose	<i>Rosa rubiginosa</i>	C		
Box Elder	<i>Acer negundo</i>	H C I		
Camphor Laurel	<i>Cinnamomum camphora</i>	H C S		For small plants apply herbicide by vertically scraping the stem with a knife blade and applying herbicide.
Cassia	<i>Senna pendula</i>	H C I		
Castor Oil Plant	<i>Ricinus communis</i>	H C		
Coral Tree	<i>Erythrina xyskiesii</i>	H C I		
Cotoneaster	<i>Cotoneaster glaucophyllus</i>	H C I		
Cox's Coral Tree	<i>Erythrina crista-galli</i>	H C I		
English Broom	<i>Cytisus scoparius</i>	H C I		
Gleditsia	<i>Gleditsia tricanthos</i>	C I		Stem injection best from early spring to autumn.
Gorse	<i>Ulex europaeus</i>	C		
Green Cestrum	<i>Cestrum parqui</i>	H S I	Yes	Garlon® and diesel is a very effective herbicide for adults of this species. Some degree of reshooting may occur with all treatments requiring follow-up.
Hackberry	<i>Celtis occidentalis</i>	H C I	Yes	
Indian Hawthorn	<i>Raphiolepis indica</i>	H C I		
Broad-leaved Privet	<i>Ligustrum lucidum</i>	H C I		
Montpellier Broom	<i>Genista monspessulana</i>	H C I		
Mulberry	<i>Morus alba</i>	H C I		
Ochna	<i>Ochna serrulata</i>	S I		
Pittosporum	<i>Pittosporum undulatum</i>	H C I		
Radiata Pine	<i>Pinus radiata</i>	H C I		
Rhus Tree	<i>Toxicodendron succedaneum</i>	H C I		
Narrow-leaved Privet	<i>Ligustrum sinense</i>	H C I		

Wild Tobacco	<i>Solanum mauritianum</i>	H C		
Tree-of-Heaven	<i>Ailanthus altissima</i>	S I	Yes	Tordon is effective in treating this species using the cut and paint technique. Basal bark application of Garlon® and diesel also effective.
Willow	<i>Salix spp.</i>	H C S I		
Willow Leaf Wattle	<i>Acacia saligna</i>	H C I		

Appendix 3. Notes on Specific Weed Control

African Boxthorn

African Boxthorn (*Lycium ferocissimum*) is a tough thorny shrub forming dense thickets adapted to a number of habitats and found during the flora survey on both reserve areas on this site. Plants can become dormant during long dry spells and winter, but flower and fruit profusely at any time of year in favourable conditions. Seeds are dispersed by birds, foxes, reptiles, water and machinery, with germination possible at any time of the year but peaking in spring and summer. Plants can reshoot from the base or suckers, with broken branches and stems remaining alive for months (Muyt 2001).

Boxthorn is widespread on the Cumberland Plain, and although it can be effectively treated by basal spraying with a prescribed solution of diesel and Garlon®, this method should not be used in areas where native regeneration is expected (DEC 2005) so should be avoided in both reserve areas on this site.

Infestations on this site should be treated by spraying with selective herbicide during active growth, not during drought dormancy or cold winter. In addition, since the plant provides fauna understorey habitat, treatment during peak breeding season (late spring or summer) should be avoided. The preferred treatment time is early spring.

Larger individual plants should be treated by stem injection, and smaller individual plants by the cut and paint method.

All treated thickets and large individual plants must be followed up at 6 monthly intervals to eradicate seed regrowth and reshooting (Muyt 2001).

Appendix 4. General Guidelines for Weed Control

General

- a) Comprehensive treatment of all weeds in an area is to be carried out prior to planting.
- b) Maintenance weeding of all areas is to be carried out prior to seed set.
- c) All weed propagules are to be bagged and removed from site.

Herbicide use

The manufacturers' safety and application directions must be followed at all times. Contractors are required to obtain all necessary approvals and complete all necessary notifications before using herbicides, particularly near waterways.

Hand Removal

The removal of weeds by hand is the preferred method and is most suitable for the removal of seedlings, herbaceous weeds, and many grasses. Always place seeds and or fruit into a plastic bag before pulling out the rest of the plant. Dispose of the contents of the bag and the plant off-site to avoid the further spread of the weed. Wherever possible take advantage of favourable seasonal conditions, e.g. work after good rain when soil moisture conditions allow for easier removal.

Treatment of weeds with underground reproductive parts

The most effective treatment for weeds with underground reproductive parts is to carefully dig up the entire plant with all tubers, bulbs and corms intact. The reproductive parts must then be bagged and removed from site.

Spraying with herbicide can be employed where no native species are present. This will kill above ground vegetative growth and some underground reproductive parts but subsequent hand removal of the remaining underground parts is often necessary.

Spraying with herbicide is most effective between flowering and seed set.

Treatment of exotic vines

Most exotic vines can either be dug up by hand or sprayed with herbicide to remove vegetative growth above the ground and then followed up with hand removal of re-shooting nodes.

Treatment of exotic grasses and herbs

Most exotic grasses and herbs can be hand removed or 'crowned' with a knife. Where no native species are present they can be sprayed with diluted herbicide.

The slashing of tall herbaceous weeds and the spraying of regrowth can also be used to reduce the amount of herbicide used. Debris from slashing will contain weed propagules and must be raked up and removed from site.

Some exotic grasses and herbs can be extremely difficult to eradicate by hand removal. It is important that these species are controlled prior to planting, as the ability to spray herbicide after planting will be greatly reduced.

Cut and paint treatment for woody weeds

The following cut and paint treatment is appropriate for most woody weeds:

- a) Woody weeds are to be cut as close to the ground as possible and at an angle horizontal to the ground to prevent herbicide running off the stump.
- b) Undiluted herbicide must be applied to the stumps immediately.
- c) On large stumps only the outer (sapwood) rim of the stump requires poisoning.

Debris from woody weeds that is capable of re-shooting (e.g., Small Leaf Privet) must never be left in contact with the ground. Such debris is either to be removed from site or piled on temporary 'rafts' until dead.

Scrape and poison treatment for woody weeds

Scrape and poison treatment is required for weeds where relatively small stem diameters do not permit enough herbicide to penetrate large rootstock for cut and poison treatment to be effective.

- a) Long scrapes are to be made with a knife along either side of each stem to expose the sapwood.
- b) Care must be taken not to scrape around the entire stem.
- c) Undiluted herbicide is to be applied to scrapes immediately.
- d) Plants must then be left *in situ* until dead.

Herbicide injection of large trees

Herbicide injection of large trees must, ideally, occur during periods of active growth (Spring). For deciduous trees treatment must occur between late Summer and early Autumn to ensure an effective 'take-down' of herbicide.

Only adequately trained and experienced personnel are permitted to carry out this procedure to ensure safe and effective treatment.

- a) Holes are to be drilled into the base of the tree trunk at 10 cm intervals, evenly spaced around the entire trunk and at a downwards angle to hold the herbicide.
- b) Holes must be drilled to penetrate the phloem (sapwood) of the tree and no further.
- c) Herbicide must be applied to the holes immediately after drilling.

Injected trees must be left undisturbed for at least six months to ensure an effective 'kill'.

Appendix 5. Company Profile

Abel Ecology has been in the flora and fauna consulting business since 1991, starting in the Sydney Region, and progressively more state wide in New South Wales since 1998, and now also in Victoria. During this time extensive expertise has been gained with regard to Master Planning, Environmental Impact assessments including flora and fauna, bushfire reports, Vegetation Management Plans, Management of Threatened Species, Review of Environmental Factors, Species Impact Statements and as Expert Witness in the Land and Environment Court. We have done consultancy work for industrial and commercial developments, golf courses, civil engineering projects, tourist developments as well as residential and rural projects. This process has also generated many connections with relevant government departments and city councils in NSW. Our team consists of four scientists and two administrative staff, plus casual assistants as required.

Licences

NPWS s132C Scientific licence number is S10557 expires 22 Jan 2010

NPWS GIS data licence number is CON95034

DG NSW Agriculture Animal Care and Ethics Committee approval AW 95/082

DG NSW Agriculture Animal Research Authority AW 95/082

The Consultancy Team

Danny Wotherspoon

- PhD, researching Cumberland Plain vegetation and fauna habitat, at Centre for Integrated Catchment Management (University of Western Sydney, 2007)
- Planning for Bushfire Protection Certificate course (University of Technology, 2006)
- Consulting Planners Bushfire Training Course (Planning Institute of Australia, 2003)
- M.A. (Macquarie University, 1991)
- Wildlife Photography Certificate (Sydney Technical College, 1987)
- Herpetological Techniques Certificate (Sydney Technical College, 1986)
- Applied Herpetology Certificate (Sydney Technical College, 1980)
- Dip Ed. (University of New England, 1978)
- B.Sc. (University of New England - Triple Majors in Zoology, incl. Ecological Zoology, 1974)

Mark Sherring

- Consulting Planners Bushfire Training Course (Planning Institute of Australia, 2003)
- Certificate of Horticulture (Richmond TAFE, 1995)
- Bush Fire Operations modules (Mt. Riverview Fire Brigade, 1993)
- Certificate of Permaculture (Hazelbrook)
- Certificate of Bush Regeneration (Nepean TAFE, 1992)
- Certificate of Rural Operations. (Nepean TAFE, 1992)
- B.Math (University of Newcastle, 1990)

Dr Daniel McDonald

- PhD (The University of Sydney 2006)
- M. Agr (The University of Sydney 1996)
- B. Agr Sc. (The University of Sydney 1991)

Graham Dowden

- TAFE Certificate III in Conservation and Land Management (Ryde TAFE, 2009)
- M.App.Sc.Env.Sci. (The University of Sydney, 2008)
- M.App.Sc. (University of Technology, Sydney, 1989)
- B.Sc. (Macquarie University, 1982)