AIRDS BRADBURY URBAN RENEWAL PROJECT

CONCEPT BUSHLAND MANAGEMENT PLAN

October 2011

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CONCEPT BUSHLAND MANAGEMENT PLAN

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1 INTRODUCTION

1.1 Background

A Concept Plan has been prepared for the urban renewal of Airds and Bradbury, in the Campbelltown Local Government Area, southwestern Sydney (Figure 1).

As part of the Concept Plan, several areas of native vegetation are to be retained within the site, and managed to enhance their ecological values. These areas include:

- a remnant/regrowth patch of native vegetation approximately 4.2 hectares in size, located northwest of the Airds Shopping Centre;
- a corridor of remnant/regrowth vegetation in the east of the site, approximately 8000m^2 in size, located immediately south of the cul-de-sac of Boonoke Place;
- a remnant patch approximately 1.6 hectares in size, located in the southeastern corner of the site;
- a stand of native trees, approximately 3000m^2 in size, located in the northwestern corner of the Reiby Juvenile Justice Centre.

Two additional areas containing poor quality vegetation adjacent to the site are to be regenerated and restored, to offset vegetation losses within the site. These are:

- a corridor of very poor quality vegetation along Smiths Creek, approximately 2 hectares in size, located to the west of the Bus Depot;
- approximately 10 hectares of predominantly cleared land located along the western edge of the Georges River Riverside Reserve.

The Concept Plan includes a commitment to protect and manage the retained and additional areas of native vegetation, to ensure long-term viability of ecological values within the site.

1.2 Objectives

The purpose of this Concept Bushland Management Plan is to set out the native vegetation management actions and protection measures that will be implemented as part of the Airds Bradbury Renewal Project.

Further specific details will be provided for each area of vegetation progressively, as part of the staged detailed planning of the project.

FIGURE 1 *Concept Plan.*

2 RELEVANT BUSHLAND MANAGEMENT GUIDELINES

2.1 Cumberland Plain Recovery Plan (DECCW 2010)

The NSW Department of Environment Climate Change and Water (DECCW) prepared the Cumberland Plain Recovery Plan to provide for the long-term survival and protection of seven threatened species, four endangered populations and nine threatened ecological communities listed on the *NSW Threatened Species Conservation Act 1995* that are found only on the Cumberland Plain.

The Plan provides for protection of both Cumberland Plain Woodland (CPW) and Shale Sandstone Transition Forest (SSTF).

2.1.1 Relevant Recovery Actions

The following recovery actions for which Campbelltown City Council has responsibility, and which are relevant to bushland management within the subject site include:

Action 2.2: Support and promote the adoption of best practice standards for bushland management and restoration (as specified in Appendix 2) on public and private lands within the Cumberland Plain.

Action 3.4: Work collaboratively with local government authorities and other organisations to inform communities about the value and role of remnant vegetation on the Cumberland Plain, the best practice standards for its management, and any opportunities to participate in the recovery program.

Action 3.5: Work with Aboriginal communities, landowners, community groups, and students to deliver best practice management in the priority conservation lands, and to identify other opportunities for involvement in the recovery program.

Action 3.7: Develop interpretive programs for key local reserves that contain examples of the threatened biodiversity addressed in the recovery plan Recovery Plan.

2.1.2 Best Practice Standards (Appendix 2 of the Recovery Plan)

Public lands where conservation is a primary management objective:

1. Bushland on public lands within or outside the priority conservation lands which have conservation as a primary management objective requires:
    - an adopted plan of management, management system or biodiversity strategy (or similar planning document), which addresses management of threatened biodiversity and is consistent with the recovery plan;
    - that the implementation of the plan, system or strategy is funded such that its objectives are met;
    - details of the implementation of the plan, system or strategy to be publicly reported;
    - monitoring to be undertaken periodically to determine the status of threatened entities, or to assess the effectiveness of threat abatement measures being implemented (for guidance see the monitoring manual for bitou bush control and native plant recovery (Hughes et al. 2009) at www.environment.nsw.gov.au/bitouTAP/monitoring.htm);

- management to be consistent with the following documents, and any additional best practice documents that DECCW [now OEH] may promote at a later date:
  - Recovering Bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005a);
  - the recommended fire regimes in the Appendix 3;
  - a landscape-scale response to African Olive invasion on the Cumberland Plain (as per completion of action 2.6).

Public lands where conservation is not a primary management objective, but is compatible with the primary management objective:

2. Bushland on public lands outside the priority conservation lands where conservation is not a primary management objective but is compatible with the primary management objective requires:
   - an adopted management system or policy (or similar planning document) which addresses management of threatened biodiversity and is consistent with the recovery plan;
   - the land to be managed such that the objectives of the management system or policy are met;
   - monitoring to be undertaken periodically to determine the status of threatened entities, or to assess the effectiveness of threat abatement measures being implemented (for guidance see the Monitoring manual for bitou bush control and native plant recovery (Hughes et al. 2009) at www.environment.nsw.gov.au/bitouTAP/monitoring.htm);
   - management is consistent with the following documents, and any additional best practice documents that DECCW [now OEH] may promote at a later date:
     - Recovering Bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005a);
     - the recommended fire regimes in the Appendix 3;
     - a landscape-scale response to African Olive invasion on the Cumberland Plain (as per completion of action 2.6).

2.1.3 Recommended Fire Regimes (Appendix 3 of the Recovery Plan)

General fire regimes recommended for Cumberland Plain Woodland and Shale Sandstone Transition Forest are set out in Table 1 below.

Table 1 *General fire regimes*

Ecological Community	Suggested minimum fire interval (years)	Suggested maximum fire interval (years)
Cumberland Plain Woodland	5	12
Shale Sandstone Transition Forest	7	30

2.2 Recovering Bushland on the Cumberland Plain (DEC 2005)

Recovering Bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005).

The three guiding principles of this document are:

1. Retain all areas of native vegetation;
2. Protect areas of native vegetation through consolidation and fencing;
3. Manage retained and protected areas of native vegetation.

Active management of vegetation 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.

Restoration of native vegetation is the process of assisting recovery. It does not necessarily imply total intervention. Current restoration practices in eucalypt woodland involve a number of approaches arranged along a continuum from minimal to extensive intervention (Davies & Christie 2001):

- natural regeneration, where recovery occurs purely through natural processes on the site;
- assisted regeneration, where the natural processes that lead to the re-establishment of native plant species are 'triggered' by management;
- reconstruction, where more active steps of planting out stocks of native seedlings and/or reseeding are undertaken to start the process of native plant restoration;
- fabrication, where the entire woodland is built from scratch.

This document provides detailed and specific information to assist with identifying pressures on areas of retained native vegetation, and how to reduce and manage these pressures.

This document will form the basis for preparation of the detailed Bushland Management Plan.

3 GENERAL MANAGEMENT AND RESTORATION MEASURES

3.1 Protection through Concept Plan and VPA

All areas of vegetation retained as public open space within the Concept Plan would be protected through a Voluntary Planning Agreement (VPA), forming part of the Concept Plan.

3.2 Weed Control

All areas of vegetation within the study contain a high percentage of exotic weed species in the understorey and groundcover strata.

Surveys conducted within the main patch of vegetation northwest of the Airds Shopping Centre recorded a total of 78 plant species, including 52 native species and 26 exotic species.

Surveys conducted along the Smiths Creek corridor recorded a total of 63 plant species, including 32 native species and 31 exotic species.

Table 2 *Weed species recorded within areas of native vegetation within the subject site.*

Noxious Weed Class	Botanical name	Common name	Dean Park	Smiths Creek
	Foeniculum vulgare	Fennel	●	●
	Araujia sericifera	Moth Vine	●	●
	Protasparagus aethiopicus	Asparagus Fern	●	
	Asparagus officinalis	Asparagus		●
	Bidens pilosa	Cobbler's Pegs	●	●
	Cirsium vulgare	Spear Thistle	●	●
	Conyza sp.		●	●
	Hypochaeris radicata	Catsear	●	●
	Senecio madagascariensis	Fireweed	●	●
	Jacaranda mimosifolia	Jacaranda		●
4	*Hypericum perforatum*	St. Johns Wort	●	
	Cyperus brevifolius		●	
	Trifolium repens	White Clover		●
	Acacia saligna	Golden Wreath Wattle		●
	Centaurium tenuiflorum		●	●
	Pavonia hastata			●
	Sida rhombifolia	Paddy's Lucerne	●	●
	Nandina domestica			●
4	*Ligustrum lucidum*	Large-leaved Privet	●	●
4	*Ligustrum sinense*	Small-leaved Privet	●	●
	Plantago lanceolata	Lamb's Tongues	●	●
	Andropogon virginicus	Whisky Grass		●
	Briza maxima	Quaking Grass	●	●
	Briza minor	Shivery Grass	●	●
	Briza subaristata		●	●
	Bromus catharticus			●
	Chloris gayana	Rhodes Grass		●
	Eragrostis curvula	African Lovegrass	●	●
4	*Nassella neesiana*	Chilean Needle Grass	●	
	Paspalum dilatatum	Paspalum	●	●
	Pennisetum clandestinum	Kikuyu Grass	●	●
	Setaria gracilis	Slender Pigeon Grass	●	
	Anagallis arvensis	Scarlet/Blue Pimpernel		●
4	*Rubus fruiticosus*	Blackberry complex	●	
	Solanum nigrum	Black-berry Nightshade	●	●
4	*Lantana camara*	Lantana		●
	Verbena bonariensis	Purpletop	●	●

Each vegetation zone will be re-surveyed for weeds prior to a detailed weed control strategy being prepared.

Weed control priorities will be:

Primary: Noxious weeds listed under the *NSW Noxious Weeds Act 1993* for the Campbelltown Local Government Area.

Secondary: Invasive woody weeds and climbers, and isolated patches of weeds where complete removal is possible in the short term.

Tertiary: Weeds likely to affect the viability of retained areas of native vegetation, or compromise revegetation works.

Weed control objectives are:

1. Removal of all Primary weeds within 2 years from issue of development consent of the relevant stage of the project.
2. Removal of all Secondary weeds within 2 years from issue of development consent of the relevant stage of the project.
3. Reduction in extent of Tertiary weeds to less than 30% of the groundcover of vegetated areas within 2 years from issue of development consent of the relevant stage of the project.

3.3 Supplementary Planting

Supplementary planting would occur within retained areas of native vegetation, to increase the floristic diversity of these areas, and to restore important structural elements.

Plant species used for supplementary planting would be selected from lists of characteristic species for Cumberland Plain Woodland and Shale Sandstone Transition Forest, and would be propagated from local sources, *ie* from plant material collected within the Smiths Creek catchment if possible, otherwise from lands elsewhere within the eastern portion of the Campbelltown LGA.

The extent and quantity of supplementary planting within relevant zones would be determined at the time of preparation of the detailed plan for each zone, when accurate mapping of the retained vegetation will be conducted.

In general, supplementary planting will be required to:

- enhance the viability and improve ecological functioning of areas of vegetation retained for conservation purposes;
- improve connectivity of retained vegetation northwest of the Airds Shopping Centre with the Smiths Creek corridor;
- enhance habitat characteristics for Koalas along the eastern edge of the subject site, and within corridors extending into the site.

3.4 Revegetation

Revegetation works will be required where lands have previously been predominantly or completely cleared of native vegetation.

Plant species used for revegetation works would be selected from lists of characteristic species for Cumberland Plain Woodland and Shale Sandstone Transition Forest, having regard to species of value for the Koala, and would be propagated from local sources, *ie* from plant material collected

within the Smiths Creek catchment if possible, otherwise from lands elsewhere within the eastern portion of the Campbelltown LGA.

Revegetation works would be designed to restore the natural floristics and structure of either Cumberland Plain Woodland or Shale Sandstone Transition Forest, as appropriate.

It is intended that revegetation works will apply to:

- approximately 3,800m^2 of Cumberland Plain Woodland as a series of small patches around the relocated pond, west of the Airds Shopping Centre, and around the playing fields to link the pond to the main retained patch northwest of the Airds Shopping Centre;
- approximately 2 hectares of Shale Sandstone Transition Forest along Smiths Creek, west of the bus depot;
- approximately 10 hectares of Shale Sandstone Transition Forest within the Georges River Riverside Reserve to the east of the subject site.

3.5 Fire Management for Conservation

Native vegetation within the subject site is currently affected by too frequent fire.

One of the primary objectives of the urban renewal project is to reduce antisocial behaviour within the subject site, such as the lighting of fires, and to engender respect for the built and natural environs of Airds and Bradbury.

It is anticipated that fire management will consist of extinguishing all fires which start either naturally or otherwise within the subject site.

It is unlikely that there will be a requirement to conduct control burns within or adjacent to the subject site.

It is not anticipated that there will be a need to conduct environmental burns to avoid exceeding the recommended maximum of 12 years between burns within Cumberland Plain Woodland and 30 years between burns within Shale Sandstone Transition Forest.

The detailed Bushland Management Plan will recommend that the issue of fire management shall be reviewed after 2 years. In the event that vegetation zones are not burnt within this time, a fire regime may be recommended for some vegetation zones.

3.6 Management of Human Disturbance

All areas of native vegetation within the subject site are substantially affected by human disturbance. In particular, the main patch of vegetation to the northwest of the Airds Shopping Centre is criss-crossed by a network of informal vehicle, bike and foot tracks.

Some areas of vegetation are dissected by cleared service easements. Some areas are affected by mowing or slashing of the understorey beneath the Eucalypt canopy.

All areas of vegetation are affected by trampling, rubbish dumping and firewood collection.

Human disturbance within zones being managed for conservation will be managed by measures such as:

- cessation of mowing/slashing, except where necessary for maintenance of asset protection zones;

- rationalisation of existing tracks, with closing of duplicated and unnecessary tracks;
- construction or planting of barriers;
- installation of interpretative signs;
- improvement of access tracks important for pedestrian or bicycle access, to reduce pressure on closed tracks;
- increased visibility and lighting to reduce antisocial behaviour such as rubbish dumping.

Detailed plans of each vegetation zone will be produced for the detailed Bushland Management Plan, to set out the type and location of measures to be utilised within each zone.

These plans will need to be produced in conjunction with final development layout plans, to ensure that proposed footpaths, cycleways and the location of services and shops are considered when rationalising track use through areas of native vegetation.

3.7 Erosion Control

Erosion does not appear to be a current issue for vegetation management within the subject site.

This issue will be reviewed as part of the detailed planning of each development stage, to consider whether the urban renewal project requires installation of erosion control features to avoid or minimise impacts on native vegetation.

In the event that erosion control measures are required, these will be described and quantified in the detailed Bushland Management Plan.

3.8 Nutrient Control

Smiths Creek is substantially degraded due to urban nutrification, and associated weed infestation. The majority of the nutrient load comes from off-site sources, which are beyond the scope of this project to control.

Other areas of native vegetation do not appear to be currently affected by nutrients, other than in small discrete patches.

Control of nutrients in urban run-off will be considered and addressed as part of the detailed planning of each development stage.

In the event that nutrient control measures are required, these will be described and quantified in the detailed Bushland Management Plan.

3.9 Management of Dead Timber

Dead trees will be retained within areas of native vegetation being retained primarily for conservation. In the event that trees or branches are identified as posing a risk to life, these will be felled and left in situ to provide habitat and structure for native flora and fauna.

It may be appropriate to install interpretative signs highlighting the importance of dead timber to native flora and fauna.

Dead trees within areas of vegetation being managed primarily for recreation will be felled, and placed intact on the ground within the areas of vegetation being managed for conservation.

The following tree removal protocol shall apply to areas of Cumberland Plain Woodland and Shale Sandstone Transition Forest being removed from the site, and shall include dead trees and stags.

Tree Removal Protocol

1. Each patch of vegetation to be cleared shall be inspected by an ecologist prior to commencement of clearing works. The ecologist shall identify and mark trees that are likely to be of importance for hollow-dependent native fauna, in particular, microchiropteran bats, parrots and owls. The ecologist will also check for Koalas.

2. Marked trees shall be removed during the period from February to May, to avoid the winter hibernation/torpor period of microchiropteran bats, and avoid the spring/summer breeding period of bats and parrots. In the event that clearing needs to occur during winter (June to September – weather conditions pending), then additional bat surveys should be conducted during the preceding late summer/autumn, to identify whether any significant bat roosts that may be used for hibernating occur in the area to be cleared. In the event that clearing needs to occur during Spring to early Summer (September to February), then all trees shall be inspected by an Arborist or wildlife handler prior to being felled, to remove and relocate bird nests. It is possible that some marked trees may need to be retained until later in the summer, if significant bird species are found to be nesting with young chicks still in the nest. Clearing of trees outside of the February to May period should be conducted in consultation with an ecologist.

3. Marked trees shall be removed as late in the afternoon as possible, so that any resident nocturnal fauna are evicted into the dusk, and have an entire night to find alternate shelter.

4. Marked trees shall initially be 'bumped' using machinery to encourage any resident fauna to evacuate on their own accord. 'Bumping' shall be repeated at 1 minute intervals for approximately 5 minutes per tree. Care shall be taken to place the machinery such that it is not likely to be hit by falling branches.

5. Removal of marked trees shall occur after an interval of approximately 5-10 minutes following the 'bumping'.

6. Removal of marked trees shall occur in a manner that allows either the whole tree, or hollow sections of the tree, to be placed gently (*ie* not free-fall) on the ground, and re-located entire or in large sections to one of the bushland reserve areas within the site.

7. A wildlife handler shall be in attendance at the site during removal of marked trees, to inspect hollows once trees are on the ground, to rescue any injured native fauna, and take appropriate action. In the event that native fauna requires medical treatment by a vet, or long-term care by a wildlife rescue agency, all costs shall be covered by the proponent.

8. The wildlife handler is to maintain records of all fauna species rescued during the tree removal works, and of the actions taken.

4 MONITORING

A monitoring program shall be established to monitor all areas of supplementary planting and revegetation conducted as part of the Concept Plan.

Specific performance criteria will be identified once planting regimes and densities are established in the detailed Bushland Management Plan.

Monitoring will include at a minimum:

- establishment of permanent photo points;
- quantitative assessment of plant growth and survival;
- quantitative assessment of floristic and structural diversity;
- visual assessment for signs of erosion, trampling, grazing, fire, rubbish dumping or other disturbance;
- preparation of annual progress reports to be submitted to Council and/or OEH, as required.
- Preparation of a final report 2 years after commencement of the final stage of the urban renewal project, with concluding statements as to the effectiveness of bushland management measures, and whether the objectives of the Bushland Management Plan have been achieved.

5 APPLICATION OF MANAGEMENT AND RESTORATION MEASURES

5.1 Vegetation Management Zones

Areas of vegetation to be managed as part of the Airds Bradbury Renewal Project have been grouped into five management zones, as follows (and shown on Figure 2):

1. ***Zone 1*** is the main patch of vegetation to be retained northwest of the Airds Shopping Centre. This zone includes the main retained patch of Cumberland Plain Woodland, and adjoining areas of Shale Sandstone Transition Forest to the south and west, which provide a link through to the Smiths Creek corridor.

   Zone 1 is be managed with the dual objective of protecting and enhancing ecological values, whilst also maintaining visibility and improving safety for local residents visiting this area for passive recreation.

2. ***Zone 2*** is the area around the proposed sporting fields and relocated pond, west of the Airds Shopping Centre. This area adjoins Zone 1, and provides some additional habitat resources to Zone 1.

   Zone 2 is to be managed primarily for active recreation, with secondary management for conservation, as practicable.

3. ***Zone 3*** is the Smiths Creek corridor north of Zone 1 and west of the Bus Depot. This area contains poor quality Shale Sandstone Transition Forest, but is of strategic value as a movement corridor for native fauna, including Koalas.

   Zone 3 is to be managed primarily for conservation, having regard to maintaining visibility to avoid the area becoming a focus for antisocial behaviour.

4. ***Zone 4*** is a series of disconnected stands of vegetation to be retained along the eastern edge of the site, including a corridor of vegetation extending into the site immediately south of the cul-de-sac of Boonoke Place.

   Zone 4 is to be managed primarily for conservation, having regard to maintaining visibility to avoid the area becoming a focus for antisocial behaviour.

5. ***Zone 5*** is the predominantly cleared lands adjoining the site to the east in the Georges River Riverside Reserve. Zone 5 is to be managed for conservation.

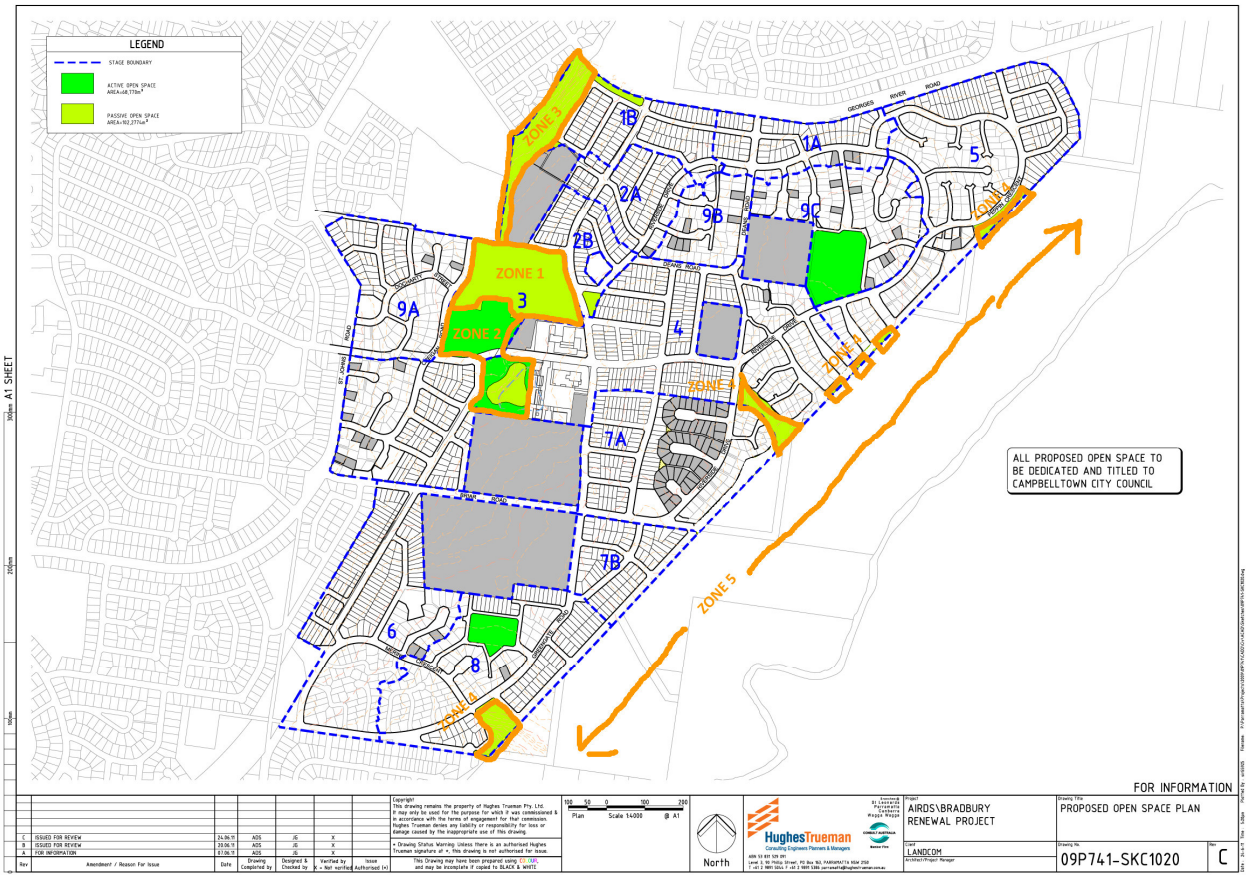

FIGURE 2 *Vegetation Management Zones.*

5.2 Zone Requirements for Management and Restoration Measures

Table 3 *Application of Management and Restoration Measures to each Vegetation Management Zone*

Management Action	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Legal Protection	✓	✓	✓	✓	✓
Weed Control	✓	✓	✓	✓	✓
Supplementary Planting	✓	-	✓	✓	✓
Revegetation	-	✓	✓	-	✓
Fire Regime	*	-	*	*	*
Human Disturbance	✓	-	✓	-	✓
Erosion Control	*	*	*	*	*
Nutrient Control	*	*	*	*	*
Dead Timber	✓	✓	✓	✓	✓
Monitoring	✓	✓	✓	✓	✓

* to be reviewed

6 FINANCE AND RESPONSIBILITY

6.1 Land Ownership

All public open space lands within Zones 1, 2, 3 and 4 will be dedicated and titled to Campbelltown City Council.

Zone 5 will remain under the ownership of the NSW Department of Planning.

6.2 Implementation of Management Actions

Landcom/Housing NSW will prepare further specific details for the protection, management and restoration of each zone, as part of the VPA and staged detailed planning of the project.

These specific details will be based on the concepts set out in Chapters 3, 4 and 5 above, and will progressively form a detailed Bushland Management Plan for the Airds Bradbury site.

Responsibility for implementation of the Bushland Management Plan will rest with Landcom/Housing, for a period of 2 years for each stage of the project, dated from issue of the Practical Completion for that stage by Campbelltown City Council.

Landcom/Housing NSW shall engage suitably qualified contractors to undertake bushland management activities. Appropriate qualifications and experience for contractors will be established as part of the detailed Bushland Management Plan.

6.3 Finance of Management Actions

Management actions shall be financed for a 2 year period by the proponent of the development.

After this time, ongoing management (as and if required) will be financed by the relevant land-owner, either Campbelltown City Council, or the Department of Planning & Infrastructure.

7 REFERENCES

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AIRDS BRADBURY URBAN RENEWAL PROJECT

BIODIVERSITY OFFSET PACKAGE

October 2011

1 INTRODUCTION

1.1 Context

This report sets out a commitment to biodiversity offsets proposed as part of the urban renewal of the Airds and Bradbury localities, in the Campbelltown Local Government Area, southwestern Sydney.

The subject site for the urban renewal project is bound generally by the Georges River Road in the north, the Georges River Riverside Reserve to the east, Greengate Road in the south and St John's Road in the west (Figure 1 below).

The subject site has been previously developed for public housing. Several schools, a juvenile justice centre and village shopping centre are centrally clustered.

The project is regarded as necessary due to the poor quality of housing and urban design within the site, which has concentrated social disadvantage and resulted in urban decay and a poor quality and poorly maintained residential environment not appreciated or respected by many of the residents.

The Concept Plan would necessarily result in some loss of native vegetation and biodiversity values within the subject site.

An assessment of impacts on biodiversity values is documented in the Ecological and Bushfire Assessment Report (Hayes Environmental, April 2011). Relevant findings are summarised in Chapter 2 below.

This report has been prepared as an addendum to the Ecological and Bushfire Assessment Report (Hayes, April 2011). Terms and definitions are consistent with the assessment report.

1.2 Objectives

The objective of this report is to describe and document a Biodiversity Offset Package that:

(a) satisfactorily compensates for impacts upon biodiversity values proposed as part of the Concept Plan;

(b) sets out the proponent's commitment to biodiversity offsets and management of existing biodiversity values; and

(c) provides sufficient information to enable consent authorities to assess the Concept Plan and make a determination in relation to biodiversity matters.

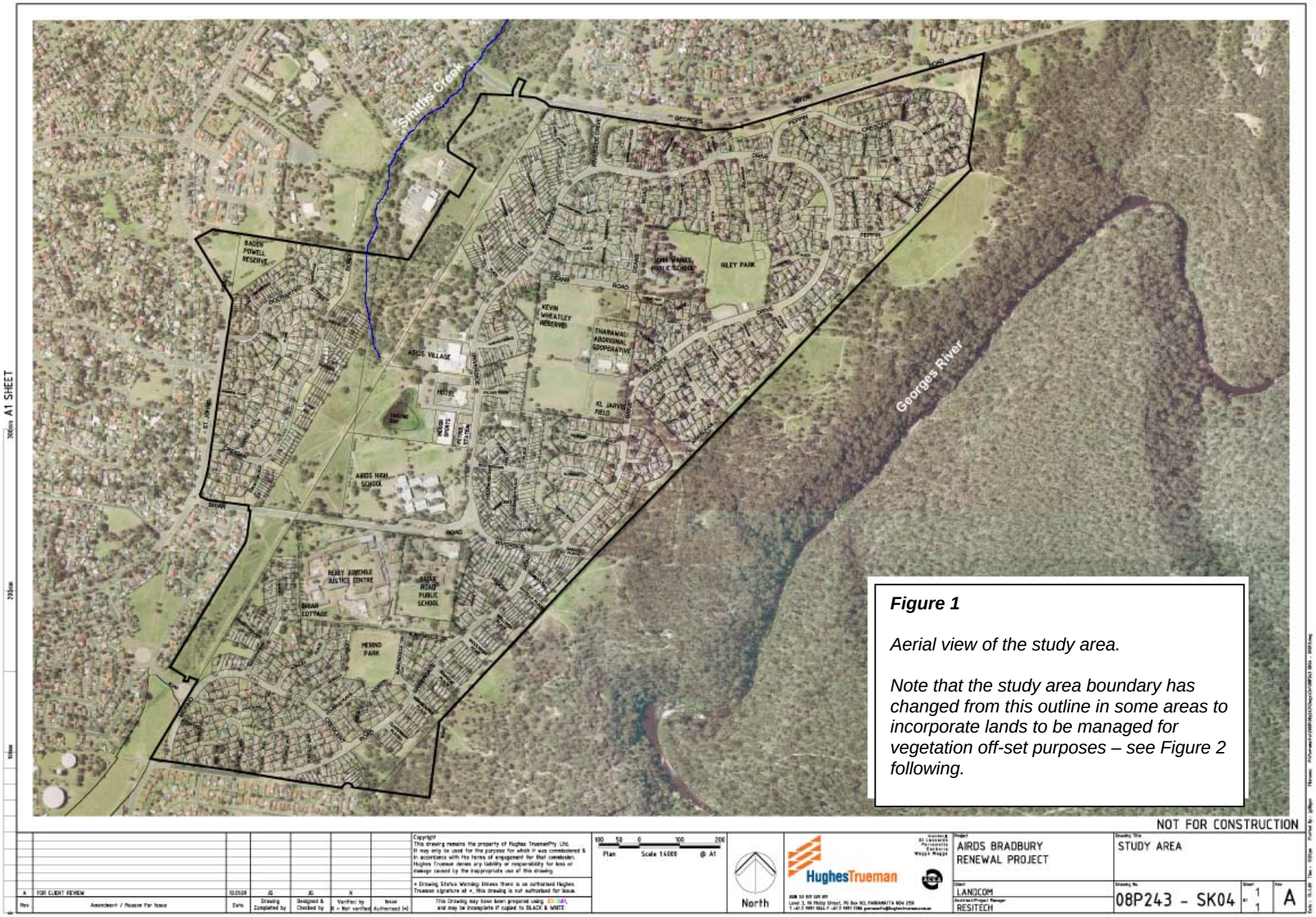

Figure 1

Aerial view of the study area.

Note that the study area boundary has changed from this outline in some areas to incorporate lands to be managed for vegetation off-set purposes – see Figure 2 following.

Figure 2 Concept Plan.

2 IMPACT OF THE CONCEPT PLAN ON BIODIVERSITY VALUES

2.1 Impact on Existing Biodiversity Values

The Concept Plan would necessarily result in loss of some areas of native vegetation and habitat from the subject site. Refer to Figure 2.

In general, the Concept Plan:

- retains areas identified as being of 'primary' conservation value within the site (Hayes, April 2011);
- retains the majority of vegetation and habitat identified as being in moderate to good condition (Hayes, April 2011);
- would clear most areas of vegetation identified as being in very poor condition, with low regeneration potential (Hayes, April 2011); and
- would clear several very small and isolated stands of vegetation that would not be viable, nor practicable to manage within an urban environment (Hayes, April 2011).

2.1.1 Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) is listed as a 'critically endangered ecological community' under both the TSC Act and the EPBC Act.

Approximately 4.4 hectares of this community occurs within the subject site, all of which is in a degraded and modified condition. Some areas retain moderate floristic diversity and structure, and are likely to respond well to assisted regeneration works.

Development in accordance with the Concept Plan would result in loss of approximately 1.21 hectares of CPW including:

- the northeastern fringe of the main patch located northwest of the existing Airds Shopping Centre (approx 6000m^2); and
- two small, isolated stands of canopy trees without a representative shrub or groundcover strata which would otherwise be surrounded by residential development (approx 3000m^2 each).

Approximately 3.19 hectares of CPW would be retained within the subject site, including:

- the majority of the main patch located northwest of the existing Airds Shopping Centre (approx 2.9 ha); and
- a small isolated patch located within the existing Reiby Juvenile Justice Centre (approx 3000m^2).

2.1.2 Shale Sandstone Transition Forest

Shale Sandstone Transition Forest (SSTF) is listed as an 'endangered ecological community' under both the TSC Act and the EPBC Act.

Approximately 8.14 hectares of SSTF occurs within the subject site.

Development in accordance with the Concept Plan would result in loss of approximately 4.41 hectares of SSTF including:

- three regrowth areas in the northwestern corner of the site, in very poor condition (limited floristic diversity, poor structure, low functionality) and with a very low regeneration potential (approximately 2.41 hectares);

- two areas located north and south of the main patch of CPW, in poor to moderate condition with some limited regeneration potential (approx 1.2 ha in total); and
- six short, narrow strips of trees located adjacent to existing residential areas within the site (approximately 8000m^2 in total).

Approximately 3.73 hectares of SSTF would be retained within the subject site, including:

- two areas adjacent to the main patch of CPW, and linked to the Smiths Creek corridor (approximately 1.3ha);
- a corridor linking the Dharawal Aboriginal Area to the Georges River Riverside Reserve (approximately 8000m^2); and
- a patch in the southeastern corner of the site adjacent to the Georges River Riverside Reserve (approximately 1.6ha).

2.1.3 Threatened Fauna

Koala's have been recorded within the Airds Bradbury site on a number of occasions, and a tagged male Koala is known to reside in the nearby Smiths Creek corridor. There is no evidence that Koalas reside within the subject site, or that the resident Koala in the Smiths Creek corridor is a regular visitor to the site.

Development in accordance with the Concept Plan would remove some vegetation linked to the Smiths Creek corridor, of potential or theoretical value for Koalas.

Koala access corridors have been retained in the east of the site, at locations indicated by Koala sightings.

Several threatened microchiropteran bat species are known and/or likely to occur within the subject site.

Development in accordance with the Concept Plan would remove areas of potential habitat for some microchiropteran bat species. This impact is not considered significant due to the extent of potential habitat for these species that would be retained on the site, in the adjacent Georges River Riverside Reserve and in the locality.

2.2 Measures to Avoid Impacts on Biodiversity Values

Hayes Environmental was commissioned in the early masterplanning stages of the project to identify ecological constraints to development within the subject site. Hayes Environmental mapped areas and features of ecological value within the subject site, and prepared a Constraints Map to facilitate ongoing discussion and design of options for the project.

The Concept Plan has been significantly informed by a comprehensive consultation process, that has involved key stakeholders, a multi-disciplined technical consultant team, government agencies and the community.

The culmination of the consultation process was a three day Enquiry by Design (EBD) workshop held in Airds Bradbury in May 2010, that brought together key stakeholders, residents, government agencies, and a range of specialist consultants to discuss the potential for new development and renewal within Airds Bradbury.

The key outcome from the EBD workshop was the identification of three concept masterplan options. These options were refined and further developed with input from stakeholders, and further testing by specialist consultants. The Concept Plan is the result of this process.

On the basis of masterplanning process, the following important ecological values were retained and protected:

- the main patch of Cumberland Plain Woodland (CPW);
- linkage of the main patch of CPW to the Smiths Creek corridor;
- space for a vegetated corridor to be re-established along Smiths Creek;
- existing corridors extending into the site from the Georges River reserve area in the east which provide potential access for Koalas.

2.3 Measures to Mitigate Impacts on Biodiversity Values

The purpose of the Renewal Project is to reduce antisocial behaviour, with its *inter alia* corresponding lack of respect for open space and bushland amenity. Current significant threats to native vegetation within the subject site include frequent fire, rubbish dumping, recreational impacts and weed invasion.

Further impact mitigation measures such as street tree planting arrangements and species, Koala friendly fencing, traffic calming measures, detailed revegetation works *etc* have been discussed, and will be implemented during the detailed design of each progressive stage of the project.

A Concept Bushland Management Plan has been prepared by Hayes Environmental (August 2011) to document the range of measures that are to be implemented within the site, to mitigate and compensate for impacts on biodiversity values.

Matters that are addressed in the Concept Bushland Management Plan include:

- retention of existing vegetation;
- legal protection of retained vegetation through the Concept Plan and VPA;
- weed control within retained vegetation;
- supplementary planting, including Koala feed tree and shelter species;
- further consultation with Dr Robert Close in order to maximise opportunities for Koala access and movement through the subject site;
- a protocol for tree removal within the subject site, to minimise disturbance to native fauna;
- fire management for conservation;
- management of human disturbance within retained vegetation;
- erosion control;
- nutrient control;
- management of flow regimes; and
- management of dead timber.

3 GUIDING PRINCIPLES

3.1 Cumberland Plain Recovery Plan (DECCW, January 2011)

The NSW Department of Environment Climate Change and Water (DECCW) prepared the Cumberland Plain Recovery Plan to provide for the long-term survival and protection of seven threatened species, four endangered populations and nine threatened ecological communities listed on the *NSW Threatened Species Conservation Act 1995* that are found only on the Cumberland Plain.

The Plan provides for protection of both Cumberland Plain Woodland (CPW) and Shale Sandstone Transition Forest (SSTF).

3.1.1 Priority Conservation Lands

DECCW [now OEH] conducted an assessment of the remaining bushland on the Cumberland Plain on the basis of four principles:

1. The protection and management of large, intact remnants is more effective and efficient than for smaller, fragmented remnants.
2. Recovery efforts need to aim to ensure that a representative sample of all target threatened species, populations and communities is conserved.
3. Active management to best practice standards is needed to prevent the degradation of the remaining bushland in such a fragmented landscape. Without active management, weed invasion, frequent fire, stormwater flooding, grazing, mowing and recreational impacts such as illegal rubbish dumping will continue. This will be complemented by increasing the extent and condition of vegetation on the Cumberland Plain using assisted natural regeneration and revegetation techniques.
4. Where impacts on threatened species, populations, and ecological communities cannot be avoided, they should be offset using appropriate means.

The assessment resulted in identification of a range of 'Priority Conservation Lands' (PCLs).

The PCLs have been identified as lands that represent the best remaining opportunities in the region to secure long-term biodiversity benefits for the lowest possible cost. They contain a total of 11,754 ha of the targeted threatened ecological communities, representing almost 40% of their combined remaining extent, along with 50–100% of the remaining populations of each threatened flora species and endangered population covered by the plan.

Within the Campbelltown LGA, there are four areas identified as PCLs:

- Gilead – vegetated lands along the eastern edge of the Nepean River, and including the Leafs Gully Creek corridor;
- Mount Annan – highly degraded vegetation along a strip of land between the Mount Annan Botanic Gardens and the Hume Highway;
- Peter Meadows Creek, Kentlyn – vegetated lands centered on Peter Meadows Creek;
- Macquarie Fields – vegetated and cleared lands on the western side of the Georges River, including Simmos Beach public reserve and extending north to Bunbury Curran Creek.

The identification of the PCLs as priorities should not be misinterpreted as underrating the significance of other remnant vegetation. While the plan promotes the PCLs as the regional priorities for the Cumberland Plain, areas of local significance (such as corridors and smaller council reserves) will complement and enhance these regional priorities.

DECCW [now OEH] recognises that smaller remnants and corridors outside the PCLs are important and may play a role in linking the PCLs and/or supporting biodiversity in the priority conservation lands. They may also contain biodiversity that is otherwise significant and play a role in assisting species' movement in the face of climate change.

It is beyond the scope of the Recovery Plan to identify areas that are of local conservation significance as this is more effectively done at the local government scale. An action is identified in the Recovery Plan for DECCW [now OEH] to encourage local government authorities to develop biodiversity strategies that are consistent with the recovery plan and that guide protection, management and strategic investment in biodiversity, both within and outside the PCLs.

3.1.2 Mechanisms for Protection of Lands

Potential mechanisms for protection of lands include biobanking agreements, conservation covenants, and dedication of Crown reserves for environmental protection.

3.1.3 Recovery Actions

Recovery actions for which Campbelltown City Council has responsibility include:

Action 1.4: Local councils will have regard to the priority conservation lands in identifying areas for inclusion in environment protection and regional open space zones.

Action 2.1: Preferentially target any future investment associated with the management of the threatened biodiversity listed in Table 1 to the priority conservation lands where practicable.

Action 2.2: Support and promote the adoption of best practice standards for bushland management and restoration (as specified in Appendix 2) on public and private lands within the Cumberland Plain.

Action 3.4: Work collaboratively with local government authorities and other organisations to inform communities about the value and role of remnant vegetation on the Cumberland Plain, the best practice standards for its management, and any opportunities to participate in the recovery program.

Action 3.5: Work with Aboriginal communities, landowners, community groups, and students to deliver best practice management in the priority conservation lands, and to identify other opportunities for involvement in the recovery program.

Action 3.7: Develop interpretive programs for key local reserves that contain examples of the threatened biodiversity addressed in the recovery plan Recovery Plan.

Action 4.3: DECCW will encourage local councils to prepare or review biodiversity strategies to be consistent with the recovery plan that guide protection, management and strategic investment in threatened biodiversity, both within and outside of the priority conservation lands.

Action 4.4: DECCW will work collaboratively with local councils to enhance the compliance and enforcement program with regard to the unauthorised clearing of bushland on the Cumberland Plain.

3.2 Conservation Significance Assessment

The *Conservation Significance Assessment of the Native Vegetation of the Cumberland Plain* (DECCW 2002) classifies areas of native vegetation across the Cumberland Plain as being:

- Core Habitat – part of a viable conservation network;
- Support for Core – increases remnant size, buffers edge-effects, provides corridor connections; or

- Other Vegetation.

The Smiths Creek corridor located adjacent and to the north of the subject site is identified as ‘core habitat’.

Vegetation within the subject site that is linked to the Smiths Creek corridor is identified as ‘support for core’.

3.3 Cumberland Koala Linkage

The Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region (DECCW 2007) identifies the “Cumberland Koala Linkage’.

The Cumberland Koala Linkage refers to native vegetation around the rim of the Cumberland Plain which links the four Koala colonies at Wedderburn, Avon/Nepean, South Nattai and Glenbrook.

The Smiths Creek corridor is regarded as part of this ‘linkage’.

4 ON-SITE OFFSETS

4.1 Retention of Existing Vegetation

4.1.1 Main Patch northwest of Airds Shopping Centre

Retention of approximately 4.2 hectares of native vegetation northwest of the existing Airds Shopping Centre. This patch is linked to the Smiths Creek corridor and includes 2.9 hectares of CPW and approximately 1.3 hectares of SSTF.

This patch of vegetation is currently in poor to moderate condition, with a low floristic diversity. It is threatened by weed invasion, frequent fire, and by ongoing incremental damage to the understorey.

This patch of vegetation would be protected through a Voluntary Planning Agreement (VPA), forming part of the Concept Plan.

The vegetation would be enhanced and further protected through a range of mitigation measures, as set out in the separate Concept Bushland Management Plan (Hayes 2011). Refer also to Chapter 2.3 above.

Specific measures to be addressed include removal and control of weeds, fire control, rationalisation of existing tracks, controlled pedestrian and bike access, and supplementary tree and understorey plantings.

The proposed management actions would improve the ecological function of the community, and maximise the long-term viability of this patch.

4.1.2 Koala corridor

An existing corridor of SSTF (approximately 8000m^2 in area) extending into Airds from the Georges River Riverside Reserve would be retained from south of the cul-de-sac of Boonoke Place to Riverside Drive. Koalas have been sighted in this area. It is possible that the corridor is of value as a fire refuge, and provides some limited movement opportunity.

This corridor would be protected through a Voluntary Planning Agreement (VPA), forming part of the Concept Plan.

The vegetation would be enhanced and further protected through a range of mitigation measures, as set out in the separate Concept Bushland Management Plan (Hayes 2011). Refer also to Chapter 2.3 above.

Specific measures to be addressed include removal and control of weeds, and supplementary Koala habitat plantings.

4.1.3 Southeastern corner

The existing patch of SSTF in the southeastern corner of the site (approximately 1.6 ha) would be retained.

This patch of vegetation would be protected through a Voluntary Planning Agreement (VPA), forming part of the Concept Plan.

The vegetation would be enhanced and further protected through a range of mitigation measures, as set out in the separate Concept Bushland Management Plan (Hayes 2011). Refer also to Chapter 2.3 above.

4.1.4 Reiby Juvenile Justice Centre

A small isolated patch of CPW (approximately 3000m^2) is retained within the Reiby Juvenile Justice Centre. This patch would be retained for the foreseeable future.

There is limited opportunity to further protect or enhance this patch.

4.2 Revegetation of Lands within the Subject Site

4.2.1 Smiths Creek

The Smiths Creek corridor is of significant local value. It contains SSTF, and provides known habitat for Koalas.

The Smiths Creek corridor has been classed as ‘core habitat’, and is part of the Cumberland Koala Linkage.

The connection between the Smiths Creek corridor immediately to the west of the subject site and retained vegetation on the site would be strengthened through revegetation works. A calculation of area of land that would be revegetated cannot be calculated at this stage.

Planting and management details are set out in the separate Concept Bushland Management Plan (Hayes 2011).

4.2.2 Existing Dam

The existing pond located southwest of the Airds Shopping Centre would be partly re-located to the west within the Concept Plan. This area has been previously cleared of native vegetation and is highly degraded. It does not currently support CPW.

New plantings of CPW tree, shrub and groundcover species in groupings around the pond area would serve a dual purpose – i) providing public amenity and an aesthetic surrounding to the pond, and ii) providing approximately 3,800m^2 of habitat for native fauna and an ecological extension to the retained patch of CPW.

The connection of this pond feature to the main patch of CPW would improve the value and diversity of habitats for native fauna, and provide a permanent water resource for this area.

Planting and management details are set out in the separate Concept Bushland Management Plan (Hayes 2011).

5 OFF-SITE OFFSETS

5.1 Priority Conservation Lands

The subject site is not located adjacent or proximate to any of the Priority Conservation Lands identified in the Cumberland Plain Recovery Plan.

Neither Landcom nor Housing NSW own or have interests in any of the Priority Conservation Lands identified within the Campbelltown Local Government Area.

There are, however, lands identified as being of local importance along Smiths Creek, adjacent to the subject site.

There are also opportunities to improve connectivity of retained vegetation and habitat within the subject site with nearby areas of vegetation and habitat.

5.2 Lands with Local Biodiversity Significance

5.2.1 Smiths Creek

The Smiths Creek corridor has been classed as 'core habitat' in the *Conservation Significance Assessment of the Cumberland Plain* (DECCW 2002).

The corridor has also been identified as part of the Cumberland Koala Linkage in *Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region* (DECCW 2007). A male Koala is known to be resident within the corridor to the north of the subject site (R Close *pers comm*).

OEH and Council have both highlighted the importance of the Smiths Creek corridor in their correspondence regarding the Airds Bradbury Urban Renewal Project.

In the absence of available Priority Conservation Lands, the Smiths Creek corridor is regarded as the most significant biodiversity asset in the locality.

Approximately 2 hectares of land adjoining and including Smiths Creek itself, have been incorporated into the Concept Plan. These lands adjoin the western boundary of the subject site, and link the main patch of native vegetation being retained northwest of the Airds Shopping Centre, with the main Smiths Creek corridor to the north of Georges River Road.

These lands contain a sparse canopy cover of SSTF. Revegetation works would be conducted to restore the SSTF community, and provide additional habitat for Koalas. Further details are provided in the separate Concept Bushland Management Plan (Hayes 2011). Refer also to Chapter 2.3 above.

This area would be protected through a Voluntary Planning Agreement (VPA), forming part of the Concept Plan.

5.2.2 Claymore Urban Renewal Project Area

There is opportunity to conduct revegetation and regeneration works along a riparian corridor in the north of the Claymore Urban Renewal Project Area – refer to Figure 3 below.

A large part of this corridor would once have supported Cumberland Plain Woodland, and would be suitable for planting of Cumberland Plain Woodland species. Other parts of the corridor are more suited to planting of River-flat Eucalyptus Forest species.

There is opportunity to revegetate/regenerate eight proximate stands of Cumberland Plain Woodland within this corridor, totalling approximately 2.5 hectares. One of these areas should include a gradation towards River-flat Eucalypt Forest towards the creekline.

Figure 3 *Extract from Claymore Urban Renewal Project Ecological Study showing existing vegetation (Cumberland Ecology, June 2011), Figure 6.1.*

5.2.3 Georges River Riverside Reserve

The Georges River Riverside Reserve conserves many important biodiversity values, including areas of intact Shale Sandstone Transition Forest, and a viable Koala population.

Approximately 10-15 hectares of cleared and disturbed land occurs along the boundary between the Georges River Riverside Reserve and the eastern boundary of the subject site. Some of this land is zoned for the future Georges River Parkway, a major regional road.

It is proposed that approximately 10 hectares of land (outside of the Georges River Parkway reservation) would be revegetated/regenerated using SSTF plant species.

These works would improve the connectivity of retained vegetation within the subject site with the Georges River bushland, as well as providing additional habitat for Shale Sandstone Transition Forest, and for the Koala.

6 SUMMARY OF BIODIVERSITY OUTCOMES

Table 7 Summary of Biodiversity Outcomes.

Value	Impact	Outcome
Cumberland Plain Woodland	Loss of approx 6000m^2 of degraded CPW from the northeastern fringe of the main patch of this community on the site. Loss of two small, isolated stands of canopy trees, approx 3000m^2 each, which would not be viable with development of surrounding lands. Retention of 2.9 ha, with management of current threats, and with improved security and long-term viability – refer to separate Concept Bushland Management Plan (Hayes 2011): Retention of approx 3000m^2 being a small stand of trees within the Reiby Juvenile Justice Centre. Revegetation of approximately 3,800m^2, as a series of loosely connected stands linking the pond with the main patch of CPW. Revegetation/Regeneration of approximately 2.5 ha of CPW at Claymore, as a series of 8 proximate stands along a riparian corridor.	Maintain Value
Shale Sandstone Transition Forest	Loss of 2.41ha of very poor condition SSTF, with very low regeneration potential. Loss of 2ha of poor to moderate condition SSTF, with some limited regeneration potential. Retention of 3.73ha of SSTF, with improved security and long-term viability – refer to separate Concept Bushland Management Plan (Hayes 2011). Restoration of 2 ha of SSTF within the Smiths Creek corridor, with improved security and long-term viability - refer to separate Concept Bushland Management Plan (Hayes 2011). Revegetation/Regeneration of approximately 10 ha of SSTF along the western boundary of the Georges River Riverside Reserve.	Improve Value

Table 7 cont Summary of Biodiversity Outcomes.

Value	Impact	Outcome
Koalas and Koala habitat	Loss of approx 5 ha of occasional habitat, being predominantly poor quality native woodland with low viability and low regeneration potential. Retention of 6.62ha of potential habitat, with improved security and long-term viability - refer to separate Concept Bushland Management Plan (Hayes 2011). Restoration of 2 ha of habitat within the Smiths Creek corridor, with improved security and long-term viability - refer to separate Concept Bushland Management Plan (Hayes 2011). Revegetation/Regeneration of approximately 10 ha of native woodland/forest along the western boundary of the Georges River Riverside Reserve.	Maintain Value in short term Improve Value in medium and long term
Microchiropteran bat habitat	Loss of 5.62ha of potential habitat, being predominantly poor quality native woodland with low viability and low regeneration potential. Retention of 6.92ha of potential habitat, with improved security and long-term viability - refer to separate Concept Bushland Management Plan (Hayes 2011). Restoration of 2 ha of habitat within the Smiths Creek corridor, with improved security and long-term viability - refer to separate Concept Bushland Management Plan (Hayes 2011). Revegetation/Regeneration of approximately 10 ha of native woodland/forest along the western boundary of the Georges River Riverside Reserve. Revegetation/Regeneration of approximately 2.5 ha of native woodland at Claymore, as a series of 8 proximate stands along a riparian corridor.	Maintain Value in short term Improve Value in medium and long term

7 CONCLUSION

Development in accordance with the Concept Plan would result in loss of 5.62 hectares of degraded native vegetation and habitat. Some of the vegetation is regrowth in such poor condition that it has a very low regeneration potential.

This loss is necessary to achieve required social outcomes for the Airds Bradbury Renewal Project.

The loss is compensated by:

1) implementation of protection and management measures to enhance the viability of 6.63 hectares of retained vegetation within the site (2.9 hectares of CPW and 3.73 hectares of SSTF) (refer to Concept BMP, Hayes 2011); and
2) revegetation of 12 hectares of additional lands of strategic biodiversity value adjoining the site (2 hectares along Smiths Creek plus 10 hectares adjacent to the Georges River Riverside Reserve).
3) revegetation and regeneration of approximately 2.5 hectares of land within a riparian corridor at Claymore.

The Concept Plan establishes a Voluntary Planning Agreement (VPA) whereby biodiversity values would be maintained and/or improved.

8 REFERENCES

DECCW. 2002. *Conservation Significance Assessment of the Native Vegetation of the Cumberland Plain.*

DECCW. 2007. *Terrestrial Vertebrate Fauna of the Greater Southern Sydney Region*.

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