greenway

cooks river to iron cove

Flora and Fauna Literature Review

June 2010

Acknowledgements

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Disclaimer
This literature review represents a summary of data in draft format that is subject to the personal interpretations of the contributors. The objective of this review is to consolidate information relevant to the GreenWay from a variety of sources. The author has made initial recommendations based on his review and analysis of the data and information. To provide feedback or more information please contact Adam Ward, Biodiversity Officer, GreenWay Sustainability Project.

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Executive Summary

The Cooks River to Iron Cove GreenWay Flora and Fauna Literature Review been drafted in order to collate, evaluate and compare literature relevant to native flora and fauna within the Cooks River to Iron Cove GreenWay. This document provides a comparison of existing information with the purpose of presenting a comprehensive appraisal of existing biodiversity values. The aim is to present a source of information that will result in increased data accessibility for members of the public and professionals, an education resource for schools; and a mechanism for heightened public awareness within the community. Information included within this review has been sourced from a range of locations including Council and other landowner documents and records presented by the community. This information has been complimented by the inclusion of scientific references and strategic planning initiatives to provide the consolidation of data with a view to provide a point of reference for the continued rehabilitation of habitat and biological diversity within this valuable urban ecosystem.

The Cooks River to Iron Cove GreenWay corridor extends five kilometres from Iron Cove at Haberfield in the north to the Cooks River at Earlwood in the south. The corridor passes through the Marrickville, Leichhardt, Canterbury and Ashfield Local Government Areas (LGAs) following the Hawthorne Canal and the Rozelle/Dulwich Hill goods railway corridor which runs adjacent to the canal to a junction above the Cooks River at Dulwich Hill. The linear orientation of riparian open space associated with these features provides the basis for an environmental green corridor or 'GreenWay' link between the Cooks River and Iron Cove.

An integral component of the GreenWay vision is the re-establishment of local provenance native vegetation in order to provide a continuous vegetation and habitat corridor. The development of this ideal has evolved from recognition of the area's potential to support a 'nature reserve' over the last 40 years and has culminated in an exemplary case study of urban ecological restoration and volunteer commitment (Jensen 2009).

Initial assessment of fauna populations have alluded to relatively high levels of species diversity in the GreenWay when compared to study sites located out side of the corridor. This review found that 316 vertebrate species (native and introduced) are purported to occur in the locality. This may be probable, as a fauna study completed in 2007 by Australian Museum Business Services for Marrickville Council, recorded a total of 87 fauna species over only a limited survey period. The GreenWay corridor also provides habitat for threatened species known to occur in the corridor or in the greater area, including the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), the Grey Headed Flying Fox (*Pteropus poliocephalus*) and several bird species, as well as an endangered population Long-nosed Bandicoots (*Perameles nasuta*).

The advantages to floral and faunal biodiversity resulting from the reconnection of previously fragmented habitats are well documented, and the Cooks River to Iron Cove GreenWay presents an invaluable opportunity to further establish an example of a wildlife corridor in an urban context. Efforts from existing volunteer groups in realising this potential to date have been significant. Further scientific investigation and monitoring will provide a more comprehensive assessment of remnant and reinstated biodiversity values that will serve to refine future rehabilitation through revegetation projects. Research of this nature also serves to establish baseline data that will enable comparative analysis of biodiversity values in the future.

Acknowledgement of Local Indigenous Community

The author would like to acknowledge that the Cooks River to Iron Cove GreenWay area exists on country for which the members and elders of the local Indigenous community have been custodians for many centuries, and on which Aboriginal people have performed age old ceremonies. We acknowledge and respect their living culture and unique role in the life of this region.

Indigenous Heritage

The GreenWay is situated over lands of the Cadigal Wangal Aboriginal people of the Eora Nation. The Hawthorne Canal was originally the Long Cove Creek which marked the boundary between the Cadigal and Wangal aboriginal group lands.

Aboriginal People and Biodiversity

In an Aboriginal world view, people and country (both traditional lands and seas) are an integrated whole and the entire landscape has spiritual significance. This means that there is no separation of nature and culture, and the health of the natural environment and Aboriginal people are intimately connected. Empowering Aboriginals to care for their Country through access and management, and seeking input and advice from the community's knowledge holders will help meet biodiversity conservation objectives and maintain Aboriginal people's cultural heritage, connection to Country and wellbeing (DECC 2008).

1. Context of Review

This review has been drafted in order to collate, evaluate and compare literature relevant to native flora and fauna within the Cooks River to Iron Cove GreenWay. This document provides a comparison of existing information with the purpose of presenting a comprehensive appraisal of biodiversity values within the GreenWay. The intent of this document is a consolidation of this information that will serve as a point of reference for continued rehabilitation of habitat and biological diversity within this valuable urban ecosystem.

Historically land management practices in local government areas (LGA's) surrounding the Cooks River to Iron Cove GreenWay have resulted in detrimental effects on the corridor's biological diversity values. Biological diversity: the variety of all life forms - the genes they contain, and the ecosystems of which they form a part - is increased by genetic change and evolutionary processes and is significantly reduced by processes such as habitat degradation, population decline, and introduction of non native species. Biological diversity (also called biodiversity) is measured not only in terms of the number of different species that exist in an area but also in terms of the *genetic stock* and *ecosystem diversity* of the locality (Leichhardt Municipal Council, 2009).

Natural area restoration practices such as bush regeneration have proven to be the most effective means of restoring the integrity and biological diversity and the most effective method of protecting and reinstating flora and fauna compositional assemblages (Department of Environment, Science and Technology, 1996). The restoration of native flora through bush regeneration with a diversity of native plant species where intensive land development has already occurred can significantly increase native animal biodiversity. This offers a revegetated habitat that will facilitate ecological succession and not only enhance plant and animal diversity but also tend to reduce the diversity of non-native species (McKinney, 2002).

A historical context has been established in order to not only summarise the previous land use and land management practices but also to serve as a description of the composition of flora and fauna within the Cooks River to Iron Cove GreenWay prior to European settlement. The reinstatement of biological diversity to this standard has provided and will continue to provide a founding objective for land rehabilitation management practices.

2. Introduction

The Cooks River to Iron Cove GreenWay corridor extends five kilometres from the Cooks River at Earlwood in the south, to Iron Cove at Haberfield in the north (figure 1).The corridor passes through the Marrickville, Leichhardt, Canterbury and Ashfield Local Government Areas (LGAs). The Hawthorne Canal catchment extends from the upper catchment in Dulwich Hill to its outlet at Iron Cove on Sydney Harbour. The Lilyfield to Enfield goods railway corridor runs adjacent to the canal to a junction above the Cooks River.

An integral component of the GreenWay vision is the re-establishment of local provenance native vegetation in order to provide a continuous vegetation and habitat corridor. The open space associated with these features provides the basis for a GreenWay link between the Cooks River and Iron Cove. As a result of considerable volunteer work, the potential of this corridor has been recognised by the community and Ashfield, Canterbury, Leichhardt and Marrickville Councils. The GreenWay corridor concept has gained recognition and significant grant monies have been obtained to implement the vision, including $1.83 million from the NSW Government's Environmental Trust Urban Sustainability Program to implement the GreenWay Sustainability Project.

The vision of the GreenWay Sustainability Project is stated as:

> ***"The successful design and implementation of a best practice model for shared responsibility towards achieving a sustainable environmental, cultural and non motorised transport corridor, linking the sub-catchments of the Cooks River and Iron Cove."***

The biodiversity component of the GreenWay Sustainability Project reflects the potential of this corridor to provide focus for a number of stakeholders to collaborate towards achieving sustainable outcomes. This includes building capacity, techniques and tools for integrated management, creating a focal point for community engagement and the continued establishment and improvement of habitat to promote a biologically diverse urban environment.

This document has been drafted with the purpose of the consolidation of information and the comparative analysis of literature relevant to flora and fauna biodiversity within the Cooks River to Iron Cove GreenWay. The aim is to present a comprehensive and accurate source of information that will result in increased data accessibility for members of the public and professionals, an education resource for schools; and a mechanism for heightened public awareness within the community. Information included within this review has been sourced from Council and other landowner documents, and records presented by the community. This information has been complimented by the inclusion of scientific references and strategic planning initiatives to provide a consolidation of data and a more holistic representation of relative information.

This review includes an analysis of descriptive information relating to the pre-European vegetation as the re-establishment of vegetation communities along the corridor that mirror the composition of indigenous floristic composition has provided an agreed objective of volunteer based bush care activities. Included is a time line of completed bushcare activities in order to provide a record of vegetation re-establishment practices.

2.1. Cooks River to Iron Cove GreenWay Map

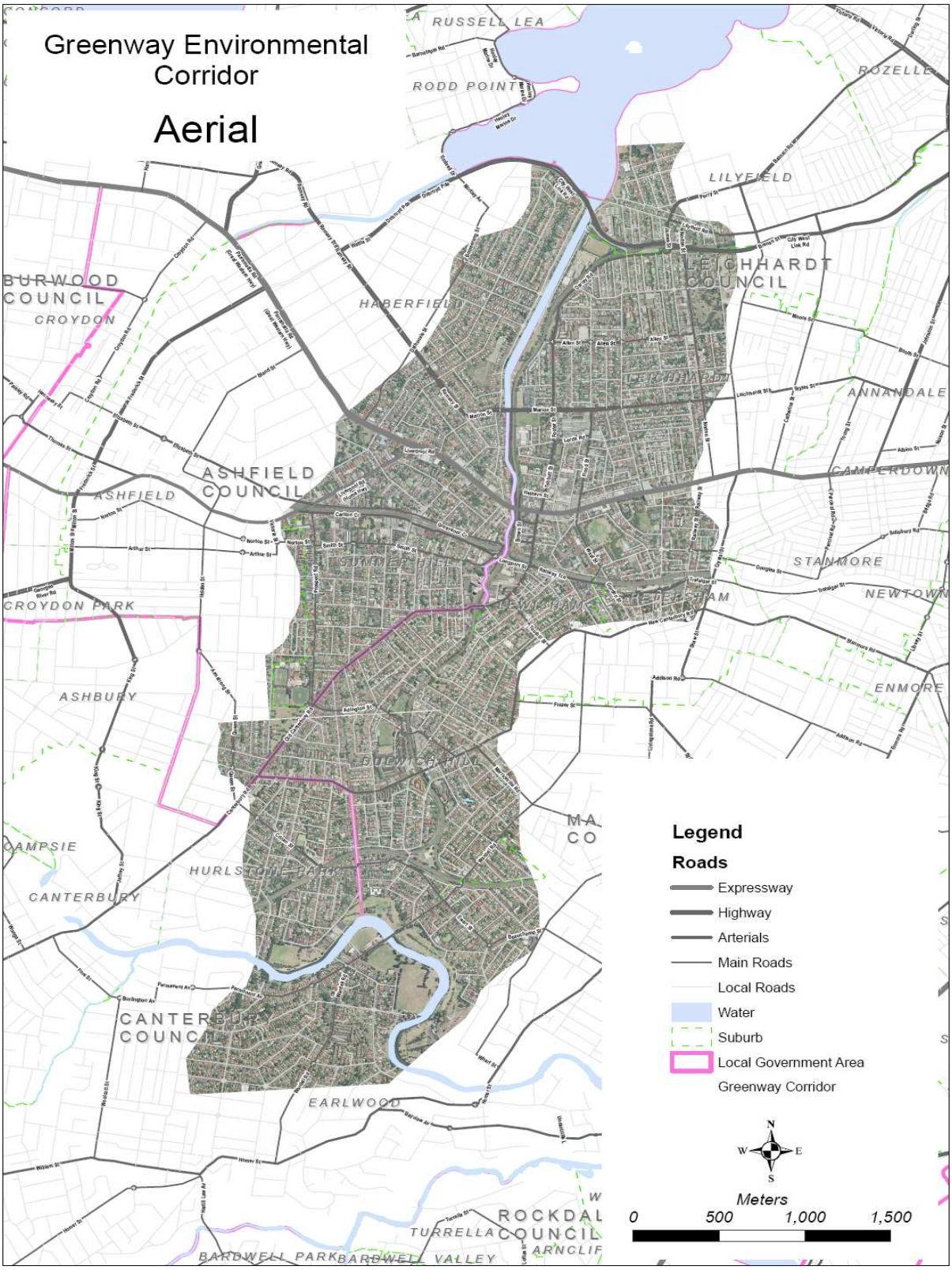

Figure 1: Cooks River to Iron Cove GreenWay Map depicting the confines of the study area included within this review.

2.2 Methodology

The methodology for this review included the following activities:

- Desktop survey of species databases
- Ashfield Council archival research
- Marrickville Council archival research
- Review of community based bushcare progress reports, including the Inner West Environment Group.
- Personal accounts and private records
- Evaluation of completed ecological assessments
- Appraisal of current published scientific research
- Review of Councils' State of the Environment Reports.

2.3. Local and Regional Environmental Context

Sydney's inner west environment has been subject to the ecological pressures associated with urbanisation over an extended period. The areas of Ashfield, Canterbury, Leichhardt and Marrickville were subjected to comprehensive land clearing and subsequent urban expansion from 1900-1910. This has resulted in a vast reduction in the abundance and species diversity within native flora and fauna populations and the consequent fragmentation of the remaining vegetation and habitat. It is well established that urbanisation is one of the principal drivers of biodiversity loss. The remaining *in situ* vegetation consists of the isolated remains of the original Turpentine Ironbark forest (Benson1990). These include remnant trees at Marrickville Golf Course and grasses near Dulwich Hill Train Station (IWEG 2000).

The Hawthorne Canal now covers the original estuarine, mangrove habitat once known as Long Cove Creek, while the estuarine complex of the Cooks River at Marrickville now supports a residential area, rail corridor, parklands and golf course. Such alteration of the landscape has resulted in vegetation reduction, modification and the invasion of exotic species. Following such significant changes to natural landscape composition and ecosystem processes, habitat alterations have led to severe impacts to fauna communities. Subsequently urban expansion with in this area has led to the creation of a complex range habitat niches which typically are known to support a high diversity of fauna species including rare and threatened species (Niemela 1999).

Niche habitat areas within relatively taxonomically rich riparian zones provide invaluable opportunities. When these areas are subject to bush regeneration activities they have shown to reveal significant variation in invertebrate faunal structure (Ives 2007). Australian native flora and fauna species that lack gap tolerances depend on suitably connected corridors of vegetation for population persistence. Factors such as spatial configuration of vegetation assemblage within the landscape are of primary importance to species that have become restricted in their dispersal range and in the kinds of habitat through which they can disperse (Brooker *et al.* 1999). The advantages of a increased connection of habitat within a biodiversity corridor include important ecological functions relating to biodiversity, gene flow, population dynamics and species movement and dispersal (McRae et al 2008) This relationship serves as ecological evidence providing scientific and social foundations for the merits of environmental corridors and the importance of the continued protection and rehabilitation of this valuable natural resource.

Within the inner west of Sydney, the Lilyfield to Enfield goods railway corridor runs adjacent to the Hawthorne Canal through Ashfield, Canterbury, Leichhardt and Marrickville Local Government areas (LGAs) in a north/south direction. The geographical orientation of this infrastructure, corresponding examples of residual vegetation and open space areas along a linear orientation from the Cooks River at Marrickville to Iron Cove on Sydney Harbour has provided an opportunity for the establishment of a sustainable restored native vegetation and habitat corridor. Potential for the establishment of this green link or 'GreenWay' between these two waterways has been adopted by the community and local and state governments as the Cooks River to Iron Cove GreenWay.

More recently an increase in support from landowners with the adoption of the *GreenWay Master Plan and Coordination Strategy* by the community and Ashfield, Canterbury, Leichhardt and Marrickville Councils acknowledges that this open space corridor forms a connection with the two major waterways and has potential to form the "GreenWay" link.

This demonstrates the amount of public recognition of the potential to complete the establishment of a native vegetated and habitat corridor. In an effort to consolidate this potential local residents have completed a wealth of bushcare activities over the last 40 years within areas along the rail corridor and along the Cooks River. These areas have been subject to extensive community based bush re-establishment programs and these sites now support species-rich examples of the original vegetation.

2.4 Hydrology

The replacement of Long Cove Creek with Hawthorne Canal and the development of Shea's Creek Dulwich Hill has caused a severe reduction in hydrological interactions within both catchments. The following section is an overview of changes made to these waterways. The waterways themselves, consisting of concrete channels and conveying stormwater of variable quality, do not support the range of aquatic life that the original creeks would have contained (LMC SOE 08/09. The Cooks River at the southern end of the GreenWay is currently undergoing extensive rehabilitation and water quality is monitored by the Australian Catholic University as a component of their RiverScience Ecological Monitoring Program.

Hawthorne Canal

The entrance to Hawthorne Canal (historically known as Long Cove Creek) was surveyed by Captain John Hunter and Lieutenant William Bradley 1788 who described the vegetation as a thick covering of Grey Mangroves (*Avicennia marina*) on estuarine mud flats (Benson & Howell 1995, Sabolch 2006) Construction of the Long Cove Creek canal or Hawthorne Canal commenced by the Public Works Department in c.1895, this initial phase of construction was completed up to the planned site of Hawthorne Canal footbridge. The Hawthorne Canal footbridge was constructed c.1902, and a ferry service then commenced operation along the canal to the Haberfield wharf adjacent to Barton St Leichhardt. The ferry service ceased operation in 1905 due to the canal being subject to siltation. The Hawthorne Canal was extended upstream, realigned and concreted by the Public Works Department in 1922. Additionally in 1922 the public works department agreed to narrow the width of the canal to 40 feet (12.19 metres) from Marion Street to the existing footbridge and a new footbridge was constructed. In 1939 the remainder of the canal was narrowed to 40ft (12.19 metres) in order for it to function as a stormwater channel.

These alterations to the drainage structure coupled with changed land use within the catchment have resulted in increased contaminant loads entering Iron Cove despite the introduction of gross pollutant traps. Currently pollutants contained within stormwater emanating from terrestrial ground water flows and run-off within the GreenWay's Hawthorne canal catchment are recognised as the most serious threats to water quality and biological productivity within Iron Cove. Current 'source- to-sink' studies conducted within the Iron Cove catchment explain the relationship between the environmental status of the catchment and the quality of sediments in the adjacent receiving basin (Iron Cove). The study concluded that high concentrations of sediment containments such as heavy metals suspended within stormwater entering Iron Cove were likely to cause adverse biological effect on benthic organisms (Birch & McCready (2009). These results are complimented by research conducted by Birch & Hutson (2009) in which it was concluded that muddy sediments in Iron Cove contained heavy metals, organochlorine pesticides and polycyclic aromatic hydrocarbons. Birch and Huston concluded that the entrance to Hawthorne canal on Iron Cove presents an area of medium-high sediment risk in an area of low ecological/ conservation value. Birch and McCready (2009) conclude that due to the

large array of possible non- point source pollutants detailed investigation of contaminant generation is required to construct and apply reduction and remedial strategies (Birch and McCready 2009).

Cooks River

Bank stabilisation originally provided by the roots of eucalyptus trees, wattle shrubs, casuarinas, mangroves, salt marsh, reeds and other plants have been removed since European settlement to provide timber for building and fuel, and land for agricultural, industrial and urban development. With them went unique habitats which supported a huge diversity of native wildlife. Subsequently the banks of the Cooks River are now largely formed by walls of stone, concrete and steel.

More recently the Cooks River is gradually benefiting from a number of riverbank rehabilitation projects which use more environmentally sensitive methods to control erosion and stabilise banks while restoring natural values and processes at the same time. Along the river banks sandstone rocks, terracing and dense plantings of native vegetation are being used to turn eroding, weed-infested reaches of the River into a stable, bio-diverse and naturally functioning watercourse (City of Canterbury 2007). Currently nutrients metals and Total suspended solids (TSS) are discharged from the GreenWay's Cooks River catchment largely untreated. Beck (2009) states that a catchment wide approach where pollutants are treated via sediment filtration basins located at the point of base flow discharge will present favorable conditions for the assimilation of pollutants into benthic sediments.

3. Guiding Documents

The role of local government in biodiversity conservation is recognised in the following legislation:

- *Threatened Species Conservation Act 1995*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *National Local Government Biodiversity Strategy*
- *Local Government Act 1993*
- *Native Vegetation Act 1993*
- *Noxious Weeds Act 1993*
- *Noxious Weeds Amendment Act 2005*

3.1 The National Strategy for the Conservation of Australia's Biological Diversity

The National Strategy for the conservation of Australia's Biological Diversity (1996, p6) defines biodiversity as "the variety of all life forms -the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part". Existing biodiversity values within the GreenWay are subject to severe pressure from the effects of land use associated with human activity. The strategy promotes the conservation of biological diversity in urban areas through retention of habitat and by encouraging action by local governments to retain and improve natural ecosystems and to use locally indigenous species for plantings in urban areas.

3.2 A new Biodiversity Strategy for NSW: Discussion Paper October 2008

The NSW Department of Environment and Climate Change (now DECCW) provides a strategic foundation for the preservation of Biodiversity in NSW through the consolidation of the guiding principles of biodiversity conservation. The discussion presents that biodiversity is best conserved in its natural environment (*in situ*) and that maintaining the integrity, dynamics and resilience of natural systems is critical to conservation efforts. This document also clarifies that habitat connectivity is vital at local, regional and continental scales and that government at all of these levels should adopt and implement the principles of ecologically sustainable development in particular the intergenerational equity and precautionary principles (DECC 2008)

Department of Environment and Climate Change NSW: Adaptation Strategy for Climate Change Impacts on Biodiversity

The NSW Biodiversity and Climate Change Adaptation Framework emphasizes the advantages of cross-tenure connectivity conservation. The document outlines the need to increase awareness and acceptance of the importance of connectivity conservation as a mechanism to mitigate the effects of climate change on biodiversity. It is presented that habitat connectivity increases the chances that a large range of species will survive climate change, changing fire regimes, invasive species and altered rainfall patterns.

3.3 Local Government Responsibilities

Biodiversity Planning Guide NSW National Parks and Wildlife Service (DEC 2001)

The role of local government in biodiversity conservation is recognised in the *Local Government Act 1993* (LG Act) and the *Environmental Planning and Assessment Act 1979* (EP&A Act). It is also referred to the in the *National Local Government Biodiversity Strategy* adopted in 1998. More generally, this role is a consequence of the direct and long-term influences on biodiversity by land development processes, which are substantially regulated and guided by local government.

Under the LG Act it is part of each council's charter to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible. This charter is reinforced by the objects of the EP&A Act, including:

> *An objective of the EP&A Act is the encouragement and protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats*.

Local government has an important positive (non-regulatory) role in biodiversity conservation. For example, councils play a significant management role in traditional functions such as maintaining reserves and open space. They are also able to offer incentives and other supporting mechanisms that may promote biodiversity conservation objectives (DEC 2001)

3.4 The National Strategy for Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) is dependent on the conservation of biological diversity which is one of the three core objectives of The National Strategy for Ecologically Sustainable Development 1996 which states:

> *Biological diversity underpins human well-being through the provision of ecological services such as those that are essential for the maintenance of soil fertility and clean, fresh water and air. It also provides recreational opportunities and is a source of inspiration and cultural identity.*

The strategy outlines the conservation of biological diversity in urban areas through the retention and rehabilitation of habitat and the implementation of strategic planning and infrastructure coordination.

4. Stakeholder and Landowner Documents

Primary stakeholders of the Cooks River to Iron Cove GreenWay include: local residents in the GreenWay catchment, Volunteer bushcare groups, Council parks and gardens staff, Friends of the GreenWay, the GreenWay Steering Committee, Sydney Water, Roads and Traffic Authority NSW and Railcorp.

Land owners such as Railcorp and Energy Australia have documented provisions for the protection of fauna species habitats within management plans. The protection of threatened species through the drafting of recovery plans is also outlined. Management actions such as the utilisation of local provenance species and the control of weed and pest species are also recommended.

4.1 Railcorp

Railcorp Biodiversity Management Plan Metro South Rail Corridors (2006)

The Railcorp Metro South Biodiversity Management Plan (BMP) denotes the protection of native threatened and non-threatened plant and animal species and communities and the provision of a vegetation complex that protects native vegetation and wildlife habitat as key objectives. Also within the objectives of the plan Railcorp's commitment to the principals of Ecological Sustainable Development is affirmed. The BMP goes on to state that the re establishment of native vegetation through bush regeneration on the rail corridor is a priority of their approach to weed management.

The Railcorp BMP provides a basic overview of management objectives relevant to bush regeneration including approaches to tree, shrub and weed management as well as bush regeneration policies and vegetation management strategies.
The document explains that land management actions will be carried out within a prioritisation framework. This framework places a higher priority on land parcels within a close proximity to national parks and native bushland with the highest priority reserved for maintenance of previous vegetation works. Lower priority values are assigned to land parcels within a close proximity minor waterways and Adjacent to a public facilities such as schools and hospitals. The approach is dictated by resources restrictions and takes into consideration areas of threatened flora and fauna however consideration of biodiversity corridors and connection of habitat zones are not evaluated.

The Railcorp Biodiversity Management Plan outlines procedures necessary for the protection of threatened fauna species and the protection of vegetation providing habitat for those fauna communities. The document includes stated responsibilities for pest and weed management within areas that contain threatened fauna. Management actions such as the installation of signage and appropriate weed control are stipulated.

The Metro South Rail Corridor's Biodiversity Management Plan includes key objectives for the management of Threatened species, populations and ecological communities.
The plan states that all threatened flora species, populations and ecological communities that occur in the region should be entered into sensitive sites registers. The management plan further states that If a threatened species, population or ecological community occurs in the region and a Recovery Plan has been prepared by the Department of Environment and Conservation (NPWS division) for that species, population or ecological community, and names RailCorp as having responsibilities then a corresponding management plan should be prepared by RailCorp to actively manage this sensitive site.

4.2 Energy Australia

Energy Australia Tree Safety Management Plan (2007)

The Energy Australia Tree Safety Management Plan (2007) outlines the agency's approach to relevant safety clearances (typically 1.5 metres around bare low voltage overhead wires) which hold specific relevance to planting height restrictions on land controlled by the agency. The management plan also takes native vegetation and threatened species into consideration. Planting guidelines within the document stipulate the consideration of preference given to planting species native to the local area and the planting of species that won't invade the surrounding environment. These actions require consideration under the terms of the plan however are not indicated as a necessary requirement.

5. Flora Assessment

Description of flora compositions within the corridor have been obtained from reports compiled by of community based bush re-establishment programs carried out by the Inner West Environment Group and Cooks River Mudcrabs. These works have been based on the text by Benson, Ondinea and Bear (1999) titled “Missing Jigsaw Pieces: the Bushplants of the Cooks River Valley”. These projects have reinstated species of the Sydney Turpentine-Ironbark forest and Sandstone heath/forest respectively. These efforts have served to provide resurgence in native vegetation abundance with current bushcare sites and are an exemplary case study of urban ecological restoration and volunteer commitment (Jensen 2009).

Limited examples of remnant vegetation within the Cooks River to Iron Cove GreenWay have dictated the approach to this assessment of the existing floristic composition.

Extensive land clearing to facilitate urban expansion and transport infrastructure has reduced the natural vegetation within the corridor to such a degree that in order to establish the state of floristic characteristics examination of the re established vegetation parcels remains the most feasible approach. In saying this however, comprehensive efforts to reinstate the indigenous vegetation of the area by volunteer groups over an extended period have resulted in the significant restoration of urban ecology.

Completed rehabilitation projects have resulted in accurate reproductions of the original vegetation cover. Adherence to the division between Sydney Turpentine Ironbark communities on clay soils derived from Wianmatta shale formations and the Sandstone Forest and Sandstone Heath areas closer to the Cooks River have served to further refine this result. With the continued adoption of important ecological principles such as vegetation succession and the use of generally local provenance seed, completed works will provide a sound foundation for further development of this significant wildlife corridor.

5.1 Pre-European Vegetation

Vegetation communities along the ridges would have been consisted of an open forest structure of Turpentine-Ironbark forest consisting of Turpentine trees, Broad-leaved Iron Bark and Grey Ironbark with a generally grassy understorey consisting of Kangaroo Grass, Wallaby grass, Three-awned Spear Grass and Blady Grass…and Eucalypt forests with a scleophyllous understorey on Hawkesbury sandstone at the southern end of the GreenWay gave way to extensive mangrove salt marsh flats along the Cooks River.
(Benson and Howell 1990)

Initial regeneration work carried out within the GreenWay in the late 1970s by volunteer groups created the need for a more detailed account of the species composition of pre European flora. In order provide strategic direction to the continuation of land rehabilitation Kartzoff's '*Nature and the City: The Native Vegetation of the Sydney Area*' was adopted as the foundation and guidance for the continuation of bush regeneration works (Kartzoff 1969). This evaluation of indigenous vegetation based on historical botanical assessment references and existing examples of remnant flora was utilised to facilitate a swelling of community enthusiasm.

Kartzoff (1969) classifies the pre-European vegetation associations within the Cumberland basin with consideration of climatic, edaphic and topographic considerations. He articulates that the native vegetation of the Hawthorne Canal and Cooks River catchments would have maintained a Blackbutt - Sydney Blue Gum association characteristic of lower formations of the Triassic Wianamatta group mainly on shale with some sandstone. The composition of this vegetation association would have consisted of co-dominant Blackbutt (*Eucalyptus pilularis*) and Sydney Blue Gum (*E. saligna*), with other species including Ironbarks (*E. paniculata* and *E. fibrosa*), Turpentine (*Syncarpia glomulifera*), Smooth Barked Apple (*Angophora costata)*, with Rough Barked Apple *(A. floribunda),* Red Mahogany (*E. resinifera*), Red Bloodwood (*E. gummifera*) on sandstone or laterite. Kartzoff further describes that on the western edge of this association, Scribbly Gum (*E. haemastoma* var. *scerophylla*) replace Blackbutt and Sydney Blue Gum. Katzoff expresses the difficulty in speculating on the original composition of the understorey and resides to describing the natural understorey in its current state as consisting mainly of Sweet Pittosporum (*Pittosporum undulatum*) and of a number of Leguminosae and Proteaceae.

Katzoff described the GreenWay area as residing in an area of high rainfall (over 40" (101.6cm) upon soils of the Triassic Wianamatta group with Hawkesbury sandstone derived soils in the northern end of the corridor at Haberfield and Quaternary alluvial along the Cooks River sections.

The Kartzoff text divided indigenous vegetation associations in the area as either Ashfield Shale carrying a Blackbutt - Sydney Blue Gum association, such as at the end of Longport Street Summer Hill (Felton 1982) and a Smooth Barked Apple association at the junction of Parramatta Rd and Hawthorne Canal.

5.2 Turpentine-Ironbark Forest

In *Missing Jigsaw Pieces: the Bushplants of the Cooks River Valley*, Benson *et al*. (1999) extrapolate that the pre-European vegetation patterns within the Cooks River to Iron Cove GreenWay Valley would have consisted of Sydney Turpentine-Ironbark Forest along the ridges and Sandstone Forest and Sandstone Heath between New Canterbury Road and the Cooks River, with an area of Floodplain Forest bordering the south eastern corner at Marrickville and Earlwood. This information is established using remnant features as primary information source as well as geological and soil clues, and builds on the already comprehensive work by Benson and Howell (1990), discussed in the next section.

Benson *et al*. (1999) state that vegetation communities on better drained deep clay Wianamatta shale country along the ridge line now followed by Canterbury Road would have been Turpentine-Ironbark Forest consisting of Turpentine (*Syncarpia glomulifera*), Broad-leaved Iron Bark (*Eucalyptus fibrosa)* and Grey Ironbark *(E. paniculata).* Characteristic of these communities would have been a generally grassy understorey consisting of Kangaroo Grass (*Themeda australis),* Wallaby Grass *(Danthonia tenuior*) three-awned spear grass *(Aristida vagans)* and Blady Grass *(Imperata cylindrical).* Shrub species would have included Blackthorn (*Bursaria spinosa*), Orange-flowered Pea (*Daviesia ulicifolia*) and Pink-flowered Pea (*Indigofera australis)*

Benson (1999) refers to studies from the 1840s conducted by Mrs Charles Meredith to describe the composition of vine species and understorey. These include *Hardenbergia violacea*, *Kennedia rubicunda* and *Pandorea pandorana*. Other species named within this document include *Dillwynia juniperina (now Dillwynia sieberi)* and *Platylobium formosum, Daviesia ulicifolia, Viola hederacea* and *Oxalis corniculata, Polymeria calycina* (or *Convolvulus erubescens*) and *Wahlenbergia* spp.*,* as well as various Epacridaceae (for example, *Lissanthe strigosa* and *Leucopogon juniperinus*) are described as being present in the Turpentine-Ironbark forests of Homebush. A comprehensive list of species derived from this text is contained within **Appendix 5**.

5.3 Indigenous Vegetation by Locality

Benson and Howell (1990) describe the indigenous vegetation on a suburb by suburb basis based on the existent remnant species and historical studies. The following section summarises the state of fauna composition within the suburbs of the GreenWay prior to colonisation and the subsequent extensive land clearance for agriculture.

Ashfield

Benson and Howell (1990) state that isolated examples of remnant tree species provide evidence of the vegetation that once grew on clay soils derived from Wianmatta shale within the Ashfield area. These include Grey Gum (*Eucalyptus punctata*), Turpentine (*Syncarpia glomulifera),* Blackbutts (*Eucalyptus pilularis*), and Red Mahoganies (*Eucalyptus resinifera*). A comparison of vegetation on similar soils at Concord West provides clues as to the composition of shrub layers and ground covers that were most likely to occur within Ashfield. Theses include shrubs such as *Dodonaea triquetra, Melaleuca nodosa* and *Pittosporum undulatum*. Throughout these forested areas would have been patches of Kangaroo Grass *(Themeda australis)* and herbaceous groundcover plants such as *Dichondra repens* and *Hardenbergia violacea.* On the marsh land along Long Cove Creek, Haberfield grew Swamp She-oak (*Casuarina glauca)* forests. Primeval forest between Parramatta Road and Iron Cove contained Native Currants *(Leptomera acida).* The majority of the Ashfield Turpentine-Ironbark forest was cleared for suburban expansion in the late nineteenth century.

Canterbury

Sydney Turpentine-Ironbark forest covered much of Canterbury, while at the eastern end of the municipality in Hurlstone Park and Earlwood, Hawkesbury sandstone outcrops would have supported Smooth-barked Apple (*Angophora costata*), Blackbutt (*Eucalyptus pilularis*), Sydney Peppermint (*Eucalyptus piperita*), Red Bloodwood *(Eucalyptus gummifera*) and Turpentine (*Syncarpia glomulifera).* A varied shrub understorey comprised of ferns such as *Gleichenia dicarpa, Culcita dubia* and *Pteridium esculentum*, sclerophyllous shrubs like *Kunzea ambibua* and tufty grasses like *Themeda australis* are also mentioned (Benson and Howell, 1990).

Leichhardt

The suburbs of Leichhardt and Lilyfield would most likely have supported Turpentine-Ironbark forest on shale-derived clay soils prior to land clearing in the nineteenth century for agricultural estates. Peter Miller Cunningham in the text '*Two Years in New South Wales, 1827'* details the land along Parramatta road between Annandale and Ashfield and describes Grey Iron Barks (*Eucalyptus paniculata*), Blackbutts (*Eucalyptus pilularis*) and Red Mahoganies (*Eucalyptus resinifera*). Benson and Howell (1990) surmise that the now ubiquitous *Lomandra longifolia* on rock out crops at Callan Park indicate the existence of this species in the area prior to European settlement.

Marrickville

The original vegetation of the Marrickville area also consisted of Turpentine-Ironbark forest and was cleared in the early nineteenth century, mostly for agriculture.
Along the Cooks River at the southern end of the municipality the Blackbutt (*Eucalyptus pilularis)* forest with scleophyllous understorey on Hawkesbury sandstone such as those along Wolli Creek became Grey Mangrove (*Avicennia marina*) and saltmarsh flats along the Cooks River as far up as Illawarra Road.

These were filled for playing fields after World War II at this time Swamp-oak Forest (*Casuarina glauca)* was also common along the banks of the Cooks River (Benson and Howell 1990).

5.4 Remnant Vegetation

Sydney Turpentine–Ironbark Forest is a transitional community that once linked Cumberland Plain Woodland in drier areas with Blue Gum High Forest on adjacent higher-rainfall areas of the Sydney region. This forest community originally extended over 26,000 ha westwards to Guildford, and north of the Parramatta River from Ryde to Castle Hill. It also occurred on the shale ridge caps in the Hornsby Plateau.

Keith (2004) concludes that Sydney Turpentine-Ironbark forest is classified among the most southern occurrences of Northern Hinterland Wet Sclerophyll forests (grassy sub formation) with a predominant grassy ground cover below an open layer of mesophyllous and sclerophyllous shrubs. The tree layer is open and tall and includes a variety of eucalypt species. The presence of iron barks (*Eucalyptus fibrosa, E. beyeriana, E. siderophloia, E. paniculata*), grey gums (*E. punctata*), sclerophyllous shrubs and a well developed grassy layer are characteristic of this formation. The soils are moderately fertile loams derived from siltstones and mudstones in areas of annual rainfall greater that 1000mm.

Over 200 years of intensive land use in the Sydney Basin Bioregion has severely affected the Turpentine-Ironbark Forest. Most of the forest has been cleared, and less than 5 per cent of the pre-1788 forest retains its structural integrity. The Inner West Environment Group summarises the state of remnant vegetation within the Hawthorne Canal Catchment by explaining that there are virtually no remnant areas, the limited remaining endemic species reside in small pockets which have survived in situ or in areas where groups and species have recolonised from other remnant areas. The Interrupted 'green corridor' along Hawthorne Canal does not support consolidated native vegetation communities (LMC SOE 08/09).

Small and unconnected fragments of the original vegetation remain, such as riparian vegetation along the foreshores of the Cooks River, and grasses form the Turpentine-Ironbark forest such as kangaroo grass (*Themeda australis*) and *Aristida vagans* within the railway corridor between Dulwich Hill and Hurlstone park stations. There are also remnant trees representative of the Turpentine-Ironbark forest within Marrickville Golf Course. Ashfield Park contains examples of Turpentines (*Syncarpia glomulifera*), and Blackbutts (*Eucalyptus pilularis*) and Red Mahogany (*Eucalyptus resinifera*) are present within Victoria Square, Summer Hill.

There are remnant and/or recolonised native plant species on the western side of the corridor along the cutting between New Canterbury Rd and Constitution Rd these include *Acacia falcata, Acacia parramatensis, Cymbopogon refractus, Aristida* sp. and *Austrodanthonia* sp. As well as native fern species at the Cadigal Reserve and Davis St bushcare sites and examples *microlena stipoides* at the Waratah Mills bushcare site. Remnants are found mainly where there is a pre-European soil profile present and restriction in herbicide application (IWEG 2010)

Summer Hill Public School contains one specimen of Grey Gum (*Eucalyptus punctata).* Robson Park contains mature examples of Swamp Mahogany (Eucalyptus *robusta*) and Blackbutts remain in Marrickville Golf Course (Benson and Howell 1990). Table 1 shows a list of species recorded by Mudcrabs Ecovolunteers prior to regeneration at Foord Ave, Hurlstone Park.

Table 1: The Mudcrabs - Native Species Present at Foord Ave Prior to Regeneration		
Lomandra longifolia	*Crassula siberana*	*Histiopteris ineisa*
Kunzea ambigua	*Commelina cyanea*	*Asplenium flabellifolium*
Kennedia rubicunda	*Selaginella uliginosa*	*Wahlerbergia gracilis*
Pteridium esculentum	*Cyperus garcilis*	*Cotula Australis*
Pittosporum undulatum	*Entolasia marginata*	
Glochidion ferdinandii	*Omalanthus populifulius*	

5.5 Re-established Flora

"The Inner West Environment Group's vegetation re-establishment project makes an exemplary case study of urban ecological restoration and volunteer commitment."

Peter Jensen, Greening Australia 2009

An assessment of the Inner West Environment Group's progress by Peter Jensen of Greening Australia in June 2009 states that:

"The success IWEG's vegetation re-establishment makes an exemplary case study of urban ecological restoration and volunteer commitment. An indicative trait of the success is the natural recruitment of planted species particularly in such highly disturbed soils". Jensen (2009) makes the observation that the species diversity within the IWEG sites is appropriate for the objective of attracting a range of different fauna species. Jensen expresses a positive evaluation of IWEG's site establishment and management strategies and states that the most effective process to retain some dynamics and maintain species diversity and abundance is to conduct a controlled burn. In addressing concerns that dominant native species may out compete rivals and result in a reduction of species diversity Jensen states that the extent of required intervention of native species is dependant on the objectives of the site. However it is concluded that weeding of exotic weeds should remain a priority over weeding endemic species**.**
This assessment is presented within personal correspondence between Peter Jensen of Greening Australia and IWEG project Officer Bruce Ashley.

The following section presents a summary of bushcare activities completed in the GreenWay, this information is provided to accurately assess the status of vegetation re-establishment within the corridor that has resulted in the positive evaluation made above.

5.6 History of GreenWay Bushcare Activities

GreenWay Development
The potential of open space areas to provide the basis of a GreenWay corridor consisting of revegetated urban nature reserve have been formed over the last 40 years.

- **1972** proposed nature reserve adjacent to Hawthorne canal
- **1978** The vision of an area planted with (as near as practical) the original plants of the area and functioning as a mainly passive recreation area and mini nature reserve is recorded
- **1987** The Forsite Report details the linear quality of open space adjacent to the Hawthorne Canal and surmises that this aspect provides an identifiable element in the landscape and a good opportunity to establish a pedestrian and cycle route.

Substantial community based re-establishment of native flora in the Cooks River to Iron Cove GreenWay has been completed over the last 40 years. These efforts have served invaluable in the formation of the idea of an Urban GreenWay and are presented below in the form of a historical timeline. Archival records of early revegetation works have been presented here to consolidate these records and to provide a detailed description of reinstated flora species. A directory of GrenWay plant inventories is presented within Appendix 2. Index of GreenWay planting inventories

Timeline

1972
August-Ashfield Council and Mr M Kartzoff of the Forestry Commission NSW conduct a site visit of Hawthorne Canal in order to evaluate substrate condition with a view to evaluate the feasibility of a proposed nature reserve adjacent to Hawthorne Canal.

Project objective: to establish a screen of vegetation between the houses facing Hawthorne Parade and the industrial buildings on the eastern side of the canal.

Table 1. Plantings along Hawthorne Canal 1972

Common name	Botanical name	Planting Details	Local provenance
Swamp Oak	*Casuarina glauca*	@12 foot spacing	
Coast tea-Tree	*Leptospermum laevigatum*	Plantings within Casuarina spacings	
Washington Hawthorne	*Crataegus phaenopyrum*	@ 25ft spacing along Street line	No, Exotic Spp.

The proposal of this project further outlined the following species as recommended plantings to be utilised intermittently throughout Richard Murden Reserve:

- *Eucalyptus botyryoides*
- *Eucalyptus saligna*
- *Melaleuca quinquenervia*
- *Lagunaria pastersonia*
- *Ficus micorcarpia*

1977 - 1979
A resident's bushcare group started by Clare Felton of Summer Hill commences work in and around the sight now known as Cadigal Reserve. The native vegetation in situ consists of 'a couple of native grasses and two or three Acacias native to Western Australia'. After primary treatment of weeds such as lantana (*Lantana camara*) and rubbish removal assisted by Ashfield Venturers scout group, the first on site plantings commenced after Ashfield Municipal Council agreed to reimburse Clare for the cost of the seedlings used. Species were chosen as a result of prior research conducted by Clare Felton on the viability of seedlings planted in local soil samples. A list of plantings undertaken within this period can be obtained from Ashfield Council's financial records. Many of these seedlings were purchased as seed stock from the NSW State Forests and propagated by Felton (*Sabolch 2006).* In September 1979, a volunteer working day was conducted, works included removal of weeds such as Privet (*Ligustrum* spp.) and Lantana (*Lantana camara*), rubbish removal and planting of native vegetation. Shortly after these plantings the text: 'The Native Vegetation of the Sydney Area' by (Kartzoff 1969) was adopted as the foundation and guidance for the continuation of bush regeneration works.

The Kartzoff text divided indigenous vegetation associations in the area as either Ashfield Shale carrying *Eucalyptus saligna – Eucalyptus pilularis* forest such as at the end of Longport St, Summer Hill (Felton 1982) and the *Angophora costata* association at the junction of Parramatta Rd and Hawthorne Canal. The Riverside Vegetation section of the text was used as a guide for species to be planted on the unstable banks of the canal. *Eucalyptus fibrosa* and *Eucalyptus maculata* associations were utilised in areas where the substrate use deemed unstable, degraded and weed infested. Most plantings were carried out between February and May from forestry tube stock, seed raised stock (*Callicoma serratifolia*) and from stock purchased commercially or from Joylyn Native Nursery at Annangrove, more advanced stock was supplied by Ashfield Council. The original plant list is presented within the appendix: Appendix 1: Hawthorne Canal Planting list prior to 1982

1978
Correspondence from Clare Felton to Ashfield Municipal Council documents acknowledgement of previous contribution from council and tree donations. The GreenWay vision is recorded as "We visualise it as an area planted with (as near as practical) the original plants of the area and functioning as a mainly passive recreation area and mini nature reserve".

The request for the following provisions is contained within:
1kg of grass seeds: Carpet grass, Perennial Rye and White Clover
20 trees from the Forestry Commission: 6 *Eucalyptus fibrosa* (for the Grosvenor embankment), 4 *Casuarina distyla*, 2 *Angophora costata*, 2 *Leptospermum squarrosum* and 6 assorted Acacias including *A. cultriformis, A. glaucascene, A. longifolia* and *A. spectabilis.*

1979
The Metropolitan Water, Sewerage and Drainage board suspend herbicide spraying in the area of community based bush regeneration works. Following this State Rail grant permission for Felton to carry out beautification works within the rail corridor.

1982
August - Clare Felton invoices Ashfield Council for materials used in regeneration works and planting list and description of works completed are included. The document states that most of trees raised or purchased have been planted between Longport St Summer hill and the main railway bridge (over Hawthorne Canal) and on the Eastern side of the Canal opposite to Haig Avenue Summer Hill. Early plantings within the GreenWay are presented in Appendix 1. Hawthorne Canal Planting list prior to 1982.

1987
August - Forsite Landscape Architects and Planners Pty Ltd submit preliminary plans for the redevelopment of Hawthorne canal as part of the 'Greening the Grey Spots' program run by The then Department of environment and Planning.

Plantings detailed within this report include:

Form	**Botanical name**	**Common name**
Tree	*Ficus microcarpa* var. *hillii*	Hill's weeping fig
Tall shrubs	*Acacia falcata*	
	Banksia ericifolia	
	Callistemon citrinus	
	Callistemon endeavour	
	Hakea salicifolia	
	Kunzea ambigua	
Ground covers	*Grevillia gaudichaudi*	
	Grevillia poorunda	Royal Mantle
	Hardenbergia violacea	
	Kenedia rubicana	Dusky Coral Pea
	(Possibly *Kennedia rubicunda*)	
Vines	*Doxantha uguis – cati*	Cat's Claw Creeper
	(Possibly *Macfadyena unguis-cati*)	(Now declared noxious)

The Forsite Report details the linear quality of open space adjacent to the Hawthorne Canal and surmises that this aspect provides an identifiable element in the landscape and a good opportunity to establish a pedestrian and cycle route.

1988 – 1991

Greening the Grey Spots Project was initiated under the Metropolitan improvement Program in the late 1980s and early 1990s by the then Department of Urban Affairs and Planning to rejuvenate degraded inner Sydney areas. The NSW Department of Environment and Planning selected Hawthorne canal as a site to be included in the Greening the Grey Spots urban beautification program and Morton Bay and Port Jackson figs were planted at Haberfield. Casuarinas (*Casuarina glauca*) were planted between Marion Street and Parramatta Road. Specialist consultants Forsite identify the potential appeal of open space along the canal and outline revegetation works as a mechanism to recapture the natural setting of the water course. The program's timeframe is extended from its original 4 month term to its completion in 1991.

1993
The Whipple truss bridge section of the rail line is translocated onto a display site resulting in destruction of trees planted by Clare Felton and the volunteers.

1999-2000
A community tree planting as part of National Tree Day in July 1999 is organised by Clare Felton and Mark Sabolch. As a result, local residents form the Inner West Environment Group (IWEG) and boosted by the Chinese community on the weekend of the 5 and 6th August, planted "over 400 local volunteers planted 2000 local native trees and shrubs beside the canal" (Sabolch 2006) as part of an Olympic Landcare program. Plant stock for this event was sourced where possible from community native nurseries with a preference for plant species that indicative of Sydney Turpentine Ironbark Forest (STIF). This direction and preference for local provenance species has continued through out the ongoing works completed by IWEG within the GreenWay (Sabolch 2006).

2003-2010
Ashfield and Leichhardt Councils Project Funding: $33,057
Protection and restoration of the endangered Sydney Turpentine-Ironbark Forest ecological community in the Ashfield/Leichhardt localities and creation of a bushland link between the remnant vegetation patches on the upper catchment ridgeline of Hawthorn Canal leading to and along the southern foreshore of Iron Cove. Specific planting sites include the ridge lying between Ashfield Park (Ashfield) and Robson Park (Haberfield), and the area extending along the Iron Cove foreshore from Iron Cove Creek to Elkington Park. The project also provides incentives for private land holders to plant local provenance native species to link the remnant areas through an incentive scheme whereby interested land holders will be offered free local provenance plants and information on planting techniques. The local provenance native plants will be grown at both the Rozelle Bay Community Native Nursery and a local primary school.

2006
Metropolitan Greenspace Program, GreenWay Coordination Strategy Part I (2008 – 2010)
Metropolitan Greenspace Program, GreenWay Coordination Strategy Part II (2008 – 2010);

2008- 2011
The NSW Environmental Trust awards member councils Ashfield, Leichhardt Marrickville, Canterbury, $1.83M to implement Urban Sustainability Project (USP)

2009 - 2010
The Cooks River Valley Association (CRVA) is made up of local residents committed to rehabilitating the Cooks River and promoting community spirit. The group's objectives include improving the health of the Cooks River, including its water quality, riverbed condition and flora and fauna. The group's objectives are to increase community activities in the Cooks River Valley and improve community relationships.
Members take part in a variety of volunteer activities including Mudcrabs - a monthly foreshore cleanup and restoration program and Friends of Ewen Park.
Bush regeneration and rehabilitation along the Cooks River within the Green Way has recently been completed at two sites within 2009/2010. These activities have been carried out as a joint project between the bushcare groups: The Mudcrabs and The Friends of Ewen Park facilitated by the City of Canterbury and funded by the Sydney Metropolitan Catchment Management Authority.

Activities at theses site include plantings at Ewen Park Hurlstone Park During 2009 over 4000 local native plants were planted along the river foreshore. Local residents joined the Mudcrabs and the Friends of Ewen Park to complete the plantings over an 8 week period. A comprehensive planting inventory is included within the appendices of this review. The second site called Foord Avenue Bluff at Hurlstone Park consists of a broad sandstone rock platform with a steep sandstone cutting adjacent to the Cooks River.

This site presents excellent potential for establishment of sandstone heath vegetation with ferns at the cutting base. The additional attribute of these heath plantings is the provision of good small bird habitat. The Foord Avenue site is in close proximity to mangrove and casuarina species along the banks of the Cooks River (Benson 2009). Planting inventories for the Ewen Park and the Foord Avenue projects are presented within Appendix 6: The Mudcrabs: Foord Avenue Bushcare Site Planting Inventory and Appendix 7: Ewen Park Bushcare Site Planting Inventory

Inner West Environment Group Timeline

The Inner West Environment Group (IWEG) is a community-based bushcare group that was started by local residents to undertake bush re-establishment in the Hawthorne Canal catchment. Since the groups inception in 1998 IWEG has made a significant contribution towards the longer-term re-establishment of a bush corridor based on a Turpentine-Ironbark vegetation community. IWEG volunteers have planted over 6,000 tube stock of local provenance species. IWEG's on ground works have been centred on six bushcare sites that have been managed under the group's vision "to improve the natural biodiversity within the Hawthorne Canal catchment of the inner west Sydney". The group has realised its core activity of establishing, improving and maintaining biodiversity and natural habitat over the last 12 years through the adoption of Benson's summation and classification of the pre European vegetation classification of Turpentine-Ironbark open forest on shale (Benson 1990). This classification provided the basic of Flora inventories derived from historical evidence and geographical comparisons which have enabled IWEG to establish and outline exclusive use of comprehensive local provenance species lists.

Approval has been granted to expand the group's activities to include a further eight sites in the future. Evidence of natural seed spread and germination indicates the significant success the group's project.

1998

The Inner West Environment Group forms

June 1999

Over the next 12 months, volunteers (Marrickville South bicycle group and the Ashfield Chinese community) complete 1000 plantings over 500 person hours within 500m of corridor between Grosvenor St and Marion Street.

2000

IWEG submits an application for Environmental Trust grant submitted (5/4/2000)
The NSW Environmental Trust awarded the Inner West Environment Group (matched) funding of $37,018 under the *Creating a Green-Link* Project. This funding would then be used for revegetation and restoration works with objective to

"Re-establish, within a highly urbanised area, a viable and sustainable restored native vegetated corridor linking the Cooks River and Iron Cove"

2001
IWEG successful in obtaining $37,000 Environmental Trust funding for the 'Creating a Green-Link' project.

Between March 2001 and April 2004, 3,700 tube stock were planted over 40 separate advertised community planting days and a total of 2,080 volunteer hours. In an effort to ameliorate the degraded natural environment, increase indigenous vegetation as well as biodiversity and habitat values and to decrease infestations of noxious weeds

2002
IWEG establishes a number of bushcare sites including Cadigal Reserve. Ashfield, Canterbury, Leichhardt and Marrickville Councils agree in-principle to support the GreenWay vision.

The 1st 'Creating a green link' project report presented to Environmental Trust by IWEG

2003 and 2006
Three bushcare sites established within the Dulwich Hill freight rail corridor Davis St (Area1), Piggot St (Area 2) and Waratah Mills (Area 3).

2006 – 2010
January 2008 - IWEG successful with $26,000 Envirofund grant funding for the now-named 'Creating a Bush Link' project;
February 2008 - Marrickville Council and IWEG create a joint agreement for funding of $5,000, which continues in August 2009 for the 2009-10 financial year.
IWEG continues to maintain bushcare sites within the corridor with occasional assistance and in-kind support from Ashfield and Marrickville Councils.

A complete species list of plantings within the corridor completed by IWEG is presented within Appendix 5: Plant Stock and Species Planted in GreenWay Corridor – to February 2008

5.7 Seed Collection and Local Provenance

Local plants for a local project: Home grown seed provides plant stock that has intrinsic adaptations to local environments and the continued re-establishment of these local provenance species will result in realisation of bush regeneration objectives.
(NSW DNR 2006)

The desire to re-establish vegetation with a composition as similar as possible to that of the pre-European communities dictates that local provenance species be utilised exclusively during revegetation projects within the GreenWay. Completed plantings by volunteer groups have adhered stringently to this requirement. Professionally, suppliers of plant tube stock and seed have been chosen on the basis that they can supply local provenance species grown from seed collected within remnant bushland areas as close to possible to the intended destination of these seedlings. Seed collection activities by IWEG and nursery staff has been conducted with utilisation of specific seed harvesting methods aimed at protecting genetic integrity of seed stock.

The IWEG GreenLink Report details that plant species selection for bushcare sites is guided by the overall objective of restoring endemic plant communities to the area that occurred prior to European settlement, with the secondary objective of habitat provision for small mammals and birds, reptile and invertebrate fauna.

The texts of *Missing Jigsaw Pieces – The Bushplants of the Cooks River Valley* (Benson et al, 1999) and *Taken for Granted – the Bushland of Sydney and its Suburbs* (Benson & Howell, 1990) were used as descriptive resources to establish local provenance species selection for each site was based on plant availability, site suitability and local constraints such as overhead clearances and vehicle access in the freight rail corridor.

Seed Collection
Currently the Inner West Environment group (IWEG) is the only bushcare group that collects and propagates seed stock for revegetation works within the corridor. It was the intent to propagate and plant species grown from seed collected within a 5km radius of the project area. Propagation involved collection of seed from local sources and propagation at community nurseries and member's homes. Most of the propagation and tube stock supply for IWEG was undertaken by Cornucopia (Mars Community Nursery), Marrickville Community Nursery and Rozelle Bay Community Nursery (IWEG 2004).

The Rozelle Bay Community Native Nursery collects seeds and cuttings from the closest remaining bushland, to propagate and reintroduce Local Provenance Plants to the area. The reintroduction of Local Provenance Plants within LGAs adjacent to the GreenWay provide habitat for a diverse range of butterflies, dragonflies, birds, lizards and frogs. Marrickville Community Nursery is supported by Marrickville Council and grows local provenance plants of the lower Cooks River valley for landscaping and revegetation projects as well as for sale to the community.
Bush regeneration and rehabilitation along the Cooks River within the GreenWay carried out by Mudcrabs utilises tube stock sourced by Apunga Ecological management from Marrickville Community Nursery.

Local provenance plants are those that have naturally evolved to suit the climatic, light and soil conditions of an area. The Department of Natural Resources (now DECCW) urges that the following principles be considered during plant species selection during the planning and preparation stages of native vegetation rehabilitation programs:

- the fundamental principals of plant succession,
- assessment of the suitability of land; and
- soil conditions and the utilisation of local provenance species.

The report specifies local provenance as occurring within a 10 kilometre radius (with similar soil landscape conditions) of the intended site. In regards to seed collection, processing and storage the department stipulates that the Flora Bank Seed Collection Guidelines should be adhered to (NSW DNR 2006).

5.8 Weeds

Noxious weeds of the GreenWay corridor include Green Cestrum and Lantana, the latter of which is classified as a Weed of National Significance. However, the complex structure of these plants provides habitat for small birds, reptiles and threatened Long-nosed Bandicoots.

The Cooks River to Iron Cove GreenWay contains numerous species of noxious and environmental weeds, as shown in Table 2. Invasive weeds have been identified as a threatening process to fauna populations within the Dulwich Hill Freight Rail Corridor (AMBS 2001) and the NSW Department of Environment, Climate Change and Water (DECCW undated) denotes the control of weed species as a top priority for the conservation of threatened populations of the Long-nosed Bandicoot (*Perameles nasuta)*.

In response the legislative requirements of the *Noxious Weeds Act 1993* , landowners and local control authorities have detailed the control of noxious weeds within specific weed management plans. Within member councils these documents are made available to the public through display on the internet. State agency documents demonstrate recognition of these agencies intent to comply with weed legislation.

A stated objective of the Railcorp Metro South Biodiversity Management Plan is the control and management of environmental weeds as expected by the community and as required under the *Noxious Weeds Act 1993. Also,* Energy Australia's objectives include the prevention and minimisation of noxious weed occurrence and dispersal in accordance with legal requirements. However their current land maintenance practices have resulted in the contrary. IWEG concludes that:

> "*The corridor currently acts as a reservoir for noxious and invasive weeds, and control is required to enhance environmental condition. Although an active rail corridor, there has been very little vegetation maintenance in the past, and what*

has been done in the past to control weeds has tended to exacerbate the situation. Previous landscaping work in a section of the corridor has also created vegetation management problems through the planting of inappropriate species" (IWEG 2000).

Assessment of the current distribution of weed species demonstrates current land management practices have proved inappropriate or not effective. Noxious weeds are found on both public and private property within the GreenWay including Asthma Weed or Pellitory (*Parietaria judaica*), Chinese Hackberry (*Celtis sinensis*) Cestrum (*Cestrum parqui*), Pampas Grass (*Cortaderia spp*.) (LMC SOE 2008/9).

Considerable efforts of volunteer and professional bush regenerators have resulted in a reduction in the abundance of weed species within bushcare sites. However, these efforts have been compromised by inappropriate land management practices currently being utilised by state agencies as mentioned above. Vegetation and fauna surveys conducted within the GreenWay and surrounding LGAs detail management practices that will restrict the abundance of these species. However the importance of habitat value provided by the complex structural nature of weed species is clearly detailed. Land management practices that utilise a staggered approach to weed control in order to maintain habitat integrity are endorsed within these documents.

The Leichhardt Avian Biodiversity Study (2008) explains that weed removal should be undertaken very carefully so as not to remove habitat faster than the local wildlife can cope with. Only areas of about 30 square metres should be cleared at any one time and even smaller areas if this would exceed more than 20% of the total area to be weeded. Shrub and tree species should be planted with the provision that they are done so in a weeded area before the next adjacent area is weeded and that the newly planted area should be sufficiently mature to provide substitute habitat for the lost weedy area.

Environmental Weeds

Environmental weeds are plants that represent a threat to the conservation values of natural ecosystems. They invade native plant communities and out-compete them, causing a reduction in plant diversity and resulting in a loss of habitat for native animals. Environmental weeds include native Australian plants that are not local (indigenous) to the area they are growing in. Examples of native Australian plants that are doing this are sweet pittosporum (*Pittosporum undulatum*) and coast wattle (*Acacia sophorae).*

Noxious Weeds

Noxious weeds are weeds that are classified under the *Noxious Weeds Act 1993*. Under the Act's definition, noxious weeds are plants that pose a potentially serious threat to primary production, the environment or human health. Noxious weeds within the GreenWay are either class the 3 or 4 (do you mean 3 or 4?), which means that they are widely distributed in the area and are likely to spread in the area or to another area. The onus to satisfy the legislated control requirements rest with the land owner/ occupier (if leased) and are enforced by the local control authority.

Table 2: Weed Species in the GreenWay

Common Name	Botanical Name	Classification
Blackberry	*Rubus fruticosus* aggregate species	Noxious (Weed Class 4)
Castor oil plant	*Ricinus communis*	Noxious (Weed Class 4)
Lantana	*Lantana* spp	Noxious (Weed Class 3)
Asthma Weed/Pellitory	*Parietaria judaica*	Noxious (Weed Class 4)
Privet (Broad –leaf)	*Ligustrum lucidum*	Noxious (Weed Class 4)
Privet (Narrow - leaf)	*Ligustrun sinense*	Noxious (Weed Class 4)
Green Cestrum	*Cestrum parqui*	Noxious (Weed Class 3)
Asparagus Fern		Environmental Weed
	Oxalis spp.	Environmental Weed
Trad/Wandering Jew	*Tradescantia fluminensis*	Environmental Weed
Morning Glory		Environmental Weed
Balloon Vine		Environmental Weed
Madeira Vine	*Anredera cordifolia*	Environmental Weed
Ochna/Mickey Mouse Plant		Environmental Weed
Panic Veldt Grass		Environmental Weed
	Ehrharta erecta	Environmental Weed
Barley Gras		Environmental Weed
Wild Oates	*Avena* spp.	Environmental Weed
Pigeon Grass	*Setaria* spp	Environmental Weed
Native Geranium	*Geranium magallancium*	Environmental Weed
Flickweed	*Cardamine* spp.	Environmental Weed
	Chorloris gayana	Environmental Weed
Chickweed	*Stellaria media*	Environmental Weed

6. Fauna Assessment

This review assesses the current state of floral and faunal biodiversity within the Cooks River to Iron Cove GreenWay. As a component of this review a desktop survey was conducted with regard to commonwealth and NSW environmental legislation in order to identify threatened species, populations and ecological communities listed under the *Threatened Species Conservation Act 1995* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* that were likely to occur within the study area. A collation of community based reports and Local government Literature has been compiled in order to consolidate information and to present descriptive terms of the GreenWay's environmental state.

This study found 316 vertebrate species (native and introduced) were known to occur in the locality. This data is reinforced by a fauna study completed in 2008 by Australian Museum Business Services on behalf of Marrickville Council in which a total of 87 fauna species were recorded. This species list included two species listed as threatened on the State and Commonwealth legislation the Eastern Bentwing Bat and the Grey Headed Flying Fox.

A population of Endangered Population Long-nosed Bandicoots (*Perameles nasuta*) has previously been recorded within the GreenWay and this population of Australian native, nocturnal marsupials has been declared as an Endangered Population under the *Threatened Species Act (1995) NSW*.

In 2008 a study of birds found in reserves and parkland areas across the Leichhardt LGA including sites situated within the GreenWay found 35 species of birds, 21 of these are considered to be uncommon to rare within the LGA. These included the Magpie-lark (*Grallina cyanoleuca) and* Superb Fairy-wren (*Malurus cyaneus).* This study is complemented by a record of bird species both resident and migratory recorded by IWEG member Daivid Rudder that documents 26 species at one site within the upper catchment and 36 species within the lower catchment. This includes sightings of a Peregrine Falcon (*Falco peregrinus*) by GreenWay resident Chris King.

As discussed previously in this review, fauna populations within the Cooks River to Iron Cove GreenWay have been subjected substantial ecological pressures associated with the process of urbanisation. These pressures include fragmented and reduced habitats and population sizes, as well as compromised genetic strength and increased predation pressures resulting in increased extinction rates. The consolidation of a corridor habitats represents an opportunity to facilitate continuity between isolated populations in two ways - firstly, by providing a pathway for the dispersal of single animals between patches; and secondly, by enabling gene flow through populations resident within corridors (Bennett 1990).

Research into fauna composition within the corridor is limited, to say the least. However studies conducted by Marrickville and Leichhardt Councils (and personal accounts of community members) provide valuable information and the foundation for further studies. Initial investigation into the species abundance within the GreenWay suggests that sites are comparatively species rich in contrast to open space areas within surrounding LGA's. For example, "Blackmore Oval, within the GreenWay has as many species as King George Park but the surveyed area is only a third the size and it is smaller than several other reserves and parks surveyed" *(*LMC 2008).

These initial results confirm scientific evaluation of the merits associated with habitat corridors, however considerable science-based investigation and assessment is required to confirm this data. Since the information in this section is limited by the distinct lack of site specific surveys, studies conducted on a LGA basis have been included as primary sources. Data on resident threatened species is presented and a review of the scientific evaluation of the inner west's endangered population of Long-nosed Bandicoot (*Perameles nasuta*) is provided.

Database searches of DECC Wildlife Atlas, Australian Museum, Birds Australia, Cumberland Bird Observers Club were conducted as a component of the 2007 Fauna Study, Marrickville LGA. This search revealed that 316 vertebrate species (native and introduced) were known to occur in the locality. This included the following:

- 10 species of frogs and 1 species of toad;
- 31 species of reptiles;
- 239 species of birds;
- 32 mammals; and
- 2 species of fish.

6.1 Species of Conservation Significance

Rare owls, bandicoots, honey eaters, oyster catchers and flying foxes: the threatened species in the GreenWay are a diverse group and provide an opportunity for an essential urban conservation program.
(AMBS 2007)

The 2007 Fauna Study, Marrickville LGA recorded two species of conservation significance - the Eastern Bent Wing Bat (*Miniopterus schreibersii oceanensis*) and the Grey-headed Flying Fox (*Pteropus poliocephalus*). The report concludes that potential for the support of a wider range of species could be realised through bush regeneration designed to increase the biodiversity of native plant species and management of key threatening processes such as the control of pets and pest species (AMBS 2007). By planting native vegetation (in particular, species which would once have naturally occurred in the local area), it is possible to recreate habitat that can support a greater range of biodiversity, especially insect and bird species but also small reptiles and mammals as well as amphibians .

The NSW Department of Environment, Climate Change and Water (DECCW) database of wildlife of fauna and flora stipulates the following threatened species have previously been recorded within 5 kilometres of the study area. Records within the LGAs of the four councils involved with the GreenWay Sustainability Project are listed below:

Ashfield

- NIL

Canterbury

- Swift Parrot (*Lathamus discolour*)
- Turquoise Parrot (Strigidae *Neophema pulchella)*
- Powerful Owl *(Ninox strenua*)
- Masked Owl (*Tyto* novaehollandiae)

Leichhardt

- Pied oyster catcher (*Haematopus longirostris*)
- Grey-headed Flying-fox *(Pteropus poliocephalus)*
- Eastern Bent Wing-bat *Miniopterus schreibersii oceanensis*

Marrickville

- Long-nosed Bandicoot (*Perameles nasuta)*
- Grey-headed Flying-fox (*Pteropus poliocephalus)*
- Oceanensis Eastern Bent wing-bat (*Miniopterus schreibersii)*
- Regent Honeyeater (*Xanthomyza Phrygia)*
- Superb Fruit-Dove (*Ptilinopus superbus)*
- Green and Golden Bell Frog (*Litoria aurea)*

Long-nosed Bandicoots (Perameles nasuta) of inner west Sydney

The GreenWay's own threatened bandicoot population! A product of mischief, escapees, long-term residents or recent immigrants? The origin of this population remains a mystery, however the proven existence of this group necessitates appropriate habitat management actions.

(*Leary *et al. undated)

Community members reporting evidence and sightings of Long-nosed Bandicoots (*Perameles nasuta)* in the corridor resulted in the follow up studies being completed by National Parks and Wildlife staff.

In October 2002 and November 2006, Long-nosed Bandicoots (*Perameles nasuta)* were captured and recorded in the GreenWay. In total seven dead animals and seven live animals were recorded within this period. Subsequent radio tracking and trapping programs have been conducted by NPWS staff. This program is detailed in a research paper titled: "Yuppie bandicoots of the Inner West – in hiding or urban renewal?" (Leary et al., undated). The study details the results of tracking and trapping activities and presents hypotheses on the origin of the inner west bandicoot population. Threats to the population are also documented. Suggested origins of the population include a number of individuals dispersing from "good habitat" elsewhere into a "sink" where some animals may temporarily established a territory. This implies that there is a larger parent population in close proximity. Alternatively, it is proposed that the inner west bandicoots could be part of a self-supporting population that is either newly established or a remnant population that has persisted from the 1950s. The study also investigates the possibility that bandicoots may have been placed in the location by a 'mischievous person', or inadvertently escaped from a wildlife carer. In conclusion the study states that further study is required to gain further understanding of the population (Leary et al. undated).

In November 2008, the NSW Scientific Committee made a final determination to list the Long-nosed Bandicoot population of inner western Sydney as endangered population under the NSW *Threatened Species Conservation Act 1995* due to its disjunct geographic range and the estimated total number of mature individuals of the population (NSW Scientific Committee, 2008).

In the 2007 Fauna Study, AMBS hypothesise that "it is highly likely the Long-nosed Bandicoots have followed the existing railway line in order to cross the Cooks River, and then utilised a matrix of micro-corridors such as the Marrickville Golf Course to reach the Dulwich Hill Freight Rail Corridor". This would add considerable demonstration of the importance of wildlife habitat corridors. The AMBS study denotes that dense undergrowth vegetation is critical for small ground dwelling mammals as they rely on the constant availability of dense understorey for sustenance, to facilitate movement, and for the protection from introduced predators such as foxes, cats and dogs. In conclusion, the AMBS strongly recommends the future implementation of research projects which could provide detailed information on the animals occurring in the area, including population size ,age and breeding status of animals.

Land management actions such as weed removal on IWEG bushcare sites within close proximity to areas where long-nosed bandicoots have been recorded have been curtailed to ensure minimal habitat disturbance. This is in line with legal requirements of the *Threatened Species Conservation Act 1995* which denotes the legal requirements of habitat preservation. The instatement of well-defined habitat preservation areas within the GreenWay will serve to more effectively ensure the success of the inner west Long nosed bandicoot population. The Long-Nosed Bandicoot has the potential to generate community interest in urban wildlife.

6.2 Birds

The Cooks River to Iron Cove GreenWay provides habitat for both resident and migratory bird species including the following threatened species:

- ***Turquoise Parrot (Neophema pulchella)***
- ***Powerful Owl (Ninox strenua)***
- ***Masked Owl (Tyto novaehollandiae)***
- ***Regent Honeyeater (Xanthomyza Phrygia)***
- ***Superb Fruit-Dove (Ptilinopus superbus)***
- ***Pied Oystercatcher (Haematopus longirostris)***
- ***Swift Parrot (Lathamus discolour)***

In 2009, a Peregrine Falcon (Falco peregrinus) was sighted and photographed in the corridor by IWEG members.

Database studies of bird species within adjacent LGAs listed 239 avian species. Sources of this information include the DECC Wildlife Atlas, Australian Museum, Birds Australia, Cumberland Bird Observers Club (AMBS 2007) This broad scale information has been complimented by site specific studies commissioned by both Marrickville Council and Leichhardt Council. These studies provide details of species composition recorded during the duration of a restricted study period however a description of avian species recorded over a more substantial time frame has been provided by a report submitted by IWEG member David Rudder.

The results of these studies are discussed below and presented within Appendix 3: GreenWay Avian Study Results.

Avian Biodiversity Monitoring and Bird Habitat Management: Merops Services March 2008, a report for Leichhardt Council

This report describes the results of the survey conducted in 2007 to 2008 of birds found in reserves and parkland areas across the Leichhardt LGA. Sites included within this study situated within the GreenWay include Blackmore Oval and Maliyawal Reserve. Bird species for each reserve are listed and the study examines the habitat preferences of each bird species within each reserve. Although the methodology was different from a previous survey completed in 2003 it enables the comparison of changes in bird species composition for each reserve over time. 35 species were detected during the survey 21 of these are considered to be uncommon to rare within the LGA. Target species detected preferred habitat areas with structurally complexity with a dense cover of vegetation between 1 and 5 metres tall. The report concludes that Most native bird species are still in very low abundance in the LGA except for large and/or aggressive birds such as Ravens, Currawongs, Magpies and Noisy Miners; Small insect foraging bird species depend upon the presence of a shrub and mid storey layer of vegetation and are therefore much scarcer in the area.

Australian Museum Business Services (AMBS): fauna study for Marrickville Council 2007

In 2007 on behalf of Marrickville Council the Australian Museum compiled an extensive fauna list which contains avian species recorded within the municipality. Study sights include locations within the GreenWay Marrickville Golf Links, Dibble Ave Waterhole and Dulwich Hill Freight Rail Corridor. Exotic species recorded have also been recorded have also been included. Sixty-three (63) bird species were observed during the diurnal bird surveys throughout Marrickville LGA. The most abundant among this assemblage of species were the Silver Gull (*Larus novaehollandiae*), the Rainbow Lorikeet (*Trichoglossus haematodus*), the Australian White Ibis (*Threskiornis molucca*), the Red-rumped Parrot (*Psephotus haematonotus*), the Noisy Miner *(Manorina melanocephala*) and the Common Myna. (*Acridotheres tristis*).

Bird list for Hawthorne Canal as at March 2007, David Rudder IWEG

A list of avian fauna sighted within the Hawthorne Canal between 2002 and 2006 titled 'Bird list for Hawthorne Canal as at September 2006' presents a record of bird species both resident and migratory recorded by IWEG member David Rudder. The list divides Hawthorne Canal into upper (between Marion Street Haberfield) and Cadigal Reserve Haberfield) and Lower (North of Marion Street Haberfield) habitats. The survey documents 26 species within the upper habitat and 36 species within the lower habitat. Exotic species have also been recorded.

Recommendations

Both professional studies conducted within the GreenWay describe the importance of connectivity between potential habitat patches. These links are essential as bird species need to be able to reach newly created habitat areas in order to establish populations. Isolated populations become inbred and individuals need to be able to move between colonies or family groups in order to maintain genetically diverse and viable populations. The Leichhardt Avian Biodiversity Study states that it is important to establish links or corridors wherever possible.

Small patches are deemed to be too small to be viable for some target bird species, but are found to function as useful habitat because they were associated with corridors. The Merops study urges that the consolidation of habitat corridors requires the involvement of landholders so that the land is managed effectively to maximise corridor function (LMC 2008).

The AMBS study outlines importance of planting native grasses, shrubs and trees in particular food tree species and those with decorticating bark must be promoted if bird species diversity is to be maintained or even improved upon. The importance of habitat size is also assessed and it is stated that target species are more likely to be found in core habitat areas as they prefer environments that provide protection from non-desirable bird species afforded by larger habitat areas. Furthermore both studies detail the importance of further research and monitoring and more stringent control of cats and dogs as essential to ensure positive outcomes in terms of species composition.

Avian Fauna Summary

The Cooks River to Iron Cove GreenWay provides habitat for a diverse range of avian fauna. Population dynamics reflect the influences of an urban environment. Species with aggressive behavioural traits such as the native Australian Noisy Minor and Pied currawong along with the introduced Indian Myna and Common Starling are able to compete more effectively than other species for limited roosts. Avian studies in the GreenWay have demonstrated that the corridor provides interim habitat for threatened migratory bird species including the Black-tailed Godwit, *Limosa limosa*, the Broadbilled Sandpiper, *Limicola falcinellus*, the Greater Sand Plover, *Charadrius leschenaultii*, and the Lesser Sand-plover, (*Charadrius mongolus*),

Resident bird populations also include threatened species and recent recordings have revealed that species including Turquoise Parrot (*Neophema pulchella*) Powerful Owl (*Ninox strenua)*, Masked Owl (*Tyto novaehollandiae)* Regent Honeyeater (*Xanthomyza Phrygia)* Superb Fruit-Dove (*Ptilinopus superbus),* Pied Oystercatcher (*Haematopus longirostris*) and Swift Parrot (*Lathamus discolour)* have been recorded within the corridor.

However with most native bird species in very low abundance except for large and/or aggressive bird species the long term effects of urbanisation are overtly apparent. Rehabilitation of native flora through bush revegetation projects provide invaluable habitat niches that support vegetation composition of suitable characteristics to facilitate a more diverse and abundant avian population. Completed avian studies have concluded that habitat structure consisting of a dense shrub layer of variable height up to 5 metres tall that is not dominated by tree species will provide the best possible habitat for bird species.

Small insect foraging bird species depend upon the presence of a shrub and mid storey layer of vegetation and are therefore much scarcer in the area. It has been shown that corridors linking new and existing habitat areas provide the best possible opportunities to provide avian habitat in an urban context. Therefore the continued on ground bushcare aimed at providing habitat links within the corridor will provide positive outcomes for avian species.

A resounding plea for continued scientific assessment of avian species is included within all relevant fauna studies conducted including sites located within the GreenWay.

In order to provide a more rigid assessment of the composition of avian populations within the GreenWay corridor site specific study is required. Analysis of population/ habitat interactions relevant to vegetation composition should demonstrate the advantages of reconstructed landscapes.

A complete list of species recorded within the GreenWay within the Marrickville Fauna study, Leichhardt Avian Biodiversity Study and the species recorded by David Rudder are contained within Appendix 5: Species recorded within GreenWay Avian Studies.

6.4 Amphibians

Site specific information regarding the abundance diversity of amphibia in the GreenWay is minimal, therefore descriptive information relevant to species composition in the surrounding LGAs has been included to provide context.

The Marrickville Fauna Study summarises that the 2007 survey recorded the presence of three relatively common frog species, the Striped Marsh Frog, Peron's Tree Frog and the Common Eastern Froglet. All three species were recorded from captures and calling observations from constructed water bodies at Tempe Lands and the ubiquitous Common Eastern Froglet was heard calling from a small drainage line/soak at Dulwich Hill Freight Rail Corridor. The study states that these results are reflected by a fauna study conducted in Marrickville LGA in 1997 in which there was 'paucity in frog observations'. A search of the DECC Wildlife Atlas database indicated that a possible nine species of frog have previously occurred within 5 kilometres of the study area, these species are list below.

Hylidae Tree Frogs

- Green and Golden Bell Frog (*Litoria aurea)**
- Bleating Tree Frog (*Litoria dentate)*
- Eastern Dwarf Tree Frog (*Litoria fallax)*
- Jervis Bay Tree Frog (*Litoria jervisiensis)*
- Peron's Tree Frog (*Litoria peronii)*
- Green Stream Frog (*Litoria phyllochroa)*

Myobatrachidae Southern Frogs

- Common Eastern Froglet (*Crinia signifera)*
- Bullfrog (*Limnodynastes dumerilii)*
- Striped Marsh Frog (*Limnodynastes peronii)*

*Some of the species recorded such as the Green and Golden Bell Frog would be unlikely to occur at any of the survey sites (AMBS 2007).

6.5 Bats and Flying foxes

Species of Significance

The threatened Grey-headed Flying-fox (Pteropus poliocephalus) is frequently sighted within the GreenWay corridor.

The Eastern Bentwing Bat and the Grey-headed Flying-fox (*Pteropus poliocephalus)* have been detected (NPWS Wildlife Atlas 2007) although the Grey-headed Flying-fox is the only species that is seen regularly (AMBS 2007). Opportunistic observations of the *vulnerable* Grey Headed Flying Fox are documented within the Marrickville Fauna study which states that there is potential for several bat species to occur within the area due to adaptations that enable mobility these species can persist in fragmented landscape.

Grey-headed Flying-foxes are also likely to stop to feed on trees as they forage over a greater range. The retention of trees with hollows is recommended for the provision of essential roosting sites.

Management actions including minimising risk to public safety and assets through diversion of pedestrian access and creation of landscape buffers, and substitution of hollows with nest boxes of appropriate size, height and location for targeted species is recommended. To conclude the study states the requirement of Further Anabat ultrasonic bat call detection surveys and capture surveys.

6.6 Reptiles

Species Diversity!
A recently completed study of fauna in Marrickville LGA recorded six reptile species throughout ten sites within the LGA, however five of theses species were recorded at the Dulwich Hill freight rail corridor site.

Reptile studies conducted in the Marrickville LGA concluded that reptiles recorded during field studies were common and small in number. Management actions aimed at abating threats from predatory species such as dogs and mortality on roads will serve to further increase reptile abundance. The provision of additional habitat features such as rocks, logs and bark will facilitate improvements in habitat suitability and reptile multiplicity as connectivity with source populations is essential for any increase in reptile diversity. The retention of these features has been practiced with GreenWay bushcare sites by IWEG volunteers. The utilisation of these features by reptile species within bushcare sites requires further investigation. Study results have shown a higher level of species abundance within corridor study sights when compared to study sites within the surrounding LGA. This provides a reasonable suggestion of higher rates of habitation that bears further enquiry.

Lizards

Skink species have adapted to an urban environment that still provides rock and stone surfaces exposed to the sun with nearby crevices for shelter from predators. Australian Museum Business services 1995 concluded that the following lizard species as likely to found in parks, gardens found in the Leichhardt area.

- Dark-flecked Garden Skink
- Cream-stripped Shining Skink
- Eastern Water Skink
- Pale Flecked Skink

Several other species are also likely to be found in Leichhardt, including the Three-Toed Skink and the Weasel Skink. Eastern Bluetongue lizards (*Tiliqua rugosa*) are also known to exist in Leichhardt

The 2007 Fauna study for Marrickville Council (AMBS 2007) recorded six species throughout the ten study sites. However five of these species were recorded at the Dulwich Hill Freight Rail site. These included diurnal terrestrial skinks that forage through creek side vegetation and are often seen basking on rocks or logs. The Fence Skink *(Cryptoblepharus virgatus)*, Copper Water Skink (*Eulamprus quoyii)*, Dark-flecked Garden Sunskink *(Lampropholis delicate)*, Pale-flecked Garden Sunskink *(Lampropholis guichenoti),* and Weasel Shadeskink (*Saproscincus musteline)* were recorded at the Dulwich hill freight rail corridor site. with the exception of The Blue-tongue Lizard (*Tiliqua scincoids),* a ground dwelling species that eats insects, snails, carrion and vegetation, and is known to seek nocturnal shelter in hollow night logs*.* The blue tongue was the only lizard recorded that wasn't found within the GreenWay and this species is commonly sighted by volunteers within the GreenWay.

Snakes

Diurnal reptile surveys at Dulwich Hill freight rail corridor concluded that no snakes were observed during the field survey and urged that additional surveys in the beginning of summer would probably reveal a greater number of reptiles in the locality. However the DECC Wildlife Atlas database provided a number of snake records listed below. Reptile species recorded within 5km of the corridor are presented within Appendix 4. Reptile Species NSW NPWS Wildlife Database (within 5km).

Typhlopidae Blind Snakes

- Proximus Blind Snake (*Ramphotyphlops proximus)*

Boidae Pythons

Diamond Python (*Morelia spilota spilota)*

Elapidae Elapid Snakes

- Yellow-faced (Whipsnake *Demansia psammophis)*
- Red-naped Snake (*Furina diadema)*
- Dwyer's Black Headed Snake (*Suta dwyeri)*
- Eastern Bandy-bandy *(Vermicella annulata)*

6.7 Pest Fauna Species

Threats and pressures

***Introduced predators such as dogs, foxes and cats have the potential to compromise endangered animal populations with the GreenWay. Non native bird species have reduced the abundance of native avian fauna such as the Sacred Kingfisher*.**

The 2007 Fauna Study for Marrickville LGA concluded that the control of introduced predatory species and restrictions in the predation potential of domestic pets will improve the potential for increased biodiversity of fauna species within areas of the Cooks River to Iron Cove GreenWay (AMBS 2007). The New South Wales Department of Environment Climate Change and Water (DECCW) denotes the control of feral species as a top priority for the conservation of endangered populations of the Long-nosed bandicoot (*Perameles nasuta)* endangered population

The Leichhardt avian fauna study states that Pest avian fauna species within the corridor include the Indian Myna (*Acridotheres tristis) and* Common Starling (*Sturnus vulgaris)* (Merops Services, March 2008). The DECC wildlife atlas and the Marrickville fauna study (AMBS 2007) list the following species within the area of this review.

- European Goldfinch *(Carduelis carduelis)*
- House Sparrow *Passer (domesticus)*
- Common Blackbird *(Turdus merula)*
- Red-whiskered Bulbul *(Pycnonotus jocosus)*
- Eurasian Skylark *(Alauda arvensis)*
- Spotted Turtle-Dove *(Streptopelia chinensis)*
- Rock Dove (*Columba livia)*
- Mute Swan *(Cygnus olor)*
- Dog *Canis (lupus familiaris)*
- Fox *(Vulpes vulpes)*
- Cat *(Felis catus)*
- European Rabbit *(Oryctolagus cuniculus)*
- Nutmeg Mannikin *(Lonchura punctulata)*

Fauna studies conducted in the area recommend that consideration should be given to the control of introduced fauna species (such as the fox) at survey sites where they occur, and within the wider local government areas. Marrickville Council currently have on leash/off leash areas with varied policing but this could be more heavily enforced in ecologically sensitive areas such as Johnson Park (near Dulwich Hill Freight Rail Corridor). Furthermore, fencing along this seemingly significant wildlife corridor should be repaired immediately and routinely checked and maintained (AMBS 2007).

Indian Myna Birds

Leichhardt Municipal Council's Draft Indian Myna report outlines species affected by the competitive nature of the Indian Myna (*Acridotheres tristis).* Avian species

recorded within the GreenWay such as the Sacred Kingfisher, Dollar bird and parrot species are adversely affected by competition for food and nesting hollows. The report recommends that Leichhardt maintains a watching brief on trapping trails and research and that information on passive control measures be provided to the public (Anderson 2009). Myna birds also have the potential to disrupt efforts to protect avian and bat populations as species such as Common Mynas are known to colonise artificial nest boxes. Studies conducted on Myna birds in the GreenWay have concluded that Indian Mynas are in high abundance in the area. These birds dominate urban environments because they can aggressively defend their territories in the open vegetation structure.

Summary of Pest Species

The Cooks River to Iron Cove GreenWay is subject to resident and transient intrusions from pest species including dogs, rabbits, cats and foxes. Aggressive introduced bird species compete with native species for habitat, food sources and nesting sites. The competitive nature and specific behavioural adaptations of introduced fauna species results in increased competition for habitat and predation pressures on indigenous fauna. The severe ramifications of which include the recorded killing of members of the GreenWay's resident endangered bandicoot population by dogs. Due to the existence of the Long-nosed bandicoots within the corridor the importance of population monitoring of pest species and assessment of control measures can not be overstated. Fauna studies completed within the corridor concur that increased restrictions on under-controlled domestic animals and increased maintenance on exclusion fencing are the priority actions to increase native species diversity.

7. Conclusion

The Cooks River to Iron Cove GreenWay presents an invaluable opportunity to further establish an example of and environmental corridor in an urban context. The advantages to floral and faunal biodiversity resulting from the reconnection of previously fragmented habitats are well documented. Efforts from existing volunteer groups to date have been significant. Further scientific investigation and monitoring will provide a more comprehensive assessment of base line data that will serve to refine future rehabilitation through revegetation projects.

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List of Appendices

Appendix 1

Hawthorne Canal Planting list prior to 1982

Table 1: Hawthorne Canal Planting list prior to 1982

***Eucalyptus saligna* Group**	**Rain forest group**	***Angophora costata* Group**	**Other Acacias**	**Heath plants & Ground covers**
Euc. saligna	*Brachychiton acerifolium*	*Angophora Costata*	Ac. Saligna	*Goodia lotifolia*
Euc. pilularis	*Acmena smithii*	*Euc. viminalis*	Ac. Longifolia	Eutaxia obovata
Euc. gummifera	*Hymenosporum flavum*	*Euc. Eximia*	Ac. Decurrens	Hardenbergia violacea
Euc. puncata	*Grevillia robusta*	*Euc.piperita*	Ac. Floribunda	Kennedeia prostrata
Euc. resinifera	*Stenocarpus sinuatus*	*Euc.Umbra*	Ac. Glaucescens	
Euc. piperita	*Tristnana Laurina*	*Ironbark Group*	Ac. Suaveolens	Other plants
Euc. elata	*Calltris Rhombodia*	*Euc. Fibrosa*	Ac. Falcata	Westringia rosemarinifolia
Euc. crebra	*Toona Australis*	*Euc. Sideroxylon*	Ac. Lineata	*Callistemonlinearifolia*
Euc.longifolia	*Acmena brachyandra*	*Euc. Maculata*	Ac. Botrycephala	Grevillia rosemarinifolia
Euc. globoidea	*Cerapetalum Spp.*	*Euc. Paniculta*	Ac. Binervata	Grevillia Hookerarana
Euc. Haemestoma	Misc. large Trees	*Euc. crebra*	Ac. Polydarifolia	Grevillia Glabrata
Syncarpia Glommulifera	*Euc. Microcoys*	Small Trees	Ac. Drummondii	Grevillia Buxifolia hybrid
Dodonea Spp.	*Ac. Melanoxylon*	*Casuarina Distyla*	Ac. Cultriforma	Grevillia Lavandulacea
	Ac. Elata	*Agonis flexuosa*		Grevillia Juniperina (prostrate)
Pittosporum undulatum	*Ac. Prominens*	*Callistemon armarillis*		Leptospermum Squarrosum
		saligna		Leptospermum petersonii
Hakea Saligna	Euc. Botryoides, amplifolia and robusta	*Melaleuca laterita*		Banksia erecifolia
		Albizzia lopantha		Banksia Marginata
		Hakea sericez		Melaleuca hypericifolia
		Banksia robur		Melaleuca Nesophylla
		Banksia integrifolia		Kunzea ambigua
		Banksia robur		

Appendix 2

Index of GreenWay planting inventories

Index of GreenWay planting inventories

Date	Title	Location of Document	Details
undated	Provisional Planting List for Areas 3 and 4 in Dulwich Hill Railway Corridor	IWEG creating a green link project Project management plan	
Oct 2002	Planting List for Planting by residents	Inner west environment group Creating a green link project - Resident planting project	
Jan 2003	Provisional Planting List for Area 3 in Dulwich Hill Railway Corridor	Project Management Plan for Revegetation within Dulwich Hill Goods Railway Corridor	
May 2004	Planting List for Area 2 in Dulwich Hill Railway Corridor	"Creatng a Green Link" Project Site Management Plan for Area 2 – Piggot St, Dulwich Hill	
June 2006	Sowing Guide for Disturbed Site Stabilisation	Railcorp 2006 Biodiversity Management Plan Metro South Rail Corridors Railcorp	
2006	Planting List for Area 1 in Dulwich Hill Railway Corridor	Site Management Plan for Area 1 – Davis St, Dulwich Hill June 2006	Area 1 only
2007	Plants generally suitable for use near Energy Australia's Network	The Energy Australia tree safety management plan	
2008	Species List for bushcare sites to November 2008	'Within a document titled Site Tour Notes'	Contains planting list of all Iweg sites
2008	Planting List	Creating a bush link : Restoration & Rehabilitation Project	Marrickville LGA area only
Undated	Native plants of the Cooks River Valley	Flyer prepared by Marrickville Council nursery and Environmental Services	A selection of plants native to the native

			(Marrickville) area
1982	Table 1: Hawthorne Canal Planting list prior to 1982	The Cooks River to Iron Cove GreenWay Flora and Fauna Literature Review	
2009	Ewen Park Bushcare Site Planting Inventory	The Cooks River to Iron Cove GreenWay Flora and Fauna Literature Review	
2010	The Mudcrabs: Foord Avenue Bushcare Site Planting Inventory	The Cooks River to Iron Cove GreenWay Flora and Fauna Literature Review	Previously unpublished

Appendix 3

Avian GreenWay Avian study results

Appendix 3 GreenWay Avian study results

Australian Museum Business Services: fauna study for Marrickville Council 2007	**Avian Biodiversity Monitoring And Bird Habitat Management Merops Services March 2008**	**David Rudder Report Bird list for Hawthorne Canal 2007 Middle Canal Habitat**	**David Rudder Report Bird list for Hawthorne Canal 2007**
Charadriidae Plovers *Vanellus miles* Masked Lapwing (LMC A.S 2008) **Laridae Gulls** *Larus novaehollandiae* Silver Gull **Maluridae Fairy-wrens** *Malurus cyaneus* Superb Fairy-wren (LMC A.S 2008) **Cuculidae Cuckoos** *Eudynamys scolopacea* Common Koel(LMC A.S 2008) **Parrots** *Trichoglossus chlorolepidotus* Scaly Breasted Lorikeet *Trichoglossus haematodus* Rainbow Lorikeet(LMC A.S 2008) *Psephotus haematonotus* Red-rumped Parrot *Glossopsitta concinna* Musk Lorikeet **Threskiornithida Ibis** *Threskiornis molucca* Australian White Ibis **Ardeidae Herons** *Egretta novaehollandiae* White-faced Heron *Gallinula tenebrosa* Dusky Moorhen **Anatidae Ducks** *Anas castanea* Chestnut Teal *Anas superciliosa* Pacific Black Duck **Columbidae Pigeons** *Columba livia** Rock Dove (Feral Pigeon) *Ptilinopus superbus* Superb Fruit-Dove *Streptopelia chinensis** Spotted Turtle-Dove(LMC A.S 2008) **Anhingidae Darters** *Anhinga melanogaster* Darter **Phalacrocoracidae Cormorants** *Phalacrocorax melanoleucos* Little Pied Cormorant **Ardeidae Herons** *Nycticorax caledonicus* Rufous Night Heron **Cacatuidae Cockatoos** *Cacatua galerita* Sulphur	Australian White Ibis *Threskiornis molucca* Masked Lapwing *Vanellus miles* Rock Dove *Columba livia* Spotted Turtle-Dove *Streptopelia chinensis* Crested Pigeon *Ocyphaps lophotes* Sulphur-crested Cockatoo *Cacatua galerita* Rainbow Lorikeet *Trichoglossus haematodus* Common Koel *Eudynamis scolopacea* Superb Fairy-wren *Malurus cyaneus* Red Wattlebird *Anthochaera carunculata* Noisy Miner *Manorina melanocephala* Magpie-lark *Grallina cyanoleuca* Willie Wagtail *Rhipidura leucophrys* Figbird *Sphecotheres viridis* Grey Butcherbird *Cracticus torquatus* Australian Magpie *Gymnorhina tibicen* Australian Raven *Corvus coronoides* Welcome Swallow *Hirundo neoxena* Red-whiskered Bulbul *Pynonotus jocosus* Silvereye *Zosterops lateralis* Common Starling *Sturnus vulgaris* Common Myna *Acridotheres tristis* Masked Lapwing *Vanellus miles* Rock Dove *Columba livia*] Spotted Turtle-Dove *Streptopelia chinensis*	Australian White Ibis White-faced Herron Intermediate Egret Little Black Cormorant Pacific Black Duck Chestnut Teal Sulphur crested Cockatoo Yellow-tail Sacred Kingfisher Black-faced Cuckoo-shrike Welcome Swallow Black Cockatoo Rainbow Lorikeet Brown Goshawk Kookaburra Sacred Kingfisher Golden Whistler Black-faced Cuckoo-shrike Willy Wagtail Black Faced Monarch White Browed Shrub Wren Superb Blue Wren Brush Wattle Bird Red Wattle bird White plumed honey eater New Holland honeyeater Eastern Spinebill Spotted Pardalote Brown Warbler Silver eye Olive Backed Oriole Pee Wee Australian Raven Pied Currawong Spangled Drongo Dollarbird	Little Pied Cormorant Intermediate Egret Little Black Cormorant White-faced Herron Striated Heron Royal Spoonbill Black- winged stilt Crested turn Chestnut Teal Masked Lapwing Silver Gull Crested Pigeon Sulphur Crested Cockatoo Galah Rainbow Lorikeet Red-rumped Parrot Eastern Rosella Black-shouldered Kite Australian Reed Warbler Fairy Martin Willy Wagtail Superb Blue Wren Noisy friarbird White plumed honeyeater New Holland Honeyeater Easter Spinebill Figbird Olive-backed Oriole Pee wee Grey Butcher Bird Australian magpie

Crested Cockatoo (LMC A.S 2008)
Cuculidae Cuckoos
Eudynamys scolopacea Common Koel
Meliphagidae Honeyeaters
Anthochaera carunculata Red Wattlebird (LMC A.S 2008)
Anthochaera chrysoptera Little Wattlebird
Manorina melanocephala Noisy Miner (LMC A.S 2008)
Phylidonyris novaehollandiae New Holland Honeyeater
Campephagidae Cuckoo-shrikes
Coracina novaehollandiae Black-faced Cuckoo-shrike(LMC A.S 2008)
Artamidae Magpies
Gymnorhina tibicen Australian Magpie (LMC A.S 2008)
Strepera graculina Pied Currawong (LMC A.S 2008)
Rhipiduridae Fantails
Rhipidura leucophrys Willie Wagtail (LMC A.S 2008)
Corvidae Crows
Corvus coronoides Australian Raven (LMC A.S 2008)
Monarchidae Monarch Flycatchers
Grallina cyanoleuca Magpie-lark (LMC A.S 2008)

Timaliidae White-eyes
Zosterops lateralis Silvereye (LMC A.S 2008)
Pyconotidae Bulbuls
*Pycnonotus jocosus** Red-whiskered Bulbul (LMC A.S 2008)

Crested Pigeon *Ocyphaps lophotes*
Little Corella *Cacatua sanguinea*
Sulphur-crested Cockatoo *Cacatua galerita*
Red Wattlebird *Anthochaera carunculata*
Noisy Miner *Manorina melanocephala*
Magpie-lark *Grallina cyanoleuca*
Willie Wagtail *Rhipidura leucophrys*
Black-faced Cuckoo-shrike *Coracina novaehollandiae*
Pied Currawong *Strepera graculina*
Welcome Swallow *Hirundo neoxena*
Common Starling *Sturnus vulgaris*
Common Myna *Acridotheres tristis*

Appendix 4

Reptile Species NSW NPWS Wildlife Database

GreenWay Reptile Species	
Reptile Species NSW NPWS Wildlife Database (within 5km)	Species record within the AMBS study
Scincidae Skinks	Fence Skink
Cryptoblepharus virgatus Fence Skink	*Cryptoblepharus virgatus*
Ctenotus robustus Robust Ctenotus	Eastern Water Skink
Ctenotus taeniolatus Copper-tailed Ctenotus	*Eulamprus quoyii*
Cyclodomorphus michaeli Eastern She-oak Skink	Weasel Skink
Eulamprus quoyii Copper Water Skink	*Saproscincus musteline*
Eulamprus tenuis Bar-sided Forest-skink	Dark-flecked Garden Sun-skink
Lampropholis delicata Dark-flecked Garden Sunskink	*Lampropholis delicata*
Lampropholis guichenoti Pale-flecked Garden Sunskink	Pale-flecked garden Sunskink
Saiphos equalis Yellow-bellied Three-toed Skink	*Lampropholis guichenoti*
Saproscincus mustelina Weasel Shadeskink	Eastern Bluetongue Lizard
Tiliqua scincoides Common Bluetongue	*Tiliqua scincoides*
Agamidae Dragons	
Physignathus lesueurii Eastern Water Dragon	
Amphibolurus muricatus Jacky Lashtail	
Pygopodidae Legless Lizards	
Lialis burtonis Burton's Snake-lizard	
Pygopus lepidopodus Southern Scaly-foot	
Gekkonidae Geckos	
Diplodactylus vittatus Eastern Stone Gecko	
Oedura lesueurii Lesueur's Velvet Gecko	
Phyllurus platurus Broad-tailed Gecko	
Underwoodisaurus milii Thick-tailed Gecko	
Varanidae Goannas	
Varanus varius Lace Monitor	
Chelidae Freshwater Turtles	
Chelodina longicollis Eastern Snake-necked Turtle	
Typhlopidae Blind Snakes	
Ramphotyphlops proximus Proximus Blind snake	
Boidae Pythons	
Morelia spilota spilota Diamond Python	
Elapidae Elapid Snakes	
Demansia psammophis Yellow-faced Whipsnake	
Furina diadema Red-naped Snake	
Suta dwyeri Dwyer’s Black Headed Snake	
Vermicella annulata Eastern Bandy-bandy	

Appendix 5

Plant Stock and Species Planted in GreenWay Corridor to February 2008

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
Trees										
A.parramattensis			Y	Y	Y #					
Angophora floribunda				Y						
Banksia integrifolia		Y			Y					
Casuarina cunnighamiana *	Y	Y		Y	Y	Y				
E. paniculata		Y	Y	Y		Y				
E. fibrosa			Y							
E.globoidea			Y							
E.pilularis										
E.punctata		Y?								
E.resinifera										
E. saligna										
Glochidion ferdinandi				Y	Y					
Melaleuca decora				Y						
M.lineariifolia					Y					
Syncarpia glomulifera		Y	Y	Y		Y				
Shrubs/herbs/ferns										
Acacia falcata	Y	Y	Y	Y	Y	Y				
A. longifolia var. longifolia		Y	Y	Y	Y	Y				
A. myrtifolia	Y	Y	Y	Y	Y	Y				
A.stricta		Y		Y						
[A.suaveolens]		Y		Y	Y	Y				
A.terminalis		Y								
[A.ulicifolia]		Y		Y	Y					
Breynia oblongifolia		Y			Y					
Bursaria spinosa	Y	Y	Y	Y	Y	Y				

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
[Calicoma serratifolia]										
Calotis cuneifolia										
Cassinia arcuata										
Cassinia longifolia										
Cassytha pubescens										
Centella asiatica					Y					
Cheilanthes sieberi										
Daviesia ulicifolia		Y		Y	Y	Y				
Dillwynia parviflora										
Dillwynia seiberi 1										
Dillwynia retorta		Y		Y	Y					
Dodonea triquetra	Y	Y	Y	Y	Y	Y				
Goodenia bellidifolia										
Goodenia hederacea										
Goodenia heterophylla		Y			Y					
Goodenia ovata										
[Gonocarpus teucriodes]		Y	Y	Y	Y					
Grevillea buxifolia		Y			Y					
(Hakea sericea)		Y	Y	Y	Y	Y				
Hibbertia aspera										
H.teretifolia		Y								
H. pendunculata										
H. scandens		Y			Y					
Indigofera australis		Y	Y	Y	Y	Y				
Kunzea ambigua		Y		Y	Y	Y				

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
Leptospermum polygalifolium2		Y			Y	Y				
Leucopogon juniperinus										
Lissanthe strigosa										
Maytenus sylvestrus										
Melaleuca nodosa		Y			Y					
Melaleuca decora		Y								
Notolea longifolia			Y	Y	Y					
Olearia microphylla		Y			Y					
Ozothamnus diosmifolium3		Y			Y					
Persoonia linearis										
Phyllanthus gastroemii										
Pittosporum revolutum		Y			Y					
[Podolobium illicifolium]4										
Polyscias sambucifolia										
Pseudoanthemum variable		Y								
Pultanea villosa		Y		Y	Y					
Zieria smithii			Y	Y	Y					
Grasses, sedges, rushes and lillies										
Agrostis avenacea										
Aristida vagans					Y					
Austrodanthonia setacea					Y?	Y?				
A.vulva (or linkkii var linkii)?	Y?	Y?	Y?	Y?	Y	Y?				
A.tenuior?	Y?	Y?		Y?	Y	Y				
Bothriochloa macra			Y	Y	Y					
Calotis cuneifolia										

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
Carex appressa		Y			Y					
Chrysocephalum apiculatum										
Cymbopogan refractus			Y	Y	Y					
Cyperus gracilis #				Y	Y	Y				
Dianella longifolia		Y		Y						
Dianella revoluta										
Dianella caerula	Y	Y	Y	Y	Y	Y				
Dichelacne crinita		Y	Y	Y	Y	Y				
D. micrantha		Y		Y	Y	Y				
D. rara					Y	Y				
Echinopogon caespitosus var. caespitosus	Y	Y	Y	Y	Y					
Einadia hastata			Y	Y	Y	Y+				
Entolasia stricta										
Entolasia marginata					Y					
Eragrostis brownii			Y		Y					
Imperata cylindrica		Y			Y					
Juncus subsecundus #					Y					
J. continuus					Y					
*Lachnagrostis filiformis **					Y					
Lepidosperma laterale			Y	Y	Y					
Linum marginale										
Lomandra longifolia	Y	Y	Y	Y	Y	Y				
L.multifolora			Y		Y					
Microlaena stipoides		Y	Y	Y	Y	Y+				
Opercularia varia										

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
Oplesmenus aemulus			Y	Y	Y					
Oxalis exilis										
Panicum distans										
Poa affinis			Y	Y	Y					
Poranthera microphylla										
Prostanthera incana										
Schoenus apogon										
Stackhousia viminea										
Stipa pubescens										
Themeda australis		Y	Y	Y	Y	Y				
Wahlenbergia gracilis		Y	Y	Y	Y					
Ground covers / creepers / vines										
Billardiera scandens										
*Commelina cyanea**	Y	Y	Y	Y	Y	Y				
Convolvulus erubescens										
Desmodium rhytidophyllum		Y			Y					
Dichondra repens				Y	Y	Y				
Glycine clandestina										
Glycine tabacina										
Hardenbergia violacea	Y	Y		Y	Y	Y				
Kennedia rubicunda		Y			Y	Y #				
Pandorea pandorana		Y	Y	Y	Y					
Pratia purpurescens			Y	Y	Y	Y				
Rumex brownii										
Smilax glyciphylla										
Veronica pleibeia			Y	Y	Y					

	Lords Rd	Cadigal	Area 1	Area 2	Area 3	Annex	Area 5	Area 6	RMR	Old Cant.
Viola hederacea					Y					
Total Plants Ordered										
Total Plants in stock										
Hyco being raised now										
Total Plants										
Total Species (including "?")	12	51	34	48	69	33				

***Y** = Species planted or present in corridor*

Y = Species planted 1st April 2007in Area 3

Species not yet planted but to be obtained

[Additonal species for sandstone communities]

* accidental introductions or re-colonisation and continuously removed
# natural re-colonisation – kept under control
+ natural recolonisation or spread from other sites of local prvenance plants
? Plant Species/sub-species to be confirmed
Synonyms:
1 - *Dillwynia seiberi* = Dillwynia junipera
2 - *Leptospermum polygalifolium* = Leptospermum flavescens
3 - *Ozothamnus diosmifolius* = Helichrysum diosmifolium
4 - *Podolobium illicifolium* = *Oxylobium ilicifolium*

Appendix 6

The Mudcrabs: Foord Avenue Bushcare Site Planting Inventory

The Mudcrabs: Foord Avenue Bushcare Site Planting Inventory			
13/06/09	**27/06/09**	**25/07/09 (20 seedlings)**	**22/08/09**
Acacia suaveolens	Selaginella	Acacia suaveolens	Hardenbergia
Dodonaea triquetra	Commelina	Dodonaea triquetra	Acacia suaveolens
Kunzea	Kunzea	Banksia serrata	Kunzea
Banksia serrata	Acacia suaveolens	Lomandra	Banksia serrata
Lomandra	Acacia terminalis	Kennedia rubicunda	Acacia suaveolens
Imperata	Dodonaea triquetra		Acacia terminalis
Microlaena	Banksia serrata		Kennedia rubicunda
	Lomandra		Pteris tremula
	Acacia ulicifolia		
Plantings October 2009 (53 seedlings)			
Melaleuca nodosa	Microlaena	Oplismenus	Calochlaena
Plus other species already listed within this table			

Appendix 7

Ewen Park Bushcare Site Planting Inventory

Planting Schedule

Symbol	Botanical Name	Common Name	Pot Size	Quantity
Trees				
	Angophora floribunda	Rough Barked Apple	25ltr	3
	Melaleuca linariifolia	Snow-in-summer	25ltr	6
	Acacia decurrens	Black Wattle	25ltr	26
Shrubs				
	Dodonea triquetra	Common Hop Bush	Viro tube	21
	Acacia ulicifolia	Prickly Moses	Viro tube	19
	Acacia terminalis	Sunshine Wattle	Viro tube	18
	Leptospermum polygalifolium	Lemon-scented Tea Tree	Viro tube	19
Grasses and Groundcovers				
	Lomandra longifolia	Mat Rush	Viro tube	150
	Dianella caerulea	Blue Flax Lily	Viro tube	250
	Juncus usitatus	Common Rush	Viro tube	240
	Danthonia longifolia	Wallaby Grass	Viro tube	1602
	Microlaena stipoides	Weeping Grass	Viro tube	630
	Dichelachne spp.	Plume Grass	Viro tube	2082
	Persicaria decipiens	Slender Knotweed	Viro tube	630
	Viola hederacea	Native Violet	Viro tube	215

CANTERBURY CITY COUNCIL
City of Cultural Diversity

TITLE: COOKS RIVER- EWAN PAKR RIVER EDGE PLANTING PLAN

SCALE: NO SCALE A1 | SHEET No. 2/2 | REV B

Appendix 8

Threatened Species for LGAs in Parramatta River Catchment

Scientific Name	Common Name	Legal Status
Litoria aurea	Green and Golden Bell Frog	E1
Pseudophryne australis	Red-crowned Toadlet	V
Pandion haliaetus	Osprey	V
Ixobrychus flavicollis	Black Bittern	V
Callocephalon fimgriatum	Gang-gang Cockatoo	E2
Ephippiorhynchus asiaticus	Black-necked Stork	E1
Xanthomyza phrygia	Regent Honeyeater	E1
Limosa limosa	Black Tailed Godwit	V
Ninox strenua	Powerful Owl	V
Petaurus australis	Yellow-bellied Glider	V
Pteropus poliocephalus	Grey-headed Flying-fox	V
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V
Miniopterus schreibersii oceanensis		V
Tetratheca glandulosa		V
Epacris purpurascens var. purpurascens		V
Callistemon linearifolius	Netted Bottle Brush	V
Darwinia biflora		V
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V
Leptospermum deanei		V
Melaleuca deanei	Deane's Paperbark	V

V= Vulnerable
E1 = Endangered
E2 = Endangered population