

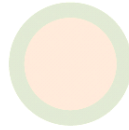
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Citywide Bushland Management Plan

Volume 1

Holroyd City Council

Total Earth Care Pty Ltd
December 2007



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Citywide Bushland Management Plan Holroyd City Council

Volume 1

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Citywide Bushland Management Plan Holroyd City Council

Volume 1

EXECUTIVE SUMMARY

The Holroyd Local Government Area (HLGA) covers approximately 39.5 square kilometres and is located on the Cumberland Plain in Western Sydney. As a result of extensive industrial and residential development in the HLGA it is estimated that only approximately 6% of the original native vegetation covers remains. Generally remnant bushland in Holroyd is disjunct and widely separated with threats such as weed invasion and further clearing for development continuing. Despite the limited occurrence and restricted distribution of remnant native vegetation in the HLGA, previous studies and reports have highlighted the biodiversity values and conservation significance of native plants and plant communities in bushland remnants of the HLGA. Consistent with previous survey and descriptions of bushland within the HLGA, survey for this Citywide Bushland Management Plan has identified and described remnants of the *Threatened Species Conservation Act 1995* (TSC Act) listed Cumberland Plain Woodland endangered ecological community and located threatened plant species. Several threatened fauna species are known from the HLGA. Although detailed fauna survey is beyond the scope of this survey and assessment, bushland and vegetated corridors of the HLGA such as Greystanes Creek, Lower Prospect Canal, Prospect Creek and Greystanes Woodlands (Alpha Park and other reserves) are either known or are potential habitat for threatened fauna species as well as other native fauna.

The Citywide Bushland Management Plan (Citywide BMP) has been prepared in accordance with Holroyd City Council ('Council') statutory obligations under the *Local Government Act 1993*. Additionally Council is committed to the protection and rehabilitation of bushland and management of threatened species in the HLGA. The aim of this Citywide Bushland Management Plan is to provide a working document for the sustainable management, restoration, protection and rehabilitation of native vegetation and associated habitats within the HLGA. The focus has been to determine the extent of bushland in selected reserves, define plant communities in these reserves and assess the conservation values, integrity as remnant and regrowth native plant communities or values as modified or reconstructed plant communities. Quantitative and qualitative assessment of native plant communities and other plant communities has provided the basis for prioritising areas and vegetation management measures for continuing and future bushland management within the HLGA. The Citywide BMP focuses primarily on the larger Council reserves, several small reserves with pockets of native vegetation and some reserves that are currently managed as open space but have been identified as retaining natural resilience and therefore regeneration potential.

Volume 1 of Citywide BMP frames the context, provides the background and describes the methods of the Plan. More specifically review of the relevant legislation, policies, other environmental planning instruments, current Plans of Management and previous surveys and studies for Council Reserves is presented in Volume 1. Field survey, desktop mapping and the community consultation process used to develop the Citywide BMP are described in Volume 1. A major aspect of the field survey has been site inspection of every reserve addressed in the Citywide BMP to determine the extent of bushland, classify the plant communities of the bushland and determine the condition of native vegetation. Mapping of bushland and classification of native plant communities has relied on previous broad scale mapping of the native vegetation of western Sydney (NPWS 2002 and Tozer 2003). Generally the extent of bushland identified for this Citywide BMP correlates to the extent of previous mapping (NPWS, 2002). Similarly native plant community classification is mainly consistent with existing community descriptions (Tozer, 2003) but this has been modified in the current survey to accurately describe field observation and provide an element of condition assessment. Vegetation classification and plant community mapping from the current survey has resulted in eleven distinct vegetation communities being identified within the HLGA reserves. Mapping of these vegetation communities has defined the extent of bushland in HLGA for the reserves covered in the Citywide BMP. A Geographic Information System (GIS) has been used to produce a hard copy series of vegetation

maps to accompany this document and a digital data set compatible with Councils GIS has also been prepared.

Volume 1 also describes the consultation process undertaken in the preparation of the Citywide BMP which has included the preparation of preliminary draft for review and comment by Council bushland management staff and local Bushcare groups, prior to the preparation of the draft for public exhibition. Concurrent to the draft Citywide BMP being placed on public exhibition, Council held a public information presentation in association with the authors, to further communicate the purpose and strategies of the plan and invite additional comment and participation in the plan development. At the completion of the public exhibition and consultation phase Council received one written submission to the Citywide BMP.

Implementation of the Citywide BMP requires integration into other Council management plans and operational plans and mechanisms for reporting. Importantly this has required the development of targets and performance measures to meet certain criteria. Volume 1 recommends generic actions, targets and performance measures these have also been applied to each reserve or management group of reserves with more specific detail. This method provides level of connectivity from individual reserve management to Citywide BMP implementation, SoE reporting and Council strategic planning.

Volume 2 of the Citywide BMP describes the native and other plant communities at each reserve encompassed by the plan and recommends the strategies, actions, targets and performance measures for the implementation of the Citywide BMP for each reserve. Each reserve or management grouping of reserves forms an individual chapter in the Citywide BMP. This format provides a structure that allows for each reserve to be stand alone document. In formulating the management recommendations reference has been made to 'best practice' industry guidelines such as *Bush Regeneration - Recovering Australian Landscapes* (Buchanan, 1989), *Recovering Bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland* (Dept of Environment and Conservation, 2005) and *Bush Regeneration. A Practical Guide to Contract Management*. (Blue Mountains Urban Runoff Control Program, 2003).

The following Reserves or group of Reserves have been surveyed as part of the Citywide Bushland Management Plan:

- Central Gardens;
- Greystanes Creek Reserves;
- Greystanes Woodland Reserves 1 and 2, including Alpha Park, Widemere Reserve and Gardenia Parade Reserve;
- Hyland Road Reserves (north and south);
- Lower Prospect Canal Reserve;
- Prospect Creek Reserves, including Gipps Road Playing Fields; and
- Stop Mow Reserves including, Adler Parade Reserve, Bolaro Ave Reserve, Boothtown Reserve, Brighton Reserve, Gallard Reserve, Greystanes Sports Ground, Nemesia Street Park and Pendle Hill Park Reserve.

Central Gardens Reserve comprises a total area of 11.7 hectares and includes 3.5 hectares of Shale Plains Woodland (SPW). Council (HCC) prepared the *Central Gardens Plan of Management* (HCC, 2002) and the recommendations of this Citywide BMP are generally inline with objectives and strategies of the plan of management. The SPW has been re-established by 'stop mow' management since 1993/94 and species diversity within this section of the Reserve has increased substantially. In addition to managing the restored SPW, this Citywide BMP recommends that objectives identified for bushland in the plan of management be adopted for other areas focusing on retaining and using the existing native vegetation and natural resilience of the site. Proposed actions include weed removal and control, bush regeneration techniques, erosion control and revegetation.

Greystanes Creek Reserve is located between Fox Hills Golf Course in the south and the Main Western Railway Line in the north. The reserve comprises a total area of approximately 3ha along 2.5 kilometres of creek line. The *Greystanes Creek Reserves Plan of Management* (Bernhard and Associates, 1998) established management objectives and strategies for recreation, ecological

restoration, flood mitigation and other values and uses of the corridor. Since the adoption of the plan of management significant progress has been made in its implementation and the recommendations of this Citywide BMP are formulated with consideration of the objectives and strategies of the plan of management. The natural vegetation along Greystanes Creek Reserve is discontinuous stands of regenerating endangered ecological community, River Flat Eucalypt Forest on Coastal Floodplains (RFEFCF), and these have been supplemented by the establishment of reconstructed plant communities along the corridor.

The aim of vegetation management for Greystanes Creek Reserve will be to enhance the condition of the RFEFCF and Disturbed RFEFCF (DRFEFCF), improve vegetation connectivity between these two communities, with a long term aim of establishing a regional vegetation corridor. This will be achieved through a continued bush regeneration program including weed control and supplementary planting and expanded revegetation works.

The Greystanes Woodland Reserve is a linear reserve comprising a total area of 7 hectares located between Alpha Road/Kurrajong Road and Smithfield Industrial Estate. Alpha Park Reserve forms the western section of the Greystanes Woodland. There is a central area of woodland that is privately owned and this in turn adjoins Widemere Reserve which forms the eastern extent of Greystanes Woodland Reserve. In association with the nearby Gipps and Hyland Road Reserves, Lower Prospect Canal Reserve, Prospect Creek Reserve and bushland of Prospect Reservoir, Greystanes Woodland forms part of a locally significant wildlife corridor for Western Sydney.

In addition to supporting the SPW endangered ecological community the Greystanes Woodland remnant has high conservation significance due to the presence of threatened flora and fauna species and three flora species of regional significance. The main objective for bushland management at Greystanes Woodland is to enhance the SPW and Disturbed SPW communities. Vegetation management actions will include noxious weed control, regular maintenance weeding and revegetation of Disturbed SPW. Threatened biodiversity management should be in accordance with DEC Recovery Plans, and some experimental approaches are proposed for the management of threatened flora species known from the reserve.

Hyland Road Reserve in Greystanes is approximately 32.5 hectares and incorporates two stands of bushland north and south of Hyland Road. Hyland Road Reserve North has most recently been managed as an Arboretum with planting of locally and non-locally occurring native species. Hyland Road Reserve South has been used as a land fill tip (now decommissioned) and part of the site is used as a Council depot for materials storage. RFEFCF, an endangered ecological community, occurs along Munro Creek in both the northern and southern sections of the Reserve. The Reserve forms part of a locally significant wildlife corridor for Western Sydney particularly the riparian vegetation and aquatic habitat of Munro Creek. The rest of the site contains a mix of Cleared and Disturbed, Exotic Shrubland, Native Grassland and Planted Shrubland/Woodland communities.

The specific objective for native vegetation will be to enhance the condition of the RFEFCF community. Primary weeding is to commence in the RFEFCF and should not progress into other plant communities until the RFEFCF is stabilised and maintenance weeding is providing a level of certainty to the long term survival and enhancement of resilience for this community. Primary weeding will progress in stages throughout the remainder of Hyland Road Reserves from areas of highest resilience to areas of lower resilience. Revegetation works are recommended to supplement and consolidate the RFEFCF, reduce erosion potential in Munro Creek and provide links to the native grassland areas and Cumberland Plain Woodland to the north along Munro Creek. Stormwater management works have also been recommended within Munro Creek to reduce impacts on the RFEFCF community.

The Lower Prospect Canal Reserve (LPC) covers approximately 62 hectares and stretches from near Prospect Reservoir to Guildford at its eastern extent. The *Lower Prospect Canal Plan of Management* (LPC PoM) by Environmental Partnership (1999) was prepared following decommissioning of the water supply canal. The condition of the native plant communities varies considerably along the corridor, but includes stands of Cumberland Plain Woodland, threatened plant species, regionally significant plant species and high native plant species richness in remnant bushland and generally throughout the reserve. The reserve has potential to be linked to remnant vegetation of Eastern Creek to the west, Prospect Creek to the south and Duck River to the east to improve its regional corridor values. Planted areas have been established throughout LPC to supplement or link native plant community remnants.

The specific objective for native vegetation will be conservation of threatened flora that occurs in the reserve and enhancing the condition of the SPW and Disturbed SPW communities. Three threatened flora species are found in the Lower Prospect Canal Reserve Downy Wattle, Spiked-Rice flower and Matted Bush-pea. Management actions should focus on implementation of Recovery Plans where these have been prepared and/or implementation of the relevant priority actions identified by the DEC as part of the Recovery Strategies for each species and ecological community. There is a high priority for the immediate implementation of priority actions for the recently discovered Matted Bush-pea plants.

Focusing on areas of higher resilience, management actions will include noxious weed and vine weed control, expanded primary weeding in Exotic Shrublands and Disturbed SPW and continued secondary and maintenance weeding throughout areas currently being managed. Staged revegetation should continue to create vegetated links firstly between remnant and regrowth native plant communities and filling in gaps to creating fully or partially continuous vegetated links. Support and development of local Bushcare groups should be encouraged, and the use of fire as a management tool should be considered.

The land comprising Prospect Creek Reserve has a total area of 17 hectares, and forms the boundary between Holroyd and Fairfield Local Government Areas. Vegetation along Prospect Creek is mostly remnants of RFEFCF linked by areas of revegetation with the creek forming a regionally significant wildlife corridor. The RFEFCF has moderate resilience, however long edges with the Cleared and Disturbed plant community and continuing impacts from stormwater runoff, erosion and sedimentation and canopy smothered in vine weed are major threats to the current resilience.

Vegetation management for Prospect Creek will enhance the endangered ecological communities, maintaining an important local and regional vegetation corridor that supports habitat and habitat potential for locally rare flora and fauna species but also incorporates open space functions and recreational opportunities. Primary weeding, including noxious and vine weeds, is required throughout the RFEFCF community and should focus on areas of higher resilience, progressively expanding as each area enters a maintenance phase.

Staged revegetation of Prospect Creek will enhance the RFEFCF community, create buffers to regeneration sites, supplement natural regeneration in higher resilience areas and provide stream bank stability where large stands of noxious or woody weeds are cleared. Installing canopy plantings in the Cleared and Disturbed areas between stands of Disturbed SPW along Gipps Road will link them to each other and the RFEFCF community of Prospect Creek. Ultimately this will provide a corridor that connects Prospect Creek to remnants of Hyland Road and adjacent bushland such as Alpha Park and Lower Prospect Canal. It is also recommended to improve stormwater management to reduce impacts on the native vegetation.

Council has recommended several reserves as stop mow sites, in addition to Gum Tree Reserve, and sections of Central Gardens and Hyland Road. The maintenance of native species cover and suppression of weed species in native plant communities that have been regularly mowed is the main principal for implementing a stop mow management regime. The regeneration of a fully or partially structured native plant community following the removal of mowers is limited by resilience and on-going maintenance. Recovery of endangered ecological communities is the main objective and there is potential for the exacerbation of weed regrowth if not controlled once mowing ceases. Additionally a reallocation of resources to maintain established stop mow areas at the expense of maintaining resilient endangered ecological communities must be avoided.

It is recommended that eight reserves are considered for 'stop mow' management, and the expected resilience of each area has been mapped. Sections of Boothtown and Bolaro Reserves and Greystanes Sports Ground contain areas of SPW and Disturbed SPW with moderate resilience, and have close proximity to (and potential to supplement) regionally significant wildlife corridors. Pendle Hill Reserve also contains an area of Disturbed SPW with moderate resilience. The remaining four Reserves (Nemesia, Gallard, Brighton and Adler) contain areas of Disturbed SPW with low to moderate resilience. A program for the introduction of 'stop-mow' management in these reserves is proposed.

Citywide Bushland Management Plan Holroyd City Council

Volume 1

1 INTRODUCTION

1.1 Background to Project

Holroyd City Council ('Council') has requested Total Earth Care Pty Ltd to prepare a Citywide Bushland Management Plan (BMP) to guide and assist Council in its commitment to the protection and rehabilitation of bushland in the Holroyd City Council Local Government Area (HCCLGA). The Citywide Bushland Management Plan has been prepared in accordance with Council's statutory obligations under the *Local Government Act 1993*. The plan has also considered the requirements of legislation administered by the New South Wales Department of Environment and Climate Change (DECC) in developing the bushland management strategies and actions proposed.

The Holroyd Local Government Area covers approximately 39.5 square kilometres and is located on the eastern side of the Cumberland Plain and south-west of Parramatta (NPWS, 1997). The HCCLGA has been extensively developed in the past for industrial and residential purposes, with currently only approximately 6% of remnant native vegetation remaining (NPWS, 1997). These bushland remnants are typically isolated, small and threatened by weeds and further clearing. Despite these pressures they do support a wide range of native plant species and contribute to the overall natural heritage values of the area (NPWS, 1997).

The main objectives of the Citywide BMP are to identify the extent of bushland under Council tenure and assess their relative quality. The Citywide BMP applies to the areas of natural area bushland under Council's care, control and management within the HCCLGA as shown in the overview map of Appendix A. The Citywide BMP makes recommendations for future management of these areas in order to maintain or enhance biodiversity, and at the same time improve amenity and quality of the areas of remnant bushland. Significantly the preparation of the Citywide BMP is identified as an action under the Holroyd City Management Plan 2005-2009 which is linked to the biodiversity category of the *Holroyd City Council State of Environment Report 2005/2006* (HCC, 2006).

The Citywide BMP has researched existing literature and previous mapping of the native vegetation of the HCCLGA and the identified gaps in this information. Site surveys and field assessments were undertaken, based on the identified data gaps, the project objectives, legislative considerations (eg Federal and State Acts), feedback from Council staff and community and stakeholder liaison.

The bushland site analysis included;

- field surveys of sites across HCCLGA to determine the extent of bushland under Council tenure, fill data gaps and verify existing regional data, ie *Native Vegetation of the Cumberland Plain, Western Sydney* map series (NPWS, 2003);
- classification and mapping of plant communities;
- threatened flora species targeting;
- compilation and/or update of flora species inventories, including environmental and noxious weed species;
- assessment and mapping of predicted resilience;
- assessment and inventories of threats to bushland; and
- identification of vegetation management actions such as areas to be rehabilitated, areas to be revegetated and other management requirements.

Volume 1 of the Plan presents the background and context for the Citywide BMP. It contains chapters on the statutory and legislative requirements by which HCC is bound in its planning and management of natural bushland areas; a summary of previous flora survey work and existing management plans for the bushland Reserves of Holroyd; details on the methodologies used for the field survey and mapping; a brief description of environmental data relevant to the local government area as a whole; the public consultation and review process; and references cited in the plan.

Volume 2 of the Citywide BMP contains separate chapters for each reserve, or management group of reserves, that are the subject of the Citywide BMP. Within each chapter there is a description of the reserve and the results of the site assessments and the management recommendations for each area. There is also a series of figures to go with each chapter which show the vegetation communities for each reserve, and mapping of the predicted resilience.

Species inventories combining previous and current surveys are also included in Volume 2.

1.2 Statutory and Other Regulatory Requirements

The following section of the report provides a summary of the relevant Commonwealth, State and Local government legislation and environmental planning instruments and Councils main natural resource management strategies, policies plans or guides.

1.2.1 Environment Protection and Biodiversity Conservation Act

Under the *Environment Protection and Biodiversity Conservation Act 1999*, any action which:

- has, would have, or is likely to have a significant impact on a matter of National Environmental Significance; or
- has, would have, or is likely to have a significant impact on the environment on Commonwealth land,

triggers the Act and therefore requires Commonwealth assessment and approval. Matters of National Environmental Significance include nationally threatened species, populations and ecological communities. As actions proposed as part of this bushland management plan may potentially impact upon nationally threatened species and ecological communities the need for an approval from the Commonwealth Environment Minister must be assessed under the procedures and guidelines in force under the Act.

1.2.2 NSW Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the conservation and protection of threatened species, populations and ecological communities of animals and plants through specific objectives relating to the conservation of biodiversity and promoting ecologically sustainable development. The Schedules of the TSC Act identify endangered or vulnerable species, populations, ecological communities, critically endangered species or ecological communities and key threatening processes affecting the listed species, populations and ecological communities. Provision is made for the preparation of recovery plans for listed threatened species, populations and ecological communities and threat abatement plans to manage key threatening processes. Responsibility for the implementation of recovery plans and threat abatement plans by public authorities is set out in Sections 69 and 86 of the TSC Act.

The TSC Act provides for the declaration and mapping of habitats that are critical to the survival of those identified threatened species, populations and ecological communities that are classified as endangered (critical habitats). Further, the TSC Act also sets out the methods of assessment, management and regulation of actions that may damage critical or other habitat or otherwise significantly affect threatened species, populations and ecological communities.

1.2.3 Local Government Act 1993

The *Local Government Act 1993* provides for the management of all community land administered by Councils, and requires the preparation of plans of management for these areas. The plans of management categorise the land as being within one or more categories according to their use, condition of the natural environment, and significance to the community.

The categories for classification include Natural Area, Sportsground, Park, Area of Cultural Significance and General Community Use. Natural Areas are further classified into Bushland, Wetland, Escarpment, Watercourse, and Foreshore.

The aim of the Act is to assist councils in developing best management practices and plans of management consistent with the principles of ecologically sustainable development for land under its ownership and control. Section 36J of the Act specifically sets out the core objectives for management of community land categorised as bushland, which are:

- (a) to ensure the ongoing ecological viability of the land by protecting the ecological biodiversity and habitat values of the land, the flora and fauna (including invertebrates, fungi and micro-organisms) of the land and other ecological values of the land, and
- (b) to protect the aesthetic, heritage, recreational, educational and scientific values of the land, and
- (c) to promote the management of the land in a manner that protects and enhances the values and quality of the land and facilitates public enjoyment of the land, and to implement measures directed to minimising or mitigating any disturbance caused by human intrusion, and
- (d) to restore degraded bushland, and
- (e) to protect existing landforms such as natural drainage lines, watercourses and foreshores, and
- (f) to retain bushland in parcels of a size and configuration that will enable the existing plant and animal communities to survive in the long term, and
- (g) to protect bushland as a natural stabiliser of the soil surface.

Additionally the Act sets out the requirements for State of Environment Reporting. State of Environment Reporting (SoE) is not only a major component of Councils annual reporting cycle but also provides for management planning. This integrated approach can be achieved through the SoE clearly identifying key issues and proposing performance measures and targets (NSW Dept of Local Government, 2000).

1.2.4 Rural Fires Act 1997

The *NSW Rural Fires Act 1997* (RF Act) provides for the prevention, mitigation and suppression of fires within rural fire districts, for the protection of persons and property and for the protection of the environment.

Under Part 4 Division 1 of the RF Act "it is the duty of a public authority (in this case Holroyd Local Government¹) to take the notified steps and any other practicable steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of a bush fire on or from, any land vested in or under its control or management".

The Holroyd local government area falls within the management area of the NSW Fire Brigades, however the issue of fire permits within NSW Fire Brigade areas is covered by this Act. Section 50 of

¹ Under the *Rural Fires Act 1997* a 'public authority' is defined as:

- (a) any public or local authority constituted by or under an Act other than this Act, or
- (b) any Government Department, or
- (c) a statutory body representing the Crown, or
- (d) a State owned corporation, or
- (e) any person prescribed by the regulations as a public authority.

the *Rural Fires Act* sets up provisions for establishing Bushfire Management Committees (BFMC's) with the task of developing and coordinating cooperative fire management between fire authorities across the state.

1.2.5 Noxious Weeds Act 1993

The objectives of the *Noxious Weeds Act* 1993 are to reduce the negative impact of weeds on the economy, community and environment of NSW by establishing control mechanisms to prevent, restrict and reduce areas of significant weeds. The Act also aims to provide for the monitoring of and reporting on the effectiveness of the management of weeds in NSW. The Act places weeds into control classes which specify how certain weeds need to be managed in each local government area. Order 20 of the Act identifies the weeds that are declared noxious within the HCCLGA.

1.2.6 State Environment Planning Policy No. 19 – Bushland in Urban Areas

State Environmental Planning Policy No.19 – Bushland in Urban Areas (SEPP 19) has been prepared according to Part 3 of the NSW *Environmental Planning and Assessment Act 1979*. SEPP 19 aims to, amongst other things, “protect and preserve bushland” within the urban areas of Sydney (Department of Planning, 1986). The policy applies where natural vegetation (or ‘bushland’) remains or vegetation representative of the structure and floristics of natural vegetation exists. As such, this policy applies to the reserves containing remnant vegetation within the HCCLGA.

1.2.7 Biodiversity Planning Guide for NSW Local Government

The Biodiversity Planning Guide for Local Government (Fallding *et al*, 2001) has been prepared to assist local councils in NSW, and was an action under the NSW Biodiversity Strategy. The guide describes biodiversity concepts and practices, and shows how councils can effectively plan to facilitate biodiversity conservation. The guide focuses on strategic planning, and how local government administrations can incorporate biodiversity principles into core business and operations.

The Biodiversity Planning Guide outlines how a selection of plans and policies should be compiled and implemented, including Local Environmental Plans, Development Control Plans, and Plans of Management. Specifically, the Guide outlines how each should be written, including documents such as Bushland Management Plans. It is stated in the Guide that plans such as this BMP need to address issues such as how, where, when and by who any action should be taken, as these directly affect biodiversity.

In a planning and site specific management context, the guide sets out various evaluation methods and ecological parameters for plans such as this Citywide BMP. Ecological parameters listed include assessing vegetation condition, vegetation communities and remnant characteristics. Methods of evaluation include compiling species lists, conducting vegetation surveys, conducting literature reviews, and assessing weed densities, all which have been adopted in the site assessments of this Citywide BMP.

1.2.8 Holroyd Council Local Environmental Plan

The Holroyd Council Local Environmental Plan 1991 (HLEP) provides planning controls for land under council administration. A specific aim of the HLEP is to enhance and conserve the natural environment through appropriate planning controls. The land for which this BMP applies is zoned 6 (a) Public Open Space.

The objectives of the Public Open Space zoning are:

- to identify land which is currently used or is intended to be used for the purposes of open space or public recreation;

- to allocate sufficient open space to serve the present and future recreational needs of residents and visitors; and
- to enable development associated with, ancillary to or supportive of public recreational use.

1.2.9 Beyond 2006 – The City Strategic Plan and City Operational Plan

Holroyd has released the 2006 – 2010 Strategic Plan that sets out the Council's vision for the next four years and beyond. It has identified four major areas that affect the activities of Council, one of which being the Environment. The Plan will address management and coordination of activities that will preserve the past, protect what currently exists and hand over a safe and healthy environment to future generations. The accompanying Operational Plan details the specific actions and targets to achieve the objectives set out in the Strategic Plan. The Operational Plan contains actions for the implementation of Council's responsibilities under the relevant environmental, planning and local government Acts, and the ongoing implementation of "Living Holroyd: A Sustainable Future" with the Holroyd community. The next review of these Plans should consider incorporating recommendations for bushland management within the Council managed areas of Holroyd. This will also ensure that the Citywide Bushland Management Plan is part of the Council's Plan review process.

1.2.10 Holroyd City Council Agenda 21

Local Agenda 21 is a program designed to implement sustainable development at the local level. Ecologically Sustainable Development (ESD) is defined as 'development that improves the total quality of life both now and in the future, in a way that maintains the ecological processes on which life depends' and was defined in 1992 at the United Nations Conference on Environment & Development, which was held in Rio de Janeiro. This conference is commonly referred to as the Rio Earth Summit. The Rio Earth Summit called upon local governments around the world to develop and implement an action plan for sustainable development linking in with current policies, programs and activities. Also, under the *Local Government Act 1993*, Local Councils have an obligation to properly manage, enhance, and conserve the environment for which they are responsible, in a manner that is consistent with and promotes the principles of ESD.

Holroyd Council has adopted a Local Agenda 21 action plan, *Living Holroyd: A Sustainable Future* (HCC, 2003), which forms the framework for which local government activities can be linked. The progress of Living Holroyd is reported annually in Council's State of Environment Report and a detailed review of Living Holroyd is due to commence in 2006. Objectives of the biodiversity framework contained in the action plan are listed below;

- Manage & restore ecologically valuable natural areas;
- Promote the need to conserve biodiversity;
- Encourage community participation in preserving & enhancing ecologically valuable natural areas; and
- Reduce the impacts of new & existing urban development on natural areas.

Further to these objectives key biodiversity indicators are identified as;

- Area of indigenous vegetation as a percentage of the local government area; and
- Number and diversity of indigenous bird and animals.

Strategies to achieve these objectives include identifying remnant vegetation within the local government area, developing flora and fauna species databases, Bushcare volunteer participation, extending, enhancing and preserving green corridors and implementing plans of management. This Citywide BMP has a direct link to the biodiversity objectives, strategies and forms an action of *Living Holroyd: A Sustainable Future* (HCC, 2003). The subsequent implementation of this Citywide BMP will provide a biodiversity conservation and management tool for Council's continuing commitment to Local Agenda 21.

1.2.11 Sydney Metropolitan Catchment Management Authority

The Sydney Metropolitan Catchment Management Authority (SMCMA) was formed as a result of natural resource management reforms within NSW. The SMCMA has a responsibility to manage natural resources at the catchment scale. They provide independent advice to the State government and have a role in developing partnerships with the wider community and local government in implementing natural resource management actions at a catchment level. Their key role is in preparing Catchment Action Plans (CAPs) by integrating previous natural resource management work with the latest information and science, and with local knowledge. This includes the Southern Sydney and the Sydney Harbour Catchment Blueprints.

The draft Sydney Metro CAP contains biodiversity targets that aim to maintain and increase the extent, condition and connectivity of native vegetation, and provide for improved management of threatened species and greater control and removal of invasive species. The CAP will encapsulate initiatives from previous studies and relevant policies and plans including the Georges River Foreshores Improvement Program, the Georges River Regional Environment Plan No. 2 (DUAP 1999) and the Biodiversity of the Georges River Catchment (Stellar 2004).

2 BUSHLAND MANAGEMENT PLAN AIMS AND OBJECTIVES

The general aim of the bushland management plan is to provide a working document for the sustainable management and restoration, protection and rehabilitation of native vegetation and associated habitats within the Holroyd City Council local government area. The focus is on determining what remaining bushland conservation values exist across the Holroyd local government area, and prioritising areas for ongoing and future bushland management actions.

The Citywide Bushland Management Plan is being prepared in accordance with '*The Biodiversity Guide for NSW Local Government*' (Fallding *et al*, 2001), with a focus on assessing the extent of native vegetation within natural bushland areas. The Plan will guide Council in their day to day management of these areas, and set out actions to improve the biodiversity resource within these bushland areas.

The Citywide Bushland Management Plan does not address ways in which Council can achieve biodiversity conservation objectives using the existing planning processes and instruments. The Guide provides extensive information and examples of the ways in which Council can seek to improve biological conservation within the local government area, such as existing land use planning and development control processes as governed by the NSW *Environmental Planning and Assessment Act 1979*.

Specifically, the aims and objectives of the bushland management plan are to:

- clearly identify the extent of bushland sites within Holroyd local government area;
- assess the relative quality of the vegetation remnants within the study area, including physical disturbance, native plant diversity and resilience;
- identify opportunities and constraints within the bushland areas;
- assist Council's to fulfil its statutory responsibilities under current NSW legislation and Council Policy;
- prepare a draft Citywide Bushland Management Plan in accordance with '*The Biodiversity Guide for NSW Local Government*' for public exhibition and comment;
- determine appropriate vegetation management measures in alignment with current sustainability principles, including bush regeneration and revegetation methods, to ensure the longevity and success of all rehabilitation and restoration works within the study area;
- recommend the appropriate timing of vegetation management measures, assign responsibilities for work tasks and an estimation of costs, and;
- provide data in a form that is compatible with Council's Geographical Information System.

The following Reserves or Group of Reserves have been surveyed as part of the Citywide Bushland Management Plan:

- Central Gardens;
- Greystanes Creek Reserves;
- Greystanes Woodland Reserves 1 and 2, including Alpha Park, Widemere Reserve and Gardenia Parade Reserve;
- Hyland Road Reserves (north and south);
- Lower Prospect Canal Reserve;
- Prospect Creek Reserves, including Gipps Road Playing Fields; and
- Stop Mow Reserves including Adler Parade Reserve, Bolaro Ave Reserve, Boothtown Reserve, Brighton Reserve, Gallard Reserve, Greystanes Sports Ground, Nemesia Street Park and Pendle Hill Park Reserve.

3 PREVIOUS STUDIES AND SURVEYS

The following section provides a summary of relevant regional information relating to natural bushland areas and reserves within Holroyd including the NSW National Parks and Wildlife Service vegetation mapping of the Cumberland Plain (Tozer, 2003) and the Urban Bushland Biodiversity Survey (UBBS) (NPWS, 1997). Other information specific to the management of Holroyd Reserves is summarised, including those studies and reports referenced in the scope of works, annual reports from bushland regeneration projects, existing plans of management, and other available information relevant to bushland management within Holroyd local government area.

3.1 The Native Vegetation of the Cumberland Plain

At a regional scale *The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities* (Tozer, 2003), provides a survey of vegetation communities occurring on the Cumberland Plain and adjacent plateaus characterised by Wianamatta Shale soils. This study recognises that most of the native vegetation communities of the Cumberland Plain and neighbouring Wianamatta Shale are listed as endangered under the *Threatened Species Conservation Act* and states that 'Due to the rate of urban development in western Sydney there is a large potential for development proposals to significantly impact on listed communities' (Tozer, 2003). Accordingly part of the rationale for the survey was to address the need for quantitative data to assist in the identification of plant communities and provide assessment of the conservation value of vegetation remnants.

The aim of the survey was to revise the existing plant community classification to take account of; recently described communities and other communities warranting recognition; provide quantitative data for characteristic species in each community (frequency of occurrence and relative abundance); identify species showing high fidelity to each community as a basis for diagnosing community type in the field; estimate the present cover of native vegetation; and derive a spatial model as a basis for predicting the vegetation type and conservation value of all remaining remnants (Tozer, 2003).

The survey incorporated systematic, stratified field sampling to record floristic structure and composition, a classification procedure based on hierarchical, agglomerative clustering analysis, spatial modelling of community distributions using geological, climatic and topographic variables; and the interpretation of patterns in canopy composition and remnant condition in aerial photographs. The resulting *Native Vegetation of the Cumberland Plain, Western Sydney – 1:25 000 Map Series* (NPWS, 2003) incorporates Holroyd local government area in Map 9.

The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities (Tozer, 2003) and *Native Vegetation of the Cumberland Plain, Western Sydney – 1:25 000 Map Series* (NPWS, 2003) have been used extensively in field survey and assessment during the preparation of this Citywide Bushland Management Plan.

3.2 Urban Bushland Biodiversity Survey of Western Sydney

The *Urban Bushland Biodiversity Survey* (UBBS) (NPWS, 1997) formed part of a State Biodiversity Survey Program aimed at identifying native vegetation remnants in the western Sydney area which are poorly conserved and greatly threatened, including the endangered Cumberland Plain Woodland. The outcomes of this survey were to provide the basis for conservation and define best management practices required to ensure conservation of these areas.

Holroyd local government area was one of the areas investigated during the UBBS, as Holroyd is located within Western Sydney on the Cumberland Plain. The UBBS identifies areas of remnant bushland within the Holroyd local government area and lists plant communities and species found within each of these identified remnants. The UBBS reports over 290 native plant species recorded within Holroyd local government area, which represents nearly 22% of species found within western Sydney (NPWS, 1997). Of this, 46% of species are considered to be vulnerable or inadequately represented within western Sydney, including *Pimelea spicata* and *Acacia pubescens* (listed as Threatened under the *Threatened Species Conservation Act* 1995) (NPWS, 1997).

Bushland remnants of conservation significance listed in the UBBS for which Council are responsible include:

- Alpha Park Reserve;
- Central Gardens;
- Lower Prospect Canal;
- Greystanes Creek;
- Gum Tree Reserve; and
- Prospect Creek.

3.3 Holroyd City Council Parks Plan of Management

As required under the *Local Government Act 1993* the *Holroyd City Council Parks Plan of Management* (EDAW, 1997) was prepared to plan for and manage community land defined under the Act as Parks. Accordingly the main objective of the Parks PoM is to '*guide the future management and development of Parks throughout the Holroyd City Council Local Government area (LGA), taking account of community expectations and the resources available to Council.*' with a Park defined as '*an area of Community Land with a predominantly passive recreational function.*' from the Parks PoM (EDAW, 1997). Further to the main objective the PoM identifies management, protection, restoration, enhancement and conservation of the conserve the environmental values of each Park, to ensure that they are sustainable for future generations as a specific object (EDAW, 1997).

Biodiversity is addressed as a specific management issue in the Parks PoM and with reference to bushland or native plant communities it is recommended that;

- Where remnant indigenous vegetation and/or significant trees occur on Parks they are to be conserved as important landscape resources.
- Protecting remnant ecological communities located within or adjacent to Parks by managing these resources in accordance with an Environmental Management Plan.
- Creating wildlife corridors by linking large stands of remnant vegetation through replanting and regeneration.
- The presence of threatened species within Parks need to be managed in accordance with the TSC Act.

3.4 Green Web Sydney

Green Web Sydney is an initiative that was established by the combined Sydney Regional Organisations of Councils (ROCs). It promotes the establishment of a green web of native vegetation to protect, conserve and enhance remnant bushland in the Sydney region. The Green Web Sydney Action Plan outlines strategies to establish habitat corridors across Sydney to link patches of remnant vegetation, and highlights the role of Local Government in biodiversity management. There are three main elements contained in the Action Plan. These include recommendations outlining policy, planning strategies and management practices to help conserve biodiversity in Sydney, mapping of remnant vegetation and areas suitable for revegetation, and a summary of vegetation communities.

For local councils, Green Web Sydney provides profile sheets for each LGA and suggests policies, planning strategies, works and development controls for vegetation management. It also lists statistics, vegetation communities present and further references about remnant vegetation in each participating LG region. Holroyd is listed as a participating Local Council, and as such is included in the Action Plan.

3.5 Bird Surveys by Cumberland Bird Observers Club

Ongoing bird surveys are conducted in many reserves within Holroyd by the Cumberland Bird Observers Club. Locations include Hyland Road Reserve, Lower Prospect Canal Reserve and Greystanes Creek Reserve.

3.6 Bird Habitat Management within Holroyd Local Government Area

Field surveys conducted between April 2006 and January 2007 in Greystanes Creek Reserve, Hyland Road Reserve and the Lower Prospect Canal Reserve as part of the *Bird Habitat Management within Holroyd Local Government Area* (Saunders, 2007) study recorded a total of seventy bird species within these major corridor reserves. The broad aim of the study was 'to document bird patterns in relation to habitat structure and to use this information to make recommendations towards maximising biodiversity and corridor function of these three reserves.' The study found that bird diversity within these reserves was concentrated in areas with good vegetation structure and which included areas of dense weed cover. Significantly the report suggests that the presence of 'bush bird' species, which are generally in decline in urban Sydney, is due in part to habitat provided by this structural diversity. Additionally width of corridor and connectivity to other bushland are proposed as key elements of observed diversity.

Generally the report recommends that existing bird habitat, particularly vegetation structure, needs to be taken into account in reserve management. More specifically and relevant to this BMP, the report recommends that vegetation management such as bush regeneration in these reserves consider staged removal of weed where it forms bird habitat and revegetation within narrow corridors areas needs to develop more vertical structure.

3.7 Central Gardens

A Plan of Management has been prepared for Central Gardens (Central Gardens Plan of Management, Holroyd City Council 2002), which contains objectives relating to the zoning and classification of the area as community park land and a natural area. The main aim of the Plan is to guide future management and development within the reserve, in conjunction with other council plans and policies. Specific aims of the Plan include protecting, conserving, restoring and enhancing the environmental values of the park, to ensure it is sustainable for future generations while being visually attractive and pollution free, and to manage the areas containing remnant Cumberland Plain Woodland in accordance with all regulatory documentation (HCC, 2002).

Within Central Gardens there is an area of Shale Plains Woodland (SPW), a sub unit of the Cumberland Plain Woodland (CPW) endangered ecological community. The area of SPW is referred to in the Plan as Management Zone B. A specific objective of the Plan is to manage this area in accordance with the Recovery Plan for CPW, and the requirements of the *Threatened Species Conservation Act 1995*. In the past, this area has been subject to a high level of disturbance, however some of the current vegetation has regenerated naturally after these past uses. The current structure and composition of the remnant is such that it can be considered a valuable representative of CPW (HCC, 2002).

Appropriate management of this remnant will enable its continuing recovering from past disturbances. A long-term regeneration and management strategy for the bushland areas in Central Gardens, including this CPW remnant has been started by Holroyd City Council. This program involves the use of the fenced off area (or 'Stop mow' area) for educational and scientific purposes, while at the same time this management ensures that its value as a vegetation remnant is increased. It is also proposed to use this area as a seed source to produce tube stock seedlings that will then be used for landscaping purposes throughout the rest of the park (HCC, 2002).

3.8 Greystanes Creek

A Plan of Management has been prepared for the Greystanes Creek Reserve area (Bernhard, 1998). The Reserve contains a rare remnant of the Riverine Floodplain community, which was once common in the Holroyd area. The Greystanes Creek Reserve is located between Fox Hills Golf Course in the south and the Main Western Railway Line in the north. The aim of the Plan is to outline future management, access, use and development within the Reserve and enhance conservation and recreation values within the area.

The Plan for Greystanes Creek refers to the area as seven separate segments, and states the condition of the land in each of the seven areas. Vegetation condition, fauna habitat and ecological significance are among some of the issues the Plan addresses. It also lists management objectives for each area, including those for both the catchment and the site specifically. Issues and strategies referred to are aimed to address concerns regarding recreation within the Reserve, vegetation, weeds, fauna habitat, wetlands, stormwater and water quality, and erosion.

In conjunction with the objectives of the Plan, a Development Control Plan (DCP) was established for the Greystanes Creek Reserve area (DCP No. 29, Holroyd City Council). The DCP controls development impacts to the creek by controlling the planting of vegetation, erosion and general development within the area.

3.9 Lower Prospect Canal Reserve

The Lower Prospect Canal was once used to supply water to the Sydney network before being decommissioned in 1995. The area within the Canal Reserve preserves some areas of Cumberland Plain Woodland, and the area has now been conserved as an addition to the public open space of Holroyd (Environmental Partnership, 1999). In 1999 a Plan of Management was compiled aiming to identify conservation issues and management strategies for the area (Environmental Partnership, 1999).

3.9.1 Lower Prospect Canal Reserve Plan of Management

The '*Lower Prospect Canal Reserve Plan of Management*' (Environmental Partnership, 1999) identifies biodiversity, heritage and community issues for the area, and the value of these for conservation purposes. It also provides a Management Strategy Framework for decisions regarding conservation and environmental improvements within the Reserve.

Within the Plan, strategies for *Bushland Management* have been recommended. Regeneration techniques are listed with the aim of allowing for natural regeneration of the canal. Bushland Management actions are also listed in conjunction with these strategies. Fauna management strategies and actions are listed and are designed to protect and enhance habitat value for threatened species, or those which are regionally significant. A key Bushland Management issue as listed in the Plan includes the protection and management of specific species and areas that contain high conservation value (Environmental Partnership, 1999). The Plan is subject to review after 5 years of its adoption.

3.9.2 Fire Management Plan

A Fire Management Plan is in preparation for Lower Prospect Canal but was not reviewed in the preparation of the draft or current Bushland Management Plan. It is however envisaged that review and incorporation of relevant recommendations and actions from the Fire Management Plan may be considered in the preparation of the Final Bushland Management Plan.

3.10 Prospect Creek

The '*Prospect Creek Open Space Corridor Plan of Management*' (Mandis Roberts, 2004) was compiled with the aim of providing long term guidance on the management of the Prospect Creek Corridor, under the Georges River Foreshore Improvement Programme. It lists, among other things, ecological values to the corridor and management strategies for improving the environment contained within the corridor. Future management of this area needs to be carefully planned, as the corridor forms part of the Georges River catchment, and all management measures may affect the outcomes of the Improvements Program (Mandis Roberts, 2004). These strategies will be considered for inclusion within the Sydney Metropolitan Catchment Action Plan.

3.11 Hyland Road

3.11.1 Gipps Road Open Space Master Plan

Holroyd City Council has previously been successful in receiving grant funding to prepare a Master Plan for a section of the Gipps Road Open Space, which is on the northern side of Hyland Road. The Plan has expanded in scope to include the area south of Hyland Rd. The Master Plan is currently in development and focuses on the development of sporting and recreational facilities that will integrate with the existing facilities further to the south at Gipps Reserve. Additionally the Master Plan will incorporate and develop comprehensive linkages to surrounding areas of open space such as Lower Prospect Canal. The current development of the Master Plan has included preliminary recommendations of this Bushland Management Plan specific to the vegetation of both the Hyland Rd north and south areas.

3.11.2 Review of Environmental Factors – Bushfire Risk Management – Council Reserves

Holroyd City Council has carried out a Review of Environmental Factors (REF) for a proposed bushfire hazard reduction burn in the area of bushland south of Hyland Rd. The assessment (HCC, 2004a) describes the proposal, the physical characteristics, flora, fauna and potential impacts and makes recommendations in relation to the proposal. Plant communities described for the site from this survey include Freshwater Reed Swamps, disturbed Sydney Coastal River Flat Forest (now recognised as being included in and replaced by River Flat Eucalypt Forest on Coastal Floodplains) and Cumberland Plain Woodland. A flora species inventory is also included.

The REF includes an assessment of significance under the previous provisions of Section 94 of the *Threatened Species Conservation Act* (formerly known as the '8-Part Test') for threatened species and ecological communities known from the site or previously recorded from the NPWS Wildlife Atlas from within 5 kilometres of the site. The 8-Part Test concludes that the proposal will not have a significant effect on threatened species or ecological communities from the study area or subject site and recognises that weed control is required post burn to prevent reestablishment of noxious and environmental weeds to maintain the natural resilience of the site (HCC, 2004a).

4 METHODS

4.1 Desktop Research

Prior to field surveys, extensive desktop research was conducted. This research included viewing records of all threatened species, populations and endangered ecological communities recorded in past surveys, including the '*Urban Bushland Biodiversity Survey*' (UBBS) (NPWS, 1997), and the '*Native Vegetation of the Cumberland Plain*' (Tozer, 2003). A comprehensive literature review was conducted of all documentation in relation to areas of bushland both within Holroyd, and in the region in general. This included any Plan of Management already in existence for areas of land under the control of Holroyd City Council, past flora and fauna assessments, previous management actions and history of Reserves and areas of remnant bushland with the Holroyd local government area. The Plan and Holroyd City Councils obligations under State and Federal acts were also a subject of this

research. Data gaps and areas for further investigation were identified. All information was collated and streamlined in order to align and incorporate the objectives of the Citywide BMP.

During this process of data collection, sites to be surveyed were selected. In selecting sites to include in the bushland management plan, it was not envisaged that all council reserves be included, but a representative portion be surveyed which included those with the highest ecological value. In determining which sites to survey, many factors were taken into consideration, including:

- zoning of the land as a 'Park or Reserve' under the care, control and management of Holroyd City Council;
- the conservation significance of the area as per NPWS (2003) mapping, which included classification of an area as 'Core Habitat', 'Other Remnant Vegetation', 'Support to Core Habitat' or 'Trees (Critically endangered community)';
- the location of endangered ecological communities including the Cumberland Plain Woodland as per NPWS (2003) mapping ;
- direction from Council staff; and
- existing plans for Reserves by Holroyd City Council e.g. Stop-Mow Reserves, or proposed Stop-Mow Reserves.

From this process, a group of Reserves were selected to be included in the Citywide BMP. The existing vegetation communities and management recommendations of the selected Reserves are described in Volume 2.

4.2 Flora and Plant Community Survey

Prior to field survey, previous studies and surveys such as UBBS (NPWS, 1997), '*The native vegetation of the Cumberland Plain, Western Sydney* (Tozer, 2003)', as well as plans or studies for individual reserves were reviewed and these have been summarised in earlier sections.

A general botanical field surveys were conducted over the study area between May and July 2006, involving:

- the identification of commonly occurring native and exotic plant species;
- the identification and mapping of plant communities (where present) according to the structural definitions of Specht & Specht (1999), and to previous broad-scale mapping of the Cumberland Plain by NPWS (2003); and
- bushland resilience assessment and mapping.

Plant species identification during the field survey was not intended to be comprehensive. Generally field survey was designed to; compliment existing flora species inventories (where in existence); determine common native plant species to assist in determining plant community mapping units that were consistent with published classification schemes such as Specht & Specht (1999), Tozer (2003) and NSW Scientific Committee (2005); and locate plant species of conservation significance using the "random meander" method (Cropper 1993). Plants were identified in the field using Robinson (2003) and according to the latest published scientific names in Harden (1992, 1993, 2000 and 2002). Species inventories are in Appendix A of Volume 2 of this Plan.

The vegetation survey work has resulted in eleven distinct plant communities being recorded within the bushland reserves of the Citywide BMP. These communities are described below and images representative of each community are shown in Appendix B of this volume. These plant community categories are the mapping units of the vegetation maps in Volume 2.

The plant communities have been determined by either one or multiple combinations of the parameters listed for each unit in Table 2 following.

Table 2 Summary description of plant community mapping units.

Plant Community	Summary Description
Cleared and Disturbed	<ul style="list-style-type: none"> ▪ An absence of any plant cover. ▪ Dominated by exotic grasses and herbs. ▪ Presence of native groundcover, shrub and tree species at densities that do not constitute a native plant community. ▪ May include widely scattered native and exotic remnant, regrowth or planted tree species and shrubs. ▪ Open parkland or easements that are maintained by mowing or slashing. ▪ Sites of major disturbance to surface and subsurface soil profiles including excavation, filling and alteration/realignment of drainage lines. ▪ Very low potential to recover to a native plant community through natural resilience.
Exotic Shrubland	<ul style="list-style-type: none"> ▪ Community dominated by Small Leaved Privet <i>Ligustrum sinense</i> and Large Leaved Privet <i>Ligustrum lucidum</i> to 3m high and is fringed by brambles of Blackberry.
Exotic Woodland	<ul style="list-style-type: none"> ▪ Dominated by exotic trees and other woody weeds including Large Leaved Privet, <i>Salix</i> sp Willow, Olive, Lantana and <i>Cestrum parqui</i> Green Cestrum. ▪ Often shrouded in curtains of <i>Cardiospermum grandiflorum</i> Balloon Vine. ▪ Groundcover stratum commonly Crofton Weed, Japanese Honeysuckle and Rhodes Grass ▪ Native species are limited to one or two isolated River Oaks.
Mixed Native Exotic Grassland	<ul style="list-style-type: none"> ▪ Community mainly equivalent cover of native and exotic grasses and groundcovers, but also can be patchy in composition. ▪ Common native species include Blady Grass and Kangaroo Grass. ▪ Paspalum and Rhodes Grass common for exotic species.
Planted Shrubland/Woodland	<ul style="list-style-type: none"> ▪ Community is variable in structure and in places consists of either established canopy only or a mixture of established canopy over lower stratum of establishing tree and shrub species. ▪ Common species include exotic, horticultural, locally indigenous and non-locally indigenous trees and shrubs such as <i>Schinus areira</i> Pepper Tree, Olive, Forest Red Gum, <i>Corymbia maculata</i> Spotted Gum, Tallowwood, Red Ironbark, Prickly-leaved Tea Tree, <i>Callistemon</i> spp, <i>Dodonaea viscosa</i> Sticky Hop-bush and <i>Grevillea</i> spp. ▪ Groundcover stratum is either absent due to mulching of garden beds or consists of mown exotic grass.

Table 2 cont' Summary description of plant community mapping units.

Plant Community	Summary Description
Wetland	<ul style="list-style-type: none"> ▪ Community consists of a narrow margin of fringing vegetation, mixture of native and exotic herbaceous plant species. ▪ Common species include <i>Carex</i> sp, <i>Juncus usitatus</i>, Broadleaf Cumbungi, Crofton Weed and Kikuyu. ▪ Exotic groundcovers and herbs such as Kikuyu and <i>Alternanthera philoxeroides</i> Alligator Weed can dominate around the margins.
Native Grassland	<ul style="list-style-type: none"> ▪ Abundance of exotic grasses such as Paspalum, <i>B. subaristata</i> and Pigeon Grass. ▪ Native grass species are common and include Red-leg Grass, Early Spring Grass <i>Eriochloa pseudoacrotricha</i>, Western Rat-tail Grass and <i>Microlaena stipoides</i> Weeping Grass.
Disturbed Shale Hills Woodland	<ul style="list-style-type: none"> ▪ Remnant and regrowth canopy dominated by Grey Box and Forest Red Gum with Narrow-leaved Ironbark and Red Ironbark occasional. ▪ Understorey is absent due to these areas being incorporated into the managed open space. ▪ Groundcover stratum is a mixture of herbaceous native and exotic plant species.
Disturbed River Flat Eucalypt Forest on Coastal Floodplains	<ul style="list-style-type: none"> ▪ Dominated by remnant and regrowth <i>Casuarina cunninghamiana</i> River Oak, Swamp Oak with Forest Red Gum occasional. ▪ Established understorey is also absent from this plant community, where it occurs the groundcover stratum is mainly exotic grasses. ▪ Mapping of the native vegetation of the Cumberland Plain by NPWS (2003) has identified the Alluvial Woodland sub unit of Sydney Coastal River Flat Forest Shale in some areas of Holroyd including Central Gardens, along the drainage line. This plant community type is now included into and replaced by River Flat Eucalypt Forest on Coastal Floodplains.

Table 2 cont' Summary description of plant community mapping units.

Plant Community	Summary Description
Shale Hills Woodland	<ul style="list-style-type: none"> ▪ Canopy is dominated by diagnostic canopy species described by Tozer (2003) for the community. ▪ Diagnostic understorey species described by Tozer (2003) for the community are either present or absent. ▪ Diagnostic groundcover species described by Tozer (2003) for the community are either present or absent. ▪ Most closely resembles the community description by Tozer (2003) and correlates to previous mapping by NPWS. ▪ Consideration of the NSW Scientific Committee Final Determination for Cumberland Plain Woodland particularly with regard to 'Cumberland Plain Woodland sites are characteristically of woodland structure, but may include both more open and more dense areas' and 'The understorey is generally grassy to herbaceous with patches of shrubs, or if disturbed, contains components of indigenous native species sufficient to re-establish the characteristic native understorey.' And 'includes regrowth which is likely to achieve a near natural structure or a is seral stage towards that structure'
River Flat Eucalypt Forest on Coastal Floodplains	<ul style="list-style-type: none"> ▪ Dominated by Swamp Oak and <i>Eucalyptus moluccana</i> Grey Box with Forest Red Gum, planted Eucalypt species and <i>Eucalyptus amplifolia</i> Cabbage Gum occasionally. ▪ The understorey is between 3 and 8m and consists of regenerating native tree and shrub species including <i>Eucalyptus</i> spp, <i>Melaleuca styphelioides</i> Prickly-leaved Tea Tree, <i>Melaleuca decora</i> and <i>Acacia floribunda</i> White Sally Wattle and non locally indigenous native and exotic species such as <i>Grevillea robusta</i> Silky Oak, <i>Acacia baileyana</i> Cootamundra Wattle, Broad-leaved Privet, <i>Senna pendula</i> var. <i>glabrata</i> and <i>Salix babylonica</i> Weeping Willow is uncommon. ▪ Groundcovers are a mix of native and exotic herbaceous species such as Red-leg Grass, <i>Einadia hastata</i> Berry Saltbush, <i>Atriplex semibaccata</i> Creeping Saltbush, <i>Bidens pilosa</i> Cobblers Pegs, Moth Vine <i>Araujia sericifera</i> Moth Vine and <i>Sida rhombifolia</i> Paddy's Lucerne. ▪ In disturbed areas the groundcover stratum is dominated by exotic grasses and herbs.

A formal fauna survey was not required as part of the scope of works. However, incidental fauna observations and fauna habitats were recorded as part of the survey effort.

4.3 Costing BMP Implementation

Costing of the implementation of the proposed management actions for this BMP are based on standard bush regeneration industry rates or landscaping rates where appropriate. A costing schedule was prepared that establishes a single unit measure of each task within a major work type. An example of the schedule is provided in Table 1 below.

Table 1 Summary description of plant community mapping units.

Works	Task	Units				Rates per unit			
		m ² /hr	m ³ /hr	m/hr	unit	\$/m ²	\$/m ³	\$/m	\$/unit
Noxious Weed Control	motorised spraying	XXX				0.00			
Maintenance Weeding - woody weeds	motorised spraying	XXX				0.00			
	hand spraying	XXX				0.00			
	hand weeding	XXX				0.00			
Maintenance Weeding - vine weeds	motorised spraying	XXX				0.00			
	hand spraying	XXX				0.00			
	hand weeding	XXX				0.00			
Maintenance Weeding - annual and grass weeds	motorised spraying	XXX				0.00			
	hand spraying	XXX				0.00			
	hand weeding	XXX				0.00			
Revegetation - supply and install	forestry tube				X				0.00
	hyco				X				0.00
	virocell				X				0.00
	tray cell				X				0.00
	bag and stake				X				0.00
Mulching - supply and install	Machine spread		X						0.00
	Hand spread		X						0.00

It is envisaged that the cost estimate schedules, combined with desktop mapping (as provided in the current survey) will provide baseline information for Council in bush regeneration and restoration project planning and can be easily updated or amended to allow for spatial and temporal variability within and between project sites. For example a cost estimate can be generated for an area of highly resilient bushland (as assessed in the current survey) that only requires occasional noxious weed control and regular maintenance weeding by applying unit rates to the individual tasks over the area subject to an estimate.

Clearly there will be limitations to this methodology given the variable condition of the vegetation and other physiographic elements of discrete areas within a reserve, and from one reserve to another. However individual unit costs have allowed for some level of vegetation, landscape and contractor heterogeneity and attempt to provide a median cost for each unit.

4.4 Mapping

Prior to conducting the field survey work, a series of base maps were generated from rectified aerial photography for recording of the vegetation community and resilience information in the field. The base maps were overlaid with clear transparency sheets, and the survey information was recorded directly onto these in the field. These transparency sheets were then scanned and imported into ArcView Geographical Information System software as .tif files.

The .tif files were then rectified using an ArcView geoprocessing wizard. Waypoints using a Global Positioning System were recorded in the field for easily distinguished landmarks such as gates and paths, and this information was used to ensure that the rectified images were spatially located correctly. This rectified image was then digitised to create the vegetation community polygons. Field survey data was used to verify and update both the spatial and attribute components of the data.

TEC uses ESRI ArcView 8.x software, and this program stores geographic data in Shape file format. All spatial datasets (shape files) will be provided to Council in Projection GDA 94 MGA Zone 56. All datasets will include ANZLIC compliant metadata statements. The database will store attribute data for each theme/dataset in its own table and can be linked to the GIS via a unique ID.

A series of maps have been produced for the BMP using the data layers supplied by Council in conjunction with the field survey data collected. These maps for each reserve, or group of reserves, are located within the relevant Reserve chapter of Volume 2 of the BMP.

4.5 BMP Consultation and Stakeholder Liaison

The consultation and stakeholder liaison process for the Citywide BMP has been completed in two stages. The initial consultation was conducted with Council staff regarding the aims and objectives of the project, the scope of the survey work and format of the Plan. The initial phase of the project also included the review of existing information, including review of reports in areas where community stakeholders have been actively engaged in bushland management activities.

A preliminary draft of the bushland management plan was provided to Council and a selection of community stakeholders for review. This initial review was conducted prior to the Draft Citywide Bushland Management Plan being placed on formal public exhibition by Council. In association with the release of the draft report for public exhibition, a public presentation was held at Council to provide background information to the aims and objectives of the report, the survey area and survey methodology for gathering the biodiversity information, and disseminating the preliminary findings and recommendations of the Plan.

Comments received following the public exhibition have been considered by Council and the Consultant, resulting in the incorporation of some issues raised into the Final BMP adopted by Council.

Section 6 provides further information regarding the formal exhibition and review process of the Citywide Bushland Management Plan.

5 BIODIVERSITY DATA

The Holroyd Local Government Area comprises approximately 39.5 km² and is situated on the eastern side of the Cumberland Plain (NPWS, 1997). The area is mostly undulating Wianamatta Shale and would have previously been covered by Cumberland Plain Woodland comprising Grey Box *Eucalyptus moluccana*, Narrow-leaved Ironbark, *Eucalyptus crebra*, and a grassy cover with patches of *Bursaria spinosa* scrub (Benson and Howell, 1990). Very little of the woodland vegetation has survived to this day as farming and grazing activities occurred from the early days of settlement, and the rate of clearing of the vegetation of Holroyd increased following the suburban expansion of Sydney since the end of World War II (Benson and Howell, 1990).

5.1 Soils

The Blacktown soil landscape is predominant across the Cumberland Plain, which comprises much of Holroyd. The Blacktown soil landscape is generally characterised by “gently undulating rises on Wianamatta Group shales and Hawkesbury shale” (Chapman and Murphy, 1989). Soils are shallow to moderately deep red and brown podsollic soils on crests, upper slopes and well drained areas, with deep yellow podsollic soils and soloths on lower slopes and in areas of poor drainage. Soil limitations include moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

The South Creek soil type is associated with floodplains, valley flats and drainage depressions on the Cumberland Plain, and is found along the Greystanes and Prospect Creek corridors within Holroyd. Soils are often deep layered sediments over bedrock or relict soils. Red and yellow podsollic soils are common on terraces with small areas of minimal krasnozems, leached clays and yellow solodic soils. Soil limitations include erosion hazard and frequent flooding (Chapman and Murphy, 1989).

Two smaller areas of Berkshire Park soils, associated with the South Creek soils, are found along two sections of Prospect Creek. One area occurs in the Gipps Road sporting complex area, with the other area occurring from the Cumberland Highway in a south east direction to the boundary of the Holroyd local government area. Soils in these areas are described as being weakly pedal orange heavy clays and clayey sands, where ironstone nodules are common. Soils include Solods and yellow podsollic soils where drainage conditions are poor, red podsollic and chocolate soils on flats and in small drainage lines, and unstructured plastic clays and krasnozems in drainage lines or on crests. Soil limitations include high wind erosion hazard if cleared, gully, sheet and rill erosion on dissected areas. Soils are also prone to waterlogging, have impermeable subsoils, and have low fertility.

Prospect Hill was formerly a prominent feature formed from an igneous dolerite intrusion. The associated richer volcanic soils in this area would have supported different plant species to the surrounding Cumberland Plain, however this area has been extensively disturbed by human activity, including complete disturbance, removal or burying of original soil layers (Benson and Howell, 1990).

5.2 Topography

The topography of the greater Cumberland Plain is gently undulating ground, which rises from just above sea level in the east and north to its highest altitude of around 350 metres in the south. The altitude within the Holroyd local government area ranges from approximately 15 metres in the east to approximately 70 metres above sea level in the west. Slopes rise steeply beyond the Prospect Canal Reserve Cycleway to the 120m contour on Prospect Hill to the west and northwest and gentle slopes continue in a southerly direction toward Prospect Creek.

Many of the parks and reserves within Holroyd are relatively flat, with some localised elevations.

5.3 Drainage

The southern portion of the Holroyd local government area is within the Prospect Creek catchment, a sub-catchment of the Georges River catchment. Prospect Creek originates from Prospect Reservoir, and drains the surrounding floodplain south-east to the Georges River (Mandis Roberts, 2004), and captures runoff from an extensive area of Holroyd’s local government area. Within the Prospect Creek corridor there are two wetland areas, one to the north-east of the Gipps Rd Sporting Complex, and the second between Vineyard Ave and Coopers Crescent, Prospect Creek East.

Greystanes Creek is a major tributary of Toongabbie Creek, which flows into the Upper Parramatta River. The Greystanes Creek catchment covers an area of 979 hectares (Bernhard, 1998). The creek flows in a northerly direction, and the main low flow consists of diverted stormwater from the Boral Blue Metal Quarry to the south-west of the site. Stormwater pollution and urban runoff concentrate in the area as Greystanes Creek Reserve is low lying compared to the rest of the catchment (Bernhard, 1998).

Other drainage catchments within the northern portion of Holroyd flow in a north-easterly direction towards the Upper Parramatta River including the catchments of Pendle Hill Creek, Coopers Creek,

Finlaysons Creek, Westmead Creek, Domain Creek, Clay Cliff Creek, A'Becketts Creek and Duck River.

Central Gardens Reserve falls within the Finlaysons Creek Catchment region, and the centre of this Reserve contains an open water body.

5.4 Flora and Fauna

Holroyd local government area contains a large diversity of flora and fauna, and in particular contains many threatened flora and fauna species, populations and endangered ecological communities, as listed under the *Threatened Species Conservation Act 1995*. Threatened flora species contained within Holroyd include *Acacia pubescens* (Downy Wattle), *Pimelia spicata* (Spiked-Rice flower), and *Pultenaea pedunculata* (Matted Bush-pea) which was recently located within Lower Prospect Canal Reserve. Endangered populations include *Marsdenia viridiflora R. Br subsp. viridiflora*, and endangered ecological communities include Cumberland Plain Woodland. The Cumberland Plain Woodland can be broken in discrete communities, and is also listed under the Federal *Environmental Planning and Biodiversity Conservation Act 2000*. Communities included as part of Cumberland Plain Woodland include Shale Hills Woodland, Shale Plains Woodland, Alluvial Woodland and Sydney Turpentine Ironbark Forest.

There are seven threatened fauna species, as listed under the TSC Act 1995, contained within the Holroyd LGA. These include *Meridolum corneovirens* (Cumberland Plain Land Snail), Swift Parrot, Green and Golden Bell frog, Grey Headed Flying Fox, Eastern Freetail Bat, Greater Broad-nosed Bat, and the Eastern False Pipistrelle (DEC Wildlife Atlas 2006).

Within the Holroyd LGA flora and fauna corridors have been identified. There are three main areas where corridors already exist, and these can be developed and extended in order to link further areas within the region (NPWS, 1997). Existing flora and fauna corridors in the current survey include:

- Greystanes Creek corridor;
- Lower Prospect Canal Corridor;
- Prospect Creek Corridor; and
- Greystanes Woodlands.

Previous management actions undertaken to enhance biodiversity of existing bushland reserves within Holroyd has been substantial in some reserves. Of the reserves included in this Bushland Management Plan, bush regeneration activities have occurred in Greystanes Creek Corridor, Alpha Park Reserve, Central Gardens, Gum Tree Reserve, Gardenia Parade Reserve, Prospect Creek and Lower Prospect Canal. These works have been carried out by a mix of Council staff, Contractors and volunteers under the guidance of Holroyd City Council. It is an aim of this Bushland Management Plan to further enhance the condition of existing remnant vegetation within Holroyd, and consolidate the major vegetation corridors, and bushland within surrounding Reserves.

6 CITYWIDE BUSHLAND MANAGEMENT PLAN REVIEW PROCESS

6.1 Public Exhibition

Holroyd Council requested that formal comment be sought from the community and stakeholders on the draft Citywide Bushland Management Plan. In line with section 38 of the *Local Government Act 1993*:

- 1) A council must give public notice of a draft plan of management.
- 2) The period of public exhibition of the draft plan must be not less than 28 days.
- 3) The public notice must also specify a period of not less than 42 days after the date on which the draft plan is placed on public exhibition during which submissions may be made to the council.
- 4) The council must, in accordance with its notice, publicly exhibit the draft plan together with any other matter which it considers appropriate or necessary to better enable the draft plan and its implications to be understood.

In addition to the above Council also provided the opportunity to inform the community and invite comment on the Citywide Bushland Management Plan through a public information presentation.

6.1.1 Public Presentation

A public presentation outlining the scope, aims, objectives, survey methods and highlighting some of the key recommendations of the Citywide Bushland Management Plan was carried out as part of the consultation process. A cross section of reserves were summarised in the presentation to provide community, Council staff and Councillors with an overview of the approach taken. Question time following the presentation provided the attendees with opportunity to ask questions and raise issues relating to the Citywide Bushland Management Plan. Technical responses relating specifically to the Citywide Bushland Management Plan were provided by Total Earth Care project staff whilst the responses to Councils wider ranging biodiversity conservation and environmental management strategies and planning were provided by a combination of Council staff and the Mayor Cllr Dr John H Brodie. Table 3 below summarises the most relevant issues raised during the public presentation of the Citywide BMP.

Table 3 Summary of issues from the public presentation of the Citywide BMP.

Issue/Question	Respondent	Response/Comment
What is being done with respect to the management of fauna and fauna habitat?	Total Earth Care	TEC indicated that the BMP contained information on incidental fauna observations during the survey work as part of the BMP, there is recognition of the corridor values of some reserves and broad fauna habitat values for each targeted reserve are identified in the BMP.
	Council Maree Costigan	Council has been successful in receiving a Grant for the survey of small birds, fauna and reptiles in the Hyland Road area.

Table 3 cont' Summary of issues from the public presentation of the Citywide BMP.

Issue/Question	Respondent	Response/Comment
What recommendations if any were made for the management of the former Arboreteum that was located in the Hyland Rd North site	Total Earth Care	The BMP recommends that the Arboreteum site is revegetated using species that are representative of the communities found on the Cumberland Plain. The revegetation should be staged, and the initial work should focus on the Munro Creek area as this section of Hyland Rd contains remnant native vegetation and is a potential vegetation link between Lower Prospect Canal Reserve and Prospect Creek.
	Council Maree Costigan	Council stated that a section of the site is managed as a 'stop-mow' area, and is significant for its representation of native grasses.
A comment was made on the importance of coordinated management of the bushland areas located at the boundaries of the LGA, e.g. Greystanes Creek area adjoining Blacktown and Prospect Creek adjoining Fairfield.	Total Earth Care	The BMP recognises the importance of the Greystanes Creek and Prospect Creek corridors as they are currently some of the larger areas of remnant and reconstructed bushland within the LGA and are providing vital fauna habitat and fauna corridors within the local region. The BMP states that a coordinated approach with Holroyd's neighbouring Councils is essential in the management of these areas. Holroyd is currently conducting bush regeneration activities in conjunction with adjoining LGA's.
	Council Maree Costigan	Council also intends to apply for joint grant funding with Fairfield and Blacktown in these areas, and the BMP is a vehicle that can benefit the success of these applications.
	Council Mayor Brodie	Mayor Brodie stated that he is regularly in contact with adjoining Council elected members and the value and importance of cross border projects were often discussed.

Table 3 cont' Summary of issues from the public presentation of the Citywide BMP.

Issue/Question	Respondent	Response/Comment
With regard to the proposed 'stop-mow' Reserves, is Council committed to the on-going funding of the maintenance of these areas once the mowers are removed?	Total Earth Care	The BMP addresses certain areas as potential 'stop-mow' Reserves based on the observed resilience of the sites. The recommended 'stop-mow' areas are only in those sites currently displaying high resilience, and are likely to regenerate well and require less amounts of maintenance compared to other sites. However, no matter how resilient the site, maintenance will be required and this is a crucial component of the change in management at the sites. Gum Tree Reserve was highlighted as an example of successful 'stop-mow' management.
	Council Mayor Brodie	Mayor Brodie stated his understanding of the issue of maintenance with respect to any proposed 'stop-mow' sites, and indicated that the issue of on-going maintenance would be part of any decision to remove mowers from sites.
What factors are currently affecting vegetation communities such as the Shale Plains Woodland?	Total Earth Care	The main threats to remnant bushland are set out in the BMP. The main threats within Holroyd include noxious and environmental weeds, altered fire regimes, stormwater impacts, soil disturbance, mowing, vandalism and illegal clearing.

6.1.2 Written Submissions

Table 4 following provides a summary of relevant issues raised in the written submissions received by Council from the Draft Citywide BMP public exhibition.

Table 4 Summary of written submissions to Council during Draft Citywide BMP public exhibition.

Respondent	Summary of Submission
Steve Norton Holroyd Resident	<p>In addition to the local, regional and national conservation significance of native plant species and native plant communities of Holroyd reserves, the relatively limited amount of bushland in Holroyd LGA provides an increased level of importance for its retention and conservation as bushland. Whilst the retention and conservation of bushland should not limit the recreational, scientific research and educational functions of the reserves for the community, these functions should not be further developed in areas of bushland in such a way as to threaten the integrity and operation of the ecological values and conservation significance of the native plants and plant communities from impacts such as clearing.</p> <p>At a broad scale, clearing of native vegetation for infrastructure projects and facilities continues to threaten bushland in the LGA. At a more local, or reserve specific scale, pressures on urban bushland in Holroyd LGA include encroachment into reserves, fill dumping, wood collection and tree removals for view improvement or as acts of vandalism.</p> <p>Adequate funding is critical for success in the implementation of the Citywide Bushland Management Plan and this includes continuing support for the Bushcare programme. A rate levy is proposed as a source of additional funding for bushland maintenance and a Central Bushcare Committee is also suggested. The function of a central Bushcare Committee is summarised and this includes responsibility for raising participation, collaborating with Council staff in implementing the Citywide Bushland Management Plan and liaison with other community groups and stakeholders.</p>

6.2 Ongoing Review

The Citywide BMP will function as a site specific plan to guide the management of bushland within Holroyd for the next five years. Actions from this Plan may also be incorporated into the Holroyd Council Strategic Plan, and as such will be subject to the same review and monitoring process as set out within that Plan. As a minimum, the Citywide BMP should be reviewed every five years. Councils Operational Plan may incorporate specific management actions for a Reserve or group of reserves, and these will be subject to an annual review process conducted by Council.

Ongoing review of the Citywide BMP should also occur as changes in legislative requirements, planning controls or Federal, State and HCC policy occurs. Review of this document should also occur as management actions are implemented, and as the natural character of the land changes.

7 CITYWIDE BUSHLAND MANAGEMENT PLAN IMPLEMENTATION

7.1 Management Plan Integration

As noted in earlier sections of this volume, opportunity exists for integration of this Citywide BMP into other Council management plans and operational plans and reporting. Integration of the Citywide BMP into existing and updated management and operational plans and annual reporting provides multiple pathways for the administration and implementation of the actions recommended here for biodiversity management and conservation within the HCCLGA. The development of targets and performance measures is key to the integration of the Citywide BMP with other Council management plans and strategies and this could range from linkages to local environmental plans (Fallding *et al*, 2000) to LGA wide planning documents such as *Living Holroyd: A Sustainable Future* (HCC, 2003).

7.2 Measuring Performance

The extent which plans are successfully implemented requires an integrated monitoring and reporting system in which suitable targets for the main purposes of detecting non-compliance with regulatory requirements, facilitating corporate performance reporting and to provide data for the analysis of environmental change over time (Fallding *et al*, 2000). Whilst there is no general agreement on the most suitable indicators for biodiversity conservation Fallding *et al* (2000) state that biodiversity management plan targets and indicators can be used for planning, reporting or management issues influencing biodiversity. Further, biodiversity management plan targets and indicators should;

- be practical;
- relate to the appropriate geographical scale for the issue being considered; and
- link to the corporate performance reporting processes and in particular, SoE reporting.

Criteria recommended by Fallding *et al* (2000) for the development of biodiversity indicators to measure biodiversity management plans include but are not limited to the following;

- minimising the number of indicators;
- making the indicator definable and measurable;
- ensuring the data required to produce the indicator is easy to collect;
- the indicator must be capable of showing trends over time;
- the indicator should be readily understandable by the community;
- the methodology for deriving the indicator should be reproducible (eg regular monitoring at the same sites, using the same techniques);
- the indicator must give results that are not prone to misinterpretation;
- the indicator should be compatible with GIS systems;

This Citywide BMP has considered the broad guidelines above and has developed performance indicators that are specifically related to the actions (main vegetation management measures) recommended for each reserve or management group of reserves. Targets have also been formulated that provide a benchmark to which performance indicators can be measured (Volume 2). Complimentary to the actions, targets and performance measures recommended for each reserve or management group of reserves the overall performance measure for the implementation of this Citywide BMP is provided for the following Table 5. Table 5 incorporates all the main generic actions, targets and performance measures from the reserves and provides is suitable for incorporation into SoE reporting.

Table 5 Actions, targets and performance indicators for the implementation of the Citywide BMP.

Action	Target	Performance Indicators
Noxious weed control	Noxious weeds are managed according to the control category specified in the <i>Noxious Weeds Act 1993</i> and species specific regional management plans.	The distribution and percentage cover of noxious weeds is reduced over the LGA. Occurrences of previously unrecorded noxious species for the LGA are prevented from establishing.
Vine weed targeting	Vine weeds are prevented from establishing in the canopy of native plant communities.	Canopy of native plant communities to be free of vine weed on four monitored occasions per year (quarterly). No loss of native canopy cover due to vine weed infestation.
	Strategic management of vine weed along the creek lines with common boundaries to adjacent LGA's.	Timing coordination and funding collaboration with adjacent LGA's in vine weed targeting.
Bush regeneration	Management and conservation of the endangered ecological communities and other native plant communities of the reserve.	Increased area of native plant communities under bush regeneration contract. Increased native plant species richness in areas under bush regeneration contract as determined by ongoing flora survey and monitoring.
Revegetation	Expansion of native plant communities to form wider regional vegetation corridors.	Increased native plant species cover and species richness in stands of native plant communities within the LGA. Increased native plant species cover and species richness between stands of native plant communities within the LGA.
Threatened flora species management	Management and conservation of the threatened species known from the LGA.	No loss of or damage to populations of threatened plant species of the LGA. Implementation of DECC recovery strategies, actions and plans for the known populations of threatened plant species of the LGA. Regular monitoring of the populations of the threatened plant species of the LGA including census.
Removal of mowers	Regeneration of endangered ecological communities and other native plant communities in the LGA.	Staged spatial and temporal removal of mowing practices in areas of proposed reserves identified as retaining resilience.

Table 5 cont' Actions, targets and performance indicators for the implementation of the Citywide BMP.

Fire	Preparation of Bushfire Management Plans for LGA reserves.	Integration of Bushfire Management Plans with this Citywide BMP. Adoption and implementation of Bushfire Management Plans.
	Fire hazard reduction and ecological burns are carried out in native plant communities according to the <i>Rural Fires Act 1997</i> , RFS guidelines and standards and Bushfire Management Plans for the reserves.	Approvals gained from consent authorities. Broad burns or pile burns carried out.
Stormwater Management	Management and conservation of the endangered ecological communities and other native plant communities of the LGA without compromising flood mitigation.	Installation of stormwater management devices and flood mitigation works that integrate engineering and ecological restoration works.
Recreation	Provision of recreational opportunities that does not compromise the management and conservation of the endangered ecological communities and other native plant communities of the LGA.	No loss of native plant cover from the construction of recreational facilities or infrastructure.
Bushcare	Participation of the community in natural resource management and biodiversity conservation.	Increased participation of in established Bushcare Volunteer Groups. Re-establishment and support of inactive Bushcare Volunteer Groups. Establishment and support of new Bushcare Volunteer Groups. Provision of opportunities for one off or event based participation by the wider community.
	Establishment of a Central Bushcare Steering Committee chartered with the responsibility for raising participation, collaborating with Council staff in implementing the Citywide Bushland Management Plan and liaison with other community groups and stakeholders.	Investigation of the feasibility of establishing a Central Bushcare Steering Committee through public consultation and expression of interest.

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