ASSESSMENT | PLANNING | MANAGEMENT

Ponds Subiaco Creek Waterways Maintenance and Rehabilitation Masterplan 2009-2020

Vision: A healthy, safe and attractive place where people can interact with, learn about and respect, a biologically diverse natural environment.

(Project No. 068-002)

Report prepared for:
Parramatta City Council

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Executive Summary

The Ponds Subiaco catchment lies within Parramatta local government area. It includes the suburbs of Dundas, Rydalmere, Ermington, Telopea, Dundas Valley and Carlingford. Ponds Creek and Subiaco Creek drain into the Parramatta River to the south.

The district of Ponds Creek was settled by Europeans in 1791 and named because of the chain of ponds along the northern reaches of the waterways that drained the valleys. Farming and subsequent urban development have significantly altered the ecology and geomorphology of the area from its pre-European state. Patches of remnant bushland survive along the creek banks, particularly in the upper reaches of Ponds Creek.

This Masterplan identifies and prioritises actions to rehabilitate the ecology and geomorphology of the riparian corridor, while maintaining its heritage values and improving its recreational facilities.

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VOLUME ONE – MASTERPLAN REPORT

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1. Introduction

1.1 Strategic context

The objective of this Master Plan is to create a clear direction for future management, ongoing protection and rehabilitation works within the Ponds Subiaco Creek catchment. This Master Plan is consistent with the following suite of Council plans and strategies:

- Destination 1 in Parramatta's Strategic Plan Twenty 25 "Land and water that is protected, respected and sustained"
- Strategy LW1 in Parramatta's Strategic Plan Twenty 25 "Protect and rehabilitate high priority waterways and manage major impacts on medium and low priority waterways"
- Priority No 5 of the 2002 Parramatta City Council *'Rivers of Opportunity'* report. This report identifies the development of maintenance and rehabilitation Master Plans for high priority waterways, one of which is Ponds Subiaco Creek
- Council's Environmental Improvement Program (2005-2009) "Healthy Waterways Outcome"
- The 10 Key Biodiversity Outcomes outlined in the 2003 Parramatta Biodiversity Plan, and
- Catchment Target W1 – Waterway and Riparian Corridor Health, within the Sydney Metro Catchment Management Authority's Catchment Action Plan (CAP)

In order to meet the community expectations and achieve the suite of strategic outcomes, Council is taking an integrated or total catchment management approach to managing our waterways. This Master plan seeks to coordinate natural resource management across the whole catchment on the basis for sustainable planning and management of land, water, vegetation and community so as to balance resource utilisation and conservation.

1.2 Maintenance and Rehabilitation Masterplans

Council requires Maintenance and Rehabilitation Masterplans for waterways within its jurisdiction. The Masterplans will identify:

- What the waterways were once like
- Their current status
- A vision for the specific waterway corridor
- Future opportunities and current constraints in improving them
- Detailed recommendations of works required (actions)

Actions that are recommended in the Masterplans include estimated budgets, areas of responsibility, priority and type of action. Types of action may include:

- Capital works
- Education
- Research
- Strategic Management

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- Maintenance

The Action Plan is not fixed and changes each year as new information is collected and more detailed investigations are undertaken. Actions will then be implemented either through Council's ongoing services or through targeted projects.

1.3 Legislative policy framework

Council's Waterways Maintenance and Rehabilitation Masterplans are prepared and implemented within a broad legislative and policy framework. A summary of relevant Commonwealth, State and Local Government legislation, policy documentation and environmental planning instruments as they apply in the waterway and riparian corridor management context, is provided in Appendix A.

1.4 Best practice framework

In the *River Restoration Framework*, Koehn et al. (2001) state that river restoration should focus on:

- Restoration of ecosystem function
- Being pro-active and positive
- Ensuring sustainability of the resource
- Committing the community ownership of problems and participation in management
- Ensuring performance-based accountable management and practices
- Being holistic, encompassing the entire ecosystem
- Using an integrated coordinated approach to maximise efficiency
- Sharing responsibilities between the community, local, state and federal governments
- A dynamic and adaptable approach

Rutherford et al. (2000) describe the target of stream rehabilitation as the 'return, as far as is possible, the vegetation, structure, hydrology, and water quality of the original streams. The assumption is that by providing these physical elements, the original suite of organisms that occupied the stream will also return.' The improvements should be ecologically self-sustaining.

The characteristics of streams in good geomorphic and ecological condition are indicated in Table 1. As well as good geomorphic conditions, appropriate water quantity and quality are important for a diverse biological community.

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Table 1 Characteristics of a 'good' stream

	Geomorphic condition	Ecological condition
Equilibrium	Rate of channel change is acceptable (ie. the stream is no longer eroding and depositing at an 'unusual' rate)	The community structure is fairly stable, taking into account natural seasonal changes. Species diversity is a good measure of this
Complexity	Presence of appropriate geomorphic complexity, providing sufficient habitat diversity to support the biological community	Species diversity should be similar to natural levels for the stream in question. This should include those species which are sensitive to degradation
Relationship with floodplain	A natural flooding regime is important for nutrient cycling, and for access to habitats such as billabongs and the inundated floodplain itself	Presence of riparian vegetation to nutrient inputs to the stream and habitat for aerial stages of stream insects. Access to floodplain habitat (billabongs and inundated vegetation) which can be important for life cycles of fish

Source: Rutherford et al. (2000)

1.5 Principles

Guiding principles that have consistently been adopted in Parramatta's Waterway Maintenance and Rehabilitation Masterplans are as follows (after Kapitzke 1999):

- Sustainability – provide for long term ecological functions, benefits and uses of stream
- Multiple objectives – adopt multiple objectives recognising natural stream function and human use
- Catchment context – plan maintenance and rehabilitation within reach and catchment contexts, recognising different influences and process that occur
- Multidisciplinary approach – integrate hydrological, geomorphological, ecological, access and recreational considerations in any planning and design stages
- Stakeholder consultation – involve stakeholders in identifying problems, setting objectives and determining appropriate rehabilitation activities

These principles have been adopted in the preparation of this Masterplan. They are reflected in the vision and objectives for the corridor, which are described in Section 3.

1.6 Project need

The riparian corridor within the Ponds Subiaco catchment is valued for its recreational and environmental qualities. Unfortunately much of the corridor has become degraded, primarily by land clearing and urbanisation resulting in increased weeds and erosion. A Masterplan is needed to provide the planning framework to

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rehabilitate the corridor. Council requires the Masterplan to preserve the ecological integrity of the waterway while recognising and managing the constraints provided by urbanisation at an acceptable level.

1.7 Preparation of the Masterplan

Preparation of the Masterplan is the initial step in the process of stream and riparian corridor rehabilitation. It will be followed by design, on-ground implementation, monitoring and adaptive management. It describes past and current environmental conditions, and identifies and prioritises actions.

Steps in the process of preparing the Masterplan are outlined below:

- Data and literature review
- Mapping
- Field investigation
- Consultation with the community and Council
- Define the vision and objectives
- Identify and prioritise actions

The Masterplan has been prepared by Eco Logical Australia and comprises three parts:

- Volume 1 – main report (this volume) and feature maps
- Volume 2 – detailed reach maps with issues and actions
- Volume 3 – technical reports

Specialist investigations that are reported in Volume 3 were undertaken by:

- Riparian Engineering – geomorphology
- Paul Davies – European heritage
- Kelleher Nightingale – Aboriginal heritage

Table 2 indicates dates when field studies were conducted. In most cases, field investigation involved walking the length of the corridor and observing/recording features. Sampling was done for aquatic ecology.

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Table 2 Field investigation

Group	Purpose	Date
Eco Logical Australia & Riparian Engineering	Initial site inspection	13 December 2007
Eco Logical Australia	Terrestrial ecology	21 & 22 February 2008
Eco Logical Australia	Aquatic ecology	17 March 2008
Riparian Engineering	Geomorphic assessment	February & March 2008
Paul Davies	European heritage	March 2008
Kelleher Nightingale, Darug Tribal Aboriginal Corporation, Darug Custodian Aboriginal Corporation & Darug Aboriginal Cultural Heritage Assessments	Aboriginal heritage	5 March 2008
Kelleher Nightingale & Metro Local Aboriginal Land Council	Aboriginal heritage	11 March 2008

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2. Description of the corridor

This section outlines current conditions within the study area. Past conditions and activities are described where these may be relevant to future management actions. This section and the technical reports in Volume 3 are not intended to provide a comprehensive history or environmental assessment of the area.

All maps referred to are positioned at the end of this section.

2.1 Study area

The Ponds Subiaco catchment lies within Parramatta local government area (LGA) and includes the suburbs of Dundas, Rydalmere, Ermington, Telopea, Dundas Valley and Carlingford. It has an area of 839 ha, comprising 472 ha of the Ponds Creek catchment and 367 ha of the Subiaco Creek catchment.

The catchment is bounded by Pennant Hills Road to the north, Marsden Road to the east, the main northern railway line to the west and Parramatta River to the south. The catchment directly adjoins the Baulkham Hills and Ryde LGAs.

The study area is illustrated in Figure 1 and comprises the Ponds and Subiaco Creeks riparian corridor. The corridor is well defined by topography and land use for most of its length. For ease of reference throughout the Masterplan, the corridor has been divided into 29 reach segments based on geographic features, as shown in Figure 1.

2.2 Land use zones

2.2.1 Residential Development Strategy

The Draft Residential Development Strategy (RDS) was adopted by Council on 30 November 2006 and contains the vision for future residential development in the Parramatta LGA. The strategies outlined in the Draft RDS, together with the comments from public authorities, inform the preparation of the draft local environmental plan (LEP) and the draft development control plan. Section 2.2.2 outlines features of the draft LEP.

The draft RDS recommends increased residential densities in some areas. Where these areas fall within the Ponds Subiaco catchment they are shown in Figure 2 as medium or high density residential zones under the Draft LEP. They are referred to in the Draft RDS as the Telopea, Dundas and Carlingford Focus Housing Areas and are located on the western boundary of the catchment.

New development within the catchment will be required to adopt water sensitive urban design principles. However, additional development is likely to place further pressure on the natural environment through increased areas of impervious surface and associated hydrologic/hydraulic changes, reduced vegetation cover and potential loss of habitat, and more sources of litter and pollution. Connectivity with existing, aging infrastructure (e.g. stormwater and sewerage) will also present a challenge.

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2.2.2 Local Environmental Plan

Land use is controlled by planning instruments such as the local environmental plan. The Draft Parramatta Local Environmental Plan 2008 (PLEP 2008) was adopted by Council on 30 May 2007. Council is currently refining the PLEP 2008 prior to seeking approval from the State government.

Land use zones within the Ponds Subiaco catchment are indicated in Figure 2. Areas immediately adjacent to the waterways are typically zoned for Environmental Conservation (E2) or Public Recreation (RE1). Major reserves within the study area include:

- Acacia Park (Dundas Valley)
- Barayly Park (Dundas Valley)
- Cowells Lane Reserve (Ermington)
- Coxs Park (Carlingford)
- Curtis Oval (Dundas Valley)
- Dundas Park (Dundas Valley)
- Eccles Park (Ermington)
- Eric Mobbs Reserve
- Fitzgerald Forest
- Galaringi Reserve (Dundas Valley)
- Jim Crowgey Reserve (Dundas)
- Kilpack Park (Dundas Valley)
- Lockyer Reserve (Ermington)
- Ponds Creek Reserve (Dundas and Dundas Valley)
- Rapanea Community Forest (Telopea)
- Sir Thomas Mitchell Reserve (Dundas Valley)
- Sturt Street Reserve (Telopea)
- Subiaco Creek Reserve (Rydalmere)
- Thomas Wemyes Memorial Reserve (Ermington)
- Upjohn Park (Dundas)
- Williams Reserve (Dundas)

The majority of the catchment is zoned Low Density Residential (R2), with pockets of Medium or High Density Residential (R3 or R4). Industrial areas are concentrated in the lower catchment.

2.3 Topography

A digital elevation model in Figure 3 illustrates how elevation within the catchment is highest in the upper reaches of the Ponds Creek catchment, peaking at about 133 m above sea level. The highest parts in the northern portion of the sub-catchment are associated with a main ridgeline that forms the eastern boundary of the sub-catchment and is defined by the axis of Marsden Road. The banks within the riparian corridor are generally steep and eroded. The terrain is less steep below the confluence of Ponds and Subiaco Creeks, and drains south to the Parramatta River.

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2.4 Flooding

Flood modelling by Council defines the 20 and 100 year flood extent within the catchment. As shown in Figure 4, the steep banks along the riparian corridor mean that the extent of flooding during the 20 and 100 year events are very similar. However, there are some discrepancies between the 20 and 100 year models, and the upper reaches are incomplete.

The major flows in Subiaco Creek originate in Ponds Creek. SKM's (1990) flood study found that flows through Ponds and Subiaco Creeks are impeded by heavy vegetative growth in the riparian zone. In the downstream areas near the junction with Parramatta River, flood levels are dominated by the water level in the Parramatta River.

SKM's (2006) Subiaco Creek Sub-catchment Management Plan recommended measures to prevent properties at four locations from being affected by unsafe overland flooding in the 1% Annual Exceedance Probability Event.

2.5 Stormwater network

Figure 5 depicts the known stormwater pipe network throughout the Ponds Subiaco catchment, which was constructed by the state government primarily in the 1950s and is now managed by Council. There are more than 100 locations where stormwater discharges into Ponds and Subiaco Creeks. Floating litter booms have been installed:

- Adjacent to 48 Kirby Street, Rydalmere, downstream of the road bridge (Subiaco Creek)
- Upstream of the road bridge at Sturt Street, Telopea (Ponds Creek)
- Downstream of the road bridge at Park Road, Rydalmere (Subiaco Creek)

Volumes of litter collected at these locations between November 2007 and January 2008 are:

- 750 L at Kirby Street
- 937.5 L at Holland Place
- 1,350 L at Park Road

Council has rescheduled litter collection to occur following rainfall events, rather than monthly.

2.6 Soils

The study area occurs at the interface of two underlying geologies: Hawkesbury sandstone and the Wianamatta Group shale. The geologically younger Wianammatta Groups shales overly the Hawkesbury sandstone, and occurs along the higher rolling terrain within the Ponds Subiaco sub-catchment. The Hawkesbury sandstone is more likely to have been exposed along the deeper creekline corridors within the sub-catchment. This means that the only location that outcrops of sandstone are likely to occur is along the creek bed or creek margins.

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There are four soil landscapes within the Ponds Subiaco study area, as shown in Figure 6. The Department of Natural Resources has adopted the Australian Soil Classification, which has been endorsed and recommended by the Australian Soil Conservation Council, the Australian Collaborative Land Evaluation Program and the National Landcare Program as the official Australian soil classification (http://www.dnr.nsw.gov.au/care/soil/ssu/termsdef.htm). Classes relevant to Ponds Subiaco are:

- **Residual Soil Landscapes** are dominated by sites where deep soils have formed from *in situ* weathering of parent materials. Residual soil landscapes typically have level to undulating elevated landforms. Landform elements include some summit surfaces, plateaux, terrace plains, peneplains and old ground surfaces. Stream channels are usually poorly defined.
- **Colluvial Soil Landscapes** are affected by mass movement. Soil parent material consists mostly of colluvial mass movement debris including scree and talus along with other landslide, mudflow and creep deposits. Colluvial soil landscapes usually include alcoves, cliffs, cliff-footslopes, scarps, landslides, talus, some moderately inclined to precipitous hillslopes and areas with commonplace evidence of mass movement. Slope wash processes are considered less dominant.
- **Disturbed Soil Landscapes** are dominated by ground surfaces arising from human activity. Soil parent materials have been moved, accumulated, removed or replaced (with soil or other items). Landform elements include fill-tops, embankments, cut faces, cut-over surfaces, dams, mounds and pits.
- **Erosional Soil Landscapes** have been sculpted primarily by erosive action of running water. Streams are well-defined and competent to transport their sediment load. Soil depth is usually shallow (with occasional deep patches) and mode of origin is variable and complex. Soils may be either absent, derived from water-washed parent materials or derived from *in situ* weathered bedrock. In many instances, subsoils have formed *in situ* while topsoils have formed from materials washed from further up-slope. Erosional soil landscapes usually consist of steep to undulating hillslopes and may include tors, benches and areas of rock outcrop. Evidence of mass movement is rare.

The soil landscapes on the high points along the main ridgeline on the eastern and northwestern subcatchment boundaries are colluvial, whilst the soil landscapes across the higher rolling terrain and the Ponds Subiaco corridor is largely erosional. The predominant erosional soil landscape within the Ponds Subiaco corridor is the Gymea soil landscape (Bannerman and Hazelton 1990: 56), and is associated with Hawkesbury sandstone geology. The Gymea soil landscape is susceptible to erosion, especially following the removal of stabilising vegetative cover, especially those areas that have been cleared and poorly maintained (Bannerman and Hazelton 1990: 57). Residual soil landscapes occur within the lower southern and southwestern portion of the sub-catchment.

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2.7 Geomorphology

2.7.1 Stream classification

Segments of Ponds and Subiaco Creeks have been assessed and classified according to their geomorphological characteristics. (Refer to the Geomorphic Study in Volume 3 of the Masterplan for a detailed description). Features that were incorporated in the classification include:

- Geomorphic extent – the geomorphic processes zone was defined as the area affected by sedimentary transport processes and floods
- RiverStyle classifications as developed by Brierley & Fryirs (2002) – the RiverStyle assessment characterises streams based on catchment topography, geology and recognised stream geomorphic processes that are commonly observed in coastal stream in NSW
- Geomorphic stability – geomorphic stability was assessed by reference to creek and bed condition, vertical stability/degradation/aggradation, channel pattern, lateral stability, river profile and bed features, channel dimensions, stream channel scour/deposition potential, stream channel stability, and stream type evolution

The results of the classification are presented in Figure 7. This map should be interpreted with the Geomorphic Assessment report in Volume 3 and data in Appendix B, which tabulates the geomorphic qualities of each segment of the riparian corridor.

2.7.2 Strategic locations

Strategic points in the stream that are experiencing active geomorphic instability were identified. These include sites of:

- Geomorphic degradation – bed level adjustment, major bank erosion (Figure 8)
- Civil structure failure – weir failure, bed scour downstream of culverts, exposed sewer pipes and eroding stormwater pipes (Figure 9)

2.8 Water quality

There is no water quality data available for Ponds Creek or Subiaco Creek. Data is available for the Parramatta River at Silverwater Bridge, HMAS Parramatta and Marsden Street weir. However, water quality at these locations is influenced by a wider catchment and is not likely to be indicative of the Ponds Subiaco system.

2.9 Aquatic biota

2.9.1 Current condition

Aquatic invertebrates were surveyed in Ponds and Subiaco Creeks on 17th March 2008 by ELA ecologists. At the time of survey it was sunny with a light WNW breeze and the air temperature was approximately 23 °C.

Five sites (Figure 10) were assessed throughout the creek system in areas of suitable habitat (e.g. vegetated creek banks, rubbley creek bed, flowing water). The sites were

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selected because they appeared to provide the best aquatic habitat within the study area (e.g. pools, riffles, logs), as observed during inspection of terrestrial conditions. Macroinvertebrates were collected along 20 m stretches of creekline using a dip net. Animals were sorted and preserved in the field and brought back to the laboratory for identification.

All animals were identified to family level where possible. Many macroinvertebrates are very difficult to identify (e.g. oligochaetes or segmented worms), and these organisms were identified at the higher taxonomic levels of class or order. SIGNAL (Stream Invertebrate Grade Number Average Level) scores were recorded using the Order-Class-Phylum protocol. Weighted SIGNAL scores were calculated for each of the five sites as the sum of individual scores for all orders/classes present divided by the total number of orders/classes at the site.

The results are presented in Appendix C.

Ponds and Subiaco Creeks had low diversity and abundance of aquatic invertebrates. Across the five sites, 136 individuals were collected, belonging to 11 invertebrate classes/orders and 2 vertebrate species (mosquito fish and tadpole). At the site level abundance of individuals ranged from 12 to 44. The low numbers of invertebrates is likely to be a consequence of limited habitat availability. There is limited vegetation and complex habitat (e.g. rubble and stones, logs and debris) for invertebrates to occupy.

The most common invertebrates found in Ponds and Subiaco Creeks were dragonfly nymphs (Order Odonata) and true bugs (Order Hemiptera) including water striders and back swimmers. No rare (or threatened) species were found. Mosquito fish (*Gambusia*) were found at 2 sites. This is an aggressive invasive species, known to outcompete native fish.

SIGNAL scores rank invertebrates according to their pollution resistence. The lower the score, the more tolerant the animal is of polluted environments (scores range from 1-10). All animals found in Ponds and Subiaco Creeks had SIGNAL scores ≤5, indicating they are pollution tolerant. SIGNAL scores for each site ranged from 1.8 to 2.75. Scores of <4 generally indicate severe pollution, thus suggesting Ponds and Subiaco Creeks are in very poor ecological condition.

2.9.2 Previous studies

Council undertook macroinvertebrate sampling at four locations in Ponds and Subiaco Creeks in 2002-04. The sampling locations are indicated on Figure 10. A SIGNAL analysis concluded that the waterway was severely polluted. This finding is consistent with the results of the 2008 investigation and suggests that water quality has been similar for at least the last few years.

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2.10 Terrestrial ecology

2.10.1 Pre- 1750 vegetation

The types of vegetation communities likely to have existed within the study area at the time of European settlement are depicted on Figure 11 based on ecological modelling by Tozer (2003) for sandstone areas of the Cumberland Basin and vegetation mapping of the Sydney region by Benson and Howell (1994). These vegetation community types can be used as a guide to restoration activities.

Figure 11 suggests that Turpentine-Ironbark Forest dominated the upper catchment of Ponds Creek and Subiaco Creek. The middle slopes were vegetated with Turpentine-Ironbark Margin Forest. Sydney Sandstone Complex vegetation grew on sandstone areas of the riparian corridor. The lower reaches were Shale Sandstone Transition Forest.

2.10.2 Extant flora and fauna

The current ecology of the study area has been determined by NSW Wildlife Atlas database search, literature review and field investigation. Terrestrial ecosystems within the catchment are largely degraded by weeds. Flora species that were observed within each reach of the corridor during field investigation are listed in Appendix D. Fauna species that have been recorded within the study area are listed in Appendix E.

2.10.3 Vegetation communities

Vegetation communities mapped by NPWS (2006) are presented in Figure 12. The NPWS data were validated during ELA field investigation, although this was problematic because of the high proportion of weeds throughout the catchment. Vegetation communities in the study area include:

- Western Sydney Dry Rainforest (EEC*)
- Turpentine-Ironbark Forest (EEC*)
- Turpentine-Ironbark Margin Forest (EEC*)
- Western Sandstone Gully Forest
- Mangrove Saltmarsh Complex (Coastal Saltmarsh is an EEC*)
- Exotics
- Landscape plantings

(*EECs are endangered ecological communities under the *NSW Threatened Species Conservation Act 1995*. Detailed descriptions of each EEC are provided in Appendix F. Threats and recovery strategies are also indicated.)

The upper reaches of Ponds Creek catchment are dominated by Turpentine-Ironbark Forest and Turpentine-Ironbark Margin Forest, with Turpentine-Ironbark Margin Forest extending through the middle reaches. Reaches 2, 3, 4 and 10 contain Western Sydney Sandstone Gully Forest. A small area of Mangrove Saltmarsh Complex is found adjacent to Parramatta River. Most other vegetation within the study area is exotic or landscape plantings.

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2.10.4 Threatened species

The NSW Wildlife Atlas has no records of threatened flora or fauna species within the study area. However, Council has recorded *Pomaderris prunifolia* which is classified as an endangered population under the *NSW Threatened Species Conservation Act 1995 (TSC Act)*. This population is threatened by road construction or restoration, unsympathetic landscaping and landscape maintenance, and pressure from residents and nearby businesses to 'tidy up' the plants and their habitat. The Department of Environment and Climate Change[1] has identified priority actions to be implemented to help recover this endangered population:

- Investigate the need for in situ collection
- Increase community awareness and involvement in the recovery of the population, particularly in the implementation of on ground works associated with plans of management (POMs)
- Ensure that POMs for sites include actions specific for the protection of the species and that the POMs are being adequately implemented
- Negotiate with public agencies to increase protection status of sites
- Undertake targeted surveys to find additional sites

Bushland within the catchment may provide habitat for threatened fauna such as the powerful owl (*Ninox strenua*). The powerful owl breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as turpentine (Syncarpia glomulifera), black she-oak (Allocasuarina littoralis), blackwood (Acacia melanoxylon), rough-barked apple (Angophora floribunda), cherry ballart (Exocarpus cupressiformis) and a number of eucalypt species. The powerful owl requires large tree hollows to nest (at least 0.5 m deep) in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.

Grey-headed flying foxes (*Pteropus poliocephalus*) are classified as vulnerable under the TSC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This species has camp sites in nearby locations such as Parramatta Park and Duck River. These and other neighbouring populations visit Ponds Subiaco catchment to feed. Foraging habitat in Ponds Subiaco catchment needs to be protected and rehabilitated to help sustain these flying fox populations.

2.10.5 Weeds and feral animals

The riparian corridor is heavily infested with weeds. Weed species observed at each reach are listed in Appendix D. Some of these species have been declared under the *Noxious Weeds Act 1993*. The list of noxious weed species for the Parramatta local government area and details of Council's noxious weeds program are provided in Council's website[2].

[1]http://www.threatenedspecies.environment.nsw.gov.au/tsprofile

[2] http://www.parracity.nsw.gov.au/environment/plants_and_animals/weeds

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Feral cats and foxes predate native fauna, and rabbits cause erosion by their burrows and by consuming ground cover vegetation. These species may be targeted for eradication from reserves within the corridor in consultation with the Rural Lands Protection Board. Education is perhaps the most effective long-term preventative to feral animals (e.g. don't dump kittens).

2.11 Conservation significance assessment

Conservation significance assessment (CSA) is a process using vegetation mapping and supporting ecological variables (e.g. vegetation communities, vegetation condition, ecological recovery potential and threatened species) to indicate relative ranking of areas of native vegetation in terms of ecological importance. DECC (2006) produced an integrated map of ecological constraint based on a CSA of western Sydney. The map categories are described in Table 3.

Table 3 Conservation Significance Assessment (CSA) categories

Map category	Description
Core habitat	'Core' areas are the remnants of highest conservation value. They represent areas where species or communities are at imminent risk of extinction, or large areas within the region that constitute the backbone of a viable conservation network across the landscape.
Support to core habitat	These are areas within the region that provide a range of support values including increasing the size of and buffering of areas identified as Regional Significant (Core). Support for Core areas offer the greatest potential to have their ecological values enhanced by management works and contribution to the ecological and biodiversity values of the region.
Other remnant vegetation	The remainder of native vegetation has been classified as Other Remnant Vegetation. These areas are mostly smaller, isolated or poorer quality remnants; however this category does contain areas of endangered ecological communities that are in good condition. Some of the areas classified in this assessment as Other Remnant Vegetation may have local significance.
Urban remnant trees – critically endangered communities	Scattered trees above an open or absent understorey in urban environments. The tree species are part of a critically endangered community (e.g. Blue Gum High Forest).

Source: DECC 2006

CSA data were selected for the Ponds Subiaco catchment and are represented in Figure 13. The data suggest that the upper reaches of Ponds Creek have the highest conservation value. Small pockets of core habitat and urban remnant trees have been identified in the middle reaches of the catchment.

2.12 Key threatening processes

A key threatening process threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Key threatening processes include:

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- Pest animals - Introduced animal species can compete with, and prey upon, native animals. They can also damage native plants and degrade natural habitats.
- Weeds - Weeds compete with native plants for resources such as light and nutrients. They can aggressively invade areas, displacing native plants and animals.
- Diseases - Exotic fungal infections, viruses and other pathogens can weaken and kill native species.
- Habitat loss/change - From large-scale land clearing to the gathering of bushrock for suburban gardens, humans have degraded many native environments across the state.

Key threatening processes identified by the Department of Environment and Climate Change (DECC) under the *Threatened Species Conservation Act 1995* that are likely to be relevant to Ponds/Subiaco are:

- Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands
- Clearing native vegetation
- Competition and grazing by the feral European rabbit
- Competition from feral honeybees
- Ecological consequences of high frequency fires
- Invasion and establishment of exotic vines and scramblers
- Human-caused climate change
- Infection of frogs by amphibian chytrid causing the disease *chytridiomycosis*
- Infection of native plants by *Phytophthora cinnamomi*
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of *Lantana camara*
- Loss of hollow-bearing trees
- Predation by feral cats
- Predation by European red fox
- Predation by the plague minnow (*Gambusia holbrooki*)
- Removal of dead wood and dead trees
- Bushrock removal

Under the *Fisheries Management Act 1994,* the Department of Primary Industries (DPI) identifies key threatening processes likely to be relevant to Ponds/Subiaco as:

- The introduction of fish to fresh waters within a river catchment outside their natural range
- Removal of large woody debris from New South Wales rivers and streams
- Degradation of native riparian vegetation along New South Wales water courses
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams

Threat abatement strategies and priority actions have been developed by DECC and DPI and have been considered during preparation of this Masterplan.

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2.13 Contaminated land

Council has an inventory of known contaminated land and as a precautionary measure has listed all industrial and commercial land as potentially contaminated. Sites known to Council include properties that were previously used as nightsoil depots, garbage depots, landfill refuse sites and/or reclaimed lands. These have been classified as contaminated either under the provisions of the *Unhealthy Building Lands Act 1990* or the Department of Health's database.

Figure 6 indicates the known extent of contaminated land within the area, including:

- Cowells Lane Reserve, which was previously a night soil depot
- Curtis Oval, an old landfill
- Sir Thomas Mitchell Reserve, an old landfill
- Cox Park

Contaminated land in NSW is broadly managed by:

- Department of Environment and Climate Change (DECC), which uses its powers under the *Contaminated Land Management Act 1997* to deal with contamination where DECC identifies there is 'significant risk of harm'
- local councils, which deal with less serious contamination, generally when landowners want approval to undertake new development

The Department of Planning issued planning guidelines for managing land contamination (DoP 1998) in accordance with *State Environmental Planning Policy No.55 - Remediation of Land.* The guidelines provide advice to planning authorities on the early identification of contaminated sites, consideration of contamination in rezoning and development applications, recording and use of information, and ways to prevent contamination and reduce the environmental impact of remediation activities.

2.14 Acid sulphate soils

Potential acid sulphate soils are naturally occurring soils containing iron sulfides (mainly pyrite) that form in seawater or brackish water environments. They become actual acid sulphate soils when they are exposed to air (e.g. after drainage or excavation). In air the soils form sulphuric acid which can acidify the surrounding environment. It can result in severe damage to natural ecosystems (e.g. fish kills) and steel and concrete infrastructure.

Figure 14 indicates the risk of problems associated with acid sulphate soils in the study area. The map is taken from Section 33D of the Draft 2008 Parramatta Local Environmental Plan and is based on data supplied by the NSW Department of Natural Resources. The map identifies five classes of land, with Class 1 having the highest risk for acid sulphate soils. The majority of the Ponds Subiaco catchment is classed as 5.

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2.15 Aboriginal heritage

An Aboriginal heritage assessment was conducted by Kelleher Nightingale in consultation with the local Aboriginal community groups:

- Metropolitan Local Aboriginal Land Council
- Darug Tribal Aboriginal Corporation
- Darug Custodian Aboriginal Corporation
- Darug Aboriginal Cultural Heritage Assessments

There have been eight open artefact scatters, or open camp sites, recorded previously within the catchment. These sites were recorded by an amateur archaeologist, Michael Guider, in the 1990s. These sites were generally in areas where there were existing surface exposures such as walking tracks, car parks or eroded creek banks.

Three sites have been destroyed and the five remaining sites are assessed as demonstrating low scientific significance. The Aboriginal heritage report is provided in Volume 3 of the Masterplan.

2.16 European heritage

An assessment of European heritage was conducted by Paul Davies and is provided in Volume 3. It includes inventory sheets that have been prepared for historical features in the study area. The sheets provide photographs and a description of each feature, its former and current use, condition, risk assessment and statement of significance. The main features of interest are:

- Stone surrounds to the stormwater drain pipe and rough sandstone terraces/retaining wall at Cox Park, West Street, Telopea
- Stone bridge abutments at Heness' Bridge
- Stone benches at Fitzgerald Forest near Honiton Avenue West, Telopea
- Former Dundas/Pennant Hills Quarry, Dundas Diatreme at Thomas Mitchell Reserve, Alexander Street, Dundas Valley
- Stone surrounds to drain at reserve, King Street, Dundas Valley
- Stone surrounds to drains at Dundas Park, Dundas Valley
- Timber footbridge at Ponds Creek Reserve, near Summers Street, Dundas Valley
- Road bridge and group of poplars at Sturt Street Reserve, Telopea
- Weir, stepping stones and pond at Sturts Street Reserve, near Sturt Street, Telopea
- Timber footbridge at Bennetts Road West, Dundas
- Stone surrounds to drains at Upjohn Park, Kirby Street, Dundas
- Dam wall at Upjohn Park, Ronald Avenue at Dundas
- Road bridge and footbridge at Subiaco Creek Reserve at Kirby Street, Rydalmere
- Stone cut steps at Subiaco Reserve near Ellimatta Street, Rydalmere
- Terraces with stone retaining walls at Jim Crowgey Reserve, Crowgey Street, Rydalmere

Sites of European heritage are depicted in Figure 15.

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2.17 Previous restoration

Restoration works that have previously been conducted by Council within the study area, or are proposed, are identified in Table 4. Percentage values relate to the area of bushland restoration. The primary corridor links to core areas, the secondary corridor relates to secondary tributaries.

Table 4 Previous restoration work

Location	Year	Description of works	
Brand Street opp. Larra	2002 2003	Sediment basin and channel	
Evans Road	2002 2003	Stabilise drainage channel	
Upjohn Park	2002 2003	Stabilise bank at weir	
Moffatts Drive	2003 2004	Small sediment basin and channel	
Brand Street opp. Fullarton	2003 2004	Small sediment basin and channel	
Crowgey and moffatts	2003 2004	Extend primary work	
Rumsey Cres	2004 2005	Outlet stabilisation and revegetation	
Fitzgerald Forest	2005 2006	Stabilise creek at Heritage bridge	
Rear 26 - 27 Parklands Ave	2006 2007	Drainage line rehabilitation	
Captain Strom Place	2006 2007	Stabilise outlet on channel	
Swan Street (end culdesac)	2006 2007	Stabilise outlet on bank	
Dorahy Street	2007 2008	Riparian revegetation	
Christina Street	2007 2008	Stabilise drainage channel	
Hillman Avenue, Rydalmere	2007 2008	Riparian revegetation	
Bush regeneration activities			
Galaringi	1995	Withdraw mowing	Core
Galaringi	2000-08	50% undertaken	Core
Cox Park	1994-2008	80% undertaken	Core
Fitzgerald Forest	2001-08	90% undertaken	Core
Rapanea Community Forest	1986-2005	Bushcare group	Core
Rapanea Community Forest	2004-2008	60% undertaken	Core
Ponds Creek Res - Evans Rd	2001-2008	10% undertaken	Primary corridor
Ponds Creek Res - Moffatts	2002-2008	50% undertaken	Primary corridor
Ponds Creek - Kissing point	1996-2004	Bushcare group	Primary corridor
Ponds Creeks - Kissing Point	2001-08	10% undertaken	Primary corridor
Ponds Creek - Bennetts	2002-08	50% undertaken	Primary corridor
Ponds Creek - Hillman	1990-2003	Bushcare group	Primary corridor
Ponds Creek - Hillman	1995-08	70% undertaken	Primary corridor
Ponds Creek - Weller Pl	1990-2003	Bushcare group	Primary corridor
Ponds Creek - Weller Pl	2002-08	70% undertaken	Primary corridor
Ponds Creek - Crowgey	1990-2003	Bushcare group	Primary corridor
Ponds Creek - Crowgey	2002-08	30% undertaken	Primary corridor
Charles Fraser	2000-08	Bushcare group	Secondary Corridor
Barayly Res	1998-2008	50% undertaken	Secondary Corridor
Allan Cunningham Res	1999-2004	Bushcare group	Secondary Corridor
Allan Cunningham Res	2002- 2008	30% undertaken	Secondary Corridor
Kilpack Park	1998-2008	50% undertaken	Secondary Corridor
Yates Ave Res	1998-2008	20% undertaken	Secondary Corridor
Upjohn Park	2000-08	70% undertaken	Secondary Corridor

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Location	Year	Description of works	
Cowells Lane	2000-08	10% undertaken	Secondary Corridor
Eccles Park	1998-2008	70% undertaken	Secondary Corridor
Ponds Creek - Kirby St	1995-2000	Bushcare group	Secondary Corridor
Ponds Creek - Kirby St	1999-2008	60% undertaken	Secondary Corridor

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Figure 1 Study area

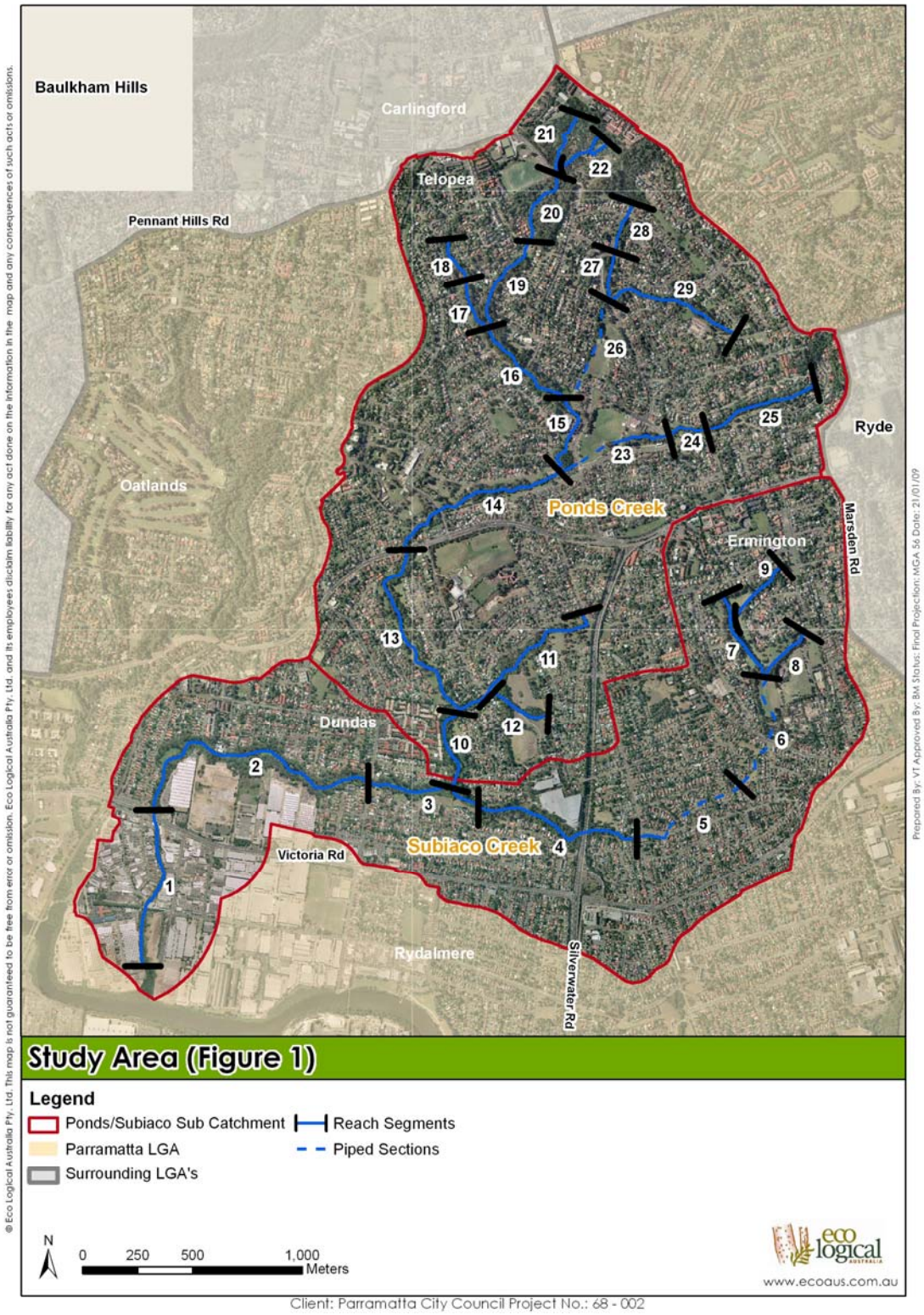

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Figure 2 Draft LEP 2008

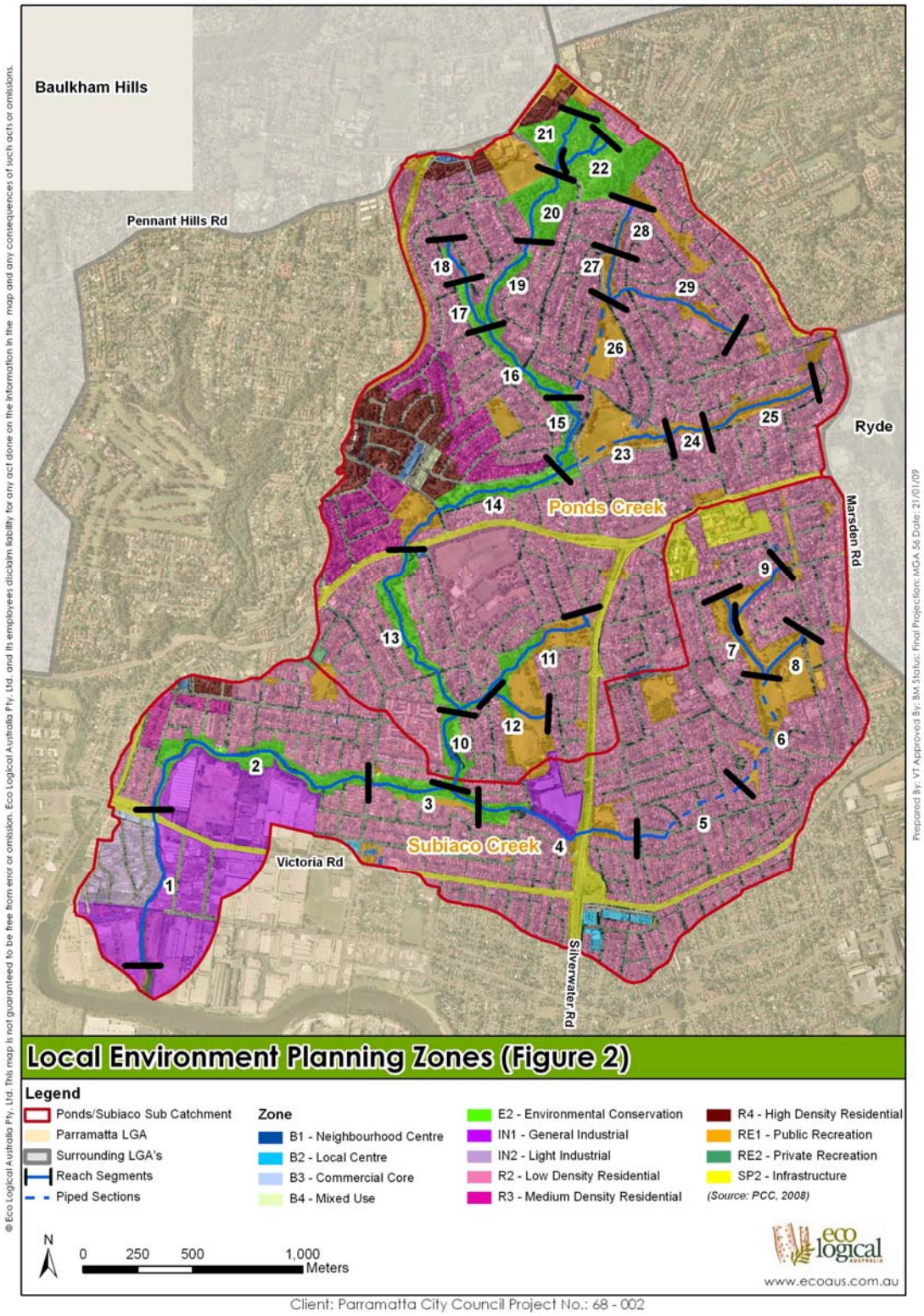

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Figure 3 Digital elevation model

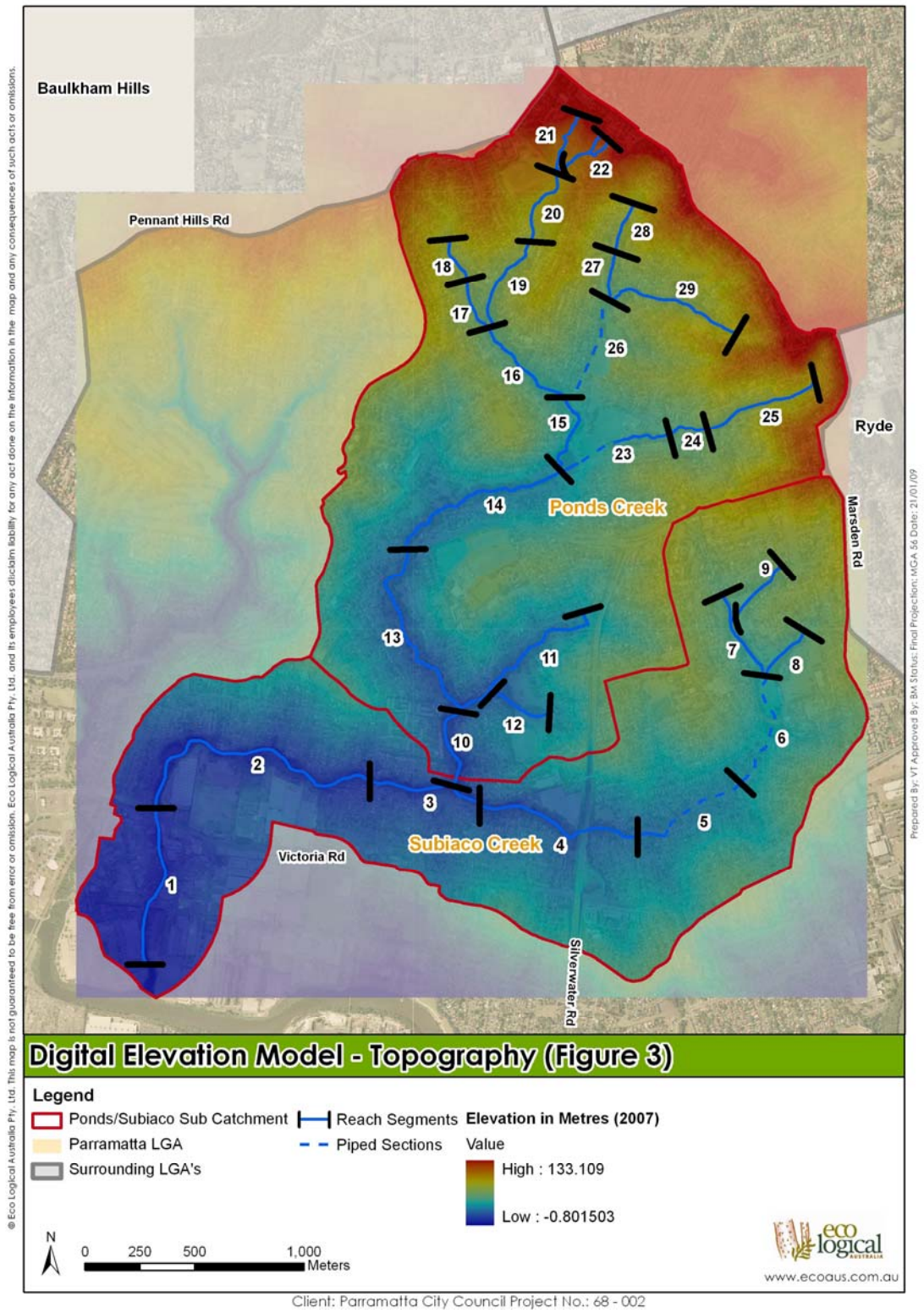

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Figure 4 Flood extent

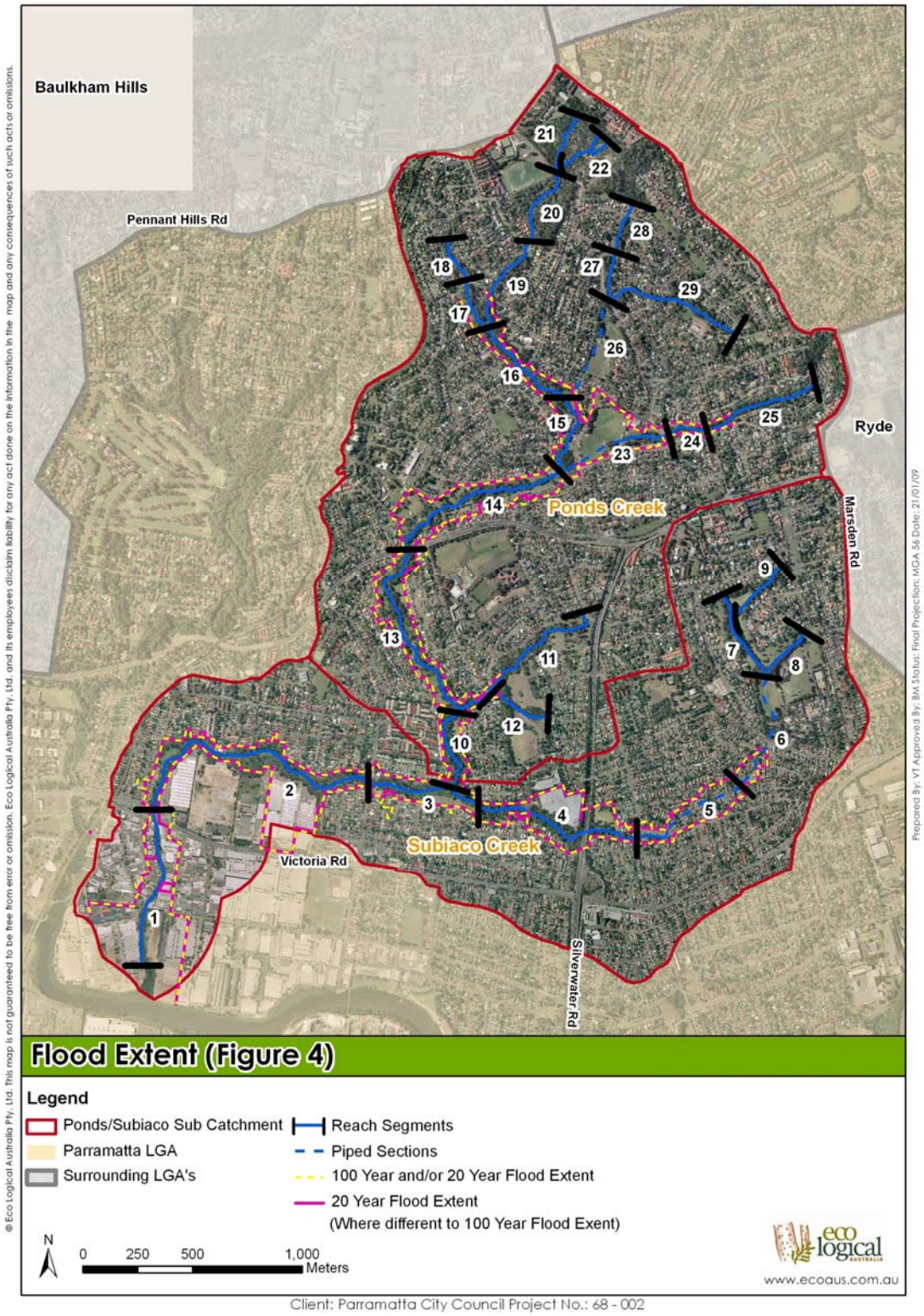

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Figure 5 Stormwater network

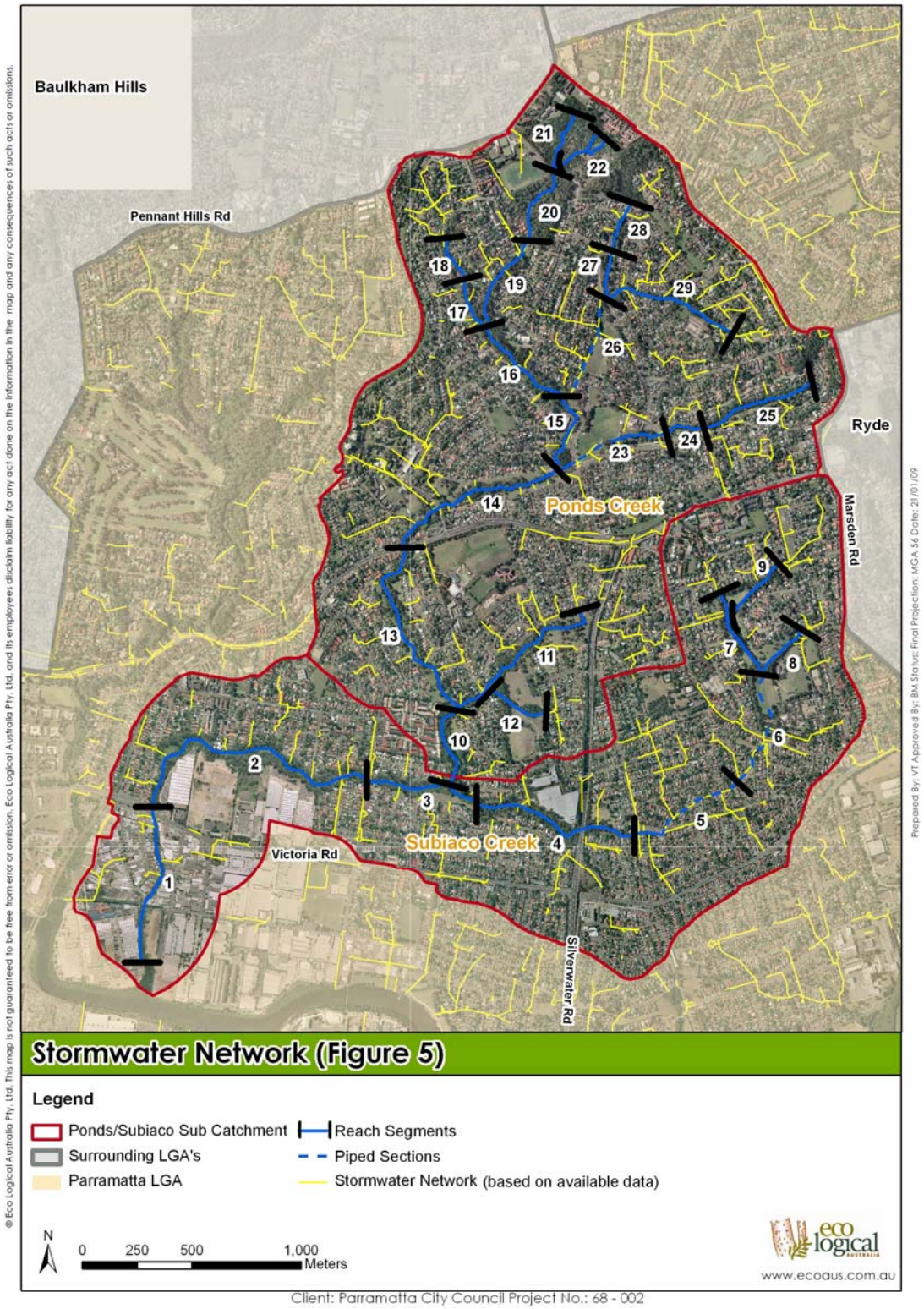

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Figure 6 Soil landscapes and contaminated land

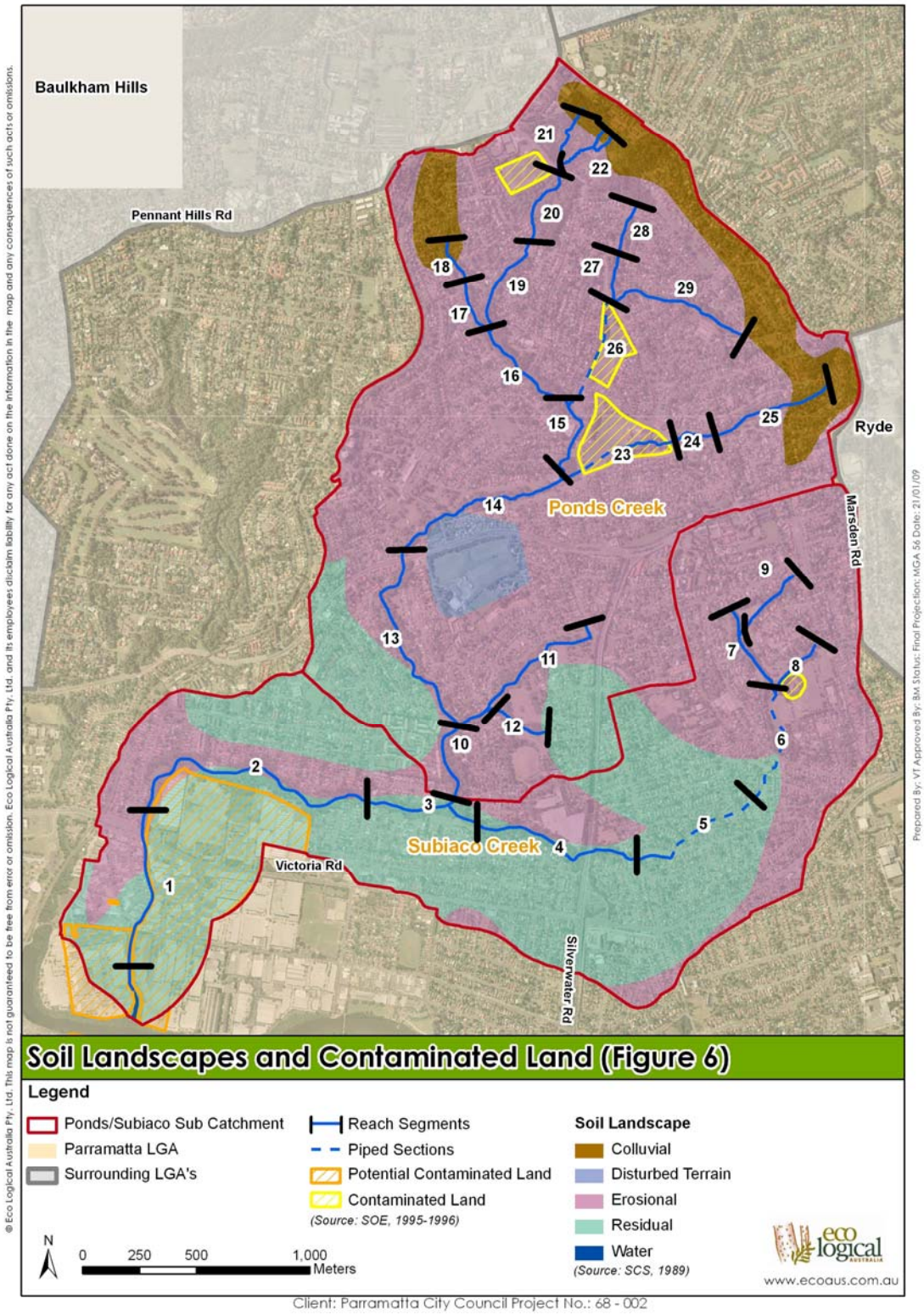

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Figure 7 Stream classification

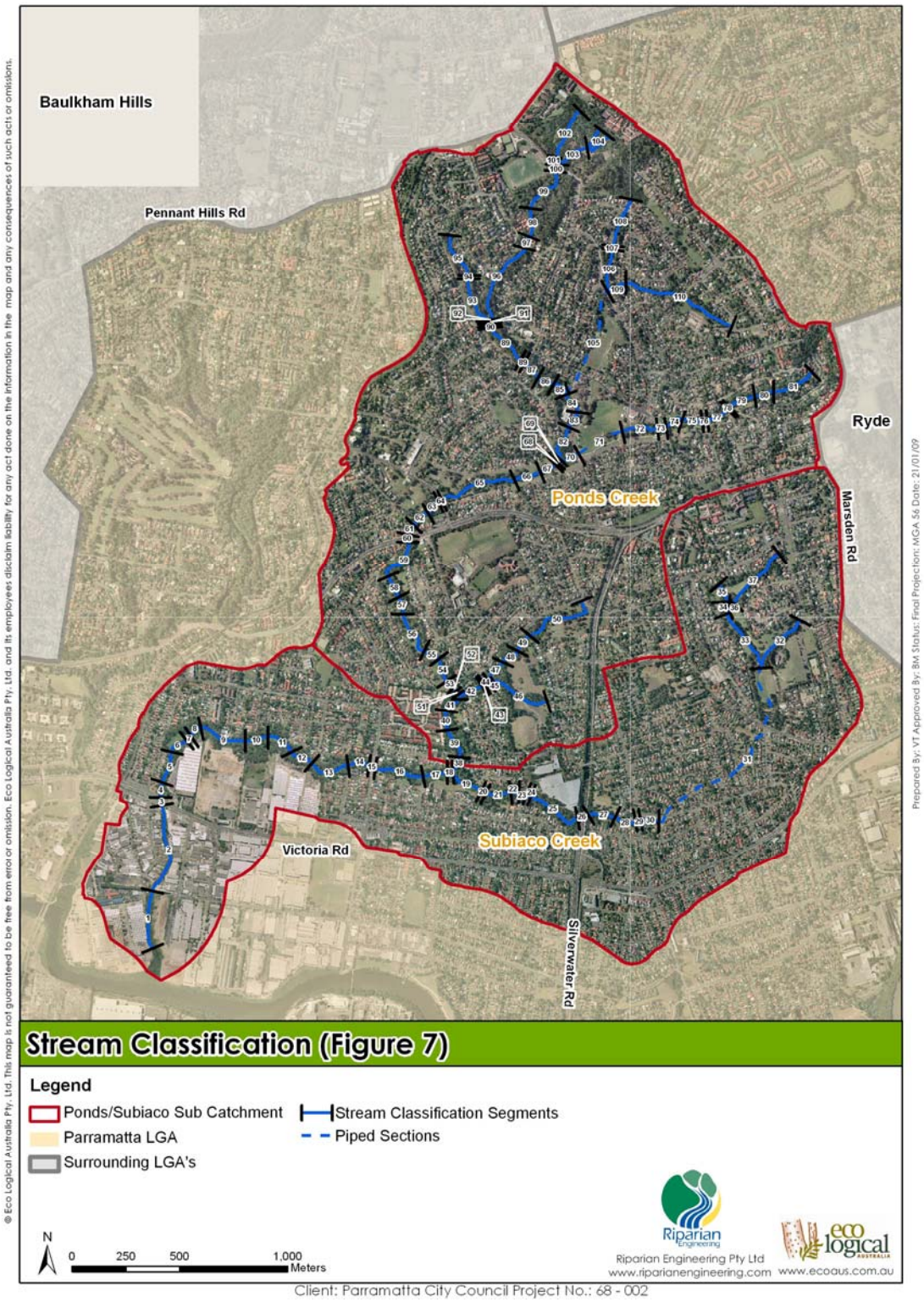

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Figure 8 Geomorphic degradation

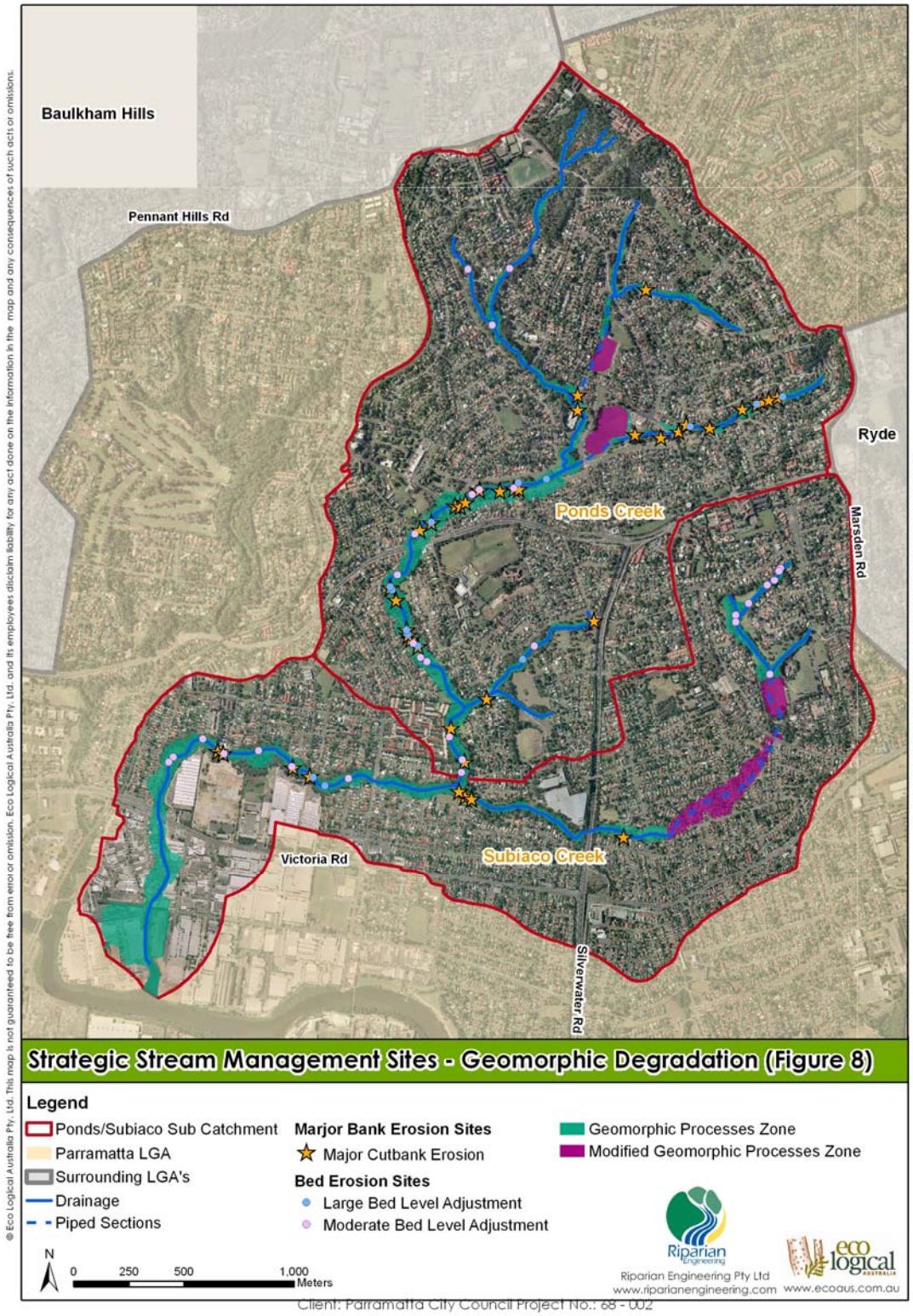

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Figure 9 Civil structure failure

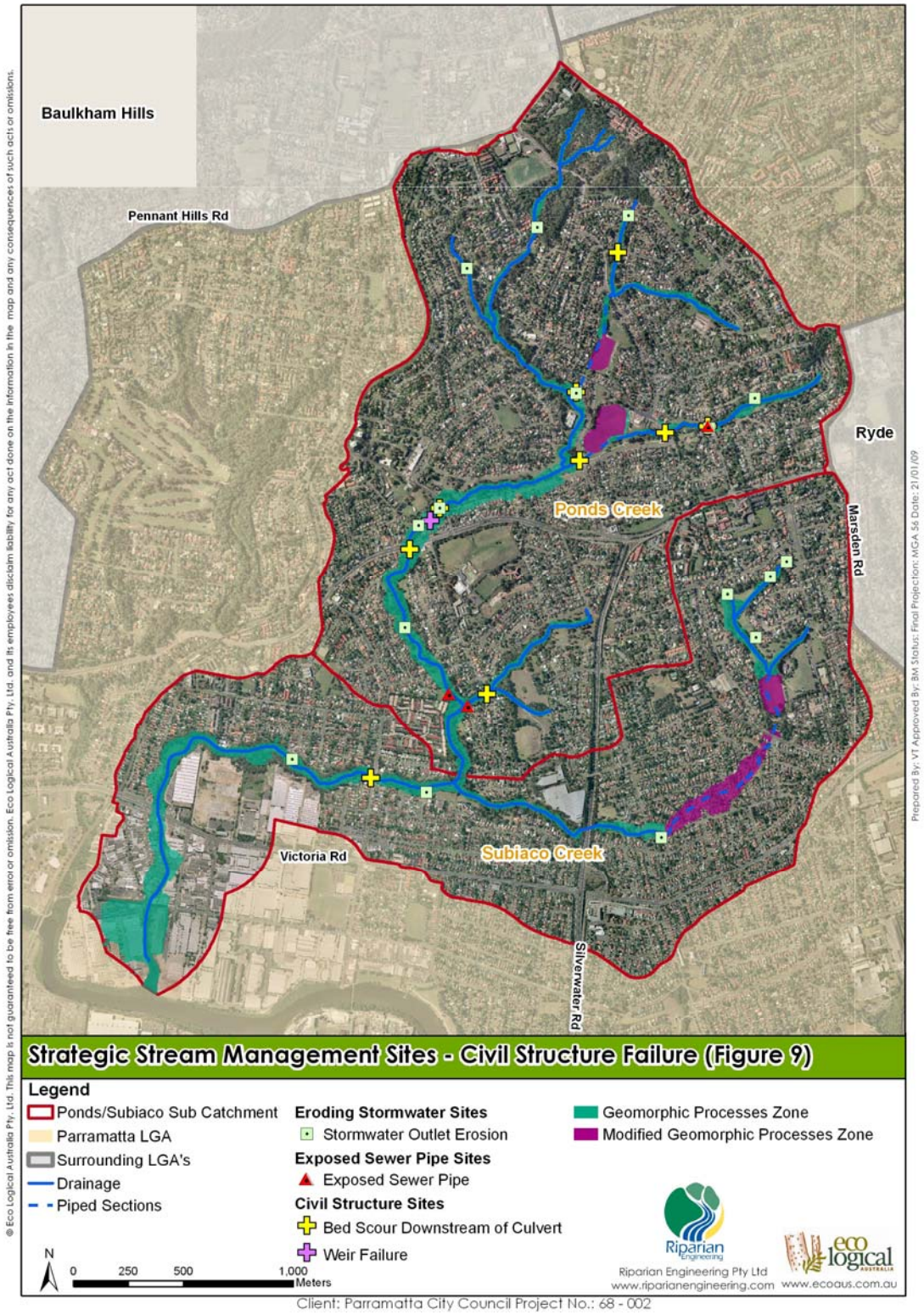

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Figure 10 Water quality sampling sites

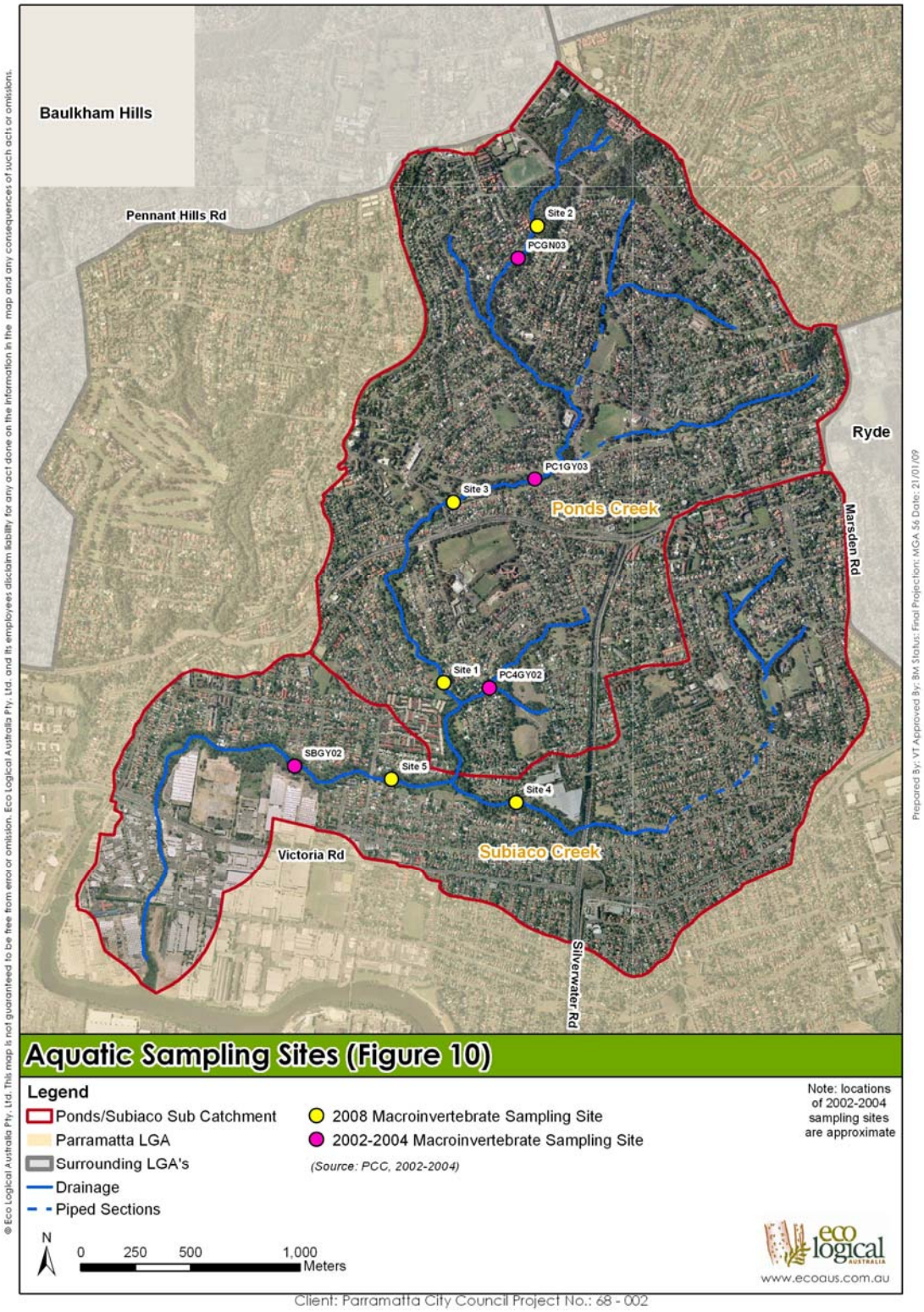

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Figure 11 Pre-1750 vegetation

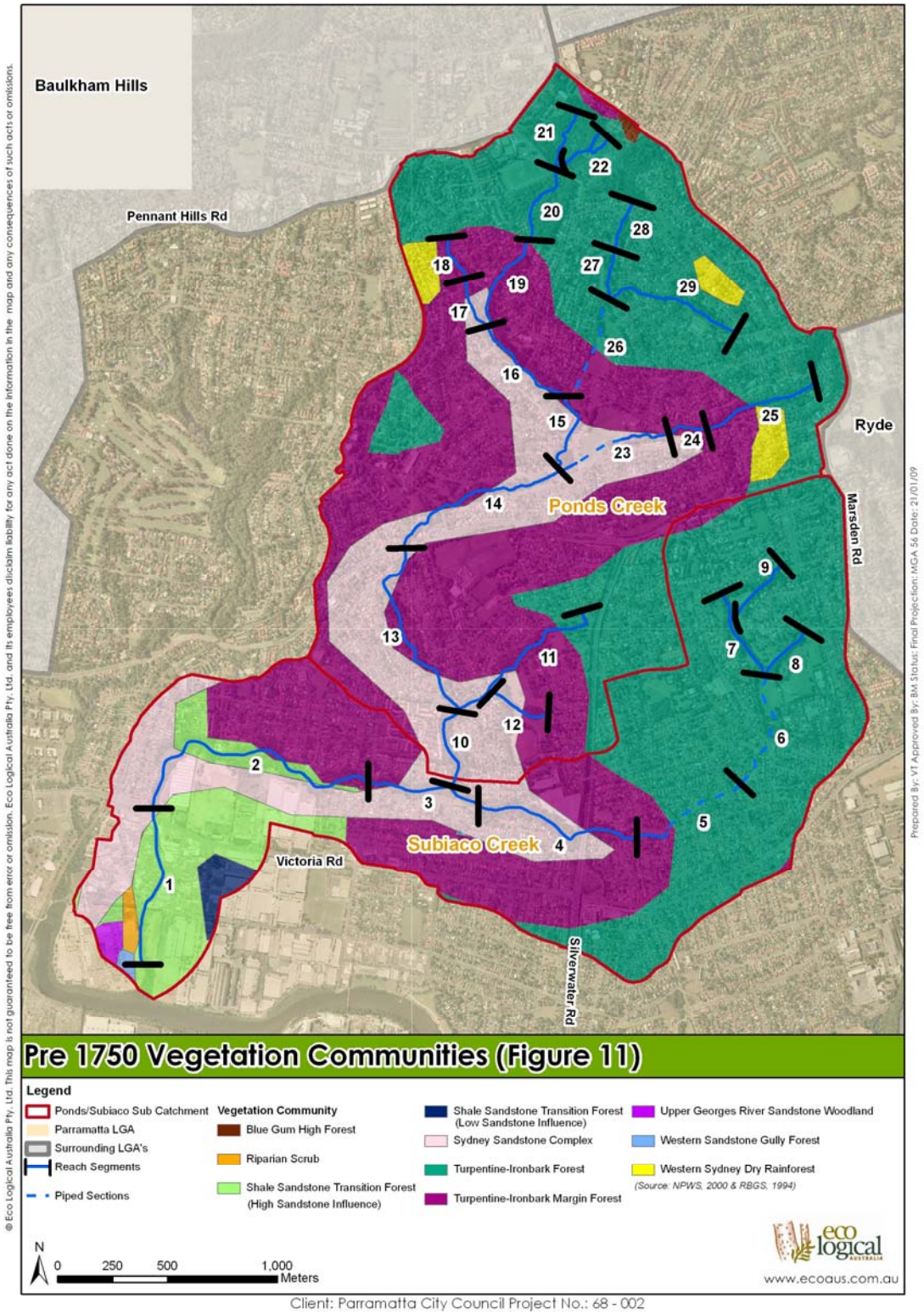

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Figure 12 Current vegetation communities

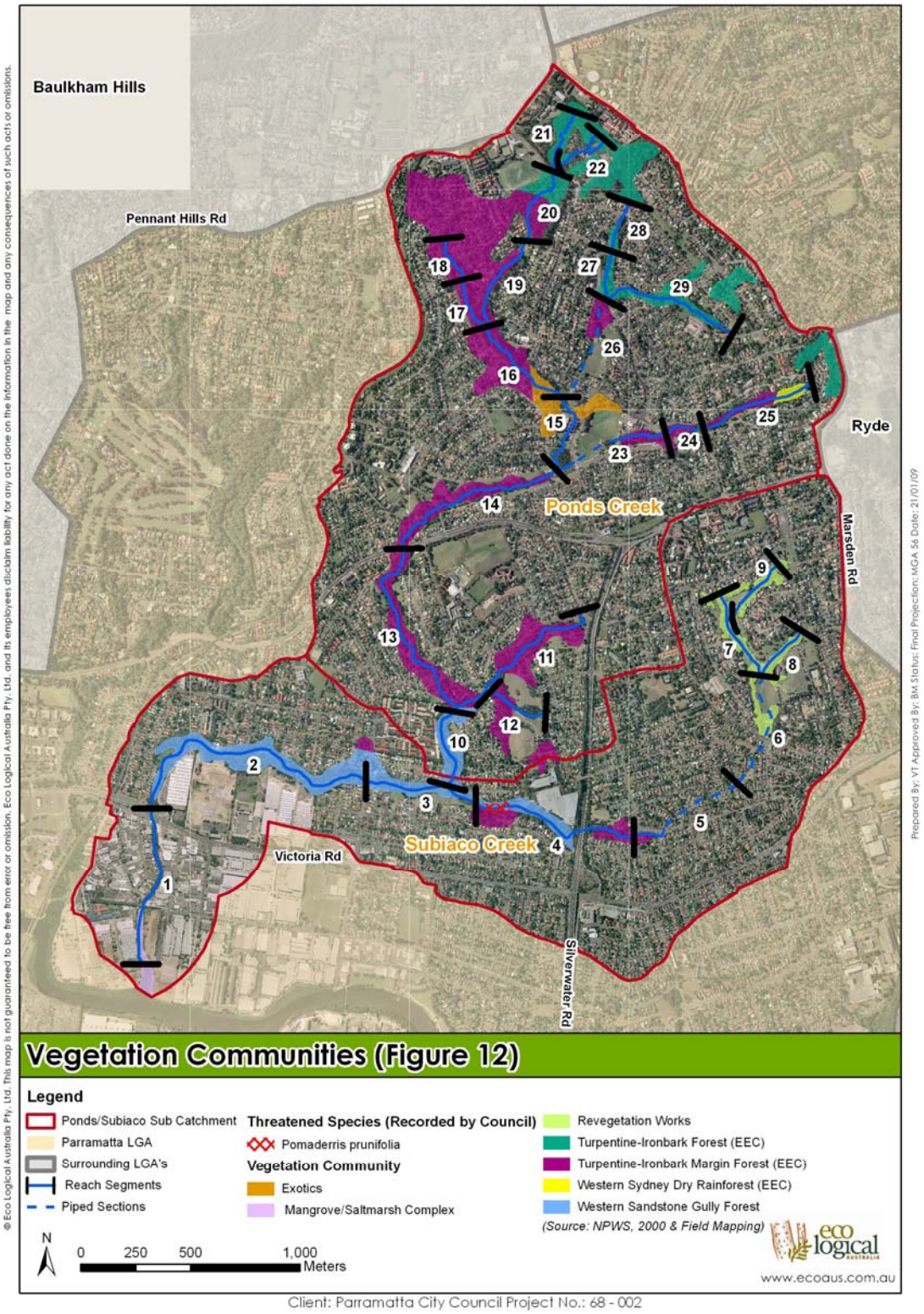

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Figure 13 Conservation Significance Assessment

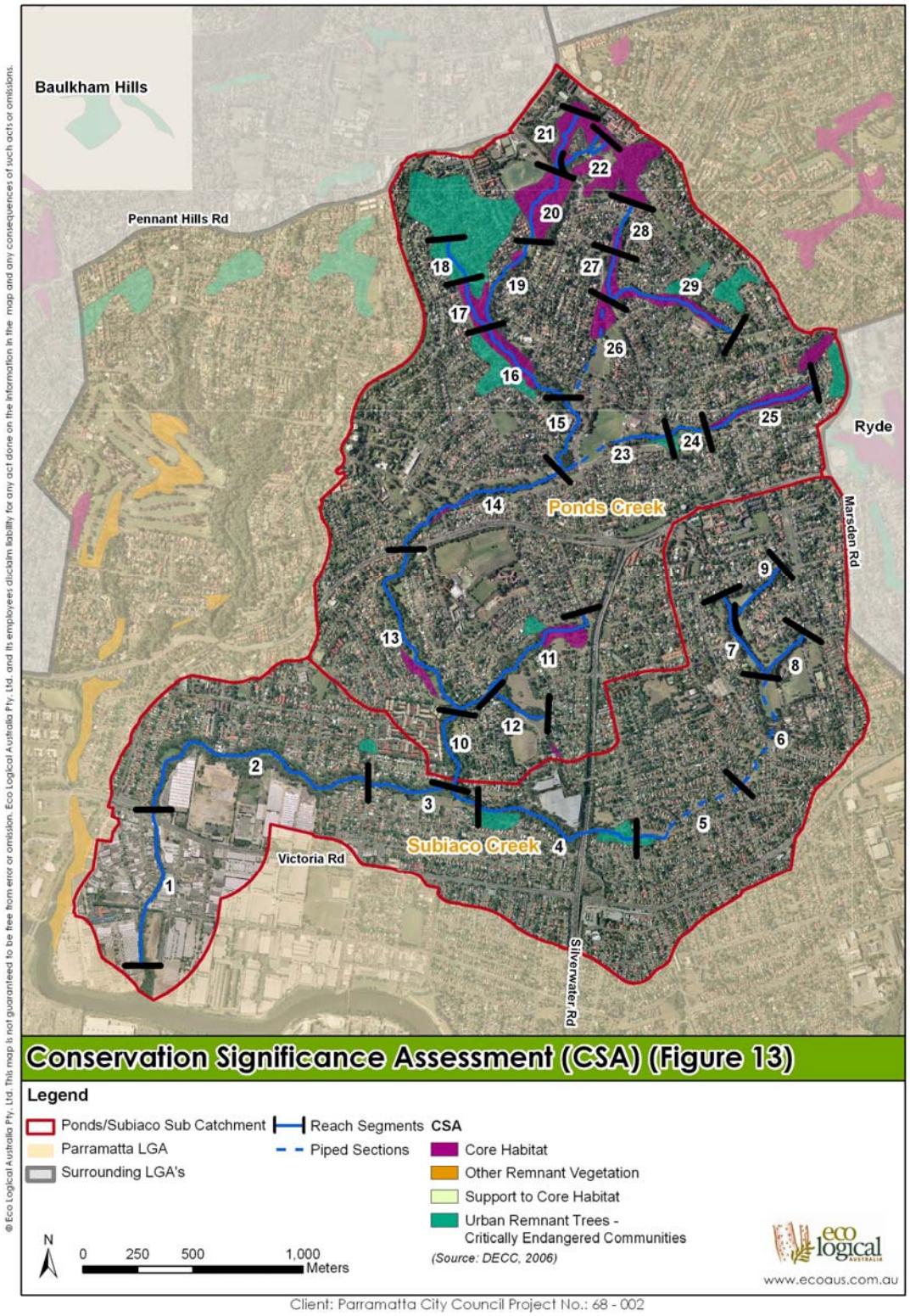

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Figure 14 Acid sulphate soils

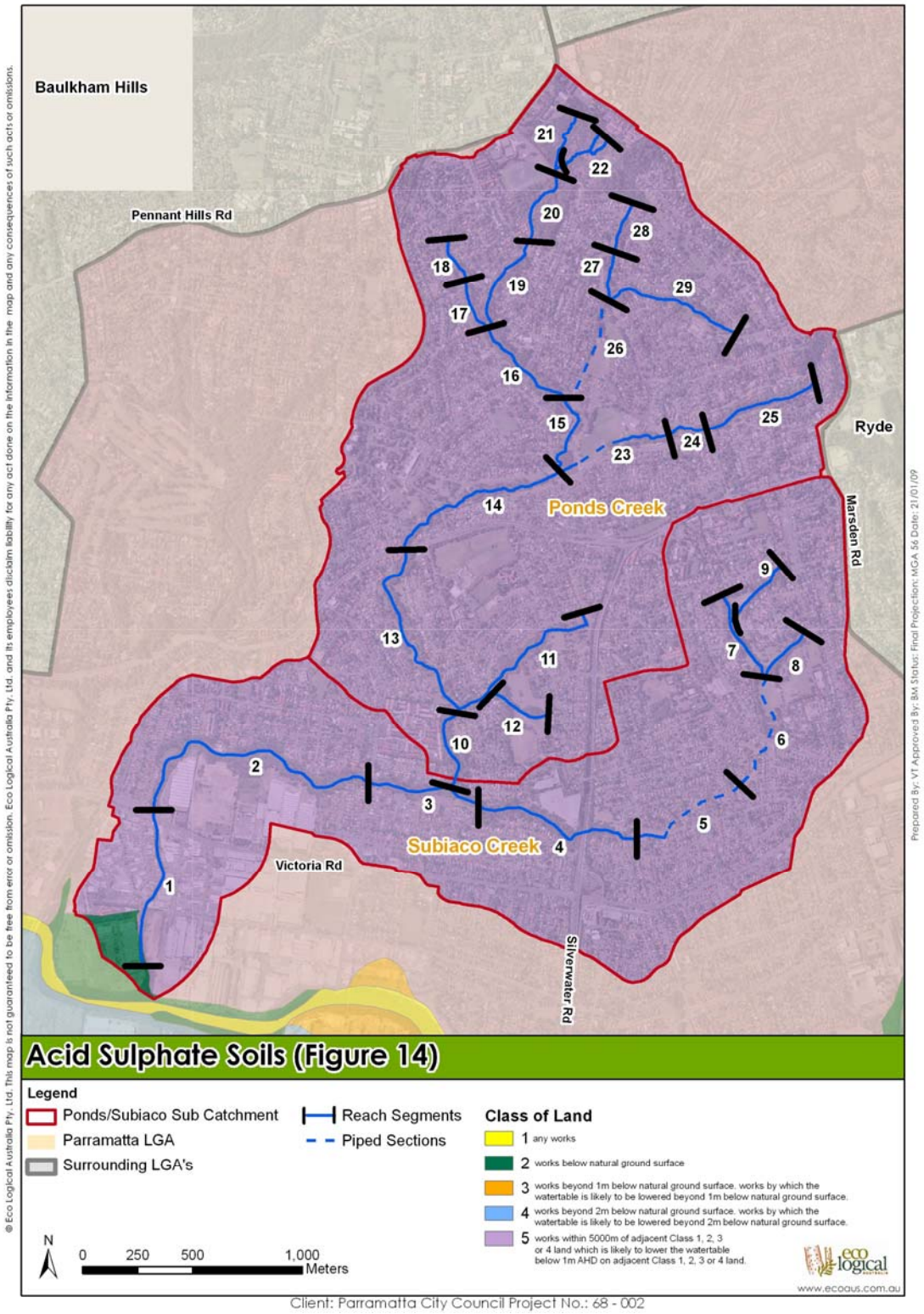

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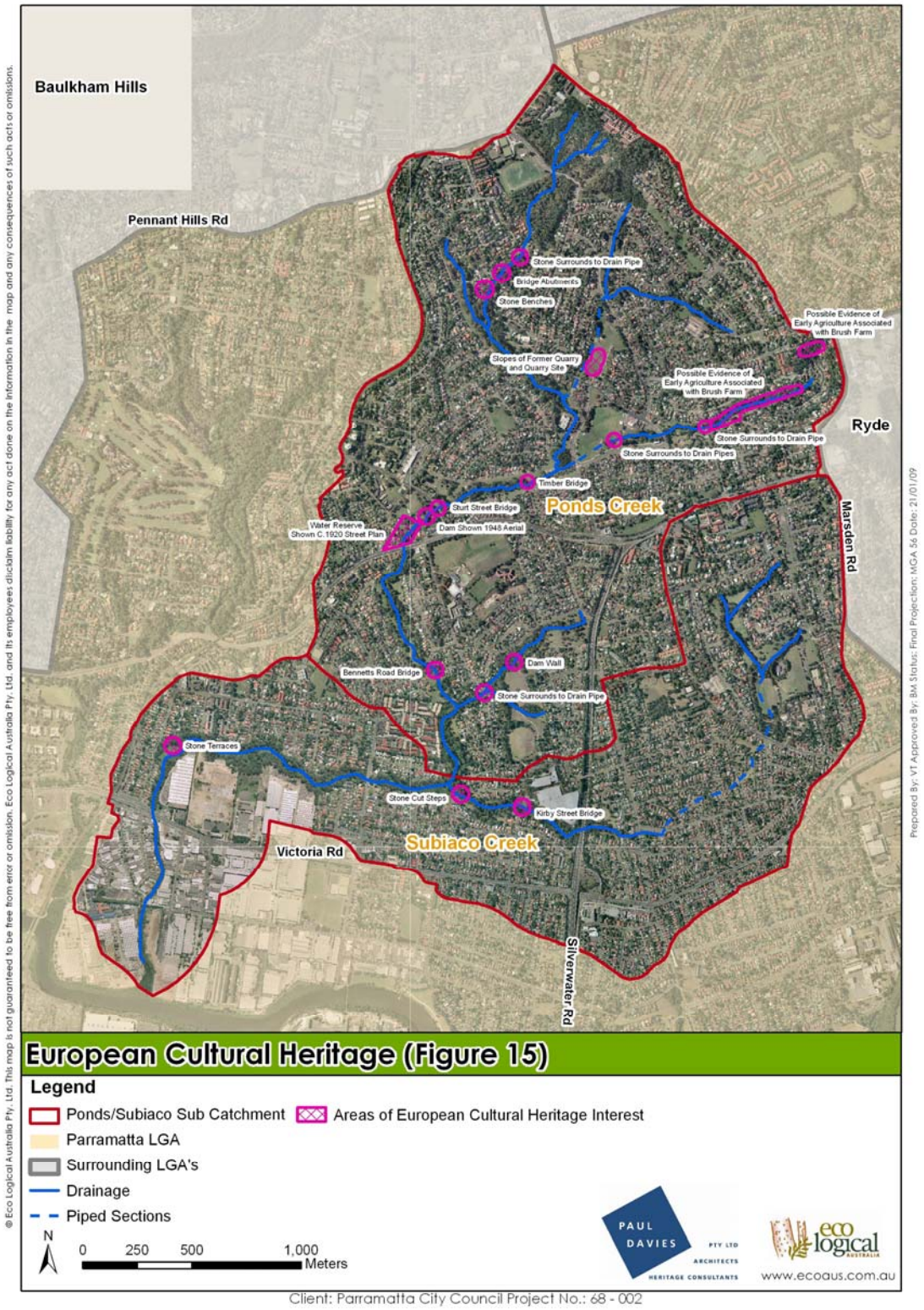
Figure 15 European heritage



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3. Vision and objectives

3.1 Defining the vision

An open community forum was held in April 2008 to develop a vision for the corridor that reflects values and desires for the future of Ponds Subiaco. Values that were identified by the community as important include:

- Passive recreation
- Active recreation
- Proximity
- Wildlife habitat
- Geology
- Cultural heritage
- Appropriate signage (clear, well maintained, informative)
- Peace and quiet
- Species diversity
- Opportunity to explore/adventure

Key issues that were identified during the forum and incorporated in the Vision are:

- Good water quality
- Weed free
- No graffiti or vandalism
- Views/ vista
- Education (schools, neighbours, scientific/tours/resources)
- Greater community involvement
- Accessibility
- More wildlife/bushland
- Rest stops e.g. seating
- Safe
- Clean and healthy

3.2 Vision for Ponds Subiaco

Ponds Subiaco will be:

> *A healthy, safe and attractive place where people can interact with, learn about and respect, a biologically diverse natural environment.*

3.3 Objectives

In recognition of the degraded state of much of the riparian corridor and the significant resources that would be required to achieve the Vision, the Masterplan proposes that rehabilitation be implemented progressively over a long time. The objectives will be to:

- Protect threatened species
- Rehabilitate endangered ecological communities and improve connectivity
- Improve water quality

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- Investigate, and if necessary, remediate contaminated land
- Repair important civil structural assets (e.g. stormwater, sewer and weir)
- Stabilise sites of geomorphological degradation (bed or bank erosion)
- Protect known Aboriginal and European heritage items
- Improve recreational facilities such as walking trails, rest areas, play areas and signage
- Increase community involvement in environmental management of the corridor, including offering opportunities for learning

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4. Actions

A complete list of actions is provided in Appendix G. Highest priority has been allocated to protecting, maintaining and restoring areas of high ecological and/or geomorphic resilience. The timetable for implementation is as follows:

- High priority to be implemented within three years
- Medium priority to be implemented within six years
- Low priority to be implemented within ten years

Council's Natural Resources team will take primary responsibility for implementation of the Masterplan.

4.1 Reach maps

A map of each reach is presented in Volume 2 of the Masterplan. The reach maps highlight features and issues relevant to the reach, such as:

- The extent of the subject reach
- Stream restoration target conditions
- Strategic geomorphic sites (e.g. sites of civil structural failure, severe bed or bank erosion)
- European heritage sites
- Contaminated land
- Ecological recovery potential
- Vegetation community
- Weed density

A photograph that illustrates conditions accompanies each reach map. Actions relevant to the reach are tabulated at the base of the map, with priorities and costs identified.

4.2 Other actions

4.2.1 Data reliability

This issue of data adequacy and reliability was raised during preparation of this Masterplan. It is recommended that:

- The apparent inaccuracy between the 20 year and 100 year flood modelling results be investigated
- Upper reaches of the catchment be included in the flood modelling
- Water quality testing be performed at locations along Ponds and Subiaco Creeks, preferably including sites where aquatic ecology is investigated
- CSA mapping be reviewed using field validated data

4.2.2 Aboriginal heritage

The Aboriginal heritage sensitivity map (provided in the Aboriginal heritage assessment report in Volume 3) has been updated for the corridor. Guidelines for the Parramatta Heritage and Conservation Environmental Plan 1996 and the Parramatta

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Regional Environmental Plan No.28 should be revised by Council based on the updated sensitivity map.

4.2.3 Local Environmental Plan

The outcomes and objectives of the Ponds Subiaco Masterplan should be incorporated in the latest revisions to the Draft Parramatta Local Environmental Plan (PLEP) 2008. The PLEP is currently being refined prior to seeking approval from State Government. In particular, the following issues should be addressed:

- Items of European and Aboriginal heritage should be incorporated into the LEP under Clause 35 Heritage Conservation
- Areas that have endangered ecological communities should be rezoned to E2 - Environmental Conservation, where possible
- Areas mapped as Urban Remnant Trees under the conservation significance assessment should be protected under the Tree Preservation Order
- Clause 33C Development on Floodprone Land should consider the results of the geomorphological study in terms of buffer area to the waterway, recommendations to rectify bank erosion issues and factors contributing to erosion etc.
- As an alternative to zoning, an 'environmental protection area' overlay can be used. A similar approach is used in the Standard Order (LEP) in 'Part 6 Additional local provisions.' Overlays are simply a map with an associated local provision in the LEP that details the matters that must be considered in assessing a DA.

  This planning overlay is recommended where environmental zoning is not possible or practical. As large areas of the Ponds Subiaco waterways are zoned for recreation, the use of an overlay would be a practical way to ensure the environmental values and objectives for management of the waterways are met during the development assessment process. Developing a spatial layer within Council GIS system that includes the riparian corridor and links to a local provision in the LEP would ensure that, regardless of the land zoning, the development needs to be consistent with the protection of riparian lands and the buffers that protect water quality within and to the receiving water outside the LGA.

  Example of an environmental protection overlay local provision:

New Clause XX: Environment Protection Overlay

1) The objective of this subclause is to protect, improve and maintain the following values, regardless of zoning;
   a) biological diversity (native fauna and flora),
   b) ecological processes necessary for their continued existence,
   c) riparian lands, buffers and their functions; and
   d) the connectivity of these within the LGA and the Harbour Foreshore.

2) This clause applies to development on land identified as Environment Protection Overlay on the Environment Protection Overlay Map.
   (a) This clause applies to development or works within Environment Protection Overlay where the proposal
      I. removes native vegetation; or

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II. alters natural flow regimes, physical or chemical properties of streams or receiving waters

3) For the purpose of this clause the Environment Protection Overlay Map means the XXX Local Environmental Plan [year] Environment Protection Overlay Map.

4) Consent must not be granted to development unless an environmental assessment has been undertaken to the satisfaction of the consent authority to identify any potential adverse impacts.

5) A person must not undertake a development or works in Environment Protection Overlay where that action:
- *a) reduces the extent of areas mapped as high biodiversity significance, or*
- *b) adversely affects habitat critical to the survival of threatened species, or*
- *c) modifies or destroys abiotic factors (such as water, nutrients, or soil) necessary for the survival of remnant vegetation, or*
- *d) results in invasive species that are harmful to remnant vegetation becoming established in an occurrence of these lands, or*
- *e) adversely affects the capacity of a regional connectivity area or riparian corridor; or*
- *f) modifies natural hydrologic or geomorphologic patterns.*

6) Where an environmental assessment conducted by a qualified ecologist has determined that the development may cause a potential adverse impact the consent authority must be satisfied;
- *a) the development meets the objectives of the clause, and*
- *b) incorporates effective measures to remedy or mitigate any adverse impact, and*
- *c) offset any significant adverse impact.*

4.2.4 Development Control Plan

It is recommended that the Parramatta Draft Development Control Plan 2008 include:

- Development setbacks from riparian zones
- Water sensitive urban design features, including best practice environment management during construction

The geomorphic study (in Volume 3 of this Masterplan) recommends that if future redevelopment extends into the geomorphic processes zone (shown on Figure 8), then at a minimum, riparian buffer widths should include both the hyporheic zone and the parafluvial zone, and should extend well into the floodplain hyporheic zone or adjoining hillslope. These zones need to be determined from detailed hydraulic and geomorphic assessments, and should be located with precision DGPS survey equipment and analysis of the 0.5m DTM.

The inclusion of water sensitive urban design features are strongly recommended to minimise the potential impacts of additional development within the catchment. It is further recommended that stream restoration targets be considered in the design and implementation of any WSUD features to be constructed within the corridor.

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4.2.5 Threatened species recovery

Implement recovery planning for the endangered population of *Pomaderris prunifolia*, as discussed in Section 2.10.4.

4.2.6 Interpretation and recreation strategy

It is recommended that an interpretation and recreation strategy be developed for the Ponds Subiaco area. The strategy would provide a framework to address education, cultural heritage, public art, way-finding, and effective ways to engage the community. Public arts components need to be included in major capital works projects (e.g. bridge construction). It is further recommended that a recreation al plan be developed for improving facilities and walking trails.

4.2.7 Community education and participation

It is recommended that community education and participation be supported and expanded. The community should be educated about the impacts associated with stormwater pollution, litter and dumping, and the benefits of growing native plants in gardens. Resources and support should be available to community groups such as residents, Bushcare, schools and scouts.

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Appendix A Legislative and policy framework

Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
COMMONWEALTH (LEGISLATION)		
Environment Protection and Biodiversity Conservation Act 1999	The objects of this Act are, among others: "• to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance" and "• to promote ecological sustainable development through the conservation and ecologically sustainable use of natural resources".	A Commonwealth Act supporting Ecologically Sustainable Development *(ESD)*, providing a significant overlap with NSW State Legislation such as the Environmental Planning & Assessment Act 1979 and the Threatened Species Conservation Act 1995. Future activities in waterway corridors should be undertaken within a framework of ESD. If approvals are required, NSW system can be accredited upon application being made to the Commonwealth Department.
COMMONWEALTH (POLICIES)		
National Strategy for Ecologically Sustainable Development (1992)	A National Strategy which has as its principal goal: "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." A core objective of the Strategy, among others, is: "• to protect biological diversity and maintain essential ecological processes and life support systems."	The National Strategy is implemented at the local level through the application of state and local government legislation and policies. Future activities in waterway corridors should be undertaken within a framework of ESD.
National Strategy for the Conservation of Australia's Biological	This National Strategy provides the framework for protecting Australia's Biodiversity. The Strategy's stated aim is "to bridge the gap between current activities and those measures necessary to ensure effective identification, conservation and	The National Strategy supports programs such as native vegetation protection and management, feral weed and pest control and management of threatened species habitat, among others.

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
Diversity	ecologically sustainable use of Australia's biological diversity."	These are activities which may form part of waterways maintenance and rehabilitation master plans.
Wetlands Policy of the Commonwealth Government of Australia	This policy provides strategies to ensure that the activities of the Government promote the conservation, ecologically sustainable use and enhancement, where possible, of wetlands functions. Among others, those strategies include: "Involving the Australian people in wetlands management" and "working in partnership with State/Territory and Local Governments".	The policy seeks to promote and support local government efforts in wetlands conservation and management, through encouragement of the preparation of local wetlands policies. Such local policies may form part of future waterway maintenance and rehabilitation master plans.
Local Agenda 21	In 1992, at a UN conference on environment and development, Agenda 21 was endorsed, and set out how both developed and developing countries could work towards sustainable development. Local authorities were one of the groups recognised as being fundamental in working towards sustainable development *(and hence "Local" Agenda 21)*. At the local level in Australia, the 1997 "Newcastle Declaration" (*made at an international conference focussing on the challenge of sustainability for local government)* clarified and re-stated the commitment of local government in Australia to Agenda 21 and sustainable development.	The application of the principles of Local Agenda 21 during the preparation and implementation of waterway maintenance and rehabilitation master plans will ensure application within a framework of ESD. Stakeholder and Focus Group meetings are proposed so as involve the community through the development of specific "*Visions*" for each of Council's waterways.
STATE (LEGISLATION)		
Catchment	This is an Act to implement the total catchment	The Act and its accompanying Regulation support

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
Management Act 1989	management of natural resources. The Act promotes the sustainable use of natural resources and seeks to provide for, among others, stable soil and protective vegetation cover within water catchments.	total catchment management practices through the establishment of Catchment Management Boards.
Environmental Planning & Assessment Act, 1979	This Act and its accompanying Regulation are the primary legislation for landuse planning in NSW. The Act encourages, among other things: • the "*proper management, development and conservation of natural and artificial resources*"; • the "*protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats*"; and • "*ecological sustainable development*".	The Act ensures that future activities in the waterway corridors are undertaken within a framework of ESD, and that future maintenance and rehabilitation activities are permissible within each landuse zone within which the waterway corridor lies, and that the environmental impact of any activity or work has been properly assessed.
Fisheries Management Act 1994	This Act aims to "*conserve develop and share the fishery resources of the State for the benefit of present and future generations*". Among other things, the Act aims to "*conserve threatened species, populations and ecological communities of fish and marine vegetation*" and "*to promote ecologically sustainable development*"..	This Act will ensure that any future activities in the waterway corridors will maintain and enhance aquatic habitat. Approvals may be required under this Act depending on the nature of the proposed works.
Local Government Act 1993	This is an Act to guide the operation of Local Government. It requires Councils among other things, "*to carry out activities, appropriate to the current and future needs of local communities …..*". The Act directs Councils to prepare plans of management for, among others, community land.	The Council's management of its waterways, and in particular the preparation of waterways Maintenance and Rehabilitation master plans, is driven through compliance with this Act.

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
	Where community land is categorised as a "*natural area*", and is further categorised as a "*watercourse*", specific directions are made as to the core management objectives. Where land is categorised as a "*natural area*" the core management objectives include:	
Local Government Act 1993 *(cont'd)*	• to "*conserve biodiversity and maintain ecosystem function*"; • to "*maintain the land,..., in its natural state and setting*"; • to "*provide for the restoration and regeneration of the land …..*". Where land is further categorised as a "*watercourse*" the core management objectives also include: • to "*manage watercourses so as to protect the biodiversity and ecological values of the instream environment, particularly in relation to water quality and water flows*"; • to "*manage watercourses so as to protect the riparian environment, particularly in relation to riparian vegetation and habitats and bank stability*"; • to "*restore degraded watercourses*"; and • to "*promote community education and community access to and use of the watercourse*".	
Noxious Weeds Act 1993	This act aims to ensure appropriate measures for the control of noxious weeds throughout NSW, and requires control of weed species listed under	As a landowner, Council has an obligation to control noxious weeds along waterway corridors. Noxious weeds declared within Parramatta, include:

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
	various schedules.	• Balloon Vine – Class 4 • Lantana – Class 4 • Large-leaved Privet – Class 4 • Small-leaved Privet – Class 4 • Castor Oil Plant – Class 4 • Madeira Vine – Class 4 • Cape Ivy – Class 4 • Willows – Class 5 (Salix sp.) • Climbing Asparagus Fern – Class 4 • Blackberry – Class 4
Protection of the Environment Administration Act 1991	The principal objective of this Act is to constitute the Environment Protection Authority and to provide for the integrated administration of environmental protection. The Act requires that regard be had to the need for ecologically sustainable development.	This Act ensures that future activities within waterway corridors are undertaken within a framework of ESD.
Protection of the Environment Operations Act 1997	This Act has as one of its objectives, among other things, to "*protect, restore and enhance the quality of the environment in New South Wales having regard to the need to maintain ecologically sustainable development*". The Act provides for a range of key pollution control legislation including waters, noise and air. These Regulations enable the classification of waters in NSW and regulate the permissible discharge of pollutants to those waters.	Parts of this Act regulate the discharge of pollutants into waterways in NSW.
Soil Conservation Act 1938	This Act makes provision for the conservation of soil resources and for the mitigation of soil erosion.	A landowner may be directed under the provisions of this Act to undertake remedial works to reduce an erosion hazard. Should the bed or banks of any waterway be identified as such a hazard, Council,

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
		as a landowner, may be directed to carry out such works. The Masterplans will identify appropriate works.
Threatened Species Conservation Act 1995	An Act to conserve threatened species, populations and ecological communities. Among other things, the objects of this Act include:	Where any activities, proposed to be carried out in the Masterplans, are located within or adjacent to an endangered species or critical habitat, compliance with this Act may require the preparation of an eight part test to assess likely impacts and if necessary, the preparation of a Species Impact Statement, or may require the provision of alternative conservation measures.
Threatened Species Conservation Act 1995 *(cont'd)*	• to "*conserve biological diversity and promote ecologically sustainable development*" and • to "*protect the critical habitat of those threatened species, populations and ecological communities that are endangered*".	
Water Management Act 2000	This Act replaces the Water Act 1912 and the River and Foreshores Improvement Act 1948 and provides for "*the protection, conservation and ecologically sustainable development of the water sources of the state*". The Act sets out water management principles which include: • "*water sources, floodplains and dependant ecosystems (including groundwaters and wetlands) should be protected and restored and, where possible, land should not be degraded*"; • "*habitats animals and plants that benefit from water or are potentially affected by managed*	This Act ensures that future activities in the waterway corridors are undertaken within a framework of ESD. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the Water Management Act. (s91) 'Controlled activities' include, inter alia: • the removal of material or vegetation from land by excavation or any other means; • the deposition of material on land by landfill or otherwise; or • any activity that affects the quantity or flow of water in a water source.

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
	activities should be protected and (in the case of habitats) restored";	'Waterfront land' is defined as the bed of any river or lake, and any land lying between the river or lake and a line drawn parallel to and forty metres inland from either the highest bank or shore (in relation to non-tidal waters) or the mean high water mark (in relation to tidal waters).
STATE (POLICY)		
Flood Prone Land Policy	The primary objective of the policy is "*to reduce the impact of flooding and flood liability on individual owners and occupiers of floodprone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible*". The policy provides for among other things: "*… the need to consider ways of maintaining and enhancing the riverine and floodplain ecology in the development of floodplain risk management plans*".	Any future activity to be implemented through the master plans will be considered from a floodplain risk management perspective. Impacts of works or activities will be assessed against predicted impacts on flood behaviour. The policy sets out the process leading to the preparation of Floodplain Risk Management Plans, for the waterways and associated floodplains.
Rivers and Estuaries Policy	A Policy which has as its objectives the management of the State's Rivers and Estuaries in ways which: • "*slow, halt or reverse the overall degradation in their systems*"; • "*ensure the long term sustainability of their essential biophysical functions*"; and • "*maintain the beneficial use of these resources.*"	One of the principles of this Policy is: "*Environmentally degraded areas should be rehabilitated and their biophysical functions restored*". This principle will guide the planned activities to be implemented through the Toongabbie Creek master plans.
NSW Biodiversity Strategy	A strategy launched by the NSW Government in 1999. The strategy commits all government agencies to biodiversity conservation across all	This strategy ensures that State Government authorities involved throughout the preparation and implementation of master plans will focus

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
	landscapes of the State. Goals of the strategy include, among others: "• Protecting native species and ecosystems"; "• Managing natural resources better"; and "• Involving landowners and communities in biodiversity conservation".	broadly on biodiversity conservation.
NSW Weirs Policy	The aim of this policy is to reduce and remediate the environmental impact of weirs. Main components of the policy require: • the limiting of approvals for new and expanded weirs; • the review of all existing weirs in NSW; and • the consideration of the need for fishways at each structure.	Elements of this policy will ensure the consideration of fish migration where in-stream structures *(eg. a rock riffle)* are proposed for implementation in the master plans.
NSW Fisheries – Policy and Guidelines for Aquatic Habitat Management and Fish Conservation	These Policies and Guidelines support one of the principal functions of NSW Fisheries, that is, the protection and management of fish resources, marine vegetation and aquatic habitat. General policies include, among others: *"Fish and their aquatic habitats are important natural resources, and impacts on these resources must be assessed, in all development and planning procedures, using a precautionary approach"; and,* *"Terrestrial areas adjoining freshwater, estuarine and coastal habitats should be carefully managed in order to minimise landuse impacts on these aquatic habitats. As a precautionary approach, foreshore buffer zones at least 50 metres wide should be established and*	Elements of these policies and guidelines will provide direction as to the protection of aquatic habitat during the preparation and implementation of the waterway master plans.

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
	maintained, with their natural features and vegetation prescribed….".	
State Environmental Planning Policy *(SEPP)* 19 – Bushland in Urban Areas	SEPP 19 offers protection to natural bushland on areas zoned or reserved for public open space purposes	Where any works or activities to be implemented through the masterplan impacts on areas of urban bushland, the provisions of SEPP 19 will apply. Those provisions relate to the extent that the Council must consider the conservation of any bushland proposed to be disturbed.
LOCAL GOVERNMENT		
Draft Parramatta Local Environmental Plan *(LEP)* 2008	Draft Parramatta LEP 2008 describes the planning controls which apply to landuse zones throughout the Parramatta local government area. Most of the land within the riparian corridor is zoned: • E2 - Environmental conservation • RE1 – Public recreation	Any action or work required through implementation of the Masterplan will be prepared in accordance with the objectives and requirements of the relevant land use zone.
Draft Parramatta Development Control Plan *(DCP)* 2008	The Draft DCP 2008 provides controls to support the standards set down in the Draft PLEP 2008. This document will consolidate all of Council's existing DCPs into a single document. The controls will include requirements for such issues as setbacks.	Future actions or works proposed to be implemented through the Masterplans will be assessed against the appropriate performance standards set down in Parramatta's Draft DCP 2008.
Parramatta City Centre Plan 2001	The City Centre Plan complements and reinforces the aims and objectives of State Regional Environmental Plan No. 28 *(Parramatta) (SREP 28)* 1999 by establishing guidelines and controls for the built form of Parramatta City Centre. The Plan facilitates the establishment of Parramatta City Centre as an attractive, safe and vibrant city.	Future actions or works proposed to be implemented through the Masterplans which affect the City Centre area will be assessed against the appropriate performance standards set down in Parramatta City Centre Plan 2001.

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Legislation or Policy Title	Description Summary	Effects on Maintenance and Rehabilitation Activities in Waterway Corridors
Parramatta City Council Tree Preservation Order	The purpose of Council's Tree Preservation Order is to: "*establish procedures for the proper management of trees in order to minimise the unnecessary loss of significant tree resources*".	Any activity or work required through implementation of the Masterplans, where trees or bushland may be impacted, will require consent under Council's Tree Preservation Order.
Stormwater Management Plans *(various catchments)*	During 1997, the NSW Environment Protection Authority *(EPA)* issued Notices to Councils in NSW requiring the preparation of Stormwater Management Plans *(SMPs)* for catchments under each Council's management. In metropolitan Sydney, most of the SMPs were completed and submitted to the EPA during 1999 and 2000.	Development of a "*Vision*" for each of Council's waterway corridors will be assisted by the range of catchment values developed during preparation of SMPs. It is expected that waterway Masterplans will be consistent with the aims and objectives of each relevant SMP.
Stormwater Management Plans *(various catchments) (cont'd)*	Each plan described existing catchment conditions, and established catchment values through a process of consultation. Management options and implementation strategies were developed to achieve aims and objectives set out in the SMPs.	
Upper Parramatta River Catchment Trust: Green Corridors Vegetation Management Strategy	The Green Corridor Vegetation Management Strategy identifies a network of green corridors in the Upper Parramatta River catchment, which are to be protected and managed for biodiversity conservation. The strategy also provides an overview of the catchment's indigenous vegetation and habitat and identifies opportunities for achieving their conservation and enhancement.	Having regard to the rehabilitation of riparian vegetation along waterway corridors and the conservation of biodiversity, actions and implementation strategies proposed in waterway Masterplans should be consistent with those identified in the Green Corridors Vegetation Management Strategy.

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Appendix B Geomorphic characteristics of each segment

Refer to Figure 7 for map showing location of each stream segment and its classification. Descriptions of each category are provided in the Geomorphic Assessment report in Volume 3.

Stream Classification Number	Pre-European River Style	River Style	Level II Stream Type	Geomorphic stability	Indicative Condition	Recovery Potential	Controls	Geomorphic Unit	Valley Setting	Bedrock Controls	Stream Restoration Target
1	(estuarine) low sinuosity fine grained	(estuarine) low sinuosity fine grained	f	moderately unstable	good	high		estuarine pool/riffle	LUC estuarine		Target Not Specified
2	(estuarine) low sinuosity fine grained	(estuarine) low sinuosity fine grained	f	moderately unstable	moderately impacted	moderate		estuarine pool/riffle	LUC estuarine		Target Not Specified
3	low sinuosity planform-controlled discontinuous floodplain	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
4	headwater	headwater	b	moderately unstable	good	high		pool/riffle	PC discontinuous floodplain		Target 14
5	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	moderately unstable	good	high		pool/riffle	PC discontinuous floodplain		Target 1
6	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	moderately impacted	moderate		riffle/pool	PC discontinuous floodplain		Target 2
7	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	moderately unstable	moderately impacted	high	bedrock control	riffle	PC discontinuous floodplain		Target 1
8	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	moderately impacted	moderate		pool/riffle	PC discontinuous floodplain		Target 2
9	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	moderately impacted	moderate		pool/riffle	PC		Target 2
10	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	moderately impacted	moderate		pool/riffle	PC discontinuous floodplain		Target 2
11	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	moderately impacted	moderate		pool/riffle	PC		Target 2

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Stream Classification Number	Pre-European River Style	River Style	Level II Stream Type	Geomorphic stability	Indicative Condition	Recovery Potential	Controls	Geomorphic Unit	Valley Setting	Bedrock Controls	Stream Restoration Target
12	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	g	highly unstable	moderately impacted	moderate		pool/riffle	PC		Target 3
13	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	g	unstable	moderately impacted	moderate		pool/riffle	PC		Target 3
14	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	moderately unstable	moderately impacted	high		pool/riffle	PC		Target 1
15	low sinuosity planform-controlled discontinuous floodplain	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
16	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	moderately unstable	moderately impacted	high		pool/riffle	PC		Target 1
17	headwater	headwater	b/g	unstable	moderately impacted	moderate	isolated bedrock controls	bedrock controlled headwater	PC		Target 16
18	chain of ponds,intact valley fill	low sinuosity fine grain	f	(acceting) moderately unstable	moderately impacted	moderate	isolated bedrock controls	headwater gully	PC		Target 8
19	headwater	headwater	b/g	highly unstable	degraded	moderate		pool/riffle	PC		Target 16
20	headwater	headwater	b	moderately unstable	good	high	bedrock controlled	pool/riffle	PC	bedrock controlled stream bed	Target 15
21	headwater	headwater	b	moderately unstable	good	high		pool/riffle	PC		Target 14
22	headwater	headwater	b	stable	good	conservation	bedrock controlled	bedrock riffle	PC	bedrock controlled stream bed	Target 14
23	headwater	headwater	b	unstable	degraded	moderate		degraded stream bed	PC		Target 14
24	low sinuosity planform-controlled discontinuous floodplain	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
25	headwater	headwater	b	moderately unstable	good	high	isolated bedrock controls	pool/riffle	PC	isolated bedrock controlled	Target 14

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Stream Classification Number	Pre-European River Style	River Style	Level II Stream Type	Geomorphic stability	Indicative Condition	Recovery Potential	Controls	Geomorphic Unit	Valley Setting	Bedrock Controls	Stream Restoration Target
										stream bed	
26	headwater	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
27	headwater	headwater	b	stable	good	conservation	bedrock controlled	riffle/pool	PC	bedrock controlled stream bed	Target 14
28	low sinuosity fine grain	low sinuosity fine grain	g	unstable	degraded	moderate		glide	PC		Target 7
29	low sinuosity fine grain	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
30	low sinuosity fine grain	low sinuosity fine grain	g	unstable	degraded	moderate		degraded stream bed	PC		Target 7
31	chain of ponds,intact valley fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
32	chain of ponds,intact valley fill	chain of ponds,intact valley fill	e	stable	good	conservation	modified drainage	intact fill	LUC		Target 9
33	chain of ponds,intact valley fill	low sinuosity fine grain	e/g	moderately unstable	good	high	modified drainage	pool/riffle	LUC		Target 9
34	chain of ponds,intact valley fill	chain of ponds,intact valley fill	e	moderately unstable	good	high	modified drainage	intact fill	LUC		Target 10
35	low sinuosity fine grain	low sinuosity fine grain	e	moderately unstable		high		low slope headwater	headwater low slope		Target 5
36	chain of ponds,intact valley fill	chain of ponds,intact valley fill	e	stable	good	conservation	modified drainage	intact fill	LUC		Target 9
37	chain of ponds,intact valley fill	channelized fill	e	stable	moderately impacted	moderate	modified drainage	degraded stream bed	LUC		Target 11
38	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	f	(acceting) unstable	degraded	moderate		pool/riffle	PC		Target 4
39	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e/g	unstable	degraded	moderate		pool/riffle	PC discontinuous floodplain		Target 2
40	headwater	headwater	b/g	unstable	degraded	moderate		pool/riffle	PC discontinuous floodplain		Target 16
41	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	stable	very good condition	conservation	bedrock controlled	pool/riffle	PC bedrock controlled discontinuous flood	bedrock controlled stream bed	Target 1
42	headwater	headwater	b	moderately unstable	good	high	isolated bedrock	bedrock controlled	PC	isolated bedrock	Target 15

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Stream Classification Number	Pre-European River Style	River Style	Level II Stream Type	Geomorphic stability	Indicative Condition	Recovery Potential	Controls	Geomorphic Unit	Valley Setting	Bedrock Controls	Stream Restoration Target
							controls	headwater		controlled stream bed	
43	headwater	bridge/culvert	b	stable	good	conservation	isolated bedrock controls	bedrock controlled headwater	headwater	isolated bedrock controlled stream bed	bridge/culvert
44	headwater	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
45	chain of ponds,intact valley fill	low sinuosity fine grain	f	(acceting) moderately unstable	moderately impacted	moderate	isolated bedrock controls	bedrock controlled headwater	PC		Target 8
46	chain of ponds,intact valley fill	low sinuosity fine grain	f	(acceting) moderately unstable	moderately impacted	moderate	isolated bedrock controls	headwater gully	PC		Target 8
47	low sinuosity fine grain	low sinuosity fine grain	e/g	moderately unstable	moderately impacted	moderate		low slope headwater	PC		Target 6
48	chain of ponds,intact valley fill	low sinuosity fine grain	weir pond	stable	good	high	weir	weir pond	PC		weir pond
49	chain of ponds,intact valley fill	low sinuosity fine grain	e/g	unstable	moderately impacted	moderate		low slope headwater	headwater low slope		Target 6
50	chain of ponds,intact valley fill	low sinuosity fine grain	f	(acceting) moderately unstable	moderately impacted	high		low slope headwater	headwater low slope		Target 8
51	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	e	moderately unstable	very good condition	conservation	bedrock controlled	bedrock waterfall	PC discontinuous floodplain	bedrock controlled stream bed	Target 1
52	low sinuosity fine grain	low sinuosity fine grain	c	moderately unstable	good	high	bedrock controlled	pool/riffle	PC discontinuous floodplain	bedrock controlled stream bed	Target 5
53	low sinuosity fine grain	low sinuosity fine grain	c	unstable	good	high	bedrock controlled	pool/riffle	PC discontinuous floodplain	bedrock controlled stream bed	Target 5
54	low sinuosity fine grain	low sinuosity fine grain	c	moderately unstable	good	high	bedrock controlled	pool/riffle	PC discontinuous floodplain	bedrock controlled stream bed	Target 5
55	low sinuosity fine grain	low sinuosity fine grain	c	moderately unstable	good	high		pool/riffle	PC discontinuous floodplain		Target 6
56	low sinuosity fine grain	channelized fill	e/g	highly unstable	moderately impacted	moderate		pool/riffle	PC discontinuous floodplain		Target 6
57	low sinuosity fine grain	low sinuosity fine grain	e/g	unstable	moderately impacted	moderate		pool/riffle	PC discontinuous floodplain		Target 6
58	low sinuosity	channelized	g	highly	moderately	low		pool/riffle	PC		Target 11

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	fine grain	fill		unstable	impacted				discontinuous floodplain		
59	chain of ponds,intact valley fill	low sinuosity fine grain	e	moderately unstable	moderately impacted	high		pool/riffle	PC discontinuous floodplain		Target 5
60	chain of ponds,intact valley fill	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
61	chain of ponds,intact valley fill	low sinuosity fine grain	e	moderately unstable	moderately impacted	high		pool/riffle	PC discontinuous floodplain		Target 5
62	chain of ponds,intact valley fill	channelized fill	g	highly unstable	degraded	low		pool/riffle	PC discontinuous floodplain		Target 11
63	chain of ponds,intact valley fill	low sinuosity fine grain	e	moderately unstable	moderately impacted	moderate		weir pond	PC discontinuous floodplain		Target 5
64	chain of ponds,intact valley fill	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
65	chain of ponds,intact valley fill	channelized fill	g	highly unstable	degraded	low		degraded stream bed	LUC		Target 11
66	chain of ponds,intact valley fill	channelized fill	g	highly unstable	degraded	low		degraded stream bed	PC discontinuous floodplain		Target 11
67	chain of ponds,intact valley fill	channelized fill	e/g	unstable	moderately impacted	moderate		pool/riffle	LUC		Target 6
68	headwater	headwater	b	moderately unstable	good	high		intact headwater gully	headwater		Target 14
69	chain of ponds,intact valley fill	channelized fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
70	chain of ponds,intact valley fill	channelized fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
71	chain of ponds,intact valley fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
72	chain of ponds,intact valley fill	channelized fill	g	unstable	moderately impacted	moderate		degraded stream bed	LUC		Target 11
73	chain of ponds,intact valley fill	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
74	chain of ponds,intact valley fill	channelized fill	g	highly unstable	moderately impacted	moderate		degraded stream bed	LUC		Target 11
75	chain of ponds,intact valley fill	channelized fill	g	moderately unstable	moderately impacted	moderate		degraded stream bed	LUC		Target 11

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76	chain of ponds,intact valley fill	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
76	chain of ponds,intact valley fill	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
77	chain of ponds,intact valley fill	channelized fill	f	(acceting) unstable	moderately impacted	moderate		sedimentation in channel	headwater		Target 12
78	chain of ponds,intact valley fill	channelized fill	f	(acceting) unstable	moderately impacted	moderate		sedimentation in channel	headwater		Target 12
79	low sinuosity fine grain	channelized fill	g	highly unstable	moderately impacted	moderate		degraded stream bed	headwater		Target 11
80	low sinuosity fine grain	headwater	b/g	highly unstable	moderately impacted	moderate		degraded stream bed	headwater		Target 16
81	headwater	headwater	b	moderately unstable	good	high		intact headwater gully	headwater		Target 14
82	chain of ponds,intact valley fill	channelized fill	f	(acceting) moderately unstable	degraded	moderate		sedimentation in channel	PC discontinuous floodplain		Target 12
83	chain of ponds,intact valley fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
84	chain of ponds,intact valley fill	channelized fill	f	(acceting) moderately unstable	moderately impacted	moderate		glide	LUC		Target 12
85	chain of ponds,intact valley fill	channelized fill	f	(acceting) moderately unstable	moderately impacted	moderate		wetland	LUC		Target 12
86	chain of ponds,intact valley fill	low sinuosity fine grain	f	(acceting) moderately unstable	moderately impacted	moderate		pool/riffle	LUC		Target 8
87	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets	f	(acceting) moderately unstable	moderately impacted	high		pool/riffle	LUC		Target 4
88	low sinuosity planform-controlled discontinuous floodplain	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
89	headwater	headwater	b	moderately unstable	good	conservation	isolated bedrock controls	step pool/riffles	PC discontinuous floodplain	isolated bedrock controlled stream bed	Target 14
90	chain of ponds,intact valley fill	channelized fill	e	stable	moderately impacted	moderate	modified drainage	degraded stream bed	LUC		Target 11
91	headwater	headwater							PC		Target 2

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	with occasional floodplain pockets	with occasional floodplain pockets							discontinuous floodplain		
92	headwater	headwater	b	stable	good	conservation	isolated bedrock controls	bedrock controlled headwater	headwater	isolated bedrock controlled stream bed	Target 14
93	headwater	headwater	b	stable	good	conservation	isolated bedrock controls	bedrock controlled headwater	headwater	isolated bedrock controlled stream bed	Target 14
94	headwater with occasional floodplain pockets	headwater with occasional floodplain pockets							PC discontinuous floodplain		Target 2
95	(estuarine) low sinuosity fine grained	(estuarine) low sinuosity fine grained	f	moderately unstable	good	high		estuarine pool/riffle	LUC estuarine		Target Not Specified
96	headwater	headwater	b	stable	good	conservation	isolated bedrock controls	bedrock controlled headwater	headwater	isolated bedrock controlled stream bed	Target 14
97	headwater	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
98	headwater	headwater	a	moderately unstable	good	conservation	bedrock controlled	bedrock controlled headwater	headwater	bedrock controlled stream bed	Target 13
99	headwater	headwater	b	stable	good	high		low slope headwater	headwater		Target 14
100	headwater	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
101	headwater	headwater	b	stable	good	high		low slope headwater	headwater		Target 14
102	headwater	headwater	b	moderately unstable	good	high		headwater	headwater		Target 14
103	headwater	headwater	b	stable	good	high		low slope headwater	headwater		Target 14
104	headwater	headwater	b	moderately unstable	good	high		headwater	headwater		Target 14
105	chain of ponds,intact valley fill	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage	modified drainage		modified drainage
106	headwater	headwater	b	moderately unstable	moderately impacted	moderate		low slope headwater	headwater		Target 14
107	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert	bridge/culvert		bridge/culvert
108	headwater	headwater	b	moderately unstable	moderately impacted	moderate		low slope headwater	headwater		Target 14
109	headwater	headwater	b	stable	good	high	bedrock	bedrock	headwater	bedrock	Target 14

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							controlled	controlled headwater		controlled stream bed	
110	headwater	headwater	b	moderately unstable	moderately impacted	moderate		low slope headwater	headwater		Target 14

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Appendix C Results of macroinvertebrate sampling in Ponds and Subiaco Creeks

Class / Order	SIGNAL score	Families present	Common name	Site 1	Site 2	Site 3	Site 4	Site 5
Amphipoda	3		Side swimmers / scuds	0	0	0	2	0
Coleoptera	5	Hydrophilidae, Coccinellidae	Water scavenger beetle, lady beetle	2	0	0	1	0
Gastropoda	1	Planorbidae	Freshwater snail	9	2	6	8	1
Hemiptera	2	Gerridae, Notonectidae, Veliidae	Water striders, back swimmers	8	15	15	0	0
Hirudnea	1		Leech	0	0	1	0	0
Lepidoptera	2		Aquatic caterpillar	0	1	0	0	0
Odonata	3	Coenagrionidae, Corduliidae / Libellulidae, Petaluridae	Dragonflies	10	2	18	0	5
Oligochaeta	2		Segmented worms	0	5	3	2	0
Amphibia	no signal score		Tadpole	0	0	1	0	0
Arachnida		Tetragnathidae	Long jawed spider	0	0	0	0	1
Polychaeta			Worm	8	3	0	0	0
Cyprinodontiformes		Poeciliidae	Mosquito fish (*Gambusia*)	1	0	0	0	5
Myriapoda			Millipede	0	0	0	1	0
			TOTAL INDIVIDUALS	**38**	**28**	**44**	**14**	**12**
			Sum signal scores	11	10	9	11	4
			Number of Classes / Orders	4	5	5	4	2
			SIGNAL SCORE	**2.75**	**2**	**1.8**	**2.75**	**2**

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Appendix D Flora observed during field investigation

Reach 1

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Casuarina glauca*	Swamp Oak	*Salix spp.*	
	Avicennia marina	Grey Mangrove		
Mid			*Cardiospermum grandiflorum*	Balloon vine
			Ipomoea purpurea	Common Morning Glory
			Lantana camara	Lantana

Reach 2

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus piperita*	Sydney Peppermint	*Cinnamomum camphora*	Camphor Laurel
	Eucalyptus saligna	Sydney Blue Gum	*Ligustrum lucidum*	Large-leaved Privet
			Ligustrum sinense	Small-leaved Privet
	Angophora costata	Sydney Red/Rusty Gum		
Mid	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	*Lantana camara*	Lantana
	Trema tomentosa	Native Peach	*Ricinus communis*	Castor Oil Plant
	Indigofera australis		*Anredera cordifolia*	Madeira Vine
Ground	*Pteridium esculentum*	Bracken	*Ipomoea purpurea*	Common Morning Glory
	Commelina cyanea	Native Wandering Jew	*Cardiospermum grandiflorum*	Balloon vine
Aquatic	*Typha spp.*		*Colocasia esculenta*	Elephant ears

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Reach 3

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
		Stringybark		
	Syncarpia glomulifera	Turpentine		
	Angophora costata	Sydney Red/Rusty Gum		
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Nicotiana tabacum*	Tobacco
	Pittosporum revolutum	Rough Fruit Pittosporum	*Ligustrum sinense*	Small-leaved Privet
	Acacia parramattensis	Parramatta Wattle	*Lantana camara*	Lantana
	Acmena smithii	Lilly Pilly		
Ground	*Lomandra longifolia*	Spiny-headed Mat-rush	*Tradescantia spp.*	Wandering Jew
	Commelina cyanea	Native Wandering Jew	*Delairea odorata*	Cape Ivy
			Anredera cordifolia	Madeira Vine
			Cardiospermum grandiflorum	Balloon vine

Reach 4

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus pilularis*	Blackbutt		
	Syncarpia glomulifera	Turpentine		
	Angophora floribunda	Rough-barked Apple		
	Angophora costata	Sydney Red/Rusty Gum		
		Stringybark		
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Lantana camara*	Lantana
	Acacia parramattensis	Parramatta Wattle	*Ricinus communis*	Castor Oil Plant
	Trema tomentosa		*Nicotiana tabacum*	Tobacco
			Ligustrum lucidum	Large-leaved Privet
Ground	*Dichondra repens*	Kidney Weed	*Cardiospermum grandiflorum*	Balloon vine
	Smilax glyciphylla	Sweet Sarsparilla	*Acetosa sagittata*	Rambling Dock

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Strata	Natives		Weeds	
			Ageratina adenophora	Crofton Weed
Aquatic			*Arundo donax*	False bamboo

Reaches 5 and 6 (piped)

Reach 7

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum	*Salix sp.*	
	Allocasuarina spp.			
	Angophora floribunda	Rough-barked Apple		
Mid	*Pittosporum undulatum*	Sweet Pittosporum		
	Glochidion ferdinandi	Cheese Tree		
	Melaleuca styphelioides	Prickly-leaved Tea Tree		
	Callistemon viminalis	Weeping Bottlebrush		
Ground	*Lomandra longifolia*	Spiny-headed Mat-rush		
Aquatic	*Typha spp.*			

Reach 8

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Casuarina glauca*	Swamp Oak		
	Populus sp	Poplars		
Mid	*Melaleuca styphelioides*	Prickly-leaved Tea Tree		
	Acmena smithii	Lilly Pilly		
Ground	*Lomandra longifolia*	Spiny-headed Mat-rush		

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Reach 9

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Casuarina glauca*	Swamp Oak		
	Eucalyptus saligna	Sydney Blue Gum		
	Syncarpia glomulifera	Turpentine		
Mid	*Pittosporum undulatum*	Sweet Pittosporum		

Reach 10

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus pilularis*	Blackbutt	*Cinnamomum camphora*	Camphor Laurel
	Angophora costata	Sydney Red/Rusty Gum		
	Angophora floribunda	Rough-barked Apple		
		Stringybark		
Mid	*Syncarpia glomulifera*	Turpentine	*Ligustrum sinense*	Small-leaved Privet
			Lantana camara	Lantana
			Nicotiana tabacum	Tobacco
			Ricinus communis	Castor Oil Plant
Ground	*Commelina cyanea*	Native Wandering Jew	*Anredera cordifolia*	Madeira Vine
			Cardiospermum grandiflorum	Balloon vine
			Asparagus plumosus	Climbing Asparagus Fern
			Hedera helix	Ivy
Aquatic			*Colocasia esculenta*	Elephant ears
			Bryophyllum pinnatum	Resurrection Plant

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Reach 11

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Angophora costata*	Sydney Red/Rusty Gum	*Salix sp.*	
	Syncarpia glomulifera	Turpentine		
	Eucalyptus pilularis	Blackbutt		
Mid	*Acacia parramattensis (dominant)*	Parramatta Wattle	*Ligustrum sinense*	Small-leaved Privet
	Pittosporum undulatum	Sweet Pittosporum	*Lantana camara*	Lantana
Ground	*Lomandra longifolia*	Spiny-headed Mat-rush	*Tradescantia spp.*	Wandering Jew
	Pteridium esculentum	Bracken	*Cardiospermum grandiflorum*	Balloon vine
	Dianella spp.			
Aquatic	*Typha sp.*		*Cyperus papyrus*	Egyptian papyrus

Reach 12

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Syncarpia glomulifera*	Turpentine		
	Angophora costata	Sydney Red/Rusty Gum		
	Eucalyptus pilularis	Blackbutt		
Mid	*Trema tomentosa*			
	Melaleuca linariifolia			
	Acacia parramattensis	Parramatta Wattle		
	Pittosporum revolutum	Rough Fruit Pittosporum		
Ground	*Commelina cyanea*	Native Wandering Jew		
	Lomandra longifolia	Spiny-headed Mat-rush		
Aquatic	*Callistemon salignus*	Willow Bottlebrush	*Canna x generalis*	Canna lily
			Pennisetum clandestinum	Kikuyu

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Reach 13

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Syncarpia glomulifera*	Turpentine	*Erythrina X sykesii*	Coral tree
	Eucalyptus saligna	Sydney Blue Gum	*Cinnamomum camphora*	Camphor Laurel
	Angophora costata	Sydney Red/Rusty Gum	*Salix sp*	
Mid	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	*Lantana camara*	Lantana
	Trema tomentosa		*Ipomoea purpurea*	Common Morning Glory
	Melaleuca linariifolia		*Ageratina adenophora*	Crofton Weed
	Acacia falcata?		*Solanum nigrum*	Black-berry Nightshade
	Lasiopetalum ferrugineum?		*Ligustrum sinense*	Small-leaved Privet
			Ligustrum lucidum	Large-leaved Privet
	Ceratopetalum gummiferum	Christmas Bush		
Ground	*Dianella spp.*		*Acetosa sagittata*	Rambling Dock
	Commelina cyanea	Native Wandering Jew	*Stellaria media*	Chickweed (dominant)
	Pandorea pandorana	Wonga Wonga Vine	*Cardiospermum grandiflorum*	Balloon vine
			Ricinus communis	Castor Oil Plant
			Cinnamomum camphora	Camphor Laurel
			Tradescantia albiflora	Wandering Jew
Aquatic	*Callistemon salignus*	Willow Bottlebrush	*Anredera cordifolia*	Madeira Vine
			Myriophyllum aquaticum	Parrots Feathers

Reach 14

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
	Grevillea robusta	Silky Oak		
Mid	*Trema tomentosa*		*Lantana camara*	Lantana
			Ageratina adenophora	Crofton Weed
			Ligustrum sinense	Small-leaved Privet

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Strata	Natives		Weeds	
			Ligustrum lucidum	Large-leaved Privet
Ground	*Pteridium esculentum*	Bracken	*Cardiospermum grandiflorum*	Balloon vine
			Ipomoea purpurea	Common Morning Glory
			Asparagus plumosus	Climbing Asparagus Fern

Reach 15

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Grevillea robusta*	Silky Oak		
Mid			*Lantana camara*	Lantana
			Nicotiana tabacum	Tobacco
			Ricinus communis	Castor Oil Plant
Ground	*Pteridium esculentum*	Bracken	*Cardiospermum grandiflorum*	Balloon vine
			Ipomoea purpurea	Common Morning Glory
Aquatic			*Colocasia esculenta*	Elephant ears

Reach 16

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus crebra*	Narrow-leaved Ironbark		
	Eucalyptus piperita	Sydney Peppermint		
	Eucalyptus tereticornis	Forest Red Gum		
Mid	*Glochidion ferdinandi*	Cheese Tree	*Lantana camara*	Lantana
	Pittosporum undulatum	Sweet Pittosporum	*Ligustrum sinense*	Small-leaved Privet
			Ligustrum lucidum	Large-leaved Privet
	Acacia parramattensis	Parramatta Wattle	*Anredera cordifolia*	Madeira Vine
Ground	*Dichondra repens*	Kidney Weed	*Tradescantia spp.*	Wandering Jew
	Commelina cyanea	Native Wandering Jew	*Ageratina adenophora*	Crofton Weed

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Reach 17

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus piperita*	Sydney Peppermint		
	Eucalyptus saligna	Sydney Blue Gum		
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Senna spp.*	
	Syncarpia glomulifera	Turpentine	*Anredera cordifolia*	Madeira Vine
	Glochidion ferdinandi	Cheese Tree		
Ground			*Ageratina adenophora*	Crofton Weed
			Tradescantia spp.	Wandering Jew
			Cardiospermum grandiflorum	Balloon vine

Reach 18

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus piperita*	Sydney Peppermint		
	Eucalyptus saligna	Sydney Blue Gum		
	Eucalyptus crebra	Narrow-leaved Ironbark		
	Eucalyptus tereticornis	Forest Red Gum		
	Eucalyptus fibrosa	Red Ironbark		
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Lantana camara*	Lantana
	Bursaria spp.		*Anredera cordifolia*	Madeira Vine
	Zieria sp		*Ligustrum sinense*	Small-leaved Privet
	Glycine spp.		*Ligustrum lucidum*	Large-leaved Privet
	Glochidion ferdinandi	Cheese Tree		
Ground	*Pteridium esculentum*	Bracken	*Ageratina adenophora*	Crofton Weed
	Commelina cyanea		*Tradescantia spp.*	Wandering Jew
	Dichondra repens	Kidney Weed		

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Reach 19

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus tereticornis*	Forest Red Gum		
	Angophora costata	Sydney Red/Rusty Gum		
	Angophora floribunda	Rough-barked Apple		
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Lantana camara*	Lantana
	Glochidion ferdinandi	Cheese Tree		
	Pittosporum revolutum	Rough Fruit Pittosporum		
	Trema tomentosa	Native Peach		
Ground	*Oplismenus spp.*		*Ageratina adenophora*	Crofton Weed
	Dichondra repens	Kidney Weed		
	Entolasia spp.			
Aquatic	*Ludwigia spp.*			

Reach 20

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Mid	*Pittosporum undulatum*	Sweet Pittosporum	*Lantana camara*	Lantana
	Acacia parramattensis	Parramatta Wattle	*Ligustrum sinense*	Small-leaved Privet
	Polyscias sambucifolic		*Ligustrum lucidum*	Large-leaved Privet
	Trema tomentosa	Native Peach		
	Olearia spp.			
	Bursaria spp.			
Ground	*Cissus antarctica*			Paspalum spp.
	Entolasia marginata	Bordered Panic		
	Clematis spp.			
Aquatic	*Ludwigia spp.*		*Myriophyllum aquaticum*	Parrots Feathers

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Reach 21

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus tereticornis*	Forest Red Gum		
Mid	*Acacia parramattensis*	Parramatta Wattle	*Lantana camara*	Lantana
	Bursaria spinosa		*Ligustrum sinense*	Small-leaved Privet
			Ligustrum lucidum	Large-leaved Privet
Ground	*Cissns antarctics*			Paspalum spp. (dominant)
	Entolasia marginata		*Rubus spp.*	Blackberry
	Clematis spp.		*Pennisetum clandestinum*	Kikuyu
Aquatic	*Ludwigia spp.*			

Reach 22

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
	Syncarpia glomulifera	Turpentine		
	Eucalyptus paniculata	Grey Ironbark		
	Angophora costata	Sydney Red/Rusty Gum		
	Glochidion ferdinandi	Cheese Tree		
Mid	*Acacia parramattensis*	Parramatta Wattle	*Lantana camara*	Lantana
	Bursaria spinosa		*Anredera cordifolia*	Madeira Vine
	Trema tomentosa	Native Peach	*Ligustrum sinense*	Small-leaved Privet
	Pittosporum undulatum	Sweet Pittosporum	*Ligustrum lucidum*	Large-leaved Privet
Ground	*Commelina cyanea*		*Ageratina adenophora*	Crofton Weed
	Pteridium esculentum	Bracken	*Hedera helix*	Ivy
	Entolasic		*Pennisetum clandestinum*	Kikuyu
	Oplismenus spp.		*Tradescantia spp.*	Wandering Jew
	Clematis spp.			

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Reach 23

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
Mid			*Lantana camara*	Lantana
			Ligustrum sinense	Small-leaved Privet
			Ligustrum lucidum	Large-leaved Privet
			Nicotiana tabacum	Tobacco
			Cinnamomum camphora	Camphor Laurel
			Erythrina X sykesii	Coral tree
Ground			*Ageratina adenophora*	Crofton Weed
	Pteridium esculentum	Bracken	*Senna spp.*	
			Anredera cordifolia	Madeira Vine

Reach 24

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper		Stringybark		
	Angophora floribunda	Rough-barked Apple		
	Grevillea robusta	Silky Oak		
	Acmena smithii	Lilly Pilly		
Mid	*Trema tomentosa*	Native Peach	*Lantana camara*	Lantana
	Pittosporum revolutum	Rough Fruit Pittosporum	*Senna spp.*	
	Breynia oblongifolia	Coffee Bush	*Nicotiana tabacum*	Tobacco
Ground			*Ageratina adenophora*	Crofton Weed
	Pteridium esculentum	Bracken	*Tradescantia spp.*	Wandering Jew
			Anredera cordifolia	Madeira Vine

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Reach 25

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
Mid	*Acacia parramattensis*	Parramatta Wattle	*Erythrina X sykesii*	Coral tree
	Pittosporum revolutum	Rough Fruit Pittosporum	*Anredera cordifolia*	Madeira Vine
	Melaleuca styphelioides	Prickly-leaved Tea Tree	*Ligustrum sinense*	Small-leaved Privet
	Bursaria spinosa			
	Acmena smithii	Lilly Pilly		
Ground	*Trema tomentosa*	Native Peach	*Ageratina adenophora*	Crofton Weed
	Pteridium esculentum	Bracken	*Tradescantia spp.*	Wandering Jew
	Persoonia linearis	Narrow-leaved Geebung	*Cardiospermum grandiflorum*	Balloon vine

Reach 26 (piped)

Reach 27

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus tereticornis*	Forest Red Gum		
	Syncarpia glomulifera	Turpentine		
Mid	*Acacia parramattensis*	Parramatta Wattle		
	Glochidion ferdinandi	Cheese Tree		
	Trema tomentosa	Native Peach		
Ground	*Commelina cyanea*		*Ageratina adenophora*	Crofton Weed
			Tradescantia spp.	Wandering Jew
Aquatic	*Typha orientalis*		*Colocasia esculenta*	Elephant ears

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Reach 28

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Lophostemon confertus*	Brushbox (planted?)		
	Syncarpia glomulifera	Turpentine		
	Eucalyptus robusta	Swamp Mahogany (planted?)		
	Eucalyptus resinifera	Red Mahogany (planted?)		
Mid	*Acacia parramattensis*	Parramatta Wattle	*Senna spp.*	
			Nicotiana tabacum	Tobacco
			Lantana camara	Lantana
			Anredera cordifolia	Madeira Vine
Ground	*Pteridium esculentum*	Bracken	*Ageratina adenophora*	Crofton Weed
			Ligustrum sinense	Small-leaved Privet
Aquatic			*Colocasia esculenta*	Elephant ears

Reach 29

Strata	Natives		Weeds	
	Scientific name	**Common name**	**Scientific name**	**Common name**
Upper	*Eucalyptus saligna*	Sydney Blue Gum		
	Syncarpia glomulifera	Turpentine Stringybark		
Mid	*Acacia parramattensis*	Parramatta Wattle		
	Notelaea spp.			
Ground	*Cyathea sp.*	Tree Fern	*Ageratina adenophora*	Crofton Weed
	Commelina cyanea		*Anredera cordifolia*	Madeira Vine
			Cardiospermum grandiflorum	Balloon vine

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Appendix E Fauna recorded in the catchment

This list has been compiled using data provided by Council. It includes observations by the community, council officers and consultants.

Common name	Scientific name
Bird	
Brown Quail	*Coturnix ypsilophora*
Satin Bowerbird	*Ptilonorhychus violaceus*
Sacred Kingfisher	*Todiramphus sanctus*
Straw-necked Ibis	*Threskiornis spinicollis*
Eastern Whipbird	*Psophodes olivaceus*
Satin Bowerbird	*Ptilonorhynchus violaceus*
King Parrot	*Alisterus scapularis*
Eastern Rosella	*Platycerus eximius*
White-browed Scrubwren	*Sericornis frontalis*
Buff-banded Rail	*Gallirallus philippensis*
Crimson Rosella	*Platycerus elegans*
Crested pigeon	*Ocyphaps lophotes*
Pied Currawong	*Strepera graculina*
Eastern Spinebill	*Acantorhynchus tenuirostris*
Spotted Pardalote	*Pardalotus punctatus*
Masked Lapwing	*Vanellus miles*
Tawny Frogmouth	*Podargus strigoides*
Red Wattlebird	*Anthochaera carunculata*
Straw-necked Ibis	*Threskiomis spinicollis*
Red-browed Firetail	*Neochmia temporalis*
King-Parrot	*Alisterus scapularis*
Australian Raven	*Corvus coronoides*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Chestnut Teal	*Anas castanea*
Galah	*Cacatua roseicapilla*
Laughing Kookaburra	*Dacelo novaeguineae*
Common Koel	*Eudynamys scolopacea*
Grey Butcherbird	*Cracticus torquatus*
Little Corella	*Cacatua sanguinea*
Australian Magpie	*Gymnorhina tibicen*
Tawny Frogmouth	*Podargus strigoides*
Sulphur-crested Cockatoo	*Cacatua galerita*
Magpie Lark	*Grallina cyanoleuca*
Noisy Miner	*Manorina melanocephala*
Rainbow Lorikeet	*Trichoglossus haematodus*
White-faced Heron	*Egretta novaehollandiae*
Pacific Black Duck	*Anas superciliosa*
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*
Mammal	
Short Beaked Echidna	*Tachyglossus aculeatus*
Reptile	
Eastern Long-necked Tortoise	*Chelodina longicollis*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Eastern Water Dragon	*Physignathus lesueurii*
Eastern Blue Tongue Lizard	*Tiliqua scincoides*

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Common name	Scientific name
Amphibian	
One Leaf Green tree Frog	*Litoria phyllochroa*
Invertebrates	
Blue Triangle	*Graphium sarpedon ssp. choredon*
Citrus Butterfly	*Papilio anactus*
Moonlight Jewel	*Hypochrysops delicia*
Fish	
Short-finned Ee	*Anguilla australis*
Empire Gudgeon	*Hypseleotris compressa*

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Appendix F Endangered ecological communities

The following information is taken from DECC's threatened species website (http://www.threatenedspecies.environment.nsw.gov.au).

Western Sydney Dry Rainforest

Western Sydney Dry Rainforest is a dry vine scrub community of the Cumberland Plain, western Sydney. Canopy trees include Prickly Paperbark (*Melaleuca styphelioides)*, Hickory Wattle (*Acacia implexa)* and Native Quince (*Alectryon subcinereus)*. There are many rainforest species in the shrub layer, such as Mock Olive *(Notolaea longifolia)*, Hairy Clerodendrum (*Clerodendrum tomentosum)* and Yellow Pittosporum (*Pittosporum revolutum)*. The shrub layer combines with vines, such as Gum Vine (*Aphanopetalum resinosum)*, Wonga Vine (*Pandorea pandorana)* and Slender Grape (*Cayratia clematidea)* to form dense thickets in sheltered locations.

It is restricted to hilly country where it occurs on the sheltered lower slopes and gullies. It is generally found at higher elevation, in areas receiving higher rainfall than areas of Cumberland Plain Woodland. It occurs on clay soils derived from Wianamatta shale. Rainforest plants within this vegetation are fire sensitive and dependent on the sheltered aspect and density of vegetation for protection.

Under the NSW Threatened Species Conservation (TSC) Act 1995, the Western Sydney Dry Rainforest in the Sydney Basin Bioregion is an endangered ecological community. The TSC Act defines 'endangered' as a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.

Threats to this community include:

- The main threat is further clearing for rural development, and the subsequent impacts from fragmentation. The small size of the remnants makes them particularly vulnerable to further fragmentation.
- Weed invasion, particularly African olive *Olea europaea* ssp. *africana*.
- High fire frequency, which has altered the appropriate floristic and structural diversity.

Recovery strategies include:

- Promote public involvement in restoration activities
- Apply necessary fire regimes to maintain the community's appropriate floristic and structural diversity
- Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants of the community in the land use planning process, particularly development consents, rezonings and regional planning
- Weed control
- Undertake restoration including bush regeneration and revegetation

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Turpentine-Ironbark Forest

Turpentine-Ironbark Forest has an open forest structure, with dominant canopy trees including Turpentine (*Syncarpia glomulifera)*, Grey Gum (*Eucalyptus punctata)*, Grey Ironbark (*Eucalyptus paniculate)* and Thin-leaved Stringybark (*E. eugenoides)*. In areas of high rainfall (over 1050 mm per annum) Sydney Blue Gum (*E. saligna)* is more dominant. The shrub stratum is usually sparse and may contain mesic species such as Sweet Pittosporum (*Pittosporum undulatum)* and Elderberry Panax (*Polyscias sambucifolia)*.

This vegetation community occurs close to the shale/sandstone boundary on the more fertile shale influenced soils, in higher rainfall areas on the higher altitude margins of the Cumberland Plain, and on the shale ridge caps of sandstone plateaus. It is a transitional community, between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges.

The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act* 1999 categorises Turpentine-Ironbark Forest in the Sydney Basin Bioregion as a critically endangered ecological community. This means that it is facing an extremely high risk of extinction in the wild in the immediate future.

Under the NSW Threatened Species Conservation (TSC) Act 1995, the Sydney Turpentine-Ironbark Forest is an endangered ecological community. The TSC Act defines 'endangered' as a species, population or ecological community that is likely to become extinct or is in immediate danger of extinction.

Threats to this community include:

- The main threat is further clearing for urban development, and the subsequent impacts from fragmentation
- Mowing, which stops regrowth
- Urban run-off, which leads to increased nutrients and sedimentation
- Weed invasion
- Inappropriate fire regimes, which have altered the appropriate floristic and structural diversity

Recovery strategies include:

- Promote public involvement in restoration activities.
- Apply necessary fire regimes to maintain appropriate floristic and structural diversity.
- Protect habitat by minimising further clearing of the community. This requires recognition of the values of all remnants of the community in the land use planning process, particularly development consents, rezonings and regional planning.
- Promote regrowth by avoiding unnecessary mowing.
- Protect habitat by controlling run-off entering the site if it would change water, nutrient or sediment levels or cause erosion.
- Control weeds.

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- Undertake restoration including bush regeneration and revegetation.

Coastal Saltmarsh

Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. It is frequently found as a zone on the landward side of mangrove stands. Characteristic plants include *Baumea juncea*, *Juncus krausii*, *Sarcocornia quinqueflora*, *Sporobolus virginicus*, *Triglochin striata*, *Isolepis nodosa*, *Samolus repens*, *Selliera radicans*, *Suaeda australis* and *Zoysia macrantha*. Occasionally mangroves are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans.

Threats to this community include:

- In-filling for development, including roads, residential, industrial, recreational, waste disposal and agricultural purposes.
- Modification of tidal flows as a consequence of artificial structures being erected.
- Alteration of salinity and increasing nutrient levels resulting from the discharge of stormwater into saltmarshes.
- Weed invasion, particularly by Juncus acutus.
- Physical damage from human disturbance, domestic and feral animals.
- Dumping of rubbish and pollution from oil or chemical spills from shipping or road accidents; catchment runoff of nutrients and agricultural chemicals.
- Invasion by mangroves.
- Inappropriate fire regimes

Recovery strategies include:

- Protect areas of saltmarsh from runoff that contains high levels of nutrients or pollutants.
- Reduce the amount of sediment reaching the estuary to reduce migration of mangroves.
- Maintain buffer zones of terrestrial vegetation adjacent to saltmarsh to allow for expansion of saltmarsh and to minimise nutrient flow.
- Allow areas of saltmarsh to regenerate naturally where possible.
- Protect from clearing and development through fencing, signage and active management.
- Minimise human disturbance by preventing access from recreational vehicles, including four wheel drives.
- Erect educational signs to provide information to visitors and residents of the importance of coastal saltmarsh.
- Undertake weed control programs.
- Prohibit grazing and burning.
- Restore natural hydrological regime by removing stormwater drains or artificial structures that restrict tidal flows.
- Consult with Department of Primary Industries (formerly NSW Fisheries) to determine an appropriate mangrove management program

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Appendix G Actions

OSNR - Open Space and Natural Resources, DECC - Department of Environment and Climate Change, LUTP - Land Use and Transport Planning, Regulatory – Regulatory Services, Culture and Tourism – City Culture, Tourism and Recreation, CSU – City Strategy Unit

Reach no.	Action no.	Priority	Detail	Capital cost	Annual maintenance cost	Responsibility	Works Type
1	1.01	Med	Remove climbers and revegetate	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
1	1.02	Med	Investigate contamination	$50-100K	-	OSNR, DECC, Regulatory	Waste management
2	2.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
2	2.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
2	2.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
2	2.01d	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
2	2.02a	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
2	2.02b	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
2	2.03a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03c	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03d	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03e	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03f	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.03g	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
2	2.04h	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
2	2.05	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
2	2.06	Low	Stream restoration - Target 1 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
2	2.07	High	Stream restoration - Target 2 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
2	2.08	Med	Stream restoration - Target 3 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K	OSNR	Stream restoration
2	2.09	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
2	2.10	Med	Follow-up bush regeneration and planting at the end of Swan St	$5-15K per ha	$5-15K per ha	OSNR	Vegetation Management
2	2.11	Med	Investigate pedestrian bridge to link tracks	$20-50K	<$1K	OSNR	Research
2	2.12	Med	Primary bush regeneration	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management

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Reach no.	Action no.	Priority	Detail	Capital cost	Annual maintenance cost	Responsibility	Works Type
2	2.13	Med	Inspect stone bridge abutments and stone retaining walls in Jim Crowgey Reserve annually and record condition	-	$500 per site	Built Assets	Built asset maintenance
2	2.14	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
2	2.15	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K per site	OSNR, Culture and Tourism	Education
3	3.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
3	3.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
3	3.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
3	3.02	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details; investigate use of GPT	$20-30K	-	Built Assets	Stormwater remediation
3	3.03	Low	Stream restoration - Target 1 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
3	3.04	Low	Stream restoration - Target 8 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
3	3.05	Med	Stream restoration - Target 16 - See section 5.3 of geomorphology report for details	$30-70K per 100m	$3-5K per 100m	OSNR	Stream restoration
3	3.06	High	Follow-up bush regeneration at the end of Elm Place	$5-15K per ha	$5-15K per ha	OSNR	Vegetation Management
3	3.07	Med	Primary bush regeneration and revegetation elsewhere; avoid dense revegetation near playground	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
3	3.08	High	Prepare individual conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges	$5K to $10K per site	-	OSNR, Culture and Tourism	Built asset protection
3	3.09	High	Remove invasive vegetation on all heritage items and maintain	>$25K over 10 years	>$2.5K for all sites	OSNR	Built asset maintenance
3	3.10	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K per site	OSNR	Education
4	4.01	Low	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	Built Assets	Erosion management
4	4.02	High	Stream restoration - Target 7 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
4	4.03	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
4	4.04	High	Stream restoration - Target 15 - See section 5.3 of geomorphology report for details	$15-30K per 100m	$2K per 100m	OSNR	Stream restoration
4	4.05	High	Continue bush regeneration near Kirby St	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
4	4.06	Med	Extensive primary bush regeneration and revegetation	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
4	4.07	Med	Formalise access to prevent soil erosion	<$1-10K per 100m	<$1K per 100m	OSNR	Access management
4	4.08	High	Prepare individual conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges; retain Kirby Street bridge in situ	$5K to $10K per site	-	OSNR, Culture and Tourism	Built asset protection

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4	4.09	High	Remove invasive vegetation on all heritage items and maintain	>$25K over 10 years	>$2.5K for all sites	OSNR	Built asset Maintenance
4	4.10	High	Implement recovery plan for *Pomaderris prunifolia*	$40-50K per ha	$5-30K per ha	OSNR	Strategic management
4	4.11	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K per site	OSNR, Culture and Tourism	Education
5	5.01	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	<$1K	OSNR	Stormwater remediation
5	5.02	High	Stream restoration - Target 7 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
6	-	-	No actions identified	-	-	-	-
7	7.01	Med	Investigate potential contaminated land	$50-100K	-	OSNR	Research
7	7.02a	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
7	7.02b	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
7	7.03a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
7	7.03b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
7	7.04	Low	Stream restoration - Target 5 - See section 5.3 of geomorphology report for details	<$1-7K per 100m	<$1K per 100m	OSNR	Stream restoration
7	7.05	Low	Stream restoration - Target 9 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
7	7.06	Low	Stream restoration - Target 10 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
7	7.07	Med	Maintain bush regeneration of creekline and planted areas	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
7	7.08	Med	Revegetate understorey and groundcover, particularly at toe of bank to inhibit erosion	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
7	7.09	Med	Extend planting with safe distance of residential properties	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
7	7.10	Med	Maintain existing dirt track	<$1-10K per 100m	<$1K per 100m	OSNR	Access management
8	8.01	Med	Investigate potential contaminated land	$50-100K	-	OSNR, DECC, Regulatory	Research
8	8.02	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K per site	-	OSNR	Erosion management
8	8.03	Low	Stream restoration - Target 9 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
8	8.04	High	Remove stormwater litter and sediment from trashrack		$5-10K	Built Assets	Waste management
8	8.05	High	Investigate irrigation runoff/reuse in council nursery	$50	-	Built Assets	Research
8	8.06	Med	Revegetate to improve species diversity	$5-15K per ha	$5-15K per ha	OSNR	Vegetation Management
9	9.01	Med	Investigate potential contaminated land	$50-100K	-	OSNR, Regulatory	Research
9	9.02a	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
9	9.02b	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation

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9	9.03a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
9	9.03b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
9	9.03c	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
9	9.03d	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
9	9.03e	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
9	9.04	Low	Stream restoration - Target 9 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
9	9.05	Medium	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5k per 100m	OSNR	Stream restoration
9	9.06	Med	Revegetate banks with all strata, particulary groundcover and shrubs; maintain bush regeneration in planted areas; extend revegetation	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
10	10.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
10	10.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
10	10.02a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
10	10.02b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
10	10.02c	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
10	10.03	Low	Stream restoration - Target 1 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
10	10.04	High	Stream restoration - Target 2 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
10	10.05	Low	Stream restoration - Target 4 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
10	10.06	Med	Stream restoration - Target 16 - See section 5.3 of geomorphology report for details	$30-70K per 100m	$3-5K per 100m	OSNR	Stream restoration
10	10.07	Med	Primary bush regeneration followed by revegetation	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
10	10.08	Med	Stabilise track and maintain track markers	<$1-10K per 100m	<$1K per 100m	OSNR	Access management
11	11.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K per site	$1-2K per site	OSNR	Erosion management
	11.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K per site	$1-2K per site	OSNR	Erosion management
11	11.02	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K per site	-	OSNR	Erosion management
11	11.03	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K per site	-	OSNR	Erosion management
11	11.04	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K per site	-	OSNR	Erosion management

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11	11.05	Low	Exposed sewer pipe - See section 6 of geomorphology report for details - liaise with Sydney Water	-	-	OSNR, Sydney Water	Wastewater management
11	11.06	High	Stream restoration - Target 6 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
11	11.07	Low	Stream restoration - Target 8 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
11	11.08	High	Stream restoration - Target 15	$15-30K per 100m	$2K per 100m	OSNR	Stream restoration
11	11.09	Med	Continue bush regeneration near Kirby St	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
11	11.10	High	Extensive primary bush regeneration in very weedy areas; instream weed control	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
11	11.11	High	Revegetate on northern bank after some primary clearing	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
11	11.12	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
11	11.13	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	-	>$5K for all sites	Built Assets	Built asset maintenance
11	11.14	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
12	12.01	Low	Stream restoration - Target 8 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
12	12.02	High	Maintain bush regeneration of revegetated areas	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
12	12.03	Med	Weed control on banks and revegetate southern side of creek	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
12	12.04	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
13	13.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.01d	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.01e	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.01f	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
13	13.02a	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
13	13.02b	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
13	13.02c	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
13	13.02d	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
13	13.02e	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management

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13	13.03a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
13	13.03b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
13	13.03c	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
13	13.03d	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
13	13.04	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
13	13.05	Low	Exposed sewer pipe - See section 6 of geomorphology report for details - liaise with Sydney Water	-	-	OSNR, Sydney Water	Wastewater management
13	13.06	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K per site	-	OSNR	Stormwater remediation
13	13.07	Low	Stream restoration - Target 1 - See section 5.3 of geomorphology report for details	$0-10K per 100m	<$1K per 100m	OSNR	Stream restoration
13	13.08	Low	Stream restoration - Target 5 - See section 5.3 of geomorphology report for details	<$1-7K per 100m	<$1K per 100m	OSNR	Stream restoration
13	13.09	High	Stream restoration - Target 6 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
13	13.10	Med	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
13	13.11	High	Primary bush regeneration and revegetation to widen riparian buffer	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
13	13.12	High	Wooden bridge or stepping stones needed at creek crossing (used by school children and recreational walkers)	$20-50K	-	OSNR	Infrastructure development
13	13.13	High	Remove rubbish and stormwater litter	<$5K	-	OSNR	Waste management
13	13.14	High	Prepare individual conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges	$5K to $10K per site	-	OSNR, Culture and Tourism	Built asset protection
13	13.15	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
13	13.16	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR	Education
14	14.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01d	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01e	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01f	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01g	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.01h	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management

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14	14.01i	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
14	14.02a	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
14	14.02b	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
14	14.02c	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR	Erosion management
14	14.03a	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
14	14.03b	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
14	14.03c	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
14	14.03d	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
14	14.04	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
14	14.05	High	Weir failure - See section 6 of geomorphology report for details	$30-80K	$1-2K	Built Assets	Infrastructure maintenance
14	14.06a	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
14	14.06b	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
14	14.07	Low	Stream restoration - Target 5 - See section 5.3 of geomorphology report for details	<$1-7K per 100m	<$1K per 100m	OSNR	Stream restoration
14	14.08	High	Stream restoration - Target 6 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
14	14.09	Med	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
14	14.10	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
14	14.11	High	Primary bush regeneration and revegetation	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
14	14.12	High	Remove dumped shopping trolleys and garden refuse	<$5K	-	OSNR	Waste management
14	14.13	High	Prepare individual conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges	$5K to $10K per site	-	OSNR, Culture and Tourism	Built asset protection
14	14.14	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
14	14.15	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	-	>$5K for all sites	Built Assets	Built asset maintenance
14	14.16	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
14	14.17	Med	Commence further research into the heritage of the weir in Sturt St Reserve	$10K	-	OSNR, Built Assets	Research
14	14.18	Med	Maintain track markers	-	<$1K	OSNR	Access management

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14	14.19	High	Maintain sedimentation basin	-	$2K to $5K	OSNR	Infrastructure maintenance
15	15.01	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
15	15.02	High	Stream restoration - Target 12 - See section 5.3 of geomorphology report for details	$0-10K per 100m	<$1K per 100m	OSNR	Stream restoration
15	15.03	Low	Intensive clearing of weeds, mulching and revegetating all strata	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
16	16.01	Low	Stream restoration - Target 4 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
16	16.02	Low	Stream restoration - Target 8 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
16	16.03	High	Stream restoration - Target 12 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
16	16.04	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
16	16.05	High	Primary bush regeneration of groundcovers and vines	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
16	16.06	High	Maintain sedimentation basin off Brand St	-	$2K to $5K	OSNR	Infrastructure maintenance
16	16.07	Med	Trial no-mow area	<$5K	<$5K	OSNR	Vegetation Management
16	16.08	Low	Investigate "cone" site for geological and geomorphological origins	$5k	-	OSNR	Research
17	17.01	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Erosion management
17	17.02	High	Stream restoration - Target 2 - See section 5.3 of geomorphology report for details	$20-50K per 100m	$2-5K per 100m	OSNR	Stream restoration
17	17.03	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
17	17.04	Med	Investigate potential swale along Brand Street	$10-30K	-	OSNR	Research
17	17.05	High	Primary bush regeneration of groundcover and climbers	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
17	17.06	Med	Trial no-mow area	<$5K	<$5K	OSNR	Vegetation Management
18	18.01	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K	-	OSNR	Erosion management
18	18.02	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K per site	-	OSNR	Stormwater remediation
18	18.03	High	Primary bush regeneration of groundcover and revegetate with shrubs and groundcovers	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
18	18.04	Low	Investigate provision of track access	<$5K	-	OSNR	Access management
18	18.05	High	Remove dumped material and litter from creek	<$5K	-	OSNR	Waste management
19	19.01	Med	Moderate bed level adjustment - See section 6 of geomorphology report for details	$2-5K per site	-	OSNR	Erosion management
19	19.02	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
19	19.03	High	Maintain bush regeneration along creek line	$5-30K per ha	$5-30K per ha	OSNR	Vegetation Management
19	19.04	High	Remove dumped tyres and litter	<$5K	-	OSNR	Waste management

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19	19.05	Med	Check property boundaries for encroachment	<$5K	-	CSU, Property Services	Strategic management
19	19.06	High	Prepare individual conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges	$5K to $10K per site	-	OSNR, Culture and Tourism	Built asset protection
19	19.07	High	Maintain stone bridge abutments and stone retaining walls	>$30K per site	-	OSNR, Culture and Tourism	Built asset protection
19	19.08	High	Remove invasive vegetation on all heritage items and maintain	>$25K over 10 years	>$2.5K for all sites	OSNR	Built asset maintenance
19	19.09	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	>$50K over 10 years	>$5K for all sites	Built Assets	Built asset maintenance
19	19.10	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
20	20.01	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
20	20.02	Low	Stream restoration - Target 13 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
20	20.03	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
20	20.04	High	Primary bush regeneration; revegetate understorey and canopy species	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
20	20.05	High	Maintain existing track	<$5K	<$5K	OSNR	Access management
20	20.06	High	Conduct controlled burns	$5K	$5K	OSNR	Vegetation Management
21	21.01	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details, and maintain existing ponds including aquatic weeds management	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
21	21.02	High	Primary bush regeneration; revegetate understorey and canopy species	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
21	21.03	High	Maintain existing tracks	<$5K	<$5K	OSNR	Access management
21	21.04	High	Conduct controlled burns	$5K	$5K	OSNR	Vegetation Management
22	22.01	Low	Stream restoration - Target 14, and maintain ponds including aquatic weeds management	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
22	22.02	High	Primary bush regeneration, especially along creek; revegetate understorey and groundcover species	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
22	22.03	High	Remove litter from creek and garden refuse from bottom of reach	<$5K	-	OSNR	Waste management
22	22.04	High	Maintain existing tracks	<$5K	<$5K	OSNR	Access management
22	22.05	High	Conduct controlled burns	$5K	$5K	OSNR	Vegetation Management
23	23.01	Med	Investigate potentially contaminated land	$50-100K	-	OSNR, DECC, Regulatory	Research
23	23.02a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
23	23.02b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management

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23	23.03a	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
23	23.03b	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
23	23.04	Med	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
23	23.05	Med	Primary bush regeneration and revegetate all strata	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
23	23.06	High	Remove invasive vegetation on all heritage items and maintain	-	>$2.5K for all sites	OSNR	Built asset maintenance
23	23.07	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	-	>$5K for all sites	OSNR, Built Assets	Built asset maintenance
23	23.08	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
24	24.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
24	24.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
24	24.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
24	24.02	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	Built Assets	Erosion management
24	24.03	Low	Exposed sewer pipe - See section 6 of geomorphology report for details - liaise with Sydney Water	-	-	OSNR, Sydney Water	Wastewater Management
24	24.04	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K per site	-	Built Assets	Erosion management
24	24.05	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K per site	-	OSNR	Erosion management
24	24.06	Med	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
24	24.07	High	Bush regeneration and revegetation; revegetate to widen creek buffer	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
24	24.08	High	Remove invasive vegetation on all heritage items and maintain	>$25K over 10 years	>$2.5K for all sites	OSNR	Built asset maintenance
24	24.09	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	>$50K over 10 years	>$5K for all sites	Built Assets	Built asset maintenance
24	24.10	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
25	25.01a	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
25	25.01b	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
25	25.01c	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
25	25.01d	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management
25	25.01e	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K	OSNR	Erosion management

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25	25.02a	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR, Built Assets	Erosion management
25	25.02b	High	Large bed level adjustment - See section 6 of geomorphology report for details	$30-100K	-	OSNR, Built Assets	Erosion management
25	25.03	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
25	25.04	Med	Stream restoration - Target 11 - See section 5.3 of geomorphology report for details	$50-100K per 100m	$5K per 100m	OSNR	Stream restoration
25	25.05	High	Stream restoration - Target 12 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
25	25.06	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
25	25.07	Med	Stream restoration - Target 16 - See section 5.3 of geomorphology report for details	$30-70K per 100m	$3-5K per 100m	OSNR	Stream restoration
25	25.08	High	Primary bush regeneration and revegetate all strata; remove coral trees from adjacent park under powerlines	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
25	25.09	High	Remove invasive vegetation on all heritage items and maintain	>$25K over 10 years	>$2.5K for all sites	OSNR	Built asset maintenance
25	25.10	Med	Inspect all stone drainage surrounds annually, reset loose stones and repoint when necessary	>$50K over 10 years	>$5K for all sites	Built Assets	Built asset maintenance
25	25.11	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	<$1K	OSNR, Culture and Tourism	Education
26	26.01	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
26	26.02	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
26	26.03	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
26	26.04	Med	Investigate potentially contaminated land	$50-100K	-	OSNR, DECC, Regulatory	Research
26	26.05	Low	Identify curtilage for significant parts of former quarry and diatreme	$5-10K	-	OSNR, Culture and Tourism	Strategic management
26	26.06	High	Prepare conservation and maintenance plans for stone bridge, stone retaining walls, quarry and road bridges	$20 to $40K	-	OSNR, Culture and Tourism	Built asset protection
26	26.07	Med	Install interpretative signage at all heritage sites	$2K to $5K per site	-	OSNR, Culture and Tourism	Education
27	27.01	Med	Bed scour downstream of culvert - See section 6 of geomorphology report for details	$10-30K	-	OSNR	Erosion management
27	27.02	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
27	27.03	Med	Bush regeneration maintenance	$20-30K per ha	$5-30K per ha	OSNR	Vegetation Management
28	28.01	Low	Stormwater outlet erosion - See section 6 of geomorphology report for details	$2-10K	-	OSNR	Stormwater remediation
28	28.02	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
28	28.03	High	Primary weed control and revegetate all strata	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
28	28.04	High	Trial no-mow zones	<$5K	<$5K	OSNR	Vegetation Management

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29	29.01	High	Major cutbank erosion - See section 6 of geomorphology report for details	$20-50K	$1-2K per site	OSNR	Erosion management
29	29.02	Low	Stream restoration - Target 14 - See section 5.3 of geomorphology report for details	<$1-10K per 100m	<$1K per 100m	OSNR	Stream restoration
29	29.03	Med	Primary weed control and revegetate all strata	$40-50K per ha	$5-30K per ha	OSNR	Vegetation Management
All	1	High	Review flood modelling for catchment, including checking data reliability for apparent inaccuracies between 20 year and 100 year flood modelling, adding impacts from climate change, and incorporating upper reaches of the catchment	$10-20K	-	OSNR	Strategic management
All	2	High	Incorporate items of European and Aboriginal heritage in LEP under Clause 35 Heritage Conservation	-	-	CSU, LUTP	Strategic management
All	3	High	Rezone endangered ecological communities to E2 - Environment Conservation where possible, or use an 'environment protection area' overlay	-	-	CSU, LUTP	Strategic management
All	4	High	Include development setbacks from riparian zones in the Development Control Plan	-	-	CSU, LUTP	Strategic management
All	5	High	Include water sensitive urban design features in the Development Control Plan, including best practice environmental management during construction	-	-	CSU, LUTP	Strategic management
All	6	High	Develop heritage interpretation plan for Ponds Subiaco Creek, including education, cultural heritage, public art, way-fiding and effective ways to engage the community	$10-20K	-	OSNR, Culture and Tourism, CSU	Education
All	7	High	Control aquatic weeds (e.g. Parrots Feather)	-	$5-10K	OSNR	Vegetation Management
All	8	High	Adopt the updated Aboriginal heritage sensitivity mapping for Ponds/Subiaco. Obtain s.90 consent under the NP&W Act 1974 if an Aboriginal site is to be impacted. Where a s.90 consent is required, continue consultation with Aboriginal stakeholders	-	-	CSU, LUTP	Strategic management
All	9	High	Where possible reduce Council operational material going to landfill and reuse/recycle especially with green waste	-	-	Strategic Asset Management	Waste management
All	10	High	Widen riparian corridor where opportunities exist, in consultation with community	$70-90K per ha	$10-20K	OSNR	Strategic management
All	11	High	Extend and continue industrial auditing program, including an education emphasis, in the entire catchment	$5-10K	-	Regulatory	Education
All	12	High	Develop priority list of litter traps to manage litter from shopping centres	-	-	Built Assets, CSU	Waste management
All	13	High	Enforce pollution risk avoidance and clean up provisions in Protection of the Environment Operations Act 1997	-	-	Regulatory	Regulation
All	14	High	Implement a water quality and aquatic ecology monitoring program	$5-10K	$5-10K	OSNR	Monitoring

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All	15	High	Review all development applications in relation to riparian setback requirements	-	-	Development Unit	Strategic management
All	16	High	Implement education program for the community on the negative impacts of releasing exotic fauna and flora into the Ponds/Subiaco system	$5-10K	-	OSNR	Education
All	17	High	Support streamwatch program	-	-	OSNR, Sydney Water	Education
All	18	High	Keep updated on key threat processes and threatened species and enforce and implement actions	-	-	OSNR, CSU	Strategic management
All	19	High	Check property boundaries for possible weed source	$5K	-	Development Unit	Vegetation Management
All	20	High	Continue to support Bushcare groups and actively encourage new groups in the catchment	$1K	-	OSNR	Education
All	21	High	Investigate options for maintenance of potential heritage items	<$10K	-	Built Assets	Built asset maintenance
All	22	Med	For future development that extends into the geomorphic processes zones (shown in figure 8 of the report) a riparian buffer width should include both the hyporheic zone and the parafluvial zone.	-	-	LUTP	Strategic management
All	23	Med	Develop a recreational plan for improvement of facilities and walking trails	$5-10K	-	OSNR	Access management
All	24	Med	Investigate requirements for water pollution control devices (e.g. GPTs), including an audit of the stormwater system (refer to SKM 2006)	$10-20K	-	Built Assets	Stormwater remediation
All	25	Med	Incorporate previously recorded Aboriginal sites into areas of re-vegetation, with dedicated paths in those areas that have a high frequency of foot traffic	$20-30K	$5-10K	OSNR	Strategic management
All	26	Med	Develop priority list of pollution control devices to manage oils and other contaminants from industrial areas	-	-	CSU, Built Assets, Regulatory	Waste management
All	27	Med	Retain large woody debris in stream where possible	-	-	OSNR	Fauna management
All	28	Med	Incorporate fish movement when constructing road crossings	-	-	Built Assets	Fauna management
All	29	Med	Control foxes	$1K per den	$2-5K	OSNR	Fauna management
All	30	Med	Control feral cats	$5K	$5K	OSNR	Fauna management
All	31	Med	Control feral honey bees	$5K	$1-2K	OSNR	Fauna management
All	32	Low	Areas mapped as Urban Remnant Trees under the conservation significance assessment are to be protected under the Tree Preservation Order	-	-	Development Unit	Vegetation Management
All	33	Low	Review CSA mapping using field validated data	-	-	CSU, LUTP	strategic management

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All	34	Low	Remove fill slope under quarry escarpment in accordance with conservation plan recommendations	>$50K	-	Built Assets	Infrastructure development
N/A	35	High	Work with Sydney Water to reduce the impacts of sewage exfiltration on water quality in Ponds/Subiaco Creek	-	-	CSU, Sydney Water	Wastewater management
N/A	36	High	Develop and imlement a community education program targeting stormwater issues	<$50K	-	OSNR	Education
N/A	37	High	Develop and imlement a community education program targeting biodiversity issues	<$50K	-	OSNR	Education
N/A	38	High	Promote the use of OSD and WSUD in the development process, including at-source controls & reducing impervious surface areas	<$5K	-	CSU, Development Unit	Education
N/A	39	High	Enforce erosion and sediment controls on building sites	-	-	Development Unit	Regulation
N/A	40	High	Promote the use of endemic vegetation in landscapes adjacent to natural areas	<$5K	-	OSNR	Education
N/A	41	High	Quantify impacts of all stormwater outlets discharging into bushland and outline maintenance needs	$5-10K	-	OSNR	Research

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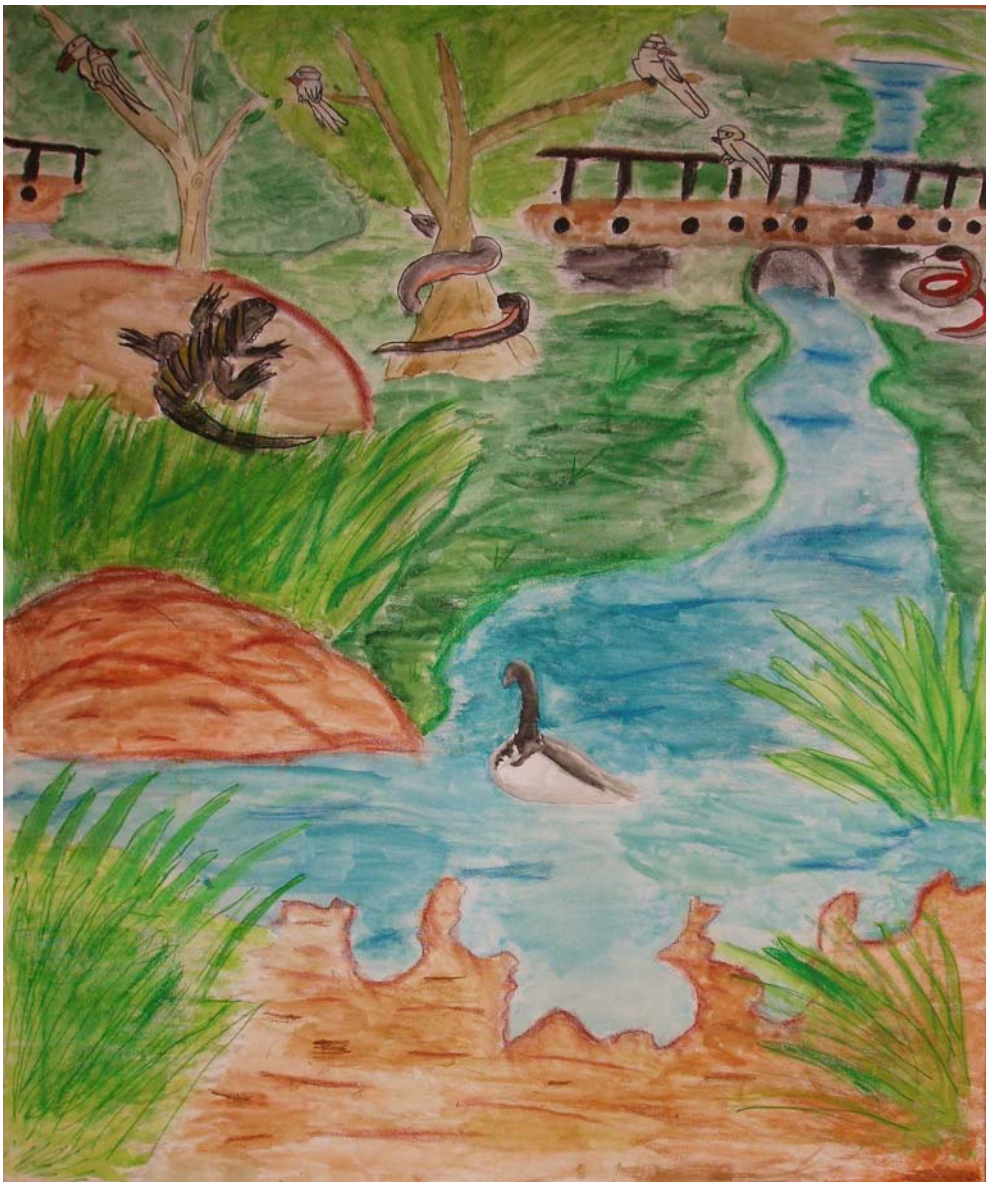
VOLUME TWO – REACH MAPS



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VOLUME THREE – TECHNICAL REPORTS