Department of Water Environment and Natural Resources

Highbury Aqueduct Reserve
Final Master Plan Report

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1.0 Introduction and Project Overview

The Highbury Aqueduct land comprising 51 hectares formerly managed by SA Water has been transferred to the Department of Planning, Transport and Infrastructure (DPTI). Funds were made available to the Department of Environment, Water and Natural Resources (DEWNR) through the Planning and Development Fund to prepare a Master Plan that can be implemented progressively over an agreed staging program.

In 2010 the former Minister for Planning and Local Government, Hon. Paul Holloway, indicated that in the long term the Government would "transform the site into a reserve comparable to the nearby Linear Park. Ultimately it will be our goal to upgrade the whole reserve so that it not only poses a much lower fire risk, but is also much more accessible to the people of Highbury". A Concept Plan for the site was released for public comment in November 2010 by Newland MP Tom Kenyon. At that time residents were promised that work would begin on Stage One by June 2011.

1.1. This Master Plan

In May 2012 DEWNR engaged a multi-disciplinary consultant team lead by URPS, urban and regional planning and community engagement with WAX Design for landscape analysis and design, Southfront for stormwater management and EBS Ecology for assessment of biodiversity assets and development of environmental management actions.

The Highbury Aqueduct Reserve Master Plan has been prepared to guide the future development of the land as it is opened up for community recreation.

1.2. Stage One Reserve Development

Following preliminary consultation it was decided by DEWNR and DPTI to begin to open up the reserve for public access by taking down the fences and removing or hazard pruning trees that posed a risk of failure. These were mostly Aleppo Pines that had reached the end of their life cycle.

The costs of tree management meant that it was not possible to completely open up the area indicated as Stage One. The Stage One area is located between Majestic Grove and Historic Drive. The reserve was able to be opened up to part way along Country Lane by the time that the local Member of Parliament, The Honourable Tom Kenyon launched the Highbury Aqueduct Reserve on 8 December 2012.

2.0 Project Methodology

The project was undertaken in five stages as follows:

- situation analysis, research and consultation;
- design development, documentation, tender assessment and site supervision for Stage One of Reserve development;
- preparation of preliminary Draft Master Plan and community consultation;
- preparation of Final Draft Master Plan for community feedback;
- Final Master Plan Report (this document).

3.0 Outcomes and Objectives

The consultant team worked with staff from DEWNR and DPTI to prepare objectives and guidelines to guide the preparation of the Master Plan.

These objectives were tested through community consultation and the guidelines have informed landscape design and stormwater and environmental management actions.

Community Access

Objective 1: Open up the Highbury Aqueduct Land to provide physical access and improve visual access for the local community.

Guidelines

1.1 Undertake the strategic removal of perimeter fencing according to a staged Implementation Plan.

1.2 Identify existing destinations that are important to the community such as schools, playgrounds and recreation facilities and establish links to these.

1.3 Improve the visual appearance of the land by replacing the high mesh fence with a more permeable alternative in locations which require fencing.

1.4 Design park access points to restrict access by motorbikes and vehicles, other than those used for by emergency services and maintenance crews.

1.5 Develop a linear park which has strong links to residential areas to the north and south and to the River Torrens Linear Park.

1.6 Provide a neighbourhood facility that provides important links to the regional level River Torrens Linear Park.

Recreation

Objective 2: Provide a range of spaces that accommodate informal active recreation, social activities and peaceful reflection.

Guidelines

2.1 Design paths that respond to the natural bush setting and the neighbourhood level function of the park.

2.2 Facilitate the shared use of paths and spaces by walkers, cyclists, people walking dogs on leads and people on scooters and skateboards.

2.3 Identify areas that could be designated for uses such as BMX riding, mountain biking and exercising dogs off lead.

2.4 Develop at least some areas of the park to be accessible by people with reduced levels of physical mobility including those using mobility aids.

2.5 Find ways to foster children's independence and creativity through natural play spaces, water in the landscape, climbing areas and other installations.

2.6 Introduce bird hides and seating in the wetland area to support quiet reflection and nature study.

Community Participation

Objective 3: **Provide diverse opportunities for members of the local community to participate in developing, managing and maintaining the Park.**

Guidelines

3.1 Provide a framework to support community participation in revegetation activities. Develop partnerships with Urban Biodiversity Program and other relevant organisations.

3.2 Explore potential links to NRM funded revegetation and habitat restoration programs.

3.3 Encourage residents to replicate community gardens elsewhere in the Park.

3.4 Provide children's play space areas in ways that enable community participation in supervising and supporting safe creative play experiences.

Vegetation Management

Objective 4: Develop, manage and maintain vegetation within the park to contribute to biodiversity, visual amenity and safety.

4.1 Maintain representative vegetation communities in good condition.

4.2 Maintain and/or restore habitat for vulnerable birds and animals including yellow tailed black cockatoos, echidnas.

4.3 Make sure plantings are consistent with the Fire Management Plan.

4.4 Selectively remove trees that pose a risk to people and property.

4.5 Establish landscape character zones as the basis for vegetation management.

Stormwater Management

Objective 5: Address existing stormwater management issues and introduce innovative water sensitive design approaches to support effective stormwater management in the future.

Guidelines

5.1 Reduce the risks of flooding and stormwater damage including erosion and siltation.

5.2 Protect the remnants of built heritage from further stormwater damage.

5.3 Identify opportunities to reintroduce water into the landscape by redirecting existing stormwater drainage and integrating stormwater from urban developments.

5.4 Improve water quality by developing grassed swales, wetlands and planting appropriate sedge and rush species.

Linkages

Objective 6: Provide new links that increase people's opportunities to walk or cycle to work, school or recreation facilities.

Guidelines

6.1 Maximise the walking and cycling links to the River Torrens Linear Park.

6.2 Create links to existing facilities such as schools, shops and services, playgrounds, sporting and recreation facilities.

6.3 Develop loops within the Park that provide more interesting and appealing routes, especially for walkers.

Risk Management and Maintenance

Objective 7: Design to reduce risk and enable efficient maintenance

Guidelines

7.1 Fire management will be supported by an appropriate planting regime.

7.2 Landscape zones based on character and activities will be designed to require low levels of maintenance.

7.3 All materials used in the Park will be selected to be robust, resistant to weathering and vandalism.

7.4 Park design will utilise crime prevention through environmental design (CPTED) principles for day-time safety. Night-time use will not be encouraged.

7.5 Seek to balance active recreation and creative play with an acceptable level of risk.

7.6 An audit will be undertaken of risk elements before and after construction and this will inform a Risk Management Plan.

4.0 Audit of Existing Conditions

4.1. Landscape Character

The landscape character associated with the Highbury Aqueduct is currently a 14km narrow fenced corridor of underutilized land coinciding with the disused aqueduct. On arrival, the Aqueduct landscape setting creates a degree of disorientation and lack of legibility as visitors try to negotiate through sections of unconnected pathways and maintenance tracks bordering either side of the remnant Aqueduct. The natural flow of the corridor is characterized by steep slopes and undulating terrain. Overall, this is a highly modified landscape with the concrete Aqueduct removed leaving a shallow indent running through the Reserve. Stormwater management within the site has been neglected and needs attention to address existing issues of erosion (see Stormwater Management in Section 4.3).

The site contains a variety of dense vegetation of largely introduced Aleppo Pine and understorey weed species, restricting remnant native and indigenous vegetation which is scattered throughout the site. The wild unkept nature of the park makes it inaccessible and unsafe for public use. Adjoining housing provides some restriction to emergency vehicles and the existing internal fire access track network does not provide sufficient access to the park. The adjacent Linear Park and River Torrens runs in parallel to the Reserve and creates a strong point of difference to the naturalistic setting of the Reserve with its European aesthetic of lawns and parkland setting of trees.

Key issues:

- recognise and protect important indigenous vegetation groups;
- need to maintain visual natural character of Reserve;
- consider and analyse steep topography;
- define public access routes and safety within the Reserve;
- address stormwater management and safety issues across site;
- need to provide additional fire and maintenance tracks.

4.1.1. Visual Amenity

Currently the dense vegetation restricts access, views and space within the area. Fencing around the perimeter of the reserve however, acts as a visual and physical barrier to the site creating a sense of disconnection for those who live adjacent to the reserve. Pedestrian and cycle movements between adjacent housing areas, local space, playspace areas, Linear Park, Turramurra Recreation Centre and main road corridors are also compromised and inhibited by the existing boundary fencing. The reserve has close proximity to the recreation spaces of Linear Park, but has no direct connection, accessibility or visual connection to the Park. Views from within the reserve range from overlooking some backyards of houses to expansive and impressive views of both the Adelaide Hills and the city of Adelaide.

Sections of established indigenous vegetation hold high amenity value for the reserve, including SA Blue Gum open woodland and natural water course and creeks. Remaining stone walled sections of the Aqueduct serve as an important historic reference however currently are concealed, inaccessible, unsafe and unmaintained.

Key Issues:

- need to establish visual and physical connections within the reserve to Linear Park, Turramurra Recreation Centre, main road corridors and surrounding housing;
- maintain a 'naturalistic' feel within the Reserve which distinguishes it from other reserves;
- maintain residential privacy in areas where necessary;
- optimise opportunities for views to Adelaide Hills and the city centre;
- protect important indigenous vegetation groups within specific areas of reserve;
- restore historic stone walled sections of Aqueduct to recognise important engineering and cultural heritage.

4.1.2. Quality of Experience

There is no existing path network within the landscape or facilities for pedestrian, cycling, shared use or access for people. The aqueduct generates interesting and individual gradients in the topography which need to be reinforced and developed into a feature of the reserve. There are areas of topography that are suitable for access paths and other sections of the reserve with steeper embankments that limit potential access opportunities along the watercourse. Sections of the reserve also incorporate extreme topography with dangerous inclines and erosion. Gateways and entrances to the park are currently closed and or fenced off to the public, hence the site lacks a sense of arrival and legibility.

Existing stormwater discharge and interfaces with the Aqueduct are currently causing issues with erosion and stormwater management. (See Section 4.3). Fire maintenance access tracks within the reserve are accessible, however there is need for new extensions to fire and maintenance tracks which ensure better connections to the road and trail network.

Key Issues:

- establish recreation links and network access through the reserve;
- improve safety by managing level changes;
- utilize overflows and underground water runoff to reinstate a natural waterway swale with native planting;
- increase biodiversity;
- provide legibility;
- need to maintain existing fire and maintenance access tracks;
- create extensions to fire tracks to increase fire safety and support increased level of bushfire preparedness.

4.2. Biodiversity Assets

The site contains a number of attributes which are important biodiversity assets. These include patches of remnant vegetation, wildlife habitat to common and threatened fauna species, existing indigenous revegetation and wildlife corridors.

Remnant vegetation

The site is located on the upper slopes of the River Torrens and remnant vegetation is largely confined to a small pocket of intact *Eucalyptus leucoxylon* ssp. *leucoxylon* (SA Blue Gum) woodland, an area of *Eucalyptus camaldulensis* var. *camaldulensis* (Red Gum) woodland associated with the River Torrens riparian corridor and scattered native grassland patches containing *Austrodanthonia caespitosa* (Common Wallaby-grass), *Austrodanthonia racemosa* var. *racemosa* (Slender Wallaby-grass), *Austrostipa mollis* (Soft Spear-grass), *Austrostipa scabra* ssp. *scabra* (Rough Spear-grass) or *Themeda triandra* (Kangaroo Grass). The majority of the remaining areas are dominated by *Pinus halepensis* (Aleppo Pine) forest over an exotic dominated understorey.

Flora species

Table 1 shows the native flora species recorded on site (Note this is not a comprehensive list of the species on site).

Table 1. Native flora species recorded during field survey.

Species name	Common name	Conservation Status	
		Aus	SA
Acacia paradoxa	Kangaroo Thorn		
Acacia pycnantha	Golden Wattle		
Allocasuarina verticillata	Drooping Sheoak		
Amyema miquelii	Box Mistletoe		
Arthropodium strictum	Chocolate Lily		
Astroloma conostephioides	Flame Heath		
Austrodanthonia caespitosa	Common Wallaby-grass		
Austrodanthonia racemosa var. racemosa	Slender Wallaby-grass		
Austrostipa eremophila	Rusty Spear-grass		

Species name	Common name	Conservation Status	
		Aus	SA
Austrostipa mollis	Soft Spear-grass		
Austrostipa scabra ssp. scabra	Rough Spear-grass		
Bursaria spinosa	Sweet Bursaria		
Callitris gracilis	Southern Cypress Pine		
Calostemma purpureum	Pink Garland-lily		
Cheilanthes austrotenuifolia	Annual Rock-fern		
Convolvulus erubescens complex			
Dianella revoluta	Black-anther Flax-lily		
Dodonaea viscosa ssp. spatulata	Sticky Hop-bush		
Eucalyptus camaldulensis var. camaldulensis	River Red Gum		
Eucalyptus leucoxylon ssp. leucoxylon	South Australian Blue Gum		
Exocarpos cupressiformis	Native Cherry		
Geranium sp.	*Geranium*		
Goodenia sp.	Goodenia		
Hakea carinata	Erect Hakea		
Hibbertia riparia	Bristly Guinea-flower		
Hibbertia sericea	Silky Guinea-flower		
Hardenbergia violacea	Native Lilac		
Juncus kraussii	Sea Rush		
Lomandra densiflora	Soft Tussock Mat-rush		
Olearia ramulosa	Twiggy Daisy-bush		

Species name	Common name	Conservation Status	
		Aus	SA
Phragmites australis	Common Reed		
Themeda triandra	Kangaroo Grass		
Vittadinia gracilis	Woolly New Holland Daisy		

Regions: AUS: Australia (Environment Protection and Biodiversity Conservation Act 1999), SA: South Australia (National Parks and Wildlife Act 1972). Conservation Codes: EN/E: Endangered, VU/V: Vulnerable, R: Rare. MI: Migratory, Ma: Marine

Habitat to native wildlife in the urban area

Fauna diversity within the Highbury Aqueduct area is generally fairly low due to the lack of suitable habitat and high predation from invasive feral animals (foxes, cats and rats), symptomatic of the high levels of disturbance and urbanisation of the area. The low levels of intact native vegetation (natural or revegetated) limits the number of species which may utilise the site as it does not provide large enough habitat areas and provision of resources such as shelter and food. However a number of common native fauna species are known to utilise the site. Terrestrial birds such as the Australian Magpie (*Gymnorhina tibicen*), Magpie Lark (*Grallina cyanoleuca*) and Noisy Miner (*Manorina melanocephala*) are habitat generalists which are common within the Adelaide metropolitan area and have adapted well to urban habitats such as this. Other native species that are known to utilise the area include the Ringtail Possum (*Pseudocheirus peregrines*) and Brush-tailed Possum (*Trichosurus vulpecula*). The Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) is also known to feed on the feral Aleppo Pines on the site and a group of approximately 50 individuals was observed during the field survey feeding on Pines just north of the Rive Torrens corridor where it adjoins the Highbury Aqueduct site. Other species listed in Appendix B may utilise habitat on site, particularly the remnant SA Bluegum woodland patch.

Native Revegetation

Several revegetation projects have been undertaken in the past five to ten years across the site. Some of the flora species have been selected to replicate the pre-European vegetation that was thought to originally dominant the upper slope environs of the River Torrens. The current condition of the revegetation area is reasonable with fairly high seedling survival rates. Weeds are currently managed by regular mowing which is helping reduce competition with the natives. Weed control will need to be ongoing to ensure natural regeneration is encouraged and competition with existing natives is reduced.

Proximity to River Torrens environs

The Highbury Aqueduct site is in very close proximity to the River Torrens Linear Park and is directly linked in sections on the northern side. The linear nature of the River Torrens provides a wildlife corridor, linking the Adelaide foothills with the Gulf of St

Vincent. It also provides links to a number of other reserves and smaller tributaries flowing into the River Torrens.

4.2.1. Threats to Biodiversity

A number of attributes are contributing to the decline of biodiversity within the project area including weeds, erosion, feral animals, water pollution and current maintenance regimes. The following is a summary of these threatening processes.

Weeds

Vegetation along Linear Park is dominated by exotic flora species. Many of these species have been introduced to the Highbury Aqueduct environs by means of regeneration from amenity plantings, garden escapees, external soil dumping or have entered via natural processes (seed dispersal via wind, water or animals). A number of these species are identified as highly invasive due to their ability to rapidly regenerate and colonise areas, vigorously outcompeting and in some cases, smothering indigenous flora species. The major weeds recorded across the site are listed in Table 2 (Note this is not a comprehensive list of the species on site).

Table 2. Exotic species recorded during field survey.

Species name	Common name	Declared or Environmental Weed
Acacia iteaphylla	Flinders Ranges Wattle	
Acacia longifolia	Sallow Wattle	E
Acacia saligna	Golden Wreath Wattle	E
Asparagus asparagoides f. asparagoides	Bridal Creeper	D
Asphodelus fistulosus	Onion Weed	D
Avena sp.	Oat	E
Brachychiton populneus ssp. populneus	Kurrajong	
Briza maxima	Large Quaking Grass	
Bromus diandrus	Great Brome	
Casuarina glauca	Swamp Oak	E
Chrysanthemoides monilifera ssp. monilifera	Boneseed	D
Conyza sp.	Fleabane	

Species name	Common name	Declared or Environmental Weed
Cynara cardunculus ssp. *flavescens*	Artichoke Thistle	D
Cynosurus echinatus	Rough Dog's-tail Grass	
Euphorbia terracina	False Caper	E
Echium plantagineum	Salvation Jane	D
Eucalyptus maculata	Spotted Gum	
Fraxinus angustifolia ssp. *angustifolia*	Desert Ash	E
Fumaria sp.	Fumitory	
Hakea laurina	Pin-cushion Hakea	
Melaleuca armillaris ssp. *armillaris*	Bracelet Honey-myrtle	
Olea europaea ssp. *europaea*	Olive	D
Oxalis pes-caprae	Soursob	D
Paspalum dilatatum	Paspalum	
Pennisetum clandestinum	Kikuyu	
Phalaris aquatica	Phalaris	E
Pinus halepensis	Aleppo Pine	E
Piptatherum miliaceum	Rice Millet	E
Plantago lanceolata var.	Ribwort	E
Romulea rosea var. *australis*	Common Onion-grass	
Rubus ulmifolius var. *ulmifolius*	Blackberry	D
Ricinus communis	Castor Oil Plant	E
Scabiosa atropurpurea	Pincushion	E

Species name	Common name	Declared or Environmental Weed
Solanum nigrum	Deadly Nightshade	E
Trifolium arvense var. *arvense*	Hare's-foot Clover	
Vicia hirsuta	Hairy Vetch	
Watsonia bulbillifera	Bulbil Watsonia	D

D = Declared plant under the *Natural Resources Management Act 2004*
E = Environmental weed (DTEI Environmental Weeds List)

Feral animals

There is a wide variety of feral animals known from this area, including the River Torrens Linear Park environs. The European Fox (*Vulpes vulpes*) preys upon native wildlife and have had a particularly devastating effect on the smaller native species of mammals, birds and reptiles. In conjunction with widespread loss of habitat within the neighbouring areas due to urbanisation, foxes have placed further pressure on remaining populations of native species. They are likely to utilise the area for feeding and den sites, and also as an access route within the urban environment.

It is likely that Rabbits (*Oryctolagus cuniculus*) also occur within the site despite none being observed during the field survey. One active warren was recorded at the western end of the Highbury Aqueduct site. Rabbits compete with native animals for food resources and damage native plants by ringbarking trees and shrubs, inhibiting regeneration by eating seed and seedlings and in extreme cases, causing soil disturbance. There is the potential that their foraging habits may threaten the recruitment of juvenile native flora and seedling survival within revegetation areas.

The Black Rat (*Rattus rattus*) is common in the metropolitan area and can have an impact on native animals, being a good climber that can predate on the eggs of native bird species.

Feral birds such as the Mallard, Blackbird and the House Sparrow are common throughout the area, and are known to actively compete with native birds for food and nesting habitat.

Species such as feral bees can directly compete with native wildlife commonly reducing the availability of nesting hollows for native birds and possum species.

Erosion

There are a number of locations where erosion is active, primarily within the direct vicinity of the steep slopes of the aqueduct. Erosion is exacerbated by a lack of vegetation along the steep banks, thereby exposing the soils to the erosive forces of rainfall and surface runoff.

Map One on the following page shows the current vegetation.

Ecology

Vegetation_Association

- COMMUNITY INFORMAL GARDEN
- EUCALYPTUS CAMALDULENSIS VAR. CAMALDULENSIS (RIVER RED GUM) RIPARIAN OPEN WOOLAND
- EUCALYPTUS LEUCOXYLON (SOUTH AUSTRALIAN BLUE GUM) WOODLAND
- NATIVE GRASSLAND
- REVEGETATION
- PHRAGMITES AUSTRALIS (COMMON REED) GRASSLAND
- PINUS HALEPENSIS (ALEPPO PINE) WOODLAND
- HIGHBURY_AQUEDUCT_REMNANT_VEGETATION_AREAS

4.3. Stormwater

4.3.1. Catchment Context

The Highbury Aqueduct reserve land is located within the River Torrens catchment, the largest and most significant watercourse on the Adelaide Plains. The reach of the River Torrens that is within close proximity to the Highbury Aqueduct Reserve is the upper reach of the River Torrens Linear Park. This Linear Park was established in the 1980s to provide development across the Adelaide Plains with protection from major river flood events, while also creating a shared path network and associated open space development, from the foothills to the coast.

A number of urban catchments (totalling an area of 90ha) located on the northern side of the reserve discharge into the Aqueduct reserve land via Council stormwater drainage systems. Each of these drain discharges are conveyed across the reserve land in open channels, and pass back into Council drainage systems at the southern reserve boundary or discharge directly into the River Torrens.

A short distance east of Majestic Drive, a tributary of the Torrens (catchment area of 308 ha) passes through the reserve and under the former aqueduct channel. This tributary drains a larger area to the north that encompasses the Highbury Quarry and vacant land that is understood to potentially be the subject of future land development. It is likely that this tributary is fed by spring(s) in its upper reaches during the winter period.

4.3.2. Local Hydrology

Rainfall data from the nearby Hope Valley Reservoir Bureau of Meteorology gauge station was obtained to provide local rainfall information (refer Figure 1 below). The annual average rainfall at this site (588mm) is slightly above the Adelaide (Kent Town) average (545mm).

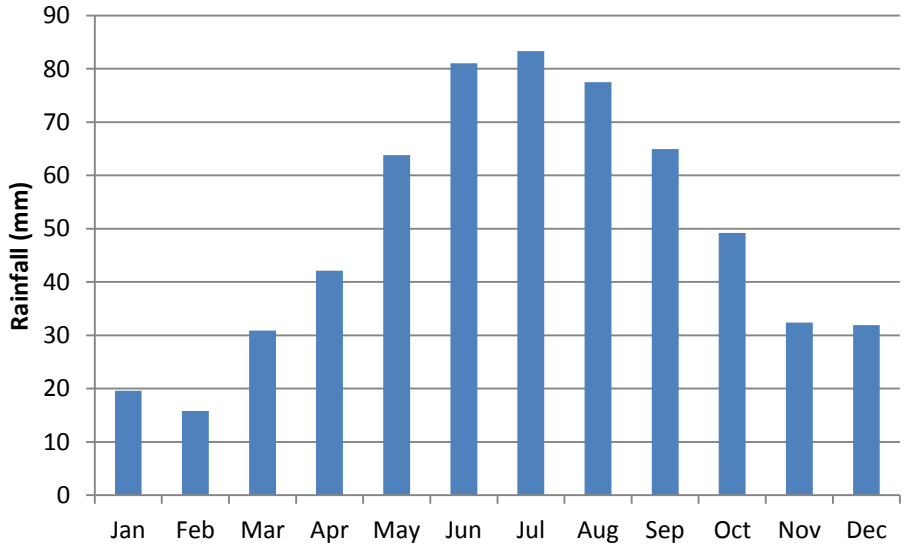


Figure 1 Monthly Rainfall Averages (Hope Valley Reservoir)

The average number of rain days (in excess of 1mm) was determined from this daily rainfall data record (refer Figure 2 below). This information provides an indication of

the average monthly distribution of discharge flow volume from the urban catchments into the reserve.

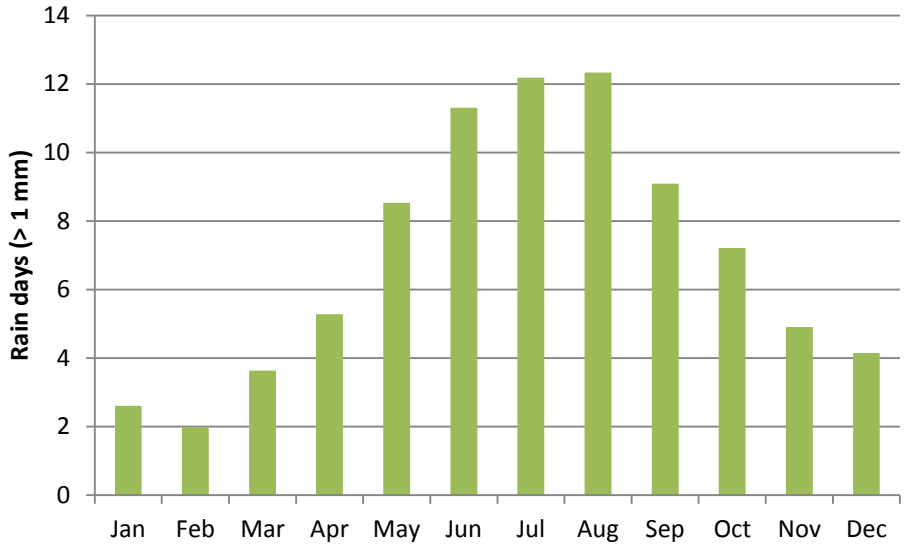


Figure 2 Monthly Average Rain Days > 1mm (Hope Valley Reservoir)

An average flow volume of 60ML/yr is estimated to drain through the aqueduct reserve land from the adjacent northern urban area. Flow estimates through the River Torrens tributary to the east are difficult to estimate due to the relatively small proportion of urban development, the likely presence of a spring-fed seasonal baseflow, and influences associated with the quarry operations.

4.3.3. Aqueduct Decommissioning Works

During the planning process for the construction of the new gravity pipeline to replace the old aqueduct channel, an investigation was undertaken to assess the interaction between the abandoned aqueduct and local stormwater in order to identify infrastructure to manage identified issues (KBR, 2006).

The former aqueduct channel was a gravity drain with a gentle longitudinal gradient, and consequently the open section between Majestic Drive and the western end of the reserve land approximates a land elevation contour.

The assessment was subsequently followed by the design of civil engineering works (KBR, 2007) and construction to allow for:

- appropriate continuation of Council stormwater drains across the aqueduct alignment;
- regrading of the channel (in many cases reversing the flow direction of the former aqueduct) to drain back to nominated locations along the aqueduct alignment, to provide a drainage outlet for any flows captured by the aqueduct channel;
- managed overflow of intercepted stormwater runoff (generated within the reserve) from the aqueduct channel at the nominated locations, via rock-lined spillways or piped outlets.

The concrete lining of the former aqueduct has been removed, and in most locations a bare earth trapezoidal channel now remains. At intersecting road crossings

(Boundy Road, Majestic Drive) the culvert structures are no longer connected, and are understood to have been sealed off and filled with concrete.

4.3.4. Issues known to Council

Preliminary discussions with Council staff have identified the following known stormwater management issues associated with the reserve:

- erosion of drainage channels across the reserve;
- some reported drainage overflow from the reserve into adjoining properties (Woodland Court);
- Council is unlikely to pursue stormwater harvesting from the urban catchments that drain through the reserve, due to a combination of factors including the relatively small available flow volume, the lack of a suitable local bore for aquifer injection and availability of a more reliable water harvesting source in the River Torrens.

It was also suggested that the former aqueduct concrete lining may have been buried (intact or in broken pieces) below the current bare earth formation.

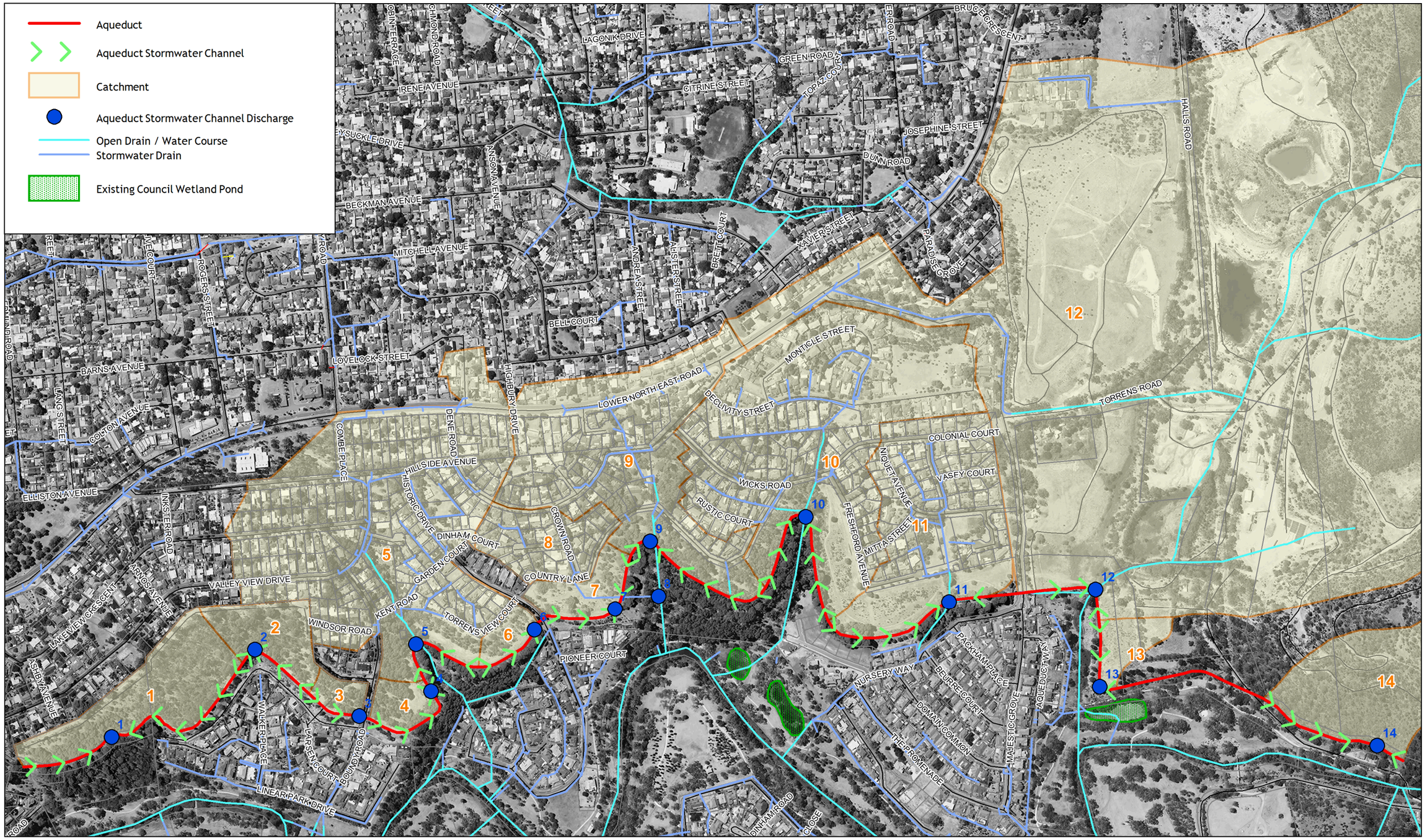
4.3.5. Analysis

Inspection of the aqueduct confirms that the channel that has been constructed in place of the former concrete-lined aqueduct provides a role in intercepting locally generated (reserve) stormwater runoff and conveying these flows to designated points for discharge, in a manner that is generally consistent with the documented design (KBR, 2007). For the purposes of this assessment, catchments draining to each aqueduct drainage crossing / discharge point have been delineated (refer Figure 3). Stormwater management issues identified through the site inspection are summarised in Table.

A number of the Council stormwater drainage systems that pass across the reserve land are exhibiting significant and ongoing erosion and this is identified as the most significant stormwater management issue. This is attributable to a combination of the hydrological regime produced by the upstream residential catchments, and the very steep longitudinal gradients of the open channels within the reserve. Remedial works are necessary, both to stabilise and prevent further erosion, and also to address public safety issues associated with undermined and unstable vertical channel banks.

Due to the steep gradients of these sections, it is unlikely that the use of vegetation alone will be successful in mitigating against further erosion and that remedial works will required a combination of revegetation and engineered measures.

Figure 3 Stormwater Features



Sources:
DPTI (Stormwater), DENR (Roads, Cadastre)
Southfront (Aqueduct, Catchments)

southfront

Highbury Aqueduct LMP
Stormwater Analysis

Figure 1.3

Stormwater Features

Table3 Stormwater Issues, by Catchment

Catchment Ref	Area (ha)	Identified Issues
1	5.1	Some adjoining allotments (fronting Valley View Drive) have domestic drainage systems discharging into the reserve. No associated impacts of concern observed.
2	2.4	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
3	0.7	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
4	1.1	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
5	22.3	Generally degraded creek throughout, with channel erosion below the aqueduct. Abandoned dam structure overgrown with vegetation, high level of debris buildup. Concrete drop structure near southern boundary has dangerous high vertical walls without barriers / fencing. Flows through this structure threaten to overtop fence boundary and inundate adjacent residential property(s).
6	0.8	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
7	1.7	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
8	3.2	Stormwater drain outlet into open channel is full of debris and is a safety hazard.
9	13.1	Erosion along open drain, creating a deeply incised channel exposing bedrock in the section above the aqueduct channel. Generally degraded creek throughout.
10	20.2	Significant channel erosion / blowout upstream of the aqueduct channel, with unstable and undermined banks. High vertical wall hazard associated with old stone aqueduct underdrain structure. Old underdrain structure has lost some stone blocks and drain is blocked with debris. Degraded creek downstream of aqueduct.
11	10.1	Some minor erosion along open drain, particularly around headwalls and pipes. Generally degraded creek.
12	308	No identified issues - watercourse passes under the aqueduct channel via a culvert structure. Aqueduct channel has been modified to allow for any flows captured by the channel to spill into the watercourse.
13	1.2	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure
14	7.9	No identified issues - catchment is limited to the reserve itself which is adequately served by existing infrastructure

Figure 4: Significant Channel Erosion, Bank Blowout (Catchment 10)

Figure 5: Channel Erosion, immediately upstream of the southern cliff face (Catchment 5)

Map Two on the following page shows the stormwater catchments and infrastructure.

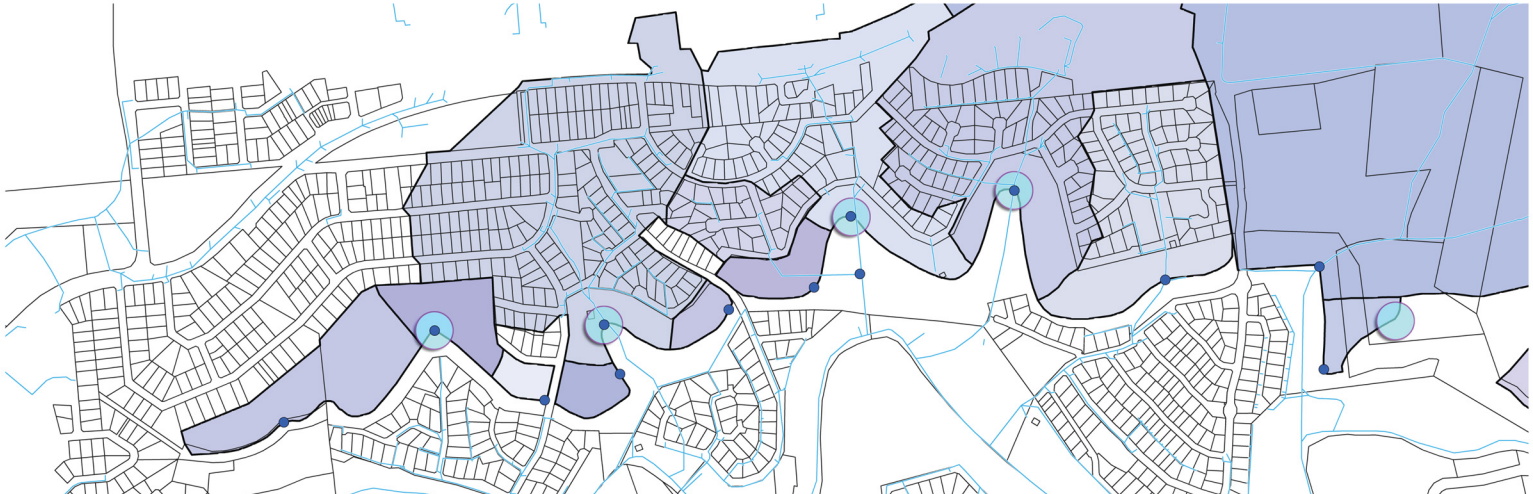
Stormwater

POTENTIAL PROJECT/AREAS

CHANNEL DISCHARGE LOCATION POINTS

STORMWATER INFRASTRUCTURE

CATCHMENT 01
CATCHMENT 02
CATCHMENT 03
CATCHMENT 04
CATCHMENT 05
CATCHMENT 06
CATCHMENT 07
CATCHMENT 08
CATCHMENT 09
CATCHMENT 10
CATCHMENT 11
CATCHMENT 12
CATCHMENT 13
CATCHMENT 14



5.0 Findings of Community Consultation Processes

Throughout the master planning process and during the on-ground works associated with opening Stage One of the reserve the consultant team and DEWNR staff have established a regular two-way flow of information and opportunities for input.

Detailed reports for each of the three phases of consultation are provided in Attachment A.

5.1. Issues and Opportunities Identification

In October 2012 an Information Flyer was distributed to over 800 Highbury residents living adjacent to the former Highbury Aqueduct. Residents whose properties directly abut the reserve were invited to contact URPS to set up a one-on-one or small group meeting. Other individuals sent emails or telephoned a hotline advertised in the flyer.

The main issues raised were:

- the removal of Aleppo Pines, particularly large trees close to property boundaries;
- the need to retain eucalypts for habitat reasons;
- the desirability of retaining some Aleppo Pines as food for yellow-tailed black cockatoos, until replacement food sources can be established;
- the desire of most people to retain rear property fences for privacy reasons;
- the existence of large amounts of debris including materials washed down streams or eroded from culverts and remnants of tree felling.

All of those who participated could see many opportunities to develop the park as a low-key natural park primarily for use by local residents for unstructured recreation. This direction led them to express a preference for:

- walking paths of fine crushed gravel rather than bitumen;
- seats with shade, especially where there are views over the city or ranges, but not directly looking into people's backyards;
- water fountains – 1 or 2 in the park;
- natural forest areas for peaceful walking/sitting;
- natural play;
- simple signs.

The following facilitates were not considered necessary by these community members:

- BBQ's;
- children's play equipment;

- toilets;
- picnic tables;
- lighting.

There was general support for being able to walk dogs in the park, however opinion was equally divided about whether dogs should be on or off lead.

Several community members, including the Pioneer Court residents currently managing a community garden within the Aqueduct Reserve, expressed a keen interest in being involved in planting and maintaining areas of natural vegetation and in removing weeds and exotic species.

5.2. Consultation on Preliminary Draft Master Plan

5.2.1. Consultation Process

Residents of the Highbury area surrounding the Aqueduct Reserve living between Lower North East Road and the River Torrens Linear Park received Newsletter 2 in their letterboxes on 20 November 2012.

They were invited to the launch of Stage One of The Aqueduct Reserve on Saturday, 8 December where copies of the Draft Master Plan Preliminary Concepts were on display. Members of the consultant team and Department of Environment Water and Natural Resources (DEWNR) staff were available to answer questions and facilitate input.

5.2.2. Participation

Over 100 people attended the launch of Stage One by local MP Tom Kenyon.

Sixty four people placed their names and contact details on the Highbury Aqueduct Project Register. Around 60 people recorded their responses on the large sheets provided with the maps.

In addition, 19 people completed more detailed feedback sheets at the event and 5 people posted or emailed sheets back to the consultant team.

5.2.3. Findings of Consultation Process

In summary, residents are very supportive of the opening up of the Aqueduct and its progressive development as a reserve.

There is strong support for differentiating this reserve from the Linear Park by retaining and reinforcing its natural character and limiting recreation to low impact activities compatible with a natural setting.

Wetlands and Boardwalks

There was extremely strong support for stormwater management treatments that provided biodiversity and amenity benefits such as wetlands and boardwalks.

Walking and Cycling

Most respondents wanted to see paths suitable for walking and cycling. There was a slight preference for gravel over bitumen paths, although it is considered that people were recording their desire to see shared use paths rather than necessarily have a bitumen surface.

Participants were divided about the inclusion of short downhill mountain bike tracks, with 18 in favour, 9 against and 9 neutral.

Dogs On/Off Leash

The other area where there were divided opinions relates to dogs on or off leash. Thirteen people favoured off leash, 11 opposed this and 7 were neutral. Further comments indicate that one of the main concerns about dogs off leash relates to their negative impact on native fauna including koalas, echidnas and birds.

Park Amenities

* n = represents number of people recording this preference.

With respect to park amenities a majority of people would like to see:

- seating in a natural setting (n = 21);
- picnic tables and chairs (n = 20);
- drinking fountains (n = 9);
- shelter (n = 5).

Opinion was divided over the provision of toilets with 3 people recording support and 1 person recording opposition. It should be noted that toilets were not shown on the Preliminary Concepts drawing as it is unlikely they would be provided in a park where most users will be from the surrounding area or using the park as part of a walking or cycling link with the Linear Park, where toilets are provided.

Other Park Features

There was support for new community gardens (n = 17).

There was a preference for natural play spaces (n = 24) over constructed play equipment (n = 16 with 6 people opposed to this).

Maintenance, Tree Removal and Revegetation

Respondents commented on the importance of regular maintenance, weed control and grass cutting. Most people support the progressive removal of Aleppo pines subject to a proactive and early revegetation program. It was noted that alternative food sources for black cockatoos need to be provided.

Site Specific Issues

Some residents noted specific concerns associated with access points proposed near their properties, stormwater management issues, and the need for pull-in parking bays on steep sections of road to avoid safety issues for pedestrians and motorists.

5.2.4. Input incorporated in Final Draft Master Plan

This feedback from the community was considered by the consultant team and DEWNR staff in the development of the Final Draft Master Plan.

Key inclusions were:

- identification of stormwater management projects at several sites;
- identification of up to 3 activity nodes which could be a focus for seating, shelter, natural play, picnic facilities and water fountains;
- consideration of areas of habitat significance where dogs should either be on leash or excluded (eg koalas/bird breeding);
- review of access points to address privacy issues;
- provision of limited pull-off areas for parking where on-street parking could be inappropriate, in locations that could support access for people with limited mobility.

5.3. Community Feedback on Final Draft Master Plan

5.3.1. Process

Newsletter 3 was distributed to all households adjacent to the Highbury Aqueduct and the Final Draft Master Plan was placed on the Turramurra Recreation Centre.

An Open House Drop In Session and a presentation were conducted in the afternoon and evening of 6 March 2013.

5.3.2. Participation

Nine people attended a Community Feedback Session and/or workshop designed to obtain responses about the potential projects and their relative priority.

Seven feedback sheets and two emails were received by URPS staff.

While the number of responses was small, their views generally reflected those provided on the Preliminary Draft Master Plan.

5.3.3. Priority Projects

The highest priority projects were:

- the management of remnant vegetation as SA Blue Gum open woodland;
- vegetation conservation;
- stormwater and creek remediation;
- expansion of Niquet Reserve on Freshford Avenue to connect with the reserve.

Some respondents wanted to see:

- historic conservation and restoration of aqueduct stonework;
- bike tracks for BMX and mountain bikes;
- active playspace and community recreation;
- a toilet in Niquet Reserve.

5.3.4. Dogs in Park

There was concern expressed about the potential impact on native fauna of dogs off lead. It was considered that dogs should be on lead at all times in the park because of the potential threat to echidnas, koalas, reptiles and birds.

5.3.5. Balancing Access and Biodiversity

Some felt that there should be no pathways through the remnant Blue Gum area while others thought low-key paths with seating for reflection would provide a "bush" experience in an otherwise urban environment.

5.3.6. Community Involvement in Conservation Projects

There was, and has been, throughout the project considerable community interest in being actively involved in conservation and biodiversity activities. One respondent wrote:

"The Trees for Life model of community revegetation groups works really well. Also, involving local families and children in planting and monitoring new plantings works. If every person who walks the tracks pulled up 6 olives and baby pines at each visit, we'd all be contributing to renewal."

5.3.7. Framework for Future Development

The responses reinforced the desire for low-key development that sits well in its natural surroundings with a focus on conserving and re-establishing habitat for biodiversity.

The removal of non-native vegetation, weed species and pest animals such as foxes was seen to be an integral part of achieving this outcome.

Early revegetation of the areas that have been cleared in Stage One will help to recreate a bushland feel. Some people wanted to see a balance between the removal of Aleppo Pines for safety and fire risk and retention for habitat for black cockatoos. They preferred that early plantings include alternative food sources for yellow-tailed black cockatoos such as hakeas and casuarinas.

There has been strong support throughout the consultation process for stormwater management techniques that would bring some water back into the channel to support plantings and wildlife.

6.0 Highbury Aqueduct Reserve Master Plan

This section of the report is designed to be read in conjunction with the Master Plan drawings provided in Attachment D and the concepts for stormwater management projects provided in Attachment E.

6.1. Overarching Philosophy

Drawing on the objectives and guidelines provided in Section 3 the project team has developed a plan for the future development of the site that will provide:

- access to an improved natural environment for unstructured active recreation, reflection and relaxation and nature conservation activities;
- links between communities and existing recreational assets such as the River Torrens Linear Park, Council parks, playgrounds and recreation facilities;
- restoration of biodiversity habitat through proactive stormwater management;
- a focus for community connection that supports health and wellbeing outcomes.

6.2. Landscape Design

The Masterplan proposes that sections of the Highbury Aqueduct Reserve should be progressively opened to the public, through environmental management, enhancing the visual, natural, experiential, heritage values and safety of the reserve for the local community. Along with local management and risk mitigation, the development will ensure an increased level of bushfire preparedness ensuring guided management and strategies will be directly applied. Native vegetation such as the SA Blue Gum open woodland and natural water courses have the potential to create a strong base and network to form a unique natural corridor in the suburb of Highbury, reinforcing biodiversity and sustainability principles.

The introduction of a pathway hierarchy that flows along the remnant corridor of the Aqueduct using existing topography, protects native vegetation while creating safe and direct routes through the reserve for low-impact recreation such as walking, dog exercise, cycling connection and relaxation. The path network is designed to provide a natural character with low impact on the landscape, using the existing terrain and establishing links between the reserve and surrounding properties. The ten potential projects dispersed throughout the Reserve reconnect the community with currently inaccessible and underutilized land. These potential projects are orientated around community activated spaces including, active play space, extension of the existing community garden and expansion of the bike track. The re-vegetation of native species and minimising of noxious weed species will ensure a high quality natural space highlighting existing views of the surrounding Adelaide foothills and overlooking the city. Environmental protection orientated spaces include historic conservation of remnant Aqueduct walling, re-vegetation and management of SA Blue Gum open woodland, natural water course restoration, storm water and creek remediation and overall vegetation conservation.

6.3. Proposed Community Access and Recreation Projects

The following potential projects have been identified as ways to further enhance community experiences in the reserve. These projects are not included in current funding applications and will require consideration against other budget priorities in the medium to longer term.

6.3.1. Remnant Vegetation: SA Blue Gum Open Woodland

Fine grain minimal impact walking trails will meander through the woodland creating an opportunity for interaction and education, whilst protecting the existing SA Blue Gum remnant woodland. Clearing and minimizing of noxious weed species and exotic tree removal within the area is to be combined with a re-vegetation of native species and existing woodland. Interpretive signage will inform visitors of conservation, biodiversity and native flora and fauna along the trail.

Key elements include:

- fine grain walking trails;
- interpretive signage;
- buffer planting within and around degraded edges of remnant;
- strategic tree removal;
- weed management and exotic tree removal (Aleppo Pines);
- re-vegetation planting;
- conservation;
- dogs on leash.

6.3.2. Historic conservation

This potential project seeks to embrace existing historic aqueduct stone work through the restoration of the aqueduct bridge. An intimate space that optimises views to the Adelaide foothills and Adelaide CBD with opportunities for vantage points and lookouts, reinforcing a sense of difference from the lower Linear Park location. This will create a space for relaxation and respite centred around the importance of local historical stonework and landscape narrative. Surrounding landscape will be re-vegetated and include creek remediation and introduction of native riparian planting, increasing biodiversity opportunities for local species.

Key elements include:

- restoration of aqueduct stone work;
- informal seating;
- different surface treatment;
- interpretative signage;
- WSUD (Water Sensitive Urban Design).

6.3.3. Active playspace / community recreation

This project develops an open playspace area which seeks to reinforce a natural character to accommodate local community recreation, including adult health and

active play. Strategically placed pull-in parking bays, drop-off zones, disabled car parking and access, bike and walking trails will provide greater access to the site. This natural playspace has the potential to become a significant local destination, with prospects of BMX and mountain bike trails, adequate seating, shade and drinking fountains to be provided. Signage and interpretation will assist in providing an understanding of the history, ecology and hydrology of the Highbury Reserve. Linkages will be provided with primary trails, Turramurra Recreation Centre, residential areas and associated streets, assisting in reconnecting the space and providing a strong sense of legibility.

Key elements include:

Short term
- shade trees;
- seating;
- connection with Turramurra.

Long term
- develop community garden group;
- natural/active play and adult health;
- BMX/Mountain bike;
- formal shade, seating and drinking fountains;
- pull-in bay parking and disabled parking;
- WSUD (Water Sensitive Urban Design);
- dogs on leash;
- interpretive signage.

6.3.4. Vegetation conservation

This proposal acts as a development for a wildlife corridor, through the management and maintenance of weed and exotic tree removal. It aims to increase biodiversity within the area by creating localized re-vegetation areas, including remediating creek beds with Water Sensitive Urban Design, repairing storm water infrastructure and creating a safe and vastly improved ecosystem. Boardwalk crossings allow users to engage with surrounds and creek banks with minimal interference on the landscape.

Key elements include:

- Introduction of native riparian planting;
- repair and improve stormwater infrastructure;
- boardwalk crossing/soil embankment;
- development of wildlife corridor;
- remediate creek banks;
- weed management and exotic tree removal;
- slow flows and retain soil moisture;
- increase biodiversity opportunities for local species through enhancement of re vegetation and restoration of drainage line;
- replacement feeding habitat for yellow-tailed black cockatoo in localised re-vegetation areas.

See further detail on the stormwater management elements of this project in Section 6.5 and drawings in Attachment E.

6.3.5. Expansion of existing Community Garden

There is a great opportunity for community activation along the length of the Aqueduct, centred around expansion of the current Community Garden, which is situated to the rear of the homes along Pioneer Court. The community garden will not only provide produce but also enhance the biodiversity of the area, re-establishing native vegetation and buffering existing native vegetation areas. Ideas to increase involvement with residents who do not live directly adjacent to the facility are welcomed, to potentially work in conjunction with the established and expanded community garden. This community-led project offers individuals a sense of place and can act as a catalyst for further development of neighbourhood relationships.

Key elements include the following:

- implement signage;
- informal paths;
- local expansion of garden and potential additional gardens along Aqueduct;
- collaborate closely with residents;
- carefully design path orientation with consideration of public, semi-private and private space;
- weed management;
- biodiversity enhancement through re-vegetation and buffering around native grass areas and existing re-vegetation;
- native bush foods garden.

6.3.6. Storm water & creek remediation

This section of the Aqueduct has steep topography with erosion, storm water and safety issues, which it is essential to address. By facilitating ideas using WSUD features, including native riparian planting, the slowing of water flow to retain soil moisture and increasing biodiversity within the area, these issues can start to be addressed. Expanding connections along the aqueduct with boardwalk crossings and creating links with the adjacent park on located on Country Lane will also support access.

Key elements include:

- rock line creek bed;
- boardwalk crossing/soil embankment;
- introduce native riparian planting;
- slow flows and retain soil moisture;
- increase biodiversity opportunities for local species;
- weed management and exotic tree removal (staggered);
- replace feeding habitat for yellow-tailed black cockatoo in localised re-vegetation areas;
- potential removal of some existing native trees to facilitate reconstruction of the aqueduct.

6.3.7. Bike tracks

The area to the east of Pioneer Court is a potential area to maximize recreation within the landscape. Adding to homemade cycle ways, BMX tracks and bike jumps and a challenging cross country bike way that are currently dotted around the Highbury

Reserve and combining them into designated areas where there is low ecological value. The current project location allows the tracks to connect with Linear Park, forming a strong entry and exit point of reference to the reserve. Opportunities to work with the local youth in design and construction to facilitate a community orientated space, gaining a youth sense of ownership and overall satisfaction with the design outcome would be desirable.

Key elements include:

- expand on existing bike track;
- short downhill mountain bike;
- BMX track;
- encourage bike use in designated areas of low ecological value;
- work with local youth in both design and construction;
- bicycle racks.

6.3.8. Historic conservation

Strategically located below Freshford Avenue, the historic aqueduct stonework provides an opportunity to increase community understanding of the history of the site through the restoration of the aqueduct and additional balustrade fencing to improve safety due to steep level changes and interpretation. Existing stormwater infrastructure and interfaces with the aqueduct are currently causing issues with erosion, which will be mitigated through stormwater management.

Key elements include:

- restoration of aqueduct stonework;
- informal seating;
- surface treatment;
- interpretative signage;
- slow flows and retain soil moisture;
- introduce native riparian planting;
- increase biodiversity opportunities for local species;
- boardwalk crossing.

See further details on the stormwater management elements in Section 6.5 and Attachment E.

6.3.9. Expand Niquet Reserve to connect with Aqueduct Reserve

This potential project seeks to find a more formal layout and greater amenity on site, including tree planting, seating, drinking fountain and bicycle racks. Increasing the pedestrian and cycling connectivity to the adjacent Niquet Reserve will enabe Niquet Reserve to merge into the Aqueduct Reserve and expand the recreational value of both sites. Natural play investigation and exploration opportunities are further explored through the revitalisation of the natural waterway that traverses the site. Laid back creek banks, interpretation deck and riparian plantings could create a safe place for children to explore the water course. There is also the potential to engage with the topography of the landscape for a naturally formed amphitheatre and performance/creative open space.

Key elements include:

- strong pathway connections to Niquet Reserve;
- expand Niquet Reserve to merge into the Aqueduct Reserve;
- more formal shade tree planting, seating, drinking fountain and bicycle racks;
- deck boardwalk crossing and vehicle crossing;
- natural and interpretive play;
- small areas of irrigated grass;
- lay back creek bank WSUD opportunity;
- rock line creek bed;
- slow flows and retain soil moisture;
- introduce native riparian planting;
- increase biodiversity opportunities for local species;
- weed management and exotic tree removal;
- development of wildlife corridor.

See further details on the stormwater management elements in Section 6.5 and Attachment E.

6.3.10. Natural water course restoration

The natural water course restoration project needs a high amount of weed management to coincide with WSUD opportunities, using the current overflows and groundwater runoff to create a potential wetland at the Majestic Grove end of the site. The existing creek line and aqueduct run in parallel with each other providing for a wetland interpretation area for quiet reflection, observation of bird life and animal species.

Key elements include:

- weed management;
- deck boardwalk crossing;
- seating;
- re-vegetation and infill planting in existing re-vegetation area;
- biodiversity enhancement through re-vegetation and restoration of wetland and riparian vegetation.

See further details on the stormwater management elements in Section 6.5 and Attachment E.

6.4. Environmental Management Actions

6.4.1. Management of priority weeds

Most of the existing vegetation is dominated by exotic weeds and planted non-local revegetation species. Management of weeds across the site should be undertaken in priority order (Table 4). This will help ensure that those areas which possess the greatest biodiversity value are managed prior to those areas which are more degraded or highly modified.

Table 4. Restoration Prioritisation of areas across Highbury Aqueduct

Priority	Project Area / description	Vegetation	Management Strategies
1	Project 1 – Remnant vegetation areas (eastern and western patches)	*Eucalyptus leucoxylon* ssp. *leucoxylon* (SA Bluegum) +/- *Allocasuarina verticillata* (Drooping Sheoak) woodland	Weed Management Exotic Tree removal (*Pinus halepensis* and other exotic and non-local native trees) Potential revegetation buffering within and around degraded edges of remnant
2	Project 5 – Expansion of existing Community Garden	Non-local native revegetation with scattered patches of native grass	Protection and buffering native grass patches Non-local native plant removal Weed Management

Priority	Project Area / description	Vegetation	Management Strategies
3	Project 10 – Natural water course restoration	Degraded *Phragmites australis* (Common Reed) Grassland	Weed Management (Artichoke Thistle, Wild Mustard, Kikuyu, Scabious and Rice Millet, Blackberry) Biodiversity enhancement through revegetation and restoration of wetland and riparian vegetation Infill planting in existing revegetation area
4	Existing revegetation area - 5 years old	Indigenous revegetation area	Weed Management Infill planting
5	Project 4. Vegetation restoration associated with Aqueduct restoration	*Pinus halepensis* (Aleppo Pine) forest	Weed Management Staggered exotic tree removal (*Pinus halepensis* and other exotic and non-local native trees) Riparian revegetation

Priority	Project Area / description	Vegetation	Management Strategies
	Project 6. Stormwater and Creek remediation	*Pinus halepensis* (Aleppo Pine) forest	Weed Management (Blackberry, Aleppo Pine, Desert Ash, Olives, Kikuyu, other grassy and herbaceous exotics) Exotic Tree removal (*Pinus halepensis* removal to be staggered) Replacement feeding habitat for Yellow-tailed Black Cockatoo in localised revegetation areas. Biodiversity enhancement through revegetation and restoration of drainage line (riparian species within temporary wetland environs and upper riparian slopes). Development of wildlife corridor Potential removal of some existing native trees to facilitate reconstruction of the Aqueduct.
	Project 8. Historic Conservation	*Pinus halepensis* (Aleppo Pine) forest	Weed Management Staggered exotic tree removal (*Pinus halepensis* and other exotic and non-local native trees) Riparian revegetation
	Project 9. Expand reserve & connect with Aqueduct reserve	Native revegetation and *Pinus halepensis* (Aleppo Pine) forest	Weed Management Exotic Tree removal (*Pinus halepensis* removal to be staggered) Biodiversity enhancement through revegetation and restoration of drainage line (riparian species within temporary wetland environs and upper riparian slopes). Development of wildlife corridor

Priority	Project Area / description	Vegetation	Management Strategies
6	*Pinus halepensis* forest (all other areas)	*Pinus halepensis* (Aleppo Pine) forest	Weed Management Staggered exotic tree removal (*Pinus halepensis* and other exotic and non-local native trees) Revegetation SA Bluegum Open Woodland community and

The Maintenance Map on the following page shows the priority for weed management and the location of new tracks for maintenance and fire vehicle access.

The Fire Map shows the priority areas for bushfire management.

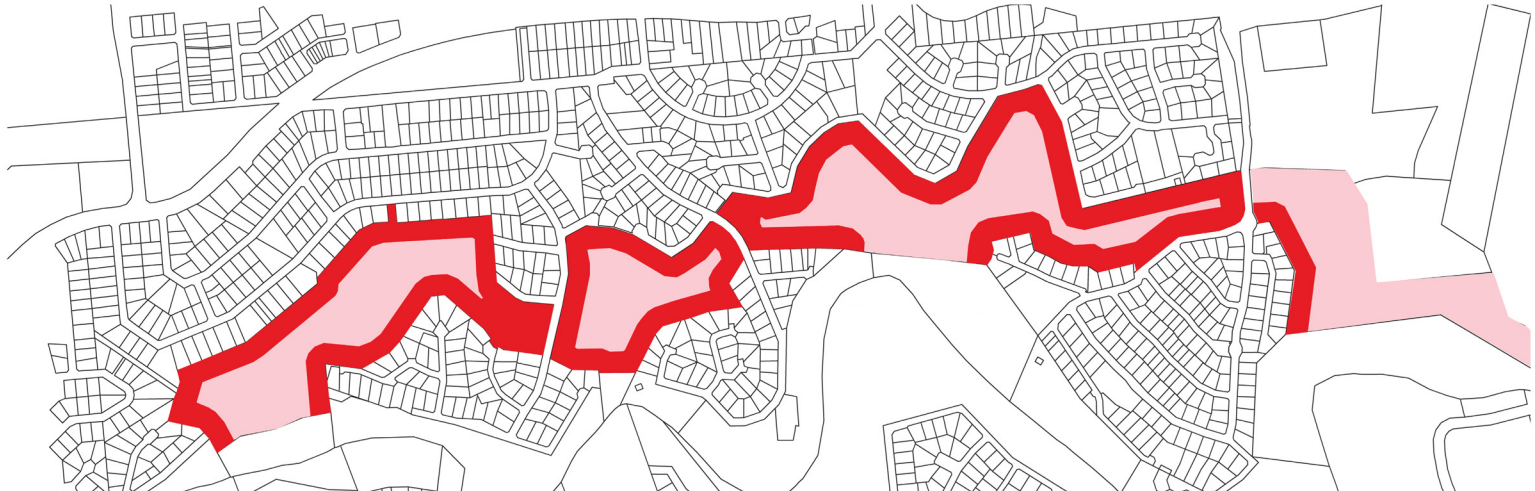
Fire

MINOR FIRE TRACK

SERVICE TRACK

ASSET ZONE

BUFFER ZONE



Maintenance

Priority

- HIGH WEED MANAGEMENT
- LOW WEED MANAGEMENT
- MEDIUM WEED MANAGEMENT
- STAGED TREE MANAGEMENT, PRUNES AND REMOVALS
- NEW FIRE TRACKS / MAINTENANCE ACCESS

6.4.2. Staggered Pine removal approach over 20 year period

The Aleppo Pine (*Pinus halepensis*) is an introduced and declared plant within South Australia due to its threat as a significant weed. However, the species provides an important artificial food source for the state vulnerable Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) (YTBC). Whilst it is important to encourage the YTBC to rely on a native diet of Hakea and Banksia species wherever possible, the value of Aleppo Pines as an alternate food source cannot be understated. This is particularly relevant when suitable woodlands used for foraging have been cleared and are fragmented across the region. The annual census completed each year by the Department of Environment, Water and Natural Resources indicated that YTBC occur in relatively low abundance across the region (EBS Ecology, 2012).

Significant stands of *Pinus halepensis* (Aleppo Pine) dominate the Highbury Aqueduct site and a group of approximately 50 birds were observed feeding in trees directly south-east of the Stage 1 site within the Highbury Aqueduct area.

A staged removal of the Aleppo Pines is proposed for the site to slowly return the site to a more natural state in association with a revegetation program, however it must be undertaken slowly to minimise significant impacts to the YTBC relying on the food source. In association with the staged removal, proposed revegetation areas will be planted with a high number of their native diet species (Hakea and Banksia species), but this will take many years to completely substitute the loss of the pines. It is proposed that the staged removal be undertaken over a 20 year period, aiming for removal of approximately 25% of the pines per 5 year period. A large number of the pines on site have been assessed by an independent arborist and assigned a priority rating according to factors such as general hazard issues, health, structure and condition of the individual and bushfire risks. Those priority ratings have been used to guide the planning for staged removal of the species across the site. There are a number of the trees which have not been individually assessed and may require assessment prior to removal.

Table 5. Staged *Pinus halepensis* removal

Stage Area	Approximate no. of trees to be removed	Proposed timing of removal (years)			
		1 - 5	5 -10	10 - 15	15 - 20
1		110	110	110	110
2		50	50	50	50
3		85	85	85	85
4		5	5	5	5
Total Trees		250	250	250	250

6.4.3. Revegetation and habitat management

To re-create suitable habitat to promote utilisation by a variety of fauna species, a greater complexity of habitats needs to occur. Revegetation projects will need to include understorey and shrub layers in addition to overstorey stratum. Native grasses provide valuable food resources to various native bird species whilst the flowers on shrubs and trees provide valuable resources to native honeyeaters and other birds. Restoring habitat complexity also creates refuge for some species, particularly those which have become displaced by predators and more aggressive native species such as the Noisy Miner. However dense areas of revegetation can pose safety issues for public users of the reserve and need to be managed accordingly.

Habitat can also be enhanced by installing bird and bat boxes and affixing hollows to trees. This will provide valuable resources to a range of species, including the Yellow-tailed Black Cockatoo. All boxes or hollows should be regularly inspected for exotic species utilisation (e.g. feral honeybees). Additional structures such as fallen logs, large rocks and leaf litter can also be deposited within the revegetation areas to provide habitat to a range of fauna species.

The broad objectives of the proposed revegetation works are to:

- improve habitat complexity and microclimates,
- improve biodiversity by revegetating areas along the riparian environment, and promote fauna movement through habitat linkages (corridors),
- buffering remnants,
- enhancing existing revegetation areas through infill planting, and
- returning modified areas to self sustaining native woodland structures.

6.4.4. Restricting public access and off-target damage

It is preferable to restrict public access to sensitive areas such as remnants and patches of native grasses. Some form of delineation may be required to protect areas from damage from mowers and weed spraying, trampling from walkers, and generally delineating from those areas being managed for weeds. In particular, there are two main remnant woodland areas and seven distinct patches of native grass that have been mapped on site and that will probably require protection.

6.5. Stormwater Management Actions

6.5.1. Design Principles

A range of treatment measures have been considered, to respond to the stormwater management issues outlined in Table 3. The following design principles have been developed to assist in scoping and prioritising remedial works that are appropriate in the context of the broader Reserve development:

- reflect the broader reserve development intent in achieving a natural bushland setting. This includes:
  - utilisation of vegetation to assist in erosion protection and to screen 'hard' protection measures;
  - maintaining stormwater drainage in open channels in preference to extending underground drains, where feasible;
  - integration of new infrastructure design with surrounding landscape
- where appropriate, implement measures that reduce in-stream erosion, and assist in the improvement of stormwater quality;
- where appropriate, implement measures that reduce flood risk and drainage nuisance to adjoining residential properties;
- ensure that implemented measures are robust and durable to minimise future maintenance requirements, with convenient access incorporated for maintenance activities;
- ensure that the final infrastructure poses as low a hazard to the general public as can reasonably be achieved within the natural constraints of the site.

6.5.2. Potential Projects

A range of stormwater management remedial measures have been identified across the reserve, which incorporate a combination of:

- replacement of open sections with piped sections;
- construction of rock scour protection within the channel;
- establishment of appropriate riparian vegetation;
- establishment of rock-lined 'pools and riffles' to both provide an enhanced environmental habitat and to reduce the erosive impacts of stormwater flows on downstream sections of channel;

- integration of gross pollutant/sediment traps, and detention storage (where appropriate) within those areas requiring rehabilitation works, where these works would reduce peak flow rates (and erosion potential) for the downstream section.

The works packages are summarised in Table 6 below, with key elements described in further detail below. Concept design sketches are included in Appendix D.

Table 6 Stormwater Management Actions Summary

Potential Project Ref	Catchment Ref	Relative Priority	Brief Description
4	5	Medium	Low flow diversion into pool/riffle system Reconstruction of detention storage and concrete drop structure
6	9	Medium	Extension of Council drain into reserve and construction of low flow detention storage
8	10	High	Rehabilitation of severely eroded channel
9	11	Low	Creation of landscaped channel with interactive elements
10	12	Low	Timber boardwalk spanning the aqueduct / watercourse crossing.

Potential Project 4

- a pool and riffle system will be established within the former aqueduct channel, such that low flows (all stormwater flow from events resulting from up to approximately 10mm of rainfall) can be diverted into the aqueduct channel;

- these pools would be ephermal, and provide a role in improving stormwater quality, reducing peak flow rates and providing a habitat for semi-aquatic species. The diversion of frequent events will also provide greater opportunity for the use of vegetation in the rehabilitation of the existing downstream channel;

- overflows from this system would be discharged into the existing Council drain connection at Historic Drive;

- larger flow events would be accommodated by high level overflow into the existing channel that traverses the reserve. Subject to further more detailed assessment, the existing abandoned dam structure would be modified such that it can serve as a detention storage structure, reducing high peak flows to a more manageable level that reduces the scale of infrastructure required downstream;

- subject to further more detailed assessment, the existing concrete drop structure and associated underground drainage infrastructure located adjacent to the southern boundary will be modified to reduce hazards to reserve visitors, and to provide an improved arrangement that reduces nuisance and flood risk to the adjacent residential properties.

Figure 6 Rehabilitated stream example with pool and riffle (Second Creek, Michael Perry Reserve)

Figure 7 Existing concrete drop structure (Catchment 5)

Potential Project 6

- the existing Council stormwater drain will be extended through the deeply eroded gully (where bedrock has been exposed), with fill placed over to provide for an even transition to the opposing gully slopes;

- an ephemeral pool will be established utilising the existing landform of the former aqueduct channel. All stormwater flow from events resulting from up to approximately 10mm of rainfall would be contained by this pool. An outlet structure discharging to the downstream open channel will provide both a trickle release for low flows and an overflow for more severe rainfall events;

- the reduction of flow rates for regular events will also provide greater opportunity for the use of vegetation in the rehabilitation of the existing downstream channel.

Figure 8 Deeply eroded gully (Catchment 9)

Potential Project 8

- the deeply incised and eroded channel banks will be addressed by laying back the banks, and establishing engineered structures (most likely in the form of rock-filled gabion baskets) to control erosion of the channel invert. The weir drop structures will provide intervening sections of channel with a relatively flat longitudinal gradient that will be suitable for the establishment of vegetation;

- the connection from the eroded section of channel through to the channel downstream of the former aqueduct channel will be redefined to incorporate the original aqueduct underdrain structure. Some remedial works are required to replace some stone blocks, and the underdrain will be cleared of debris;

- a separate, smaller Council drain that discharges into the reserve near this location requires some minor remedial works to address overflows that are causing some erosion between Country Lane and the former aqueduct channel.

Figure 9 Original Aqueduct Underdrain Structure (Catchment 10)

Potential Project 9

- the banks of this channel will be laid back and landscaped to integrate with the surrounding recreational areas and associated open space development;

- the smaller catchment / lower flows that pass through this channel are such that it is considered appropriate that interactive elements such as 'stepping stones' can be incorporated into the rehabilitation of this channel.

Potential Project 10

- the alignment of the major path intersects with the former aqueduct channel and a natural watercourse at this location. In order to provide appropriate path continuity and functionality of the intersecting elements, an elevated timber boardwalk structure will be constructed. This elevation will enable views over these elements.

Figure 10 Former Aqueduct Channel passing over watercourse (Catchment 12)

6.5.3. Climate Change

CSIRO climate change modelling predicts higher average annual temperatures and lower average annual rainfall in SE Australia. It also predicts higher intensity rainfall events in spring and summer. This scenario will exacerbate the risks associated with erosion of watercourses and loss of natural environmental habitat within these corridors through the reserve that receive stormwater flows from the surrounding urban catchments.

This project will provide measures that will mitigate against increased peak flows through low flow retention and high flow detention storage, and implementation of erosion control measures in some locations to support vegetation reinstatement. Design flow rates for these measures will adopt a 10% surcharge to current design rainfall intensity parameters to account for the predicted changes attributable to climate change.

7.0 Implementation and Costings

This section of the Master Plan Report provides a summary of the costs associated with the staged implementation of the Master Plan. The map on the following page shows the four stages as follows:

- Stage One: Majestic Grove to Historic Drive;
- Stage Two: Historic Drive to Boundy Road;
- Stage Three: Boundy Road to Gallery Road/Buchanan Court;
- Stage Four: East of Majestic Grove.

Detailed costings are provided in Attachment F.

Table 7 below shows the probable opinion of costs (before detailed design and documentation for each key component).


STAGE 1
STAGE 2
STAGE 3
STAGE 4

Table 7: Indicative Costings for Developing the Highbury Aqueduct Reserve for safe community access

Stage One: Suggested Priority Works	
Completion of Stage One works – tree management, fence removal and rubbish removal **Access paths** **Stormwater Management**	$198,000 $651,420 $341,000
Total	**$1,190,420**
Stage Two: Suggested Priority Works	
Site preparation and demolition **Tree removal 1-5 years** **Access paths** **Stormwater Management**	$50,000 $225,000 $265,580 $408,000
Total	**$948,580**
Stage Three: Suggested Priority Works	
Site preparation and demolition **Tree removal 1-5 years** **Access paths**	$90,000 $382,500 $347,500
Total	**$820,020**
Stage Four: Suggested Priority Works	
Site preparation and demolition **Tree removal 1-5 years** **Access paths** **Stormwater management**	$45,000 $22,500 $208,310 $66,000
Total	**$341,810**

Therefore the costs to open up the full length of the reserve for public access including tree removal and management for safety, developing all primary access paths and secondary links and undertaking all stormwater management projects is in the order of $3.3. million.

Table 8: Indicative Costings for Undertaking the Potential Projects in each Stage

Stage One: Potential Projects (costs rounded up) [1]	
PP5: Expansion of Community Garden	$185,00
PP6: Stormwater and Creek Remediation	$72,000
PP7: Bike Tracks	$52,000
PP8: Historic Conservation	$43,000
PP9: Expand Niquet Avenue reserve to connect with Aqueduct Reserve	$295,000
Total	**$647,000[1]**

These costs do not include the stormwater management works which are including in the Suggested Priority Works in Table 7.

Stage Two: Potential Projects (costs rounded up) [2]	
PP3: Playspace and Community Recreation	$635,000
PP4: Vegetation Conservation	$78,000
Total	**$713,000[2]**
Stage Three: Potential Projects (costs rounded up) [2]	
PP1: Remnant Vegetation	$42,000
PP2: Historic Conservation	$82,000
Total	**$124,000**
Stage Four: Potential Projects (costs rounded up) [2]	
PP10:	$155,000

(2) These costs do not include stormwater management works which are included in the Suggested Priority Works in Table 7.

Table 9 below shows the other costs which will apply to reserve wide projects.

Environmental Management Miscellaneous Costs eg bollards/fencing.

(Tree removal costs for years 1-5 have been included in Suggested Priority Works in Table 7).

Stage One: Costs Rounded Up	
Weed management/revegetation **Tree removal 6-20 years** **Mass plantings** **Miscellaneous**	$160,000 $1,665,000 $14,000 $28,000
Total	**$1,867,000**
Stage Two: Costs Rounded Up	
Weed management/revegetation **Tree removal 6-20 years** **Miscellaneous**	$86,000 $675,000 $33,000
Total	**$794,000**
Stage Three: Costs Rounded Up	
Weed management/revegetation **Tree removal 6-20 years** **Mass plantings** **Miscellaneous**	$155,000 $1,148,000 $16,000 $28,000
Total	**$1,347,000**
Stage Four: Costs Rounded Up	
Weed management/revegetation **Tree removal 6-20 years** **Miscellaneous**	$155,000 $68,000 $28,000
Total	**$251,000**

Total costs for each stage comprising:

- Suggested Priority Works;
- Potential Projects;
- Environmental Management, Fencing, Bollards and other miscellaneous items;
- 10% contingency

are as follows:

Stage One	$6.095m
Stage Two	$2.702m
Stage Three	$2.291m
Stage Four	$.823m
Total Budget over 20 years (at 2013 prices)	$11.911m

7.1. Implementation Strategy

The development of the Highbury Aqueduct Reserve is dependent on the ability for the contracted land managers, DEWNR, to obtain funding from State and National Governments. A collaborative approach to seeking this funding will require up-front investment by the State Government. The NRM Boards may be able to provide resources towards those projects that have a clear focus on improving urban stormwater management and biodiversity outcomes.

7.1.1. Working with the City of Tea Tree Gully

During the project meetings have been held with staff and Elected Members of the City of Tea Tree Gully. Council has clearly indicated that it is not interested in taking on responsibility for the Highbury Aqueduct Reserve as this area of Council is already well served with public open space. They are also concerned about the high level of liability associated with the site in its current state.

However, Council sees the value of having an Implementation Working Group comprising Council staff involved in stormwater management, biodiversity conservation, reserve and verge maintenance and traffic management working with DEWNR staff to ensure the effective and efficient management of interface issues.

Council are also willing to provide staff support to externally funded community conservation initiatives such as Bush for Life and Trees for Life.

7.1.2. Working with the Highbury Community

As a result of the community engagement for this project, over 50 people have registered their interest in being involved in conservation activities such as weeding and removal of feral species and vegetation.

It is recommended that DEWNR staff liaise with these people to link them to Bush for Life co-ordinators and resources to facilitate their participation.

It is considered preferable to nurture several Bush for Life sites at specific locations within the park rather than have a generic Friends of the Aqueduct Reserve. Targeted conservation initiatives are likely to be easier to manage and result in a sustained effort that yields higher biodiversity outcomes.

8.0 References

KBR (2006), *Stormwater Works Management Plan – Aqueduct Reserve*, prepared for Leed Engineering & Construction

KBR (2007), *Aqueduct Reserve Stormwater Upgrade Drawings (Not for Construction)*, prepared for Leed Engineering & Construction

EBS Ecology (2012) Aleppo Pine Project:
Report to City of West Torrens

9.0 Attachments

Attachment A

Detailed Consultation Summaries

Highbury Aqueduct Reserve

Consultation Report

1.0 Consultation Materials

URPS prepared an information flyer including map of the proposed Stage One Works (see Attachment One) and arranged for these to be distributed by SALMAT to 800 letterboxes of households in Highbury adjacent to the former aqueduct land.

Residents were invited to contact us by email and/or to participate in a telephone hotline advertised for Monday 15th October 9am to 9pm and Thursday 18th October 5pm to 9pm.

Residents whose properties' fences directly abut the park received a larger scale map and an invitation to contact URPS to set up a meeting (See Attachment Two).

2.0 Responses

Four emails were received from surrounding residents and one of the Tea Tree Gully Council Ward Councillors for the area. One person followed this up with a phone call to the hotline. No other calls were received on the hotline.

Small group meetings were held at homes in Nursery Way and Pioneer Court and individual meetings were held with 2 other residents of Nursery Way and 1 from Nalga Court.

3.0 Summary of Issues Raised

3.1. Trees – Retention and Removal

There was general support for the removal of Aleppo Pines, particularly large specimens close to the road or property boundaries. Some residents spoke of feeling very concerned during high speed winds and in storm situations. Several such trees have been included for assessment and/or removal in Stage One.

Only one Eucalypt was suggested for removal at the rear of a property in Pioneer Court. However, as this tree is recorded as significant in the tree report and noted as being without any significant defects, removal is extremely unlikely. Hazard pruning to remove branches with the potential to fail over public access areas.

A number of Eucalypts on Country Lane were noted by residents for protection, particularly due to the role they play as habitat for koalas and a range of birds.

All of these trees are identified for retention, although some hazard pruning may be required. One submission also noted the importance of retaining dead trees for their habitat value. The specific tree will be assessed on site.

Some people expressed concern that removal of too many of the Aleppo Pines would impact on the yellow tailed black cockatoos. However, most people were happy to accept their replacement with trees such as hakeas or casuarinas which also provide a food source for cockatoos and other birds.

The polten and debris dropped by the Aleppo Pines at this time of the year cause health concerns and inconvenience for some households. People with allergies find that they need to keep their windows closed in spring.

3.2. Access to the Park

Residents on Nursery Way would like to see signage for primary access directed towards Packham Street as this links in with the existing maintenance vehicle track to the north of the aqueduct.

3.3. Signage

Some people preferred that signage be low key – limited to location identification while others thought that having a map of the Aqueduct Reserve showing links to the Linear Park and nearby facilities would make walking around more interesting as you could do different loops or use the path to get to a variety of destinations.

3.4. Fencing

Most of these who spoke to us wish to retain their existing fencing.
Residents of Nursery Way – numbers 20 to 26 have a steep slope behind their fences and they are concerned about overlooking. Most would like to see some sort of tall clear trunked trees planted at the top of the slope. Some suggested a secondary fence however it may be that path location and vegetation treatments reduce the necessity for this. A secondary fence could make maintenance difficult.

The residence at number 24 Nursery Way has a very low back fence and the owners would like assistance to raise that fence by 2 metres to prevent overlooking of their swimming pool area (currently being developed).

Residents of Pioneer Court requested that the fencing either side of the gates on the eastern side of the Historic Drive be retained, at least in Stage One, to prevent vehicle access to the communal garden area.

3.5. Rubbish Removal, Weeds and Pests

Several sites were noted as being particularly bad for debris from washed out culverts (near Country Lane), earlier tree felling campaigns (near Pioneer Court) and at the rear of Nagla Court.

The area adjacent to 20 Nursery Way is extremely weed infested. There are also many artichokes and thousands of self seeded pines behind pioneer Court. There are also serious white ant infestations in pine tree stumps left behind after felling. Can these be treated?

3.6. Opportunities for Community Input

Residents of 20 Nursery Way would be keen to see the area to the east of their low fence planted with native shrubs which they would happy to maintain. These shrubs would deter people from walking too close to people's backyards and may be fenced later to protect them from maintenance damage.

The residents of Pioneer Court have a communal garden between their properties and the aqueduct. They have planted 50 fruit trees on the border and are happy for park users to enjoy the fruit. These residents would like to retain access to the locked gate for "Trees for life" activities and garden maintenance.

3.7. Park Facilities

Those who were consulted were all agreed that the park should function as a Neighbourhood level park for the surrounding communities. Therefore the following facilities were considered to be appropriate:

- Walking paths of fine crushed gravel rather than bitumen
- Seats with shade, especially where there are views over the city or ranges, but not directly looking into people's backyards
- Water fountains – 1 or 2 in the park
- Natural forest areas for peaceful walking/sitting
- Natural play
- Simple signs

The following facilitates were not considered necessary:

- BBQ's
- Children's play equipment
- Toilets
- Picnic tables
- Lighting

It was thought that these facilities would attract people from outside the area and lead to impacts such as increased vehicle traffic demand for car parking, noise and anti social behaviour (if lit at night).
People did not want to see designated car parking areas as this could attract more people.

3.8. Dogs in Park

There was general support for allowing dogs in the park although views were divided about 50/50 as to whether dogs should be on or off leash. It was recommended that bins and bags be provided for dog faeces but that no specific dog exercise area be provided.

It was noted that different policies apply about dogs in the Linear Park depending on which Council area you are in. For this reason people felt that the Tea Tree Gully by- law should be followed, namely dogs off lead if under control of a competent owner.

3.9. Other Issues

There are beehives in the communal garden at the rear of Pioneer Court. The gardeners could put a sign up near the path "Bees making honey here, Please bee careful".

The Pioneer Court residents are very happy to work with the contractors when they are undertaking slashing or weed treatment in this area. They are concerned about protecting recent plantings.

It would be good to have a contact number for the relevant DEWNR staff member on the signs during Stage One to enable residents to provide feedback on any unwanted activities such as vehicle or motorbike access, fires or late night parties in the park.

4.0 Summary and Next Steps

This Consultation Report will be provided to

- DEWNR project managers and Parks staff
- The contractors and consultants undertaking Stage One works
- Consultants developing the Draft Master Plan
- Those who provided input
- Mr Tom Kenyon, MP
- City of Tea Tree Gully

It will inform both Stage One works and the detailed park design being undertaken for the Draft Master Plan.

Highbury Aqueduct

Consultation Findings on Preliminary Concepts for Master Plan

1.0 Consultation Process

Residents of the Highbury area surrounding the Aqueduct Reserve living between Lower North East Road and the River Torrens Linear Park received Newsletter 2 in their letterboxes on 20 November 2012.

They were invited to the launch of Stage One of The Aqueduct Reserve on Saturday, 8 December where copies of the Draft Master Plan Preliminary Concepts were on display. Members of the consultant team and Department of Environment Water and Natural Resources (DEWNR) staff were available to answer questions and facilitate input.

2.0 Participation

Over 100 people attended the launch of Stage One by local MP Tom Kenyon.

Sixty four people placed their names and contact details on the Highbury Aqueduct Project Register. Around 60 people recorded their responses on the large sheets provided with the maps.

In addition, 19 people completed more detailed feedback sheets at the event and 5 people posted or emailed sheets back to the consultant team.

3.0 Findings of Consultation Process

Attachment One contains the vertabim record from the launch event and feedback sheets.

In summary, residents are very supportive of the opening up of the Aqueduct and its progressive development as a reserve.

There is strong support for differentiating this reserve from the Linear Park by retaining and reinforcing its natural character and limiting recreation to low impact activities compatible with a natural setting.

3.1. Wetlands and Boardwalks

There was extremely strong support (n = 49) for stormwater management treatments that provided biodiversity and amenity benefits such as wetlands and boardwalks.

3.2. Walking and Cycling

Most respondents wanted to see paths suitable for walking and cycling. There was a slight preference for gravel over bitumen paths, although it is considered that people were recording their desire to see shared use paths rather than necessarily have a bitumen surface.

Participants were divided about the inclusion of short downhill mountain bike tracks, with 18 in favour, 9 against and 9 neutral.

3.3. Dogs On/Off Leash

The other area where there were divided opinions relates to dogs on or off leash. Thirteen people favoured off leash, 11 opposed this and 7 were neutral. Further comments indicate that one of the main concerns about dogs off leash relates to their negative impact on native fauna including koalas, echidnas and birds.

3.4. Park Amenities

* n = x represents number of people recording this preference.

With respect to park amenities a majority of people would like to see:

- Seating in a natural setting (n = 21)
- Picnic tables and chairs (n = 20)
- Drinking fountains (n = 9)
- Shelter (n = 5)

Opinion was divided over the provision of toilets with 3 people recording support and 1 person recording opposition. It should be noted that toilets were not shown on the Preliminary Concepts drawing as it is unlikely they would be provided in a park where most users will be from the surrounding area or using the park as part of a walking or cycling link with the Linear Park, where toilets are provided.

3.5. Other Park Features

There was support for new community gardens (n = 17).

There was a preference for natural play spaces (n = 24) over constructed play equipment (n = 16 with 6 people opposed to this).

3.6. Maintenance, Tree Removal and Revegetation

Respondents commented on the importance of regular maintenance, weed control and grass cutting. Most people support the progressive removal of Aleppo pines subject to a proactive and early revegetation program. It was noted that alternative food sources for black cockatoos need to be provided.

3.7. Site Specific Issues

Some residents noted specific concerns associated with access points proposed near their properties, stormwater management issues, and the need for pull-in parking bays on steep sections of road to avoid safety issues for pedestrians and motorists.

4.0 Development of Draft Master Plan

This feedback from the community has been considered by the consultant team and DEWNR staff in the development of the Draft Master Plan.

Key inclusions will be:

- Identification of stormwater management projects at several sites
- Identification of up to 3 activity nodes which could be a focus for seating, shelter, natural play, picnic facilities and water fountains
- Consideration of areas of habitat significance where dogs should either be on leash or excluded (eg koalas/bird breeding)
- Review of access points to address privacy issues
- Provision of limited pull-off areas for parking where on-street parking could be inappropriate.

5.0 Consultation on Draft Master Plan

From late February there will be a 4 week consultation period on the Draft Master Plan involving the distribution of Newsletter 3, a display at the Turramurra Recreation Centre, an Open House Drop-in Session, a presentation and workshop and the opportunity to provide written feedback.

The Plan will be finalised by mid-April. Those who have participated in the process will be provided with access to the Final Plan.

6.0 Appendices

Attachment One

Summary of feedback sheets from Stage 1 - Launch of Highbury Aqueduct

Element	Don't Support	Neutral	Support
Gravel walking trails	1	6	36
Dog off the leash with owners (under control)	11	7	13
Natural play space	1	8	24
Bitumen shared walking/cycling path	5	6	34
Picnic tables and chairs	5	5	20
Short downhill mountain bike tracks	9	9	18
Wetlands and boardwalks		7	49
New community gardens	3	10	17
Constructed play equipment (e.g. modular plastic)	6	8	16
Seating in a natural setting		3	21
Drinking fountains			9
Shelter			5

High support for gravel walking trails, wetlands and boardwalks and bitumen shared walking/cycling path.

Comments about any of these elements

- I support dogs off leash to align with TTG by laws on Linear Park. I think it unnecessary to have cycle tracks due to the closeness of Linear Park and the conflict with walkers and dogs.
- Please minimise any organised/group recreation activities. The area should be for quiet reflective activity.

- We wouldn't like equipment that will cause noise for the neighbourhood like mountain bikes or sport grounds, or dogs off leash.
- See kangaroos and koalas on Linear Park. Please no dogs off lead. Also for general safety of walkers.
- Dogs on leash only!
- Keep area to just walkers – maximise trees and shrubs (indigenous) in the open areas;
- Perhaps a small kiosk at the end of the trail.
- We appreciate the fact that a lot of thought has gone into keeping it as original as possible as far as vegetation but at the same time, beautifying and making the space accessible and usable to all in the area.
- Need water fountains and toilets (only one or two spaced out).
- Continuous weed control and grass cutting. ✓✓
- Bitumen paths should be a long term project.
- Wetlands would be good if feasible.
- The aqueduct park should be kept as natural as possible with development for human activity kept only to a level to attract participation in a natural setting. Please do not over develop.

Comments about the Draft Master Plan overall

- I am keen to see early revegetation of areas where Aleppo pines have been removed. It is obviously going to take years for new trees such as Casuarinas to be established, so the sooner they can be planted the better.
- Please include toilet facilities for the people that could be attracted to this healthy environment. If none are included people will not come!
- Exclude added access Valley View Drive. Please remove as many pine trees as possible as soon as possible, health issues – asthma
- Stage 3: Do not support opening access to Windsor Road which is currently a dead end. I live next to the reserve and do not want people walking past my house; it is an increased security risk and negative impact on privacy.
- Linear Park is close for other recreational activities. Keep this one for the environment.
- As a relatively new resident to the area, we are very excited about this plan; it will add so much value to the area, both financially as well as in terms of 'healthy lifestyle'.
- Please keep as natural as possible.
- Congratulations to all staff of Parks and Wildlife. In just a short time there has been a vast improvement in the Highbury Aqueduct. Great job – well done.
- Well designed plan – relieved to observe work commencing (Pioneer Court – 10 residents).
- Great ideas – we hope it can all be achieved.

Additional concerns/comments

Nature and environment (trees, revegetation, wetlands etc)

- Keep the park tidy, not only in summer but all year (Historic Drive side).
- Reduce the fire risk – progressively remove all Aleppo (feral) pines.
- Kaurna words in the signage for native plants.
- Marked walking and riding tracks for adults/children.
- Remove Aleppo Pines of concern.
- Aleppo Pines are important for Black Cockatoos and nesting for Magpies and other birds (keep some).
- Consider the natural flora, but need to keep safe (e.g. remove dangerous pine trees).
- Please improve/increase habitat for koalas.
- Excess tree removal (concern over too many pines being removed).

Park facilities (toilets, parking, bins, water fountains etc)

- Need to keep in mind the whole community – animals, seniors, children, families and teens (there needs to be things for all).
- There needs to be provision for off street parking, particularly on downhill part of Boundy Road.
- No toilets.
- Toilets, lighting, marked walking tracks.
- Toilets required.
- Toilets.
- Bins.
- Rubbish bins along trails.

Dogs (off leash, separate park etc)

- Concerned re dogs off leash and rampant dogs running uncontrolled (dangerous, antisocial behaviour).
- Don't want dogs off leash.
- Dog park – enclosed area.

BMX, parks (facilities for children)

- Skate park and BMX track.
- BMX track – kids now make their own.
- Skate/BMX track or park.
- Playground (climbing ball, slide, swing, climbing wall).
- BMX skate park.
- Concerned about environmental impact of mountain bikes.

Other activities:

- Picnic and camping area.
- Play areas with BBQ.
- Kiosks/ice cream stands/hotdogs.
- Community Christmas tree.
- Butterfly garden.
- Horse riding.
- Horse riding and stables.

Safety and Amenity

- Bury the overhead cables in Country Lane.
- Bury the overhead power lines and cables in Boundy road.
- Potential area 6: linkage path (vehicle problem, parking impossible, on a dangerous corner, additional traffic, residence issues).
- Barriers at main roads that park crosses to prevent children running straight across the roads.
- Noise (additional traffic).
- Better directions.

Attachment B

Fauna Species

Attachment B – Fauna Species

Common Name	Scientific Name	AUS - status	SA - status	MLR - status
Australasian Grebe	*Tachybaptus novaehollandiae*			
Australian Hobby	*Falco longipennis*			U
Australian Magpie	*Gymnorhina tibicen*			
Australian Pelican	*Pelecanus conspicillatus*			
Australian Ringneck	*Barnardius zonarius*			
Australian White Ibis	*Threskiornis molucca*			
Australian Wood Duck	*Chenonetta jubata*			
Barn Owl	*Tyto alba*			
Black Swan	*Cygnus atratus*			
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*			
Black-shouldered Kite	*Elanus axillaries*			
Black-tailed Native-Hen	*Gallinula ventralis*			
Brown Goshawk	*Accipiter fasciatus*			
Brown Songlark	*Cincloramphus cruralis*			
Caspian Tern	*Sterna caspia*			
Clamorous Reed-Warbler	*Acrocephalus stentoreus*			
Collared Sparrowhawk	*Accipiter cirrhocephalus*			U
Crested Pigeon	*Ocyphaps lophotes*			
Crimson Rosella	*Platycercus elegans*			
Darter	*Anhinga melanogaster*			U
Double-barred Finch	*Taeniopygia bichenovii*			
Dusky Moorhen	*Gallinula tenebrosa*			
Eastern Rosella	*Platycercus eximius*			
Eastern Spinebill	*Acanthorhynchus tenuirostris*			
Eurasian Coot	*Fulica atra*			
Fan-tailed Cuckoo	*Cacomantis flabelliformis*			
Fork-tailed Swift	*Apus pacificus*	Mi, Ma		
Galah	*Cacatua roseicapilla*			
Great Cormorant	*Phalacrocorax carbo*			
Great Egret	*Ardea alba*			
Grey Teal	*Anas gracilis*			
Hardhead	*Aythya australis*			U
Hoary-headed Grebe	*Poliocephalus poliocephalus*			
Horsfield's Bronze Cuckoo	*Chrysococcyx basalis*			
Laughing Kookaburra	*Dacelo novaeguineae*			
Little Black Cormorant	*Phalacrocorax sulcirostris*			

Common Name	Scientific Name	AUS - status	SA - status	MLR - status
Little Corella	*Cacatua sanguinea*			
Little Grassbird	*Megalurus gramineus*			
Little Pied Cormorant	*Phalacrocorax melanoleucos*			
Little Wattlebird	*Anthochaera chrysoptera*			U
Magpie Lark	*Grallina cyanoleuca*			
Masked Lapwing	*Vanellus miles*			
Musk Lorikeet	*Glossopsitta concinna*			
Nankeen Kestrel	*Falco cenchroides*			
Nankeen Night Heron	*Nycticorax caledonicus*			U
New Holland Honeyeater	*Phylidonyris novaehollandiae*			
Noisy Miner	*Manorina melanocephala*			
Pacific Black Duck	*Anas superciliosa*			
Pallid Cuckoo	*Cuculus pallidus*			
Purple Swamphen	*Porphyrio porphyrio*			
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*			
Rainbow Lorikeet	*Trichoglossus haematodus*			
Red Wattlebird	*Anthochaera carunculata*			
Red-rumped Parrot	*Psephotus haematonotus*			
Sacred Kingfisher	*Todiramphus sanctus*			
Silver Gull	*Larus novaehollandiae*			
Silvereye	*Zosterops lateralis*			
Southern Boobook	*Ninox novaeseelandiae*			
Striated Pardalote	*Pardalotus striatus*			
Sulphur-crested Cockatoo	*Cacatua galerita*			U
Tree Martin	*Hirunda nigricans*			
Varied Lorikeet [E]	*Psitteuteles versicolor*			
Wedge-tailed Eagle	*Aquila audax*			
Welcome Swallow	*Hirunda neoxena*			
White-faced Heron	*Egretta novaehollandiae*			
White-necked Heron	*Ardea pacifica*			U
White-plumed Honeyeater	*Lichenostomus penicillatus*			
Willie Wagtail	*Rhipidura leucophrys*			
Little Raven	*Corvus mellori*			
Spotted Turtledove	**Streptopelia chinensis*			
Common Blackbird	**Turdus merula*			
House Sparrow	**Passer domesticus*			
Common Starling	**Sturnus vulgaris*			
Rock Dove (Feral Pigeon)	**Columba livia*			

Common Name	Scientific Name	AUS - status	SA - status	MLR - status
Mammals				
Brush-tailed Possum	*Trichosurus vulpecula*		R	
Chocolate Wattled Bat	*Chalinolobus morio*			
Gould's Wattled Bat	*Chalinolobus gouldii*			
Lesser long-eared Bat	*Nyctophilus geoffroyi*			
Ring-tailed Possum	*Pseudocheirus peregrinus*			
Southern Freetail-bat	*Mormopterus sp4*			
Water Rat	*Hydromys chrysogaster*			
White-striped Freetail-bat	*Austronomus australis*			
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*		R	R
Black Rat	**Rattus rattus*			
Brown Rat	**Rattus norvegicus*			
House mouse	**Mus domestica*			
Feral Cat	**Felis cattus*			
Fox	**Vulpes vulpes*			
Reptiles				
Common Bluetongue	*Tiliqua scincoides*			
Common Brown Snake	*Pseudonaja textilis*			
Desert Wall Skink	*Cryptoblepharus plagiocephalus*			
Four-toed Earless Skink	*Hemiergis peronii*			
Common Long-necked Tortoise	*Chelodina longicollis*			
Marbled Gecko	*Christinus marmoratus*			
Red-bellied Black Snake	*Pseudechis porphyriacus*			
Sleepy Lizard	*Tiliqua rugosus*			
Water Skink	*Eulamprus quoyii*			
Amphibians				
Bibron's Toadlet	*Pseudophryne bibroni*		R	
Brown Froglet	*Crinia signifera*			
Brown Tree Frog	*Litoria ewingii*			
Southern Banjo Frog	*Limnodynastes dumerilii*			
Spotted Marsh Frog	*Limnodynastes tasmaniensis*			

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **Conservation Codes: CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare, **U:** Uncommon

Attachment C

Master Plan Drawings

HIGHBURY AQUEDUCT
DRAFT MASTERPLAN

18th February 2013

PROJECT OVERVIEW

The Highbury Aqueduct Reserve land was purchased by the Minister of Planning from SA Water following its decommissioning as an overland channel delivering water from The River Torrens to the Hope Valley Reservoir.

Responsibility for its maintenance and ongoing management rests with the Department of Environment, Water and Natural Resources. Funding from the Minister of Planning is being used to undertake the works necessary to develop the land as a public reserve.

In consultation with the surrounding community and the City of Tea Tree Gully the State Government has engaged consultants to prepare a Master Plan to guide the future development of the reserve as a place for community recreation in a natural environment.

OBJECTIVES

Community Access

Objective 1:
Open up the Highbury Aqueduct Land to provide physical access and improve visual access for the local community.

Recreation

Objective 2:
Provide a range of spaces that accommodate informal active recreation, social activities and peaceful reflection.

Community Participation

Objective 3:
Provide diverse opportunities for members of the local community to participate in developing, managing and maintaining the Park.

Vegetation Management

Objective 4:
Develop, manage and maintain vegetation within the park to contribute to biodiversity, visual amenity and safety.

Stormwater Management

Objective 5:
Address existing stormwater management issues and introduce innovative water sensitive design approaches to support effective stormwater management in the future.

Connection

Objective 6:
Provide new links that increase people's opportunities to walk or cycle to work, school or recreation facilities.

Risk Management

Objective 7:
Design to reduce risk and enable efficient maintenance.

Heritage

Objective 8 :
Identify, protect and interpret natural, cultural and built heritage features.

Interpretive Signage
Seating
Remnant Vegetation
Viewpoints
Wayfinding Signage
WSUD (Water Sensitive Urban Design)
New Community Gardens
Dogs on Leash
Major Path Shared Use Cycling and Walking
Minor Track
Access Track
Existing Fire / Maintenance Track
New/Extension to Fire / Maintenance Track
Steps
Remnant Vegetation
Screening Vegetation
Traffic Calming / Bollards/Pinch Points
Aqueduct
Bollards
Railing fences
Connection

BACKGROUND RESEARCH

Maintenance

Priority
HIGH WEED MANAGEMENT
LOW WEED MANAGEMENT
MEDIUM WEED MANAGEMENT
STAGED TREE MANAGEMENT, PRUNES AND REMOVALS
NEW FIRE TRACKS / MAINTENANCE ACCESS

Stormwater

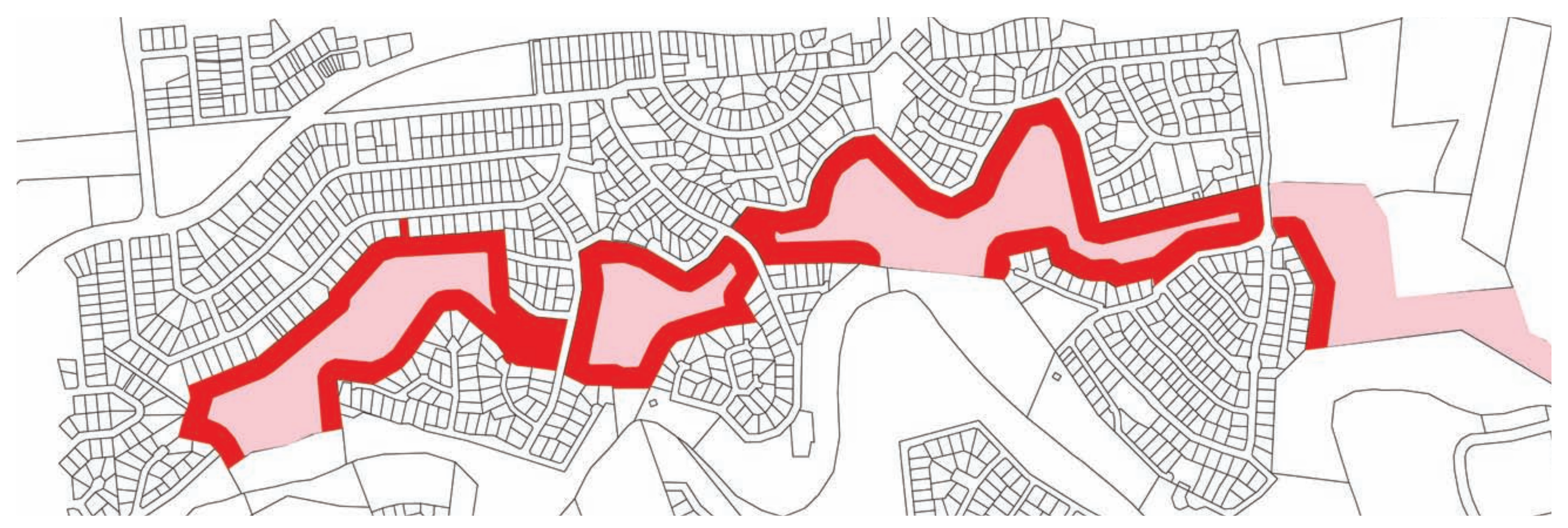
POTENTIAL PROJECT/AREAS
CHANNEL DISCHARGE LOCATION POINTS
STORMWATER INFRASTRUCTURE
CATCHMENT 01
CATCHMENT 02
CATCHMENT 03
CATCHMENT 04
CATCHMENT 05
CATCHMENT 06
CATCHMENT 07
CATCHMENT 08
CATCHMENT 09
CATCHMENT 10
CATCHMENT 11
CATCHMENT 12
CATCHMENT 13
CATCHMENT 14

Ecology

Vegetation_Association
COMMUNITY INFORMAL GARDEN
EUCALYPTUS CAMALDULENSIS VAR. CAMALDULENSIS (RIVER RED GUM) RIPARIAN OPEN WOOLAND
EUCALYPTUS LEUCOXYLON (SOUTH AUSTRALIAN BLUE GUM) WOODLAND
NATIVE GRASSLAND
REVEGETATION
PHRAGMITES AUSTRALIS (COMMON REED) GRASSLAND
PINUS HALEPENSIS (ALEPPO PINE) WOODLAND
HIGHBURY_AQUEDUCT_REMNANT_VEGETATION_AREAS

Fire

MINOR FIRE TRACK
SERVICE TRACK
ASSET ZONE
BUFFER ZONE

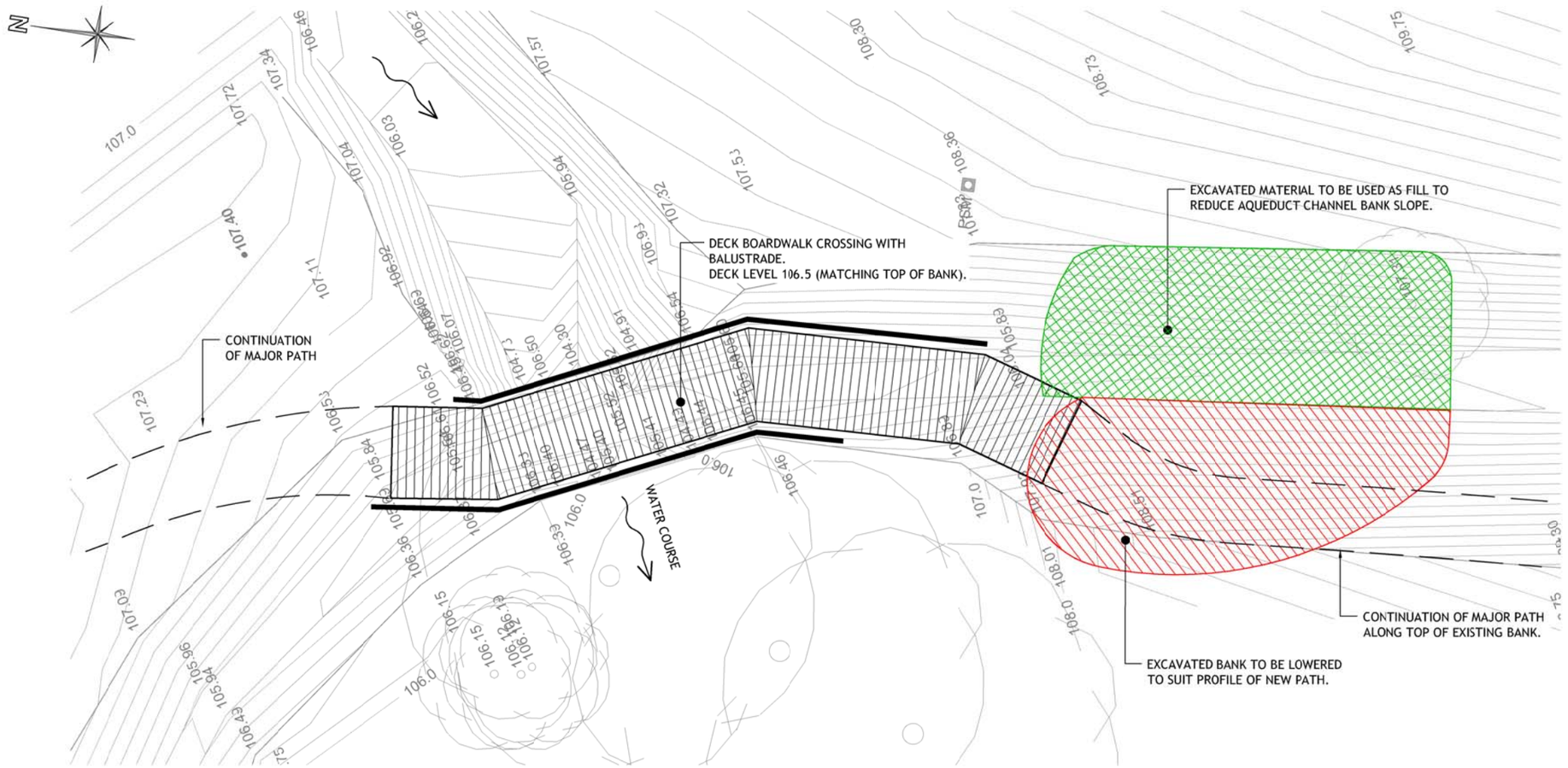


WAX

Attachment D

Stormwater Projects

NOT FOR CONSTRUCTION



POTENTIAL PROJECT 10

SCALE 1:200 @ A3

PROJECT OBJECTIVE:

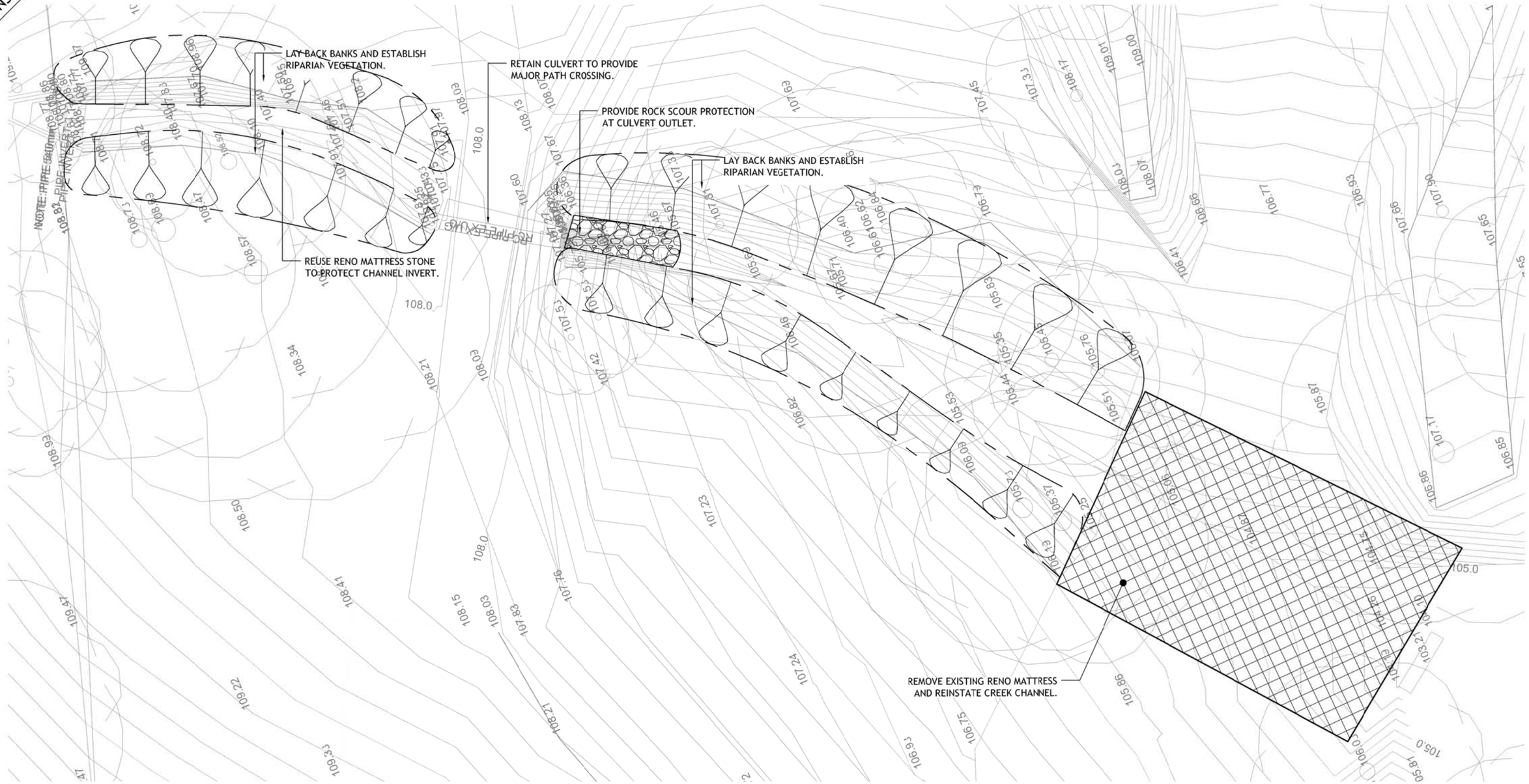
- PROVIDE SAFE CROSSING FOR RESERVE VISITORS AT INTERSECTION OF WATERCOURSE AND OLD AQUEDUCT CHANNEL.

0 2 4 6 8m
1 SCALE 1:200m

southfront
170 GREENHILL ROAD, PARKSIDE SA 5063
P: (08) 8172 1088
F: (08) 8271 2055
E: enquiry@southfront.com.au
W: www.southfront.com.au

DRAWING No.	CLIENT
01	DEPARTMENT OF ENVIRONMENT, WATER & NATURAL RESOURCES
PROJECT No.	PROJECT
12001	HIGHBURY AQUEDUCT RESERVE MASTERPLAN POTENTIAL PROJECT CONCEPTS
DATE	
FEBRUARY 2013	

NOT FOR CONSTRUCTION



POTENTIAL PROJECT 9

SCALE 1:200 @ A3

PROJECT OBJECTIVE:

- ENHANCE CREEK CHANNEL THROUGH REVEGETATION OF RIPARIAN ZONE AND LAYING BACK OF BANKS.

0 2 4 6 8m
1 SCALE 1:200m

southfront
170 GREENHILL ROAD, PARKSIDE SA 5063
P: (08) 8172 1088
F: (08) 8271 2055
E: enquiry@southfront.com.au
W: www.southfront.com.au

DRAWING No.	CLIENT
02	DEPARTMENT OF ENVIRONMENT, WATER & NATURAL RESOURCES
PROJECT No.	PROJECT
12001	HIGHBURY AQUEDUCT RESERVE MASTERPLAN POTENTIAL PROJECT CONCEPTS
DATE	
FEBRUARY 2013	

NOT FOR CONSTRUCTION

N

SPILLWAY INTO EXISTING CHUTE.
RL. 106.00

GABION WEIR.
TOP: 107.00
BOTTOM 106.20

GABION WEIR.
TOP: 108.00
BOTTOM 107.20

ROCK LINED CHANNEL INVERT.

ADJUST EARTHWORKS TO
RETAIN EUCALYPT.

LAYBACK BANKS.

DAMAGED STONE
WALL TO BE REPAIRED.

EXISTING CULVERT,
CLEAN OUT DEBRIS.

ROCK SCOUR PROTECTION
DOWNSTREAM OF OUTLET HEADWALL.

EXTEND DRAIN AND CONSTRUCT
NEW HEADWALL (INV 188.20).

TREE TO BE REMOVED.

TREE TO BE REMOVED.

TREE TO BE REMOVED.

REMOVE HEADWALL AND
CONSTRUCT DRCP JUNCTION BOX.

ESTABLISH RIPARIAN
VEGETATION.

RECONSTRUCT ROCK CHUTE.

RECONSTRUCT DRAINAGE STRUCTURE
ADJACENT TO COUNTRY LANE TO
INCORPORATE GPT BASKET.

POTENTIAL PROJECT 8

SCALE 1:200 @ A3

PROJECT OBJECTIVE:

- REHABILITATE SEVERELY ERODED CHANNEL
- INTEGRATE WITH ORIGINAL AQUEDUCT CROSS DRAIN STRUCTURE

0 2 4 6 8m
1 SCALE 1:200m

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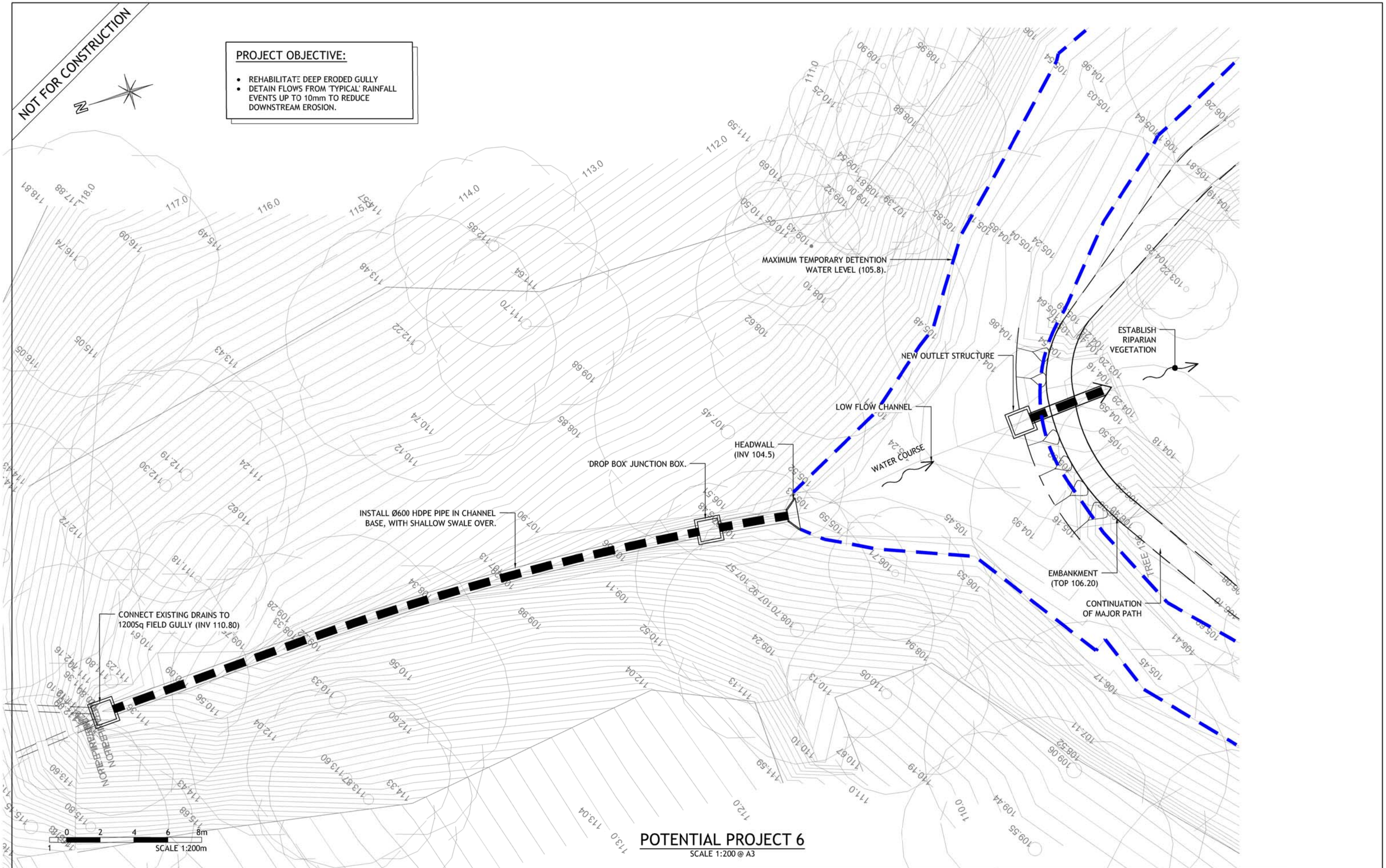
F: (08) 8271 2055
E: enquiry@southfront.com.au
W: www.southfront.com.au

DRAWING No.	CLIENT
03	DEPARTMENT OF ENVIRONMENT, WATER & NATURAL RESOURCES
PROJECT No.	PROJECT
12001	HIGHBURY AQUEDUCT RESERVE MASTERPLAN POTENTIAL PROJECT CONCEPTS
DATE	
FEBRUARY 2013	


NOT FOR CONSTRUCTION
PROJECT OBJECTIVE:
• REHABILITATE DEEP ERODED GULLY
• DETAIN FLOWS FROM 'TYPICAL' RAINFALL EVENTS UP TO 10mm TO REDUCE DOWNSTREAM EROSION.
MAXIMUM TEMPORARY DETENTION WATER LEVEL (105.8).
ESTABLISH RIPARIAN VEGETATION
NEW OUTLET STRUCTURE
LOW FLOW CHANNEL
HEADWALL (INV 104.5)
WATER COURSE
'DROP BOX' JUNCTION BOX.
INSTALL Ø600 HDPE PIPE IN CHANNEL BASE, WITH SHALLOW SWALE OVER.
EMBANKMENT (TOP 106.20)
CONTINUATION OF MAJOR PATH
TREE
CONNECT EXISTING DRAINS TO 1200Sq FIELD GULLY (INV 110.80)
0 2 4 6 8m
1 SCALE 1:200m
POTENTIAL PROJECT 6
SCALE 1:200 @ A3

southfront

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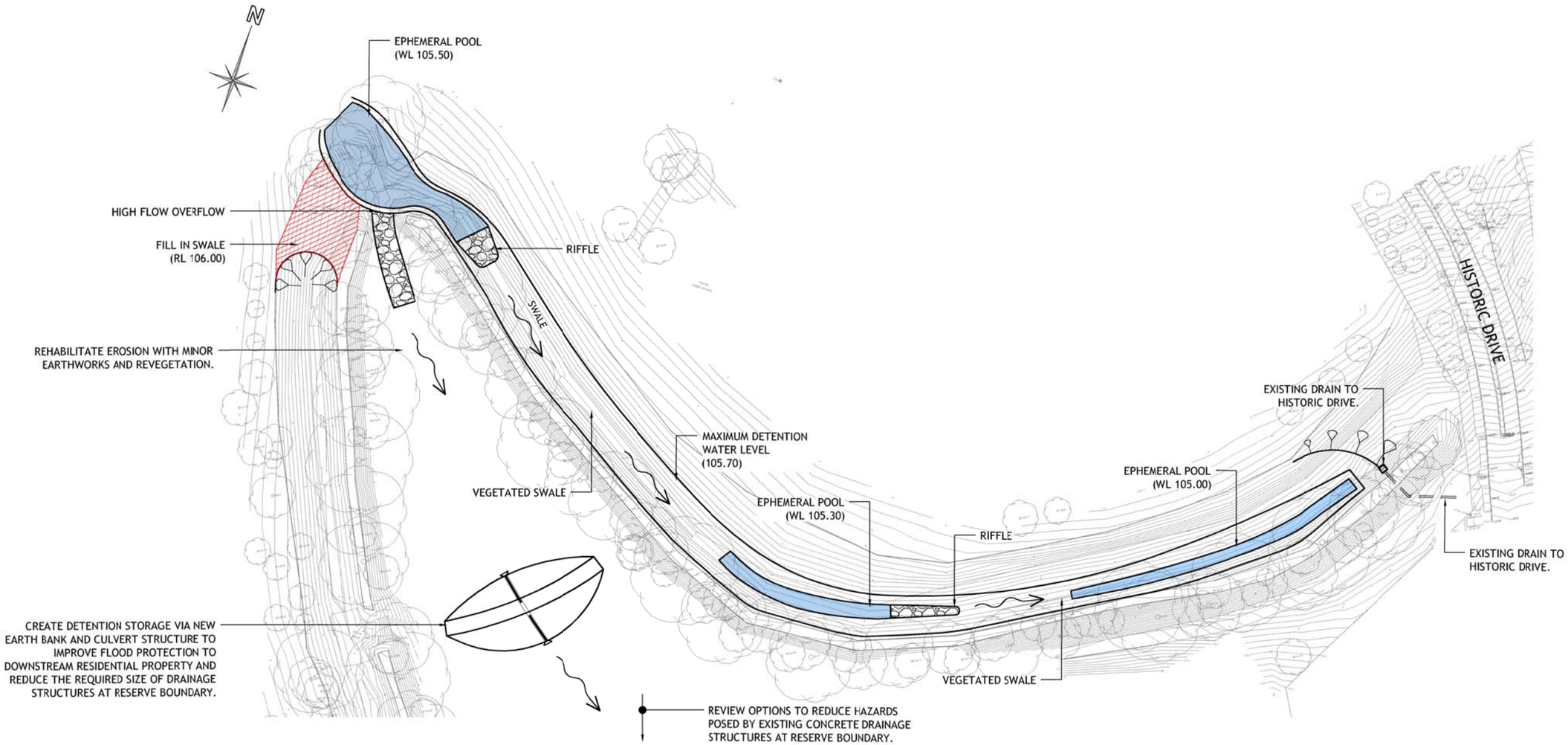
W: www.southfront.com.au

DRAWING No.	04
PROJECT No.	12001
DATE	FEBRUARY 2013
CLIENT	DEPARTMENT OF ENVIRONMENT, WATER & NATURAL RESOURCES
PROJECT	HIGHBURY AQUEDUCT RESERVE MASTERPLAN POTENTIAL PROJECT CONCEPTS

NOT FOR CONSTRUCTION

PROJECT OBJECTIVE:

- DIVERT LOW FLOWS INTO POOL/RIFFLE SYSTEM IN AQUEDUCT CHANNEL, DESIGNED TO IMPROVE WATER QUALITY, REDUCE DOWNSTREAM GULLY EROSION
- MITIGATE HIGH FLOWS WITHIN A DETENTION STORAGE TO REDUCE FLOOD RISK AND TO PROVIDE OPPORTUNITY FOR DOWNSTREAM DRAINAGE STRUCTURE MODIFICATIONS.



POTENTIAL PROJECT 4

SCALE 1:1000 @ A3

0 2 4 6 8m
1 SCALE 1:200m

southfront

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P: (08) 8172 1088
F: (08) 8271 2055
E: enquiry@southfront.com.au
W: www.southfront.com.au

DRAWING No.	CLIENT
05	DEPARTMENT OF ENVIRONMENT, WATER & NATURAL RESOURCES
PROJECT No.	PROJECT
12001	HIGHBURY AQUEDUCT RESERVE MASTERPLAN POTENTIAL PROJECT CONCEPTS
DATE	
FEBRUARY 2013	

Attachment E

Detailed Costings for Staged Implementation of Master Plan

Project: HIGHBURY AQUEDUCT STAGE 1

Number: 12HVM

Client: URPS

26 February 2013

Probable Opinion of Costs

Item		Description	Unit	Qty	Rate ($)	Amount ($)			
		STAGE ONE							
		SITE PREPARATION & DEMOLITION							
	1.1	Removal of all rubbish and debris from site.	item						
	1.2	Remove/prune existing trees as per instruction on site.	No.						
	1.3	Remove existing cyclone mesh boundary fencing as per drawings and specification.	lin m						
	SUB TOTAL (AREAS A + B)					250,000.00	(based on works already undertaken)		
	1.4	Continued site preparation and demolition in stage 1 (not including tree removal and pruning)	Item	1	45000.00	45,000.00			
	SUB TOTAL (AREAS C +D)					45,000.00			
		ACCESS PATHS							
	2.1	Major paths (2m) - Supply and lay Stoneyfell compacted quarry fines path with required earthworks and timber edging	m^2	3240	130.00	421,200.00	100.00	162m	Allowing $30 per m2 for base cut excavations
	2.2	Minor paths (1.1m) - Supply and lay PM20 compacted quarry rubble path with required earthworks and timber edging to one side.	m^2	503	110.00	55,330.00	80.00	457m	
	2.3	Access tracks (0.9) - Supply and lay PM20 sub base to depth of 100mm with required earthworks	m^2	503	70.00	35,210.00	40.00	453m	
	2.4	Fire tracks (4m) - Supply and lay PM20 compacted quarry rubble path with required earthworks	m^2	1552	90.00	139,680.00	60.00	388m	
	SUB TOTAL					651,420.00			
		POTENTIAL PROJECT 5 - Expansion of Community Garden							
	3.1	Community Garden - Supply and install raised vegetable beds, water tanks, timber pergola, picket fencing, informal paths, timber seating, signage, composting bays, garden shed, fruit trees, irrigation, bike racks	Item	1	150000.00	150,000.00			
	3.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	1600	7.68	12,288.00	Based on 20% of node area		
	3.3	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	17400.00	17,400.00	Estimate supplied by EBS		
	3.4	Supply and install interpretative signage	No.	4	1000.00	4,000.00			
	SUB TOTAL					183,688.00			
		PROJECT 6 - Stormwater and creek remediation							

Item		Description	Unit	Qty	Rate ($)	Amount ($)	
	4.1	Supply and install boardwalk crossing, soil mounding and rocks to creek bed.	Item	1	50000.00	50,000.00	
	4.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	500	7.68	3,840.00	
	4.3	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	14900.00	14,900.00	Estimate supplied by EBS
	4.4	Supply and install interpretative signage	No.	3	1000.00	3,000.00	
	4.5	Stormwater management. Including earthworks, required walling and infrastructure.	Item	1	80000.00	80,000.00	Estimate supplied by Southfront
	4.6	Stormwater management. Site remediation	Item	1	30000.00	30,000.00	
	4.7	Stormwater management. Engineering and design review with complete documentation	Item	1	11000.00	11,000.00	10% of total stormwater management cost
	SUB TOTAL					**151,740.00**	
		PROJECT 7 - Bike tracks					
	5.1	BMX track construction	Item	1	35000.00	35,000.00	
	5.2	Downhill mountain bike tracks construction	Access tracks included in Paths costings above				
	5.3	Supply and install interpretive signage	No.	5	1000.00	5,000.00	
	5.4	Supply and install bike racks	No.	6	220.00	1,320.00	
	5.5	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	1300	7.68	9,984.00	
	SUB TOTAL					**51,304.00**	
		PROJECT 8 - Historic conservation					
	6.1	Supply and install timber seating and hand rail and earth works at crossing point	Item	1	25000.00	25,000.00	
	6.2	Supply and install interpretive signage	No.	2	1000.00	2,000.00	
	6.3	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	500	7.68	3,840.00	
	6.4	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	12050.00	12,050.00	Estimate supplied by EBS
	6.5	Stormwater management. Including earthworks, required walling and infrastructure.	Item	1	100000.00	100,000.00	Estimate supplied by Southfront
	6.6	Stormwater management. Site remediation	Item	1	30000.00	30,000.00	
	6.7	Stormwater management. Engineering and design review with	Item	1	13000.00	13,000.00	10% of total stormwater management cost
	SUB TOTAL					**142,890.00**	
		PROJECT 9 - Expand reserve to connect with aqueduct reserve					
	7.1	Supply and install timber seating, boardwalk and vehicular crossing, bike racks, irrigation lawn area, rocks to creek bed, natural and interprevative play.	Item	1	200000.00	200,000.00	
	7.2	Supply and install interpretive signage	No.	4	1000.00	4,000.00	
	7.3	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	3280	7.68	25,190.40	
	7.4	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	54450.00	54,450.00	Estimate supplied by EBS
	7.5	Stormwater management. Including earthworks, required walling and infrastructure.	Item	1	40000.00	40,000.00	Estimate supplied by Southfront
	7.6	Stormwater management. Site remediation	Item	1	30000.00	30,000.00	
	7.7	Stormwater management. Engineering and design review with complete documentation	Item	1	7000.00	7,000.00	10% of total stormwater management cost

Item		Description	Unit	Qty	Rate ($)	Amount ($)				
	SUB TOTAL					323,640.40				
		ENVIRONMENTAL MANAGEMENT								
8.1		Weed management and revegetation (based on 20% of stage area)	Item	1	159724.00	159,724.00	Estimate supplied by EBS			
8.2		Tree removal 1-5 years	No.	34	4500.00	153,000.00	Refer to EBS costing to see yearly tree removal breakdown			
8.3		Tree removal 6 - 20 years	No.	370	4500.00	1,665,000.00				
8.4		Supply and plant 200mm pots to mass screening plant areas at 1m centres	No.	800	17.43	13,944.00				
	SUB TOTAL					1,991,668.00				
		MISCELLANEOUS								
9.1		Supply and install timber post and rail knee barrier to road ways	lin m	70	60.00	4,200.00				
9.2		Supply and plant 140mm pots to protrubrances	Item	1	500.00	500.00				
9.3		Supply and install timber bollards	No.	4	200.00	800.00				
9.4		Pedestrian crossing protrubrances	Item	2	2500.00	5,000.00				
9.5		Supply and install timber steps with handrail	Item	2	7500.00	15,000.00				
9.6		Supply and install pram ramp with tactile indicators	No.	2	1100.00	2,200.00				
	SUB TOTAL					27,700.00				
		Sub-total (ex-GST)				3,569,050.40				
		CONTINGENCIES								
10.1		10% contingincies	Item	1	368,905.04	368,905.04				
		SUB TOTAL				368,905.04				
		STAGE 1 TOTAL (ex- GST)				3,937,955.44				
		STAGE TWO								
		SITE PREPARATION & DEMOLITION								
1.1		Removal of all rubbish and debris from site and remove existing cyclone mesh boundary fencing as per drawings and specification.	Item	1	50000.00	50,000.00				
	SUB TOTAL					50,000.00				
		ACCESS PATHS								
2.1		Major paths (2m) - Supply and lay Stoneyfell compacted quarry fines path with required earthworks and timber edging	m^2	1240	130.00	161,200.00	100.00	620m	Allowing $30 per m2 for base cut excavations	
2.2		Minor paths (1.1m) - Supply and lay PM20 compacted quarry rubble path with required earthworks and timber edging to one side.	m^2	258	110.00	28,380.00	80.00	235m		
2.3		Access tracks (0.9) - Supply and lay PM20 sub base to depth of 100mm with required earthworks	m^2	160	70.00	11,200.00	40.00	176m		
2.4		Fire tracks (4m) - Supply and lay PM20 compacted quarry rubble path with required earthworks	m^2	720	90.00	64,800.00	60.00	180m		
	SUB TOTAL					265,580.00				
		POTENTIAL PROJECT 3 - Playspace & community recreation								

Item		Description	Unit	Qty	Rate ($)	Amount ($)	
	3.1	Community Garden - supply and install raised vegetable beds, water tanks, timber pergola, picket fencing, informal paths, timber seating, signage, composting bays, garden shed, fruit trees, irrigation, bike racks	Item	1	50000.00	50,000.00	
	3.2	Playspace - supply and install of play equipment, shelters, seating, barbecues, drinking fountains, car parking, softfall rubber, exposed aggregate concrete, signage, timber decking	Item	1	500000.00	500,000.00	
	3.3	Supply and plant 140mm pots to mass planting areas at 0.7m centres	No.	6000	7.68	46,080.00	based on 30% of node area
	3.4	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	32845.00	32,845.00	Estimate supplied by EBS
	3.5	Supply and install interpretative signage	No.	4	1000.00	4,000.00	
	SUB TOTAL					632,925.00	
		PROJECT 4 - Vegetation conservation					
	4.1	Supply and install boardwalk crossing. Remediate creek banks	Item	1	50000.00	50,000.00	
	4.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	560	7.68	4,300.80	
	4.3	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	20425.00	20,425.00	Estimate suppied by EBS
	4.4	Supply and install interpretative signage	No.	3	1000.00	3,000.00	
	4.5	Stormwater management. Including earthworks, required walling and infrastructure.	Item	1	340000.00	340,000.00	Estimate supplied by Southfront
	4.6	Stormwater management. Site remediation	Item	1	30000.00	30,000.00	
	4.7	Stormwater management. Engineering and design review with complete documentation	Item	1	38000.00	38,000.00	10% of total stormwater management cost
	SUB TOTAL					417,725.80	
		ENVIRONMENTAL MANAGEMENT					
	8.1	Weed management and revegetation (based on 20% of stage area)	Item	1	85376.45	85,376.45	Estimate supplied by EBS
	8.2	Tree removal 1-5 years	No.	50	4500.00	225,000.00	Refer to EBS costing to see yearly tree removal breakdown
	8.3	Tree removal 6 - 10 years	No.	150	4500.00	675,000.00	
	SUB TOTAL					310,376.45	
		MISCELLANEOUS					
	5.1	Supply and install pram ramp with tactile indicators	No.	2	1100.00	2,200.00	
	5.2	Supply and install timber post and rail knee barrier to road way	lin m	150	60.00	9,000.00	
	5.3	Supply and plant 140mm pots to protrubrances	Item	1	500.00	500.00	
	5.4	Supply and install timber bollards	No.	4	200.00	800.00	
	5.5	Pedestrian crossing protrubrances	Item	2	2500.00	5,000.00	
	5.6	Supply and install timber steps with handrail	Item	2	7500.00	15,000.00	
	SUB TOTAL					32,500.00	
		Sub-total (ex-GST)				1,709,107.25	
		CONTINGENCIES					
	6.1	10% contingincies	Item	1	242,410.72	242,410.72	
		SUB TOTAL				242,410.72	
		STAGE 2 TOTAL (ex- GST)				1,951,517.97	
		STAGE THREE					

Item		Description	Unit	Qty	Rate ($)	Amount ($)			
		SITE PREPARATION & DEMOLITION							
	1.1	Removal of all rubbish and debris from site and remove existing cyclone mesh boundary fencing as per drawings and specification.	Item	1	90000.00	90,000.00			
	SUB TOTAL					**90,000.00**			
		ACCESS PATHS							
	2.1	Major paths (2m) - Supply and lay Stoneyfell compacted quarry fines path with required earthworks and timber edging	m²	1780	130.00	231,400.00	100.00	890m	Allowing $30 per m2 for base cut excavations
	2.2	Minor paths (1.1m) - Supply and lay PM20 compacted quarry rubble path with required earthworks and timber edging to one side.	m²	82	110.00	9,020.00	80.00	820m	
	2.3	Access tracks (0.9) - Supply and lay PM20 sub base to depth of 100mm with required earthworks	m²	1170	70.00	81,900.00	40.00	1300m	
	2.4	Fire tracks (4m) - Supply and lay PM20 compacted quarry rubble path with required earthworks	m²	280	90.00	25,200.00	60.00	70m	
	SUB TOTAL					**347,520.00**			
		POTENTIAL PROJECT 1 - Remnant vegetation							
	3.1	Bluegum open woodland - Supply and install walking trails, way finding signage	Item	1	30000.00	30,000.00			
	3.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	1300	7.68	9,984.00			
	3.3	Supply and install interpretative signage	No.	2	1000.00	2,000.00			
	SUB TOTAL					**41,984.00**			
		PROJECT 2 - Historic conservation							
	4.1	Restoration of aqueduct stone work. Supply and install timber hand rails, timber seating, bike racks	Item	1	70000.00	70,000.00			
	4.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	1300	7.68	9,984.00			
	4.3	Supply and install interpretative signage	No.	2	1000.00	2,000.00			
	SUB TOTAL					**81,984.00**			
		ENVIRONMENTAL MANAGEMENT							
	5.1	Weed management and revegetation (based on 20% of area)	Item	1	154503.70	154,503.70	Estimate supplied by EBS		
	5.2	Tree removal 1 - 5 years	No.	85	4500.00	382,500.00	Refer to EBS costing to see yearly tree removal breakdown		
	5.3	Tree removal 6 - 20 years	No.	255	4500.00	1,147,500.00			
	5.4	Supply and plant 200mm pots to mass screening plant areas at 1m centres	No.	900	17.43	15,687.00			
	SUB TOTAL					**1,700,190.70**			
		MISCELLANEOUS							
	6.1	Supply and install timber post and rail knee barrier	lin m	70	60.00	4,200.00			
	6.2	Supply and plant 140mm pots to protrubrances	Item	1	500.00	500.00			
	6.3	Supply and install timber bollards	No.	4	200.00	800.00			
	6.4	Pedestrian crossing protrubrances	Item	2	2500.00	5,000.00			
	6.5	Supply and install timber steps with handrail	Item	2	7500.00	15,000.00			
	6.6	Supply and install pram ramp with tactile indicators	No.	2	1100.00	2,200.00			
	SUB TOTAL					**27,700.00**			
		Sub-total (ex-GST)				**2,289,378.70**			

Item		Description	Unit	Qty	Rate ($)	Amount ($)			
		CONTINGENCIES							
	7.1	10% contingincies	Item	1	228,937.87	228,937.87			
		SUB TOTAL				**228,937.87**			
		STAGE 3 TOTAL (ex- GST)				**2,518,316.57**			
		STAGE FOUR							
		SITE PREPARATION & DEMOLITION							
	1.1	Removal of all rubbish and debris from site and remove existing cyclone mesh boundary fencing as per drawings and specification.	Item	1	45000.00	45,000.00			
	SUB TOTAL					**45,000.00**			
		ACCESS PATHS							
	2.1	Major paths (2m) - Supply and lay Stoneyfell compacted quarry fines path with required earthworks and timber edging	m^2	800	130.00	104,000.00	100.00	400m	Allowing $30 per m2 for base cut excavations
	2.2	Access tracks (0.9) - Supply and lay PM20 sub base to depth of 100mm with required earthworks	m^2	153	70.00	10,710.00	40.00	170m	
	2.3	Fire tracks (4m) - Supply and lay PM20 compacted quarry rubble path with required earthworks	m^2	1040	90.00	93,600.00	60.00	260m	
	SUB TOTAL					**208,310.00**			
		POTENTIAL PROJECT 10 - Natural water course restoration							
	3.1	Supply and install boardwalk, timber seating and handrails	Item	1	80000.00	80,000.00			
	3.2	Supply and plant 140mm pots to mass planting areas at 1m centres	No.	1300	7.68	9,984.00			
	3.3	Supply and plant riparian and woodland species for revegetation and required weed management	Item	1	26830.00	26,830.00	Estimate supplied by EBS		
	3.4	Supply and install interpretative signage	No.	2	1000.00	2,000.00			
	3.5	Stormwater management. Including earthworks, required walling and infrastructure.	Item	1	30000.00	30,000.00	Estimate supplied by Southfront		
	3.6	Stormwater management. Site remediation	Item	1	30000.00	30,000.00			
	3.7	Stormwater management. Engineering and design review with complete documentation	Item	1	6000.00	6,000.00	10% of total stormwater management cost		
	SUB TOTAL					**184,814.00**			
		ENVIRONMENTAL MANAGEMENT							
	5.1	Weed management and revegetation (based on 20% of area)	Item	1	154503.70	154,503.70	Estimate supplied by EBS		
	5.2	Tree removal 1 - 5 years	No.	5	4500.00	22,500.00	Refer to EBS costing to see yearly tree removal breakdown		
	5.3	Tree removal 6 - 20 years	No.	15	4500.00	67,500.00			
	SUB TOTAL					**177,003.70**			
		MISCELLANEOUS							
	4.1	Supply and install timber post and rail knee barrier to road way	lin m	70	60.00	4,200.00			
	4.2	Supply and plant 140mm pots to protrubrances	Item	1	500.00	500.00			
	4.3	Supply and install timber bollards	No.	4	200.00	800.00			
	4.4	Pedestrian crossing protrubrances	Item	2	2500.00	5,000.00			
	4.5	Supply and install timber steps with handrail	Item	2	7500.00	15,000.00			
	4.6	Supply and install pram ramp with tactile indicators	No.	2	1100.00	2,200.00			
	SUB TOTAL					**27,700.00**			

Item		Description	Unit	Qty	Rate ($)	Amount ($)	
		Sub-total (ex-GST)				642,827.70	
		CONTINGENCIES					
	5.1	10% contingincies	Item	1	71,432.77	71,432.77	
		SUB TOTAL				71,432.77	
		STAGE 4 TOTAL (ex- GST)				714,260.47	
		STAGE 1 SUGGESTED PRIORITY WORKS					
		Site Preparation & Demolition				45,000.00	
		Access Paths				651,420.00	
		Stormwater Management				341,000.00	Inc. Earthworks & infrastructure, site
		Tree Removal 1-5 years				153,000.00	remediation, engineering & design
							review with documentation
		TOTAL PROJECT COST (ex-GST)				1,190,420.00	
		STAGE 2 SUGGESTED PRIORITY WORKS					
		Site Preparation & Demolition				50,000.00	
		Access Paths				265,580.00	
		Stormwater Management				408,000.00	Inc. Earthworks & infrastructure, site
		Tree Removal 1-5 years				225,000.00	remediation, engineering & design
							review with documentation
		TOTAL PROJECT COST (ex-GST)				948,580.00	
		STAGE 3 SUGGESTED PRIORITY WORKS					
		Site Preparation & Demolition				90,000.00	
		Access Paths				347,520.00	
		Tree Removal 1-5 years				382,500.00	
		TOTAL PROJECT COST (ex-GST)				820,020.00	
		STAGE 4 SUGGESTED PRIORITY WORKS					
		Site Preparation & Demolition				45,000.00	
		Access Paths				208,310.00	
		Stormwater Management				66,000.00	Inc. Earthworks & infrastructure, site
		Tree Removal 1-5 years				22,500.00	remediation, engineering & design
							review with documentation
		TOTAL PROJECT COST (ex-GST)				341,810.00	
		TOTAL SUGGESTED PRIORITY WORKS COST					
		Stage 1 Total				1,190,420.00	
		Stage 2 Total				948,580.00	
		Stage 3 Total				820,020.00	
		Stage 4 Total				341,810.00	
		TOTAL STAGE COST (ex-GST)				3,300,830.00	
		TOTAL MASTERPLAN COST					
		Stage 1 Total				4,057,955.44	
		Stage 2 Total				2,666,517.97	
		Stage 3 Total				2,518,316.57	
		Stage 4 Total				785,760.47	

Item		Description	Unit	Qty	Rate ($)	Amount ($)
		TOTAL PROJECT COST (ex-GST)				10,028,550.45

Indicative Construction Cost Estimate

Project	Highbury Aqueduct Reserve
Job Number	12001
Cost Estimate	DJ
Checked	BS
Date	6-Feb-12

Item	Description	Unit	Quantity		Rate		Total
PP 4	Preliminaries, Miscellaneous	item	1	$	45,600.00	$	45,600
	Earthworks	item	1	$	10,000.00	$	10,000
	Overflow structure	item	1	$	30,000.00	$	30,000
	Outlet Structure	item	1	$	3,000.00	$	3,000
	Pool / riffle	ea	3	$	25,000.00	$	75,000
	Concrete Structure modifications (estimate)	item	1	$	50,000.00	$	50,000
	Detention Storage bank / culvert	item	1	$	70,000.00	$	70,000
	20% Contingencies	item	1	$	47,600.00	$	47,600
	Subtotal					**$**	**340,000**
PP 6	Preliminaries, Miscellaneous	m	1	$	6,800.00	$	6,800
	600 mm dia HDPE	m	40	$	500.00	$	20,000
	Headwall, JB, Field Gully	ea	3	$	3,000.00	$	9,000
	Earthworks	item	1	$	10,000.00	$	10,000
	Rock pitching	m2	50	$	100.00	$	5,000
	Outlet Structure	item	1	$	10,000.00	$	10,000
	20% Contingencies	item	1	$	12,160.00	$	12,160
	Subtotal					**$**	**80,000**
PP 8	Preliminaries, Miscellaneous	item	1	$	13,480.00	$	13,480
	Earthworks	item	1	$	10,000.00	$	10,000
	Gabions	ea	8	$	300.00	$	2,400
	750 dia RCP	m	7	$	500.00	$	3,500
	Headwall, JB	ea	3	$	3,000.00	$	9,000
	Rock pitching	m2	250	$	100.00	$	25,000
	Tree Removal	ea	5	$	2,500.00	$	12,500
	Culvert cleanout	item	1	$	5,000.00	$	5,000
	20% Contingencies	item	1	$	16,176.00	$	16,176
	Subtotal					**$**	**100,000**
PP 9	Preliminaries, Miscellaneous	item	1	$	4,400.00	$	4,400
	New headwall	item	1	$	3,000.00	$	3,000
	Earthworks	item	1	$	10,000.00	$	10,000
	Rock Pitching	m2	120	$	100.00	$	12,000
	20% Contingencies	item	1	$	5,880.00	$	5,880
	Subtotal					**$**	**40,000**
PP 10	Preliminaries, Miscellaneous	item	1	$	4,000.00	$	4,000
	Earthworks	item	1	$	5,000.00	$	5,000
	Boardwalk	m2	75	$	200.00	$	15,000
	20% Contingencies	item	1	$	4,800.00	$	4,800
	Subtotal					**$**	**30,000**
	Grand Total					**$**	**590,000**

Notes

All figures are exclusive of GST.
The above costs are based on an assumed scope of work that will be amended during the design process. All rates and quantities are based on current best estimates given the limited information available.

Indicative Construction Cost Estimate

Project	Coromandel Parade Drainage Investigation
Job Number	12004
Title	Option 1
Cost Estimate	DJ
Checked	DK
Date	22-Feb-12

Item	Description	Unit	Quantity		Rate		Total
Design	Detailed Design and Documentation	item	1	$	10,000.00	$	10,000.00
	Contract Administration and Supervision	item	1	$	5,000.00	$	5,000.00
	Subtotal					**$**	**15,000.00**
Preliminaries	Site Establishment	item	1	$	5,000.00	$	5,000.00
	Survey/Setout	item	1	$	3,000.00	$	3,000.00
	Testing	item	1	$	2,000.00	$	2,000.00
	Traffic Control	item	1	$	5,000.00	$	5,000.00
	Subtotal					**$**	**15,000.00**
Stormwater Drainage	375 mm dia RCP	m	131	$	320.00	$	41,920.00
	450 mm dia RCP	m	130	$	360.00	$	46,800.00
	525 mm dia RCP	m	177	$	460.00	$	81,420.00
	900 sq JB	ea	10	$	3,300.00	$	33,000.00
	1900 x 900 DSEP	ea	5	$	3,800.00	$	19,000.00
	Connect to existing drain	item	3	$	1,000.00	$	3,000.00
	Subtotal					**$**	**225,140.00**
Pavement	Trench Reinstatement (Council Roads)	m2	438	$	60.00	$	26,280.00
	Subtotal					**$**	**26,280.00**
Service Alterations	Alteration of Underground Services	item	1	$	-	$	-
	Subtotal					**$**	**-**
Totals	Total					$	281,420.00
	20% Contingencies					$	84,426.00
	Grand Total including Contingencies					**$**	**365,846.00**

Notes

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Indicative Construction Cost Estimate

Project	Coromandel Parade Drainage Investigation
Job Number	12004
Title	Option 2
Cost Estimate	DJ
Checked	DK
Date	22-Feb-12

Item	Description	Unit	Quantity		Rate		Total
Design	Detailed Design and Documentation	item	1	$	10,000.00	$	10,000.00
	Contract Administration and Supervision	item	1	$	5,000.00	$	5,000.00
	Subtotal					**$**	**15,000.00**
Preliminaries	Site Establishment	item	1	$	5,000.00	$	5,000.00
	Survey/Setout	item	1	$	3,000.00	$	3,000.00
	Testing	item	1	$	2,000.00	$	2,000.00
	Traffic Control	item	1	$	5,000.00	$	5,000.00
	Subtotal					**$**	**15,000.00**
Stormwater Drainage	375 mm dia RCP	m	131	$	320.00	$	41,920.00
	450 mm dia RCP	m	130	$	360.00	$	46,800.00
	900 sq JB	ea	7	$	3,300.00	$	23,100.00
	1900 x 900 DSEP	ea	5	$	3,800.00	$	19,000.00
	Connect to existing drain	item	3	$	1,000.00	$	3,000.00
	Subtotal					**$**	**133,820.00**
Pavement	Trench Reinstatement (Council Roads)	m2	261	$	60.00	$	15,660.00
	Subtotal					**$**	**15,660.00**
Service Alterations	Alteration of Underground Services	item	1	$	-	$	-
	Subtotal					**$**	**-**
Totals	Total					$	179,480.00
	20% Contingencies					$	53,844.00
	Grand Total including Contingencies					**$**	**233,324.00**

Notes

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Indicative Construction Cost Estimate

Project	Coromandel Parade Drainage Investigation
Job Number	12004
Title	Coromandel Parade
Cost Estimate	TR
Checked	DJ
Date	11-Jul-12

Item	Description	Unit	Quantity		Rate		Total
Preliminaries	Site Establishment	item	1	$	15,000.00	$	15,000.00
	Setout	item	1	$	1,500.00	$	1,500.00
	Testing	item	1	$	5,000.00	$	5,000.00
	Traffic Control	item	1	$	5,000.00	$	5,000.00
	Subtotal					**$**	**26,500.00**
Stormwater Drainage	375 mm dia RCP	m	266	$	320.00	$	85,120.00
	450 mm dia RCP	m	49	$	360.00	$	17,640.00
	375x300 mm RCBC	m	37	$	450.00	$	16,650.00
	900 sq JB	ea	4	$	3,300.00	$	13,200.00
	Rocla QKIS2400 inlet structure	ea	10	$	4,000.00	$	40,000.00
	Horizontal splay bend	ea	7	$	800.00	$	5,600.00
	Connect to existing drain/ pit	item	2	$	1,000.00	$	2,000.00
	Subtotal					**$**	**180,210.00**
Pavement	Trench Reinstatement (Council Roads)	m2	0	$	60.00	$	-
	Subtotal					**$**	**-**
Service Alterations	Alteration of Underground Services	item	1	$	-	$	-
	Subtotal					**$**	**-**
Totals	Total					$	206,710.00
	10% Contingencies					$	20,671.00
	Grand Total including Contingencies					**$**	**227,381.00**

Notes

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