

# PARRAMATTA CITY COUNCIL



## QUARRY BRANCH CREEK: MAINTENANCE AND REHABILITATION MASTERPLAN

**VOLUME 1: Summary Report**  
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This Master Plan document has been prepared to ensure the on-going protection and enhancement of Quarry Branch Creek (Northmead Gully). The study area is located between Northmead, Winston Hills and Baulkham Hills, extending for 2.6km in length and with a surrounding catchment of 241ha.

The extensive bushland corridor adjoining the creek contains threatened and regionally significant species and provides a valuable local passive recreation area and fauna habitat node. Important European and Aboriginal heritage sites have been identified in the corridor, including rock shelters, quarries, quarry roads and creek channel features.

The ecological values of the creek have largely been protected from water flowing from stormwater outlets to the channel by adjoining bushland vegetation. This has however, led to a degradation of the terrestrial vegetation with significant weed invasion.

There are a number of impacts on the reserve threatening the integrity of these values, primarily associated with urban runoff, vandalism, fire frequency, weed invasion and feral animals. These and others are discussed in detail as part of this Master Plan together with opportunities that have been presented to ameliorate them.

## Objectives of the Master Plan

The objective of this Master Plan is to create a clear direction for future management and ongoing protection and rehabilitation works. The information required has been developed by undertaking a detailed assessment of all relevant environmental, heritage, social and economic aspects and impacts associated with the creek corridor and the surrounding catchment.

This Master Plan is to be consistent with Priority No 5 of the 2002 Parramatta City Council '*Rivers of Opportunity*' report. This report identifies the development of maintenance and rehabilitation Master Plans for high priority waterways, one of which is Quarry Branch Creek.

The Development of the Master Plans is also consistent with the 10 Key Biodiversity Outcomes outlined in the 2003 *Council Biodiversity Plan* and objectives of the *Upper Parramatta Stormwater Management Plan*.



## A 'Vision' for Quarry Branch Creek

The vision is an overarching statement directing the priorities for future management of the corridor. It provides a focus for the direction of resources and a target with which to assess success.

***“A corridor that enables community access for the enjoyment and understanding of its significant natural and heritage values”.***

This vision was developed from the outcomes of a community workshop held on Tuesday 11<sup>th</sup> October 2005. Attendees at the meeting provided valuable input towards the vision through informed discussion and vote compilation. The results of the voting indicated the significance of preserving and improving the creek's natural values (primarily vegetation) and heritage.

Appropriate access and interpretation of the values associated with the reserve were deemed important, as were managing the implications of stormwater runoff and water quality.

## Objectives for the corridor

Objectives are tangible goals to realise the vision. They focus specifically on attributes or values, something worked toward or striven for. The objectives have been derived from the vision, based on discussion at the community workshop, and the current values determined from fieldwork. These objectives translate into the *target condition* for the creek and associated corridor over the next twenty years.

### Objectives:

#### **Actions**

1. Enhance community awareness of the value of Quarry Branch Creek
2. Educate community on the threats to Quarry Branch Creek and encourage active participation in protection of the creek
3. Remediate zones or locations of degradation or instability

#### **Results**

1. Expanded area of high habitat value for native fauna
2. In-stream habitats are protected and enhanced
3. Heritage values protected and enhanced

Measurable targets can be used to judge the on-going success of the Master Plan implementation.

## Target conditions

| Reach | Target Condition  |
|-------|---|
| 1     | An equilibrium of native species with exotic species in the understorey and groundcover. This condition should support and encourage movement of fauna within and between the Toongabbie corridor whilst maintaining and enhancing the instream habitat. By 2020: 80% of weeds removed.   |
| 2     | A reduction in diffuse stormwater pollution, dumping and general litter. This reduces aesthetic appeal and associated social values with the bushland corridor.   |
| 3     | A reduction in Lantana infestation along the riparian zone. Protect heritage items. Increase social infrastructure within this corridor.  |
| 4     | Increased social values and reduced stormwater impacts throughout the corridor, including reduction in threatening inputs from surrounding catchments. Maintenance of bushland around infrastructure and residential dwellings to increase access and reduce likelihood of damage to private property.  |
| 5     | Increased native biodiversity through regeneration and wide scale removal of invasive privet, and targeted removal of Willows and <i>Camphor laurel</i> , working in a southerly direction. Benchmark target is reinstatement of common riparian canopy species such as <i>Casuarina glauca</i> and <i>Callicoma serratifolia</i> which are present in other reaches of the corridor. |



## Management priorities

From the field assessments it was evident that the study area holds many high values associated with the natural environment and heritage. The values should be protected and maintained.

Priorities are derived from the vision and objectives, and based on existing condition (value), trajectory (will it get better or worse if no action is taken), sensitivity to change and the associated threat:


|   |
|---|
| <b>Value + Trajectory + Sensitivity + Threat = Priority</b> |
|---|

A suite of over 100 actions were noted during the study and assessed as to how effective they were in addressing threatening factors and improving the overall values associated with the corridor. These actions include vegetation and fauna management, access and education, stormwater and pollutant control, and habitat and heritage preservation.

Actions have been ranked according to whether they:

- address a priority as defined in the vision
- target a cause rather than just a symptom
- protect a high value asset
- are effective in achieving the target condition.

Previous master plans had prioritised actions based on cost, not cost-benefit. By doing this expensive but worthy projects are prejudiced. It was felt that prioritisation results should be presented in raw format based on field observations and community input. It is up to Parramatta City Council, the implementers of the Master Plan, to allocate resources based on prioritisation, budget cycles/annual priorities and the opportunities for external funding. The latter is frequently the key driver for larger projects.





## Summary of current condition of Quarry Branch Creek

### Vegetation

The vegetation condition within the reserve is mixed. Areas that have been recently burnt, and where there is little historical ground disturbance, display a quality unexpected in an established urban environment. The value associated with this vegetation community should not be understated and its protection and improvement is a priority for the City of Parramatta.

Other areas are severely impacted – primarily due to earlier clearing activity, stormwater impacts and a changed fire regime. Resilience (ability to recover from impacts) within these areas is dependent on the degree to which the soil profile has been modified. To this end it was felt that in most locations resilience would be high if a suitable fire regime is introduced. Exceptions to this are areas adjoining residential and road reserves, where tipping has occurred and Reach 5 where evidence of previous agricultural practices are apparent.

Dumping of garden material and grass clippings is having a significant impact on the long term integrity of the reserve.

### Terrestrial habitat

Terrestrial habitat values throughout the corridor were, on the whole, excellent. Areas for minor improvement were confined to previously disturbed sites and relate primarily to the addition of nesting boxes for arboreal mammals and birds.

Good practice bush regeneration, utilising mosaic techniques in the removal of lantana, will ensure the significant small bird population is maintained and enhanced.

Observations of reptiles and associated habitat indicated a thriving population throughout the reserve. This is potentially threatened however, by the removal of timber for firewood and bush rock for gardens. Enforcement of illegal practices and educational materials/signage on the value of this habitat to the local ecology may assist.

A number of primary threats to the integrity of the fauna population were observed, including domestic animals, foxes and European honey bees. The bees especially were acting to displace native fauna from valuable hollows and compete with the nectar feeders and pollinators.

### Aboriginal heritage

Fifteen Aboriginal sites were identified during the assessment including four that were previously recorded. Artefacts were observed at a number of the shelters. These sites represent a significant part of the heritage of the Parramatta City Local Government Area.





Many of the shelters have been severely damaged both through deliberate vandalism and unintentional disturbance. This includes graffiti, dumping, construction of a sewer line, pathway location, fire and littering. Some of the sites however were well preserved and had not been recorded previous to this study. These sites must be documented, registered and protected from further damage malicious or otherwise.

### **European heritage**

A suite of European heritage items exist within the corridor associated with the quarrying of sandstone and include haul roads, quarries, bridge structures and building footings.

There has been little to no restoration or protection work conducted on the heritage items and they are in decline due to stormwater damage, dumping of materials and weed invasion. Opportunities exist to improve the condition and educational value of these items by encouraging visitation and promoting the area as a heritage site.

Activities such as past building of toilet facilities on heritage footings, and on-going dumping of household waste into quarries is of concern.

### **Community Access and Usage**

The reserve currently has an extensive network of tracks, both formal and informal, that afford visitors the opportunity to walk throughout the area. The tracks currently have little directional or interpretive signposting and could be improved with the provision of more formalised access points and infrastructure.

Bush regenerators and other Council staff have made a good start in the formalisation of the tracks but a concerted effort and specification of the quality, location, interpretation and dimension of walkways is required. Additional structures such as stairs and boardwalks will reduce some of the impacts associated with the increased traffic.

This corridor has the potential to be a significant regional passive recreation feature linking current Council-run facilities such as playgrounds and playing fields. There are opportunities to further enhance the area by providing a picnic/BBQ area in Model Farms Reserve.

### **Aquatic habitat**

The creek displays many attributes associated with high quality aquatic habitat. Deep pools exist that provide refuge for fish and macro-invertebrates during dry periods. Variations in bed sediment size, form and quantity provide opportunities for spawning and invertebrate diversity. Cascades facilitate the oxygenation of water which acts to counter eutrophication associated with urban runoff. The creek also has a continuous canopy providing a stable thermal environment for aquatic fauna.



In-stream timber and native leaf litter were identified throughout the creek. These provide important breeding sites, bio-films and food sources.

### **Geomorphic stability and creek integrity**

Geomorphically, Quarry Branch Creek channel and floodplain are stable and in good condition. Although there are isolated pockets of instability and erosion extant in the channel zone, these do not present a threat to morphological stability or habitat. The substrate of the channel has a variety of grainsize ranging from sand to gravel and cobbles. In mid catchment bedrock sheets form the base of the channel and extend for many metres and cross channel bedrock bars form steps in the long profile that have induced formation of plunge pools.

There are only minor point sources of sediment in the channel zone and only small quantities of sediment are being liberated from these.

There is no evidence of a sediment slug currently moving through the system. However, the total quantities of sediment, from all sources, moving through the system is unknown. The amount of sediment being stored within the channel is insufficient to present a threat to channel bedforms or in-stream habitat. However, there is evidence that a sediment slug has moved through the system in the past.

Where Quarry Branch Creek meets Toongabbie Creek the channel has cut down into the floodplain so that it is inset well below the level of its surrounds. This has occurred in two stages as is evidenced by the current channel being inset within a larger, higher level, (macro) channel. Upstream of the area of convergence the relatively high banks and narrow valley width act to concentrate flow, confine the channel and limit sideways movement. However, in the area of convergence, the enlarged channel capacity, in concert with backwater effects from Toongabbie Creek, have acted to slow the flow exiting from Quarry Branch Creek and deposition of sediment has resulted. This can be seen as a ridge form on the semi flat area adjacent to the channel and below the level of the floodplain.

### **Educational value**

Existing educational value of the gully is quite low for the uninitiated. There are few formal or informal resources available for the interpretation of the creek and little local understanding on the importance of the area both from a heritage and environmental perspective.

The potential educational value of the creek for schools and the community is significant. Interpretive walking trails supported with school curriculum materials and community brochures will assist in the understanding of the attributes and values of the corridor and creek. With commitment from the Council and local schools the corridor can be developed into a resource that schools from across the region can enjoy on field trips. This will complement and relieve some of the existing pressure on Lake Parramatta.



## **Water quality**

No physical water quality tests were taken as part of the Master Plan development. However, water quality modelling was conducted (using the MUSIC urban stormwater model) to predict flow rates and pollutant loads of stormwater flowing into the creek. From field observations of the creek and stormwater outlets, and understanding the disturbance history of the catchment corridor, it is suggested water quality is good to excellent for an urban stream.

As mentioned elsewhere in this plan the creek water quality has largely been protected by the filtration mechanism of stormwater running over vegetated areas. This serves to reduce the pollutants carried in runoff from roads and residential areas entering the creek. Steps must be taken to ensure this remains the case.

This said there was evidence the sewer network has frequently surcharged to the creek, probably during rainfall when illegal cross-connections (between sewer and stormwater pipes) and infiltration into cracked pipes overcomes the capacity of the sewer system. Many of the inspection covers were displaced indicating recent activity.

A number of locations were identified that were believed to be cross-connections of sewer to stormwater and these should be investigated.

## Threats to Quarry Branch Creek

Threats are prioritised based on existing values determined through the site assessment and apparent level of risk to those values.

| Priority | Risk  | Consequence   | Proposed solutions   |
|----------|---|---|--|
| 1        | <b>Stormwater quantities in frequent rainfall events</b> (3 month to 1 year events) | Frequent high flows in the creek lower the ability of microfauna to survive. Without the lower end of the food chain a stable ecosystem cannot function.  | Reduction of 'effective catchment imperviousness' by the introduction of swales, rainwater tanks on houses, prevention of connection of piped areas directly to the creek. These measures reduce the volume of urban runoff and slow the water down to less than erosive velocities.                 |
| 2        | <b>Loss of corridor intactness</b>  | Loss of vegetation adjoining the creek leads to instability in the channel and will lead to a reduction in the quality and value of the corridor.   | Prevent any clearing of native vegetation and ensure no development occurs within the existing footprint of the vegetated area. Rezone the reserve to Bushland protection or Waterway.   |
| 3        | <b>Stormwater quality (acute)</b>   | A spill of a toxic substance such as pesticide, detergent or oil washed into the stormwater system during dry weather has the potential to kill all aquatic species and, without intervention, cause permanent degradation. | Maintain, where possible, a lack of direct connection between stormwater outlets and the creek. The further the water (or contaminant) has to travel over soil and vegetation the better protection afforded to the creek.   |
| 4        | <b>Damage to heritage</b>   | Heritage items, especially aboriginal shelters, have been degraded through vandalism and other antisocial behaviour. Fire can also cause damage to sandstone and reduce the value of important sites.                       | Prevent casual access to the Aboriginal sites and ensure walking tracks are located away from them. Interpretive signage to provide education on the significance of the sites for which access is desired or inevitable. Clearing around all the known sites prior to any planned burning activity. |

| Priority | Risk                                     | Consequence   | Proposed solutions  |
|----------|--|---|---|
| 5        | Weed density                             | Weeds have become established in areas of high ecological value, changing the microclimate and shading conditions and enabling more weeds to establish.   | Implement established bush regeneration techniques working from best to worst areas. In some areas maintain the present condition by periodically clearing weeds that threaten existing trees. Importantly, reintroduce a fire regime that will change the microclimate to favour natives and making weed control easier in the longer term. Support existing community bush regeneration groups.   |
| 6        | Terrestrial habitat loss and recruitment | A reduction of terrestrial habitat reduces the population of species responsible for seed transfer and opens a niche for exotic species. The integrity of the reserve, and size and structure of vegetation communities depend on suitable habitat being available. | Prevent removal of, and introduction new fauna refuges, including nest boxes, fallen trees and bush rock.   |
| 7        | Stormwater quality (chronic)             | During rain pollutants contained in stormwater (such as nutrients, oils, heavy metals, tyre rubber and sediment) remain in the creek, degrading the environment for micro-organisms. Litter also lessens visual amenity.  | Treatment at the pipe outlet can reduce the amount of material entering the creek, however, these devices are expensive to install and maintain. Retaining semi-natural channels between the pipe and the creek, allowing overbank flow of water in a controlled manner, reduces the concentration of nutrients and associated pollutants that make it to the creek. However, it will increase maintenance requirements in the bushland adjoining the pipe and vegetation types may change locally. |

| Priority | Risk                        | Consequence   | Proposed solutions   |
|----------|-----------------------------|---|--|
| 8        | <b>Aquatic habitat loss</b> | Existing aquatic habitat values are very high. These habitats will be reduced with removal of canopy species (shade), in-stream rock, sediment and large woody debris. The addition of additional vegetative matter (deciduous leaf drop in autumn) will also have a deleterious effect.  | No snags or other material (except litter) are to be removed from the channel. Where possible implement mosaic weed removal adjacent to the channel to retain some shade over the water, especially pools. Prevent deciduous tree species leaves entering the channel. |
| 9        | <b>Feral fauna</b>          | Cats, foxes, off-leash dogs and rabbits have a damaging impact on the flora and fauna of the reserve: directly through predation or scent deterring native fauna movement. European honey bees have an impact through the occupation of important nesting hollows and displacing of native nectar feeding animals. Significant populations were observed. | Education and enforcement of companion animal legislation. Baiting for foxes and rabbits. Removal of honey bee colonies.   |
| 10       | <b>Urban interface</b>      | Baiting for rats or slugs in properties adjoining the reserve impact the local owl population. Weeds escaped from gardens have been observed adjoining most properties within the reserve. Nutrient runoff is promoting weed growth. Dumping of garden materials, grass clippings and general rubbish lessens visual amenity and introduces nutrients.    | Education of residents adjoining the reserve. Information and brochures exist and can be easily rebadged for Parramatta.   |

| Priority | Risk                       | Consequence  | Proposed solutions  |
|----------|----------------------------|--|---|
| 11       | <b>Uncontrolled access</b> | Increased access to the reserve from development and promotion of tracks and educational materials. As use increases it becomes more important that there are defined walkways and access points to prevent additional damage to vegetation, habitat and heritage items. | Establish defined access points to the reserve with signage and interpretive information. Close off the multiple "goat tracks" throughout the reserve and formalise and repair existing main tracks. Construct stairs in steep areas and water crossings to prevent erosion and improve safety. |
| 12       | <b>Fire frequency</b>      | Frequent fires can damage the local flora and fauna populations, some of which are threatened. Lack of fire can change vegetation communities, promote weed growth and increase the danger to residents.   | Establish a fire regime within the reserve consistent with the Threatened Ecological Community recovery plan. In the short term there are large areas that require burning to promote germination of native species and control weeds. See weed density above.                                  |



## Master Plan Priorities & Actions

*All actions ranked by priority and location*

*See appendix 19 for actions ranked by priority and action type.*

| Priority | Map location | Action Type |                                    | Detail  | Implementation | Maintenance year 1 |
|----------|--------------|-------------|------------------------------------|---|----------------|--------------------|
| <b>U</b> | All          | C           | Catchment                          | Policy (DCP) development to limit catchment imperviousness with new development | \$6,000        | \$0                |
| <b>U</b> | 23           | E.2         | Enforce dumping garden             | Tipping was identified in this area   | \$1,000        | \$500              |
| <b>U</b> | 30           | V.2         | Targeted control weed              | Removal of <i>Ludwigia longifolia</i> / Pampas Grass, <i>Salvinia</i>           | \$100,000      | \$40,000           |
| <b>U</b> | 39           | D.3         | Investigate contamination          | Numerous (100's) dumped car batteries   | \$10,000       | \$0                |
| <b>U</b> | 40           | D.1         | Remove dumped materials            | Asbestos and other rubbish  | \$6,000        | \$0                |
| <b>U</b> | 42           | V.7         | Fox baiting                        | Fox spotted in this area  | \$0            | \$1,000            |
| <b>U</b> | 74           | S.10        | Stabilise outlet                   | Erosion occurring around outlet   | \$8,000        | \$0                |
| <b>U</b> | 75           | S.10        | Stabilise outlet                   | Outlet is deepened  | \$8,000        | \$0                |
| <b>H</b> | 7            | V.1         | Support existing bush regeneration | Support existing program  | \$5,000        | \$5,000            |
| <b>H</b> | 8            | V.11        | Increase habitat                   | Place terrestrial timber  | \$2,000        | \$0                |
| <b>H</b> | 13           | V.2         | Targeted control weed              | Remove <i>Pittosporum</i> which are becoming established                        | \$10,000       | \$2,000            |
| <b>H</b> | 31           | S.8         | Divert stormwater                  | Divert stormwater to quarry for wetland   | \$7,000        | \$0                |





| Priority | Map location | Action Type |                                    | Detail  | Implementation | Maintenance year 1 |
|----------|--------------|-------------|------------------------------------|---|----------------|--------------------|
| H        | 32           | S.8         | Divert stormwater                  | Divert stormwater to northern quarry              | \$5,000        | \$0                |
| H        | 33           | S.8         | Divert stormwater                  | Divert stormwater to northern quarry              | \$1,000        | \$0                |
| H        | 34           | S.6         | Create basin/wetland <sup>a</sup>  | Raise natural drainage exit point to form a basin | \$3,000        | \$0                |
| H        | 51           | S.4         | Regularly clean GPT                | Clean out trash rack after rainfall               | \$0            | \$8,000            |
| H        | 54           | V.10        | Targeted Camphor removal           | Remove along waterway and replant                 | \$12,000       | \$0                |
| H        | 58           | D.7         | Water testing quality              | Testing to quantify sewer leaks                   | \$500          | \$0                |
| H        | 60           | D.7         | Water testing quality              | Elevated nutrient levels require testing          | \$500          | \$0                |
| H        | 63           | E.3         | Enforce bush rock theft            | Listed as key threatening process                 | \$1,000        | \$0                |
| H        | 65           | D.6         | Remove Honey bees                  | Identified throughout corridor                    | \$5,000        | \$1,000            |
| H        | 69           | E.1         | Conduct dogs on leash education    | Enforce dog walking on leash only                 | \$2,000        | \$500              |
| H        | 70           | E.4         | Support community                  | Support school in stream watch                    | \$2,500        | \$1,500            |
| H        | 71           | E.4         | Support community                  | Support scouts in bush regeneration/stream watch  | \$0            | \$4,000            |
| H        | 80           | V.10        | Targeted Camphor removal           | Remove along waterway and replant                 | \$25,000       | \$0                |
| H        | 86           | V.1         | Support existing bush regeneration | Support existing program                          | \$20,000       | \$20,000           |



| Priority | Map location | Action Type |                                  | Detail  | Implementation | Maintenance year 1 |
|----------|--------------|-------------|----------------------------------|---|----------------|--------------------|
| H        | 89           | V.8         | Manage dieback tree              | Determine cause of dieback                            | \$2,000        | \$0                |
| H        | 94           | V.8         | Manage dieback tree              | Determine cause of dieback                            | \$2,000        | \$0                |
| H        | 97           | V.8         | Manage dieback tree              | Determine cause of dieback                            | \$2,000        | \$0                |
| H        | 99           | A.1         | Reach 2_Close / Formalise trails | Close informal trails and formalise others            | \$9,000        | \$2,000            |
| H        | 101          | A.1         | Reach 4_Close / Formalise trails | Close informal trails and formalise others            | \$2,000        | \$2,000            |
| H        | 103          | S.7         | Re-shape channel                 | Remove pipe & create channel with GPT                 | \$200,000      | \$5,000            |
| H        | 106          | V.2         | Targeted removal weed            | Minor woody weed removal                              | \$15,000       | \$5,000            |
| H        | 107          | V.2         | Targeted removal weed            | Targeted woody weed                                   | \$10,000       | \$7,000            |
| H        | 112          | V.2         | Targeted removal weed            | Targeted woody weed removal                           | \$5,000        | \$1,000            |
| H        | 113          | V.2         | Targeted removal weed            | Target weed removal                                   | \$20,000       | \$12,000           |
| H        | 114          | V.4         | Controlled burn                  | Remove pittosporums and other woody weeds, broad burn | \$20,000       | \$5,000            |
| H        | 115          | V.2         | Targeted removal weed            | Ongoing woody weed removal                            | \$40,000       | \$20,000           |
| H        | 117          | V.2         | Controlled burn                  | Controlled burn                                       | \$5,000        | \$2,000            |
| H        | 119          | V.4         | Controlled burn                  | Drop weeds and burn                                   | \$30,000       | \$9,000            |
| H        | 122          | V.12        | Broad scale weed                 | Pile & burn   | \$25,000       | \$6,000            |



| Priority | Map location | Action Type |                                   | Detail  | Implementation | Maintenance year 1 |
|----------|--------------|-------------|-----------------------------------|---|----------------|--------------------|
|          |              |             | removal                           |   |                |                    |
| H        | 125          | V.2, V.3    | Targeted removal weed             | Required in this area                                       | \$15,000       | \$5,000            |
| H        | 126          | V.2         | Targeted removal weed             | Continue weed removal                                       | \$18,000       | \$6,000            |
| H        | 132          | D.1         | Remove dumped materials           | Asbestos, fill, tyres, metal, and other detritus in quarry  | \$30,000       | \$0                |
| M        | 0            | A.2         | Close access point                | Erosion from Scout access is causing instability            | \$300          | \$0                |
| M        | 2            | V.3         | Burn weed piles                   | Existing weed piles to be burnt                             | \$3,000        | \$0                |
| M        | 4            | INF.1       | Protect infrastructure            | Aerial pipe crossing  | \$10,000       | \$0                |
| M        | 6            | S.2         | Clear sediment outlet             | As described  | \$200          | \$0                |
| M        | 10           | V.11        | Increase habitat                  | Install next boxes due to the majority being juvenile trees | \$500          | \$0                |
| M        | 17           | INF.1       | Protect infrastructure            | Erosion around aerial pipe pylon                            | \$10,000       | \$0                |
| M        | 20           | S.2         | Clear sediment outlet             | Outlet half covered with sediment                           | \$100          | \$0                |
| M        | 26           | D.2         | Remove derelict car body          | Remove derelict car   | \$600          | \$0                |
| M        | 28           | S.6         | Create basin/wetland <sup>a</sup> | Construct   | \$1,500,000    | \$50,000           |
| M        | 35           | D.2         | Remove derelict car body          | Remove derelict car   | \$600          | \$0                |
| M        | 36           | D.2         | Remove derelict car               | Remove derelict car   | \$600          | \$0                |

| Priority | Map location | Action Type |                           | Detail   | Implementation | Maintenance year 1 |
|----------|--------------|-------------|---------------------------|--|----------------|--------------------|
|          |              |             | body                      |  |                |                    |
| M        | 38           | S.8         | Divert stormwater         | Stormwater flow causing damage to heritage road                                | \$500          | \$0                |
| M        | 41           | D.2         | Remove derelict car body  | Remove derelict car  | \$600          | \$0                |
| M        | 45           | A.5         | Build stairs              | Stairs required  | \$15,000       | \$0                |
| M        | 46           | A.2         | Close access point        | Close point of access  | \$200          | \$0                |
| M        | 53           | V.9         | Targeted removal Willow   | 4 mature <i>Salix babylonica</i> .   | \$3,500        | \$0                |
| M        | 56           | CO.1        | Construct amenities       | Suitable location for amenities such as tables, toilets BBQ's etc.             | \$350,000      | \$2,000            |
| M        | 57           | A.5         | Build stairs              | Stairs required behind 'The Willows' due to formalise access and ensure safety | \$15,000       | \$0                |
| M        | 62           | E.2         | Education and enforcement | Dumping of garden material and grass clippings identified                      | \$1,000        | \$100              |
| M        | 64           | S.7         | Re-shape channel          | Re-shape channel with small wetland / basin                                    | \$15,000       | \$3,000            |
| M        | 66           | H.1         | Clear prior to burning    | Clear around wall prior to burn  | \$1,000        | \$0                |
| M        | 68           | A.3         | Formalise entry point     | Formalise access point with signage  | \$1,500        | \$0                |
| M        | 79           | D.4         | Remove BMX trail          | Level and revegetate   | \$2,500        | \$0                |
| M        | 82           | A.4         | Minor track works         | Clear, formalise and drain trail where necessary                               | \$6,000        | \$0                |
| M        | 83           | E.5         | Interpretive signage      | Put signage at entrance to trail   | \$13,000       | \$0                |
| M        | 84           | E.5         | Interpretive signage      | Directions, maps etc   | \$3,000        | \$0                |
| M        | 85           | A.3         | Formalise entry           | Entry point requires definition  | \$1,000        | \$0                |



| Priority | Map location | Action Type |                                  | Detail   | Implementation | Maintenance year 1 |
|----------|--------------|-------------|----------------------------------|--|----------------|--------------------|
|          |              |             | point                            |  |                |                    |
| M        | 98           | A.1         | Reach 1_Close / Formalise trails | Close informal trails and formalise others                 | \$5,000        | \$2,000            |
| M        | 100          | A.1         | Reach 3_Close / Formalise trails | Close informal trails and formalise others                 | \$9,000        | \$2,000            |
| M        | 102          | V.2         | Targeted weed removal            | Create native mosaic                                       | \$10,000       | \$10,000           |
| M        | 102          | A.1         | Reach 5_Close / Formalise trails | Close informal trails and formalise others                 | \$6,000        | \$2,000            |
| M        | 104          | V.2         | Targeted weed removal            | Continue contracting regeneration                          | \$5,000        | \$2,000            |
| M        | 108          | V.2         | Targeted weed removal            | Maintenance of planting site                               | \$2,000        | \$2,000            |
| M        | 114          | V.2         | Targeted weed removal            | Control 'edge' effect                                      | \$2,000        | \$1,000            |
| M        | 116          | V.2         | Targeted weed removal            | Minimise spread of terrestrial weeds                       | \$7,000        | \$2,000            |
| M        | 118          | V.2         | Targeted weed removal            | Continue weed removal                                      | \$5,000        | \$2,000            |
| M        | 121          | V.12        | Broad scale weed removal         | Heavy infestation, drill/ spray weeds leave in situ & burn | \$45,000       | \$15,000           |
| L        | 1            | D.1         | Remove dumped materials          | Old lounges and other dumped materials                     | \$400          | \$0                |
| L        | 3            | S.1         | Clear vegetation outlet          | Rubbish was identified around outlet                       | \$300          | \$0                |
| L        | 9            | S.3         | Stabilise undercut               | Identified as required                                     | \$500          | \$0                |



| Priority | Map location | Action Type |                           | Detail   | Implementation | Maintenance year 1 |
|----------|--------------|-------------|---------------------------|--|----------------|--------------------|
|          |              |             | outlet                    |  |                |                    |
| L        | 11           | S.1         | Clear vegetation outlet   | High vegetation around outlet                            | \$200          | \$100              |
| L        | 12           | S.1         | Clear vegetation outlet   | High vegetation around outlet                            | \$200          | \$100              |
| L        | 14           | S.2         | Clear sediment outlet     | Clear sediment from blocked pipe                         | \$500          | \$200              |
| L        | 15           | S.3         | Stabilise undercut outlet | identified as required                                   | \$1,000        | \$0                |
| L        | 16           | D.5         | Clear blockage rubbish    | Build up around this point                               | \$0            | \$2,000            |
| L        | 18           | S.2         | Clear outlet sediment     | Outlet half blocked with sediment                        | \$200          | \$100              |
| L        | 19           | S.5         | Monitor erosion           | Monitor right bank erosion which is minor at present     | \$0            | \$100              |
| L        | 24           | S.1, S.2    | Clear sediment outlet     | Clean veg & sediment, create basin to capture low        | \$5,000        | \$500              |
| L        | 27           | E.5         | Interpretive signage      | Plunge pool  | \$1,000        | \$100              |
| L        | 29           | D.1         | Remove dumped materials   | Significant dumping in quarry. Remove refuse and replant | \$5,000        | \$0                |
| L        | 37           | A.3         | Formalise entry point     | Formalise access from Windsor Road                       | \$3,000        | \$0                |
| L        | 43           | S.3         | Stabilise undercut outlet | Undercut headwall on rock requiring stabilisation        | \$1,000        | \$0                |
| L        | 44           | S.5         | Monitor erosion           | Minor erosion on right bank requires monitoring          | \$0            | \$200              |
| L        | 47           | S.3         | Stabilise undercut outlet | Undercut off cliff                                       | \$1,000        | \$0                |



| Priority | Map location | Action Type |                                  | Detail  | Implementation | Maintenance year 1 |
|----------|--------------|-------------|----------------------------------|---|----------------|--------------------|
| L        | 48           | S.3         | Stabilise undercut outlet        | Outlet onto cliff face                                | \$2,000        | \$0                |
| L        | 49           | S.9         | Replace headwall apron           | Apron missing   | \$1,000        | \$0                |
| L        | 50           | S.3         | Stabilise undercut outlet        | Undercut headwall                                     | \$500          | \$0                |
| L        | 52           | V.5         | Clear for access                 | Resident complaints                                   | \$1,000        | \$1,000            |
| L        | 55           | S.1         | Clear outlet vegetation          | Willow roots coming out of outlet                     | \$500          | \$0                |
| L        | 59           | S.3         | Stabilise undercut outlet        | Apron requires concrete under apron                   | \$500          | \$0                |
| L        | 67           | D.5         | Clear rubbish blockage           | Gross pollutants getting caught in large woody debris | \$0            | \$2,000            |
| L        | 72           | V.14        | Fauna investigation              | Investigate bat population in Hammers Rd Bridge       | \$1,200        | \$0                |
| L        | 73           | S.11        | Place rock at outlet             | Place rock to prevent deepening                       | \$1,800        | \$0                |
| L        | 76           | I.1         | Monitor aquatic weed infestation | Liaise with BHSC re weed infestations                 | \$0            | \$0                |
| L        | 77           | V.6         | Plant native strata              | Plant to road verge to increase corridor width        | \$20,000       | \$5,000            |
| L        | 78           | E.2         | Education and enforcement        | Identified adjoining this property                    | \$500          | \$0                |
| L        | 81           | V.5         | Clear for access                 | Create buffer behind houses                           | \$1,000        | \$500              |
| L        | 92           | V.3         | Targeted weed removal            | Control privet & Madeira vine                         | \$20,000       | \$2,000            |
| L        | 103          | V.2         | Targeted weed removal            | Primary weed removal                                  | \$10,000       | \$2,000            |





| Priority | Map location | Action Type |                     |      | Detail                                      | Implementation | Maintenance year 1 |
|----------|--------------|-------------|---------------------|------|---|----------------|--------------------|
| L        | 105          | V.2         | Targeted removal    | weed | Primary weed removal with follow-up         | \$30,000       | \$10,000           |
| L        | 109          | V.2         | Targeted removal    | weed | Primary woody weed removal                  | \$15,000       | \$6,000            |
| L        | 110          | V.2         | Targeted removal    | weed | Primary weed removal                        | \$18,000       | \$6,000            |
| L        | 111          | V.2         | Targeted removal    | weed | Primary clearance                           | \$25,000       | \$14,000           |
| L        | 120          | V.2         | Targeted removal    | weed | Control nutrients                           | \$2,000        | \$1,000            |
| L        | 123          | V.2         | Targeted removal    | weed | Control privet & Madeira vine               | \$20,000       | \$5,000            |
| L        | 124          | V.2         | Targeted removal    | weed | Primary control of woody weeds              | \$30,000       | \$20,000           |
| L        | 127          | V.2         | Targeted removal    | weed | Clear understorey, landscaping              | \$5,000        | \$2,000            |
| L        | 128          | V.13        | Control vine weeds  |      | Control vines from mature trees             | \$5,000        | \$5,000            |
| L        | 129          | V.6         | Plant middle storey |      | Bush regeneration has left the area denuded | \$18,000       | \$5,000            |