Projects 2012-13

LAKE BAROON CATCHMENT CARE GROUP

seqwater WATER FOR LIFE

Restoring Bridge Creek – A Partnership of the Commonwealth, State and Community

CARING FOR OUR COUNTRY

PROJECT PLAN

Project No. 1213-003

This Project proposal has been prepared by:

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PROJECT VERSIONS & APPROVALS

Version	*Date*	*Version/Description*	*Result*
n/a	27/3/2012	Community Action Grants application submitted	Approved (13/7/2012)
1.0	2/11/2012	Draft Project Proposal (Seqwater funding)	n/a
1.0	8/11/2012	Project presented to LBCCG Committee	Approved (Minutes)
1.0		Project Proposal forwarded to Seqwater for approval (email)	Approved 30/4/2012

supporting the Sunshine Coast Rivers Initiative

Cover photo: *The Bridge Creek tributary with remnant vegetation protected under a Voluntary Conservation Agreement.*

TABLE OF CONTENTS

i. EXECUTIVE SUMMARY

PROJECT TITLE: **Restoring Bridge Creek – A Partnership of the Commonwealth, State and Community**

PROJECT NUMBER: **1213-003** **DATE:** **September 2012**

PROJECT SUMMARY:

We will fence and revegetate 380 metres of a tributary of Bridge Creek establishing a vegetation corridor between remnant rainforest vegetation and a constructed wetland on the outskirts of urban Maleny. We will address poor water quality in Lake Baroon (the Sunshine Coast's most important water supply) from grazing, erosion, sedimentation, urban development, habitat fragmentation, biodiversity decline and weed spread. The project will be implemented over two adjoining properties with area mapped as Essential Habitat for threatened species by DERM (EPBC vulnerable Macadamia ternifolia and Syzygium hodgkinsoniae). Local non-profit groups will assist with the preparation, planting and maintenance of the project.

APPLICANT/LANDHOLDER DETAILS

Names	Garry Smith	Irene Keton
Postal Address	[redacted]	[redacted]
Phone Numbers	[redacted]	[redacted]
E-mail	[redacted]	[redacted]

PROJECT / SITE LOCATION

Property Address	Bridge Creek Rd, Maleny	68 Palm St, Maleny	
RP Numbers (Lot)	SP156789	MCH138 (46)	
Property Size (ha)	10.21	21.23	
Existing Land-use	Beef grazing	Residential/vegetation/beef	
Stock Carried	20	60 (agistment)	
Sub-Catchment	Bridge Creek	***Management Unit***	BR3
M.U. Priority *(LBCCG IP)*	**Low**	***M.U. Priority*** *(Pollution)*	**High**

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group	Project coordination, administration, reporting, monitoring & evaluation
Commonwealth Government (Community Action Grants)	Project funding ($19,950)
Seqwater	Project funding ($28,044 – Year 1 only)
Landholders (G. Smith, I. Keton)	Landowners, cost-sharing ($14,000 – Year 1 only)
Sunshine Coast Council	Technical advice & support ($1,000 – Year 1 only)

PROJECT DETAILS

Project Start Date	July 2012	***Project Completion Date***	June 2015
Revegetation	2,000 plants (1 hectare)		
Fencing	611 metres (380 metres waterway fenced)		
Weed Management	1 hectare - WONS lantana, blackberry (and other environmental weeds)		
Community Events	1 Field Day		

1 INTRODUCTION

1.1 BACKGROUND

Lake Baroon Catchment Care Group is an on-ground implementation, not for profit community group focussed on improving water quality in the Lake Baroon catchment. These aims are consistent with Seqwater's objectives of producing efficient, high quality potable water to the Sunshine Coast (and greater South East Queensland) region. Therefore the mutually beneficial partnership between the two organisations has been long-running and highly valuable.

Restoring Bridge Creek is a project designed to address multiple environmental issues and hence fits the criteria of Caring for Our Country Community Action Grants program (CAG) and with the successful application, is the cornerstone of funding for the project.

This Project Plan details the objectives, methodology and implementation of the CAG funding and additionally leverages further funding from Seqwater and other external sources.

Lawley Creek, a major tributary of Bridge Creek, drains approximately 280 hectares of catchment and is bounded by urban Maleny to the south, Bridge Creek Road to the west, North Maleny Road to the east and Rosella Road to the north. The confluence with Bridge Creek occurs just to the east of the first bridge on Bridge Creek Road.

The project site is in the headwaters of a Lawley Creek tributary with a relatively small (32 hectares) catchment, although this is misleading as urban Maleny, with its roads and hardened surfaces provides greater run-off than the catchment size suggests.

Lawley Creek – particularly downstream of the project site is one of the more protected and vegetated areas (although much of this vegetation is degraded by environmental weeds with arguable buffering ability) in the Lake Baroon catchment.

The uppermost areas of Lawley Creek are largely grazed. The project site represents a 'gap' in the riparian vegetation between bushland on the outskirts of Maleny and the remnant vegetation and bushland on the middle to lower reaches of Lawley Creek.

Left: The Lawley (Bridge) Creek tributary. The project is linking the remnant vegetation in the background of the photo with the wetlands and revegetation in the foreground – part of the Rangeviews Estate.

1.2 PREVIOUS ACTIVITIES

This part of the Lake Baroon catchment has attracted considerable interest over the last ten years. A series of community driven projects managed weeds and planted native tube-stock in the headwaters of Lawley Creek on the edge of urban Maleny. Landholders in the middle reaches have been active fencing riparian zones, installing off stream watering and revegetating watercourses.

Financial Year	***Project Name***	***Investors***	***Outputs***
Pre 2001	Greening Australia-Keton	Greening Australia	?
	Greening Australia-Lawley	Greening Australia	?
2001-02	Keton Revegetation Project	AquaGen	954 plants
			203 metres fencing
2002-03	Tamarind Street Group (Stage 1-5)	AquaGen	2,300 plants
		MRCCC	
		Barung Landcare	
	Lawley Stage 2	AquaGen	1,000 plants
			300 metres fencing
			Off stream watering
			Weed management
			1 creek crossing
2003-04	Keton Revegetation	AquaGen	280 plants
	Lawley Stage 3	AquaGen	Off stream watering
	Tamarind Street	AquaGen	500 plants
			Weed management
2011-12	Upper Lawley Creek Restoration	Seqwater	3,200 plants
		Community Action Grants	560 metres fencing
		Barung Landcare	Weed management
		Sunshine Coast Council	Community events

These projects represent activities that Lake Baroon Catchment Care Group were directly involved. Sunshine Coast Council has been very active in the area through Land for Wildlife programs, minor and major landholder grants and the Voluntary Conservation Agreements.

Tamarind Street Group

Left: The Tamarind Street group revegetating the headwaters of Lawley

Keton Revegetation Project

Above: The Keton property fencing and revegetation project before (2002) and after (2012).

Upper Lawley Creek Restoration

Left: Upper Lawley Creek Restoration has fenced and revegetated the upper reaches of Lawley creek.

2 LOCATION

2.1 THE BRIDGE CREEK CATCHMENT

The Lake Baroon Catchment Implementation Plan 2007 describes the Bridge Creek sub-catchment as dominated by natural vegetation, although cattle grazing (and to a lesser extent dairying) remains a significant land use in several Management Units. The sub-catchment covers an area of 2,134 hectares and has a total stream length of 52 km (significant watercourses). Approximately 43% of the sub-catchment has vegetation cover although much of this has suffered disturbance and is degraded by environmental weeds (Dunstan 2007).

Left: Bridge Creek has good riparian vegetation and displays excellent bed diversity and bank stability. The creek however is threatened by excessive sediment loads entering the waterway through erosion in the catchment – particularly in the headwaters.

Bridge Creek has been divided into six management units that reflect property boundaries, physiography, vegetation, land use, point and diffuse source impacts. This provides administrative convenience and the ability to prioritise stream zones more accurately according to various threats. The proposed project is located within Management Unit BR3 – Lawley Creek.

Left: Lawley Creek.

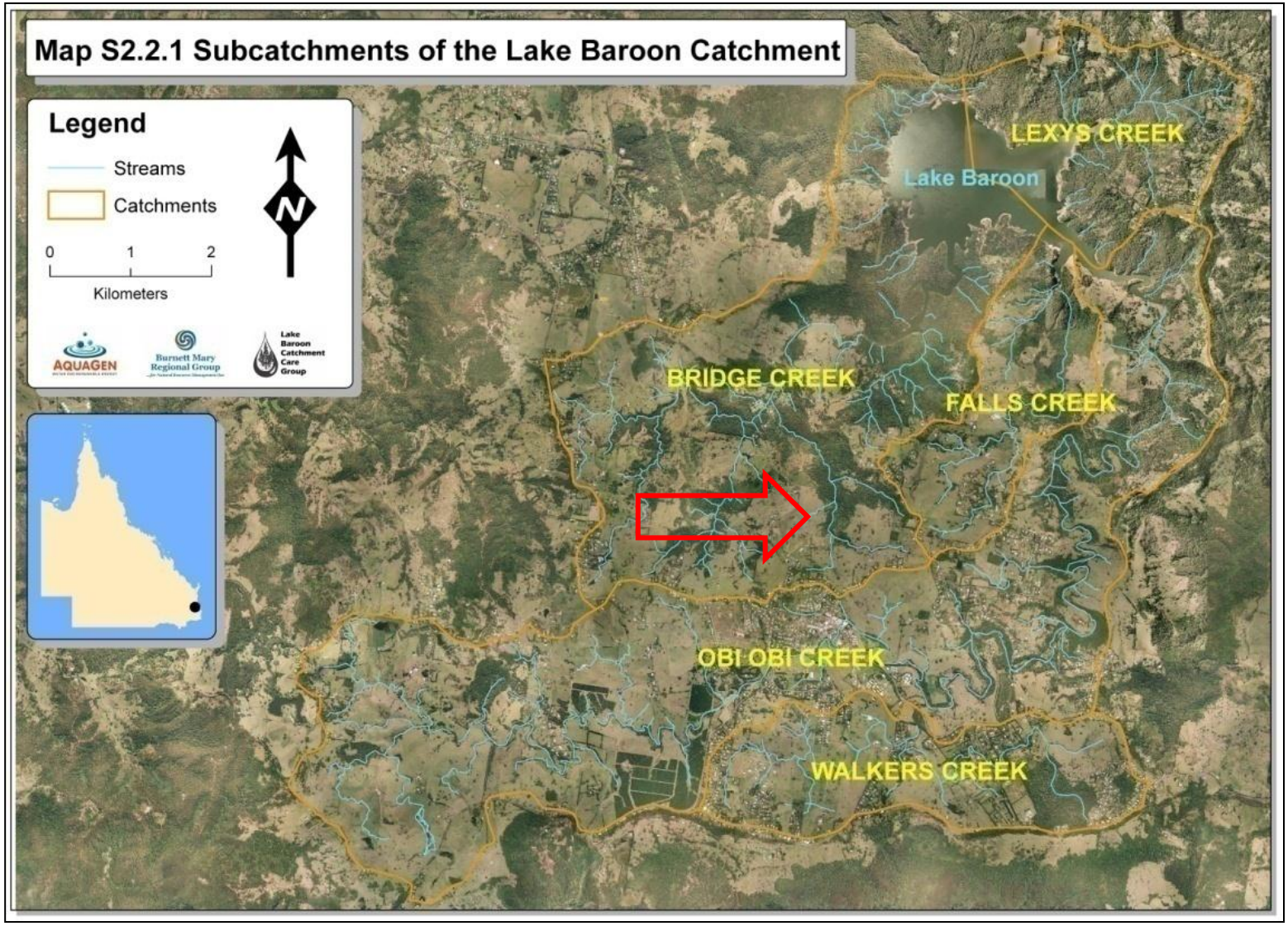
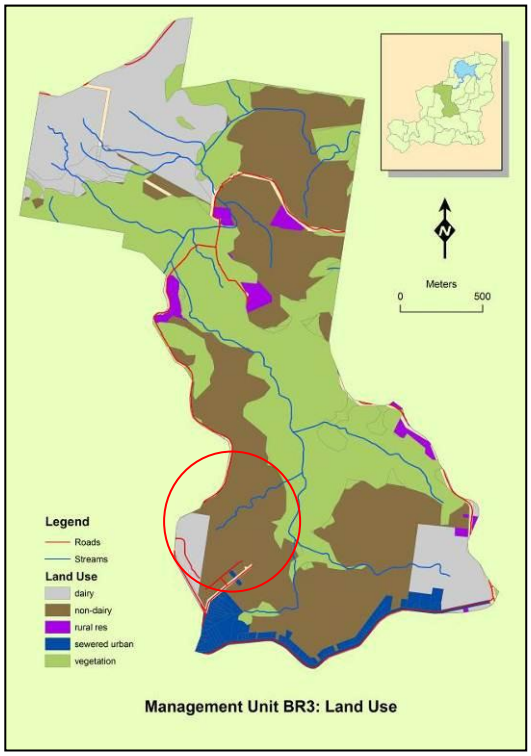


Figure 4: Lawley Creek is a tributary of the larger Bridge Creek catchment.

2.2 LAND USE

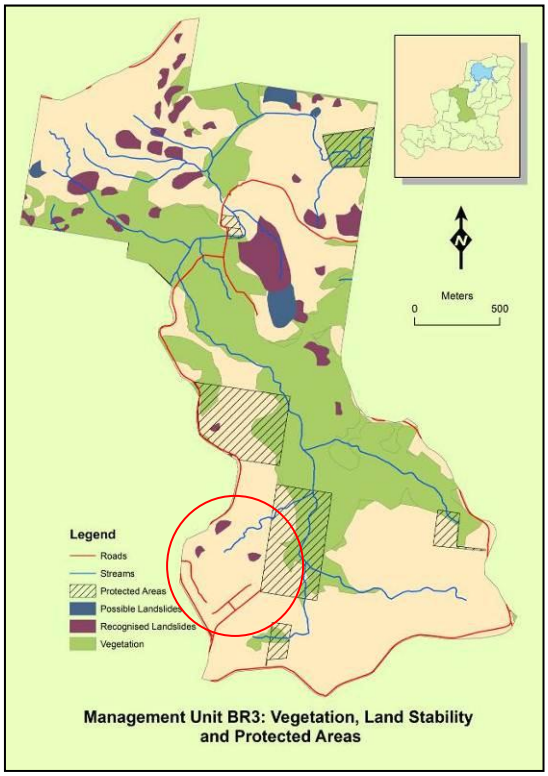


The proposed project is located within Management Unit BR3. This MU is 518 ha in size and has 14 km of significant waterways. The dominant land use in the MU is split between vegetation and beef grazing with some dairy grazing and pockets of rural residential properties. Only the residences in the very headwaters of the MU are sewered. Riparian vegetation is present alongside 40% of the waterway length, a significant proportion of which has been landholder revegetation.

The Smith and Keton properties are relatively small (totalling 31.5 hectares) and are not commercially viable for beef grazing; however cattle are utilised to manage the properties. Garry Smith runs approximately 20 head while the Keton property is currently agisted by neighbour Ed Lawley (approximately 60 head in a rotational grazing regime).

Left: The project will fence and revegetate a largely unprotected watercourse in the upper catchment of the MU.

2.3 GEOLOGY, SOILS & STABILITY



Approximately 25 million years ago extensive slow moving lava flows formed the Maleny plateau. The lava flowed from south of present day Maleny, northwards, meeting the far older North Arm volcanics on the northern bank of present day Lake Baroon. Underlying the basalt is Landsborough Sandstone which in places (notably Howells Lookout) was never covered by the flows.

Erosion, particularly water erosion and the resultant formation of drainage channels (watercourses) has in places revealed these lower layers of sandstone, and also contributed to the formation of steep and unstable hill-slopes. Both project sites, being riparian zones are predominantly black alluvial soils which influences the type of vegetation naturally found. Black soil can be particularly prone to instability (Willmott 1982 and East 1978) however the project sites are expected to remain stable.

Left: The upper part of the MU is relatively stable – largely due to the presence of Red Ferrosol soils.

3 WATER QUALITY

The proposed project is located within Management Unit BR3. This MU is 518 ha in size and has 14 km of significant waterways. The dominant land use in the MU (other than vegetation) is beef production. Riparian vegetation is present alongside 40% of the waterway length, a significant proportion of which has been landholder revegetation. The relatively steep nature of the land, moderate instability (63% of land unstable) and lack of natural cover in some areas of the catchment means that there is high erosion potential, and minimal filtering of run-off, therefore inputs of nutrients are significant with 70% of samples exceeding guideline levels (Dunstan 2007).

Water quality is affected by: land use (farming, urban areas, construction and industry all have accompanying water quality problems); stock access to streams (increases turbidity and nutrient load); cleared riparian zone (decreased buffering effect, and decreased shading of water); and point sources of pollutant such as drains, sewage effluent and industrial wastewater (Rutherfurd, Jerie, Marsh 2000).

Modern agricultural activities have been identified as a major source of diffuse pollutants into waterways (Polyakov 2005). Land management practices, such as stocking rates, grazing pressures, land clearing and the application of fertilisers have significant impacts on pasture and land condition. When best practice management is not followed these practices can result in erosion processes, decreased infiltration of soils (through compaction), and excess nutrient and sediment run-off, all of which impact on local water quality.

Pollutants entering Lawley Creek occur from three main sources. Diffuse run-off from traditional grazing practices provides nutrient inputs (animal manure and fertiliser application) and sediments from paddock erosion. Urban run-off with nutrients derived from fertilisers, car washing practices, heavy metals and hydrocarbons, litter and organic matter. Also sewer overflows (from the urban sewer system and individual wastewater treatment systems such as septic tanks) with high nitrogen, phosphorus and pathogens.

Left: Waterways provide essential access to water for livestock however unrestricted access is detrimental to water quality. Unmanaged access can cause erosion, destabilise banks, degrade the riparian buffer and deliver nutrients directly to the stream.

Water quality monitoring and analysis sampled at the Bridge Creek crossing (Wells Road) between 1991-2005 by AquaGen shows, despite much of the catchment being vegetated, contributing significant nitrates, ammonia, phosphates, phosphorus and faecal coliforms.

3.1 Statistical analysis of the raw water quality data recorded from Bridge Creek

Parameter	*pH*	*Turbidity*	*NOx (N)*	*NH3 (N)*	*PO4 (P)*	*Total P*	*Faecal Coliforms*
(units)	*(pH units)*	*(NTU)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(number/ 100 mL)*
Guideline Value	*6.5-8.2*	*<25.0*	*<0.040*	*<0.010*	*<0.030*	*<0.030*	*<100*
Max	8.2	85.6	0.316	0.166	0.068	0.335	1480
Min	6.7	0.6	0.000	0.000	0.001	0.005	0
Mean	6.9	3.6	0.059	0.026	0.023	0.043	233
Median	6.9	1.4	0.036	0.010	0.013	0.027	60
Std Dev	0.3	16.0	0.214	0.183	0.047	0.068	4627
20th Percentile	6.8	1.0	0.003	0.006	0.008	0.020	20
80th Percentile	7.0	2.3	0.118	0.040	0.041	0.050	390
Count above GV	0	1	23	24	17	22	20
Count	51	51	50	50	51	50	51
% above GV	0.00	1.96	**46.00**	**48.00**	**33.33**	**44.00**	**39.22**

The Lake Baroon Catchment Implementation Plan (2007) rates BR3 a LOW priority for rehabilitation works. However, when assessing the Management Unit using a modified version of the Prioritisation Process, which prioritises MU's on pollution input levels and land instability parameters, BR3 rates as a HIGH priority (fourth highest of all MU's in the Baroon catchment) (Dunstan 2007).

4 PURPOSE & OBJECTIVES

4.1 BACKGROUND

A healthy aquatic ecosystem is one that is stable and sustainable; maintaining its physical complexity, biodiversity and resilience. It has the ability to provide ecosystem services that provide good water quality, wildlife habitat and recreation. LBCCG activities have the primary focus of improving water quality in the Lake Baroon catchment, however all projects deliver broader environmental benefits.

An estimated 80% of sediment and 35% of nitrogen in the waterways in South East Queensland come from non-urban diffuse loads. Reduction of these loads clearly represents a major target for action if significant improvements in water quality are to continue to be achieved in South East Queensland.

Diffuse pollutants are:

- Aggregated within a catchment; but delivered from sources dispersed throughout the catchment;
- Random in nature with weather playing a critical role in the process of pollutant delivery;
- Difficult to monitor on a continuous basis for a reasonable cost (Qureshi and Harrison, 2002).

Despite the complexity of mitigating diffuse pollution, evidence suggests there is an opportunity to reduce the contribution of non-urban diffuse source pollutants to prevent further water quality degradation throughout south east Queensland. Providing incentives for landholders to change management practices is a sound strategy to improve water quality (DERM 2010).

A survey examining barriers to the adoption of best land-use management practices by farmers concluded that economic barriers pose the biggest constraint (Slack-Smith, 2005). Investment in south east Queensland catchment management has historically been quite sporadic and not well targeted, especially in rural catchments (Faulkner, 2008). Cost effective investment, targeted at the most important non-urban diffuse pollutant sources throughout South-east Queensland, is required to efficiently achieve a large reduction of sediment and nutrient loads with a limited budget (Olley, 2006).

The project will focus on the improvement of water quality in the Lawley Creek catchment by removing livestock access to a permanently flowing watercourse, and reinstating vegetation in the riparian zone to establish a wildlife corridor to constructed wetlands. Habitat will be improved and remnant vegetation will be protected. Weeds of National Significance - blackberry and lantana will be controlled along with other environmental weeds.

4.2 OUTCOMES

Healthy catchments lead to healthy waterways. Through the prioritisation and implementation of riparian protection and rehabilitation throughout rural catchments – particularly headwaters, we can provide multiple beneficial outcomes.

1. Reduce nutrient delivery to waterways.

Nutrient delivery to waterways is continuous and increases during episodic rain events.

Vegetation buffers intercept and slow overland run-off contaminated with excessive nutrients from diffuse rural and urban sources (stormwater).

2. Reduce sediment delivery to waterways.

Soil from eroding waterway beds and banks leads to high turbidity and is transported to Baroon Pocket Dam and beyond.

Vegetative buffers stabilise eroding riparian zones and intercept run-off contaminated by sediments. Our project will re-establish riparian vegetation that will slow flows reducing erosive potential while capturing and stabilising sediment.

3. Improve aquatic habitat.

Riparian vegetation plays a critical role in the creation and maintenance of aquatic habitat in freshwater ecosystems.

Riparian vegetation provides shade, limiting nuisance aquatic plant growth and provides vegetative inputs that serve as habitat and food. A healthy waterway is critical to providing good water quality.

4. Raise community awareness.

The majority of land in the Lake Baroon catchment is privately owned and without landholder and community support activities improving catchment health and water quality is impossible.

The project will demonstrate the importance of excluding livestock from riparian zones and the reestablishment of vegetation to improve water quality – at a catchment level and Lake Baroon. On-ground works provide the opportunity for land managers to apply their knowledge and experience at the local level whilst contributing to landscape scale outcomes increasing the skills in the community. Community events (a field day and field walk) will engage and raise awareness in the community.

5. Improve farm productivity.

Watercourses and riparian zones are difficult to manage in the farm management context.

Excluding livestock from riparian zones and watercourses can improve the health of livestock (providing watering points that provides cleaner water and less disease), facilitates easier mustering and reduces the risk of injury to livestock through misadventure.

6. Whole farm approach to property management.

Clear property management objectives that take into account environmental considerations lead to efficient and effective projects.

All the landholders involved have clear Property Management Plans and property objectives to ensure all activities will be implemented in a permanent and cost effective manner.

7. Reduce impacts of weeds.

Weed sources in the upper catchment contribute to the proliferation of weeds through seed and vegetative material.

The project sits in the headwaters of Lawley Creek and through staged and comprehensive weed management will remove weed sources – particularly WONS lantana and blackberry, and to a lesser extent local priority weeds camphor laurel, privet and chinese elm.

8. Restore links between vegetation and create corridors.

Riparian zones provide wildlife corridors so that fauna can safely move from one area to another.

The project will reinstate a link between the remnant vegetation on the middle reaches of Lawley Creek and vegetation in the headwaters (urban Maleny).

9. Provide terrestrial habitat including 'Essential Habitat'.

Riparian vegetation provides important habitat for the adult stages of aquatic insects and amphibious organisms such as frogs and turtles.

The project will reinstate riparian and associated vegetation providing, in time, valuable habitat for a variety of native fauna. The area is listed as Essential Habitat and EPBC listed species will benefit from the enhancement and expansion of native vegetation.

10. Reduce chemical delivery to waterways.

Improved water quality monitoring and analysis by Seqwater has identified pesticide and herbicide contamination in Baroon Pocket Dam.

The project will reinstate riparian vegetation on 1st and 2nd Order streams adjacent to agricultural land (and urban Maleny) providing a buffer to pesticides and herbicides.

11. Establish a healthy, diverse and resilient environment that will address climate change variability.

Future climate change impacts may impact on the survival of threatened and vulnerable wildlife, increase the occurrence of significant storm events leading to the degradation and decline in the environment and subsequently impact on catchment water quality.

The project addresses several of the key threats predicted by climate change. Ultimately the project will increase the resilience of the catchment to the impacts of climate change but importantly if climate change does not occur to the degree expected, the activities remain important to delivering improved water quality to Baroon Pocket Dam.

4.3 TARGETS

4.3.1 Project Objectives Summary:

* improve water quality in the Lake Baroon catchment
* provide broad environmental benefits (biodiversity, linkages, weed management etc)
* demonstrate best practice property and waterway management
* raise community awareness of the importance of good water quality

4.3.2 Re-vegetation Objectives:

* restore tree canopy with moderate diversity through revegetation (90% canopy within 5 years)
* retain dense pasture between rows and in waterway channel until revegetation establishes and naturally excludes weeds and grasses
* after 2 years encourage natural regeneration to improve diversity

4.3.3 Community Awareness:

* raise community awareness of the importance of natural areas and riparian zones and the potential impacts from urban areas
* raise community awareness pesticide, herbicide and chemical impacts
* raise community awareness stormwater impacts
* raise community awareness weed management
* raise community awareness of Seqwater and the investment in the community to improve water quality

4.3.4 Target Condition:

* stable waterway with erosion reduced to natural levels
* 75% canopy closure (revegetation) in 3 years (90% in 5 years)
* extend vegetation corridor by 620 metres
* exclude livestock from 720 metres waterway
* reduce targeted weed infestation by 90% with ongoing maintenance program
* provide 1.5 hectares of new habitat; improve quality (by 25%) of 1 hectares of existing degraded habitat

5 IMPLEMENTATION

5.1 METHODOLOGY

Many of the changes to our streams over the last 150 years were made deliberately—to reduce flooding, to provide grazing, or to reduce erosion. We must think very carefully before we blindly reverse these efforts (Rutherfurd, Jerie and Marsh 2005). LBCCG takes all potential impacts into consideration before developing projects. Landholder knowledge, experience and advice is assessed on the local and catchment level. Other organisations such as Barung Landcare, Sunshine Coast Council and other relevant groups are all approached to provide advice.

5.1.2 Revegetation projects

To realise improved water quality outcomes we aim to return, as far as possible, the vegetation, structure, hydrology, and water quality of the original streams. Importantly, the improvements should be self-sustaining, meaning that the stream should not need continual intervention to retain the improved condition.

It is important to emphasise that rehabilitation does not imply absolute stability. On the contrary, stream systems rely on a certain level of disturbance by flooding, erosion and variable water quality, to maintain their diversity. The natural, pre-European, level of stability would be the ideal state.

Revegetation projects can be described in three ways:

1. **Restoration**

Restoration is the return of the waterway to a natural state (before the arrival of Europeans), however this method is expensive, time-consuming and is effectively only possible if the entire catchment was treated. Clearly, this will almost never be possible. More usually the stream manager will aim for 'rehabilitation'.

2. **Rehabilitation**

Although restoration may be impossible, this does not leave a degraded stream without hope. By improving the most important aspects of the stream environment, we can create a stream that, although only resembling the pre-European condition, is nevertheless an improvement on the degraded stream, and often a valuable environment/habitat in its own right. Since restoration is usually impossible, rehabilitation is the more common goal of our work.

3. **Remediation**

In some cases, even rehabilitation is not possible because of irretrievable changes to the stream. In such a situation, we can say that the original state is no longer an appropriate aim for the stream, because inputs from the catchment would not support such a condition. In this situation, the suitable treatment is remediation. The aim of remediation is to improve the ecological condition of the stream, but the endpoint of that improvement will not necessarily resemble the original state of the stream (Rutherfurd, Jerie and Marsh 2005).

Our project will aim to rehabilitate the watercourse.

5.2 REACHES

The project site has been split into sections (Reaches) that reflect the different ownership, management regimes, implementation activities and the values of the site. The major activities can therefore be described as:

Reach	*Landowner*	*Major Activities*	*Description*
1	Gary Smith	Riparian fencing	469 metres
		Revegetation	1,000 tubestock
		Waterway crossing	1 low level
		Weed management	Lantana, blackberry (1 ha)
2	Irene Keton	Riparian fencing	142 metres
		Weed management	Lantana, blackberry (1 ha)
		Revegetation	1,000 tubestock

5.2.1 Reach 1 Smith

The Reaches' riparian vegetation has been simplified to a monoculture of pasture (various species) and some weeds – lantana, blackberry, camphor laurel, mist weed and other minor species. A stand of approximately 15 mature and juvenile Bunya Pine (*Araucaria bidwillii*) are the dominant remaining native vegetation with two mature Waterhousia (*Waterhousia floribunda*) and a single Small-leaf Fig (*Ficus sp*.). The waterway has permanent flow from a reliable spring further up the catchment. Two relatively large constructed wetlands are immediately upstream of the Smith boundary. Designed to intercept stormwater from the housing estate at the top of the catchment, these dams are shallow with good macrophyte and aquatic vegetation and attracts a wide diversity of water fowl and other water dependent species.

The waterway in the Reach has a defined channel and relatively steep fall but lacks significant pools despite showing evidence of being cleaned out in the past. A small nick-point in the stream bed is gradually eroding upstream but appears to be merely eroding deposited sediments. The proposed low level crossing will halt this head-ward erosion.

It is expected that once the revegetation has established the waterway will revert to a more natural stream – that is rocky bed and banks with a reduction of waterlogged alluvial areas. Native sedges, rushes and macrophytes are currently present but would be expected to decline in extent as the revegetation shades the bed and banks of the waterway.

Flooding does not appear to be a major issue on the site as its position in the catchment generally means that flooding only occurs during high rainfall events and inundation is brief. Revegetation and fencing is unlikely to be severely affected.

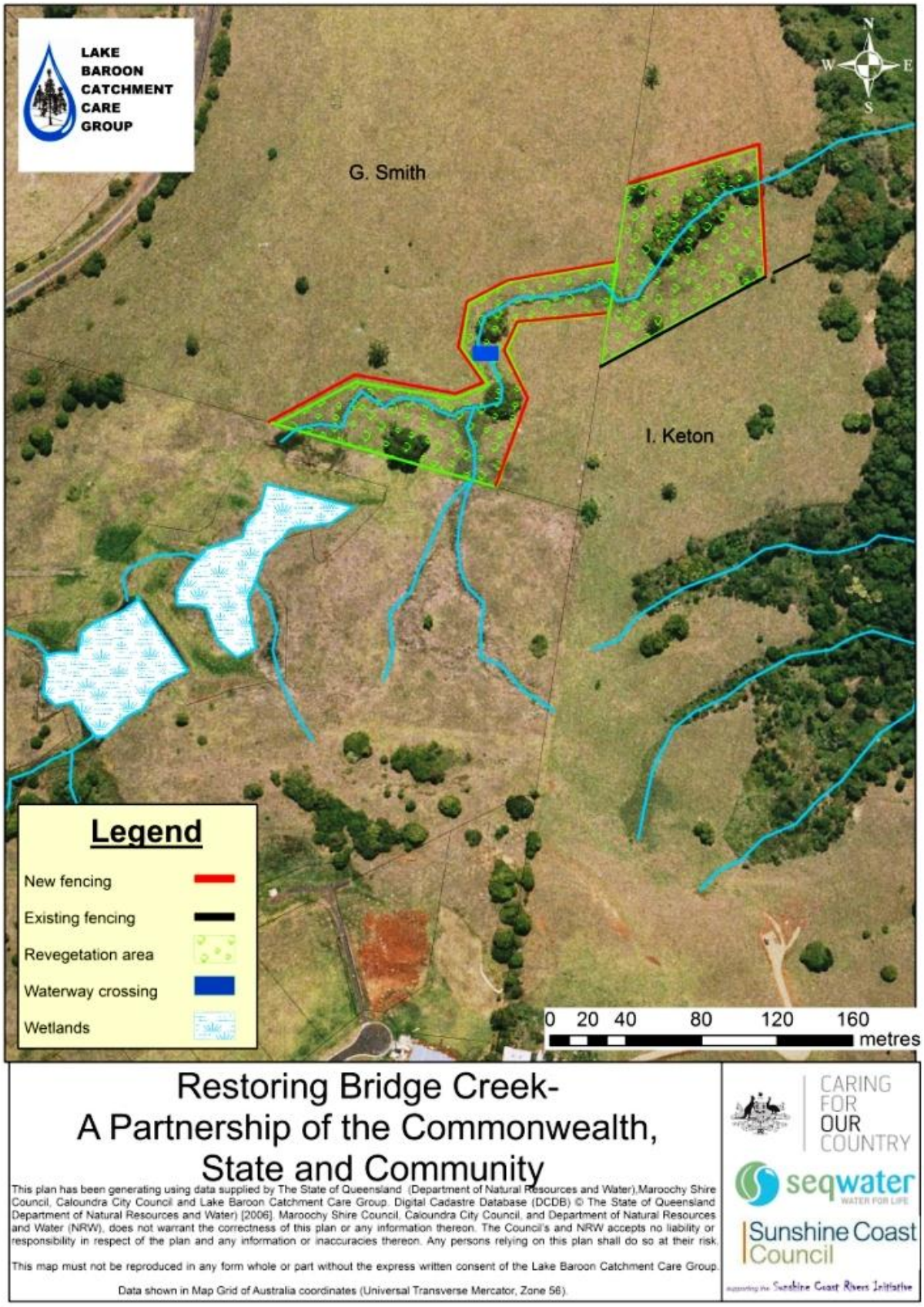
5.2.2 Reach 2 Keton

The Reach is similar to the upstream Reach 1.

This Reach retains significant remnant vegetation and is protected with a Voluntary Conservation Agreement (VCA). The vegetation is classified as RE 12.8.3. Importantly this remnant vegetation gives us a basis for the reinstatement of riparian vegetation, not only for this project but the larger upper catchment.

The vegetation has been subjected to unmanaged grazing for many years and consequently consists of primarily mature trees. Several Bunya Pine (with natural regeneration occurring) are present. It is expected that following the establishment of the revegetation and associated shading, natural regeneration will provide diversity to the planting.

5.3 PROJECT OVERVIEW



Above: Project Overview - proposed on-ground works.

5.4 ACTIVITIES

5.4.1 FENCING

Various fencing types will be used on the project site with the primary aim to exclude livestock from revegetation and riparian zones.

5.4.1.1 Reach 1 (Smith)

Standard cattle fencing will be erected on the Smith property in keeping with the rest of the property. This will consist of four strand barbed wire with timber split posts at approximately four metre spacings.

Approximately 469 metres of fencing will be required.

5.4.1.2 Reach 2 (Keton)

Fencing on the Keton property will be slightly different to the Smith fencing in that it will utilise plain top and bottom wires to minimise interference with native wildlife. With the site containing remnant vegetation and also the close proximity to the large area of remnant vegetation, wildlife – particularly bats and gliders is likely thus the need to minimise interference.

The site is already fenced on one side (requires minor restoration), therefore only approximately 142 metres of fencing is required.

5.4.2 WEED MANAGEMENT

Major environmental weeds that pose a serious and immediate threat due to their ability to alter the structure and composition of a plant community over time, or inhibit natural regeneration will be targeted for management. These include, but are not limited to:

Weed Species	***Botanical Name***	***Occurrence/Distribution***
Camphor laurel	*Cinnamomum camphora*	Isolated individual trees throughout Reach 1 and 2.
Lantana	*Lantana camara*	Infestations throughout the project site (Reaches 1 & 2) associated with remnant vegetation.
Small-leaf privet	*Ligustrum sinense*	Minor weed throughout project site (mainly Reach 2).
Large-leaf privet	*Ligustrum lucidum*	Minor weed throughout project site (mainly Reach 2).
BlackBerry	*Rubus spp.*	Infestations throughout the project site (Reaches 1 & 2) mainly in grazed and moist areas.

The key aim of the woody weed management phase is to remove Weeds of National Significance (lantana and blackberry) to allow revegetation and also promote natural regeneration.

Woody weed management will be implemented early in the implementation phase of the project with a maintenance program to ensure weeds do not re-establish. The majority of the weeds (excluding blackberry) occur under the canopy of the existing remnant vegetation/individual isolated native trees.

Follow up woody weed management (from six to thirty six months) will be regularly performed to ensure weeds do not re-establish or new weeds appear and establish.

Stand of locally significant Bunya pine (Araucaria bidwillii) with lantana infestation.

5.4.3 REVEGETATION

Final species selection and numbers will be determined immediately before planting and will be largely influenced by availability of tube-stock.

Species will be consistent with RE 12.8.3, particularly the versatile Waterhousia (Waterhousia floribunda) which tolerates a wide range of conditions (waterlogged areas, relatively dry banks and frost). To establish a canopy in the shortest period possible, several 'pioneer' species not strictly appropriate for the site (availability will dictate selection along with frost sensitivity) may be utilised. Pioneer species will over time disappear from maturing revegetation sites.

Reach	***Landowner***	***Plant Numbers***
1	Gary Smith	1,000
2	Irene Keton	1,000
Total		**2,000**

5.4.4 WATERWAY CROSSING

The watercourse on the Smith property bisects the property and a low level crossing is required for livestock and vehicular access to the small paddock in the south eastern corner.

Low level crossings are a simple design for relatively low flow waterways that are robust and result in minimal disturbance to the bed and banks of the waterway. Livestock access to the waterway is completely controlled eliminating pugging and associated erosion. In this case a small pool of water collects behind the crossing offering livestock access to water without stepping off the concrete.

In moderate flows aquatic passage is maintained although approximately 100 metres upstream the constructed wetland's dam wall entirely excludes aquatic passage.

5.4.5 COMMUNITY AWARENESS

A Field Day will be conducted at the conclusion of the project's implementation. The Field Day will address water quality decline in the catchment, the degradation of remnant vegetation, weed spread, vegetation fragmentation, urban pollution impacts on waterways, erosion and sedimentation.

Furthermore a Field Walk will be conducted for the LBCCG Committee, Seqwater staff, project partners and other major stakeholders to view the progress of the project.

Promotion of the project will be achieved through newsletter articles, website updates and a minimum of one Media Release.

6. LINKS TO STRATEGIES AND PLANS

6.1 ALIGNMENT WITH LAKE BAROON CATCHMENT IMPLEMENTATION PLAN

The project's outcomes are consistent with the Lake Baroon Catchment Implementation Plan (2007) which takes into account the Burnett Mary Regional Group Country to Coast: A Healthy Sustainable Future management actions.

LBCIP Activity Theme		***Implementation Activity***	***BMRG Program***
On ground	OG1	Develop on ground works for water quality improvement and aquatic biodiversity maintenance & improvement	Water Quality & Equitable Use Biodiversity Conservation
Weeds & pest management	WP1	Weeds and Pest Management	Weeds & Pest Management
Catchment management	CM1	Develop a program where by all landholders involved in on ground activities initiate PMP's as part of application process	Biodiversity Conservation
Catchment management	CM2	Property Management Planning Toolkit	Sustainable Use
Catchment management	CM3	Weeds toolkit	Community Capacity and Partnerships
Catchment management	CM4	Adoption of BMP for point and concentrated diffuse pollution	Community Capacity and Partnerships
Catchment management	CM6	Community involvement	Community Capacity and Partnerships
Catchment management	CM7	Stakeholder Survey	Community Capacity and Partnerships
Catchment management	CM8	Transition in NRM practice	Community Capacity and Partnerships
Catchment management	CM11	Industry involvement in NRM	Community Capacity and Partnerships
Catchment management	CM12	Training and skilling stakeholders in NRM	Community Capacity and Partnerships
Monitoring & research	MR5	Identification of point and concentrated diffuse pollution	Water Quality & Equitable Use

7 PROCUREMENT

7.1 BUDGET 2012-13

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information.

Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

7.2 BUDGET (2013-14)

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information.

Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

7.3 BUDGET (2014-15)

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information.

Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

7.4 BUDGET (2015-16)

LBCCG has a policy of keeping Project Budgets confidential as individual project costings vary and can give misleading information.

Detailed Budgets can be supplied on request. Please contact the LBCCG Project Manager on info@lbccg.org.au for further information.

7.5 SERVICES & PRODUCTS

7.5.1 PURCHASING

The Project Manager will have the authority to engage and arrange payment for services and products for all project activities once Project Plan has been approved by the LBCCG Committee and Seqwater.

The Project Owner and Project Sponsor will provide advice on suitability of services and products to ensure all purchases in the Project Budget are 'fit for purpose'.

Any deviation over $300 from the approved Project Budget requires approval from both the Project Owner and the Project Sponsor.

Services and products will be sourced locally wherever possible and from not-for–profit community organisations if appropriate.

Suppliers

Service/Product	*Preferred Supplier*	*Other Suppliers*
Fencing	R & C Ludwig	Langdale Stud
Tubestock	Barung Landcare	Florabunda Bushcare, Brush Turkey Enterprises
Revegetation & weed management (Reach 1)	Barung Landcare	Brush Turkey Enterprises
Revegetation & weed management (Reach 2)	Totem Fauna & Flora	Brush Turkey Enterprises
Waterway crossing	P & K Nash	Sommer Bros.

Multiple service and product providers are listed to ensure timelines are met. In the event of a provider being unable to supply the requested service or product an alternative source will be selected from the Procurement list of preferred suppliers.

All suppliers (where appropriate) must demonstrate full insurance and liability requirements and that all staff or personnel on site are appropriately licenced and/or experienced.

7.5.2 COST ESTIMATION METHODOLOGY

Costs for vegetation reinstatement and maintenance activities have been estimated from rates provided by Barung Landcare (December 2011) and confirmed by comparison with recent similar works. Materials costs have been estimated from prices provided by Brush Turkey Enterprises (guards, stakes and weed mats) and tube-stock from Barung Landcare nursery.

Activity	***Description***	***Cost $*** *(GST exclusive)*
Site Preparation	Ring spraying per plant	0.18
	Brush cutting per plant	0.36
Planting	Cost per plant	3.64
	Place weed mat and guard	0.91
Revegetation Materials	Think Pink 680mm x 300mm x 300mm guard	2.80
	Hardwood 1000mm x 23mm x 13mm stake	0.85
	330mm x 330mm weed mat	0.70
	Tube-stock	1.50
Maintenance	Ring spraying per plant (includes hand weed inside guard where necessary)	0.18
	Brush cutting per plant	0.36
Woody weed management	Cost per man per day (stem injection, cut & paint, spray)	$307.27
Waterway crossing	Low level concrete	$6,250
Fencing	Standard per metre cost (permanent & electric)	13.50
	12’ steel gates including associated strainer posts and installation cost	500.00

All figures subject to change due to site constraints or individual requirements.

8 ACTION PLAN

	Action	*Responsibility*	*Start Date*	*Completion Date*	*Measurable Output*
	Community Action Grant application	Project Manager			Project grant
	LBCCG Project Proposal	Project Manager	Jul 12	Nov 12	Project Plan
	Project presented to LBCCG Committee for approval (includes Seqwater rep.)	Project Manager & Committee	Nov 12	Nov 12	n/a
	Pre-works monitoring (including photo points)	Project Manager	Dec 12	Jul 12	Photo & data set
PROJECT IMPLEMENTATION	Weed Management	Contractor	Sep 12	Nov 12	2 hectares
	Fencing	Contractor	Aug 12	Oct 12	?? metres
	Waterway Crossing	Contractor	Aug 12	Nov 12	1 low level crossing
	Revegetation	Contractor	Sep 12	Dec 12	1 hectare
	Field Walk	LBCCG	Nov 12	Feb 13	1 Field Walk
	Field Day	LBCCG	Apr 13	Jun 13	1 Field Day
	Quarterly progress report (first)	Project Manager	Dec 12	Mar 12	Progress Report
	Post-works monitoring.	Project Manager	Aug 12	Dec 15	Photo & data sets
	On maintenance Report (on-ground works completed & inspected for compliance with Plan)	Project Manager	Dec 12	Mar 13	On Maintenance Report
	Continuing quarterly progress reports.	Project Manager	Mar 13	Dec 15	10 Progress Reports
	Project completed/signed off. Final Report.	Project Manager & Committee	Dec 15	Dec 15	Final Report

Note – the Project Action Plan will be used as the basis for Quarterly Reporting

9 MONITORING & EVALUATION

9.1 INTRODUCTION

Monitoring and evaluation are essential components of any environmental rehabilitation project. Evaluation is the best way to improve our knowledge about what works, what doesn't and how we can best direct our rehabilitation efforts. LBCCG is constantly reviewing monitoring strategies to not only assist in the reporting of projects but provide evidence that our projects do make a difference to catchment water quality and broader environmental objectives. However LBCCG with limited resources is effectively constrained from undertaking costly and labour intensive monitoring. Past and current projects have been monitored in partnership with Seqwater (Cork/Obi Obi Creek projects) and through Sunshine Coast University (McLauchlan/Bridge Creek), Griffith University (Spiny Crayfish research project and sediment investigation) and University of Queensland (King's Lane Weir revegetation project).

LBCCG projects are monitored for a range of parameters to enable effective evaluation and reporting.

Photo point monitoring provides evidence of completed works, a record of change over time, and provides a visual record that is particularly useful for reporting.

Monitoring of rehabilitation activities is split into periodic and episodic monitoring. Periodic monitoring is used to ensure Project Plans (project outputs) are followed and to measure the effectiveness of the activities over time. This occurs on a quarterly basis by LBCCG with assistance from the landholder. Project reports are produced on major project milestones (or by demand) – *see 10 Reporting*.

Episodic monitoring will occur following significant events (storms, rainfall events, frost, drought, fire etc.) and monitors all project activities. Usually this requires the assistance of the landholder and assists in maintaining 'ownership' of the project.

9.2 MACROINVERTEBRATES

Macroinvertebrates are small aquatic animals without backbones such as dragonfly nymphs, prawns and leeches. They are good indicators of water quality because:

- They are affected by physical, chemical and the biological conditions of the waterway.
- They have a relatively long life span, sometimes with complex life cycles.
- They are an important part of the food web – feeding on plants and being eaten by predators.
- They cannot easily escape pollution and can therefore show the effects of long and short term pollution events.
- They are abundant, easily sampled and identified.

Every organism has a range of water quality parameters that it can tolerate. Outside this range, the ability to compete with other organisms for habitat and food will decline. The tolerance of the species present is an indicator of the physical condition of the stream. If there is a variety of sensitive species present, that suggests that the stream is in good physical condition. However, if only species tolerant of polluted or degraded conditions are present, then this is probably because local conditions are degraded. The organisms present indicate the condition of the stream (Rutherfurd, Jerie & Marsh). Therefore periodic macroinvertebrate monitoring can indicate the health of a waterway and assist with the determination of water quality through periodic sampling.

Seqwater water quality monitoring conducted at set monthly intervals accurately measures water quality at a point in time but has long been suspected of missing significant events that impacts on catchment and storage water quality (Traill). High rainfall events in the catchment usually deliver high volumes of pollutants into the watercourses but occur over a very short timeframe (often referred to as 'flashy') that monthly monitoring may not accurately test.

Macroinvertebrate monitoring will be conducted before the project commences, and annually thereafter, at the same time of year and according to SIGNAL guidelines. Wherever possible volunteers, community or industry placement (work experience) students will be utilised to assist with sampling, identification, evaluation and reporting.

Essentially the monitoring and evaluation program will:

1. Raise awareness (through demonstration) and encourage further remediation works with priority landholders (primary producers and large landholders in the Lake Baroon catchment).

2. Promote cooperative projects between Lake Baroon Catchment Care Group, Seqwater, and other NRM organisations (this project has attracted funding from the Commonwealth Government).

3. Critically examine techniques and methods used throughout the project to continually improve the service to landholders conducting on-ground works in the catchment and improve best practice.

4. Develop cost-effective strategies and techniques to perform on-ground activities.

5. Assist in the evolution of monitoring and evaluation programs that meets the requirements of funding bodies, but also provides the relevant information and feedback to LBCCG and Seqwater to continually improve project delivery.

6. Provide evidence over time that rehabilitation projects improve water quality and provide other environmental outcomes.

7. Attract research bodies (Universities and others) to partner with LBCCG and Seqwater to assist in the monitoring and evaluation of projects.

9.3 MONITORING PROGRAM

Parameter measured			*What is monitored?*	*Measurement*	*Frequency*
OUTPUTS	1	Photo-points	Project site	Visual changes	Six monthly
	2	Aerial photos	Project site	Visual changes	Reliant on Nearmap/Google updates
	3	Project Plan outputs	Project outputs	Outputs completed as per Plan	Yearly
	4	Activity function	All activities	Functioning	Yearly
OUTCOMES	5	Macroinvertebrates	Water quality	Diversity, numbers	Yearly
	6a	Vegetation	Diversity	Natural regeneration	Yearly
	6b	Vegetation	Canopy cover	% of shade	Yearly
	6c	Vegetation	Stream shading	% of shade on water surface	Yearly
	6d	Woody debris	Presence of debris	Estimate of m^2	Yearly
	7	Weeds	Area & type	% of site covered by weeds	Yearly
	8	Watercourse diversity	Watercourse bed	Stream width, depth & sediment deposition	Yearly
	9a	Erosion	Watercourse banks	Bank & riparian zone erosion (m^2)	Yearly
	9b	Erosion	Livestock laneways	Material eroded (m^2)	Yearly
	10	Water quality	Turbidity Ph Temperature Dissolved oxygen	Various	Maximum yearly (dependent on availability of monitoring equipment)
	11	General observations	Project site	Unexpected changes (good & bad)	Per visit

10 REPORTING

Reporting on the progress of the project is an essential component of communicating successful on-ground outcomes. Therefore the following reporting schedule will be implemented to ensure all stakeholders are informed in a comprehensive and timely way.

Report	*Recipients of Report*	*When*
Progress Reports (presentation & brief summary).	LBCCG	Monthly
Progress Reports (written report). Based on Project Action Plan (see above)	LBCCG Seqwater Stakeholders	Quarterly
On Maintenance Report	LBCCG Seqwater Stakeholders	On-ground activities completed (excluding maintenance).
Final Report (includes evaluation & further recommendations for project)	LBCCG Seqwater Stakeholders	Completion of project

11 AUTHORISATIONS

The Project Committee which is responsible for overseeing the Project and providing advice when required is made up of LBCCG Committee members, Seqwater representatives and other Partner representatives.

Role	*Individual*	*Organisation*
Project Sponsor	Tim Odgers	Seqwater
Project Owner	Peter Stevens	LBCCG
Project Committee	G. Pechey	LBCCG
	S. Skull	LBCCG
	M. Malter	LBCCG
Project Manager	Mark Amos	LBCCG
Technical Advice & Project Support	Nick Clancy	Sunshine Coast Council
	Matt Bateman	Barung Landcare
	Jason Flynn	Totem Fauna & Flora
	Mark Dwyer	Conservation Volunteers Australia

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