Lake Baroon Catchment Care Group

Working with our community...for our waterways

Projects 2017-18

Lawley Creek Tributaries Partnership Stage 2

(Lawley, Keton & Malter)

PROJECT PLAN

Project No. 1718-015

seqwater WATER FOR LIFE

Sunshine Coast. COUNCIL

This Project Plan has been prepared by, and all enquiries to be directed to:

Mark Amos
Project Manager
Lake Baroon Catchment Care Group

PO Box 567 (455 North Maleny Rd)
Maleny, 4552
Email - info@lbccg.org.au Phone - (07) 5494 3775

Disclaimer

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How to read this Plan

This Plan is split into three distinct sections.

PART A: Executive Summary (pp. 5-6) is a two page brief description of the project and includes summarised details of the stakeholders, budgets, outputs and outcomes.
PART B: Project Background & Previous Stages (pp. 7-17) is a brief report on previous Stage progress.
PART C: Project Plan (pp. 18-30) outlines the implementation of the latest Stage project.
PART D: Attachments (pp. 31-57) provides additional information to support the Project Plan.

Terms used in this Plan

Lake Baroon and Baroon Pocket Dam are used interchangeably, although *Lake Baroon* is usually used when referring to the catchment and *Baroon Pocket Dam* refers to the dam as commercial water storage.

Confidentiality

Much of the information contained herein is confidential and must not be reproduced or passed on to any person outside Seqwater without prior written permission from Lake Baroon Catchment Care Group.

DOCUMENT VERSIONS & APPROVALS

Version	*Date*	*Version/Description*	*Result*
1.0	3/5/2018	Draft LBCCG Project Proposal completed. Project emailed to LBCCG Committee for comments and in principle approval.	n/a
1.0	10/5/2018	Project Plan will be presented at May 2018 LBCCG Meeting for approval.	Approved (Minutes 108.7.4)
1.0	15/5/2018	Project Proposal forwarded to Seqwater for approval (email)	TBD

AUTHORISATIONS

Name	*Signature*	*Date*
Prepared by: Mark Amos Project Manager, LBCCG		3/5/2018
Approved by (LBCCG): Peter Stevens President, LBCCG		10/5/2018
Approved by (Seqwater): Tim Packer Senior Planner Source Protection Planning		
Approved by (Seqwater): Andrew Smolders (Acting) Principal Source Protection Planning		

Cover photo: *Previous LBCCG revegetation on Lawley Creek.*

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PART A EXECUTIVE SUMMARY

PROJECT NUMBER & TITLE: **1718-015 Lawley Creek Tributaries Partnership Stage 2 (Lawley, Keton & Malter)**

The Lawley Creek Tributaries Partnership Stage 2 project is a continuation of previous activities in the headwaters of Lawley Creek, a major tributary of Bridge Creek. Located on the fringes of urban Maleny, the sub-catchment is high priority - delivering relatively high levels of nutrients and other contaminants to Baroon Pocket Dam. LBCCG has been very active in the upper reaches of Lawley Creek for many years fencing waterways, controlling weeds that impact on water quality and revegetating riparian zones. There are only short lengths of Lawley Creek and tributaries remaining that livestock can access. This project will bring together three adjoining landholders to further fence and revegetate to enhance riparian buffers which will help trap and process nutrients and contaminants. The landholders will make substantial contributions.

APPLICANT/LANDMANAGER DETAILS

Names	
Postal Address	
Phone Number	
E-mail	

PROJECT / SITE LOCATION

Property Address	63 N Maleny Rd, Maleny	37 Tamarind St, Maleny	68 Palm Street, Maleny
Latitude/longitude	-26.749041 152.856426	-26.752069 152.851963	-26.746594 152.852222
RP Numbers (Lot)	SP271376 (18)	SP263428 (2)	MCH138 (46)
Property Size	50 ha	10 ha	21 ha
Land-use & stock carried	Beef (60)	Beef (15)	Conservation
Sub-Catchment/MU	Bridge Creek BR3	Bridge Creek BR3	Bridge Creek BR3
M.U. Priority *(LBCCG IP)*	**Low**	**Low**	**Low**
M.U. Priority *(Pollution)*	**High**	**High**	**High**
Water Quality *(ANZECC)*	More than 70% of samples between 1991-2005 exceeded ANZECC guideline levels (Traill 2007)		

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group ***(Seqwater 2017-18 CORE Project Funding)***	On ground project implementation (**$13,702**)
Lake Baroon Catchment Care Group ***(Seqwater 2017-18 CORE Administration Funding)***	Project coordination, administration, reporting, monitoring & evaluation (**In kind $8,780**)
Landholders	Landowners, labour, cash and in-kind contributions (**$21,790** cash & in-kind)

PROJECT DETAILS

Start Date	May 2018	***Completion***	June 2018 (LBCCG)	**Duration** (implementation)	1 year (LBCCG)
TOTAL OUTPUTS					
New riparian fencing	310 m	***Repaired fencing***	615 m	***Maintained fencing***	375 m
Off stream watering (troughs)	4	***Stream crossing rehabilitation***	1	***Revegetation***	1,000

OUTCOMES	
Length of watercourse fenced (stock excluded)	236 metres
Length of fencing repaired to maintain stock exclusion	990 metres
Area of revegetation	0.5 hectares
Priority Landholder engagement	1 landholder

Maintaining water quality is critical to providing safe bulk drinking water for the population of South east Queensland. All of the raw water storages managed by Seqwater are located in catchments which are developed to varying extents and support active and growing communities, including important industrial and rural economic activity. To provide a multi-barrier approach to the supply of drinking water, Seqwater must influence the management of land not owned by, but which exert an influence on Seqwater's core business.

The Lawley, Keton and Malter properties lie in a high priority Management Unit in the Bridge Creek catchment – MU BR3. This MU is long and narrow stretching from Maleny in the south to lower Bridge Creek where the watercourse enters Baroon Pocket Dam. Lawley Creek in it's entirely is in the MU. The lower reaches support intensive beef grazing while Lawley Creek has less, but still significant grazing pressures in the headwaters. The MU is characterised by relatively steep slopes and moderate instability (63% of land unstable), and has been identified as contributing significant inputs of nutrients. The middle reaches of the MU are well forested however it is understood that urban Maleny contributes significant pollutants. As a result, the Management Unit contributes moderate volumes of sediment and high levels of nutrients (and likely pathogens) with 70% of samples collected between 1991 and 2005 exceeding ANZECC guideline levels.

The proposed project aims to complete eight components:

Activity	Description	Landholder	Funded by
Riparian fencing	150 metres	Keton	LBCCG CORE
Riparian fencing	160 metres	Malter	LBCCG CORE
Existing fencing repair	615 metres	Keton	LBCCG CORE
Existing electric fencing maintenance	375 metres	Keton	LBCCG CORE
Off stream watering	2 troughs	Keton	LBCCG CORE
Off stream watering	2 troughs	Lawley	LBCCG CORE
Stream crossing rehabilitation	1 crossing	Lawley/Malter	LBCCG CORE/Landholders
Riparian revegetation	1,000 stems	Malter	Landholder

Note: the project was identified as a <u>priority</u> in the LBCCG 2017-18 Annual Investment Strategy.

PART B PROJECT BACKGROUND & PREVIOUS STAGES

i. INTRODUCTION

Lake Baroon Catchment Care Group (LBCCG) is a not for profit community group focussed on reducing the risks to water quality in the Lake Baroon catchment - primarily through the implementation of on-ground remediation projects. This aim is consistent with Seqwater's objectives of efficiently producing high quality potable water for the Sunshine Coast (and greater South east Queensland) region.

Maintaining water quality is critical to providing safe bulk drinking water for the population of SEQ. All of the storages managed by Seqwater involve catchments which are developed (to varying extents) and support active and growing communities, along with important industrial and rural economic activity (SKM 2012).

The project will be implemented over three properties and likely be staged over multiple years (landslide remediation, revegetation and further property management activities, monitoring and evaluation) and is effectively a continuation of recent projects on neighbouring properties both upstream and downstream (*see Table below*). The LBCCG CORE funding component however will be completed in 2016/17.

The activities of LBCCG are supported by Seqwater as they align with Seqwater's commitment to the NHMRC Framework and to environmental stewardship by supporting catchment planning and targeted remediation for reduction of catchment based risks to water quality (Smolders 2011).

As this project is consistent with the LBCCG (and Seqwater) aim of reducing risks to water quality from erosion, nutrients and pathogens, the activities to fence and revegetate riparian zones Including the remediation of landslips are considered sensible to support.

ii. BACKGROUND

The upper Lawley Creek catchment (a major tributary of Bridge Creek) has been targeted for on ground activities (projects) since 2011 as this sub-catchment is recognised as delivering high volumes of nutrients and other contaminants (the northern fringes of urban Maleny lie in the catchment). Much of Lawley Creek already supports large areas of remnant and regrowth vegetation and therefore the exclusion of livestock from the short lengths of remaining streams is cost effective and effectively means that the entire sub-catchment can be 'captured'. Previous projects in this sub catchment (including many smaller projects prior to 2008) have focused on the fencing and revegetation of riparian zones with weed management as an important but minor component.

Establishing buffers on the streams assists in the treatment of contaminants that originate from cattle and horse grazing and from stormwater in urban Maleny.

Additional to the water quality benefits, riparian vegetation is important to re-establish linkages between stands of remnant and regrowth vegetation. The benefits to wildlife (including the local spiny crayfish known to inhabit the upper reaches of Lawley Creek in good numbers) are well known and documented.

The Lake Baroon Implementation Plan (2007) considered this part of the catchment as low priority for works as it was deemed virtually beyond repair, or at least would cost significant levels of investment to make any difference. Certainly the lower reaches of this sub catchment (Management Unit) can be considered difficult to remediate however the upper reaches, as mentioned above, can be effectively and efficiently remediated. Recent (2009/10) changes to how

catchments are assessed for priority, has resulted in a greater emphasis on areas that are identified as high contributors of contaminants. When this is taken into account the sub-catchment is considered High Priority (70% of samples exceeded ANZECC guideline levels 1991-2005 (Traill 2007).

iii. CONFLICT OF INTEREST & GOVERNANCE

The project is a partnership involving numerous contributors including three landholders. The various properties have similar management issues and it is sensible to include all into a single project that has a common objective and outcomes. The Malter property is arguably the minor property in the project.

Marek Malter is a Management Committee member of Lake Baroon Catchment Care Group. During development of the project Marek has not had undue influence over any commitments made by LBCCG Manager Mark Amos or any other LBCCG staff or Committee member. Any discussions or deliberations at LBCCG Management Committee meetings (where projects are approved) have not involved Marek and at these times has been asked to leave the meeting for the duration of project discussion.

Contributions made by LBCCG to the project on Marek's property are demonstrably less than what other project participants would receive. Marek is making an abnormally high contribution to his component of the project.

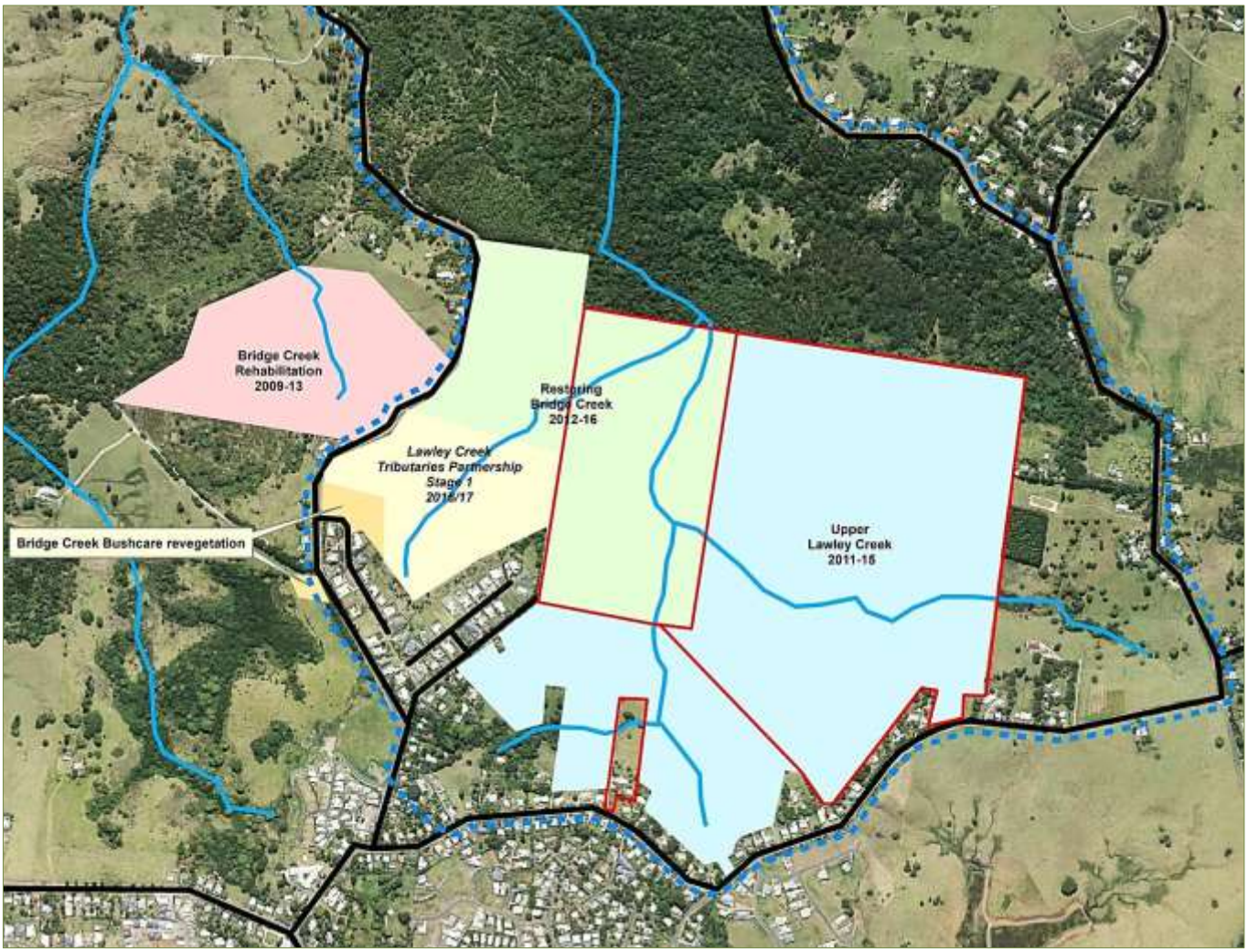
iv. PREVIOUS PROJECTS IN AREA/CATCHMENT

Several large projects have occurred in the immediate area – the upper reaches of Lawley Creek. The Upper Lawley Creek, Restoring Bridge Creek and the proposed Lawley Creek Tributaries Partnership all involve multiple landholders indicating the demand for these types of projects in the area.

LBCCG projects in the immediate location include:

Project Name	*Years implemented*	*Project outputs*	*Total Project Value*
Bridge Creek Rehabilitation (Watter)	2008-13	Riparian fencing and revegetation	$52,636
Upper Lawley Creek	2011-15	Riparian fencing, revegetation and weed management	$100,306
Restoring Bridge Creek	2012-16	Riparian fencing, revegetation, alternative watering and stream crossing	$84,348
Bridge Creek Bushcare	2015 ongoing	Revegetation and weed management (LBCCG supplied used tree guards and planting equipment only)	-
Lawley Creek Tributaries Partnership Stage 1	2016/17	Riparian fencing, revegetation, weed management, off stream watering and landslide remediation activities	$199,427

LBCCG projects in upper Lawley Creek since 2008



LBCCG projects since 2008 in the immediate area of the proposed project. Note the figure indicates the property Individual projects occurred – not the actual on-ground activity. Project boundaries are indicative only as most projects have involved multiple landholders. Stage 2 locations/properties are marked with the red outline. There have been several small projects completed in the Lawley Creek catchment before 2008.

1.0 CURRENT STATUS

The project commenced in 2016/17 (see *1617-006 Lawley Creek Tributaries Partnership Stage 1*). Multiple property projects are ideally delivered over two or more years to allow for changes, new landholders to become involved and to ensure a successful project.

The 2016/17 project/activities (eleven components) have been completed (or are on schedule):

Activity	Description	Property	Funded by	Completed?
Riparian fencing	1,025 metres	O'Brien	LBCCG CORE	YES
Off stream water	1 system/2 troughs	O'Brien	LBCCG CORE	YES
Revegetation	3,000 stems over 3 years	O'Brien	Sunshine Coast Council/Bridge Creek Bushcare	YES (on schedule)
Weed management	0.5 hectares	O'Brien	Sunshine Coast Council/Bridge Creek Bushcare	YES
Landslide fencing	500 metres	O'Brien	SCIP Landslide Program	NO
Landslide revegetation	500 stems	O'Brien	SCIP Landslide Program	NO
Landslide fencing	230 metres	Keton	Sunshine Coast Council LEG	YES
Landslide revegetation	1,000 stems	Keton	SCIP Landslide Program	YES
Riparian fencing	230 metres	Malter	LBCCG CORE	YES
Weed management	12 trees	Malter	Landholder	YES
Revegetation (including maintenance)	1,875 stems	Malter	Sunshine Coast Council LEG/Landholder/LBCCG CORE	YES (on schedule)

Budget vs Expenditure

LBCCG CORE funding only.

BUDGET	COMPONENT	EXPENDITURE
$19,952	O'Brien riparian fencing	$19,952
$15,000	O'Brien off stream water	$18,244
$4,572	Malter riparian fencing	$4,210
$4,000	Malter revegetation	$1,600
$1,976	Contingency	$0
$45,500	**Balance**	**$1,494**

Budget includes $41,500 from 2016/17 LBCCG CORE funding plus $4,000 transferred funds from a previous project.

1.1 LBCCG CORE FUNDING

1.1.1 Riparian fencing – O'Brien

Riparian fencing has been completed on the O'Brien property as per the Project Plan.

Bald Knob Fencing (Langdale Stud Pty Ltd) installing riparian fencing on O'Brien property.

Completed fencing.

1.1.2 Riparian fencing – Malter

Riparian fencing has been completed on the Malter property as per the Project Plan

Completed Malter fencing.

1.1.3 Off stream watering – O'Brien

Off stream water has been completed on the O'Brien property as per the Project Plan.

Completed off stream water on O'Brien property.

Trough on O'Brien property.

1.2 SUNSHINE COAST COUNCIL, BRIDGE CREEK BUSHCARE FUNDING

1.2.1 Weed management – O'Brien

Weed management is on schedule on the O'Brien property as per the Project Plan. The weed management will be completed in a staged manner to ensure revegetation (and natural regeneration) can replace the shade canopy as weeds are removed.

Larger weed trees such as privet are stem injected and allowed to decompose in-situ.

1.2.2 Weed management – Malter

Weed management was completed on the Malter property as per the Project Plan. Approximately 12 mature Coral trees were cut and pasted and placed into a burn pile by excavator.

Weed removal completed by the landholder and Nash Excavations.

1.2.3 Revegetation – O'Brien

Revegetation on the O'Brien property (the majority of revegetation is technically on Sunshine Coast Council easement) is being completed by Bridge Creek Bushcare with support and assistance from Sunshine Coast Council. It is being staged over three years to ensure volunteer engagement can be maintained. The revegetation is on schedule.

Revegetation on the O'Brien property can be clearly seen in this Google image. Also note the large privet that have been stem injected.

1.2.4 Revegetation – Malter

The Malter revegetation has been completed as per the Project Plan. Primarily funded by a Sunshine Coast Council Landholder Environment Grant and the landholder, much of the planting was completed by volunteers (Hinterland Bush Links Roving Restorers).

Completed revegetation on the Malter property. Planting was largely completed by volunteers.

1.3 SEQWATER LANDSLIDE PROGRAM FUNDING

1.3.1 Permanent landslide fencing – Keton

The Keton landslide fencing was funded by a Sunshine Coast Council Landholder Environment Grant and was completed by Bald Knob Fencing as per the Project Plan.

Keton fencing can be clearly seen in this aerial photo. Note the site preparation completed for the revegetation and holes being augured for tubestock.

1.3.2 Landslide revegetation – Keton

The Keton landslide revegetation was funded by the Seqwater Catchment Improvement Program (SCIP). The revegetation was completed as per the LBCCG CORE project and the SCIP Program Plan.

Keton landslide revegetation being completed by Totem Fauna and Flora. Note the slip head scarp on the left of the photo.

1.3.3 Weed management - Keton

Weed management on the Keton property was completed as per the Project Plan. Further follow up will be required.

Weed control on the Keton property was completed by Totem Fauna and Flora.

1.3.4 Semi-permanent landslide fencing – O'Brien

The activities planned for the O'Brien property addressing the landslide were suspended in 2016/17. The lack of an agreed approach (the site is very difficult to revegetate due to the very steep hillslope that has lost all topsoil) and time constraints (priority was given to completing the LBCCG CORE project) has led to rescheduling to either 2017/18 or more likely 2018/19.

Remediation activities will likely include the placement of a diversion bank at the top of the slip to redirect surface flows, fencing of the unstable zone to manage livestock grazing, control of shallow rooted weeds (while retaining any large weed trees that are assisting with stability) and revegetating where possible with araucaria species.

1.3.5 Araucaria revegetation – O'Brien

As per above.

PART C PROJECT PLAN

1.0 WHAT

(What activities will be implemented)

The proposed project aims to complete/commence eight activities before June 30, 2017 (weather dependent):

Activity	Description	Landholder	Funded by
Riparian fencing	150 metres	Keton	LBCCG CORE
Riparian fencing	160 metres	Malter	LBCCG CORE
Existing fencing repair	615 metres	Keton	LBCCG CORE
Existing electric fencing maintenance	375 metres	Keton	LBCCG CORE
Off stream watering	2 troughs	Keton	LBCCG CORE
Off stream watering	2 troughs	Lawley	LBCCG CORE
Stream crossing rehabilitation	0.5 hectares	Lawley/Malter	LBCCG CORE/Landholders
Riparian revegetation (1)	1,000 stems	Malter	Landholder/other

(1) It is likely an application to the Sunshine Coast Council 2019 Landholder Environment Grants will be submitted assisting with the funding of the revegetation on the Malter property.

Typical view of the upper Lawley Creek catchment. Moderate slopes with open grazing, stands of remnant vegetation and extensive revegetation.

2.0 WHERE

(Where in the catchment will the project occur)

The project will be implemented on the O'Brien, Malter and Colley properties in the Lawley (Bridge) Creek catchment.

(a) Lawley property
(beef grazing)
63 North Maleny Rd, Maleny

Property is approximately 50 hectares – comprising the following:

- 37.5 ha of improved pasture;
- 9.75 ha regrowth and remnant vegetation (including weeds); *and*
- 1.75 ha of revegetation; and
- 1 hectares of residential, sheds and stock handling infrastructure.

(b) Keton property
(dairy until early 2000s, rural residential, conservation and beef grazing).
68 Palm St, Maleny

Property is approximately 26 hectares – comprising the following:

- 7.5 ha of unimproved pasture (including approximately 1.5 ha of potentially unstable slopes – ***see figure below***);
- 5 ha remnant vegetation;
- 7.5 ha regrowth vegetation (including weeds);
- 0.5 ha of residential (including access laneways).

(c) Malter property
(dairy until early 2000s, residential, conservation purposes and beef grazing).
Palm St, Maleny

In 2017 Marek purchased the neighbouring residential and grazing property. Part of the motivation was to be able to include the 86 metres of Lawley Creek tributary into past revegetation projects.

In total the Malter properties are approximately 10 hectares – comprising the following:

- 5.75 ha of improved pasture;
- 2.75 ha revegetation (including a small area of remnant vegetation): *and*
- 1.5 ha of residential (including un grazed mown areas)

3.0 WHY

(What benefits will the project provide)

Lake Baroon Catchment Care Group is focussed on improving raw water quality in the Lake Baroon catchment and achieves this by working with private landholders in the catchment. Supporting landholders to improve land management, in turn provides multiple beneficial outcomes; water quality and broader environmental benefits while providing productivity gains. Catchment activities not only benefit the raw water flowing into one of south east Queensland's most important water storages (hence Seqwater's significant support) but also provides a range of other environmental outcomes which generates support from other funding providers (most notably Sunshine Coast Council).

Seqwater have a clear core business of providing high quality water to the population of the Sunshine Coast Council and to the greater south east Queensland via the Northern Pipeline Interconnector. The project will support the 2016-17 Seqwater SCIP Project *"Landslide Program"* through the provision of access to revegetation sites and the improvement of drainage on the property which will contribute to the stabilisation of land slip prone areas.

3.1 BRIDGE CREEK

Bridge Creek (2,413 hectares) is characterised by its steep slopes that lack stabilising vegetation. The soils of the catchment are predominantly black clays lacking the ability to absorb nutrients and rainfall, resulting in minimal filtering of run-off. Although there are significant areas of natural vegetation and most of the waterways have good riparian vegetation, the sub-catchment contributes high volumes of sediments, nutrients and potentially pathogens to Baroon Pocket Dam (Dunstan 2007).

Lawley Creek (a major Bridge Creek tributary) has been extensively fenced and revegetated – particularly over the last eight years by LBCCG, Sunshine Coast Council, private landholders and the Bridge Creek Bushcare Group (under the auspices of Council). Indeed this reach of Lawley Creek is one of the last parts of the stream to be rehabilitated.

3.2 RISKS TO WATER QUALITY

In excess, faecal material and associated nutrients (largely nitrogen and phosphorus) and pathogens are high risk to water quality. High levels of nutrients in surface water contribute to algae blooms that result in hypoxic or oxygen-deprived dead zones in water bodies (Baroon Pocket Dam). Throughout history, consumption of drinking water supplies of poor sanitary quality has been linked to illnesses in human populations. These illnesses most commonly present as gastrointestinal-related symptoms, such as diarrhea and nausea (Health Canada 2013).

Sampling for these pathogens is difficult and largely impractical due to the number of types and distribution variability of bacterial pathogens that can be present in animal and/or human wastes, and because detection requires significant resources. As a result, monitoring for a broad indicator of faecal contamination such as *Escherichia coli* is useful in verifying the microbiological quality and safety of the drinking water supply.

Although livestock in watercourses are an obvious risk, contamination can originate in many ways; failing or poorly performing wastewater systems, wildlife and birds, stormwater and so on.

Faecal material can also contain pharmaceuticals — anti-bacterials and hormones — given to some livestock to fight disease and promote growth. (Health Canada 2013).

3.3 WATER QUALITY MONITORING

Analysis of the raw water sampled from the Bridge Creek (Wells Road) sampling site between 1991 – 2005 (Traill 2007) shows:

- Turbidity levels exceeded guideline levels only once however it is unlikely the sampling program accurately captured the likely events (the topography of the catchment means flood waters rapidly disperse when rainfall ceases and it is unlikely sampling occurs in a timely manner;
- Nitrate levels exceeded the guideline value 46% of the time although this was falling as dairy farms converted to beef (less use of fertiliser);
- Ammonia levels exceeded the guideline value 48% of the time and varied throughout the sampling period making it difficult to pin point causes;
- Phosphate levels exceeded the guideline level 33% of the time although this is likely to be higher in reality, as phosphates attach to sediment and turbidity levels have already been identified as unusually low;
- Total phosphorus levels exceeded the guideline level 44% of the time; *and*
- Faecal coliforms exceeded the guideline level 39% of the time although widely fluctuated during the sampling period.

ANZECC - Australian and New Zealand Environment and Conservation Council.
These guidelines were part of a suite of 21 documents forming the Australian National Water Quality Management Strategy (NWQMS) originally released in 1992. The guidelines are intended to provide government, industry, consultants and community groups with tools to facilitate the assessment and management of water quality in a range of water resource types.

3.4 OBJECTIVES

The implementation of the planned activities will reduce threats to catchment water quality by:

- reduce erosion of the bed and banks of the Lawley Creek tributaries (fencing and revegetation) reducing turbidity and sedimentation;
- reduce direct faecal deposition (nutrients and pathogens) to watercourses and enhance buffers (fencing and revegetation) to overland flows;
- commence stabilisation of landslip prone hillslopes through livestock management (fencing) and revegetation;
- improve livestock management (fencing and off stream watering - important for gaining landholder acceptance);
- build land manager engagement (previously unengaged landholder – O'Brien);
- provide access for 2016/17 Seqwater Landslide Mitigation Program (ongoing);
- create wildlife corridors and habitat (revegetation and weed management); *and*
- work collaboratively with Sunshine Coast Council.

Baroon Pocket Dam in September 2013 (storage remained closed for almost 12 months). Cyanobacteria blooms disrupt recreational use of the storage and create difficulties in the production of potable water.

3.5 PRIORITY ACTIONS FOR BRIDGE CREEK

(AquaGen 2004)**:**

1. Revegetate first order streams throughout the sub-catchment to maximise buffer capacity and reduce erosion potential.
2. Provision of advice, encouragement and incentives to landholders to maintain adequate riparian buffers and erect riparian fencing and manage stock access to waterways. This includes the provision for off stream watering, shade and hardened waterway access points and livestock laneways *(see figure below).*
3. LBCCG in partnership with AquaGen, monitor the quality of stormwater infrastructure (pre and post development) from new developments on overall water quality – particularly sediment, turbidity, and Total Phosphorus.
4. Encourage good farming practices, particularly on floodplains and steep slopes which reduces the rate of soil loss to below that of natural soil forming processes.
5. Actively support SCC Land for Wildlife, NRM Small Grants Scheme (Landholder Environment Grants) and legal covenant agreement initiatives that protect and rehabilitate remnant vegetation and enhancement projects.
6. Reduce faecal counts within the Bridge Creek catchment by targeting education programs to residents to address existing on-site effluent and wastewater disposal systems and their maintenance requirements.

Despite the 2004 Lake Baroon Catchment Management Strategy being a relatively outdated document, the identified actions to address poor water quality are sound and at a level where a local catchment group such as LBCCG can have a beneficial impact.

4.0 HOW

(How will the activities be implemented)

4.1 RIPARIAN FENCING - KETON

Almost all of the riparian zones on the Keton property are fenced. There is a short section however (approximately 150 metres) that has never been fenced as this provided access to Lawley Creek at the downstream end of the property. Although rarely used for livestock water (usually there is enough water in a tributary that runs from the neighbouring Smith and O'Brien properties) it was nevertheless an essential component of the overall water strategy. With a simple of off stream watering system providing water security, Lawley Creek can be permanently fenced.

With a new grazing lessee that does not live on site, the fencing also provides security against livestock entering the riparian zone and possibly becoming lost.

Standard cattle fencing will be installed (timber split posts at four metre spacings, four wires [type to be confirmed] and steel gates).

New fencing alignment. Note previous revegetation in the foreground (Restoring Bridge Creek project).

4.2 RIPARIAN FENCING - MALTER

In 2017 Marek Malter purchased the neighbouring Stacey property. A key reason for doing so was the ability to include the 86 metres of riparian zone into previous projects that have fenced and revegetated Lawley Creek. This short section of creek is one of the few remaining that have not excluded livestock and been revegetated.

Currently livestock grazed by Ed Lawley have unrestricted access to the riparian zone impacting on the bed and banks contributing to erosion and associated turbidity and sedimentation.

Standard cattle fencing will be installed (timber split posts at four metre spacings, four wires [type to be confirmed] and steel gates).

Malter riparian zone. No livestock have been in this paddock for several months.

4.3 FENCING REPAIRS & MAINTENANCE - KETON

Most of the riparian zones on the Keton property are already fenced (virtually 100% once this current Project is implemented). Most of the fencing is standard cattle fencing (four strand barb) however when installed almost 20 years ago (circa 2000) cost savings were made on materials and therefore the fence now requires considerable repairs to ensure it remains stock proof. Additionally much of the now advanced revegetation has either pushed onto or over the fence further affecting its ability to exclude livestock.

The fencing will have overhanging tree limbs removed, a buffer along the outside of the fence cleared, broken wires repaired and failing timber and steel pickets propped with new steel posts.

On the eastern side of the property, fencing of the Voluntary Nature Conservation Agreement requires maintenance to return to stock proof standard. This fence was erected by LBCCG in 2011 and consists of timber strainers and two electrified wires. With no livestock on the Keton property for several years the fence has become overgrown and not stock proof. The fence line requires several brush cuts to keep clear until the livestock can assist with maintenance (keeping growth away from the fence).

The elderly, infirm landholder requires assistance to implement repairs and maintenance.

Fencing of riparian (and landslip) revegetation circa 2000 requires repair and maintenance.

4.4 OFF STREAM WATERING – KETON

When the last length of riparian fencing is completed a simple off stream water system is required for water security. A small but reliable dam in the centre of the property can be utilised to provide gravity fed troughs – one trough for the western paddock and one for the eastern paddock (which will be fenced to stop livestock from passing through a narrow gap between the lower residence and revegetation completed in 2000. This narrow area and the revegetation below suffer from landslip and concentrated cattle tracking adversely affects stability).

Due to the small number of livestock the property can comfortably carry (estimated around 20 head) and the possibility that grazing may not be long term, plastic troughs are recommended. Plastic troughs are smaller and lighter and simpler to install than concrete. For similar reasons the poly pipe from the dam to the troughs will be merely laid on the surface of the ground.

Small farm dam that will be used to gravity feed troughs placed on the western and eastern paddocks for livestock

water.

4.5 OFF STREAM WATERING – LAWLEY

Ed Lawley has recently sold 10 hectares of his property including water sources on the south western side of the farm. The stream crossing over Lawley Creek is now the primary source of water and constant cattle access is having an adverse impact on the relatively steep banks (the bed of the creek is bedrock). By installing troughs on this side of the property, livestock can be managed in the riparian zone.

LBCCG will supply two troughs with the landholder funding all other materials and installation costs including machine hire.

4.6 STREAM CROSSING REHABILITATION – LAWLEY

The stream crossing over Lawley Creek between the Lawley and Malter properties has become degraded due to heavy livestock use – both as a water source and as a travel route. The base of the crossing is bedrock however the relatively steep entry and exit have become severely eroded. The entry and exit will be graded and road base added to minimise erosion.

LBCCG will supply the road base and the landholder will fund machine hire.

Stream crossing between the Lawley and Malter properties. Bed is bedrock but the entry and exit requires road base to reduce erosion. Note livestock have not had access to crossing for several months.

4.7 REVEGETATION - MALTER

LBCCG will fund the riparian fencing on the 86 metres of Lawley Creek with the landholder funding the revegetation of the site. Approximately 1,000 trees will be required and will complete the riparian corridor between remnant vegetation downstream and regrowth and revegetation upstream.

Malter riparian zone to be revegetated.

4.8 FUTURE STAGES AND ACTIVITIES

The new landholders who purchased the 10 hectares from Ed Lawley have a short length of a Lawley Creek tributary (including a degraded wetland). In the future it would be beneficial to continue fencing up the tributary, excluding livestock and establishing riparian vegetation.

Upstream property that could be included in a future CORE project.

5.0 WHEN

(When will the activities be implemented)

The LBCCG CORE components of the project are scheduled for completion by 30 June 2018. It is unlikely the Malter revegetation component will be completed by June 30.

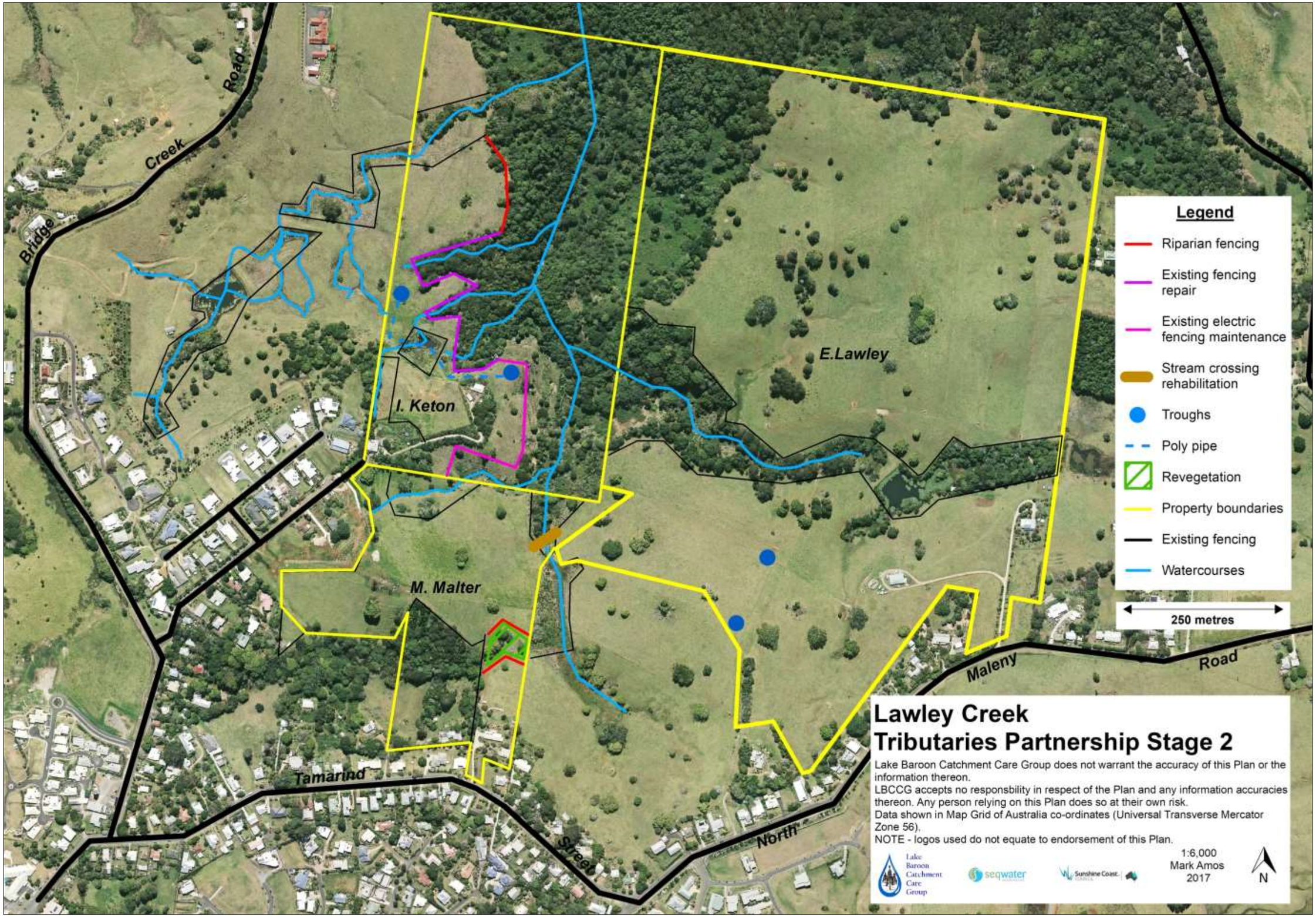
As per ALL LBCCG projects, completion of activities is weather dependent.

Project Milestones

Milestone	*Action*		*Completion Date*
1	LBCCG Project Plan completed and approved, pre works monitoring completed		May 18
2	***IMPLEMEMNTATION***	Keton riparian fencing	Jun 18
3		Malter riparian fencing	Jun 18
4		Keton fence repair	Jun 18
5		Keton fence maintenance	Jun 18
6		Keton off stream water	Jun 18
7		Lawley off stream water	Jun 18
8		Lawley stream crossing rehabilitation	Jun 18
9		Malter revegetation	Jun 19
10	Post-works monitoring completed, Final Report		Sep 18

See PART D: 5.0 Action Plan for more detail.

6.0 MAP


Bridge Creek Road
I. Keton
E.Lawley
M. Malter
Tamarind Street North
Maleny Road
Legend
Riparian fencing
Existing fencing repair
Existing electric fencing maintenance
Stream crossing rehabilitation
Troughs
Poly pipe
Revegetation
Property boundaries
Existing fencing
Watercourses
250 metres
Lawley Creek
Tributaries Partnership Stage 2
Lake Baroon Catchment Care Group does not warrant the accuracy of this Plan or the information thereon.
LBCCG accepts no responsbility in respect of the Plan and any information accuracies thereon. Any person relying on this Plan does so at their own risk.
Data shown in Map Grid of Australia co-ordinates (Universal Transverse Mercator Zone 56).
NOTE - logos used do not equate to endorsement of this Plan.
Lake Baroon Catchment Care Group
seqwater
Sunshine Coast
1:6,000
Mark Amos
2017
N

7.0 BUDGET

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.

PART D ATTACHMENTS

1.0 PROJECT RATIONALE

1.1 INTRODUCTION

In an ideal world, all waterways in the Lake Baroon catchment would be rehabilitated to provide riparian buffers and provide suitable habitat for aquatic ecology. However the limited resources available means the catchment must be prioritised into areas where the greatest gains can be achieved through the smallest investment. We cannot realistically completely restore cleared riparian zones to pre-European conditions, but we can improve the ability of the zone to maintain the quality of water delivered downstream.

Baroon Pocket Dam. Although the dam and most of the immediate surrounds are owned and managed by Seqwater, the vast majority of the catchment is privately owned. To influence land management that reduces the risk to water quality in the storage, Seqwater must engage the community. The most effective method to do this is work with existing community groups.

An estimated 80% of sediment and 35% of nitrogen in the waterways in south east Queensland comes from non-urban diffuse loads; sources such as unmanaged livestock grazing. Reduction of these loads clearly represents a major target for action if significant improvements in water quality are to be achieved in South East Queensland (DERM 2010).

Maintaining a healthy riparian system is essential for a productive landscape. When a riparian area is healthy it contains lush, thick vegetation, providing habitat for wildlife and aquatic species, maintains stream bank stability, influences morphology and provides shade which in turn lowers water temperatures and increases the oxygen carrying capacity of the stream. Additionally, riparian vegetation filters, utilizes and stores nutrients, thus preventing them from entering water systems. Weed invasion is an indicator that the riparian system is in decline and has the potential to alter the vegetation structure to such an extent that habitat and water quality outcomes are threatened.

1.2 GRAZING AND RIPARIAN ZONES

Livestock grazing is a land use that has the potential to alter the condition of a stream and riparian area if not managed properly. Improper livestock use of riparian areas can negatively affect riparian areas by changing, reducing or eliminating the vegetation within them.

In the sub-tropics, the majority of overland flow events occur during the summer to early autumn period. Conversely during the winter and spring months, most faecal contamination in water channels occurs from an animal defecating

directly into the water. Any practice that reduces the amount of time cattle spend in a stream will therefore reduce the manure loading and decrease the potential for adverse effects on water from grazing livestock.

Cattle when drinking at streams and dams enter the water to reduce bending; resulting in the stirring up of suspended solids (turbidity), and riparian zones can be difficult places for livestock to access (steep, muddy or rocky banks) placing greater effort and stress on individual animals. Additionally when cattle enter a water source they tend to defecate directly into the water body (pers. comm. Colin Cork 2012).

The direct effects of improperly managed livestock grazing on riparian vegetation include:

- change, reduce, or eliminate vegetation;
- decrease the vigour, biomass and alter species composition and diversity;
- change the channel morphology by widening and shallowing of the streambed;
- alter the stream channel through trenching or braiding depending on soil and substrate composition;
- alter the water column by increasing water temperatures, nutrients, suspended sediments and bacterial counts;
- alter the timing and volume of water flow;
- cause bank sloughing leading to accelerated sedimentation and erosion; *and*
- decrease wildlife habitat and species.

However when tightly controlled, fencing can be an invaluable, and sometimes essential tool to manage grazing in riparian zones whether permanent exclusion or managed grazed is performed.

The project will enhance vegetation buffers on Obi Obi Creek. The effectiveness of a riparian buffer to provide multiple environmental and water quality benefits varies depending on several key factors, namely bank slope, vegetation species composition and age, and soil type. Slope gradient appears to be the most important variable in removal of sediment or particulate pollutants, whereas buffer width is most important for the effective removal of dissolved nutrients (Barwick et al 2009).

Riparian buffers comprising grassed buffer strips are effective at trapping sediments and nutrients adsorbed to sediments (such as phosphorus), but tend to be relatively poor at trapping dissolved nutrients, or for the provision of shade, food sources, in-stream structure or corridors for many species. Riparian buffers comprising taller, woody vegetation are typically good at providing shade, as a source of food and woody habitats, as a screen for light and noise, as corridors for terrestrial fauna (to a varying extent depending on species composition), and as a means for reducing soluble nutrient inputs.

Designed riparian buffers usually incorporate multi-tiered systems of both native woody vegetation to enhance ecological function, and vegetated filter strips for the management of water quality. In essence, this approach seeks to mimic the complexity and effectiveness of a natural riparian buffer system, and often the best approach is to provide the required buffer width to enable a self-sustaining buffer of native vegetation (Barwick et al, 2009).

1.3 OFF STREAM WATERING

In the sub-tropics, the majority of overland flow events occur during the summer to early autumn period. Conversely during the winter and spring months, most faecal contamination in water channels occurs from an animal defecating directly into the water. Any practice that reduces the amount of time cattle spend in a stream will therefore reduce the manure loading and decrease the potential for adverse effects on water from grazing livestock.

Even without exclusion fencing of riparian zones, off-stream water sources reduce the amount of time free ranging cattle spend in or immediately adjacent to watercourses. Cattle prefer to drink from a trough over other sources of

water available to them, resulting in a significant reduction in time spent in the stream (watering) and adjacent stream side area (grazing and loafing). Studies in North America have shown that following the installation of the off-stream watering (OSW) infrastructure, stream bank erosion decreased by 77% and concentrations of total suspended solids, total nitrogen and total phosphorous decreased by 90, 54 and 81% respectively (Sheffield et al, in McIver 2004). More recent studies indicate that although the installation of OSW by itself is effective, providing livestock supplements and shade near troughs reduced riparian zone pressures even further (Ganskopp 2001, McInnis and McIver 2001, Porath et al. 2002 in McIver 2004). Porath et al. (2002) also found that the provision of supplements increased weight gain in cows and calves.

Cattle when drinking at streams and dams enter the water to reduce bending; resulting in the stirring up of suspended solids (turbidity), and riparian zones can be difficult places for livestock to access (steep, muddy or rocky banks) placing greater effort and stress on animals. Additionally when cattle enter a water source they tend to defecate directly into the water body (pers. comm. Colin Cork). Troughs provide a level, relatively dry watering point where the animal does not have to bend excessively, reducing stress by providing improved footing, increased visibility and reduced physical effort. This is likely to lead to healthier animals with less risk of injury.

Cattle use riparian areas for resources other than water - crossing points, forage, shade, grooming sites (scratching posts) and general loafing. A well designed OSW system needs to take into account all these factors. Research by Gillen et al 1984 (in McIver 2004) shows that cattle prefer to graze within 200 metres of water. Therefore to optimise uniform grazing and water efficiencies, cattle should not have to walk more than 200 - 300 metres to water.

Season and time of day also have an effect on the effectiveness of an off-stream water source in reducing degradation to riparian areas. In the warmer months, riparian areas give shade and protection from the heat and the coolness of the water often draws the animals to the water's edge. It is essential to ensure that alternative shade is provided within the paddock – preferably near the OSW trough and ideally on a high point exposed to cooling breezes.

1.4 RIPARIAN REVEGETATION

A healthy aquatic ecosystem is stable and sustainable; maintaining its physical complexity, biodiversity and resilience. It has the ability to provide ecosystem services that in turn contributes to good water quality, wildlife habitat and recreation.

Riparian areas are the transition zones between land and water environments. They are generally more productive in terms of total biomass than the adjoining area (which contributes to their clearing) and are critical for biological diversity. The protection, enhancement and rehabilitation of riparian zones is essential for sustainable catchment management and reducing risks to water quality.

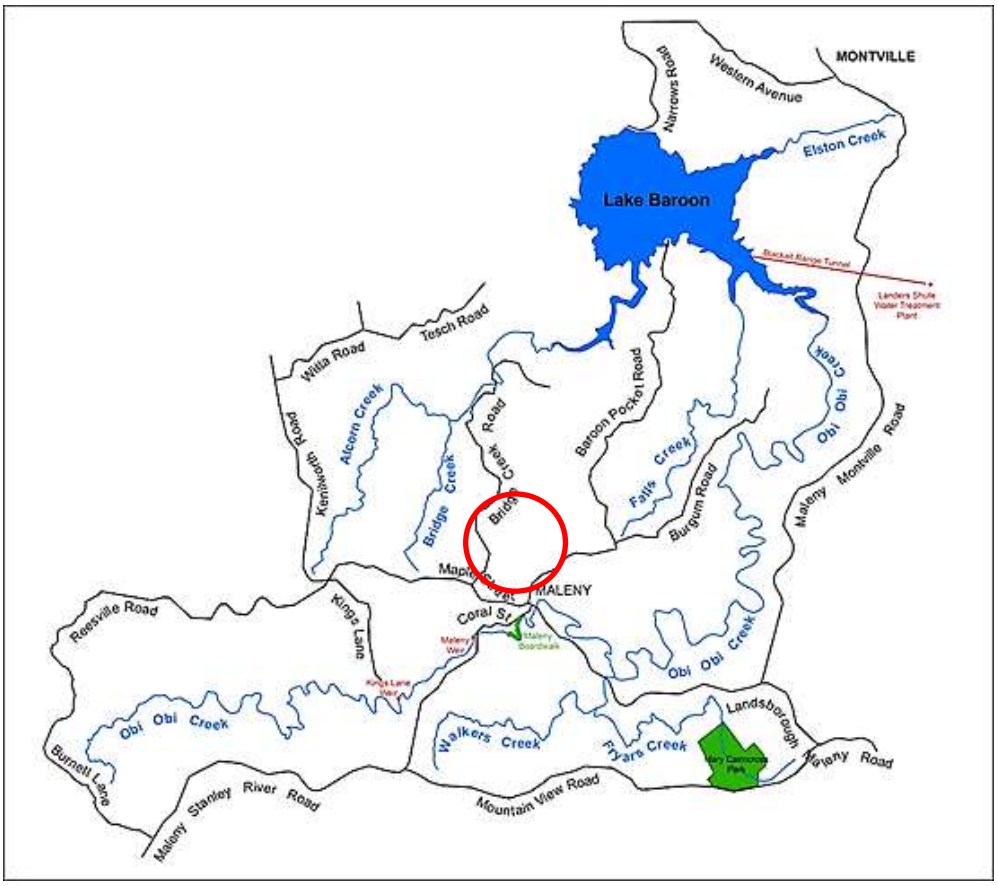
Buffer strips provide a strip of vegetation that acts as a filter for sediment. They are designed to remove sediment, organic material, nutrients and chemicals carried in run-off. Buffer strips include both vegetative filters adjacent to agricultural land and riparian zones that maintain bank and channel stability.

2.0 PROJECT LOCATION

2.1 BACKGROUND

Lake Baroon is situated on the Maleny Plateau in the headwaters of the Mary River, located inland from Sunshine Coast approximately 13 km south west of Nambour and 7 km North East of Maleny. Obi Obi Creek forms both the primary inflow and outflow of the dam. Walkers, Falls, Bridge, and Elston Creeks constitute the remaining significant creeks within the catchment providing water to Lake Baroon. The catchment encompasses an area of 74 km^2 (including the dam surface).

2.2 LOCATION



The Lawley, Keton and Malter properties are located in LBCCG Management Unit BR3.

2.3 THE BRIDGE CREEK CATCHMENT

Bridge Creek (2,413 hectares) is characterised by its steep slopes that lack stabilising vegetation. The soils of the catchment are predominantly black clays lacking the ability to absorb nutrients and rainfall, resulting in minimal filtering of run-off. Although there are significant areas of natural vegetation and most of the waterways have good riparian vegetation, the sub-catchment contributes high volumes of sediments, nutrients and potentially pathogens to Baroon Pocket Dam (Dunstan 2007).

Dairy grazing was the dominant land use until relatively recently (2000) however due to the widely varying topography, poorer soils and consequently relatively poorer pasture, dairy grazing has been restricted to three properties that have a larger proportion of grazing outside the catchment (Sommers, Oehmichen [recently leased by Maleny Cheese to run dry dairy cattle] and R. Cork dairies).

Bridge Creek varies widely in topography, land use and threats to water quality. Upper reaches are largely grazed, mid reaches support a mix of natural bush and rural residential properties with some grazing again in the lower reaches.

2.4 CATCHMENT REVIEW

2.4.1 Background

Since the arrival of European Settlers, Lake Baroon and its catchment area have undergone significant change. Timber operators first settled in the region in 1853 and selectively cleared the best timber from the area. Following the removal of the most valuable timber (1906), the majority of remaining vegetation was cleared for beef and dairy cattle (1918) (Dunstan, 2007).

As a result riparian zones have been irreparably impacted such as:

- vegetation fragmentation (as a result of clearing);
- increased erosion and sediment loads due to clearing and land use practices;
- changes to hydrology and water quality;
- altered natural processes such as grazing and urban development;
- introduction of foreign fill materials; *and*
- introduction of weeds, exotic plantings and
- exotic fauna.

2.4.2 Geology, soils & stability

The geology of the Maleny plateau is dominated by basalt lava flows occurring between 31 and 25 million years ago (MYA). However there are several other significant geological formations that influence the catchment – particularly soil type and consequently vegetation and stability.

The oldest rocks visible on the plateau are known as the North Arm Volcanics and originated somewhere in the North Arm region around 210 MYA. Multiple lava flows consisting of andesite and dacite to rhyolite form the northern bank of Lake Baroon and are visible in the lower reaches of Bridge Creek where erosion has exposed them. Rhyolite is very

hard and resistant to erosion evidenced by the Narrows where the Obi Obi Creek was forced to cut a narrow gorge through (and where Baroon Pocket Dam wall was constructed).

The North Arm Volcanics underlay the entire Maleny plateau and extend as far south as the Glasshouse Mountains. Between 210 and 180 MYA the North Arm Volcanics 'sagged' into broad depressions that were subsequently filled with sediment, forming the deep Landsborough Sandstone formation (Willmott 2007). Other geological formations in the catchment include small areas of Cedarton Volcanics – visible in the upper reaches of Obi Obi Creek; andesite rock that produces lighter coloured moderately fertile soils; and an area of Amamoor Beds – 315 MYA of hard meta-sediment rocks that were historically folded and steeply inclined exposed at Howells Knob. Composed of quartzite, these rocks weather to variable cream or yellow soils.

Maleny plateau basalts although outwardly appearing very hard have high concentrations of iron which promotes fracturing and therefore can be very prone to erosion. The Obi Obi, Bridge and Falls Creeks have gradually cut channels into the basalt plateau revealing the described layers underneath. The edges of the plateau have also eroded to form escarpments (Willmott 2007).

Soils on the site predominantly consist of heavy black clays. The bed of the watercourses on the site consists of thin, black alluvial soils that have been deposited by a combination of mass movement (landslips), hill slope (paddock) erosion and gullying. The velocity and volume of the local streams however limits sediment deposits forming.

However, clay soils erode easily and tend to reach their infiltration capacity faster than other soils, promoting overland flow. A potential consequence is that both bound and unbound nutrients will enter the watercourses via erosion and runoff (Lake Baroon Catchment Management Strategy & Caloundra City Council 2007).

Native vegetation is an indicator of soil types. The vegetation over the site therefore would have originally been a mix of rainforest (particularly in the gullies and wet and dry sclerophyll (eucalypt) forest.

2.4.3 Catchment land-use

Despite the extensive clearing, 17% of the Lake Baroon catchment is still heavily forested; a significant proportion in the immediate area around the dam, although much of this is degraded by environmental weeds. Today, the catchment is susceptible to impacts associated with an increasing diversity of land use (Keys 2009).

The area closest to the lake is popular with "tree changers" and has seen land use change from intensive grazing to smaller rural residential properties. This has resulted in the fragmentation of larger tracts of agricultural land into smaller parcels with a large increase in the number of on-site wastewater treatment systems in the catchment (Keys 2009).

Presently the catchment is susceptible to a number of land use impacts (Traill, 2007; Dunstan, 2007) including:

- poorly managed dairying and cattle grazing;
- new developments and increased stormwater runoff;
- runoff from impervious surfaces of existing developed areas;
- irrigation of treated effluent associated with the Maleny Sewage Treatment plant;
- uncontrolled stock access to the lake and its tributaries;
- lack of riparian vegetation and integrity – a result of extensive vegetation clearing;
- abundance of weeds – shift in land ownership from land managers (e.g. farmers) to inexperienced residents has potentially led to the spread and proliferation of weeds (including emerging weeds); *and*
- varying pollution sources related to increased population.

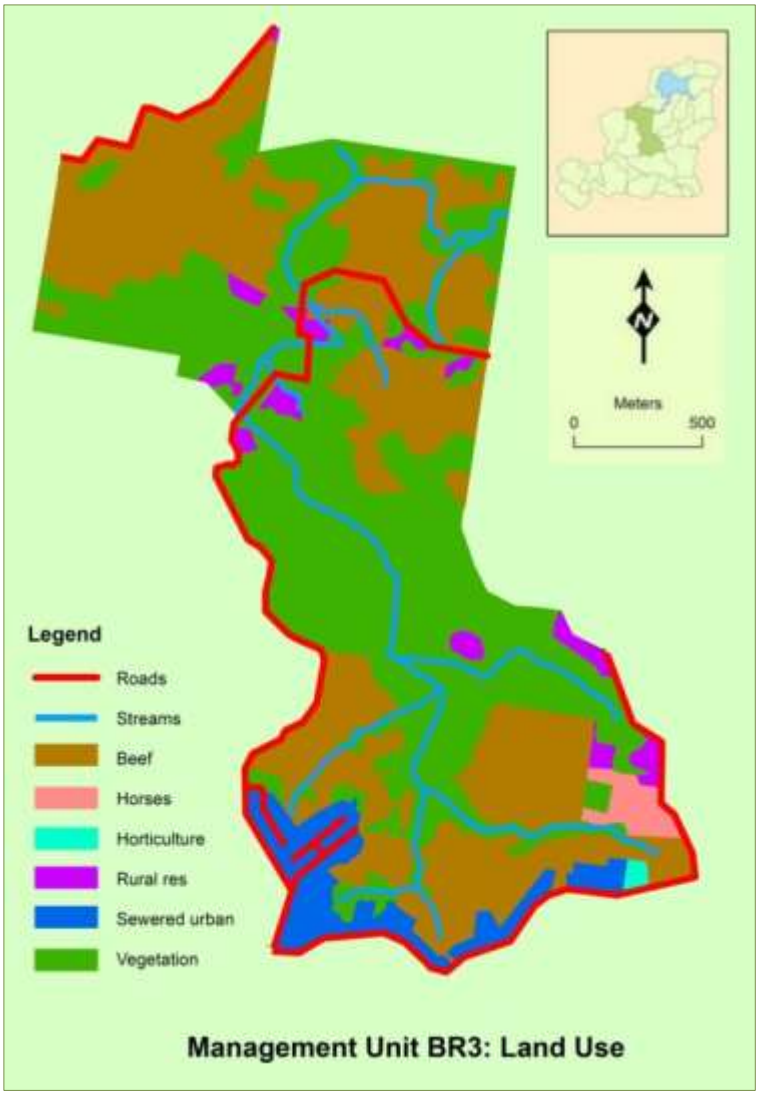
Bridge Creek has been divided by LBCCG into six Management Units that reflect property boundaries, physiography, vegetation, land use and point and diffuse pollution sources. This provides administrative convenience and the ability to prioritise stream zones more accurately according to various threats.

The proposed project is located within Management Unit BR3 – Lawley Creek.

2.4.4 Land-use in Management Unit BR3

BR3 covers an area of 518 hectares with beef grazing and rural residential supporting native vegetation the dominant land use with horticulture, horse grazing and urban Maleny a small but significant use at (Amos assessment 2017). Riparian cover is present along 40% of the watercourses (mainly in the mid reaches of Lawley Creek, some of which is remnant vegetation.

Land use in the Management Unit is split between beef grazing (40% of the MU) and vegetation/rural residential (50%) with sewered urban a minor land use (less than 5%). Other minor land use includes horticulture (less than 5%) and horse grazing (less than 5%).



Land use in MU BR3 is mainly conservation however beef grazing occurs in the upper and lower reaches. Much of the area marked as vegetation can be considered rural residential. Urban Maleny lies to the south.

2.5 LAWLEY PROPERTY REVIEW

2.5.1 Land use and property management

The Lawley property is a relatively large parcel of land (now 50 hectares) utilised for beef grazing. Ten hectares of the property were sold in 2017. The property has moderate hillslopes and has excellent groundcover year round due to strict rotational grazing and conservative cattle numbers.

2.5.2 Hydrology

2.5.2.1 Drainage Lines, Watercourses & Wetlands

The property has one main watercourse running from east to west flowing into Lawley Creek just downstream of the property boundary. Approximately one third of the property lies to the south and the remaining two thirds to the north of the stream. A permanent creek there is a single large farm dam that supplies water through an off stream water system. The entirety of this stream and associated riparian zone is fenced and where previously bare has been revegetated over several years. Intensive weed management is regularly undertaken to improve the downstream riparian zone.

2.5.2.2 Flooding

Flooding is not considered a major issue due to the small catchment.

2.5.3 Environmental Factors

2.5.3.1 Significant Vegetation & Ecosystems

There are no State recognised areas of remnant vegetation on the property although the downstream end of the watercourse does have high quality regrowth vegetation.

2.5.3.2 Flora, Fauna & Corridors

All possible wildlife corridors have been restored through revegetation and weed management.

2.6 KETON PROPERTY REVIEW

2.6.1 Land use and property management

The Keton property is a moderately sized ex-dairy farm located on the outskirts of urban Maleny. More than half of the property is permanently protected under a Voluntary Conservation Agreement consisting of remnant vegetation, regrowth and rehabilitated areas. The balance of the property is open pasture and although no livestock grazing has occurred for several years, the reintroduction of cattle is imminent.

2.6.2 Hydrology

2.6.2.1 Drainage Lines, Watercourses & Wetlands

Lawley Creek splits the property in two from south to north. Approximately a quarter of the property lies to the east of Lawley Creek and has either been fenced to protect remnant vegetation, permit revegetation or allow regrowth to return.

Virtually all riparian zones have been fenced and support good riparian vegetation. The proposed project (Seqwater Landslide Program) will not only address landslips but also continue to exclude livestock from riparian zones.

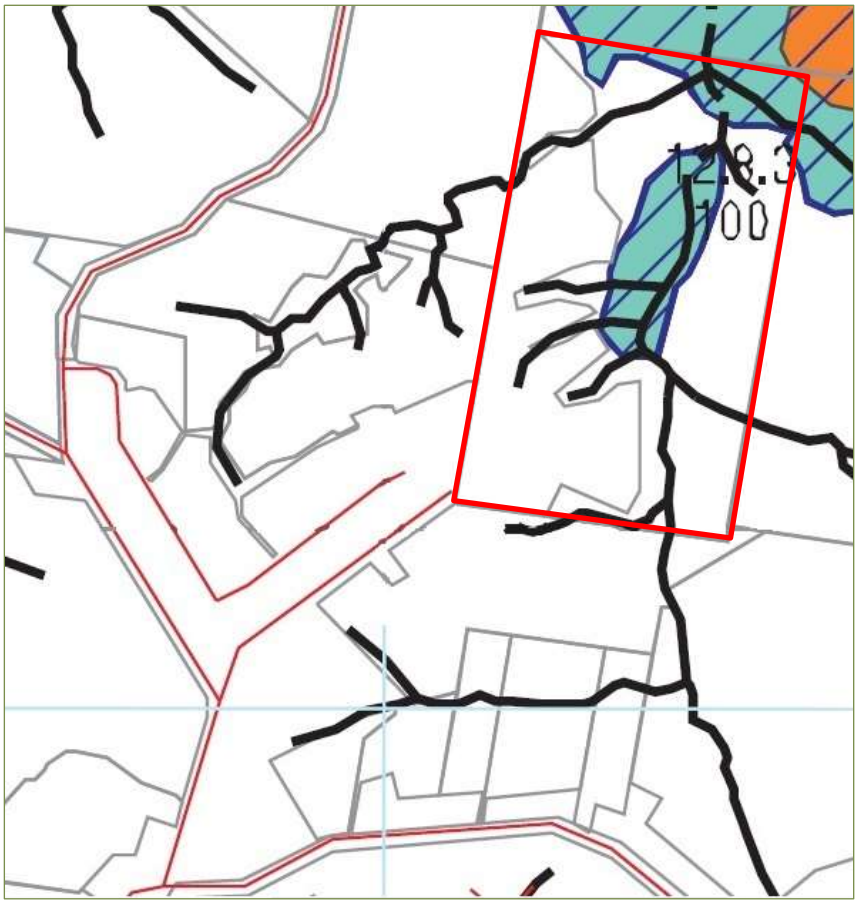
2.6.2.2 Flooding

Flooding is not considered a threat as the proposed site has very little catchment. It is the presence of the landslip that gives the site its priority. Virtually all other watercourses support established vegetation and are resilient to flooding.

2.6.3 Environmental Factors

2.6.3.1 Significant Vegetation & Ecosystems

The property supports a relatively large remnant Complex notophyll vine forest which is protected under a Voluntary Conservation Agreement. This Regional Ecosystem is not considered at risk although this particular stand has significant wildlife and habitat value.



The Keton property supports a significant stand of 12.8.3 Complex notophyll vine forest. This has been enhanced by extensive connecting revegetation and high quality regrowth.

2.6.3.2 Flora, Fauna & Corridors

The project will continue to protect and enhance the significant corridor on the property by installing new and repairing existing riparian fencing.

2.7 MALTER PROPERTY REVIEW

2.7.1 Land use and property management

The Malter property is a relatively small parcel (10 hectares) of high quality grazing with improved pasture and no major management issues. Beef cattle from the adjacent Lawley farm are utilised to manage the property. Up to 60 head of cattle are rotationally grazed through the property.

Previous projects have fenced all permanent and ephemeral watercourses except for the recently (2017) purchased 'Stacey' property.

2.7.2 Hydrology

2.7.2.1 Drainage Lines, Watercourses & Wetlands

The Malter property has only a short (approximately 240 metres) of Lawley Creek running through the eastern and southern sides of the property (the property is actually on three titles). A controlled watering point/stream crossing is maintained on the eastern reach for livestock water. The only other watercourse on the property is a fenced a revegetated ephemeral gully that was completed in the 2016/17 Stage.. This ephemeral steep sided gully receives stormwater flows from Maleny's Palm Street.

2.7.2.2 Flooding

Flooding is not considered a major issue due to the small catchment. Revegetation however will take into account the pulses of stormwater typical of hardened surface effects of roads, roofs etc. al. A thick sward of grass needs to be maintained in the watercourses bed, until adjacent planted trees have developed extensive root systems that have established in the bed and monitoring performed regularly to ensure erosion is not occurring. Lomandra and other macrophytes can be introduced once the fringing rainforest vegetation has sufficiently established.

2.7.3 Environmental Factors

2.5.3.1 Significant Vegetation & Ecosystems

There are no recognised areas of remnant vegetation (12.8.3 Complex notophyll vine forest) on the property although there is a small (possibly too small to be recognised by State NRM) stand on the short length of Lawley Creek. This has been enhanced by planting of revegetation adjacent.

2.7.3.2 Flora, Fauna & Corridors

The project will improve and enhance the Lawley Creek corridor, closing the last gap between remnant and regrowth vegetation downstream and revegetation and regrowth upstream on the outskirts of Maleny.

3.0 PURPOSE, OBJECTIVES & OUTCOMES

3.1 BACKGROUND

A healthy aquatic ecosystem is stable and sustainable; maintaining its physical complexity, biodiversity and resilience. It has the ability to provide ecosystem services that in turn contributes to good water quality, wildlife habitat and recreation.

Riparian areas are the transition zones between land and water environments. They are generally more productive in terms of total biomass than the adjoining area (which contributes to their clearing) and are critical for biological diversity. The protection, enhancement and rehabilitation of riparian zones is essential for sustainable catchment management and reducing risks to water quality.

3.2 WATER QUALITY

The environmental health of the Lake Baroon catchment is considered generally poor, and in some respects declining (personal communications with Seqwater water quality staff). A State of the Rivers Assessment (Johnson, 1996) indicated that significant sections of the waterways appear to be in moderately poor condition, with moderately to highly disturbed reach environs and considerable lengths of unstable banks and bed-streams. These were characterised by lack of native vegetation displaced by clearing, grass banks or exotic vegetation (Keys 2009).

Pollutants entering Bridge 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 carries nutrients derived from fertilisers, car washing, heavy metals and hydrocarbons from road run-off, litter and organic matter; *and*
- There is also the potential for sewer overflows (from the urban sewer system and individual wastewater treatment systems such as septic tanks) with high nitrogen, phosphorus and pathogens.

The sheer volume of excrement produced by cattle, horses, and to a far lesser extent other domestic animals, when in large herd sizes renders them significant contributors within an open drinking water catchment. Reducing connectivity (paddock to stream), through the management of riparian fencing and revegetation, would reduce the likelihood at almost all of the sites identified as high likelihood (pers. comm. A. Smolders 2012).

Less than 10% of the sub-catchment is vegetated; with minimal length of waterways supporting riparian cover of varying quality (mostly poor). The MU contributes a large nutrient load to Bridge Creek, with more than 98% of samples exceeding guideline levels (Dunstan 2007). This is most likely due to the number of rural residential properties combined with intensive grazing although the area utilised for dairying has dramatically reduced since 2007 (fall from 66% of the MU to less than 10%). Recent water quality sampling is not available but it is suspected there has been little improvement and most likely a deterioration as rural residential properties have increased and dairy grazing converting to beef grazing is high risk due to the sharp reduction in investment (pasture management, erosion etc). The MU is noted for its poor water quality but this is probably exacerbated by the fact there is insufficient riparian vegetation to filter nutrients originating in the catchment.

The Lake Baroon Catchment Implementation Plan (2007) rates BR3 a LOW priority for rehabilitation works. 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 HIGH; due to the contribution of nutrients and sediments to Bridge Creek.

3.2.1 Statistical Analysis of the Raw Water Quality Data Recorded from Wells Road 1991-2005

Water quality monitoring and analysis sampled at the Bridge Creek crossing (Wells Road) between 1991-2005 by AquaGen shows, that despite a relatively dense coverage of vegetation, the catchment contributes significant nitrates, ammonia, phosphates, total phosphorus and faecal coliforms. The Wells Road sampling site is downstream in the catchment and is affected by numerous impacts – urban Maleny, rural residential impacts (septic tanks etc), minor dairy and beef grazing and large areas of vegetation. High volumes of sediment delivered to Lake Baroon from soil erosion also occur in the catchment.

Parameter	*pH (pH units)*	*Turbidity (NTU)*	*NOx (N) (mg/L) (NITRATES)*	*NH3 (N) (mg/L) (AMMONIA)*	*PO4 (P) (mg/L) PHOSPHATE)*	*Total P (mg/L) (TOTAL PHOSPHORUS)*	*Faecal Coliforms (number/ 100 mL)*
Guideline Value (GV)	***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 outside GV	0	1	23	24	17	22	20
% outside GV	0.00	1.96	**46.00**	**48.00**	**33.33**	**44.00**	**39.22**

Analysis of the raw water sampled between 1991 – 2005 (Traill 2007) shows:

- Turbidity levels exceeded guideline levels only once however it is unlikely the sampling program accurately captured the likely events (catchment topography means flood waters rapidly disperse once rainfall ceases and it is unlikely sampling occurs in a timely manner;
- Nitrate levels exceeded the guideline value 46% of the time although this was falling as dairy farms converted to beef (less use of fertiliser);
- Ammonia levels exceeded the guideline value 48% of the time and varied throughout the sampling period making it difficult to pin point causes;
- Phosphate levels exceeded the guideline level 33% of the time although this is likely to be higher in reality, as phosphates attach to sediment and turbidity levels have already been identified as unusually low;
- Total phosphorus levels exceeded the guideline level 44% of the time; *and*
- Faecal coliforms exceeded the guideline level 39% of the time although widely fluctuated during the sampling period.

Note: The routine sampling programs (CalAqua, AquaGen, Seqwater and others) are suspected of not accurately capturing major pollution events. Conducted monthly (1991 – 1998) or bi-monthly (1999 – 2005), significant rainfall events in the catchment have likely been missed with the data collected over-estimating the catchment's water quality (Traill, 2007).

3.3 WATER SUPPLY CATCHMENT

The Lawley, Keton and Malter properties lie within the Lake Baroon Pocket Dam Catchment. Bridge Creek (2,134 hectares) comprises one of Lake Baroon's three major sub-catchments. Consequently it is the major supplier of total water to the dam.

Baroon Pocket Dam (BPD) is a key source of water supply for Seqwater. Minimum flow volumes from BPD through the Northern Pipeline Interconnector (NPI) northwards are 7 ML/day (subject to availability if BPD falls below 60% capacity) to Noosa NTP; and 30 ML/day (20 ML/day if BPD falls below 70% capacity) southwards to Caboolture, Morayfield and Narangba. This indicates both surety of supply, location and cost effectiveness of Landers Shute Treatment Plant (AOP 2013).

BPD, along with Image Flat (South Maroochy System) is the predominant source of water supply for northern South east Queensland with Ewan Maddock Dam (EMD), Lake McDonald and Mary Valley Water Supply Scheme considered additional intermittent sources (AOP 2013).

EMD operates on an as needed basis, typically during high demand periods or when raw water quality in BPD is compromised by algal blooms (and possibly turbidity). EMD, relative to Landers Shute (LSTP) is more expensive to produce potable water (despite its recent construction), hence the reliance on BPD and LSTP (AOP 2013).

It's important to note that the NPI (and all pipelines for that matter) require minimum transfer flows at all times to maintain operation and water quality. Typically this is a minimum of 5 ML/day (AOP 2013).

BPD is a reliable source of raw water (volume) but is plagued by quality issues. These issues were somewhat expected when BPD was constructed and hence the design of LSTP, however demand for supply was never intended beyond the southern half of the Sunshine Coast region.

The value of the raw water that originates in the catchment as a whole greatly exceeds the value of primary production.

Lake Baroon catchment	= 74 km^2 or 7,400 ha
Gross yearly value of water sold by Seqwater (*Saxton et al, 2013*)	= $60,000,000
Value of water per hectare	= $8,108
Area of the Lawley, Keton & Malter properties	= 81 hectares
Gross value of raw water originating from the properties	**= $656,748 annually**

Tourism has become the dominant economic driver in the catchment but relies on both the agricultural landscape (rolling green hills) and natural values equally. This is demonstrated by the popularity of Maleny Dairies milk processing plant and farm tours (in excess of 20,000 visitors per year; pers. comm. Keith Hopper) and the popularity of Mary Cairncross Park (200,000 visitors per year?).

Seqwater who receive the benefits of raw water flowing from the catchment into BPD, have an obligation to invest back into the catchment if water quality improvements are desired; into activities that reduce risks to water quality and its maintenance and protection, and broad environmental health.

The likely scenario under climate change modelling suggests more variable and possibly severe weather events; longer and more severe droughts (below average rainfall per month) and more intense rainfall events.

This will undoubtedly impact on both raw water quality entering BPD and on the storage itself. Between 2010 and 2014 unseasonal dry periods followed by intense high rainfall events have seen an increase in erosion (reactivation of land slips), turbidity and flood damage.

The community expects good water quality at their tap – free from discolouration, odours and the guarantee it will not impact their health, and increasingly demands the environment is protected as part of supply.

3.4 OBJECTIVES

Lawley Creek Tributaries Partnership is designed to reduce the impacts of livestock access on watercourses and reduce the delivery of sediment to Bridge Creek and Baroon Pocket Dam. The project is addressing high priority issues in this part of the Lake Baroon catchment – landslips, livestock access to, and impacts on watercourses. The project is directly addressing the issues and risks associated with the production of a safe water supply to the Sunshine Coast and beyond. However the project provides far broader environmental benefits that increasingly the community demands and expects.

The project aims to:

- implement an on-ground project that delivers water quality benefits;
- promote integrated catchment management in the Lake Baroon catchment;
- reduce nutrient delivery to waterways;
- reduce sediment delivery to waterways;
- protect and improve aquatic habitats;
- raise community awareness (including water quality issues);
- support and work cooperatively with like-minded community organisations;
- protect and enhance habitat;
- contribute to the conservation of threatened species;
- contribute to climate change adaptation; *and*
- demonstrate best management practice of riparian zones, landslips and remnant vegetation.

Effective riparian areas can improve water quality by trapping sediment, reducing erosion, storing nutrients and filtering contaminants before they reach water storages (Lake Baroon). Riparian zone health is a key factor in a riparian area's ability to improve water quality.

3.5 OUTCOMES

Healthy catchments lead to healthy waterways. By improving the health of riparian zones we ultimately aim to mitigate the impacts that can affect water quality. Seqwater provides generous funding and LBCCG offers appropriate incentives to landowners to implement activities that are designed to reduce risks to water quality. Through the prioritisation and implementation of riparian protection and rehabilitation throughout rural catchments – we provide multiple beneficial outcomes.

Outcomes are the ‘end product’ of our activities – what we actually achieve. It can be very difficult to measure outcomes as they may take many years to be fully realised and can be enormously expensive to quantify – potentially far more than the actual implementation of the project. We must rely on best management practice, anecdotal evidence and ideally partnerships with universities and/or Seqwater to produce ‘hard’ data to prove the effectiveness of projects.

Our project will:

1. **Reduce pathogen delivery to waterways.**
   Managing livestock in riparian zones and rehabilitating livestock laneways reduces the volume of faecal material reaching waterways.

Managing livestock in the riparian zone reduces the opportunity for direct deposition of faecal material into the watercourses. Vegetative buffers intercept run-off contaminated with excessive nutrients from diffuse paddock sources.

2. **Reduce nutrient delivery to waterways.**
   Nutrient delivery to waterways is continuous and increases during episodic rain events.

Managing livestock in the riparian zone reduces the opportunity for direct deposition of faecal material into the watercourses. Vegetative buffers intercept run-off contaminated with excessive nutrients from diffuse paddock sources.

3. **Reduce sediment delivery to waterways.**
   Soil from landslips and general erosion leads to high turbidity and is transported to Baroon Pocket Dam and beyond.

Improved management of livestock movement (stream crossings) maintain stability of riparian zones and managing livestock in the riparian zone reduces soil erosion from trampling.

4. **Improve aquatic habitat.**
   Improved management of sediments, nutrients and pathogens improves instream habitat..

A reduction in turbidity, sediments, nutrients and pathogens will improve water quality and contribute to maintaining in-stream biodiversity.

5. **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 value and importance of effective livestock management. 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 and capacity of the community.

6. **Contribute to the viability and resilience of primary production in the Lake Baroon catchment.**
   Primary production has been in decline since 2000.

For long term water quality outcomes it is preferential to work with experienced landholders who understand the catchment and are skilled land managers. New landholders to the area are often ill equipped to manage land and are high risk to water quality.

For landholders to implement a water quality improvement project there needs to be a cost benefit rather than a burden on available resources. This project provides a win-win scenario where all stakeholders benefit.

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

The project will enhance riparian and associated vegetation improving, over time, valuable habitat for a variety of native fauna. The project will significantly reduce livestock access to a significant area of riparian and vegetation.

3.6 PRIORITY LANDHOLDERS/LAND IN THE LAKE BAROON CATCHMENT

Priority landholders were initially identified in 2007 (updated in 2014) based on land-use, property size, and proximity to Seqwater infrastructure (Baroon Pocket Dam, Maleny Weir, and King's Lane Weir) and/or their potential to adversely impact on catchment water quality.

The Lawley property was identified as a priority due to size, land use and positions within the Bridge Creek catchment. The Keton and Malter properties are not a Priority Landholders however as they are adjacent to the Lawley property it is considered worthwhile to include in this project.

3.6.1 Priority Landholder Project funding since 2000 - $ per hectare (CORE funding only)

There are 59 Priority landholder properties in the Lake Baroon catchment. LBCCG has endeavoured since 2007 to engage as many as possible and implement projects that deliver water quality benefits. Not all landholders will agree to be involved however currently LBCCG has worked with 29 of these properties. Several other landholders on the list have received minor, non-project assistance (less than $1,000).

A key aim for LBCCG is to spread the funding over as many properties as possible and therefore always prioritise previously un-funded projects/landholders over those that have received funding in the past. A simple table is reproduced below showing $ per hectare spent on Priority Landholder properties since 2000 which is useful for determining priority and 'fairness' when considering a new project.

Property/ Landholder	Total Expend.	Property Ha	$ per Ha
K. Watter	30,520	16	1,907
R. McLauchlan	92,563	60	1,543
Uniting Church of Australia (Erowal Bluecare)	34,874	26	1,341
G. Willims	38,632	39	991
K. Hopper	61,037	62	984
C. Waugh	14,521	18	807
Taylor/ P. Stevens	48,905	62	789
N. Colley	69,387	90	771
C. Cork	72,109	118	611
M. Walker	29,640	51	581
Farmhouse Macadamias	74,656	134	557
G. Muller	40,000	74	541
G. Crick/Thorne	54,995	104	529
Donovan	10,443	21	497
C. Ling	7,881	17	464
K. Thomas	34,624	80	433
N. Macleod	22,039	54	408
E. Lawley	**23,023**	**50**	**460**
S. Barlow	16,964	47	361
R. Cork	44,154	126	350
F. Woods	16,514	49	337
S. Cavanagh (C. Cork)	18,758	68	276
Sunshine Coast Council (Maleny Community Precinct)	17,754	127	140

Property/ Landholder	Total Expend.	Property Ha	$ per Ha
R. Newsham	6,168	48	128
D. Beacom	4,120	56	74
M. Daley	1,914	55	35
G. Martin	777	33	24
F. Ferriday	-	26	-
Maleny Cheese (Oehmichen) (1)	-	63	-
Cimesa & O'Connor (1)	-	22	-
K. Webster (1)	-	57	-
Nedgus Trustees	-	39	-
R. Sommers (1)	-	29	-
T. Porter	-	18	-
P. Mumford/C. Porter (2)	-	169	-
D. Barlow (1)	-	30	-
G. Newton	-	25	-
B. Gartshore	-	40	-
R. Lee	-	50	-
B. McFarlane	-	38	-
R. Tonkin	-	13	-
K. Trevor	-	20	-
C. Vermeulen	-	20	-
Montana Park	-	42	-
S. Newsham (1)	-	34	-
P. Howes & Co	-	40	-
CK. Denning (3)	-	58	-
TOTALS	**$886,972**	**2,528 (4)**	**$523 (5)**

(1) SCIP Program funding 2017-19 (Dairy, Landslide, Weeds)
(2) Proposed LBCCG CORE project (unknown implementation date)
(3) Minor activities, non-project (<$1,000 total expenditure)
(4) Total hectares of Priority properties combined. To calculate the average spend per property only the hectares on project properties has been used (1,695 ha)
(5) Average project spending per landholder

Annual raw water value per hectare = $8,108

As can be determined by the table above the Lawley property has currently received less than the average funding for a property of that size ($523 per hectare). The Lawley property is considered to be a high priority for works due to size and land use. The Keton and Malter properties are not considered to be a Priority and is reflected in the small investment provided.

3.7 ALIGNMENT WITH KEY PLANS & STRATEGIES

Reducing the risk to water quality is particularly critical for the supply of bulk drinking water to the population of south-east Queensland. All of the storages managed by Seqwater involve catchments which are developed (to varying

extents) and support active and growing communities, along with important industrial and rural economic activity. If these catchments are not managed properly, the risk of exposure to water quality hazards is heightened as development continues and the population increases. As a pre-emptive measure, Seqwater is undertaking initiatives to minimise and manage the risks to water quality in its storages. Identifying and engaging stakeholders on water quality issues is critical to developing robust risk mitigation strategies and achieving good water quality outcomes in the broader catchment (Keys 2009).

The primary area LBCCG (and other community groups) can assist in the management of risk is land use – essentially livestock grazing and the associated key issue of pathogens. A number of factors can contribute to pathogen contribution by livestock. A high likelihood ranking has been attributed by Keys 2009 to any site where the following conditions exist:

- direct animal access to waterways;
- intensive feed lots and dairies;
- heavy broad scale grazing; and
- animal deposition (including bio-solids piles) possible within 50 m of intermittent or permanent waterways.

The sheer volume of excrement produced by cattle, horses, and to a far lesser extent other domestic animals, when in large herd sizes renders them significant contributors within an open drinking water catchment (Baker 2011).

With current control measures in place, water quality is still at high risk from risk sources dominated by land use activities and human access. Key issues in this section include hazards associated with the population growth in the area and the increasing rural lifestyle and urban and peri-urban land uses. Possible future mitigation measures are dominated by improved land management practices, land acquisition (especially close to the dam's edge), reduced access to the dam wall, increased public education and enforcement, as well as monitoring and research (Keys 2009).

The project's objectives and outcomes are consistent with:

- 2015-16 LBCCG Annual Investment Strategy (Lake Baroon Catchment Care Group 2014)
- Lake Baroon Catchment Implementation Plan (AquaGen/LBCCG 2007)
- Lake Baroon Catchment Management Strategy (AquaGen/LBCCG 2004)
- Seqwater Natural Assets Management Plan – Lake Baroon Catchment (Seqwater 2012)
- Sanitary Survey of Baroon Pocket Catchment Report (Seqwater 2014)
- Catchment and In-Storage Risk Assessment for Water Quality – Baroon Pocket Dam (Seqwater 2009)
- Sunshine Coast Council Waterways & Coastal Management Strategy 2011-12 (Sunshine Coast Council 2011)
- Mary River and Tributaries Rehabilitation Plan (Mary River Catchment Coordinating Committee 2001)

4.0 IMPLEMENTATION

4.1 RIPARIAN FENCING AND REPAIR

All fencing to be completed by experienced Contractor.

4.2 RIPARIAN FENCING MAINTENANCE

Initial fencing maintenance will be completed by an experienced Contractor with the landholder assuming responsibility.

4.3 OFF STREAM WATERING - KETON

Installation of off stream water will be completed by an experienced Contractor and the landholder.

4.4 OFF STREAM WATERING - LAWLEY

Quality off stream watering materials will purchased from trusted suppliers in either Toowoomba (Toowoomba Tanks) or Kyogle NSW (Grahams Precast Concrete Products) and Beerwah (The Pump House). Installation will be completed by the landholder.

4.5 STREAM CROSSING REHABILITATION

LBCCG will supply the required road base and the landholder will be responsible for machine hire and work required to complete works.

4.6 REVEGETATION

The landholder will be responsible for all revegetation. LBCCG will provide technical advice and support including the use of planting augers and watering equipment.

5.0 ACTION PLAN

Activity Start and Completion dates are indicative only and will be dependent on weather conditions.

Mile-stone	*Action*		*Responsibility*	*Start Date*	*Completion Date*	*Measurable Output*
1	LBCCG Project Plan		LBCCG Project Manager	Apr 18	May 18	Project Plan
	Project presented to LBCCG Committee for in principle approval (emailed)		LBCCG Project Manager & Committee	May 18	May 18	Approved Plan
	Project presented to LBCCG Committee for approval (Management Committee meeting)		LBCCG Project Manager & Committee	May 18	May 18	Approved Plan
	Project Plan sent to Seqwater for final approval		LBCCG Project Manager	May 18	May 18	Approved Plan
	Pre-works monitoring (including photo points)		LBCCG Project Manager	Feb 18	Jun 18	Photo & data set
2	***IMPLEMEMNTATION***	Keton riparian fencing	Contractor, landholder	May 18	Jun 18	150 metres
3		Malter riparian fencing	Contractor, landholder	May 18	Jun 18	160 stems
4		Keton fence repair	Contractor, landholder	May 18	Jun 18	615 metres
5		Keton fence maintenance	Contractor, landholder	May 18	Jun 18	375 metres
6		Keton off stream water	Contractor, landholder	May 18	Jun 18	1 system (2 troughs)
7		Lawley off stream water	Landholder	May 18	Jun 18	2 troughs
8		Lawley stream crossing rehabilitation	Landholder	May 18	Jun 18	1 crossing
9		Malter revegetation	Landholder	Jun 18	Jun 19	1,000 stems
10	Post-works monitoring		LBCCG Project Manager	May 18	Jun 18 ongoing	Photo & data sets
	Progress Reports		LBCCG Project Manager	Jun 18	Jun 19	10 Reports
	Final Report (LBCCG/Seqwater)		LBCCG Project Manager	Jul 18	Sep 18	Final Report
	Ongoing monitoring & evaluation		LBCCG Project Manager, landholders	Jun 18	ongoing	TBD

Note – the Project Action Plan will be used as the basis for Monthly Reporting (LBCCG Management Committee meetings)

6.0 N/A

7.0 PROCUREMENT

7.1 SERVICES & PRODUCTS

The Project Manager will have the authority to engage and arrange payment for services and products for all activities once the Project Plan is approved. Any deviation over $300 from the approved Project Budget requires approval from the Project Committee. Services and products will be sourced locally wherever possible and from not-for–profit community organisations if applicable.

Note – Only LBCCG components (not including SCIP Landslide Program) listed.

Service/Product	***Supplier***	***Contact (if applicable)***
Fencing	Bald Knob Fencing	Tim Simpson
	Hicks Fencing	Guy Hicks
Off stream watering	Bald Knob Fencing	Tim Simpson
	P&K Nash Excavations	Phil Nash

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 supplier will be selected from the list of preferred suppliers. All suppliers must demonstrate full insurance and liability requirements and that all staff or personnel on site are appropriately trained and/or experienced.

8.0 HAZARD & RISK ASSESSMENT (HRA)

LBCCG has a comprehensive Safety Management System that clearly directs all aspects of Projects; Project selection (on the basis of safety), Project development, Contractor and/or volunteer engagement, Landholder expectations and requirements, Project implementation and ongoing Project monitoring and evaluation.

LBCCG adheres to the relevant legislation, policy and standard requirements:

- **AS/NZS Risk Management Standard 4360:1999**
  Establishes and implement a risk management process that involves the identification, analysis, evaluation, treatment and ongoing monitoring of risks.
- **AS/NZS 4084:2001 Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques**
  Provides guidance on the development and implementation of occupational health and safety management systems (OHSMS) and principles, and their integration with other management systems.
- ***Workplace Health and Safety Act 2011* (Qld)**
  To prevent a person's death, injury or illness being caused by a workplace, by a relevant workplace area, by work activities, or by plant or substances for use at a workplace.

8.1 ASSUMPTIONS AND LIMITATIONS

Assessment of hazard and risks associated with the project was undertaken as part of the project development process. As a result, the risks and hazards identified are based on existing information about the project at the time of writing, and proposed construction and operational features. Further risks and hazards may be identified in future stages or identified risks could be downgraded or upgraded in terms of the level of risk they pose. Additional mitigation measures as required will be developed and documented in the Implementation Risk Management Plans for the project which will need to remain live documents throughout the relevant project phases. The consideration of natural hazards is based on existing information about the project area including overlay mapping from the former Caloundra and Maroochy Shire Councils (now Sunshine Coast Council). This enables a high level assessment to be made of the risk of natural hazards in the project area, however, detailed modelling or prediction of natural hazards has not been undertaken.

8.2 IDENTIFICATION OF RISKS

Landholder to coordinate Contractors and liaise with LBCCG where required.

Hazards (and related risks) have been identified relating to the four on-ground phases of the project:

1. Fencing;
2. Off stream watering;
3. Stream crossing rehabilitation; *and*
4. Revegetation.

The project is believed to be both a safe and efficient livestock management project. All activities and phases present some level of risk however, which can be identified through a HRA so that appropriate management measures can be implemented to reduce or remove the risk.

All site visitors will be provided with a site specific induction. Contractors engaged complete with the LBCCG Project Manager, a *Contractor Field Safety Induction Form* (LBCCG Form No. 007) providing current Insurances, accreditations and acknowledgement of Contractor responsibilities.

9.0 CULTURAL HERITAGE

The Native Title Determination in November 2012 awarded the Jinibara People non-exclusive title of the Maleny area including Baroon Pocket.

The paramount legislation in Queensland, with regard to Aboriginal cultural heritage issues, is the *Aboriginal Cultural Heritage Act 2003*, which states that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the 'cultural heritage duty of care') (Section 23[1]). The Act defines cultural heritage as (S8):

- a significant Aboriginal area or Aboriginal object
- evidence, of archaeological or historic significance, of Aboriginal occupation of an area.

A significant Aboriginal area is 'an area of particular significance to Aboriginal people' because of either or both of the following:

- Aboriginal tradition
- the history, including contemporary history, of any Aboriginal party for the area (S9).

The Act states that it is an offence for a person to harm, remove or possess cultural heritage if the person 'knows or ought reasonably to know that the object is Aboriginal cultural heritage' (S26).

The Maleny area and particularly the Baroon Pocket area have significant cultural heritage values for a long period of time. Items of cultural heritage significance can be discovered anywhere in the catchment however riparian zones are a likely location.

The project will involve four activities that could potentially unearth artefacts:

1. Fencing – fence alignment will require levelling up to 500 mm deep and two metres wide, holes up to one metre deep;
2. Off stream watering – trenching up to 600 mm deep, shallow excavation up to 300 mm deep;
3. Stream crossing rehabilitation – disturbance up to 500 mm deep on banks of riparian zone; *and*
4. Revegetation – shallow holes up to 250 mm deep.

Visual inspections have not identified any artefacts. Most of the activity locations have been largely disturbed since European settlement (deforestation) and have undergone significant movement of soil layers. Visual inspection of the sites during activities will be carried out and if artefacts or suspected features are unearthed activities immediately suspended and the relevant representative contacted (Ken Murphy, Jinibara Elder).

10.0 MONITORING AND EVALUATION

10.1 INTRODUCTION

Monitoring and evaluation strategies 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. Monitoring strategies are key components of the overall evaluation process that allows you and others to learn from the project and assess whether rehabilitation aims have been met.

Furthermore, monitoring results and information will be used to:

1. Raise awareness 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, Sunshine Coast Council and other Natural Resource Management organisations.
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 management.
4. Develop cost-effective strategies and techniques to perform on-ground activities.
5. Continue to develop monitoring and evaluation program that meets the requirements of funding bodies, but also provides the relevant information and feedback to the LBCCG and Seqwater to improve project delivery.

It can be very difficult to measure outcomes as they may take many years to occur or reach the final result and can be enormously expensive to quantify – potentially far more than the actual implementation of the project. We must rely on best management practice, anecdotal evidence and sometimes partnerships with universities and/or Seqwater to produce 'hard' data to the actual effectiveness of the project.

10.2 MONITORING PROGRAM

Monitoring of rehabilitation activities, particularly the LBCCG funded component – fencing and off stream watering will be split into periodic and episodic monitoring. Monitoring of the components implemented by organisations other than LBCCG may be completed by others with reporting back to LBCCG.

Periodic monitoring is important to measure the effectiveness of the activities over time and will occur on a biannual basis by LBCCG.

Episodic monitoring will occur following significant storm/rainfall events (or extended dry periods) and will check the integrity of works (fencing and off stream watering). This may, depending on the severity of the event, be achieved by a phone call to the landholders.

Photo point monitoring will provide valuable evidence of works completion, a record of changes over time, and provide an important assessment tool to evaluate the project.

11.0 REPORTING

Project updates will be provided at monthly LBCCG meetings.

A modified version of the Project Plan (specific financial details and landholder contact details deleted) will be placed on the LBCCG website: www.lbccg.org.au. The project will also be included in the LBCCG newsletter.

Reporting will be ongoing until the monitoring phase of the project is complete (December 31, 2016). PowerPoint presentations presented at LBCCG Management Committee meetings will be converted to PDF and placed on the LBCCG website and forwarded to Seqwater.

12.0 REPONSIBILITIES & ROLES

The Project Manager will be responsible for project implementation, management, reporting, evaluation and general management of the project. Other contributions will be on an as-needed basis and the following register of roles will ensure the project is implemented efficiently, effectively and follow best practice.

Role	***Individual***	***Organisation***
Project Manager	Mark Amos	LBCCG
Project Owner	Peter Stevens	LBCCG (President)
Project Committee	tbc	LBCCG (Management Committee)
	tbc	
	tbc	
Technical advice	Tim Simpson	Contractor
	Matt Bateman	LBCCG Project Officer
	Paul Mackay	LBCCG Project Officer
	Alan Wynn	Sunshine Coast Council
	Tim Odgers	Seqwater

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