



Lake
Baroon
Catchment
Care
Group

Working with our community...for our waterways

Projects 2019-20

Lower Bridge Creek Riparian Fencing



PROJECT PLAN

Project No. 1920-002

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

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How to read this Plan

This Plan is split into five sections.

PART A: Executive Summary (pp. 4-5) is a two page brief description of the project and includes summarised details of the stakeholders, budgets, outputs and outcomes.

PART B: Project Background and Previous Stages (pp. 6-8) provides useful background information and summarises projects that have occurred on the property and nearby since 2000.

PART C: Project Plan (pp. 9-29) outlines the implementation of the latest Stage project.

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DOCUMENT VERSIONS & APPROVALS

<i>Version</i>	<i>Date</i>	<i>Version/Description</i>	<i>Result</i>
1.0	28/2/ 2020	Draft LBCCG Project Proposal completed. Project emailed to LBCCG Committee for comments.	n/a
1.0	13/3/2020	Project Plan will be presented at March LBCCG Management Committee meeting for approval.	Approved (minutes 124.7.4.2)
1.0	9/3/2020	Project Proposal forwarded to Seqwater for approval (email)	Approved 9/3/2020

AUTHORISATIONS

<i>Name</i>	<i>Signature</i>	<i>Date</i>
Prepared by: Luke Ferguson – Project Manager, LBCCG		28/2/2020
Approved by: LBCCG Management Committee (signed by Peter Stevens – President)		12/3/2020
Endorsed by (Seqwater):		
Approved by (Seqwater):	<i>Joel Hodge (email)</i>	9/3/2020

Cover: Bridge Creek running through the property.

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PART A EXECUTIVE SUMMARY**PROJECT NUMBER & TITLE: 1920-002 Lower Bridge Creek Riparian Fencing**

Lower Bridge Creek Riparian Fencing will be implemented in a high priority Management Unit, that delivers high volumes of nutrients and likely high levels of faecal material (*E.coli* and pathogens) to Bridge Creek and ultimately Baroon Pocket Dam. The landholder recently purchased the ex-Morris property, a 27.1 hectare property that will be managed in conjunction with the landholder's existing adjoining block (30 hectares), at 33 McLean Road, Maleny. The property has 270 metres of Bridge Creek frontage. The block has not been grazed for many years, however the new owners intend to recommence grazing shortly. At present livestock would have access to all riparian zones on the property and a lack of internal property fencing will result in animals spending long periods in these areas grazing, drinking and loafing.

The proposed project will manage livestock in riparian zones, install alternative livestock watering points that will improve livestock management (split property into more paddocks) and pasture health, reduce erosion and will stop a reliance on natural watercourses for stock water. The project primarily aims to reduce livestock access contact with streams, and will also assist the landholder in protecting riparian zones, through targeted weed control.

APPLICANT/LANDMANAGER DETAILS

Names	
Postal Address	
Phone Number	
E-mail	

PROJECT / SITE LOCATION

Property Name & Address	
Latitude/longitude	
RP Numbers (Lot)	
Property Size	57.1 hectares total (two properties)
Land-use & stock carried	Beef (60)
Sub-Catchment/MU	Bridge Creek BR3
M.U. Priority (LBCCG IP)	Low
M.U. Priority (Pollution)	High
Water Quality (ANZECC) (Trail 2007)	70 % of samples between 1994-2005 exceeded ANZECC guideline levels

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group (Seqwater 2018-19 CORE Project Funding)	On ground project implementation (\$15,492)
Lake Baroon Catchment Care Group (Seqwater 2018-19 CORE Administration Funding)	Project coordination, administration, reporting, monitoring & evaluation (In kind \$8,341)
Bridge Creek Connections (Community Sustainability Action Grants)	Project funding and technical advice (\$2,000)
Landholder	Landowner, labour, cash and in-kind contributions (\$23,402)

PROJECT DETAILS

Start Date	Mar 2020	Completion	June 2020	Duration (implementation)	1 year
OUTPUTS					
Riparian fencing	320 metres	Off stream water	2 troughs & 1 tank		
Weed management	2 hectares	Landslip exclusion fencing	650 metres		
Stockyard bunding	50 metres				
OUTCOMES					
Length of watercourse fenced (stock managed)	320 metres				
Area excluded to livestock (unstable slopes)	11 hectares				
Priority Property engagement	1 new property				
Area of land under improved management	57 hectares				

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 property lies in a high priority sub-catchment (LBCCG Management Unit) in the Bridge Creek catchment – MU BR3. This MU is characterised by steep slopes, heavy black cracking clays, some intensive livestock grazing, and numerous permanent and ephemeral watercourses fed by springs and soaks. As a result, the Management Unit contributes very high volumes of sediments generated by large landslips, high levels of nutrients (and likely pathogens) from livestock.

The proposed project aims to complete five components:

Activity		Description	Funded by
Off stream watering infrastructure	Trough	2	LBCCG CORE
	Tank	1	LBCCG CORE
Riparian fencing		320 metres	LBCCG CORE
Stockyard bunding		50 metres	LBCCG CORE
Weed management		2 hectares	Landholder/Community Sustainability Action Grants
Landslip exclusion fencing		650 metres	Landholder

Note: the project was identified as a Preferred Project in the LBCCG 2019-20 Annual Work Plan.

PART B BACKGROUND & PREVIOUS PROJECTS

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 producing high quality, competitively priced potable water for the Sunshine Coast (and greater South east Queensland) region.

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

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 shared aim of reducing risks to water quality from erosion, nutrients and pathogens and impacts on native vegetation from livestock and invasive species, the activities to install riparian fencing, off stream watering, the control of invasive environmental weeds and the revegetation of unstable slopes and watercourses are considered sensible to support.

ii. BACKGROUND

The Bridge Creek (including Alcorn Creek) catchment has been targeted for on ground activities for many years, as this sub-catchment is recognised as delivering high volumes of sediment, nutrients and other contaminants. Additionally, there has always been strong support for water quality projects (usually delivered as revegetation activities) in the area.

The Lake Baroon Implementation Plan (2007) considered this part of the catchment as low priority for works as it was deemed too costly to achieve worthwhile water quality gains. However, 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 considered, the Management Units are considered High Priority, with 70% of samples exceeding ANZECC guideline levels 1991-2005 (Traill 2007).

Bridge Creek despite having 43% vegetation cover, still provides high levels of nutrients to Lake Baroon. This is primarily due to the very steep nature of the catchment, very high incidence of landslip and erosion and degraded riparian zones that do not adequately filter run off. Management Unit BR3 delivers high levels of nutrients due to landslips and excessive erosion liberating naturally occurring nutrients (phosphorus) and intensive beef grazing. The limiting of livestock contact with naturally occurring streams, protection and enhancement of riparian zones, and stabilisation of land slips are a priority in the Bridge Creek MU BR3.

iii. PREVIOUS PROJECTS IN AREA/CATCHMENT

Previous major LBCCG projects in the immediate location include:

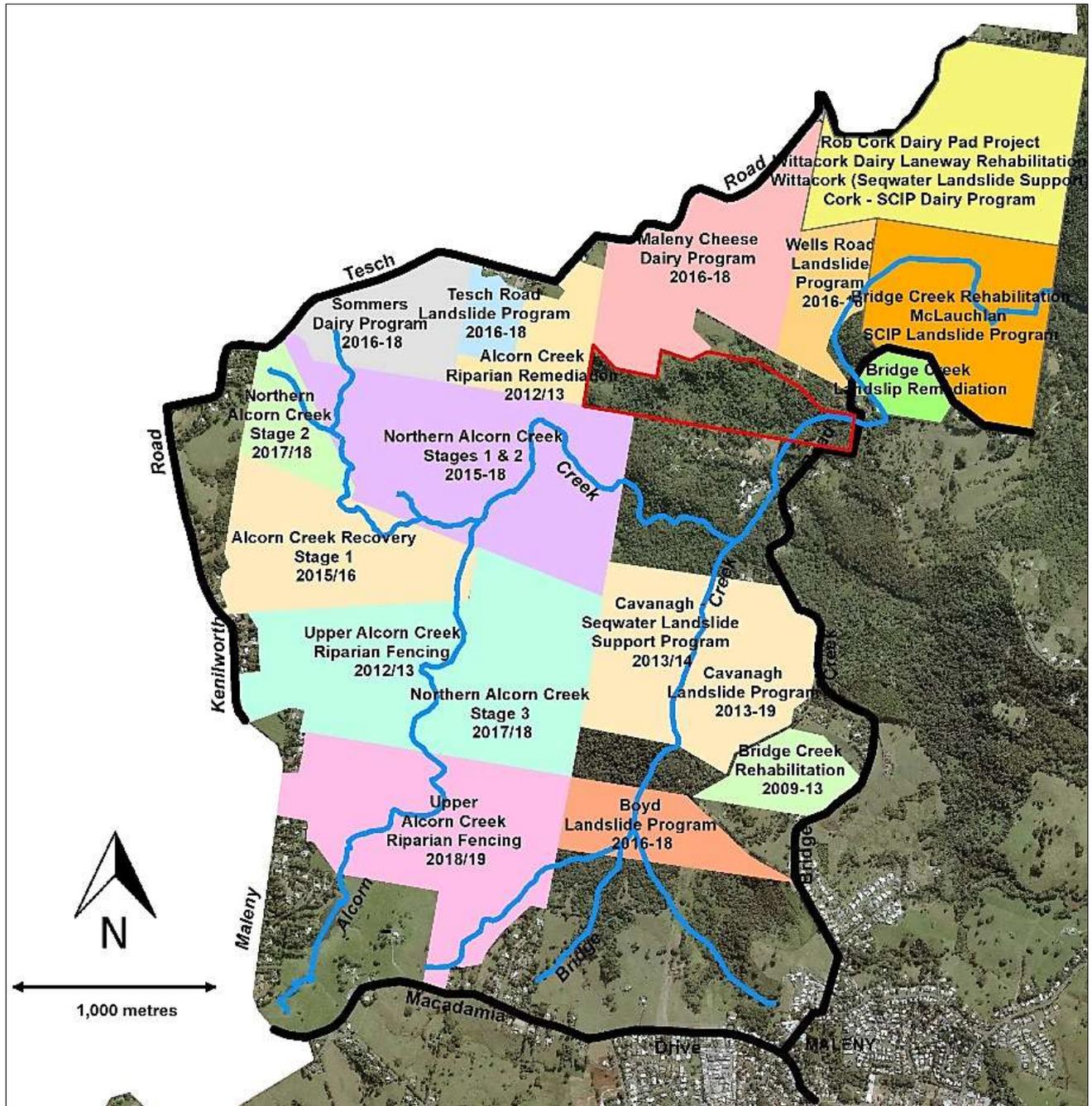
Project Name	Years implemented	Project outputs	Total Project Value
Bridging the Gap* (Barung Landcare project)	circa 2000	Riparian revegetation	?
Rob Cork Dairy Pad Project (CORE)	2008-09	Dairy apron concreting	\$23,709
Wittacork Dairy Laneway Rehabilitation (CORE)	2009-10	Laneway rehabilitation, dairy apron concreting	\$23,718
Bridge Creek Rehabilitation (McLauchlan) (CORE)	2009-14	Riparian fencing & revegetation, laneway rehabilitation, landslip revegetation, dam overflow rehabilitation, stream crossings	\$126,471
Bridge Creek Landslip Remediation (CORE)	2010-11	Landslip fencing & revegetation, drainage	\$26,651
Alcorn Creek Riparian Remediation (CORE)	2012-14	Riparian fencing and revegetation (landslip & riparian)	\$25,637
Wittacork (2013-14 Seqwater Landslide Program Support) (SCIP)	2013-14	Drainage, off stream water, laneway rehabilitation, concrete ford	\$35,938
Landslide Program (Wittacork) (SCIP)	2013-19	Landslip fencing & revegetation	\$50,000
Landslide Program (McLauchlan) (SCIP)	2015-19	Landslip fencing & revegetation	\$50,000
Alcorn Creek Recovery – Stage 1 & 2 (CORE)	2015-17	Riparian fencing, stream crossings, laneway rehabilitation and landslip remediation (drainage, fencing and revegetation)	\$161,358
Lawley Creek Tributaries Partnership (CORE)	2017-18	Riparian fencing, Off stream watering, stream crossing & revegetation	\$44,272
Dairy Program (Sommers) (SCIP)	2016-19	Off stream water, laneway rehabilitation, fencing	\$41,418
Landslide Program (Cimesa & O'Connor) (SCIP)	2016-19	Landslip revegetation, stream crossings, weed management	\$80,000
Dairy Program (Wittacork) (SCIP)	2016-19	Off stream water, laneway rehabilitation, fencing, effluent management	\$77,922
Dairy Program (Maleny Cheese/Bucher) (SCIP)	2016-19	Off stream water, laneway rehabilitation, fencing	\$36,140

* not an LBCCG project although the Group was involved in the on-ground activities.

Note - Total Project Value is the full value of the project including all contributors, in-kind and landholder contributions.

CORE – the LBCCG CORE Agriculture Program is the ongoing base funding LBCCG receives from Seqwater to implement on ground projects on catchment properties. Prior to 2015 projects primarily targeted dairy, beef and horticulture although landslides and weeds were also included on properties where grazing was the dominant land use.

SCIP – the Source Catchment Improvement Programs are specific programs to address catchment issues: Dairy, Landslides and Weeds. These programs commenced in 2015.



LBCCG projects since 2008 in the immediate area of the proposed project. Note the map indicates the property that individual projects occurred on – not the actual on-ground activity. Proposed project property is identified by red border.

PART C PROJECT PLAN**1.0 WHAT***(What activities will be implemented?)*

This project is a relatively small and simple series of activities that takes advantage of a recent change in ownership of an LBCCG Priority Property. The project will improve the management of livestock on a rural property through activities that reduce impacts on farm water quality.

The proposed project aims to complete four components before June 30, 2020 (weather dependent).

Activity		Description	Funded by
Off stream watering infrastructure (troughs)	Troughs	2	LBCCG CORE
	Tank	1	
Riparian fencing		320 metres	LBCCG CORE
Stockyard bunding		50 metres	LBCCG CORE
Weed management		2 hectares	Landholders/ Community Sustainability Action Grants
Landslip exclusion fencing		650 metres	Landholder



The property is located in the lower catchment of Bridge Creek. Don has invested a large amount of money returning the property to grazing condition. Opening up flats to grazing that were previously lost to woody weeds and regrowth vegetation.

2.0 WHERE

(Where in the catchment will the project occur?)

The project will be implemented on property in the Lower Bridge Creek catchment.

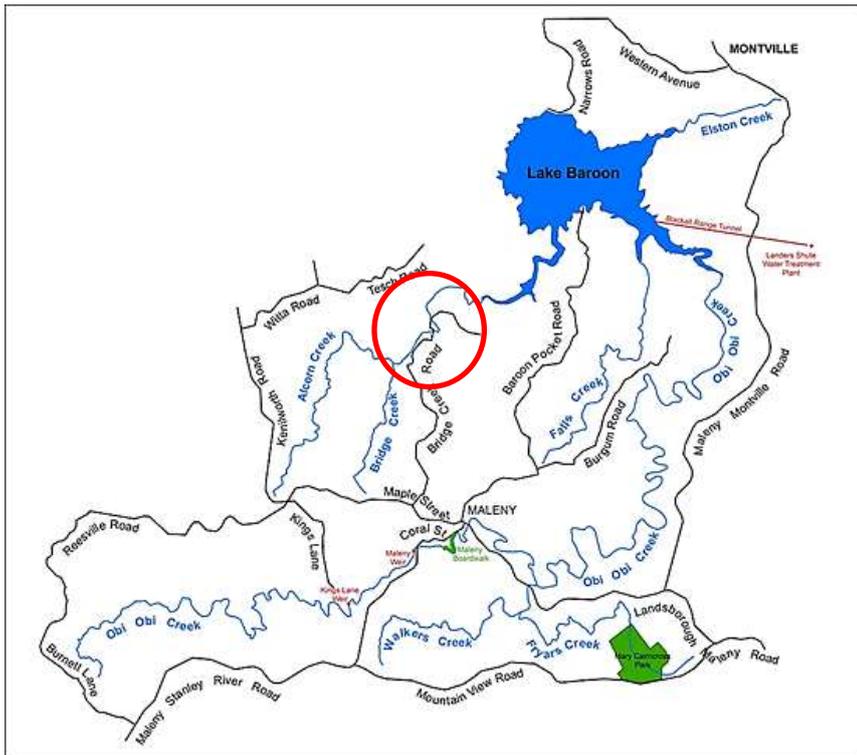


Property is approximately 27 hectares, and will be run in conjunction with an adjoining block on McLean Road. The property comprises of the following:

- 21 ha of remnant, regrowth and other vegetation including woody weeds;
- 5.7 ha of open pasture; *and*
- 0.30 ha dwellings, sheds.

Bridge Creek flows through the property with a total length of approximately 270 metres. There is another significant unnamed watercourse that feeds into Bridge Creek. This watercourse is 800 metres long, however, due to excessively harsh terrain this creek will not be fenced. Lower Bridge Creek supports a moderate coverage of vegetation remnant and regrowth. The property has had recognised landslides that have occurred previously on the block.

2.1 LOCATION



The property is located in LBCCG Management Unit BR3. This MU lies in the Lower Bridge Creek catchment in an area of intensive beef grazing and highly vegetated lifestyle blocks. The establishment of riparian buffers and improved land management is a priority for LBCCG in this sub-catchment.



Currently along Bridge Creek there is good riparian and aquatic vegetation. However, when the property is stocked, cattle will have unrestricted access to the creek, increasing the risks of sediment, pollutants and faecal matter entering Bridge Creek.

2.2 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.

2.3 THE BRIDGE CREEK CATCHMENT

The Bridge Creek catchment comprises of 2,134 ha, constituting approximately 31 % of the Lake Baroon Catchment and consisting of 52 kilometres of waterways. Bridge Creek is characterised by its cleared steep slopes with many devoid of stabilising vegetation (cleared for grazing). 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 (43% vegetation cover) and most of the waterways have good riparian vegetation, the sub-catchment contributes high volumes of sediments, nutrients and likely pathogens to Baroon Pocket Dam (Dunstan 2007).

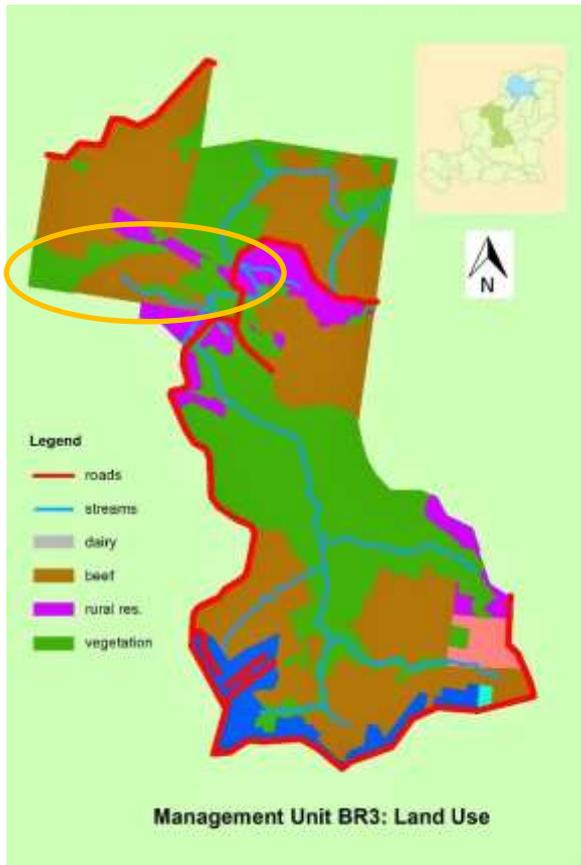
Dairy grazing was the dominant land use in the Bridge Creek catchment until relatively recently (2000) however due to the widely varying topography and soils (and consequently relatively poorer pasture), dairy grazing has been reduced to three properties (Somers, Oehmichen [recently leased by Maleny Cheese to run dry dairy cattle] and R. Cork).

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

2.3.1 Land-use in Management Unit BR3

The property is situated in the Management unit BR3. BR3 covers an area of 518 hectares with beef grazing and conservation equally dominant land uses with dairying (albeit dry dairy cow grazing - 7%) and rural residential a small but significant use at 6% (LBCCG assessment 2015). Riparian cover is present along 40% of the creeks (mainly through the middle reaches, some of which is remnant vegetation, including *Of Concern* and *Endangered Regional Ecosystems*) (Dunstan 2007). LBCCG and other organisations such as Barung Landcare and SCC Land for Wildlife have been very active in the area since 2000.

Bridge Creek despite having 43% vegetation cover still provides high levels of nutrients to Lake Baroon. This is primarily due to the very steep nature of the catchment, very high incidence of landslip and erosion and degraded riparian zones that do not adequately filter run off. Management Unit BR3, delivers high levels of nutrients, 70% of samples exceeded ANZECC guideline levels (Dunstan 2007), due to landslips and excessive erosion liberating naturally occurring nutrients (phosphorus), and intensive beef grazing. The limiting of livestock contact with naturally occurring streams, protection and enhancement of riparian zones, and stabilisation of land slips are a priority in this MU.



Major land use in MU BR3 include beef grazing (40%), conservation lifestyle blocks (40%) and rural residential (6%).

2.3.2 Land use and property management

The property is a moderate sized parcel of land with good access to water from Bridge Creek. The property has not been grazed for many years. Woody weeds and regrowth vegetation have been allowed to invade the property. Don has invested a large amount of money returning the property to grazing condition. Although a considerable amount of vegetation has been lost, the stands of remnant vegetation remain along Bridge Creek and a short tributary draining the steep slopes on the western side of the property. With grazing soon to be resumed on the property it would be beneficial to ensure Bridge Creek is fenced to provide buffers to grazing and protect riparian (remnant) vegetation along the streams.

The property will be run in unison with the adjoining block on McLean's road. The two properties combined area will give the approximately 57 ha of beef grazing country, which equates to around 11 % of the area in Management Unit BR3. Approximately 60 head of beef cattle are planned to be grazed across the two properties.

3.0 WHY

(What benefits will the project provide?)

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.

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 enhancing property management. 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 by providing a range of other environmental outcomes, generates support from other funding providers.

3.1 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 project's objectives and outcomes are consistent with:

- 2018-19 LBCCG Annual Investment Strategy (Lake Baroon Catchment Care Group 2018)
- Lake Baroon Catchment Implementation Plan (AquaGen/LBCCG 2007)
- Seqwater Natural Assets Management Plan – Lake Baroon Catchment (Seqwater 2012)
- Sanitary Survey of Baroon Pocket Catchment Report (Seqwater 2015)
- 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)
- Lake Baroon Catchment Management Strategy (AquaGen/LBCCG 2004) *see below*

3.1.1 Priority Actions for Bridge Creek and Project Objectives

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 implement.

Priority Actions for Bridge Creek

Priority Action (AquaGen 2004)	Project activities to address Priority Action	Objectives met by project
1. Revegetate first order streams throughout the sub-catchment to maximise buffer capacity and reduce erosion potential.	n/a (Bridge Creek is a 3 rd Order stream)	n/a
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.	a) Fencing of Bridge Creek to manage livestock access; b) Installation of alternative livestock water; c) Weed management to improve natural recruitment of native flora	<ul style="list-style-type: none"> reducing erosion of the bed and banks of Bridge Creek reducing turbidity and sedimentation; reducing direct faecal deposition (nutrients and pathogens) to Bridge Creek and enhance the buffer to overland flows;
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.	n/a	n/a
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.	a) Installation of alternative livestock water – positioning of troughs in the centre of paddocks	<ul style="list-style-type: none"> improves 'even' grazing, reducing risk of over grazing and resultant non-point source erosion. improving livestock management (important for gaining and maintaining landholder acceptance and engagement); build land manager engagement (including Priority Properties);
5. Actively support SCC Land for Wildlife, NRM Small Grants Scheme (now Landholder Environment Grants) and legal covenant agreement initiatives that protect and rehabilitate remnant vegetation and enhancement projects.	a) State – Community Sustainability Action Grants	<ul style="list-style-type: none"> control agricultural and environmental weeds; enhance wildlife habitat and corridors; protect remnant and good quality native vegetation;
6. Reduce faecal counts within the Bridge Creek catchment by	n/a	n/a

targeting education programs to residents to address existing on-site effluent and wastewater disposal systems and their maintenance requirements.		
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3.2 WATER QUALITY

The environmental health of the Lake Baroon catchment is considered generally poor, and in some respects declining (personal communication 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 originate 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.

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.

- Turbidity levels exceeded guideline levels (ANZECC) only once, however it is unlikely the sampling program accurately captured rainfall events (the topography of the catchment means flood waters rapidly disperse when rainfall ceases and it is unlikely sampling occurs during peak flows);
- Nitrate levels exceeded the guideline value, 46% of the time.;
- 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 declining during the sampling period.

Parts of Bridge Creek are rugged and remote with several large primary production properties located on the western side of the catchment (Alcorn Creek). Access can be difficult when dry and impossible during wet weather – particularly in the 1990s/early 2000s - therefore AquaGen sampling sites were confined to the very upstream (Porters Farm) and downstream on Wells Road close to where the creek enters Lake Baroon. A short lived (1994-98) site on Wilson’s Farm (unknown location) provides some mid-section data however this almost mirrors the data collected at the Wells Road site. The Wells Road sampling site is a short distance upstream of the project site, providing a useful source of data.

The routine sampling programs (CalAqua, AquaGen, Seqwater and others) are suspected of not adequately capturing the major pollution events that regularly occur in the catchment. Conducted either monthly (1991 – 1998) or bi-

monthly (1999 – 2005), significant rainfall events in the catchment have probably been missed and the data collected may over-estimate the catchment’s water quality (Traill, 2007).

As previously mentioned Wells Road 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.

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). This is evidenced by the lack of turbidity results.



Most of the streams in the Lower Bridge Creek catchment are unfenced to livestock (required for stock water) and the sub-catchment provides high levels of pollutants associated with intensive agriculture (grazing) – nutrients and E.coli.

3.3 OPTIONS ANALYSIS

Proposed option highlighted.

Option	Description	Benefits/Cons	Estimated remediation cost
Do nothing	Current livestock management continues with cattle having unrestricted access to Bridge Creek for water, grazing and shade.	No water quality or environmental improvements. Likely deterioration over time as bank and bed stability continues to decline.	\$0
Install off stream watering (OSW) only	Troughs are placed well away from watercourses in all paddocks.	Troughs reduce time cattle spend in riparian zones, resulting in reduced faecal matter inputs and likely pathogens. Cattle will still graze riparian zone unrestricted and are likely to utilise the shade for loafing/resting. Unrestricted grazing limits natural regeneration of native species.	\$4,500
Install riparian fencing only (Bridge Creek)	Fencing to manage grazing of riparian zone.	Significantly reduces livestock access to riparian zone. Not currently feasible - no alternative livestock water sources on Northern side of Bridge Creek. Requires OSW.	\$6,500
Install riparian fencing, OSW and weed control	Fencing to manage grazing (Bridge Creek) and installation of OSW for alternative livestock water. Control weeds in riparian zone and throughout the property	Ideal option, greatest value for money in relation to return from money invested. Reduces erosion of bed and banks of creeks, reduces faecal matter inputs and provides a buffer to overland flows that carry faecal matter. Permits natural regeneration of the riparian zone, with native vegetation.	\$43,000
Install OSW, riparian fencing (Bridge Creek), fencing one side of riparian zone (ephemeral creek), revegetation of fenced area.	Fenced riparian zone (Bridge Creek) and fencing to manage grazing over the ephemeral creek. revegetated with diverse range of local flora species (3 hectare).	Additional fencing of ephemeral creek will reduce cattle in riparian zones by 50%. Reduces erosion of bed and banks of creeks, reduces faecal matter inputs and provides a buffer to overland flows that carry faecal matter. Permits revegetation of the riparian zone. Very expensive, extra 500 m of fencing, with 3 ha of revegetation. Will take several years for revegetation to be completed.	\$132,500
Install OSW, riparian fencing (Bridge Creek), riparian fencing (ephemeral creek) with 100% stock exclusion. Revegetation of fenced area.	Fenced riparian zone revegetated with diverse range of local flora species (2 hectare).	Reduces erosion of bed and banks of creeks, reduces faecal matter inputs and provides a buffer to overland flows that carry faecal matter. Permits revegetation of the riparian zone. Very expensive, 1.3km of fencing, with 2 ha of revegetation. Will take several years for revegetation to be completed.	\$109,400

4.0 HOW

(How will the activities be implemented?)

Activity/works	Description	Benefits	Responsibility & Contractor
1. Off stream watering	Install of 2 x 6' concrete troughs strategically placed throughout the property. Install a header tank, and utilise Bridge creek to pump water. Trench 40 mm poly pipe to a depth of 400 mm minimum.	Provides alternative water source for stock enabling fencing of Bridge Creek (2019/20) riparian zone.	LBCCG - Langdale Stud (Tim Simpson) P & K Nash (Phil Nash)
2. Riparian fencing (Bridge Creek)	Fence entirety of Bridge Creek on the property. Fencing will consist of four barbs; timber split posts at four metre spacing and timber strainers. Steel 3.6 metre gates.	Management of livestock in riparian zone dramatically reducing faecal matter (pathogen and nutrient) inputs, sedimentation and turbidity and other environmental benefits. Permits regrowth of riparian vegetation and protects existing vegetation.	LBCCG - Langdale Stud (Tim Simpson)
3. Weed management & riparian regeneration	Natural regeneration of Bridge Creek riparian zones with a diverse range of native species. Management of woody weeds in riparian zone – devils fig, camphor laurel, lantana and others.	Optimal management of riparian zones with total livestock exclusion. Provides numerous long term water quality and other environmental benefits (wildlife corridors, habitat etc).	Landholder / Community Sustainability Action Grant
4. Landslip exclusion fencing	Steep, unstable hillslopes on the western side of the property fenced to exclude livestock with no weed management.	All vegetation (both native and weeds) retained to maintain stability. Despite heavy coverage of woody weeds (primarily lantana) the area does provide some habitat value and could be considered a wildlife corridor between the lower and upper Bridge Creek catchment.	Landholder
Stockyard Bunding	Establishment of a bunding wall around the cattle yards, and laying of turf to assist in bund revegetation.	The bund wall will prevent the direct flow of faecal matter, nutrients and chemicals into Bridge Creek. Turf laid will help filter runoff of faecal matter, nutrients and chemicals, captured by the wall.	LBCCG CORE

4.1 Riparian fencing

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.

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 Bridge 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).



The banks along Bridge Creek, most of the creek is straightforward to fence with relatively gentle banks. Currently livestock have unmanaged access to the stream.

4.2 Off stream watering

Even without 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 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 (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 (McIver 2004). Porath et al. (2002) also found that the provision of supplements in association with alternative watering points increased weight gain in cows and calves.



Proposed pump site in Bridge Creek on the property that will supply the off stream watering system, consisting of two troughs and a header tank.

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 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.



The header tank site just above the cattle yards. The tank will supply water from the Bridge Creek once the creek is fully fenced and cattle excluded.

4.3 Weed management

Weeds are one of the major threats to the natural environment. Major weed invasions change the natural diversity and balance of ecological communities. These changes threaten the survival of many plants and animals because the weeds compete with native plants for space, nutrients and sunlight often choking our natural waterways (Department of Agriculture, 2020). Normally LBCCG does not actively manage woody weeds in riparian zones as any vegetation in riparian zones is better than none (except for a few key species that have a detrimental impact on water quality).

The Bridge Creek riparian zone has a low to moderate coverage of woody weeds, primarily lantana, devil's fig and camphor laurel. Targeted weed control now, will prevent the build-up of the weed seed bank, and will assist in stopping the spread of weed seed, allowing for easier control of weeds in the future. The weed component of the project will be completed by the landholder with assistance and support from Bridge Creek Connections – Community Sustainability Action Grant. LBCCG will provide additional advice as required.



Riparian vegetation on the upstream reach of Bridge Creek is impacted by woody weeds, primarily lantana.

4.4 Landslip exclusion fencing

Excluding livestock from landslip-prone hillslopes reduces tracking - the formation of rutted paths leading up and across slopes. Tracking concentrates runoff down steep slopes potentially causing gully formation or direct flows to undesirable areas such as to landslips springs increasing instability. The exclusion of stock and abandonment for grazing should result in less weed management, recognising that any woody growth on unstable slopes is beneficial. Currently the hillslope is relatively stable – the least disturbance is preferential. If the hillslopes show signs of movement it may be necessary to reassess the site for landslide remediation works.

4.5 Stockyard bunding

Bunds are also referred to as contour banks. The function of bunds is to intercept runoff and safely channel it into stable grassed waterways, natural depressions, or grassed areas adjacent to a paddock. Bunds play an important role in soil conservation and therefore water quality by acting as sediment traps. Up to 80% of the soil moved from a contour may be deposited in the contour bank channel (Freebairn and Wockner, 1986). The rate of deposition and filtration of nutrients and pesticides is greatest when the channel contains a close growing crop or stubble (Carey et al., 2015).

A bunded wall will be built below the landholder's cattle yards to capture runoff and prevent the direct entrance of faecal matter, nutrients and pesticides into Bridge Creek. This bund will capture the runoff originating from the cattle yards, where the runoff water velocity will be slowed. Turf laid in the main channel of the bund will increase the bunds efficiency to trap sediment and filter the runoff water, before entry into Bridge Creek.

4.6 Future Stages and Activities

After completion of the 2019/20 planned works there are no further planned activities. The landholder expressed that he will continue to undertake weed and vegetation management and further internal fencing, to keep his block in good condition for grazing cattle. All of this work will be undertaken at the landholder's expense. LBCCG will continue to provide advice and ideas to the landholder, to help maintain the reduction of risk to water quality.



Bridge Creek on the property. The landholders have shown interest in continuing internal fencing and the natural regeneration of the riparian zone.

5.0 WHEN*(When will the activities be implemented?)***5.1 SCHEDULE & MILESTONES**

Milestone	Action	Completion Date	
1	LBCCG Project Plan (Stage 1) completed and approved, pre works monitoring completed	Mar 20	
2	IMPLEMENTATION 2019/20	Off stream watering	Jun 20
		Riparian fencing	Jun 20
		Weed management (landholder/ Community Sustainability Action Grant)	Jun 20
		Landslip exclusion fencing	Jun 20
3			
4	Post-works (LBCCG/Seqwater funded components) monitoring completed, Final Report	Jul 20	

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

5.2 MONITORING, EVALUATION & REPORTING

Monitoring of rehabilitation activities, will be split into periodic and episodic monitoring. 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). 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.

Groundcover monitoring both within the fenced riparian zones and in the adjacent grazed paddocks will assist with evaluation of the effectiveness of riparian zone fencing and revegetation providing a buffer to overland flows.

Project updates will be provided at monthly LBCCG meetings.

A modified version of the Project Plan (specific financial details and landholder contact details deleted) may be placed on the LBCCG website: www.lbccg.org.au.

Project will be reported on in the LBCCG Annual Work Plan (to Seqwater and Sunshine Coast Council) and Annual Reports (LBCCG members and placed on LBCCG website).

6.0 MAP



Lower Bridge Creek Riparian Fencing

Lake Baroon Catchment Care Group (LBCCG) does not warrant the correctness of this plan or any information thereon. LBCCG accepts no liability or responsibility in respect of the plan and any information or inaccuracies thereon. Any persons relying on this plan shall do so at their risk. This map must not be reproduced in any form whole or part without the express written consent of the LBCCG.
 Data shown in Map Grid of Australia coordinates Universal transverse mercator, Zone 56)
 Note – Logos used do not equate to endorsement of this Plan.
 Map prepared by Luke Feguson

Legend	
	Poly Pipe
	Roads
	Bunded Wall
	Property Boundary
	Riparian Fencing
	Internal Landship Exclusion Fence
	Bridge Creek
	Water Trough
	Cattle Yards
	Header Tank



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.

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