Lake Baroon Catchment Care Group

natural solutions
environmental consultants

Lake Baroon Catchment Care Group

Final Report

Large Scale Waterway Rehabilitation Business Case

May 2007

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Revision No.	**Author**	**Reviewer**	**Approved for Issue**	
			Name	**Date**
1	Steve Dudgeon/Murray Dunstan	Kristy Gentle	Steve Dudgeon	1 May 2007

Natural Solutions Environmental Consultants Pty Ltd

Sunshine Coast Office
PO Box 1522 | Noosa Heads QLD 4567
Tel: 0437 545 528

Brisbane Office:
Suite 16, Level 2 Central Brunswick,
Cnr Brunswick & Martin Sts, Fortitude Valley Qld 4006
PO Box 1156, Fortitude Valley Qld 4006
Tel: (07) 3124 9400
Fax: (07) 3124 9499

Cairns Office:
Level 2, 26 Florence Street, Cairns Qld 4870
PO Box 6935, Cairns Qld 4870
Tel: (07) 4041 3522
Fax (07) 4051 4141

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1.0 EXECUTATIVE SUMMARY

Natural solutions were engaged by Lake Baroon Catchment Care Group to provide a Large Scale Waterway Rehabilitation project business case.

There has been and a systematic transparent planning process and significant work undertaken by the group to justify implementation of on ground works.

Some of the work to date includes aligning Natural Resource Management (NRM) targets from the local catchment management strategies with broad scale NRM plans, prioritisation of waterway reaches using best management practices and development of method, objectives and criteria for site selection for large scale rehabilitation.

This business case provides justification for undertaking this type of work, cost estimates of potential works, a decision support system to select a large scale rehabilitation site, a succinct planning processes flow chart, example project management briefs and plans. In addition a detailed Gantt chart is available for viewing electronically in Microsoft project.

Key justification results from local modeling, analysis and literature review are provided below:

- Reduction of sediments and nutrients entering the waterways from adjoining land by up to 45%;
- Sequestration of 104 tones of Carbon (equivalent to running 10 vehicles for ten years);
- Provide Compensatory Habitat (project would provide approximately 10% of lost upstream habitat); and
- Achieves two of the Aquagen corporate plan outcomes and three proposed strategies from the current Aquagen Operational Plan.

This work provides a transparent and quality assured process. It ensures that resources are committed in the most cost effective manner with the highest likelihood success. It also provides the justification for selection of sites and commitment of resources, in a fair and equitable manner, to the broader community.

The highest priority reaches / sites for large scale rehabilitation are listed below (See **Figure 1**).

1. WA2 located at the mouth of Walkers Creek on Maleny Landsborough Rd; and
2. LE2 located in the headwaters of Lexys Creek on Maleny Montville Rd.

Rehabilitation works can be carried out on either of the priority sites within a budget of $100,000.

The project can be evaluated by undertaken biophysical assessment before and after implementation. Biophysical assessment is a rapid and cost effective method of assessment. The method recommended is based on the Land and Water Guidelines for Protecting Australian Waterways (2002) and was used in the Maroochy Waterway Management and Rehabilitation

plan. The method provides biophysical values based on a combination of 16 ecological, geomorphological, and hydrological and water quality indicators.

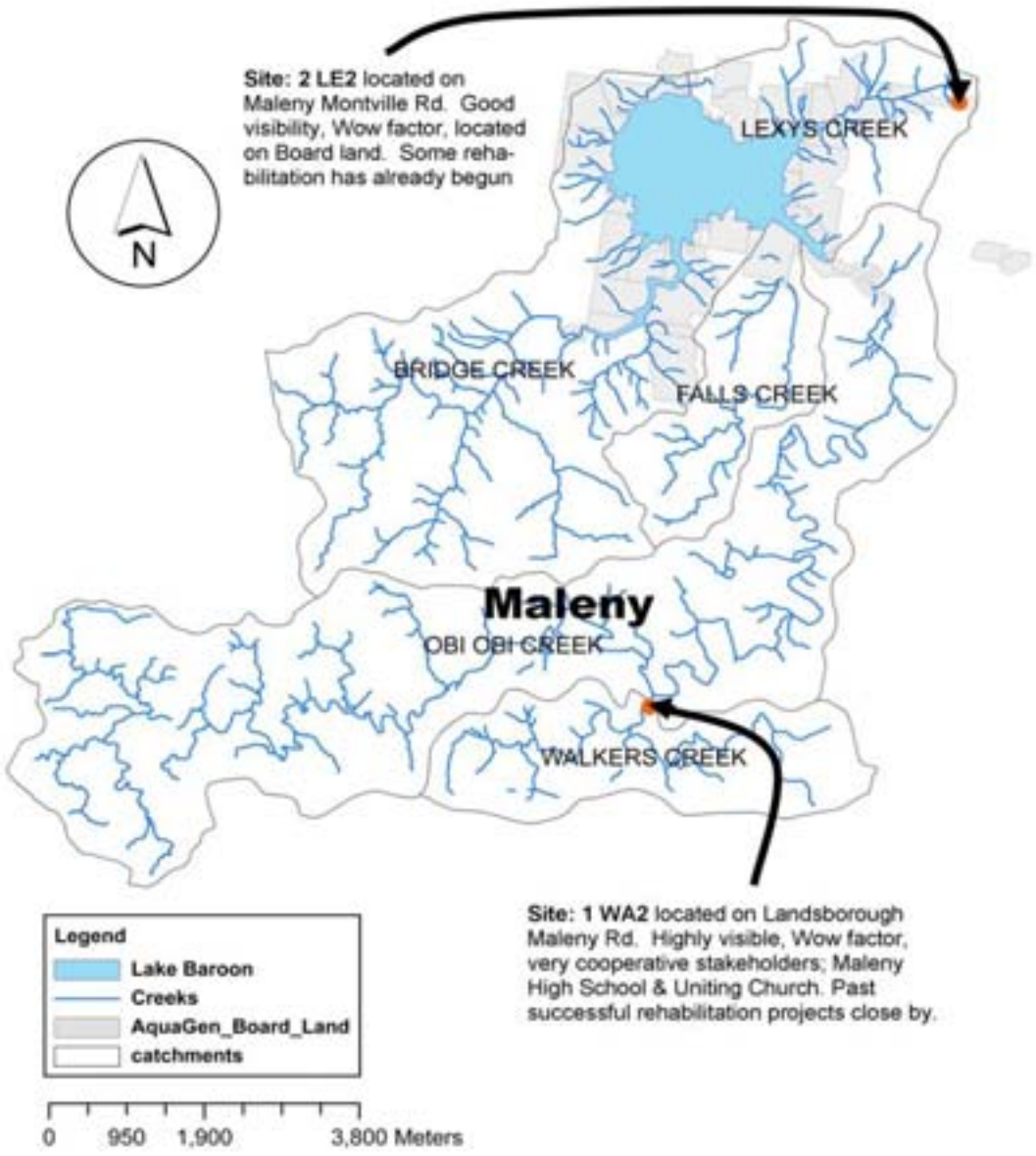


Figure 1 Map Indicating Selected Reaches for Large Scale Rehabilitation

2.0 INTRODUCTION

Natural solutions were engaged by Lake Baroon Catchment Care Group to provide a Large Scale Waterway Rehabilitation project proposal.

The Project Proposal Business Case is usually the first document outlining what change is proposed. It is the document that converts an idea or policy into the details of a potential project, including the outcomes, outputs, major risks, costs, stakeholders and an estimate of the resourcing and time required.

The Project Proposal Business case expands the initial concepts in order to:

- provide broad details of the objectives, scope, resources, budget, milestones, risks, stakeholders and related projects of the initiative;
- Define the guidelines/standards to be applied throughout the initiative; and
- Gain authorisation to proceed to the next step of the initiative.

There has been and a systematic transparent planning process and significant work undertaken by the group to justify implementation of onground works (see **Figure 2**), including:

1. Aligning the broad scale NRM targets of Burnett Mary Regional Group's Natural Resource Management plan, Country to Coast (C2C) a Healthy Sustainable Future, with Lake Baroon Catchment Management Strategy (LBCMS).

   LBCMS were summarised into 31 specific actions. These actions were then linked to the prioritised Resource Condition Targets (RCT's), Management Action Targets (MAT's) and Management Actions (MA's) from C2C. Actions were linked via the similarities of deliverable outcomes i.e. LBCMS actions that involved the conservation and restoration of habitats of species of regional significance were linked to RCT's, MAT's and especially MA's that were designed to improve the habitat and range of endangered, vulnerable, rare (EVR) and iconic species. As a result an effective linkage was established between regional and local NRM aspirations.

   A set of 39 implementation actions (IA's) was derived from the outcomes and actions developed in C2C and the LBCMS.

   The large scale rehabilitation project directly addresses most of the on ground IA's and a total of 7 of the 31 implementation actions (See **Table 1**).

TABLE 1 IMPLEMENTATION ACTIVITIES DIRECTLY ADDRESSING THE LARGE SCALE REHABILITATION PROJECT

LBCIP ACTIVITY THEME	CODE	IMPLEMENTATION ACTIVITY
On ground	OG1	Develop on ground works for water quality improvement and aquatic biodiversity maintenance & improvement
On ground	OG2	Support and develop on ground works for habitat recovery
On ground	OG3	Locate high value areas within catchment and target for protection and remediation
On ground	OG4	In-stream aquatic habitat restoration for Mary River Cod and Queensland Lungfish, Spiny Cray
Weeds & pests	WP3	Aquatic and riparian weed projects
Catchment management	CM4	Adoption of BMP for point and concentrated diffuse pollution
Catchment management	CM10	Community involvement

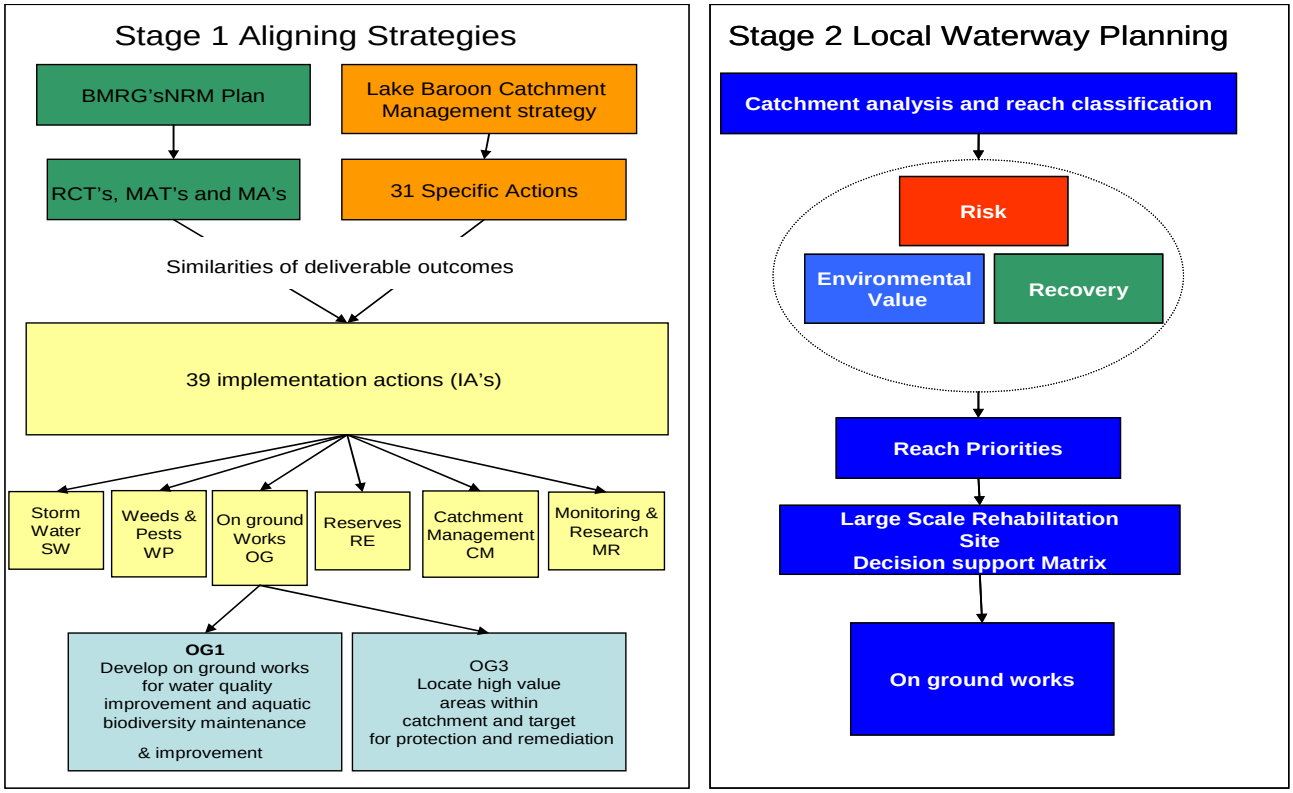
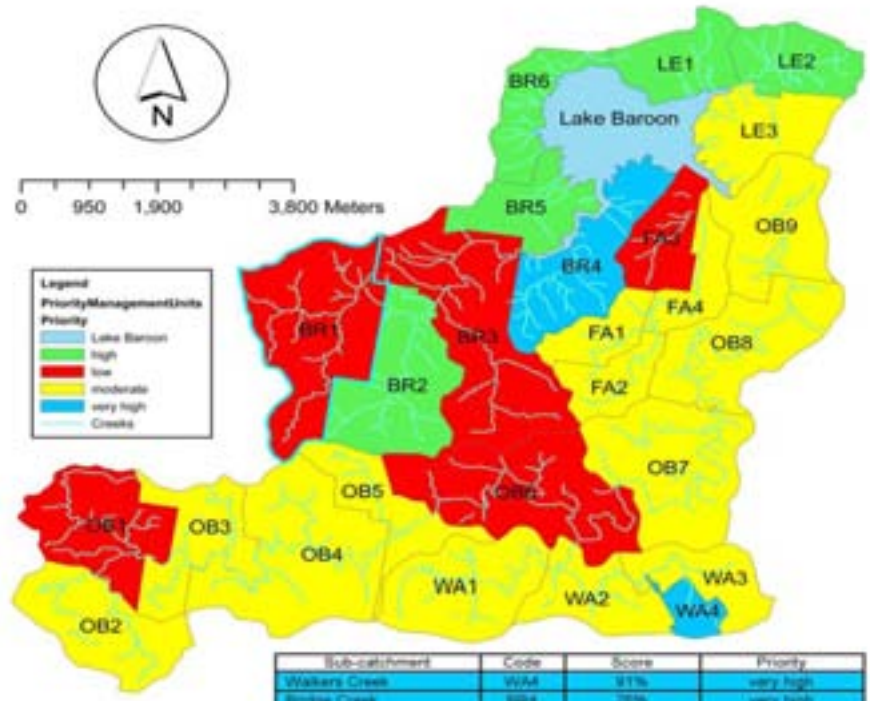


Figure 2 Schematic Diagram Demonstrating the Planning Process at a Local and Broader Scale

2. Prioritisation of waterway reaches or management units for implementation of rehabilitation and management actions. The priority system was based on best management practices and techniques developed in the Rehabilitation Manual for Australian Stream (CRCCH 2000) and Guidelines for Protecting Australian Waterway (L&W Australia 2002). The results are presented below in **Figure 3**. A detailed report is presented in **Appendix A**.



Priority	Score
very high	>75%
high	51 – 75%
moderate	25 -50%
low	<25%

Sub-catchment	Code	Score	Priority
Walkers Creek	WA4	91%	very high
Bridge Creek	BR4	78%	very high
Leeys Creek	LE1	67%	high
Bridge Creek	BR6	63%	high
Leeys Creek	LE2	59%	high
Bridge Creek	BR5	53%	high
Bridge Creek	BR6	53%	high
Obi Obi Creek	OB8	50%	moderate
Obi Obi Creek	OB9	49%	moderate
Falls Creek	FA4	47%	moderate
Walkers Creek	WA2	32%	moderate
Obi Obi Creek	OB7	32%	moderate
Obi Obi Creek	OB3	31%	moderate
Obi Obi Creek	OB5	29%	moderate
Falls Creek	FA1	29%	moderate
Obi Obi Creek	OB2	29%	moderate
Walkers Creek	WA1	28%	moderate
Leeys Creek	LE3	28%	moderate
Falls Creek	FA2	27%	moderate
Obi Obi Creek	OB4	27%	moderate
Walkers Creek	WA3	26%	moderate
Bridge Creek	BR3	22%	low
Obi Obi Creek	OB6	21%	low
Obi Obi Creek	OB1	18%	low
Bridge Creek	BR1	18%	low
Falls Creek	FA3	13%	low

Figure 3 Map and Table of Priority Reaches

3. Develop aims and criteria for site selection for large scale rehabilitation. A decision support system was constructed based on work competed by the Maroochy Shire Council for there River Recovery Initiative. There are a number of additional justifications for selecting sites for a large scale rehabilitation project.

The aims of the project are to:

- Demonstrate waterway rehabilitation within a large, continuous reach of waterway (in strategic, moderate, high or very high priority and sediment producing reach);
- Reduce sediment loads entering local waterways and Lake Baroon;
- Improve the ecological health of the waterway;
- Monitor and quantify results of project;
- Develop and document method for future potential work; and
- Quantify costs for current and potential work.

To address the aims of the project it was necessary to develop a set of criteria for site selection. The criteria for a demonstration project do not necessarily match the criteria for a catchment wide prioritisation as completed in the draft Lake Barron Priority Plan report. The draft report generally gives the highest priority to the waterway reaches with the best ecological condition as it is the most cost effective to rehabilitate these as they have the highest recovery potential. High priority reaches generally required little work or investment to rehabilitate (e.g. minor weed invasions, fencing, planning covenants etc) and were therefore not suitable as demonstration sites.

3.0 JUSTIFICATION FOR UNDERTAKING THIS TYPE OF PROJECT

3.1 WATER QUALITY AND ECOLOGICAL HEALTH IMPROVEMENTS

The downwards Water Quality trends in the Lake Baroon can be partly attributed to an increase of nutrients (phosphorus / nitrogen) and turbidity (suspended sediment) in the system. A large proportion of the nitrogen and phosphorus carried by waterways is attached to fine sediment particles. Heavy metals and pesticides are also mostly attached to soil particles.

The best practice most cost-effective method to reduce erosion and associated nutrients at a catchments scale is through the use of riparian vegetation and other soft engineering options (e.g. Introduction of large wood). Vegetation within a riparian zone can slow the overland movement of water, and cause sediment and attached nutrients to be deposited on the land before they can reach the stream channel. Riparian vegetation can also take up and remove some of the nutrients being transported. Soil erosion risks still remain, and maintaining adequate vegetative cover at times of high erosion risk is critically important. Also, riparian management is the most practical last line of defence. (National Land Water Resources Audit 2000).

The clearing of catchments for agricultural land, soil disturbance during forestry operations or urban development, and bare areas such as gravel roads and stock tracks, have led to substantial increases in the amounts of sediment (gravel, sand, silt and clay) entering our streams and rivers.

Maroochy Shire Council commissioned WBM (2004) to undertake catchment modelling to provide a better understanding of sediment and nutrient source contributions from point and diffuse sources within the Maroochy Catchment. The results indicate that the dominant contributor of sediments and nutrients is diffuse sources particularly during wet years (See **Figures 4 & 5**). The diffuse sources were identified as predominantly sheet erosion and stormwater.

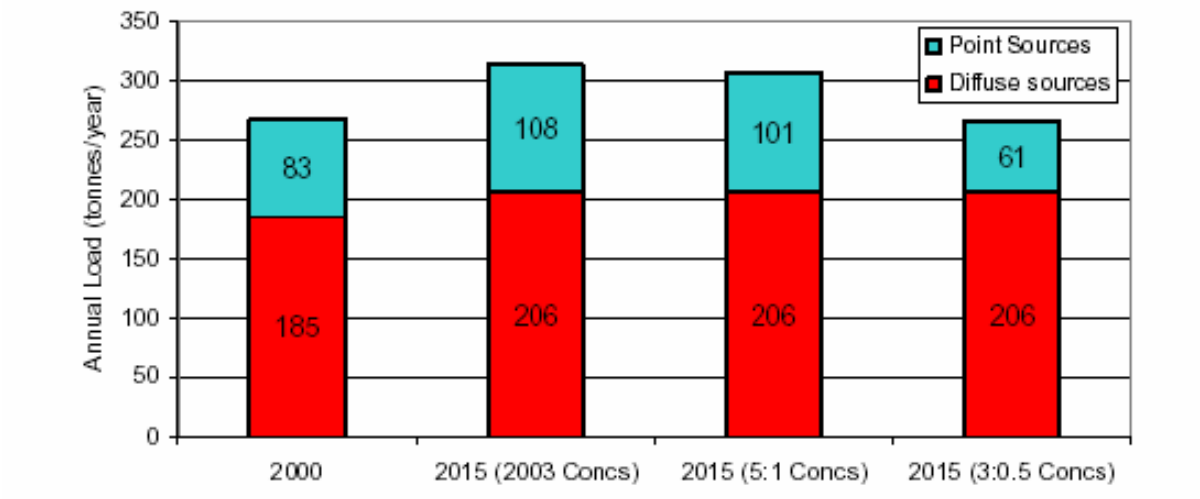


Figure 4 **Predicted Total Annual Cumulative Total Nitrogen Loads with Various STP Retrofits (Taken from WBM 2004)**

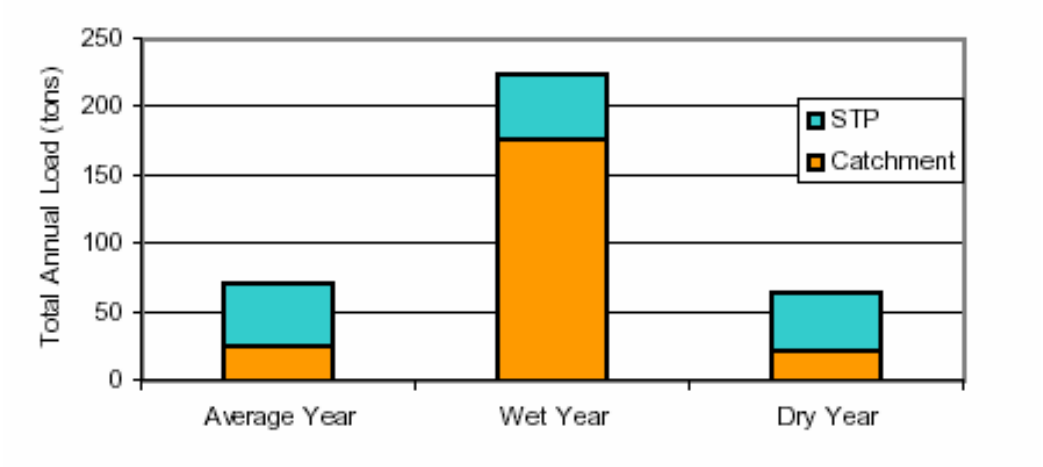


Figure 5 **Predicted Total Nitrogen Annual Load Contributions (Taken From WBM 2004)**

One of the report's main conclusions was that 'the implementation of catchment load mitigation measures to freshwater and estuarine areas will provide significant benefits to the health of local ecosystems, and therefore ultimately the entire river system'.

Another supporting result of relevance to this project is predicted reductions that could be expected from a 50% increase in riparian buffers for the Petrie Creek and Doonan subcatchments. The analysis covered predictions for Total Nitrogen, Total Phosphorus and Total Suspended Sediments loads in wet, dry and average rainfall years.

The following reductions were predicted for both catchments:

- Total nitrogen 20 to 31% total load reduction;
- Total phosphorus 19 to 33% total load reduction; and
- Total suspended solids 29 to 43% total load reduction.

Recent studies in Australia have shown that under favourable conditions, both natural vegetation and grassy filter strips can trap around 90% of the sediment moving from upslope. These strips can be just as effective in trapping or absorbing nutrients. By way of example, the Mary River Catchments Coordinating Committee is reducing sediments loads and associated nutrients through riparian rehabilitation, in the Mary River catchment, by approximately 5% per year (CSIRO).

3.2 BIOSEQUESTRATION

Carbon is involved in a number of natural chemical and biological processes. The carbon cycle in trees is one example. Trees take carbon dioxide (CO2) from the atmosphere to perform photosynthesis to produce carbohydrates and oxygen. The carbohydrates form a plant's food and the oxygen is released into the atmosphere.

In this way, trees store carbon in their roots, trunk, branches and leaves. They become a carbon 'sink.' The absorption of carbon dioxide from the atmosphere by living trees and vegetation is referred to as 'carbon sequestration' or 'biosequestration.'

Trees absorb more carbon dioxide as they are growing but less as they mature. Also, different tree species have different sequestration efficiencies - trees that grow slowly sequester carbon more slowly.

To predict the biosequestration for the Lake Baroon Large Scale Rehabilitation project, we have used the Carbon Sequestration Predictor Model Version 2.0 developed by NSW Department of Primary Industries.

From the financial budget applied we are likely to be able to undertake approximately 2ha of riparian planting (i.e. 20m x 1000m). The results (See **Figure 2**) indicate that by 5 years there will be a sequestration of 44 tonnes of carbon and 104 tonnes of carbon within 10 years.

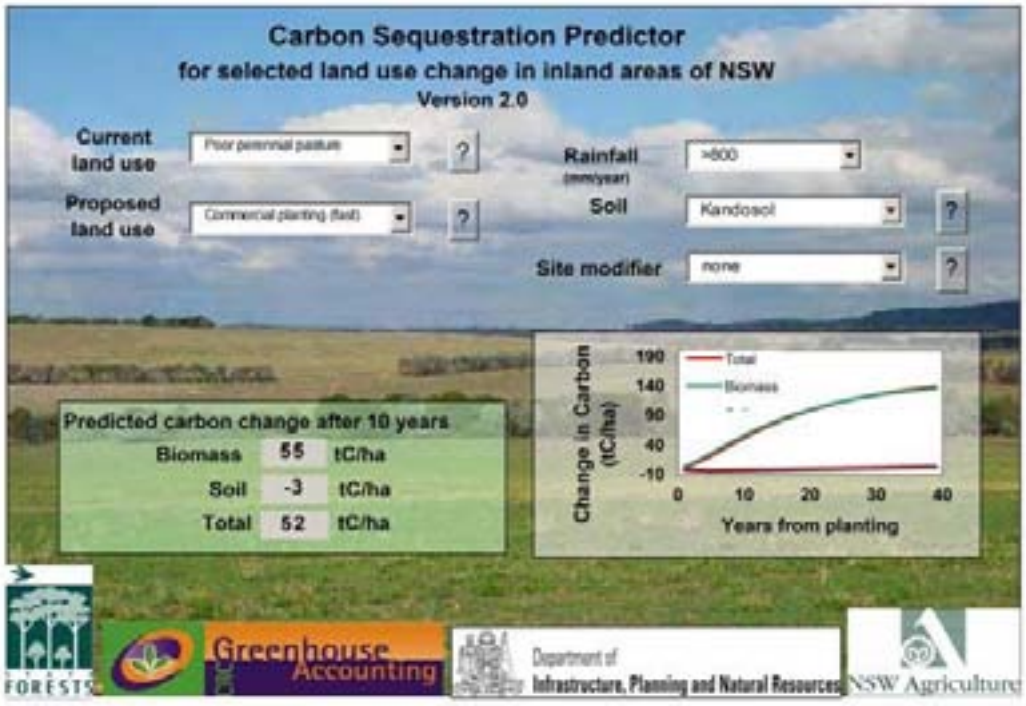


Figure 6 Lake Baroon Biosequestration Calculations

The following example carbon producing activities have been provided (Cooperative Research Centre for Greenhouse Accounting) to demonstrate the relative scale of how the Large Scale Rehabilitation project can may reduce Aquagens carbon footprint.

ACTIVITY	CARBON EMITTED (KG)	CO2 EQUIVALENT (KG)
1 year's use of family sedan sized car	1,200	4,400
1 year's household electricity consumption	2,200	8066
1 return flight from Sydney to Melbourne for 1 passenger	70	256

Ten (10) vehicles would emit 100 tonnes of Carbon over 10 years. The Large Scale Riparian rehabilitation will achieve sequestration of 104 tonnes and therefore project would offset this entirely.

3.3 COMPENSATORY HABITAT

Compensatory habitat is a term used where habitats are constructed artificially in an attempt to compensate for an area of natural habitat that is going to be destroyed.

The construction of the Lake Baroon had unavoidable impacts on both terrestrial and aquatic habitats. Approximately 10km of riparian and aquatic habitat was lost upstream of the dam and many kilometres of associated downstream impacts.

Recent Queensland infrastructure developments that have unavoidable impacts have nominated compensatory habitat to mitigate some of the effects. Hinze Dam Stage 3 Initial Advice Statement (GCCC 2006) stated that 'The impacted land area is expected to be offset by the provision of compensatory habitat. The intent of the compensatory habitat is to mitigate any loss of vegetation or ecosystem function which would otherwise result from the project.'

It is noted that some compensatory habitat rehabilitation has been undertaken through a reafforestation program which commenced in 1988 resulting in the planting of some 200,000 trees at a cost of $80,000. The total area set aside for the reafforestation was approximately 234 hectares. The reafforestation program is ongoing with the majority of trees being native to the area; Pines, Eucalypt,Hoop Pine and Bunya Pines. Further riparian restoration would complement this work.

3.4 LINKAGES WITH AQUAGEN'S OPERATIONAL PLAN

The Large Scale Rehabilitation Plan achieves the following Corporate Plan Outcomes and Proposed Strategies for Aquagen's current Operational Plan.

CORPORATE PLAN OUTCOMES	PROPOSED STRATEGIES FOR 2006/07	
3.6 REAFFORESTATION To enhance the amenity of the area.	(i)	Continue the tree planting program
4.1 CATCHMENT PROJECTS To develop projects whereby water quality entering Lake Baroon from the catchment is improved	(i)	Liaison with the Lake Baroon Catchment Care Group Inc. and the community.
	(ii)	Staff to assist the implementation of the catchment strategy

4.0 DECISION SUPPORT SYSTEM FOR LARGE SCALE REHABILITATION

To address the aims of the project it was necessary to develop a set of criteria for site selection. The Lake Baroon Catchment was divided up into prioritised management units (MUs) by the draft LBCIP. The draft LBCIP generally gave the highest priority to MUs that were in the most natural state relative to other MUs in the catchment. These areas had the highest recovery potential as they required the smallest investment of resources for rehabilitation (e.g. minor weed invasions, fencing, planning covenants etc). However, the highest priority MUs described by the draft LBCIP did not necessarily match the criteria for a demonstration project. Higher priority MUs generally required little work or investment to rehabilitate and were therefore not suitable as demonstration sites. Most high priority MUs were located in the most remote parts of the catchment and consequently provided little access for public viewing.

The site selection criterion in **Table 2** was developed to meet the aims of the project.

TABLE 2 CRITERIA USED IN THE SITE SELECTION

NO	CRITERIA	MINOR IMPORTANCE	DESIRABLE	ESSENTIAL
	Evaluation Score	**1**	**2**	**3**
1	Work can be undertaken within budget			X
2	In strategic, moderate, high or very high priority MU as outlined in the draft LBCIP			X
3	In an area that produces moderate to high nitrogen and phosphorous			X
4	Work can be undertaken on a significant continuous stretch of creek (at least 400m)			X
5	High visual impact (WOW factor)			X
6	Public accessibility			X
7	Stakeholder cooperation			X
8	Aquagen Board land		X	
9	Public open space	X		

The process for assessment was initially a desktop investigation to assess whether reaches meet criteria 1 – 4. This was followed by site inspections to determine suitability against criteria 5 and 6.

5.0 RECOMMENDED SITES

An extensive culling process was undertaken using the specified criteria. The full report is contained in **Appendix B**.

Two (2) sites were considered suitable for a large scale rehabilitation project in the Lake Baroon Catchment. These were WA2 located at the mouth of Walkers Creek on Maleny Landsborough Rd and LE2 located in the headwaters of Lexys Creek on Maleny Montville Rd (See **Figure 7**).

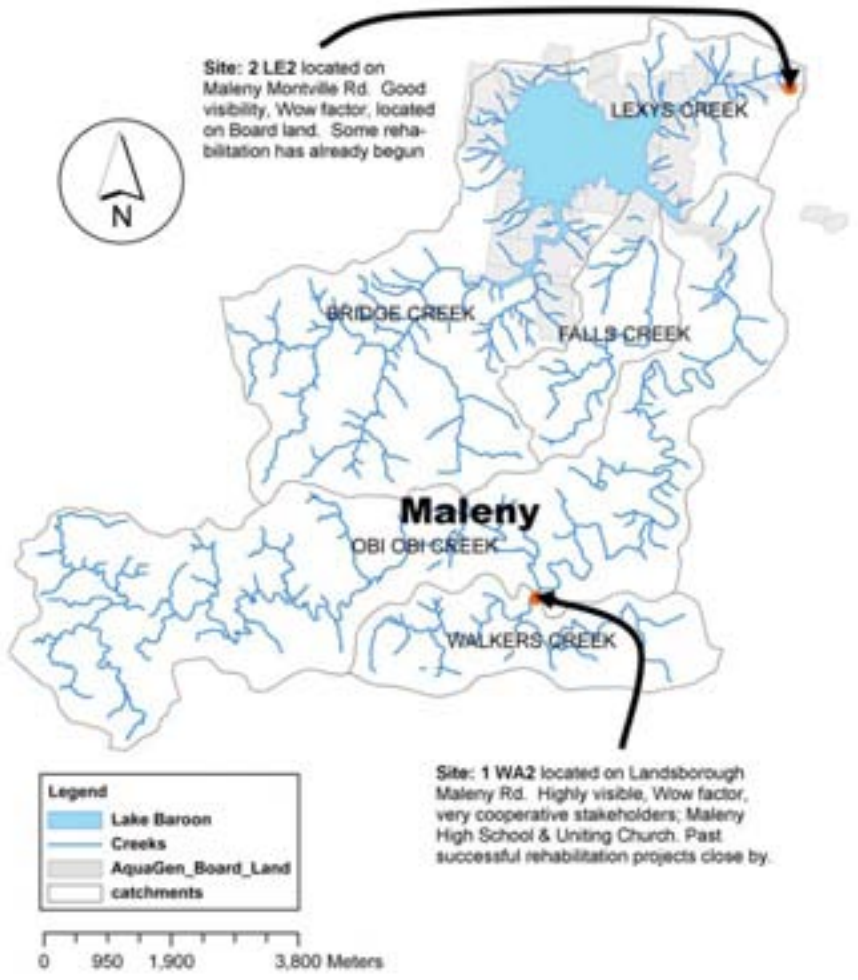


Figure 7 Location of Priority Sites for Large Scale Rehabilitation Project

6.0 QUANTIFICATION OF LIKELY COSTS AND SCALE OF WORKS

The most relevant cost analysis has been undertaken recently by Maroochy Shire Council.

Maroochy Shire Council is entering its second year of delivering a large scale rehabilitation project. It is one of Australia's largest waterway rehabilitation projects. The project area is approximately 8km long and 10m – 20m in width. There are 21 landowners involved, 60,000 trees planted, 600 camphor laurel trees have been treated, 13km of fencing installed along the creeks, 57 cattle gates and 23 low level crossings installed. The planting of tress and installation of infrastructure was undertaken in the first 3 months of the project. The site is being maintained for three years to maximise survival and growth of vegetation. There is a performance criteria specified for the contractors to meet at 6 month intervals.

The total cost of the project was approximately $1.3 million dollars.

Some general item costs for estimating project costs are as follows:

ITEM	COST
Trees (made of following)	$10/tree
Tube stock	$2/tree
Planting cost	$4/tree
Maintenance	$4/tree
Cattle Fencing – 4 wire barb	$12/metre
Fencing - Electric	$5/metre
Solar panels	$650/panel
Fencing - Goats	$20/m
Fencing Horses	$13/m
Fencing – Flood at crossings	$11/m
Concrete crossings	$5,500
Cattle Gate	$500
Camphor Removal	$300
Camphor poisoning	$30
Water trough	$500
Rock Rip Rap protection	$100/m3

The revegetation layout design for the Maroochy Large Scale Rehabilitation project designated trees to be planted on average at 2 metre spacing's.

We could estimate the cost of a 1km rehabilitation project, based on the following:

1. Degraded site 1000 metres long (completely devoid of vegetation),
2. A planting zone of 10m each side of the low flow, (total of 20m wide for both sides of the creek),

3. Four landholders.

ITEM	COST / ITEM	NUMBERS / METRES	TOTAL
Trees	$10	10,000	100,000
Fencing	$12	2,000	24,000
Crossings	$5,500	4	22,000
Solar panels	$650	4	2,600
Flood fencing	$11	200	2,200
Camphor poisoning	$30	50	1,500
Cattle gates	$500	8	4,000
Total			**$156,300**

7.0 EVALUATION OF WORKS

We recommend that Aquagen consider similar biophysical waterways assessment method to evaluate the large scale rehabilitation project as undertaken by Maroochy Shire Council (MSC).

This method has been included by MSC as part of their sub-catchment waterway health assessment. MSC have been successful at negotiating, over the last 18 months with the Healthy Waterways Partnership, for this to be included in the regional score card. If Aquagen uses a similar biophysical method they could 'piggyback' off this work.

The suggested biophysical assessment methods are based on the Land and Water Guidelines for Protecting Australian Waterways (2002). An example data field sheet is provided below in Figure 8 to demonstrate potential parameters to evaluate project.

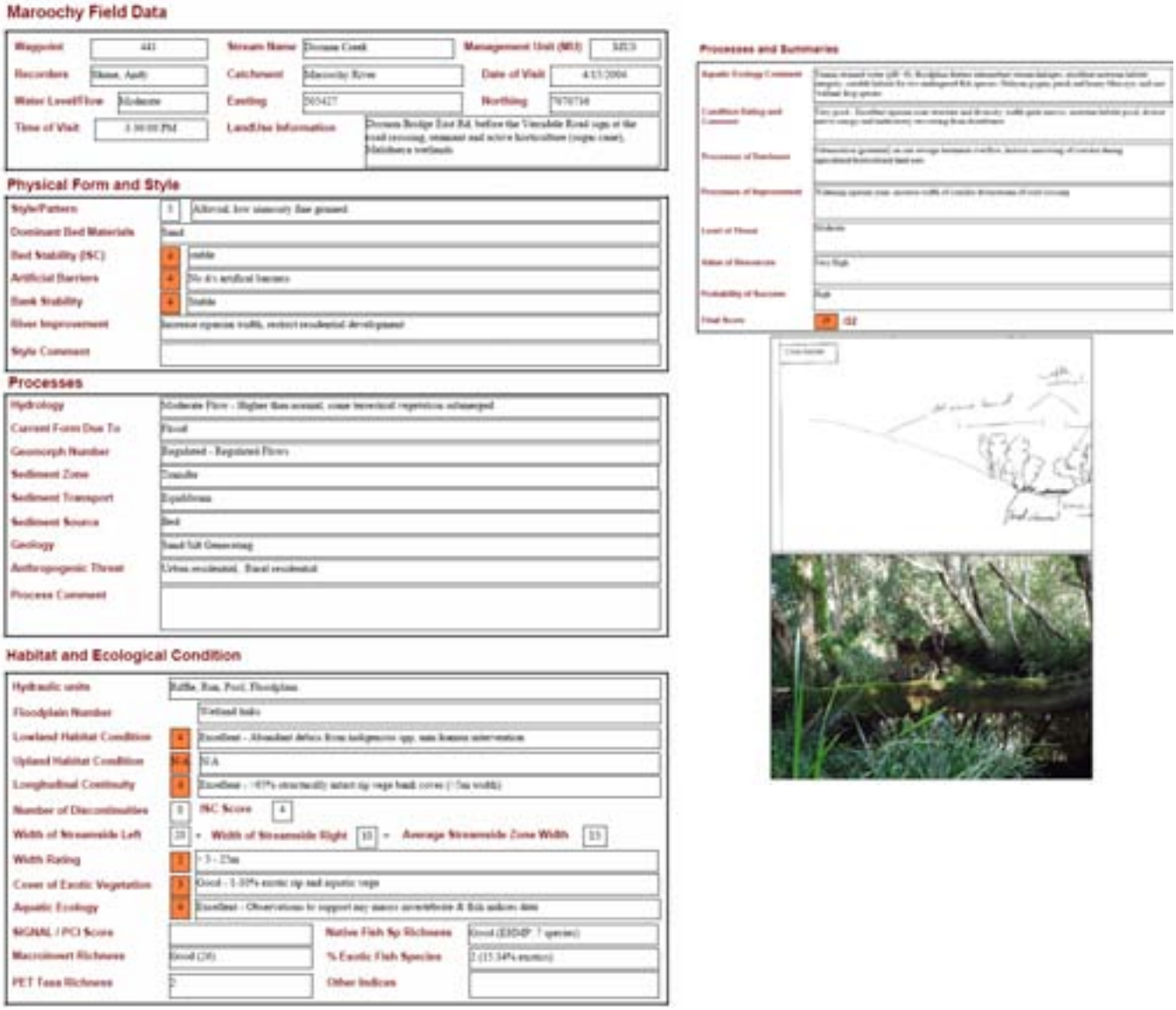


Figure 8 Example Field Assessment Sheet

8.0 PROJECT MANAGEMENT BRIEF AND PLAN

Project Management is a formalised and structured method of managing change. It focuses on achieving specifically defined outputs so that planned benefits / outcomes are achieved.

The outputs are to be completed:

- By a certain time;
- To a defined quality; and
- With a given level of resources.

Effective project management is essential for the success of a business project.

The value of good project management is that you have standard processes in place to deal with all contingencies. Using sound project management techniques and processes will give you a higher likelihood that your project will be completed on time, within budget and to an acceptable level of quality. It also provides a framework, process, guidelines and techniques to greatly increase the odds of being successful. Consider all aspects of how to manage a project, and build the right processes for your size project.

A draft project brief has been provided in **Appendix C**. If the project is accepted a detailed project management plan and timelines should be undertaken. Further information on project management and templates can be found at:

http://www.egovernment.tas.gov.au/themes/project_management

Additionally, Maroochy Councils Large Scale Rehabilitation project management plan has been provided as an example in **Appendix D**.

8.1 MICROSOFT PROJECT PLAN

An electronic file of the Microsoft Project Plan for Maroochy Shire Councils Large Scale Rehabilitation can be provided.

This is an extremely detailed cost and delivery plan that has scheduled resources, general and reoccurring tasks and costs. It could benefit the project by improving efficiency and effectiveness.

APPENDIX A Management Unit Prioritisation Report

Prioritising the Management Units

The processes and outcomes of waterway rehabilitation generally vary considerably across regions, catchments and even individual reaches. In the Lake Baroon Catchment, some waterways were highly degraded and contributed significantly to the water quality problems in the Dam. While other creeks were relatively intact and may have provided a net benefit for water quality by filtering out nutrients and sediment and lowering instream water temperatures. Moreover, the intensive land use in the catchment over the last century has left all of the waterways that flow into Lake Baroon degraded to some extent and therefore these waterways required expenditure of remediation effort.

Ideally all of the waterways in the catchment should be completely remediated; however the human and financial resources available were insufficient to facilitate this. In order to direct the available resources to the most effective areas, a prioritisation system was developed based on relevant Australian literature (Hydrobiology Pty Ltd, 4 Site Pty Ltd & MSC 2005; Bennett *et al* 2002; Stockwell 2001; Rutherfurd, Jerie & Marsh 2000 and Dunn (2000).

The prioritisation system was based on the current accepted philosophy suggested in the above mentioned literature. Most notably in the work of Rutherfurd, Jerie & Marsh (2000) where it is suggested that the most efficient use of resources is to aim recovery projects at waterways that resembled the most natural state of the catchment since these areas require the smallest amount of input for the largest value gained from their protection and enhancement.

Ecological Value Assessment

Rutherfurd, Jerie & Marsh (2000) put forward a set of principles for stream recovery that are set out in table 2 below. An ecological value assessment (Bennett *et al* 2002; Dunn 2000) or ranking system was developed to reflect these principles. The

Table: 2 Five principles of rehabilitating streams (adapted from Rutherfurd, Jerie & Marsh 2000)

Rehabilitating Australian streams
Save reaches that support valuable organisms or communities (rare or endangered) before you turn to less valuable reaches that support common organisms and communities.
Protect the streams that are in the best general condition before trying to improve those that are in poor condition.
Stop streams deteriorating, rather than waiting for them to stabilise and then trying to accelerate recovery.
Improve the condition of reaches that are damaged, beginning with those that are easy to fix.
While there are still reaches that need protecting or improving don't bother trying to fix reaches that are already extremely degraded.

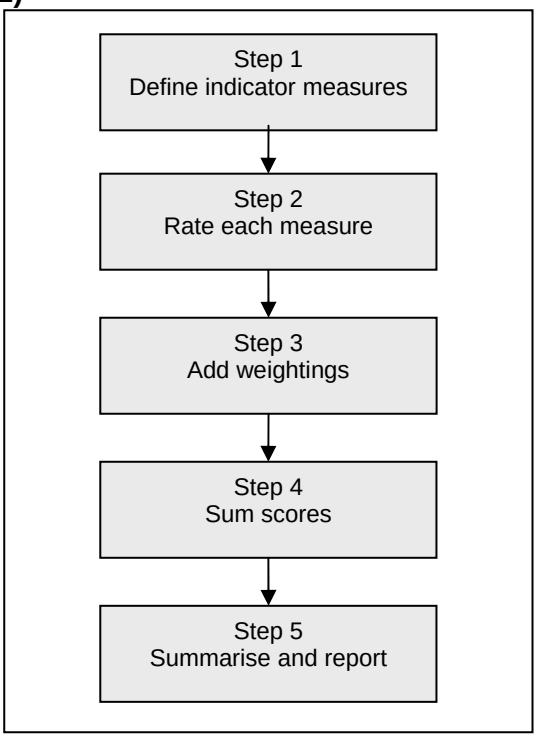
ecological values assessment, reflecting similar ranking systems used recently in Australia, was designed to highlight intact, healthy stream reaches which, as Rutherfurd, Jerie & Marsh (2000) explicate are more efficient to rehabilitate than trying to use limited resources on highly degraded areas. The system used both subjective and objective elements and was limited by the use of available data as the scope of this plan did not allow for new detailed catchment studies. Figure 1 illustrates the method used to prioritise the MUs using an ecological value assessment.

Indictor Measures

The assessment used a series of relevant indicator measures to assess the relative health of each MU. These indicator measures compared the level of disturbance

between MUs or against an accepted benchmark (e.g. ANZEC guidelines). Indicator measures were chosen on the basis of available data therefore the type and number of indicators was limited.

Figure: 1 Summary of method for ecological value assessment (adapted from Bennett *et al* 2002)



Rating the Indicator Measures

Each indicator measure was rated on a scale of 1-5 for consistency across the rating system. GIS software and spatial data was employed to set ratings for MUs. Information contained in the GIS layers arose from various sources including AquaGen, Caloundra City Council, Maroochy Shire Council, DNR and CSIRO. For dissolved phosphorous and nitrogen input, ratings were based on the accepted benchmark in the Australian & New Zealand Guidelines for Fresh and Marine Water Quality 2000 (Upland River Ecosystem). Ratings for the remaining indicators were calculated by comparing data between MUs across the whole catchment (see table 3).

Table: 3 Descriptions of indicator measures used in ecological value assessment for Lake Baroon Catchment

Indicator Measure	Description	Weighting
vegetation cover	% cover of vegetation excluding grasses	2
artificial barriers	number of dams, bridges, crossings, culverts and weirs	0.5
pollution hotspots	Number of pollution hotspots within a MU derived from the landuse layer and AquaGen data	0.5
landslip	% area of total subcatchment affected by landslip (Willmot 1983)	1
land stability	% area of total subcatchment with unstable geology (Willmot 1983)	1
dissolved P input	% area within MU above ANZEC guideline for dissolved Phosphorous	1

dissolved N input	% area within MU above ANZEC guideline for dissolved Nitrogen	1
RE	% area of endangered and of concern regional ecosystems within a MU	2
instream shading	% of waterways within MU adequately shaded by vegetation (derived from six riparian vegetation categories)	2
rehab impact	% of streams within MU that have type 1 riparian vegetation (derived from six riparian vegetation categories)	1
protected areas	% of MU protected under voluntary conservation agreement, conservation covenant, state or national park	2
10m buffer $/m	cost of regenerating a 10m buffer around waterways in a MU	1
20m buffer $/m	cost of regenerating a 20m buffer around waterways in a MU	1
50m buffer $/m	cost of regenerating a 50m buffer around waterways in a MU	1

Weightings

The ranking system was designed to identify MUs that remained as close as possible to their archetypal condition as high priority. As these reaches potentially required a small expenditure of recovery effort since they would merely have to be maintained at their current condition or slightly improved, rather than completely rehabilitated. In order to capture this type of MU, weightings were applied to each indicator measure in the ecological value assessment.

The assignment of weightings was a subjective process that aimed to emphasise the indicator measures most pertinent to catchment rehabilitation (see table 3). Consequently, vegetation cover, RE, instream shading and protected areas were given a rating of 2. This was the highest weighting applied to any of the indicator measures used in the ecological value assessment.

A weighting of 0.5 was applied to artificial barriers and pollution hotspots as these indicator measure were not considered as critical for rehabilitation in the ranking system. A weighting of 1 was applied to all the remaining indicator measures.

The Scoring Process

A series of spreadsheets were developed in order to calculate the ecological value assessment. For each MU the indicator measure scores were summed after being multiplied by the respective weighting. This score was then standardised (see equation 1) using the methods described in Bennett *et al* (2002) to account for the fact that the minimum individual score possible for each indicator measure was not zero but one.

Equation: 1 Range standardising equation for the index of priority for each indicator measure

Index of priority = (1-{B-C}/{A-C})x100%

Where:-

A = SUM of weightings
B = SUM of (weightings x indicator measure rating)
C = SUM of maximum possible scores (i.e. weighting x maximum rating)

The standardised score was then converted into a condition value category for each MU. The condition value categories were based on:-

- very high (>75%)
- high (51-75%)
- medium (25-50%)
- low (<25%)

Two MUs received a very high score; WA4 and BR4. Five MUs received a high score, fourteen received a moderate score and five received a low score (see table 4).

Table: 4 Priority listing of management units within Lake Baroon Catchment determined by the priority matrix.

Sub-catchment	Code	Score	Priority
Walkers Creek	WA4	91%	very high
Bridge Creek	BR4	76%	very high
Lexys Creek	LE1	67%	high
Bridge Creek	BR5	63%	high
Lexys Creek	LE2	59%	high
Bridge Creek	BR2	53%	high
Bridge Creek	BR6	53%	high
Obi Obi Creek	OB8	50%	moderate
Obi Obi Creek	OB9	49%	moderate
Falls Creek	FA4	47%	moderate
Walkers Creek	WA2	32%	moderate
Obi Obi Creek	OB7	32%	moderate
Obi Obi Creek	OB3	31%	moderate
Obi Obi Creek	OB5	29%	moderate
Falls Creek	FA1	29%	moderate
Obi Obi Creek	OB2	29%	moderate
Walkers Creek	WA1	28%	moderate
Lexys Creek	LE3	28%	moderate
Falls Creek	FA2	27%	moderate
Obi Obi Creek	OB4	27%	moderate
Walkers Creek	WA3	26%	moderate
Bridge Creek	BR3	22%	low
Obi Obi Creek	OB6	21%	low
Obi Obi Creek	OB1	18%	low
Bridge Creek	BR1	18%	low
Falls Creek	FA3	15%	low

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APPENDIX B Selection of Demonstration Site Discussion Paper

Site Selection for a Large Scale Waterway Rehabilitation Project in the Lake Baroon Catchment

1.0 Executive Summary

Two (2) sites were considered most suitable for a large scale rehabilitation project in the Lake Baroon Catchment. These were WA2 located at the mouth of Walkers Creek on Maleny Landsborough Rd and LE2 located in the headwaters of Lexys Creek on Maleny Montville Rd. A description of these sites along with a project outline is presented in 5.0 below.

2.0 Objective

To select a site for a large-scale demonstration project using best management practices for waterway planning and rehabilitation in the priority areas put forward in the draft Lake Baroon Catchment Implementation Plan (LBCIP).

3.0 Aims

1. Reduce sediment and nutrient loads entering local waterways and Baroon Pocket Dam,
2. Demonstrate waterway rehabilitation within a large, conspicuous reach of waterway (in strategic, moderate, high or very high priority and sediment producing reach),
3. Improve the ecological health of the waterway,
4. Monitor and quantify results of project,
5. Develop and document method for future potential work,
6. Quantify costs for current and potential work, and
7. Investigate landholders support and uptake for this type of project and identify any barriers.

4.0 Site Selection

To address the aims of the project it was necessary to develop a set of criteria for site selection. The Lake Baroon Catchment was divided up into prioritised management units (MUs) by the draft LBCIP. The draft LBCIP generally gave the highest priority to MUs that were in the most natural state relative to other MUs in the catchment. These areas had the highest recovery potential as they required the smallest investment of resources for rehabilitation (e.g. minor weed invasions, fencing, planning covenants etc). However, the highest priority MUs described by the draft LBCIP did not necessarily match the criteria for a demonstration project. Higher priority MUs generally required little work or

investment to rehabilitate and were therefore not suitable as demonstration sites. Most high priority MUs were located in the most remote parts of the catchment and consequently provided little access for public viewing.

The site selection criterion in Table 1 was developed to meet the aims of the project.

Table 1: Criteria used in the site selection

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
1	Work can be undertaken within budget			X
2	In strategic, moderate, high or very high priority MU as outlined in the draft LBCIP			X
3	In an area that produces moderate to high nitrogen and phosphorous			X
4	Work can be undertaken on a significant continuous stretch of creek (at least 400m)			X
5	High visual impact (WOW factor)			X
6	Public accessibility			X
7	Stakeholder cooperation			X
8	AquaGen Board land		X	
9	Public open space	X		

The process for assessment was initially a desktop investigation to assess whether reaches meet criteria 1 – 4. This was followed by site inspections to determine suitability against criteria 5 and 6.

4.1 Culling Process

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
1	Work can be undertaken within budget			X

It was estimated that the budget would allow rehabilitating a continuous degraded reach or reaches of at least 500 m (depending on how degraded the creek was) and 10 metres either side of the creek. No reaches were culled from this criterion.

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
2	In strategic, moderate, high or very high priority MU as outlined in the draft LBCIP			X

The draft LBCIP prioritised MUs as Low, Moderate, High or Very High and Low. Low priorities were removed (See Table 2). Five MUs were not selected using this criterion, leaving 21 reaches or 80 % of the Mus in the Lake Baroon Catchment.

Table 2: MUs meeting criterion 2

Sub-catchment	Code	Priority Score
Walkers Creek	WA4	very high
Bridge Creek	BR4	very high
Lexys Creek	LE1	high
Bridge Creek	BR5	high
Lexys Creek	LE2	high
Bridge Creek	BR2	high
Bridge Creek	BR6	high
Obi Obi Creek	OB8	moderate
Obi Obi Creek	OB9	moderate
Falls Creek	FA4	moderate
Walkers Creek	WA2	moderate
Obi Obi Creek	OB7	moderate
Obi Obi Creek	OB3	moderate
Obi Obi Creek	OB5	moderate
Falls Creek	FA1	moderate
Obi Obi Creek	OB2	moderate
Walkers Creek	WA1	moderate
Lexys Creek	LE3	moderate
Falls Creek	FA2	moderate
Obi Obi Creek	OB4	moderate
Walkers Creek	WA3	moderate
Bridge Creek	BR3	low
Obi Obi Creek	OB6	low
Obi Obi Creek	OB1	low
Bridge Creek	BR1	low
Falls Creek	FA3	low
Through to the next section		Culled

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
3	In an area that produces moderate to high nitrogen and phosphorous			X

MUs selected for this criterion had nitrogen and phosphorous loads greater than ANZEC guidelines for more than 40% of their area (from draft LBCIP). MUs that had nitrogen and phosphorous loads greater than ANZEC guidelines for less than 40% of their area were culled (See Table 3). Five MUs did not meet this criterion and were removed leaving 16 reaches or 61% of the Mus in the Lake Baroon Catchment.

Table 3: MUs meeting criterion 3

Sub-catchment	Code	Priority Score
Bridge Creek	BR4	very high
Lexys Creek	LE1	high
Lexys Creek	LE2	high
Bridge Creek	BR6	high
Obi Obi Creek	OB9	moderate
Falls Creek	FA4	moderate
Walkers Creek	WA2	moderate
Obi Obi Creek	OB7	moderate
Obi Obi Creek	OB3	moderate
Falls Creek	FA1	moderate
Obi Obi Creek	OB2	moderate
Walkers Creek	WA1	moderate
Lexys Creek	LE3	moderate
Falls Creek	FA2	moderate
Obi Obi Creek	OB4	moderate
Walkers Creek	WA3	moderate
Obi Obi Creek	OB5	moderate
Obi Obi Creek	OB8	moderate
Bridge Creek	BR2	high
Bridge Creek	BR5	high
Walkers Creek	WA4	very high
Through to the next section		Culled

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
4	Work can be undertaken on a significant continuous stretch of creek (at least 400m)			X

To address this criterion it was necessary to spatially assess the vegetation along the waterways of the short listed reaches. An ARCGIS layer developed by Caloundra City Council for the draft LBCIP called "Riparian Categories" was used to determine the longest continuous section of waterway, without significant vegetation, within each MU (See Figure 1). Following this, these continuous sections of waterway were measured and listed in Table 4. Five (5) MUs did not meet this criterion (more than 400m of creek that required revegetation) and were culled leaving 11 MUs or 38% of the MUs in the Lake Baroon Catchment.

Figure 1: The longest continuous sections of waterways, without significant vegetation, within each MU of Lake Baroon Catchment

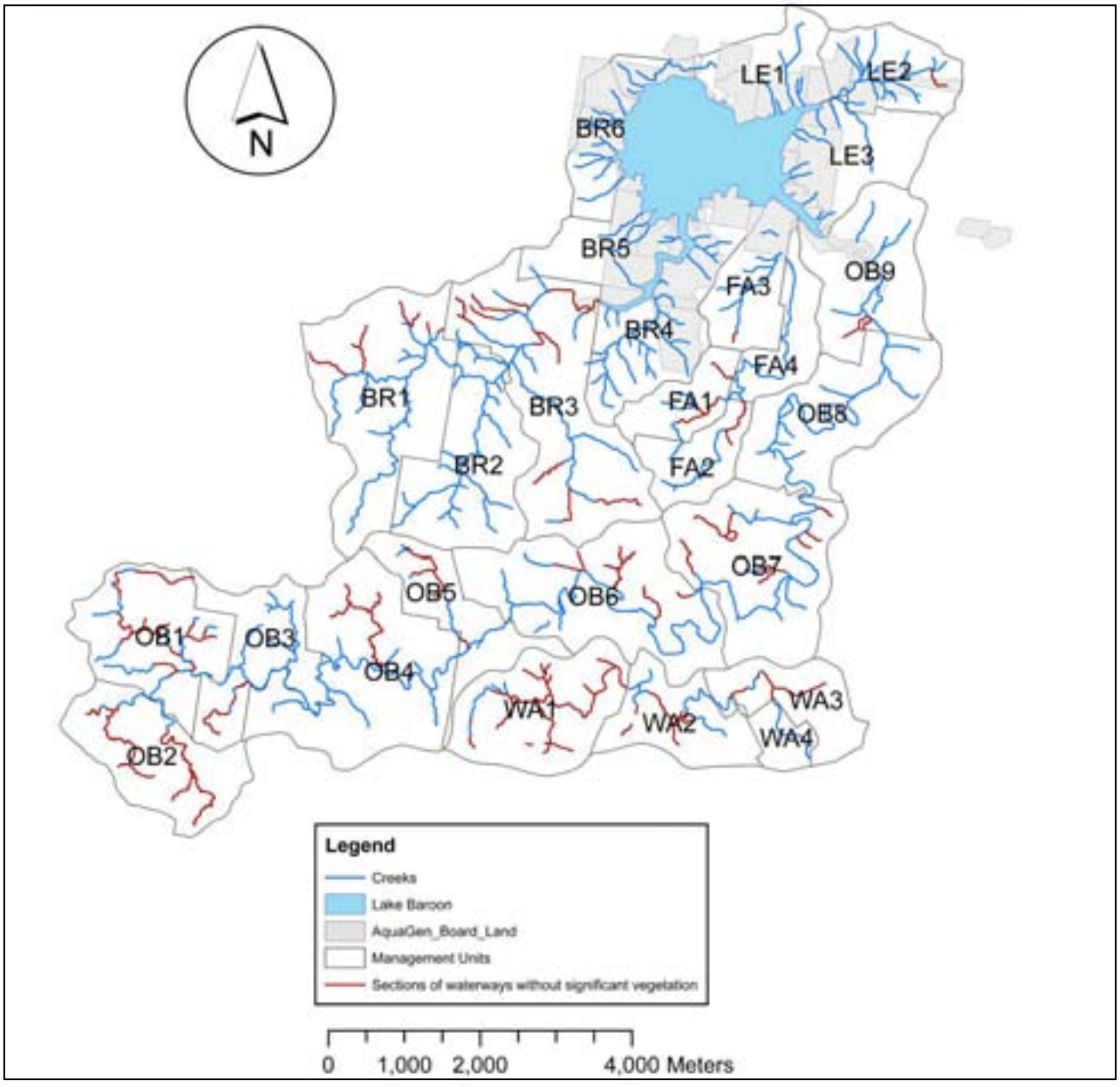

Table 4: MUs meeting criterion 4

Sub-catchment	Code	Largest section of MU requiring revegetation (m)	Total waterway length within MU (m)	Priority Score
Obi Obi Creek	OB9	460	4509	moderate
Walkers Creek	WA2	891	4224	moderate
Obi Obi Creek	OB7	924	10439	moderate
Obi Obi Creek	OB3	764	7110	moderate
Falls Creek	FA1	797	2659	moderate
Obi Obi Creek	OB2	1704	6315	moderate
Walkers Creek	WA1	6501	7644	moderate
Falls Creek	FA2	795	2812	moderate
Obi Obi Creek	OB4	1083	10061	moderate
Walkers Creek	WA3	1037	2165	moderate
Lexys Creek	LE2	409	6454	high
Bridge Creek	BR4	0	9113	very high
Lexys Creek	LE1	0	3152	high
Bridge Creek	BR6	0	5638	high
Falls Creek	FA4	0	3453	moderate
Lexys Creek	LE3	0	3869	moderate

Through to the next section		Culled	

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
5	High visual impact (WOW factor)			X
6	Public accessibility			X

Field inspections were undertaken to determine the suitability of the remaining MUs against these criteria, results of which are listed below. MUs with high to good visual amenity were selected for these criteria. MUs with reasonable and low visual amenity were culled (See Table 5). Seven MUs did not meet this criterion and were removed leaving 3 MUs.

Following is the results of the inspection.

1. Walkers Creek (WA2) high visual amenity and good access and exposure from the local roads. There were also various high points that can give a good overview of the area.
2. Obi Obi Creek (OB7) reasonable visual amenity. There is limited exposure from the local roads and limited high points to give a good overview.
3. Obi Obi Creek (OB3) good visual amenity. There is limited exposure from the local roads and limited high points to give a good overview.

4. Falls Creek (FA1) reasonable visual amenity. There is limited exposure from the local roads and limited high points to give a good overview.
5. Obi Obi Creek (OB2) high visual amenity and good access and exposure from the local roads. There were also various high points that can give a good overview of the area.
6. Walkers Creek (WA1) high visual amenity and good access and exposure from the local roads. There were also various high points that can give a good overview of the area.
7. Falls Creek (FA2) does not have the high visual impact of other creek systems due to the floodplain morphology. There is limited or no exposure from the local roads and no high points to give a good overview
8. Obi Obi Creek (OB4) reasonable visual amenity. There is limited exposure from the local roads and limited high points to give a good overview.
9. Walkers Creek (WA3) reasonable visual amenity. There is limited exposure from the local roads and limited high points to give a good overview.
10. Obi Obi Creek (OB9) does not have the high visual impact of other creek systems due to the floodplain morphology. There is limited or no exposure from the local roads and no high points to give a good overview.
11. Lexys Creek (LE2) high visual amenity and good access and exposure from the local roads. There were also various high points that can give a good overview of the area.

Table 5: MUs meeting criteria 5 & 6

Sub-catchment	Code	Priority Score
Obi Obi Creek	OB3	moderate
Obi Obi Creek	OB2	moderate
Walkers Creek	WA1	moderate
Walkers Creek	WA2	moderate
Lexys Creek	LE2	high
Falls Creek	FA2	moderate
Obi Obi Creek	OB4	moderate
Walkers Creek	WA3	moderate
Obi Obi Creek	OB9	moderate
Obi Obi Creek	OB7	moderate
Falls Creek	FA1	moderate
Through to the next section		Culled

No	Criteria	Minor importance	Desirable	Essential
	Evaluation Score	1	2	3
7	Stakeholder cooperation			X

Stakeholder cooperation was examined in order to guarantee the success of any potential rehabilitation project. Landholders within the immediate vicinity of the proposed project sites were contacted and asked to comment. As a result the likely stakeholder cooperation for each remaining project site was estimated and listed below.

1. Obi Obi Creek (OB3) stakeholder cooperation good, previous catchment rehabilitation projects have been developed in the past with some success. Some conflict over maintenance fixed assets over time.
2. Obi Obi Creek (OB2) stakeholder cooperation good, previous catchment rehabilitation projects have been developed in the past with some success. Some conflict over maintenance fixed assets over time.
3. Walkers Creek (WA1) stakeholder cooperation good, previous catchment rehabilitation projects have been developed in the past with some success. Some conflict over maintenance fixed assets over time.
4. Walkers Creek (WA2) stakeholder cooperation excellent, previous catchment rehabilitation projects have been developed in the past with some success. No conflict between maintaining fixed assets over time.
5. Lexys Creek (LE2) stakeholder cooperation excellent as land owned by AquaGen Board, previous catchment rehabilitation projects have been developed in the past with some success. No conflict between maintaining fixed assets over time.

5.0 Results

Two (2) sites were considered most suitable for a large scale rehabilitation project in the Lake Baroon Catchment. These were WA2 located at the mouth of Walkers Creek on Maleny Landsborough Rd and LE2 located in the headwaters of Lexys Creek on Maleny Montville Rd. Preliminary project outlines were developed for both of these sites and are presented below. The project outlines are by no means exhaustive and further planning and discussion are required to develop the projects to an implementation stage.

Site: 1 WA2

WA2 is located on the intersection of Landsborough Maleny Rd and McCarthy Rd, immediately east of Maleny at the mouth of Walkers Creek. The property is owned by the Uniting Church. Current land uses include the Erowal Aged Care Centre, Maleny High School Agricultural program and cattle agistment. A project on this site would involve the installation of 1,200m of fencing, two cattle crossings, the hardening of cattle laneways and the installation of two off stream watering points. In addition 600m of creek bank will be revegetated and regenerated. The project will be a partnership between AquaGen, Lake Baroon Catchment Care Group, the Uniting Church and Maleny High School.

The following is a cost estimation for the project based on current market prices and maintenance over three years.

Table: 6 Estimated cost of project at site 1 WA2

Item	Cost/item	Numbers/metres	Total
Trees	$10	6,200	62,000
Fencing	$12	1,200	14,400
Crossings	$5,500	2	11,000
Off stream watering	$5,000	2	10,000
Privet poisoning	$30	40	1,200
Monitoring	$1,200	1	1,200
Total			$99,800

Photograph 1 Looking south west over project site 1 WA2, road in right of picture is Landsborough Maleny Rd

Photograph 2 Looking south east over project site 1 WA2, previous revegetation in background

Site: 2 LE2

LE2 is located on Maleny Montville Rd 1km south of Montville on the headwaters of Lexys Creek. The property is owned by the AquaGen Board which guarantees the full cooperation of stakeholders. The current land use is as a reserve. A project on this site would involve the revegetation and regeneration of 400m of creek. The project will be a partnership between Lake Baroon Catchment Care Group and AquaGen.

The following is a cost estimation for the project based on current market prices and maintenance over three years.

Table: 7 Estimated cost of project at site 2 LE2

Item	Cost/item	Numbers/metres	Total
Trees	$10	7,000	70,000
Privet poisoning	$30	100	3,000
Weed control	$1.25	20,000	25,000
Monitoring	$1,200	1	1,200
Total			$99,200

Photograph 3 Looking west over project site 2 LE2

Photograph 4 Looking east over project site 2 LE2

APPENDIX C Example Project Brief

PROJECT BRIEF

Project Name	Large Scale Waterway Rehabilitation project		
Link to Plan	Objective: Strategy: Outcome:		
Project Owner	XXXX	**Project Sponsor**	XXXX

Project Description/Intent: (Briefly describe the project)

Design and implement large-scale rehabilitation of priority waterway reaches within the Lake Baroon Catchment. This will include riparian planting, weed control, fencing and potential soft engineering solutions (e.g. Large Woody Debris).

Project Outcome:

To make a measurable environmental health improvement at the reach scale the scale**.**

Background/Available Information: (files, reports, Council minutes, etc)

- Country to Coast a Healthy Sustainable Future (C2C).
- Lake Baroon Catchment Management Strategy (LBCMS)
- Alignment of the strategies, development of implementation actions, timeframes and partners report
- Draft Waterway Prioritisation report.

Will Work be Constructed in Stages (tick) **√ Yes** **□ No**

Details of staged work (See Microsoft Project Gantt Chart for more details):

1. Selection of site
2. Landholder negotiations.
3. Pre-rehabilitation biophysical assessment of rehabilitation reaches.
4. Detailed design and costings
5. Terms of reference development and contractor engagement
6. Monitoring of progress of projects
7. On going biophysical monitoring during and post project

Benefits (What are the tangible and intangible benefits of doing this project)

- Improved waterway health and loads reductions to receiving waters

Risks (Identify the risks associated with this project)

Resource Requirements/Cost:

Can this Project be carried out operationally? √ **Yes** □ **No**

Budget funding may be required? √ **Yes** □ **No**

Requested *Waterway unit* Capital Budget **$0 Allocated out of Pilot Project**

Requested *Waterway unit* Operational Budget **$0 Allocated out of Pilot Project**

Estimated project cost **$100,000**

What is expected project staffing/resource required?

- One part time

Target start date:

xxx 2007

Expected completion date:

xxxx 2007

Project Manager Comments:

Comments:

Name:

Signature: _____ **Date:** ____/____/___

Project Manager

LBCCG President

Comments:

Name:

Signature: _____ **Date:** ____/____/___

President LBCCG

Project Sponsor

Comments:

Name: Phil Aldridge (Aquagen General Manager)

Signature: _____ **Date:** ____/____/___

Project Sponsor

Has project been entered into a project register: □ **Yes** □ **No**

Other information/comments:

Photograph 2 Looking south east over project site 1 WA2, previous revegetation in background

Site: 2 LE2

LE2 is located on Maleny Montville Rd 1km south of Montville on the headwaters of Lexys Creek. The property is owned by the AquaGen Board which guarantees the full cooperation of stakeholders. The current land use is as a reserve. A project on this site would involve the revegetation and regeneration of 400m of creek. The project will be a partnership between Lake Baroon Catchment Care Group and AquaGen.

The following is a cost estimation for the project based on current market prices and maintenance over three years.

Table: 7 Estimated cost of project at site 2 LE2

Item	Cost/item	Numbers/metres	Total
Trees	$10	7,000	70,000
Privet poisoning	$30	100	3,000
Weed control	$1.25	20,000	25,000
Total			$98,000

Photograph 3 Looking west over project site 2 LE2

Photograph 4 Looking east over project site 2 LE2

APPENDIX C Example Project Brief

PROJECT BRIEF

Project Name	Large Scale Waterway Rehabilitation project		
Link to Plan	Objective: Strategy: Outcome:		
Project Owner	XXXX	**Project Sponsor**	XXXX

Project Description/Intent: (Briefly describe the project)

Design and implement large-scale rehabilitation of priority waterway reaches within the Lake Baroon Catchment. This will include riparian planting, weed control, fencing and potential soft engineering solutions (e.g. Large Woody Debris).

Project Outcome:

To make a measurable environmental health improvement at the reach scale the scale**.**

Background/Available Information: (files, reports, Council minutes, etc)

- Country to Coast a Healthy Sustainable Future (C2C).
- Lake Baroon Catchment Management Strategy (LBCMS)
- Alignment of the strategies, development of implementation actions, timeframes and partners report
- Draft Waterway Prioritisation report.

Will Work be Constructed in Stages (tick) **√ Yes** **□ No**

Details of staged work (See Microsoft Project Gantt Chart for more details):

1. Selection of site
2. Landholder negotiations.
3. Pre-rehabilitation biophysical assessment of rehabilitation reaches.
4. Detailed design and costings
5. Terms of reference development and contractor engagement
6. Monitoring of progress of projects
7. On going biophysical monitoring during and post project

Benefits (What are the tangible and intangible benefits of doing this project)

- Improved waterway health and loads reductions to receiving waters

Risks (Identify the risks associated with this project)

Resource Requirements/Cost:

Can this Project be carried out operationally? √ **Yes** □ **No**

Budget funding may be required? √ **Yes** □ **No**

Requested *Waterway unit* Capital Budget **$0 Allocated out of Pilot Project**

Requested *Waterway unit* Operational Budget **$0 Allocated out of Pilot Project**

Estimated project cost **$100,000**

What is expected project staffing/resource required?

- One part time

Target start date:

xxx 2007

Expected completion date:

xxxx 2007

Project Manager Comments:

Comments:

Name:

Signature: _____ **Date:** ____/____/___

Project Manager

LBCCG President

Comments:

Name:

Signature: _____ **Date:** ____/____/___

President LBCCG

Project Sponsor

Comments:

Name: Phil Aldridge (Aquagen General Manager)

Signature: _____ **Date:** ____/____/___

Project Sponsor

Has project been entered into a project register: □ **Yes** □ **No**

Other information/comments:

APPENDIX D Maroochy Shire Councils Large Scale Rehabilitation Project

ENVIRONMENTAL MANAGEMENT BRANCH – WATERWAYS UNIT

Maroochy Pilot Project - Waterways Rehabilitation

Project Management Plan

Document Reference:	T:\WATERWAYS\Projects\Pilot Projects\43131Waterway Rehabilitation Project\03Project_Management\Project Managment Plan Version 1\Waterway Rehabilitation Project Management PlanVer1.1.doc
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Waterway Management Specialist
Environmental Management Branch
Ph: 07 5441 8198

Author: Steve Dudgeon
Waterway Management Specialist
Environmental Management Branch
Ph: 07 5441 8198

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Distribution:

Name	Title	Action	Section to be reviewed
Steve Skull	Manager (project owner)	Signoff	Entire Document
Mick Smith	Coordinator, waterways	Signoff	Entire Document
John Williamson	Pilot Coordinator	Signoff	Entire Document

Approval:

Approval of the document indicates that the signatory has read the document and understands and agrees with the content of the document.

Name/Title: Steve Skull, Manager EM **Signature:** **Date:**	**Reason for inclusion for signoff:** Approval as project owner
Name/Title: Mick Smith, Coordinator Waterways **Signature:** **Date:**	**Reason for inclusion for signoff:** Approval as project sponsor
Name/Title: **Signature:** **Date:**	**Reason for inclusion for signoff:**
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1. INTRODUCTION

1.1 Project Purpose

The downwards trend in the Maroochy River Estuary Report Card can be partly attributed to an increase of nutrients (phosphorus/nitrogen) and turbidity (suspended sediment) in the system. A large proportion of the nitrogen and phosphorus carried by rivers is attached to fine sediment particles. Heavy metals and pesticides are also mostly attached to soil particles.

The best practice most cost-effective method to reduce erosion and associated nutrients at a catchments scale is through the use of riparian vegetation and other soft engineering options (e.g. Introduction of large wood). Vegetation within a riparian zone can slow the overland movement of water, and cause sediment and attached nutrients to be deposited on the land before they can reach the stream channel. Riparian vegetation can also take up and remove some of the nutrients being transported. Soil erosion risks still remain, and maintaining adequate vegetative cover at times of high erosion risk is critically important. Also, riparian management is the most practical last line of defence. (National Land Water Resources Audit 2000).

The clearing of catchments for agricultural land, soil disturbance during forestry operations or urban development, and bare areas such as gravel roads and stock tracks, have led to substantial increases in the amounts of sediment (gravel, sand, silt and clay) entering our streams and rivers.

Council commissioned WBM (2004) to undertake catchment modelling to provide a better understanding of sediment and nutrient source contributions from point and diffuse sources within the Maroochy Catchment. The results (WBM 2004) indicate that the dominant contributor of sediments and nutrients is diffuse sources particularly during wet years (See Figures 1 & 2). The diffuse sources were identified as predominantly sheet erosion and stormwater.

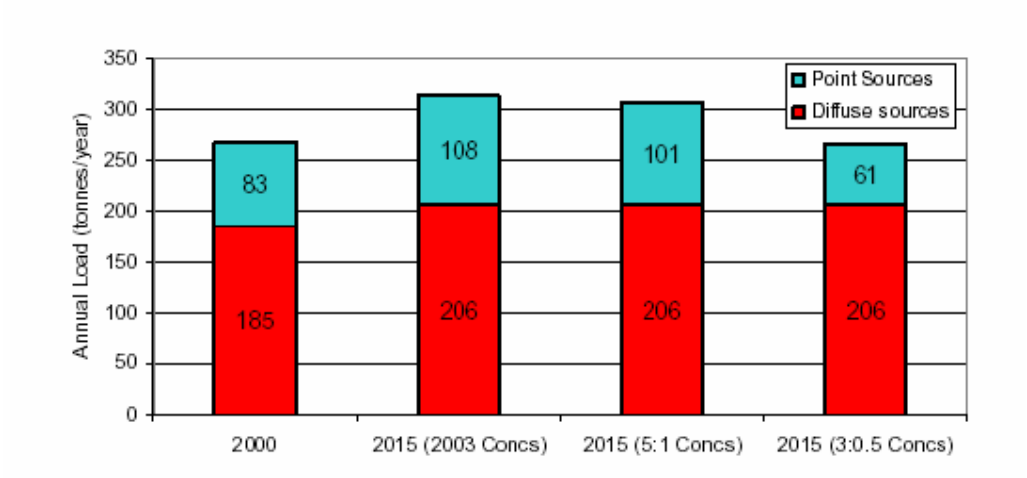


Figure 1: Predicted Total Annual Cumulative Total Nitrogen Loads with various STP retrofits (Taken from WBM 2004)

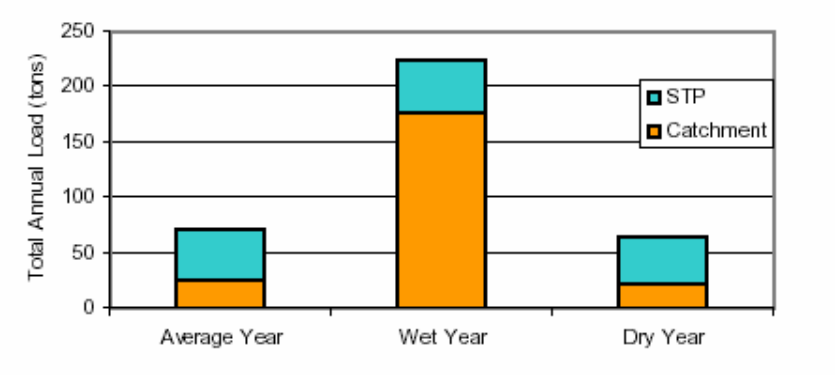


Figure 2: Predicted Total nitrogen annual load contributions (taken from WBM 2004)

One of the report's main conclusions was that 'the implementation of catchment load mitigation measures to freshwater and estuarine areas will provide significant benefits to the health of local ecosystems, and therefore ultimately the entire river system'.

Another supporting result of relevance to this project is predicted reductions that could be expected from a 50% increase in riparian buffers for the Petrie Creek and Doonan subcatchments. The analysis covered predictions for Total Nitrogen, Total Phosphorus and Total Suspended Sediments loads in wet, dry and average rainfall years.

The following reductions were predicted for both catchments:

- Total nitrogen 20 to 31% total load reduction;
- Total phosphorus 19 to 33% total load reduction; and
- Total suspended solids 29 to 43% total load reduction.

Recent studies in Australia have shown that under favourable conditions, both natural vegetation and grassy filter strips can trap around 90% of the sediment moving from upslope. These strips can be just as effective in trapping or absorbing nutrients. By way of example, the Mary River Catchments Coordinating Committee is reducing sediments loads and associated nutrients through riparian rehabilitation, in the Mary River catchment, by approximately 5% per year (CSIRO).

MSC has previously invested in riparian rehabilitation through Making of Maroochy funding following on from the recommendations of the Water Quality Taskforce. This program was largely achieved through a community grants program.

Appendix A contains a list of definitions and acronyms relative to this Project Management Plan.

1.2 Project Scope

The scope of the project is to rehabilitate priority waterway reaches and subcatchments so as to maintain or improve or waterway health, support rare and threatened species and reduce pollutant loads to the receiving waters (including the estuary).

The Waterways Management and Rehabilitation Plan (4site & Hydrobiology 2004) has defined high priority subcatchments to work in. Tools (e.g. rates rebates, covenants, concessions) will be identified to encourage landholders to participate in the program.

Council will engage consultants to undertake market research in high priority subcatchments to determine potential of support from landholders and likely success of project. This market research will be supplemented by individual landholders interviews undertaken by staff within the Waterways Unit.

The Waterway Management Specialist (WMS) and others within the Waterway Unit will undertake detailed design and costings of work.

The Aquatic Ecologist will develop a method for assessing the efficacy of on-ground work and will undertake pre restoration monitoring.

The Waterway Management Specialist will draft a Terms of Reference, advertise and engage contractor to undertake the waterway restoration works.

The Waterway Planner will draft guidelines for allocating funds under the devolved grant scheme. This scheme will be advertised in the local media. Following the close of applications, projects proposals will assessed by the Waterway Planner and site inspections will be undertaken to determine suitability for funding. The successful projects will be decided by the internal steering committee.

Both the large rehabilitation contract and the devolved grant program will be advertised concurrently to create better opportunities and options for community based groups and landholders.

Fortnightly inspections will be undertaken by the WMS to audit progress.

1.3 Project Objectives

Within the defined scope of the Project:

No	Objective	Description
1	Develop and implement devolved grant program for on ground rehabilitation works in priority reaches.	
2	Define subcatchment and reaches with the highest probability of rehabilitation success through landholder involvement and acceptance.	This will gauged through market research of landholders and individual site visits and inspections.
3	Design and implement large-scale rehabilitation of priority waterway reaches within the Maroochy Shire.	This may include riparian planting, off-stream watering, weed control, fencing and potential soft engineering solutions (e.g. Large Woody Debris).
4	Facilitate implementation with landholders	
5	Implement major rehabilitation project (to be undertaken by contractors).	
6	Monitor success of project through environmental health assessment.	Achieved through pre-rehabilitation, during and post environmental health monitoring with modified EHMP.
7	Improve the biophysical condition of waterways of Maroochy Shire	
8	Reduce sediment and nutrient loads to receiving waterways	
9	Communicate and market results. Through communication strategy.	

1.4 Business Benefits

Benefit	Description
Use to demonstrate benefits of waterway rehabilitation	Use to educate industry & community
Mitigate impacts of prior planning and development decisions	Planning and development approvals are part of councils core business. Historic decisions and approvals have impacted on the health of waterways in the Shire.

1.5 Current Situation (see introduction)

Maroochy has a large waterway network which is an important part of the landscape and lifestyle of the area. Past and current modifications to the catchments and waterways have profoundly changed many of the natural systems. There is increasing community and regulatory pressure to improve the state of many waterways, particularly where rare or threatened flora or fauna occur, or where evident degradation has taken place.

The repair and protection that has occurred to date has been critical to the continuing sustainability of the waterways – in an ecological, social and economic sense. Council, the state government and a large number of organisations and individuals continue to work for the improvement of these natural systems. However, co-ordination and budgeting for individual projects has not been undertaken within a whole-of-shire framework. There has been no systematic process of reviewing all waterways and developing long term priorities.

1.6 Proposed Business Solution

Council and its stakeholders now have a rational basis for priority setting and resource allocation. This strategy has prioritised were we should work and directs Council's resources broadly within the Shire and at a finer scale within sub-catchments. This project will start to address the historic degradation of the shires waterways and reduce the pollutant loads entering the estuary.

1.7 Systems Impacted

NA

1.8 Project Stakeholders

The Project stakeholders are:

Internal

Manager EM, Steve Skull (Environmental Management Branch)

Coordinator Waterways, Mick Smith (Environmental Management Branch)

Pilot Coordinator, John Williams (Environmental Management Branch)

Parks, Bushland & Open Space

Strategic Landuse Planning

IPP

Councillors

Community

Mary River Catchment Coordinating Association

Maroochy Mooloolah Catchment Coordinating Association

Maroochy Waterwatch

Maroochy Landcare

NRMSEQ

Maroochy 2025 community taskforce

Government Departments

DNRM

EPA

DPI
DGLP

1.9 Project Owner and Project Sponsor

The Sponsor for the project will be

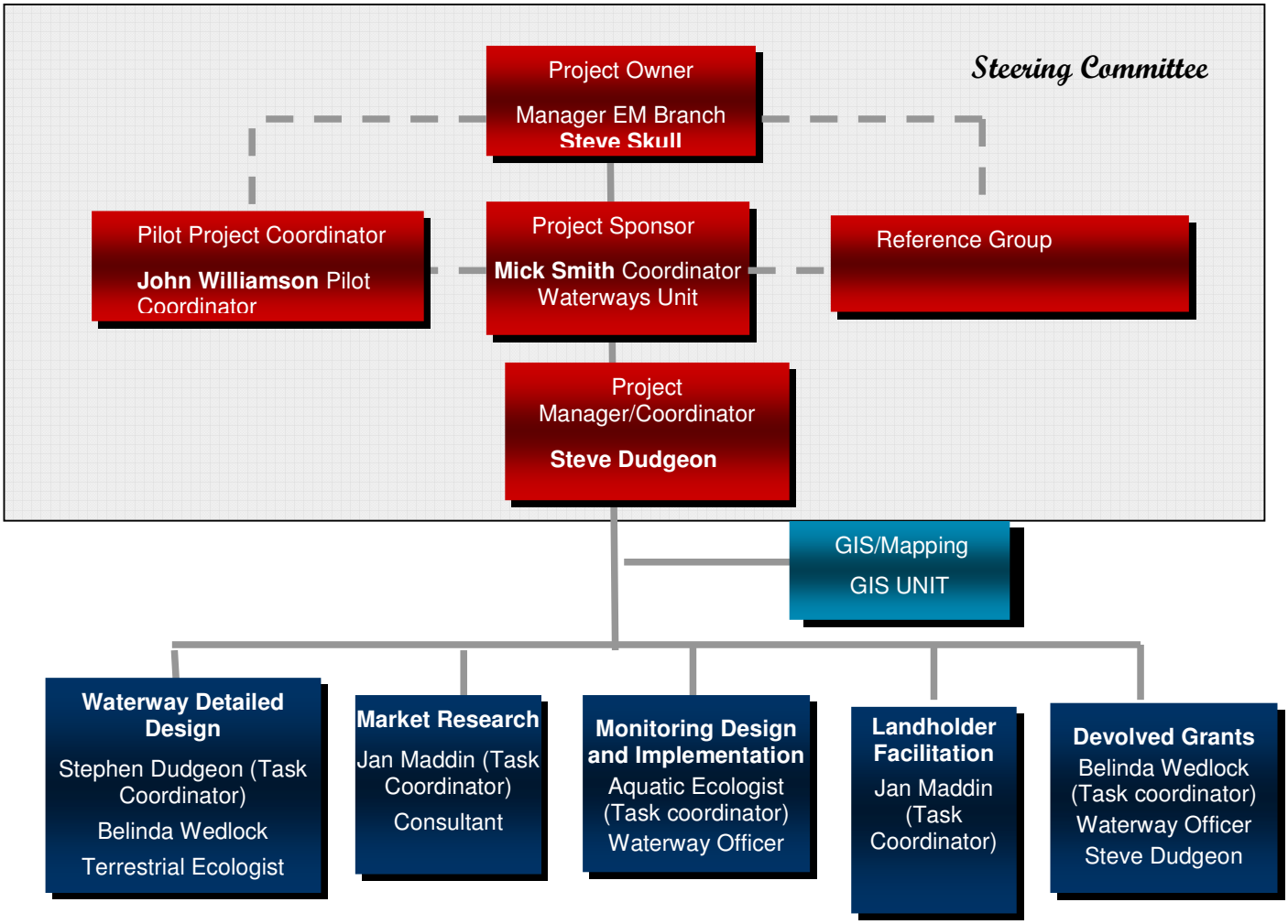
Mick Smith, Coordinator Waterways Unit.

The Owner of the project will be

Steve Skull, Manager Environmental Management

2. STRUCTURE AND RESOURCE FUNCTIONS

2.1 Project Organisational Structure Diagram



2.2 Key Project Human Resources

Appendix B – Key Project Human Resources contains a list of project human resources for this project.

3. MANAGERIAL PROCESS

3.1 Management Priorities

The following table details the milestones associated with the Project.

See attached Microsoft project outline for more detail

	Milestone	Date for Milestone Completion
1.	Waterway Management Plan	30 November 04
2.	Modelling Finalisation	30 November 04
3.	Advertisement of devolved grants	April 05
4.	Award Devolved Grants	June 05
5.	Completion of Market Research	March 05
6.	Finalise Pre Monitoring	June 05
7.	Finalisation of Detailed Design	June 05
8.	Advertisement of major contract	August 05
9.	Award Major Rehabilitation Contract	August 05
10.	Contactor starts planting	12 October 05
11.	Finalisation of Planting	11 January 06

3.2 Risk Management

A number of Risk Triggers have been identified and will be monitored throughout the project.

All risks will be monitored by Project Team members and managed by the party responsible for that risk. The risks will be reviewed on a regular basis.

3.2.1 Risk Management Plan (still to complete)

A number of Risk Triggers have been identified and will be monitored throughout the project.

Refer to the Risk Management Plan for further information.

3.2.2 Other Risk Mitigation

For the major risks identified for this project the following genuine mitigation responses will be followed:

■

3.2.3 Risks associated with carrying out the project

The Project is under the following risks of not being completed due to the following:

■

3.2.4 Risks associated with not carrying out the project

■

3.3 Monitoring and Control Mechanisms

3.3.1 Project Status Reporting

- The project team members will be responsible for monitoring and controlling adherence to the Project Plan. Each key area will be required to provide fortnightly status reports stating:
  - work completed in the month
  - work planned for the following fortnight
  - identification of any issues which may affect the project budget or schedule
  - status on sub project deliverables/activities
- A Project Status meeting will be held fortnightly to discuss any issues relating to individual parts of the project.
- The Program Manager will report 2 monthly to the Maroochy Pilot Control Group. Other project staff may be invited to these meetings as required by the Steering Board.
- Other Council internal reporting will be the responsibility of the Project Manger and project team members.

4. QUALITY PROCESS

4.1 Methods and Techniques

The project will adopt the following methods and techniques:

Detailed Design - Australian Stream Rehabilitation Manuals

Monitoring – to be provided by the aquatic ecologist

Planting and Maintenance – to be provided by the contractor

4.2 Standards, Procedures and Forms

4.2.1 Scope Changes

Any project scope changes must be detailed and agreed by the Steering Board. These changes must be detailed as set out below:

- Request for project scope change
- Reasons for the change
- Impact on time, resources, budget, quality and functionality (must be fully costed)
- Submittal to the Program Manager
- Submittal to project Steering Board
- Project Steering Board Decision

This must be detailed on the 'Project Change Request' form**Problem and Issue Resolution Process**

4.2.3 Other Quality Procedures

As defined in the in Appendix E – Project Quality Matrix.

4.3 Acceptance Testing

A Project Acceptance Test Plan will be developed detailing the tests to be performed, responsibilities and testing schedule.

Acceptance Specification & Test Scripts will be developed by the project team Members detailing:

- what processes are to be tested,
- how the processes will be tested, and
- the expected result.

4.4 Reviews and Audits

4.4.1 Project Progress

The Project Manager and project team members will undertake a review of project progress against the Project Plan every 6 months.

4.4.2 Documentation Review

Reviews of documentation will be conducted in accordance with:

4.4.3 Post Project Review

The Project Team and relevant stakeholders will undertake a post project review. The review will assess outcomes related to project successes, failures and areas for improvement. A Post Implementation Report will be produced with all parties having input.

4.5 Documentation

4.5.1 Documentation Update

The project team are to ensure procedures are in place to enable documentation to be kept up to date for the life of the proposed solution.

4.5.2 Courseware in relation to training

Training courseware is to be aimed at a Maroochy specific level and will include:

-

4.5.3 System Documentation

- The system must be supported by comprehensive documentation.
- There must be extensive system and user support training documentation.

4.5.4 Technical Documentation

- The supplied technical documentation must include Trouble Shooting and Quick Start Guide sections as well as detailed and well indexed references.

4.6 Acceptance Testing

A Project Acceptance Test Plan will be developed detailing the tests to be performed, responsibilities and testing schedule.

Acceptance Specification & Test Scripts will be developed by the project team Members detailing:

- what processes are to be tested,
- how the processes will be tested, and
- the expected result.

4.7 Communication

To de developed as part of a broader the Pilot Program communications strategy– John Williams and, Education Officer

Communication of the project vision and status will be made available using the internal project website and Newsletters, in addition to presentations to all levels of management as and when required.

4.7.1 Public Participation Requirements

4.7.2 Method of Communication

The following chart shows the communication lines to be followed by the project, particularly in terms of escalation of issues.

Stakeholders Requirements Matrix

Stakeholder	Type of information	Timing	Format	Responsibility
Insert Stakeholder/s here	*Insert type of information to be communicated*	*Once off*	*Project Plan*	*Project Manager*
		Monthly	*Project Plan progress*	*Project Manager*
		Monthly	*Report on Project Status*	*Project Manager*
		As required	*Managers' Strategic Forum*	*Project Manager*
		As required	*Network Forum*	*Project Manager*
		Monthly	*Impacted areas Branch Meetings*	*Project Team Members*
		Weekly	*Project Status Reports*	*Project Team Members*
		As Necessary	*Intranet Site*	*Project Support Officer*
		As requested	*Councillors*	*Project Manager*
		As requested	*General presentations*	*Project Team Members*
		Monthly	*Steering Board*	*Project Steering Board*
		Weekly	*Project Management Meeting*	*Project Manager*
		Weekly	*Project Status Meeting*	*Project Team Members*

4.7.3 Communications Requirements Matrix

4.7.4 Communication Requirements Matrix (TBA developed by John Williams and Education Officer)

Communication Type	Purpose	To whom	Format	How Often	Responsibility
Project Newsletter	*To keep all stakeholders informed*	*All internal stakeholders*	*Newsletter*	*Bimonthly*	*Project Manager*

Communication Briefings	*To keep employees informed*	*Employees*	*Meeting*	*Biweekly*	*Marketing, Public Relations*
Presentations	*Get stakeholders on side, inform*	*Stakeholders*	*Presentation*	*As required*	*Project Team Leaders*
External Media	*Get clients on side, inform*	*Clients*	*Press, TV*	*As required*	*Marketing Public Relations*
Weekly Status Report	*To inform Project Manager on status, and issues*	*Team Leader to Project Manager*	*Status report form*	*Weekly*	*Project Leaders*
Timesheets	*Track progress*	*Team Members*	*Timesheet form*	*Weekly*	*Project Manager*
Issues identification	*Identify., record follow up issues*	*Project Team members*	*Issues log*	*As required*	*Project Manager*
Change Management	*To inform on scope changes, impacts, costs, actions required and approvals*	*Team Leaders* *Project Manager*	*Project Change Request*	*As required*	*Project Manger*
Interest Group Meetings	*Exchange of information*	*Special interest Group (SIG)*	*Meetings*	*Bimonthly*	*Public Relations Manager*

4.7.5 Communications Calendar

Date	Communications Type	Subject	Audience	Method

5. BUDGET, SCHEDULE AND ACTIVITIES/TASKS

5.1 Project Expenditure – Capital and Operational Expenses

See Microsoft Project for more detail

Operational	**$1,375,400.00**	**Hours**
Project Staff	0	2152 (307 days)
External Consultants	38,400	25
Contractors	850,000	
Technical Costs	0	
Community Group	450,000	
Training Costs	10,000	
Licensing	0	
Leasing	0	
Other Resource Costs (contingency)	27,000	
On costs	0	
Capital	**$9,000**	
GIS package	6,000	
GPS	3,000	
	1,384,400	

5.2 Project Cost Control

Appendix F – Project Cost Control contains a Project Cost Control template to assist with calculating cost and scheduling variances.

5.3 Project Schedule

5.3.1 Project Phases

- The Initiation Phase is used to identify the problem and/or opportunity and initiate the project.
- The Concept phase is used to define the problem/opportunity and identify a solution or conduct a feasibility study.
- The Design/Develop Phase is used to design and develop a solution for opportunity/problem.
- The Implementation Phase is used to rollout/implement the solution.
- The Finalisation Phase is used to handover deliverables and review the project.

The phases are to occur to the following time-line:

Phase	Start date	End date
Initiation	6 September 04	10 September 04
Concept	10 September 04	24 September 04
Design/Develop	24 September 04	17 November 04
Implementation	17 November 04	

Phase	Start date	End date
Finalisation		30 December 05

5.4 Resource Estimation

The following information is intended to be an estimate of the resources required for the project.

5.4.1 Internal Resources

See Attached Microsoft project outline

Resource Name	Resource Type (people, materials, etc)	Role	Work Effort Days (% Commitment*) **2004**	Work Effort (% Commitment*) **2005**	Work Effort (% Commitment*) **2006**	Standard Rate	Total Cost
PROJECT LIFECYCLE PHASE:							
Activity:							
Steve Dudgeon	WMS	Project Manager	8 (3%)	94 (46%)	8 (3%)	110 (640/day)	$70,400
	Waterways Officer	Monitoring		47 (23%)		47 (320/day)	$15,040
Graham Webb	Aquatic Ecologist	Task Coordinator, Monitoring Design & Implementation		22 (11%)		22 (640/day)	$14,080
Belinda Wedlock	Waterway Planner	Task Coordinator, Detail Design	14 (7%)	43(20%)		57 (640/day)	$36,640
Jan Maddin	Waterway program officer	Task Coordinator, Market Research	20 (10%	33 (16%)	5 (2%)	58 (640/day)	$37,120
Total Internal Resources			**42 (20%)**	**239 (117%)**	**13 (5%)**	**294**	**$173,280.00**

* Based on 1638hrs/yr or 205 days/year

5.4.2 External Resources

Resource Name	Resource Type (people, materials, etc)	Role	Work Effort (days)	Standard Rate	Fixed Cost Allocation	Total Cost
PROJECT LIFECYCLE PHASE:						
Activity:						
Market Research Consultant		Market Research	30 (estimate – 10days per catchment)	960 (120/hr)		$28,800
Contractor		Riparian Rehab				$877,000
Community groups		Riparian Rehab				$450,000
Consultants		Peer review, advise	10	960 (120/hr)		$9600
Total Internal Resources						**$1,365,400.00**

5.5 Schedule of Deliverables

This Project will provide the following key deliverables:

Deliverable	Due Date	Responsibility
Project Plan	18 Nov 2004	Steve Dudgeon
Waterway Management & Rehabilitation Plan	3 December 2004	Steve Dudgeon
Advertise Devolved Grants	5 December 2004	Belinda Wedlock
Licence – DNRM, Cultural Heritage	15 December 2004	Belinda Wedlock
Market Research Results	15 December 2004	Jan Maddin
Finalisation of Pre Monitoring	31 March 2004	Graham Webb
Sub Catchment Detailed Design	11 April 2005	Steve Dudgeon
Advertisement of Contract for Rehabilitation	26 April 2005	Steve Dudgeon
Award Devolved Grants	6 June 2005	Belinda Wedlock
Award Contract for Rehabilitation	21 June 2005	Steve Dudgeon
Planting Begins	28 September 2005	Contractors
Planting Complete	28 December 2005	Contractors

5.6 Project Gantt Chart

The attached Gantt Chart Project Plan depicts the schedule of the activities and tasks for this project. This chart has been produced using Microsoft Project and is located in the folder:

T:\WATERWAYS\Projects\Pilot Projects\43131Waterway Rehabilitation Project\03Project_Management\Project Management Plan Version 1

5.7 Assumptions, Dependencies and Constraints

5.7.1 Assumptions

- Resources are available for the entire period of the project
- Funds are available to match the project requirements

5.7.2 Dependencies

Specify the dependencies between activities and tasks (e.g. review and approval of the acceptance criteria to occur before acceptance testing can occur):

- Third party requirements are available within Project timeframes.

5.7.3 Constraints

State assumptions. Examples include:

Availability of business staff to assist with Project priorities.

Appendix A - Definitions and Acronyms

Item	Description
WMS	

Appendix B – Key Project Human Resources

Name	Role	Time Required
Project Custodian	Owner of the Project Prioritising the project as strategically important to Council Providing authority to proceed with the project post approval from the <Relevant Board> (eg. The Information Technology Steering Board (ITSB) Promoting the project throughout Council Being the final escalation point for issues Signing contracts over $50,000	
Project Sponsor	Sponsor of the project Ensuring adequate funding is available for the project. Providing guidance to the Steering Board at a strategic level Providing authorisation of contract variations Providing final acceptance for payment of deliverables	
Steering Board	Representatives from Division level to steer and guide the project Authorising changes to scope and requirements that impact the project cost, time and quality constraints Reviewing the project progress and deciding action in the event of problems, including the choice of cost, time, quality or scope trade-offs Resolving escalated issues Authorising continued work on the project within the approved funding, and recommendations to the Project Sponsor concerning funding changes Approving the processes for change of scope and project progression As divisional representatives, communicating project progress, intent and all relevant issues and promoting project objectives and achievements within their Division	
Project Stakeholders	People affected by or having a specific interest in the outcomes of the Project Planning and providing sufficient resources for any analysis of requirements, planning and procedural changes	

Name	Role	Time Required
Project Manager	Responsible for the overall coordination of the Project Establishing and active management of an overall Project Plan, including resourcing requirements Ensuring the objectives of the project as detailed in the Project Management Plan are met Managing the overall implementation of the project and ensuring all budget, schedule and functionality commitments are both achievable and achieved Managing and prioritizing the activities of the Project Team and vendor/supplier resources Arranging and scheduling required project reviews Escalating issues to the Steering Board or Project Sponsor where appropriate Authorising the implementation of changes which do not affect the scope or cost of the project Reporting on the overall project progress to the Steering Board Meeting project reporting and quality requirements Providing recommendations on acceptance of the project deliverables Allocating work to the project team, ensuring they understand the objective, scope and deliverables for each task Liaising with the business stakeholders on issues relating to the business content and the acceptability of project deliverables Documenting and recommendation of process improvements Ensuring change requested during the project are channeled using the correct change procedures Ensuring stakeholders are kept fully informed of project progress and impacts Liaising with General Managers and Managers regarding project deliverables to address expectations Ensuring ownership of entities and project outcomes are clearly defined and the relevant Divisions, Branches, Teams and individual staff have accepted ownership Providing Contract and procurement management	
Vendor/Supplier Project Manager	The Vendor/Supplier Project Manager is responsible for Ensuring appropriately skilled consultants are available for the duration of the project Ensuring Vendor commitments are met Identifying and reporting any changes to the scope or schedule to the Project Manager	

Name	Role	Time Required
Project Team Members	Project Team Members are responsible for Reporting on the business project progress to the Program Manager, and the presentation of options to overcome business-related problems Ensuring the objectives of the project as detailed in the Project Management Plans are met Ensuring the project functionality, schedule and resource requirements are met Escalating to the Program Manager where problems are encountered and assisting to identify resolutions Liaising with other Team Members to ensure cross system issues are identified and resolved Ensuring stakeholders and business area clients are kept fully informed of project progress and impacts Documenting and providing recommendation for business process improvements and obtaining sign off from the business areas Assisting with the design of the system Identifying requirements for changes to key processes Assisting in the development of the Acceptance Test Plan, process changes and training manuals Ensuring the accuracy of Acceptance Testing and the recording of results Assisting in planning the implementation and changeover required to ensure the project is successful Identification of Custodians and handing over to the relevant stakeholders	

Name	Role	Time Required
Project Support Officer	Responsible for Assisting the Program Manager to organise and run the project in a controlled, auditable manner, including management of changes, processes, risks and issues Assisting Project Team staff to identify and record changed processes and procedures Establishing and managing the Project Action Register Assisting in the performance of project quality reviews Providing assurance that the quality processes for the project are adhered to and follow the Quality Management Plan objectives Determining guidelines and providing assistance to project staff in creating and developing Acceptance Test Plans, test scripts and establishing test schedules Establishing and maintaining a directory structure for all electronic documentation Developing material for the Project Intranet site Developing a Training Plan and providing training coordination Consulting with project team members to establish a Security Matrix Monitoring of the project Budget Assisting with the development of training manuals Providing communications and information distribution Ensuring all documentation and correspondence is correctly filed Assisting with the preparation of presentations, reports and other documentation Arranging meetings and taking of minutes associated with the project and preparation of agendas for same Providing general administrative support for the project	

Name	Role	Time Required
Business Systems Analyst	Responsible for: Providing assistance to the Project Team in the analysis and specification of any requirements Determining guidelines and being the lead agent for any analysis work required in defining project deliverables and business requirements being a lead agent in ensuring project processes are maintained and followed determining guidelines and being the lead agent for any analysis work required in defining project deliverables and business requirements providing advice on best practice and data management for all Acceptance Testing establishing clear test regimes and ensuring change control processes are followed for data collection, verification, testing and migration	

Responsibility Assignment Matrix

WBS Code	Activity/Task	Dependency	Work Effort	Prime	Assist	Consult	Review	Signoff	Duration

Appendix C - Risk Register

Function / Activity / Area:		
Date of risk review:		
Compiled by:		**Date:**
Reviewed by:		**Date:**

Ref	The Risk: What is it & How can it happen?	Likelihood	Consequences	Risk Rating	Risk Priority
	Landholders within desired priority subcatchment not engageing project	M	H	H	1
	Weather delays	M	L	L	2

Appendix D - Risk Treatment Schedule and Action Plan

Function / Activity / Area:		
Date of risk review:		
Compiled by:		**Date:**
Reviewed by:		**Date:**

The Risk in priority order from Risk Register (REF)	Possible Treatment Options	Preferred Options	Risk Rating after Treatment	Result of Cost / Benefit Analysis A: accept R: reject	Officer/s responsible for implementation of option	Implementation Timetable	How will this risk and the treatment options be monitored?

Appendix E – Project Quality Matrix

PROJECT LIFE CYCLE PHASE:							
Project Activity:							
WBS Code	**Task**	**Deliverable**	**Quality Objective**	**Standard**	**Test**	**Benchmark**	**Responsibility**

Appendix F – Project Cost Control

WBS Code	Description	Earned Value (EV)	Actual Cost (ACWP)	Scheduled cost (BCWS)	Cost Variance (CV)	Schedule Variance (SV)	Comments