Implementation and Management Plan for the Restoration and Enhancement of the Albert Town Lagoon Reserve

Queenstown Lakes District Council

20th December 2007

Contract Report: NS 69 /07

Prepared for:
Queenstown Lakes District Council

Natural Solutions *for Nature* Limited
P.O. Box 272, Queenstown
Phone: 03 442 7347
cell phone: 027 442 7348
fax: 03 442 7348
email: dawn.palmer@xtra.co.nz

Contents

Introduction

In autumn 2006 the Queenstown Lakes District Council initiated a long term project to enhance the Albert Town Lagoon Reserve, a 4.86ha recreation reserve vested in the council in the heart of Albert Town.

A Preliminary Restoration and Enhancement Plan was developed, and approved following public consultation and presentation to the Wanaka Community Board.

This Implementation and Management Plan sets out the practical tasks and timeframes required to implement the approved preliminary concept plan.

The implementation plan seeks to achieve the goals or visions outlined in the concept and also takes into consideration the submissions received during public consultation.

In addition to this paper copy a digital copy of the spreadsheet has been delivered to the QLDC project manager to be updated as and when needed.

Vision for the Albert Town Lagoon

The approved concept plan for the restoration and enhancement of the Albert Town Lagoon Reserve presented a vision for the reserve which this implementation plan seeks to achieve. This vision was:

- To create a diverse range of habitat within the reserve and restore the natural integrity of the lagoon as a distinctive natural feature of the Upper Clutha so that it contributes to the special landscape character of Albert Town and the Upper Clutha district.
- To enhance indigenous biodiversity of the Upper Clutha landscape by restoring the wetland to a more indigenous state
- To re-introduce species lost to the area where possible and provide habitat for endangered and threatened species
- To engage local communities and schools throughout the project to foster appreciation and understanding of indigenous ecosystems, especially wetlands
- To encourage participation and cooperation to foster commitment to local wetland restoration and care for our natural open spaces.
- To create a useable attractive recreation space, accommodate the proposed trail, and provide a range of stimulating natural landscape experiences.

The local community showed overall support for the proposed project during public consultation. However, some concerns were expressed about the extent of tree removal and how this may affect the existing wildlife of the lagoon. Several of the local residents indicated they enjoyed the wild appearance and secluded character of the reserve and did not want to see it too tidy. Concern was also expressed regarding the affect of the proposed changes on the resident frog population.

In order to mitigate the community concerns, it was reported to the Wanaka Community Board that tree removal would occur in a staged fashion rather than be clear-felled. Most of the poplars that are healthy would also remain and some willows trimmed up and left in-situ in the interim (Report to Wanaka Community Board, Gordon Bailey 24th September 2007).

As a consequence of public submissions, it was also reported to the Community Board that regular community updates via the Community Association and more frequent updates to the immediate neighbours surrounding the lagoon would occur so that they could be kept informed with the project as it proceeds.

This implementation plan therefore seeks to create a practical plan which incorporates the original approved concept and vision, and accommodates the considerations of the local community.

Management goals as a consequence of public submission are therefore:

- To maintain an in-situ frog and waterfowl population during the restoration project. To achieve this goal all management tasks will need to be undertaken in a considerate manner. Timing will be crucial to avoid disturbance during the breeding season. Consideration of the effects of herbicide use on the resident frog population will also need to be made. Contractors undertaking weed control will need to be thoroughly briefed to ensure management goals are achieved.

- To maintain some willow and poplar canopy. It is essential that trees which are to remain should be clearly identified to ensure that they are not mistakenly removed by contractors. Minor tree removal will occur on the "Island" and along the western margin of the reserve. Maintaining trees here will also help to screen the activities of removing the bulk of the willows from residents on the western side of the reserve.

- To stage the transformation to maintain existing bird and invertebrate populations and allow for community consideration. Using appropriate techniques and removing trees over a period of years will stage the removal work.

- To update the community regarding the annual programme of works. This will also allow the community to plan for any volunteer planting or weeding days.

Tasks and Timeframes

Key tasks required to implement the concept are detailed in the attached spreadsheet: **Implementation Plan Tasks and Timeframes** (**Schedule A**). This spreadsheet has also been delivered electronically to the QLDC project manager who will update as necessary.

Some initial tasks and preliminary planning is required before the major works of tree removal, track construction and planting can take place. These are listed at the top of the task sheet (Planning and Preparation).

Tasks include:

- woody weed control;
- willow clearance;
- track formation;
- surveying;
- planting;
- ongoing maintenance.
- ecological monitoring;
- community consultation; and
- applying for funding;

These tasks are all broken down into components in the Tasks and Timeframes spreadsheet (**Schedule A**). Some of the major tasks require further detailed explanation. These are included in the appended schedules (**Schedules B – G**). These schedules provide key information and should be used to compile specifications to give to contractors to ensure that the tasks are completed within the scope of the management goals and visions for the reserve.

Schedule A : Implementation Plan Tasks and Timeframes

Schedule B: Preliminary Cost Estimates

The table below contains some preliminary costs estimates to be used for budgeting and funding application. These costs estimates will be revised following initial tree removal and as planting and trail plans develop. The costs do not represent quotes for services to be provided by contractors. The budgeting spreadsheet will be delivered to the Project Manager to be updated as the project develops.

Schedule C : Tree control

Willows

Removal of willows from large areas of the reserve is the initial major task of the project which will be undertaken before any ecological restoration or track construction can take place. Initially all over mature and decaying willows will be removed, as well as broken and decayed limbs on otherwise healthy trees. Low spreading limbs will also be removed to allow for access. Remaining healthy growth will then be re-assessed for further removal work to permit the restoration planting.

It is very important that the willow infestation is brought under control before any planting takes place. Re-growth of willow seedlings if not controlled will over-top and shade the low stature indigenous wetland plants. Once plants are in the ground herbicide use to control willow seedlings will not be possible. All weeding will have to be mechanical, i.e. hand-pulling seedlings. In addition, all large tree removal work needs to be undertaken before any boardwalk construction to prevent damage to the walkway.

The majority of willow control work will take place along the east bank of the lagoon and in the lagoon itself, where the willows are densest and where indigenous wetland planting is planned (Areas A and B). Some willows will remain for aesthetic reasons. These will be identified as the project progresses. Willows which do remain must be at a low risk of spreading or wind damage, i.e. at no immanent risk of boughs cracking and striking the ground. Trees which are to remain should be limbed up. Occasional trees on the Island and along the Western bank will be tidied up and/or selectively removed.

Willow control is complicated by the diverse size of trees present, from large mature cracked trees to large quantities of small seedlings. There is also a considerable amount of dead wood present. Different techniques will be required to control the different size trees. Control methods are listed in **Table 1**.

Any control that takes place needs to minimise the further spread of willow. Fragments from felled live trees have a VERY HIGH RISK of striking and re-infesting the area. Therefore the mechanical removal of live trees should be minimised as much as is practicable. Removal of debris (twigs, branchlets) from the ground following the felling of live trees will be very important to minimise the re-growth of willow seedlings. This task should not be under-estimated in terms of importance and time allocated. Effort expended at this stage will reduce the need for herbicide use and secure ecological restoration planting from over topping by willows in the medium term.

Willow control needs to be undertaken to a sufficient standard to allow restoration planting. Planting will not be able to commence until large enough gaps in the canopy have been created, re-growth of willow (i.e. seedlings and saplings) is under control, and there is no further danger of large limbs cracking and making contact with the ground. Foliar spraying of willow seedlings will not be possible around areas of re-vegetation due to the risk posed to the planted plants, and the cost implications to the

project. Hand pulling of seedlings is a possibility, utilising community volunteer support.

Herbicide use next to water poses additional concerns. Herbicides containing Glyphosate 360 (e.g. Roundup) as the active ingredient are the only herbicide not requiring a resource consent for use over and around water if used in the manner compliant with the rules of the Otago Regional Plan : Water. Although Glyphosate 360 is inactivated on contact with soil and has no residual activity, it is still considered eco-toxic, being very toxic to aquatic organisms with long lasting effects. During public consultation the local community expressed concern about the proposed changes affecting the resident frog population. There is some research and anecdotal evidence to suggest that Glyphosate, particularly in combination with a surfactant or penetrant can be lethal to frogs and tadpoles. The use of Glyphosate may have the potential to affect the local frog population. Considering the public submissions and other comments made during the public meeting any negative effect on the frog population would not be well received by the local residents.

Judicious use of herbicide, applied in a controlled, targeted way will seek to prevent the spread of herbicide into the water. In addition, penetrants / surfactants which are most commonly used in foliar spraying to aid the uptake of Glyphosate should not be used within 5m of the water margin of the lagoon. This may reduce the efficacy of foliar spraying as a method of willow control and require repeat spraying. Surfactants/penetrants are not required for drill, frill or stump painting methods of herbicide application. Application of herbicide in this manner (i.e. drill, frill or stump painting) is therefore preferable to spraying.

Management goals :

- to remove a substantial amount of the existing willow canopy and control all willow undergrowth, so that only occasional specimen adult trees which are at low risk of spreading remain on site.
- Primary control methods should include the targeted use of herbicide
- Mechanical removal of live trees should only be undertaken if necessary. Additional effort should be made to clear up the debris (branches and twigs) after felling of live trees.
- Control methods should not spread of the willow infestation further.
- Herbicide use should be minimised and care taken to prevent contamination of the water and inadvertent spraying of non-target species.
- Willow control should permit the planting and establishment of indigenous plants through the re-vegetation project and these plants must be secure from willow re-infestation in the long term.
- Willow control should permit the long term safety of the walkway / boardwalk.
- Once plantings are established periodic control and maintenance of willows is recommended to future proof all restoration planting. Willow saplings may require control every 5 years or so and maintenance checks should be made on mature trees to minimise the risk of limbs cracking and striking on the ground.

It is important that contractors which are to be used for willow control work are briefed adequately to ensure that the management goals above are achieved. Contractors will need to hold appropriate Growsafe certification.

Appropriate control methods for willow are listed in the table below:

Table 1 : Albert Town Lagoon Willow Control Methods

Size of tree	Timing	Method	Disposal	Comment / Precautions
Small willow saplings	Any time of year (although easier in summer)	Hand pulling. Must pull all of the plant as roots and dropped branch fragments will re-shoot.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Labour intensive. Avoids the use of herbicide over large areas of wetland. Can also be undertaken by community volunteers.
Saplings to large to pull (<5cm diameter)	Autumn, before leaf fall.	Cut using hand saw and immediately dab stump with a thick Glyphosate 360 solution (33% or according to manufacturers instructions).	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	No surfactant or penetrant should be used within 5m of water margin. Swab must occur immediately for the herbicide to be taken up. Extreme care must be taken to not spill herbicide onto the ground / water.
Small to medium sized trees (5 – 15cm diameter)	Autumn, before leaf fall.	Using a small axe (or other similar tool) cut a series of gashes or feather frills into the stem of the tree. Do not ring bark the tree as this reduces the uptake of the herbicide. Apply 100ml Glyphosate / 1l to the cut. In autumn of the following year fell dead tree. If tree has not died re-apply.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	No surfactant or penetrant is required. Herbicide application must occur immediately for the herbicide to be taken up. Extreme care must be taken to not spill herbicide onto the ground / water.
Medium to large trees(>15cm diameter)	Autumn, before leaf fall.	Using a hand drill with an auger drill a series of holes 30mm deep at approx.	Mulch, place on and under plastic sheets to prevent striking in	No surfactant or penetrant is required. Herbicide application must occur

		50mm spacing. The holes need to be at an angle to allow herbicide to be applied. Do not ring bark the tree as this reduces the uptake of the herbicide. Apply a 10ml dose of 100ml Glyphosate / 1l. In autumn of the following year fell dead tree. If tree has not died re-apply.	ground and photosynthesising	immediately for the herbicide to be taken up. Extreme care must be taken to not spill herbicide onto the ground / water.
Large dangerous trees	Autumn, before leaf fall.	Mechanically fell and immediately dab stump with a thick Glyphosate 360 solution (33% or according to manufacturers instructions). Remove all debris from the ground.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	This method of control should be minimised as much as is practicable. No surfactant or penetrant is required. Herbicide application must occur immediately for the herbicide to be taken up. Extreme care must be taken to not spill herbicide onto the ground / water.
Dead wood	Autumn and Winter (to avoid bird breeding season)	Fell any dead standing wood. Cut up large branches on ground. Remove those pieces of wood which will impede planting. Some dead wood	Mulch and add to pile.	Some dead wood should remain as it will provide a habitat for invertebrates. However, the ground needs to be clear enough for planting.

		(both large and small pieces) should remain as invertebrate habitat.		
Large specimen trees to remain in-situ	Autumn and Winter to avoid bird breeding season.	Limb any boughs which are horizontal or below horizontal (i.e. below parallel to) the ground. Limb any boughs which are cracked. Remove all limbs and sucker growth below 3m height. Remove all debris (branches and twigs) from the ground.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising.	Effort must be expended removing all debris, twigs etc to prevent striking.
Re-growth around stumps of felled trees and deep rooted multi stemmed shrubs which cannot be killed by any of the above methods	Autumn, before leaf fall.	Foliar spray using a solution of Glyphosate 360 (see the manufacturers labelling for recommended dose – or 1/100). If necessary, in autumn of following year remove woody stems.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	No surfactant or penetrant should be used within 5m of water margin to avoid harmful effects to aquatic organisms. Extreme care must be taken to not spill herbicide onto the ground / water or spray non –target vegetation. This method of application poses the greatest risk to aquatic fauna and frogs / tadpoles. Its use should be minimised. Spraying

				should not occur around areas of revegetation.

Poplars

Except for poplars identified as dangerous or over mature they will not be felled in the initial phase of tree removal work. Multi-stemmed Poplars should be trimmed up, so that a single stemmed tree is left standing. An assessment of further tree removal will then be undertaken after the first phase of tree removal, in winter 2008. Trees which are required to be removed will then be identified. Poplars can be felled and Glyphosate applied to the stumps immediately. They do not have the same striking capability as willows and therefore the need to kill the tree before removal is not necessary. In addition, many of the poplars are very tall and close to property boundaries and dead standing trees would represent a hazard to adjacent properties.

In grassy areas, small seedlings will be controlled by mowing rank grass. Some spot spraying with Glyphosate could be used if they are considered to be a problem in the future, but this is not currently anticipated. In wetland areas, small poplar seedlings should be hand pulled (preferred) or spot sprayed with Glyphosate 360 (with no penetrant). Larger saplings should be felled and Glyphosate 360 applied to the stump. Re-growth should be sprayed with Glyphosate 360.

Vegetative material should be disposed by mulching, as per willow debris.

Schedule D : Woody and other Weed Control

There are many different kinds of weeds and infestations dotted throughout the reserve which require different approaches to their control. Weed control will occur as ongoing maintenance over the project period to prevent spread, but also some concerted efforts will be required in particular areas prior to revegetation. **Table 2** outlines the various weed infestations and control measures to be used. Weed control is a task which can be undertaken with community volunteer support.

Occasional woody weeds, such as broom, Douglas fir, cotoneaster and hawthorn

Where shrubs / trees are not close to water, they should be felled close to the ground and Vigilant © gel applied to cut stump immediately. Any re-growth should be sprayed the following year with Glyphosate. A penetrant or surfactant may be added providing the weed is not within 5m of the water margin. All cuttings etc should be mulched. Small seedlings can be hand pulled.

Large infestations of broom

A large broom infestation is present on the eastern terrace. This should be mechanically removed and mulched prior to seed set. Large stumps should have Vigilant © gel applied immediately. Re-growth should be sprayed with Glyphosate the following year. Control of this broom patch will be required over a time period of several years. However, revegetation of the terrace with indigenous plants will not occur until the end of the project. This provides plenty of time to gain control of the infestation before restoration planting. Hand grubbing of plants should also be considered as a means of controlling this weed without using herbicides.

Vines : Blackberry, Convolvulus and Solanum

Some significant patches of blackberry and convolvulus occur in the willows at the northern end of the lagoon. These weed patches are close enough to the lagoon margin to warrant the targeted use of Glyphosate 360 in a manner which avoids or minimises the potential for it to come in contact with the water. No surfactant or penetrant should be used.

The mechanical removal of willow trees with live *Convolvulus* vines threatens to spread this localised infestation around the reserve. The *Convolvulus* vines should be cut so that the aerial parts in trees wither and die prior to any tree felling. The remaining plant on the ground should be sprayed with Glyphosate (1/100). Considerable care should be made to target the application of herbicide to the plant and avoid contact with the ground and water. No penetrant/surfactant should be used. Re-growth should be sprayed in the spring the following year. It is likely that this vine will be difficult to control, but every effort should be made to eliminate it prior to any revegetation efforts.

Blackberry should be physically cut and mulched prior to willow removal. Any re-growth should be sprayed with Glyphosate (1.5/100). It is likely that this weed will

be tenacious and require repeated control. Control methods may need to be re-assessed.

Small patches of Solanum (Nightshade) are found around the margins of the reserve, often in piles of garden waste and compost. Control should be similar to that of Convolvulus, i.e. cutting and spraying re-growth.

Rank grass, Lupins and thistles

Rank grass will require mowing with a weed eater several times per year over the first few years. This effort will diminish as revegetation and enhancement works gradually replace areas of rank grass with native vegetation. Repeat mowing prior to seed set will also slowly diminish the lupin and thistle population.

Lupins and thistles dotted around the reserve should be controlled, particularly where any restoration planting is planned. The entrance from Alison Ave and Connors Lot will require some targeted effort. This area should be mowed with a weed eater prior to seed set each year (i.e. in November, in association with rank grass control). Individual plants should be target sprayed with Glyphosate. A penetrant / surfactant may be used (such as Pulse) where there is no danger of the herbicide coming into contact with water. This will require repeat spot spraying each year. With diminishing effort it may also be possible to hand grub out young plants with the assistance of community volunteers. This will help to reduce herbicide use on the reserve.

Aquatic weeds

Several small and localised patches of introduced water weeds (Glaucous sweet grass *Glyceria declinata*, Monkey musk *Mimulus guttatus* and water cress *Rorippa nasturutium-aquaticum*) may pose a threat to some of the wetland planting. The need to control these weeds and the threat they may pose to planting should be assessed prior to planting for each area of the reserve. Use of herbicide over water is not recommended. The patches are small enough to permit hand pulling as a control method. This task would be suitable for community participation.

Table 2 : Albert Town Lagoon Restoration and Enhancement Implementation Plan - Weed Control Methods

Weed	Timing	Method	Disposal	Comment / Precautions
Blackberry	Cut back prior to tree removal to prevent spread. Spray re-growth in spring - summer	1st year : cut back and dab Glyphosate 360 on remaining leaves and stems. 2nd year and on: spray re-growth with Glyphosate 360.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Control methods may need reassessing depending upon success. Do not use surfactant / penetrant with herbicide where patches are within 5m of water margin.
Convolvulus	Cut vines well in advance of tree removal. Spray November.	1st year : cut vines and leave in tree to wither and die at least 8 weeks prior to tree removal. 2nd year : spray re-growth with Glyphosate 360 in November before vines are beyond head height.	Remove from site and burn. Do not add to mulch pile.	Do not use surfactant / penetrant with herbicide where patches are within 5m of water margin. Care must be taken to not spread this invasive weed around the reserve.
Lupins	Before seed set in early December.	Cut annually using weed eater prior to seed set – 30 days after spraying. Spot spray individual plants with Glyphosate 360 in November.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Continual cutting prior to seed set, in conjunction with some spot spraying will over time control this localised weed.
Rank Grass	Spring and Summer	Mow using weed eater.	Leave in situ	Regular mowing will prevent the spread of

				weeds, such as broom, lupins and thistles.
Cotoneaster	Summer	Cut stem close to ground and apply Vigilant © gel to cut stump immediately	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Minor woody weed dotted around reserve.
Douglas Fir	Summer	Cut stem close to ground so that no needles are left on the stump and apply Vigilant © gel to cut stump immediately	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Minor woody weed dotted around reserve.
Broom (occasional plants)	Summer	Cut stem close to ground and apply Vigilant © gel to cut stump immediately	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Minor woody weed dotted around reserve.
Broom (major infestation)	Spring and Summer	Cut back to ground level using scrub cutter (or other similar). Apply Vigilant © gel to those stumps which are large enough. Spray re-growth with Glyphosate 360 in summer. Cut back 40 – 60 days after spraying. Following year start hand grubbing, in conjunction with spot spraying.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Penetrant / surfactant may be used if there is no danger of it coming into contact with the water.
Hawthorn	Summer	Cut stem close to ground and apply Vigilant © gel	Mulch, place on and under plastic sheets to prevent	Minor woody weed dotted around reserve.

		to cut stump immediately	striking in ground and photosynthesising	
Solanum (Nightshade)	Cut vines in summer. Spray re-growth following year in summer.	1st year : cut vines and dab either Vigilant © gel or Glyphosate onto cut stems. 2nd year : spray re-growth with Glyphosate 360 in Summer.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Use Glyhposate 360 if close to water, Vigilant © if dry. Do not use surfactant / penetrant with herbicide where patches are within 5m of water margin.
Glyceria declinata (Floating sweet grass)	Anytime of year, prior to planting.	Hand pull prior to wetland planting.	Add to mulch pile.	Herbicide use not warranted.
Water cress	Anytime of year, prior to planting.	Hand pull prior to wetland planting.	Add to mulch pile.	Herbicide use not warranted.
Monkey musk	Anytime of year, prior to planting.	Hand pull prior to wetland planting.	Add to mulch pile.	Herbicide use not warranted.
Thistles	Before seed set in late summer.	Cut annually using weed eater prior to seed set – or 30 days after spraying. Spot spray individual plants with Glyphosate 360 in November/December.	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Continual cutting prior to seed set, in conjunction with some spot spraying will over time control this localised weed.
Briar	Summer	Cut stem close to ground and apply Vigilant © gel to cut stump immediately	Mulch, place on and under plastic sheets to prevent striking in ground and photosynthesising	Minor woody weed dotted around reserve.

Schedule E : Ecological Restoration Planting

The revegetation aspect of the Albert Town Lagoon Reserve restoration and enhancement project contributes considerably towards achieving the "vision" which was created for the reserve in the preliminary concept plan. The vision and concept are appended in Schedule H.

The vision for the reserve needs to be considered by any contractors who undertake the contract to supply and plant. Revegetation will need to be able to accommodate community participation. Contractors will also be required to supply some plants which may be difficult to resource, listed as threatened, or require special permits from the Department of Conservation to collect seed.

Once the first round of willow clearance has taken place in autumn 2008, more detailed planting plans can be drawn up, which include estimated plant numbers and more detailed plant layout. It is anticipated these plans will be drawn up in winter 2008 and forwarded to contractors, along with specifications, to tender/quote for the contract of supply, plant and maintenance.

The vegetation communities which are being re-established are:

- sedge and rushland on the lagoon margin;
- broadleaf – riparian shrubland;
- grey shrubland;
- kanuka – kowhai shrubland; and
- short tussock grassland.

In addition some specimen broadleaf and podocarp plants will be dotted around the reserve. A species list is attached below. Plants highlighted in bold are dominant species, of which larger numbers will be required for the project.

Where possible all plants should be eco-sourced from the Lakes and Central Otago Ecological Regions, ideally from sites close to the reserve (e.g. the Butterfields and Hikuwai Reserves). It may not be necessary (or possible) to eco-source all plants. Where local variations in species occur or where there is taxonomic uncertainty regarding species eco-sourcing will be important. Species which should be eco-sourced are: Kanuka, Kowhai, *Ozothamnus fulvida* (Cassinia) and Kohuhu (Pittosporum). This list may expand with the development of the planting plans.

It is planned that revegetation will be phased throughout the reserve over a period of 5 – 6 years, following several years of willow and other woody weed control. The implementation spreadsheet (**Schedule A**) indicates the phasing of planting for the duration of the project. Planting will commence with dominant species and later be in-filled with minor species. Wetland species will be planted in summer, dryland species in spring. Some autumn planting may be possible later on in the project when infilling of plants occurs. Planting densities will be high to assist in the suppression of weeds. Plants should be of V150 / PB2 size. Plants will be maintained for a maintenance period of three years. Mulch will be available on site.

Table 3 : Albert Town Lagoon Restoration and Enhancement Plan – Planting List

Sedge / rush		Density (m-1)
Carex secta	**Purei sedge**	0.5
Eleocharis acuta	**Sharp spike sedge**	0.5
Juncus gregiflorus	**Native rush**	0.5
Carex buchannii	**sedge**	0.5
Carex sinclairii	Sedge	0.5
Carex solandri	Sedge	0.5
Carex tenuiculmis	Slender sedge	0.5
Carex virgata	Swamp Sedge	0.5
Deschampsia caespitosa	Tufted hair grass	0.5
Blechnum minus	Small kiokio, hard fern	0.5
Carex kaloides	Sedge	0.5
Carex maorica	Sedge	0.5
Carex petriei	Sedge	0.5
Cortaderia richardii	**Toe Toe**	0.5
Chionochloa rubra	**Red tussock**	0.5
Phormium tenax	**flax**	0.5
Schoenus pauciflorus	Bog rush	0.5
Blechnum novae-zealandiae	fern	0.5
Uncinia strictissima	Sedge	0.5
Specimen broadleaf		
Cordyline australis	**Cabbage Trees**	1
Pseudopanax ferox	**Fierce Lancewood**	1
Sophora microphylla	**Kowhai**	1
Plagianthus regius	**Manatu / lowland lacebark**	1
Small leaved shrubs		
Coprosma crassifolia	**Hairy Coprosma**	0.75
Coprosma propinqua	**Mingimingi**	0.75
Coprosma virescens	**Coprosma**	0.75
Corokia cotoneaster	**Korokia**	0.75
Discaria toumatou	**Matagouri**	0.75
Muehlenbeckia complexa	**Pohuehue**	0.75
Olearia fimbriata	**Tree Daisy**	0.75
Olearia fragrantissima	**Fragrant tree daisy**	0.75
Olearia hectorii	Rare tree daisy	0.75
Olearia lineata	**Tree daisy**	0.75
Olearia odorata	**Tree Daisy**	0.75
Ozothamnus fulvida	**Cassinia**	0.75
Podocarps and associates		
Dacrycarpus dacryoides	Kahikatea	1
Prumnopitys taxifolia	Matai	1
Cordyline australis	Cabbage trees	1
Hebe salicifolia	Koromiko	1
Pittosporum tenuifolium	Kohuhu	1
Pseudopanax ferox	Fierce lancewood	1

Sophora microphylla	Kowhai	1
Myrsine divaricata	Weeping matipo	1
Griselinia littoralis	Broadleaf	1
Cyathodes juniperium	Mingimingi	1
Melicope simplex		1
Mixed broadleaf shrubland		
Pseudopanax ferox	Fierce lancewood	0.75
Sophora microphylla	Kowhai	0.75
Myrsine divaricata	Weeping matipo	0.75
Hebe salicifolia	Koromiko	0.75
Pittosporum tenuifolium	Kohuhu	0.75
Griselinia littoralis	Broadleaf	0.75
Hoheria lyallii	Ribbonwood	0.75
Short tussock grassland		
Acaena sp. (A. buchanni, A. microphylla, A. caesiiglauca)	Mat forming native bidibidi	0.5
Carmichaelia petriei	Broom	0.75
Carmichaelia vexillata	Dwarf broom	0.5
Elymus apricus	Blue wheat grass	0.5
Elymus solandri	Native wheat grass	0.5
Festuca novae-zelandiae	**Hard tussock**	0.5
Hebe pimeloides var *rupestris*		0.5
Melicytus alpinus	**Porcupine shrub**	0.5
Muehlenbeckia axillaris	**Creeping pohuehue**	0.5
Pimelea aridula	**Native Daphne**	0.5
Pimelea pulvinaris	**Native Daphne**	0.5
Poa cita	**Silver tussock**	0.5
Poa maniototo	Desert Poa	0.5
Raoulia australis	Golden scabweed, mat daisy	0.5
Raoulia monroi	Fan leaved mat daisy	0.5
Raoulia parkii	Mat daisy	0.5
Rytidosperma buchananii	Grass	0.5
Kanuka / Kowhai shrubland		
Kunzea ericoides	**Kanuka**	0.75
Sophora microphylla	**Kowhai**	0.75

Schedule F : Ecological Monitoring

It is recommended that some form of ecological monitoring takes place to document the changes to the reserve and demonstrate the successes (or failures) of the project. Monitoring also opens up the project to further community involvement, and school groups could be involved in the regular monitoring of the reserve. Being able to document the successes of the project may be important for capturing funding, for QLDC public relations and support for future restoration projects.

- As a minimum photopoints should be established to visually document changes.

- Insect fauna are likely to benefit greatly from the revegetation and enhancement. An entomological assessment was undertaken by Brian Patrick in the original information gathering exercise for the project and advice taken from Patrick's recommendations incorporated into the overall project design. These recommendations will be further included in the more detailed planting plans. Undertaking further entomological monitoring may demonstrate some of the benefits of the restoration. Including community involvement would be beneficial and provide an opportunity to demonstrate the benefits of the project to the local residents. Monitoring would need to be established prior to willow removal and weed control work taking place. Invertebrate monitoring could take place as part of a celebration of World Wetland Day every February. A monitoring project specifically for capturing changes to invertebrate fauna could be designed by Brian Patrick. It is highly recommended that a fee estimate for designing a monitoring plan is sought.

- The Ministry for the Environment has produced guidelines for monitoring wetland condition in the form of the Handbook for Monitoring Wetland Condition (Clarkson et al 2003). The handbook describes a set of science based indicators which have been designed for managers, landowners, community groups and anyone else with a need to monitor the condition of wetlands. These guidelines provide an existing monitoring protocol which could be used to monitor the lagoon. Wetland recording sheets for use in monitoring wetland condition are appended to this schedule. The handbook can be found on the Landcare Research website and downloaded : (http://www.landcareresearch.co.nz/research/biocons/restoration/wetlands.asp) Monitoring would take place annually.

- Predator tracking could be periodically undertaken by community volunteers or school groups. Tracking tunnels would show the presence of ferrets, stoats, rats and hedgehogs. These are easy to set up and cheap to run. Should the tunnels indicate the presence of predators a programme of trapping could be established.

Append wetland record sheet here.

Schedule G : Community Consultation and Involvement

Community involvement is a key part of the vision that was created for the lagoon. Community ownership of the reserve may determine the long term success of the restoration project. Community involvement will help to keep the lagoon tidy, and to report any vandalism, restoration plant failures and weed encroachment.

It is recommended that two community notice boards are erected at the Lagoon Ave and Alison Ave entrances. Updates regarding proposed works and community participation days can be posted on these boards. Regular updates should also be made to the Albert Town Community Association.

There are several on site tasks which would benefit from community volunteers. These include planting, hand pulling willow seedlings and aquatic weeds, and grubbing out broom, lupin and thistle plants.

World Wetland Day is celebrated annually every February (around 2nd Feb). It marks the date of the adoption of the International Convention on Wetlands on 2 February 1971. Each year since 1997, government agencies, non-governmental organizations, and groups of citizens at all levels of the community around the world have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general and the Ramsar Convention in particular**.** The theme for 2008 is "Healthy wetlands, Healthy people". It is recommended that advantage is taken of world wetlands day to establish an annual community event at the reserve. This could be a community participation day, involving planting, weed control, and/or ecological monitoring.

Schedule H : Albert Town Lagoon Reserve Enhancement and Restoration Concept Plan and Vision.

- Create a diverse range of habitat within the reserve and restore the natural integrity of the lagoon as a distinctive natural feature of the Upper Clutha so that it contributes to the special landscape character of Albert Town and the Upper Clutha district.

- Enhance indigenous biodiversity of the Upper Clutha landscape by restoring the wetland to a more indigenous state

- Re-introduce species lost to the area where possible and provide habitat for endangered and threatened species

- Engage local communities and schools throughout the project to foster appreciation and understanding of indigenous ecosystems, especially wetlands

- Encourage participation and cooperation to foster commitment to local wetland restoration and care for our natural open spaces.

- Create a useable attractive recreation space, accommodate the proposed trail, and provide a range of stimulating natural landscape experiences.

insert concept plan here