BERRI BARMERA LOCAL ACTION PLANNING COMMITTEE

WETLAND MANAGEMENT PLAN – MARTIN BEND

December 1998

ID&A (South Australia) Pty Ltd

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1. INTRODUCTION

This Wetland Management Study has been commissioned by the Berri Barmera Local Action Planning Committee (BBLAPC). The aim of this study is to examine options and the preferred actions for the wetland and terrestrial areas of the Martin Bend area.

1.1 BACKGROUND

The BBLAPC area is located north of the River Murray between the Lyrup Ferry and Lock 3 and maintains 6,161 ha of irrigated horticulture and has seven hydrological complexes (wetland) units. Each of these wetlands was surveyed by Wetland CARE Australia during 1997 to determine who uses each wetland area, how healthy each wetland is, and if there were any rehabilitation works occurring or likely to occur on each wetland. A list of management options were compiled and each wetland was prioritised, providing the BBLAPC with a list of wetlands, possible management actions, and a method of determining where the money for wetland restoration projects is best spent.

The following eight criteria was used to produce a score out of 24 for each wetland:

- The existing degree of disturbance
- Urgency of action
- Representativeness of the wetland
- Ease of management
- Public value
- Value for money
- Whether it enhances other land and water programs
- The diversity of the wetland.

The results presented to the BBLAPC in May 1998 were as follows:

Cobdogla/Loveday Swamps	23
Katarapko Anabranch	22
Martin Bend	21
Spectacle Lakes Complex	21
Gerard Swamps	20
Loch Luna/Lake Bonney	20
Berri Basin	19

The BBLAPC agreed that Cobdogla/Loveday Swamps was the highest priority wetland in the BBLAPC area and (at the time of compiling this Martin Bend Wetland Management Plan) Wetland CARE Australia were developing a Wetland Land and Water Management Plan for

Cobdogla/Loveday Swamps. It was also decided during this meeting that Martin Bend was the second highest priority wetland for the BBLAPC area. As a result, the Martin Bend Steering Committee was formed in June 1998 (sub committee of the BBLAP) to develop management options and source funding for the Martin Bend area. This Plan was subsequently commissioned by the BBLAPC.

1.2 PHYSICAL ATTRIBUTES

The floodplain has good area of healthy tea tree (*Melaleuca lanceolata*), salt bush (*Atriplex sp*), black box (*Eucalyptus largiflorens*) and lignum (*Muehlenbeckia florulenta*) with river red gum (*Eucalyptus camaldulensis*) and river coobah (*Acacia stenophylla*) areas fringing the permanent wetland and river channel. The main plant species are illustrated in Appendix A.

The floodplain has, for many decades, been under the increasing influence of rising groundwater and this is affecting the health of floodplain vegetation.

There are a number of flow barriers that impede flow across the floodplain in high river flows. This includes a raised track and a number of culverts.

1.3 RECREATION USES

Martin Bend is a popular recreation area for local residents and visitors. The main recreation activities are:

Water skiing (with Berri Ski club having a club facility in the study area)
Fishing
Walking
Swimming
Rowing
Cycling
Barbecues and picnics
Camping (including a formal camping area under the management of Berri Barmera Council).

1.4 MANAGEMENT RESPONSIBILITY

The Martin Bend area is under the management of the Berri Barmera Council.

2. INTRODUCTION

2.1 LOCATION

Martin Bend is located approximately 2 km east of Berri in South Australia at an approximate river distance of 528 km form the Murray Mouth (Figure 1).

This Management Study considers the wetland pools and floodplain areas as a total unit, including riparian vegetation and floodplain terraces between the river and the edge of irrigated horticulture on a higher floodplain terrace.

Figure 1: *Location of Martin Bend Wetland Area* (Base mapping DEHAA).

2.2 CONSERVATION AND MANAGEMENT SIGNIFICANCE

Martin Bend has been identified as a priority for management in a number of previous publications. The most recent and relevant of these are:

Wetlands Management Study, WETLAND CARE, 1997, Riverine Local Action Planning Association.

Martin Bend scored 21 out of a possible 24 points in a ranking of wetlands in the Berri Barmera LAP area. This ranks Martin Bend as a joint third out of 7 for action on this regional scale.

Recommendations for management actions are:

- Improve flow through the system by installing larger capacity pipe at temporary flow path adjacent ski club and undertaking other necessary earthworks (eg removing minor obstructions).
- Support programs for improved irrigation management thus reducing saline accessions.
- Control recreation impacts.

WETLANDS ATLAS of the South Australian Murray Valley, South Australian River Murray Wetlands Management Committee, 1996, Department of Environment & Natural Resources (now Department for Environment Heritage and Aboriginal Affairs, DEHAA).

Identified as having a high conservation status. Recommended that this wetland should be protected as part of local action planning and that recent community efforts to rationalise tracks and provide a walking trail should be supported.

3. OBJECTIVES OF MANAGEMENT

The overall objectives of management for the Martin Bend area are to:

Ensure the long-term protection of the riverine environment;

Improve the health, diversity and habitat value of existing riparian and terrestrial vegetation;

Manage stormwater discharges that occur from the town to the floodplain;

Manage water quality, and therefore aquatic habitat, within the lagoon/s;

Eradicate or control of noxious weeds and exotic plants;

Control vermin and exotic animals; and

Encourage responsible public use and enjoyment of the floodplain area through the provision of recreation infrastructure and education to ensure proper understanding and recognition of its purpose and significance.

4. MANAGEMENT ISSUES AND ACTIONS

4.1 LAND TENURE

The land tenure of Martin Bend is shown in Figure 2. It occupies sections in the Berri Irrigation Area and includes:

BERRI IRRIGATION AREA

39	Recreation Reserve
1164	Recreation Reserve
1363	Afforestation and Camping Reserve
1345	Berri Barmera Council
1474	Recreation Reserve

Figure 2: *Martin Bend Land Tenure*

ACTIONS

- *Maintain current land tenure but formalise management arrangements under the control of the Berri Barmera Council.*

The formalisation of management responsibility would then simplify ongoing management.

4.2 ABORIGINAL HERITAGE

A large volume of information exists on the Aboriginal occupation of the Murray Valley (DENR 1994). The following discussion is based on the studies of Buchan (undated, 1979 in DENR 1994)) who has summarised most of the available information.

The Murray Valley originally supported a large Aboriginal population although its actual size at the time of European settlement is difficult to estimate because of the lack of consistent data on the area as a whole. However, the population along the river was noticeably more dense than elsewhere due to the concentration of resources and there fairly permanent nature. For most of the year the economy was sustained by the riverine environment although in the colder months there were minor shifts away from the river to exploit seasonally available resources. These probably did not involve long distances. Three types of Aboriginal groups were commonly seen in the early days of European settlement. Small groups of fewer than twenty people, usually men, often attached themselves to expedition parties and accompanied them for short distances, sometimes acting as guides. Also common were autonomous extended family groups consisting of a man, his wife or wives, their children and sometimes older relatives of the man. The family appears to have been the basic economic unit within which food gathering and cooking activities took place. When larger groups camped together, families shared the same fire and shelter and travelled together when on the move. A number of extended families collectively formed the tribe that shared a common language and moved with its own specific territory. On the New South Wales section of the Murray, tribes varied in size from eighty to one hundred and fifty people. Occasionally several tribes met, either to exploit abundant resources, for ceremonial purposes, or to exchange marriage partners of for defence purposes.

Food was plentiful along the Murray between spring and late autumn. It consisted largely of fish, game, vegetable foods and particularly in summer, shellfish. Possums were the most commonly hunted land animal. Many other resources were obtained from the river valley including reeds and branches for spears, spear throwers, clubs and digging sticks, fibre or rushes for nets, animal skins for clothing, large pieces of wood for bowls, stone for grinding surfaces (rock for toolmaking was imported) and bark for winter huts, cooking shelters, canoes and shields. Some red gums in the Martin Bend area may be Aboriginal canoe trees (Stockdate pers comm).

The Aboriginal culture did not persist long after the intrusion of Europeans into the Murray Valley. Epidemic diseases decimated the population within a few years of European contact and settlement ultimately led to the loss of traditional land and disintegration of Aboriginal society.

ACTION

- *Berri Barmera Local Action Planning Committee to request the Department for Environment, Heritage and Aboriginal Affairs, South Australia, to assess the*

Aboriginal and European Heritage value of the Martin Bend wetland area and make recommendations for Action/s as appropriate.

4.3 GROUND WATER

The Berri irrigation area was proclaimed in late 1910 and the first land allotted in early 1911. By about 1940, rising saline watertables started to cause waterlogging and salinity problems in the area. Initially, a series of deep seepage shafts sunk to the Pliocene sands aquifer were constructed for disposal of drainage water, however the shafts could not cope with the volume of water and, in the 1940s a comprehensive drainage scheme was developed (Nicolson & Carter, 1992).

The drainage scheme alleviated the problem initially but resulted in other environmental problems with the disposal of drainage water. Since its inception, the groundwater mound caused by irrigation has continued to expand and threaten the health of the adjacent floodplain.

Figure 3 shows how the groundwater mound has expanded and affected Martin Bend. In addition, the following salinities, noted from Drillers Well Construction Reports, provide an indication of the extent of the influence of groundwater. The current rate of expansion of the groundwater mound is not known as monitoring is no longer undertaken in this area by SA WATER (Stockdale pers comm).

BE12 8,500 ECU (13/03/86)
BE13 23,000 ECU (13/03/86)
BE14 13,000 ECU (11/03/86)
BE15 20,000 ECU (11/03/86)

Figure 3: *Berri Irrigation Area Groundwater Mount and location of wells.*

ACTION

- *Through the Local Action Planning process, encourage the development and implementation of improved irrigation practices throughout the Berri district.*

4.4 HYDROLOGICAL MANAGEMENT

Prior to European settlement the frequency of flooding across the floodplain was much greater. Due to the installation of the locks and weirs on the main river channel, construction of upstream storages and diversion of water for irrigation for frequency of flooding is now greatly reduced particularly for the smaller floods. The causes and effects of this are discussed in Appendix A for readers wishing to consider greater detail.

The important point about the reduced frequency of flooding is that much of the floodplain vegetation and fauna depends upon flooding for its long-term health. Flooding stimulates the germination and establishment of many plant species and the breeding and growth of many terrestrial and aquatic animals. Management works that improve the frequency and extent of flooding across the floodplain are therefore to be encouraged.

Flood flows across the floodplain can also assist in flushing accumulated salt and so stimulate the health of floodplain vegetation. This effect must also be considered when discussing management options for improving hydrological management as increasing the rate of flushing of salt from the floodplain may be contrary to the Murray Darling Basin Commission Salinity and Drainage Strategy. Any recommendations regarding hydrological management there need to be considered and approved within that context.

4.4.1 Pre River Regulation Hydrological Regime

The pre river regulation hydrological regime was quite different compared to the current situation. Prior to the installation of the locks and weirs, the water level in the main channel varied considerably during the year sometimes from almost no flow to large floods that completely inundated the floodplain.

The wetland basins on the floodplain were all temporary, filling only when flood flows were sufficient to pass through the natural channels on the floodplain or when the floodplain itself was subject to widespread inundation. A survey undertaken in 1910 is shown as figure 4 and as can be seen a number of natural channels and wetland depressions are clearly visible.

The height at which flows commenced to travel through the different channels and into the wetland basins varied but was lower than it is today due to the construction of raised tracks and culverts.

Figure 4*: 1910 Survey of Martin Bend (SA WATER collection).*

4.4.2 Current Hydrological Regime

The Martin Bend wetlands and floodplain consists of one permanent wetland, three temporary wetlands and a stormwater detention basin (formerly a natural wetland). These are shown in Figure 5 as:

Permanent Wetland	P1
Temporary Wetland	T1
Temporary Wetland	T2
Temporary Wetland	T3
Stormwater Basin	S1

Flood flows across the floodplain are restricted by roads and tracks that are generally raised and run roughly parallel to the main river channel around the study area. The roads and tracks are accessible by vehicle except at river distance 528 where it is a pedestrian access only. There are three pipe culvert structures through the road along the upstream side of the complex but invert levels, silting and creek bed levels restrict flows across the floodplain.

The entrance to permanent wetland P1 has silted up in recent year so that it is no longer permanent and requires flows in excess of 20,000 ML/day before flows enter it.

Wetlands T1 and T2 currently require river flows of between 60-70,000 ML/day before flows commence into them whilst wetland T3 requires flows of 56,000 ML/day before flows commence entering at the upstream end through a culvert at river distance 530 km.

A series of earthworks and culvert alterations would considerably increase the frequency with which the floodplain and wetlands were inundated. The works would consist of:

CURRENT SITUATION	RECOMMENDED WORKS	ALTERED SITUATION	ESTIMATED COST
River distance 530 km – invert of lowest pipe EL14.40, commences flowing at 56,000 ML/day.	Install a new (300 mm) culvert pipe at EL14.0.	Commence flowing at 50,000 ML/day 1 in 3.5 years.	$6,000
River distances 529.5 km – channel partially blocked upstream of culvert. Water flows at 65,000 ML/day.	Excavate channel immediately upstream of culvert and a channel 60 metres long approximately 200 metres downstream.	Water will flow at 60,000 ML/day. 1 in 5 years.	$2,000
River distance 529.4 km	Desilt pipe.	Channel downstream	$1,000

culvert pipe at river level badly silted.		will commence to flow at 50,000 ML/day. 1 in 3.5 years.	

continued

CURRENT SITUATION	RECOMMENDED WORKS	ALTERED SITUATION	ESTIMATED COST
River distance 528 km – inlet to permanent wetland silted up.	Desilt inlet and excavate channel to intercept, connect wetlands T1 & T2 to increase frequency of flushing. Install twin 1200 mm box culverts with stop logs and carp screens.	Permanent flow restored to wetland P1, flows increased to wetland T1 every three years and T2 every four years. Ability to manipulate in/out flows and exclude carp.	$2,000 $20,000
River distance 527.8 km – raised track reduces flow to wetlands T1 & T2 to 60,000 ML/day.	Reduce level of track to restore spillway.	Flows restored when flows exceed 49,000 ML/day or 1 in 3.5 years.	$3,500
River distance 526.7 km – raised track reduces flow to wetland T3 to 70,000 ML/day.	Reduce level of track to restore spillway.	Flows restored to wetland T3 at 50,000 ML/day.	$6,000
		TOTAL	$40,500

Engineering details are provided as Appendix B.

ACTION

- *Implement a series of earthworks and culvert alterations as per Appendix B to increase the frequency of floodplain and wetland inundation.*

4.5 FLOW MANAGEMENT TO WETLANDS P1,T1 & T3

The desilting of the inlet to wetland P1 and the construction of a regulator (twin box culvert and stop logs) at river distance 528 km would provide the opportunity to control inflows and outflows from that wetland. In addition, if the drainage channels recommended for wetlands T1 and T2 are created then the inflows and outflows of those two wetlands could also be controlled for flows up to 49,000 ML/day.

This would enable water levels to be manipulated to benefit regeneration of vegetation, and to provide extended inundation for the benefit of fauna.

Some recent discussion has suggested that the installation of grids in the top of culverts on the floodplain may aid the passage of native fish. Whilst this is quite likely to aid fish migration across the floodplain during high flows, in this case the culverts would be bypassed by high flows during flows that exceed 49,000 ML/day. The installation of grids in the recommended culverts would not in this case provide any additional benefit.

4.6 CARP MANAGEMENT

In addition to providing a mechanism for managing inflows and outflows to wetlands P1, T1 and T2 the construction of a regulating structure would enable the exclusion of large carp. Carp exclusion screens could be fitted to the regulating structure. This would provide additional opportunities for the enhancement of aquatic and semi-aquatic vegetation within the wetlands.

4.7 VEGETATION HEALTH

A discussion of vegetation types and health in the nearby Loxton area is contained in the PPK (1997) report "Assessment of the Impact of the Loxton Irrigation District on Floodplain Health and Implications for Future Management". The report's discussion of issues associated with vegetation health provides a useful background for readers to understand these processes. The following section is summarised from that report.

4.7.1 Vegetation Degradation Processes

Permanent Waterlogging

Waterlogging causes vegetation death by excluding air from the soil. Red Gums and Black Box are tolerant to flooding and can withstand long periods of saturation. However, they cannot withstand permanent waterlogging.

Salt stress

Salt stress causes vegetation death if the concentration of salt in the unsaturated root zone exceeds the plants salt tolerance threshold for extended periods of time. Salt stress can result in gradual decline in vegetation health over time.

Salt accumulates in the unsaturated zone when water is removed by evaporation (from bare soil) or evapotranspiration (from vegetation). The salt is flushed from the unsaturated zone by flood events and rainfall.

Vegetation health is therefore dependent on the balance between salt accumulation rates and flushing frequency. The salt accumulation rate increases as the depth to groundwater

decreases (because evaporation and evapotranspiration rates increase as the groundwater comes closer to the surface).

The main causes of higher groundwater elevations (and hence increased salt accumulation rates) in the study area are locking and irrigation. These are discussed below, along with salt flushing from overbank river flows.

Locking

Locking has increased the minimum water level in the river. For Morgan (the only historical water level record) the minimum river level is now some three metres higher than previously. As a result, the groundwater levels are now also held at a higher minimum elevation and hence the rate of evaporation and salt accumulation will now be higher than before locking.

Irrigation induced groundwater rises

The groundwater mound developed beneath the irrigation area has almost certainly increased the groundwater elevation beneath the river flats. The effect of raised groundwater levels is compounded by the concentration of salt at the surface through the actions of capillary rise and evaporation. This process itself being more pronounced in clay soils than sandy soils.

Flushing by overbank flows

Counterbalancing these salt accumulation processes is the flushing provided by flood flows. Increases in river water use have reduced the volume of water flowing down the river and the construction of dams has reduced the frequency of high flows. These two effects combine to reduce the frequency of flooding and hence reduce the frequency with which salt is flushed from the unsaturated zone.

4.7.2 Discussion

The causes of vegetation degradation are largely out of the control of the local floodplain managers, Council and community groups. The underlying causes of vegetation degradation are raised groundwater levels (resulting in raised salinities in soil) and river regulation (resulting in reduced frequency of flooding across the floodplain).

Because the causes of vegetation decline are largely beyond local control plans for revegetation works need to be aware that the establishment of vegetation in degraded or threatened areas is likely to be unsuccessful in the long term. Revegetation works should therefore rely mostly on encouraging natural regeneration through hydrological management, recreation management and rabbit control.

Some limited planting may be recommended where mounding of earth can be economically undertaken to effectively raise plants above saline groundwater. However, this is likely to be

confined to areas adjacent to channels recommended for alteration to improve flood flows across the floodplain.

Investigations into the desirability of using *Melaleuca halmaturorum* and Green Black Box variant from Chowilla floodplain for revegetation of areas with soil salinity too high for locally occurring native plants may be worthwhile. This however should be carefully considered as the vegetation in the study area is generally in better condition than many other sections of floodplain in the region. A policy of only using locally occurring indigenous plants would be a preferred policy for Martin Bend.

ACTION

- *Encourage regeneration of indigenous vegetation through the increased frequency of flooding across the floodplain.*
- *Encourage plantings in suitable limited areas.*
- *Only locally occurring indigenous species to be established.*
- *Investigate the desirability of using Melaleuca halmaturorum and Green Box variant from Chowilla floodplain for revegetation of areas with soil salinity too high for locally occurring native plants.*

4.8 RABBIT CONTROL

Evidence of recent rabbit activity was observed during the field inspections undertaken for this study. Rabbits can be a major factor in suppressing vegetation regeneration and an ongoing program of monitoring and eradication is essential for the whole floodplain area.

ACTION

- *Regularly monitor rabbit activity in the area and undertake control works as required.*

4.9 CONTROL OF PEST PLANTS

4.9.1 Willows

Willows have a negative impact on wetland and river ecosystems in the Murray Valley. Compared with native plants, willows provide a totally different, and very much poorer, living environment for invertebrates and fish and exclude native vegetation. They are deciduous and the sudden influx of organic material into the water acts effectively as an organic pollutant.

Willows are not a declared noxious weed and there if therefore no legal responsibility to remove them, however, they have the potential to impede water flow and affect water quality, so it is desirable to remove them under certain circumstances. Flows to the culvert at river distance 530 km are partially blocked by a willow which should be removed.

ACTION

- *Remove willow at river distance 530 km. Annual monitoring to identify establishing trees and remove as required.*

4.9.2 Other pest plants

No significant pest plants were identified during field inspections.

ACTION

- *Undertake an annual inspection of the area to identify any establishing pest plants and control as required.*

4.10 RECREATION USE

Recreation activity in the study area is high due to its close proximity to Berri, well established recreation infrastructure including camping area, Berri Ski Club, boat ramp, picnic areas and walking trail.

This recreation activity whilst providing a valuable social resource does have a number of environmental costs.

ACTIONS

- *Rationalise the network of tracks confining all vehicles to the single river front track. Disc plough the superfluous tracks, control weed growth and revegetate with floodplain species where appropriate. Block all superfluous tracks with wooden or steel posts and signpost as revegetation areas.*

- *Develop and install interpretation boards at the entrance to the floodplain to encourage the responsible public use and enjoyment of the wetlands and surrounding areas through education to ensure proper understanding and recognition of their purpose and significance.*

- *Formalise the main camping area and selected isolated camping areas with wooden or steel posts to prevent vehicle access to protected areas.*

- *Formalise selected fishing areas along the river front and provide at least two areas designed and constructed for wheelchair access.*

- *Board walks onto wetland/hides for bird observation.*

- *Control houseboat mooring.*

5. SUMMARY OF MANAGEMENT ACTIONS

The following table summarises the management actions and identifies roles and responsibilities. An estimate of implementation costs and sources of funding are also provided.

SUMMARY OF MANAGEMENT ACTIONS

ACTION	PRIORITY	RESPONSIBILITY	COST	POTENTIAL FUNDING SOURCE
LAND TENURE • *Maintain current land tenure but formalise management arrangements under the control of the Berri Barmera Council*	N/A	BERRI BARMERA COUNCIL	-	-
GROUNDWATER • *Through the Local Action Planning process, encourage the development and implementation of improved irrigation practices throughout the Berri district.*	HIGH	BBLAPC	-	-
HYDROLOGICAL MANAGEMENT • *Implement a series of earthworks and culvert alterations as per Appendix B to increase the frequency of floodplain and wetland inundation.*	HIGH	BERRI BARMERA COUNCIL, BBLAPC	$40,500	NHT
VEGETATION MANAGEMENT • *Encourage regeneration of indigenous vegetation through the increased frequency of flooding across the floodplain.* • *Encourage plantings in suitable limited areas.* • *Only locally occurring indigenous species to be established. Investigate the desirability of using Melaleuca halmaturorum and Green Box variant from Chowilla floodplain for revegetation of areas with soil salinity too high for locally occurring native plants.*	MEDIUM	BBLAPC, BERRI BARMERA COUNCIL	$1,000 annually	NHT
RABBITS • *Continue to regularly monitor rabbit activity in the area and*	LOW	APCB, BERRI	$1,000	BERRI

undertake control works as required.	(biannual)	BARMERA COUNCIL	(biannually)	BARMERA COUNCIL
ACTION	**PRIORITY**	**RESPONSIBILITY**	**COST**	**POTENTIAL FUNDING SOURCE**
CONTROL OF PEST PLANTS • *Remove willow at river distance 530 km. Annual monitoring to identify establishing trees and remove as required.*	LOW	APCB, BERRI BARMERA COUNCIL	$500	NHT
RECREATION • *Rationalise the network of tracks confining all vehicles to the single river front track. Disc plough the superfluous tracks and revegetate with floodplain species where appropriate. Block all superfluous tracks with wooden or steel posts and signpost as revegetation areas.* • *Develop and install interpretation boards at the entrance to the floodplain to encourage the responsible public use and enjoyment of the wetlands and surrounding areas through education to ensure proper understanding and recognition of their purpose and significance.* • *Formalise the main camping area and selected isolated camping areas with wooden or steel posts to prevent vehicle access to protected areas.* • *Formalise selected fishing areas along the river front and provide at least two areas designed and constructed for wheelchair access.*	HIGH	BERRI BARMERA COUNCIL	$25,000	BERRI BARMERA COUNCIL
ABORIGINAL HERITAGE • *Berri Barmera Local Action Planning Committee to request*	HIGH	BBLAPC	$0	N/A

the Department for Environment, Heritage and Aboriginal Affairs, South Australia, to assess the Aboriginal and European Heritage value of the Martin Bend wetland area and make recommendations for Action/s as appropriate.		DEHAA		

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