MANAGEMENT PLAN FOR

THEGOA LAGOON RESERVE

2003-2006

Revised 2003

This management plan has been prepared by the Thegoa Lagoon Management Steering Committee, comprising:

Representatives	1998-2001	2003
Carnma	Kerry Ziernicki	Graham Clarke
Dareton CWP Wentworth Aboriginal Corporation		attended by representatives from time to time
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Wentworth Shire Council	Cr Reg McKenzie, Rod Spitty	Anne Kiely David McMillan
NSW Murray Wetlands Working Group	Paul Lloyd	Paula D'Santos Howard Jones
Department of Infrastructure, Planning and Natural Resources	Don Reid	Lesley Palmer
NSW National Parks and Wildlife Service	Jo Gorman	Jo Gorman
Dareton Aboriginal Land Council		
Barkindji Elders		Maryanne Martin Peggy Thomas
Wentworth Regional Tourism		Joan Stockman

The three-year plan was prepared to allow full public review of the management of the lagoon and surrounding areas.

Following the 2003 review, the plan will be reviewed annually by the Management Committee.

If you would like a copy of this draft plan to study, please contact Wentworth Shire Council on (03) 5027 5027.

Abbreviations:		
	Dareton CWP	Dareton Community Working Party
	DIPNR	Department of Infrastructure, Planning and Natural Resources
	MWWG	NSW Murray Wetlands Working Group
	NPWS	National Parks and Wildlife Service
	WDHS	Wentworth District Historical Society
	WSC	Wentworth Shire Council
	BEC	Barkindji Elders Council
	DALC	Dareton Aboriginal Land Council

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1.0 BACKGROUND

1.1 Introduction

Thegoa Lagoon is a natural ephemeral lagoon, immediately west of Wentworth at the junction of the Murray and Darling Rivers (Figure 1). The floodplain bordered by the lagoon and the Murray River covers approximately 445 hectares. Much of this land (approximately 400 hectares) forms the Thegoa Lagoon Reserve (Reserve No. R78909 as of 16th August 2002, Parish of Wentworth, County of Wentworth) which is classified as community land for public recreation and plantation. It is Crown Land with the Shire of Wentworth as Trustee. Several small private lease-holdings occupy the remaining land in this area.

The lagoon has a surface area of almost 80 hectares and a capacity of approximately 770 megalitres. (*Revised estimated volume in 2003, 622ML between - 0.25m and – 3.0m contours based on a bathymetric survey, staff gauges and 1997 bed levels - L. Palmer Sept 03)*

1.2 History

During and following floods, the lagoon would have provided abundant wildlife and plant material for use by local Aboriginal people. It would also have been highly significant due to its strategic location at the junction of the Murray and Darling Rivers. The lagoon remained a well-known meeting place for large groups of Aboriginal people into the second half of the nineteenth century.

Figure 1: Location and features of Thegoa Lagoon

European settlement of the area occurred from the 1860s and the area of the current reserve was known as Wentworth Common from the late 1800s. A large camp was established in the reserve possibly near the existing cemetery during the construction of Weir and Lock 10 in the 1920s. Three agricultural leases were established in the floodplain bounded by the lagoon in the early 1950s, and the remaining floodplain area was gazetted as a reserve in 1956 for use as "community land for public recreation and plantation".

Prior to the construction of the Wentworth Weir in 1928, water would have only entered Thegoa Lagoon during substantial floods in the Murray or Darling Rivers.

Following the 1956 flood, Wentworth Shire Council installed a 300mm-diameter pipe in the depression upstream of the weir, when Cadell Street was reformed. It was reported in 1969 that a 600mm diameter pipe had been laid parallel to and adjoining the existing 300mm pipe, but with an invert level 600mm lower and 1200mm below pool level of the Murray River. It was ascertained that the Wentworth Shire Council also installed the 600mm pipe. These works allowed regulated flows in the Murray River to enter Thegoa Lagoon.

A license was issued to Wentworth Shire Council in May 1970 authorising a 600mm-diversion pipe with the purpose of augmenting the supply of water in Thegoa Lagoon for recreational purposes. The fate of the 300mm-diversion pipe has not been recorded, however it is no longer operative.

This artificial inlet has been operated since the 1970s; until recently, to maintain unnaturally high and constant water levels in the lagoon by allowing water from the weir pool to replenish the lagoon water level. This occurred despite the lagoon's classification by DIPNR as an unregulated watercourse. This conversion of the lagoon to a permanent waterbody provided visual amenity and a water supply to water users around the lagoon.

With the introduction of the Volumetric Allocation Scheme on the Murray River, it was determined that all water which entered the lagoon, other than at times of surplus flows in either the Murray or Darling Rivers, would be considered to be a debit against water allocated from the rivers to NSW. Upon investigation, it was concluded that the continued inflow of regulated water from the Murray River into the lagoon was causing an unreasonable loss of regulated water.

When the diversion license held by WSC was renewed in 1975 the following conditions were added to the license to address the above concerns.

- *The licensee was to install a stop valve or other control device in the diversion pipe near its point of off-take to the satisfaction of the then Water Resources Commission (now DIPNR).*
- *The authorised work was only to be used for the purpose of augmenting the supply of water in Thegoa Lagoon when the Water Resources Commission (now DIPNR) announced off-allocation supplies were available in the Murray River at the point of off-take. At all other times the diversion pipe was to be effectively closed.*

A metal slide control device was installed on the upstream end of the diversion pipe in 1980. Refurbishment and upgrading of the eastern regulator was undertaken by Wentworth Shire Council in 2002.

The final draft Management Plan was produced in January 1999.

1.3 Wetland Ecology

Prior to river regulation, the lagoon was a temporary wetland, which filled with floodwaters from either the Murray or Darling Rivers. The natural cycle of periodic filling and drying maintained the natural processes and productive environments within the lagoon.

The ecology of wetlands along the floodplains of most inland Australian rivers is adapted to periodic cycles of flooding and drying. Such cycles are a critical driving force for the ecological productivity and diversity of these wetlands. Along the Murray River, regulation of flows has resulted in near-permanent inundation of many wetlands and the loss of their natural water level variation and periodic drying. The long history of regulation, combined with the relatively high frequency of floods and high river flows in the last 25 years, has also created a perception that wetlands such as Thegoa Lagoon require permanent and stable water levels. However, such conditions have caused serious degradation to wetlands throughout the river system.

1.4 Significance of the Lagoon and its Environs

Previous studies have highlighted the significance of the wetland and floodplain environments (refer Appendix).

1.4.1 Aboriginal Heritage

The area contains numerous archaeological sites including burials, scar trees, boundary trees and middens. All but one of these sites have been assessed as moderate to high scientific significance due to their representativeness and preservation. All of the sites remain significant to Barkindji Elders and the Barkindji community. Several sites are of special significance.

1.4.2 Cultural Heritage – covers the period post European settlement.

Although a thorough assessment of the historic heritage of the reserve has not been completed, general observations have identified several significant sites throughout the area. The lagoon and surrounds have history of use as a major travelling stock route, stock reserve and town common, and location of the town cemetery and sewerage system is also located on the floodplain.

1.4.3 Environmental Significance

The lagoon and surrounding floodplain is an unusually healthy and diverse example of the riverine environment of the region. In particular, the area includes a high diversity of habitats within a relatively small area. The three vegetation communities of River Red Gum, River Cooba/Black Box and Chenopod Shrubland, occurring around the lagoon are ecologically significant and include one species that occurs only over a restricted range. Four native fauna species occurring at the lagoon are listed as *threatened* and 14 species are listed as *vulnerable and rare.*

1.4.4 Eco-cultural Tourism Potential

The area offers considerable opportunities for the development of eco-cultural tourism facilities due to its proximity to Wentworth, its accessibility and the variety and integrity of its natural and cultural features.

1.4.5 Other Values

The lagoon provides several other values. The wetland environment provides a natural setting enjoyed by local residents and visitors, as well as a recreational resource for camping, fishing and picnicking. The lagoon also provides a source of water to surrounding properties for irrigation, recreation and stock and domestic use.

1.5 The Need for a Management Plan

No integrated management of the lagoon and its environs has been undertaken to date. This has resulted in *ad hoc* management decisions in the past, which have not fully considered the implications for, and the long-term protection of, the diverse features and values of the area. In addition, several activities have been allowed to occur which have damaged the natural environment and culturally significant sites. Given its documented significance, the lagoon requires a more integrated and long term approach to the management of its land, water, vegetation and cultural heritage values.

A draft Management Plan for Thegoa Lagoon 1998 –2001 was completed in January 1999. This plan was developed to identify broadly accepted management goals and actions to ensure the natural and cultural features of the area are recognised and protected. It aimed to achieve long term rehabilitation and conservation of the natural environments and cultural features of the lagoon and floodplain. In particular, it integrated the management of all aspects of the lagoon and its environs including:

- hydrologic rehabilitation of the wetland,
- recognition and protection of the Cultural Heritage associated with the area,
- development of appropriate access and interpretation facilities.

While some of the actions have been undertaken, others have not progressed due to a lack of funds and lack of a person to run the implementation process. The plan did not get beyond draft status. The Steering Committee, based on the original membership, was re-convened to revise the Management Plan in 2003. Notification was placed with the local press advising the community of the meeting and calling for interested persons to attend. An amended membership was established at that meeting.

2.0 OBJECTIVES OF THE MANAGEMENT PLAN

The key aim of the management plan is the recognition and protection of the natural and cultural features of the lagoon and its surrounds. This will be achieved through the following principles.

MANAGEMENT PRINCIPLES

- Rehabilitation and conservation of the natural vegetation and habitats of the area.
- Rehabilitation of the wetland environment.
- Recognition and protection of Cultural Heritage sites and values.
- An appropriate level of access to, and interpretation of, the lagoon's natural and cultural features.
- Implementation of sustainable water supply arrangements for existing users.

The plan aims to integrate the management of key issues for the area and outline the actions required to ensure the integrity of the ecological and cultural values are maintained in the long term. The specific objectives of the plan are listed below.

MANAGEMENT OBJECTIVES

- Increased information about, and understanding of, the ecological and cultural features and values of the lagoon and its environs.
- Revegetation of areas affected by vegetation loss and disturbance.
- Re-establishment of more natural hydrologic patterns to promote wetland rehabilitation.
- Conservation and protection of Cultural Heritage associated with the wetland.
- Encouragement and facilitation of ecological and cultural interpretation.
- Development and maintenance of low-impact recreational opportunities.
- Promotion of greater public awareness of the features and values of the lagoon.
- Assessment of the impacts and effectiveness of management changes and actions.
- Regular reporting on progress of management objectives to Wentworth Shire Council, Dept. of Infrastructure, Planning, and Natural Resources, Lower Murray Darling Catchment Management Authority and the community.

3.0 MANAGEMENT OF THEGOA LAGOON

3.1 Background

Wentworth Shire Council classifies the land as Community Land, and a plan of management is required to be prepared in accordance with the *Local Government Act 1993.*

The resources of the lagoon and its floodplain environs have been used for a number of purposes.

- *Agricultural land uses* include livestock grazing, irrigated pasture and horticulture. Other land uses established in the floodplain are open space recreation, the Waste Water Treatment Plant for Wentworth, the Wentworth cemetery, a garden waste tip and sand extraction. The lagoon area also includes Crown Reserves and former travelling stock route. Most of the land on the inside of the lagoon is a Crown Reserve (No. 78909) covering an area of about 450 hectares. This area has been reserved for the purpose of "public recreation and plantation" with management vested with Wentworth Shire Council. Grazing, irrigated agriculture, residential premises and commercial accommodation enterprises have been established on the areas overlooking the lagoon.

- The lagoon is used to provide *water supply.* Several landholders around the lagoon draw their stock and domestic supplies from the lagoon until 2002, when temporary and some permanent alternate arrangements were made, due to the complete drying of the lagoon. A few properties extract water for irrigated agriculture.

Past management of the area has been *ad hoc* and has not integrated broader management issues such as environmental and cultural heritage conservation.

3.2 Management Areas

The floodplain of the lagoon has been divided into four management areas (Figure 2).

3.2.1 Southern

The southern section lies along the Murray River from Weir and Lock 10 to the lagoon's western inlet. It is and will continue to be the main area for general tourism and recreation access.

3.2.2 Western

Together with the north-east section, this area contains the major Aboriginal heritage sites. It will be used for low impact developments such as walking tracks.

3.2.3 North-eastern

The north-eastern section is less accessible than the others and also includes the private lease-holdings. No recreational or tourism facilities will be developed in this area.

3.2.4 Central

This area includes the sewage treatment plant, cemetery and rubbish tip. Rehabilitation will require longer term planning than the other sections and future actions are likely to be more expensive.

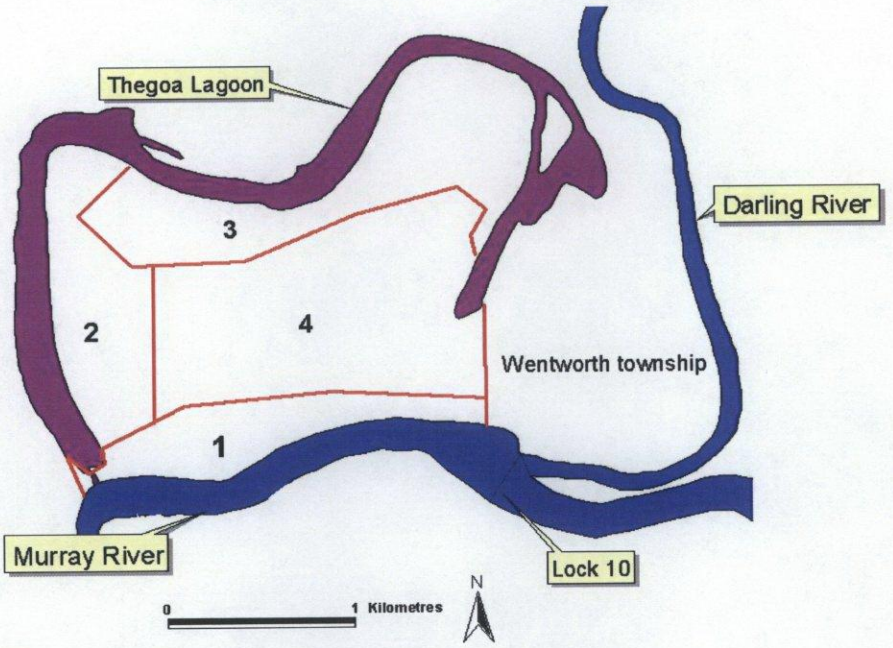

Figure 2: Thegoa Lagoon Management Zones
1. Southern Zone
2. Western Zone
3. North-eastern Zone
4. Central Zone

3.3 Statutory controls on management activities

3.3.1 Murray Regional Environment Plan No. 2 - Riverine Land
The provisions of MREP2 affect development of the Reserve.

3.3.2 Local Environmental Plan
The Shire of Wentworth Local Environmental Plan was adopted in April 1993. Under this plan the Thegoa Lagoon Reserve is zoned "General Rural" which allows agriculture and forestry without Council development consent. This plan is under review during 2004.

3.3.3 Native Vegetation Act
Approval in accordance with the *Native Vegetation Act (2003)* must be obtained for the clearing of native vegetation or the clearing of any vegetation on protected land (within 20 metres of a prescribed stream). Thegoa Lagoon has not been prescribed for the purpose of the Act. The Murray River is a prescribed stream, works authorised under Rivers and Foreshores Improvement exclude those works from the Native Vegetation Act.

3.3.4 Rivers and Foreshores Improvement Act
Under the *Rivers and Foreshores Improvement Act (1948)*, any excavations or earthworks on the bed, banks or within 40 metres of any watercourse requires a permit from the Department of Infrastructure, Planning and Natural Resources.

3.3.5 Water Management Act (Water Licensing)
Access to and use of water in any watercourse as defined by regulations is controlled by a range of Approvals and Licences by the *Water Management Act, 2000.* Statutory embargoes throughout New South Wales now mean virtually no new licences for consumptive may be lodged with the Department of Infrastructure, Planning and Natural Resources. Stock and domestic requirements are exempt from this control and those landholders with waterfrontage

property enjoy what is now known as "Basic Landholders Rights" (formerly Riparian Rights) which provide for stock and domestic access with limitations to use.

Water for irrigation and any other commercial or industrial purposes may only be obtained via a permanent transfer from another licence holder.

All diversion licences have been granted a volume and conditions of access to which they are limited.

The Water Sharing Principles of the Water Management Act, 2000 afford protection of the water source and its dependent ecosystems. Within Thegoa Lagoon the extraction of water for irrigation (principally) is limited to the seasonal availability and the depth of water stored. A gauge height has been established upon which irrigation is required to cease. Seasonal variability of inflows (ie floods or other surplus flow events) means the lagoon may dry up on occasions. Flood flows in the Murray or lower Darling need to reach a level of 50-60GL/day approximately in order for the lagoon to fill naturally from the downstream end. In surplus flow times, ie flows in excess of 10GL/day and when in-stream environmental needs have been met, water may be permitted to enter the lagoon via the works licensed to the Wentworth Shire Council on the upstream end (above Weir and Lock 10 at Wentworth).

3.3.6 NSW Water Reform Policies

The NSW Water Reform policies have been designed to improve the efficiency of water supply and use and minimise the environmental impacts resulting from water supply and use. The policies encompass a wide range of water management and pricing issues. In particular under these policies, water supply licences from unregulated streams, such as Thegoa Lagoon, will be converted to a volumetric allocation.

In general, transfers are not allowed from regulated streams (such as the Murray River) to unregulated streams (such as Thegoa Lagoon). However, the Department of Infrastructure, Planning and Natural Resources has established a community-based committee reviewing the transfer policies on unregulated streams within the Murray River Valley.

3.3.7 Western Lands Act 1901

Landuse on Western Lands Lease must be consistent with the purpose of the lease and the Western Lands lease conditions. There is grazing lease and agricultural lease on parts of Thegoa Lagoon.

3.3.8 Crown Lands Act 1989

Section 10 of the Crown Lands Act states:

The Crown Lands Act provides for the administration and management of Crown Land to ensure that Crown Land is managed for the benefit of the people of New South Wales and provided for

a) a proper assessment of Crown Land
b) the management of Crown Land
c) regulation of conditions under which the crown land is permitted to be occupied, used, sold leased, licensed or otherwise dealt with
d) the development and conservation of Crown Land
e) The reservation or dedication of Crown Land for public purposes
f) the collection recording and dissemination of information in relation to crown land

Section 11 goes on to state:

For the purposes of this Act, the principle of Crown Land management are:

a) that environmental protection principles be observed
b) that the natural resources of the Crown be conserved wherever possible
c) that the public use and enjoyment of the crown land be encouraged
d) that where appropriate, multiple use of Crown land be encouraged
e) that where appropriate, Crown land should be used and managed in such a way that both the land and its resources are sustained in perpetuity, and

f) *that Crown land be occupied, used, sold, leased, licensed or otherwise dealt with in the best interests of the state consistent with the above principles*

Any development on Crown land that requires development consent from Council, will require the consent of the Minister administering the Crown Land Act, as owner of the land, prior to the lodgement of such an application with Council. This requirement extends to Crown lands held under lease, licence, reserve or otherwise vacant Crown land.

Where the development such as a pipeline traverses Crown land that is vacant, reserved for public purposes or is otherwise licensed under the Crown Lands Act, an easement will be required. The proponent will be required to have the sites survey and have easements created over such sites under the Conveyancing Act.

3.3.9 Fisheries Management Act 2000

Sections 198-203 pertain to dredging and reclamation works. If a person or local government authority conducts works on land that is permanently or intermittently submerged by water, a permit from NSW Fisheries is required. If a public authority wishes to conduct or authorise dredging and reclamation work, it must take into consideration issues raised by NSW Fisheries.

Under section 219 of the FMA 2000 works or structures within a watercourse that may obstruct fish passage require a permit from NSWF.

The FMA 2000 makes provision for the listing of threatened species, population and ecological communities. It is an offence to harm the habitat of threatened species, populations and ecological communities.

4. MANAGEMENT ISSUES, STRATEGIES AND ACTIONS

4.1 Environmental Issues

4.1.1 Wetland Rehabilitation

The natural hydrology of the lagoon has been altered by local flow regulation since 1956. Under natural hydrologic conditions, the lagoon would have been filled by seasonal floodwaters from the Murray or Darling Rivers. Once each flood had receded, the residual pool(s) in the lagoon would gradually evaporate.

Given its location at the confluence of the Murray and Darling Rivers, the lagoon could receive inflows from floods in the two river systems - Murray River floods from winter to spring and Darling River floods from summer to autumn. As a result of these combined floods, the lagoon would not have dried completely every year with subsequent floods often refilling the wetland. However, occasional drying (MWWG suggest perhaps one in five years, on average, for partial drying out of the lagoon and one in ten years, on average, for the complete drying out of the lagoon) would have occurred when flood inflows did not happen for two or more years.

Operation of the regulator on the eastern inlet during the 1970s and 1980s maintained a constant water level in the lagoon. The wetland environment of the lagoon has degraded from the loss of natural water level fluctuations and seasonal drying. Consequently, appropriate water management and the associated on-ground engineering works are the key priority for rehabilitating the wetland environment.

Wentworth Shire Council as the licence holder under the Water Act (1912) currently operates the regulator on the eastern inlet.

Objective

Re-establishment of more natural hydrologic patterns to promote wetland rehabilitation.

Strategies

- Inflows to the lagoon will be managed to create a water regime which allows:
  1. Flooding of the lagoon in winter and spring as Murray River floodwaters naturally reach the area,
  2. Partial draining of the lagoon as floodwaters recede, and
  3. Slow drying of the residual water in the lagoon by evaporation and possibly controlled water extraction.
  4. Management of water levels in the lagoon to minimise the risk of saline groundwater intrusions. NOTE Complete drying of the lagoon occurred in 2002-3, the MWWG recommends that the dry period should not exceed 2 consecutive years until further hydrogeological investigation completed (refer Section 4.4).
- Improve the community's understanding of the lagoon's ecological condition and requirements.

Actions

- Operate flow control structures to re-establish seasonal water level fluctuations [WSC/DIPNR] - PRIORITY ACTION
- Review of regulator operation annually (WSC/DIPNR)
- Investigate the benefits and options for replacing the western inlet/outlet structure [MWWG]
- Riparian fencing to prevent unrestricted stock access to lagoon - estimated at 2km on LMD Catchment Blueprint standard costing @$6500/km

4.1.2 Native Flora

Three major vegetation communities occur across the floodplain areas (Figure 3):

1. Riparian River Red Gum and River Cooba open forest adjacent to the lagoon and Murray River,
2. Black Box open woodland backing the open forest, and
3. Chenopod shrubland with scattered Black Box across the remainder of the floodplain.

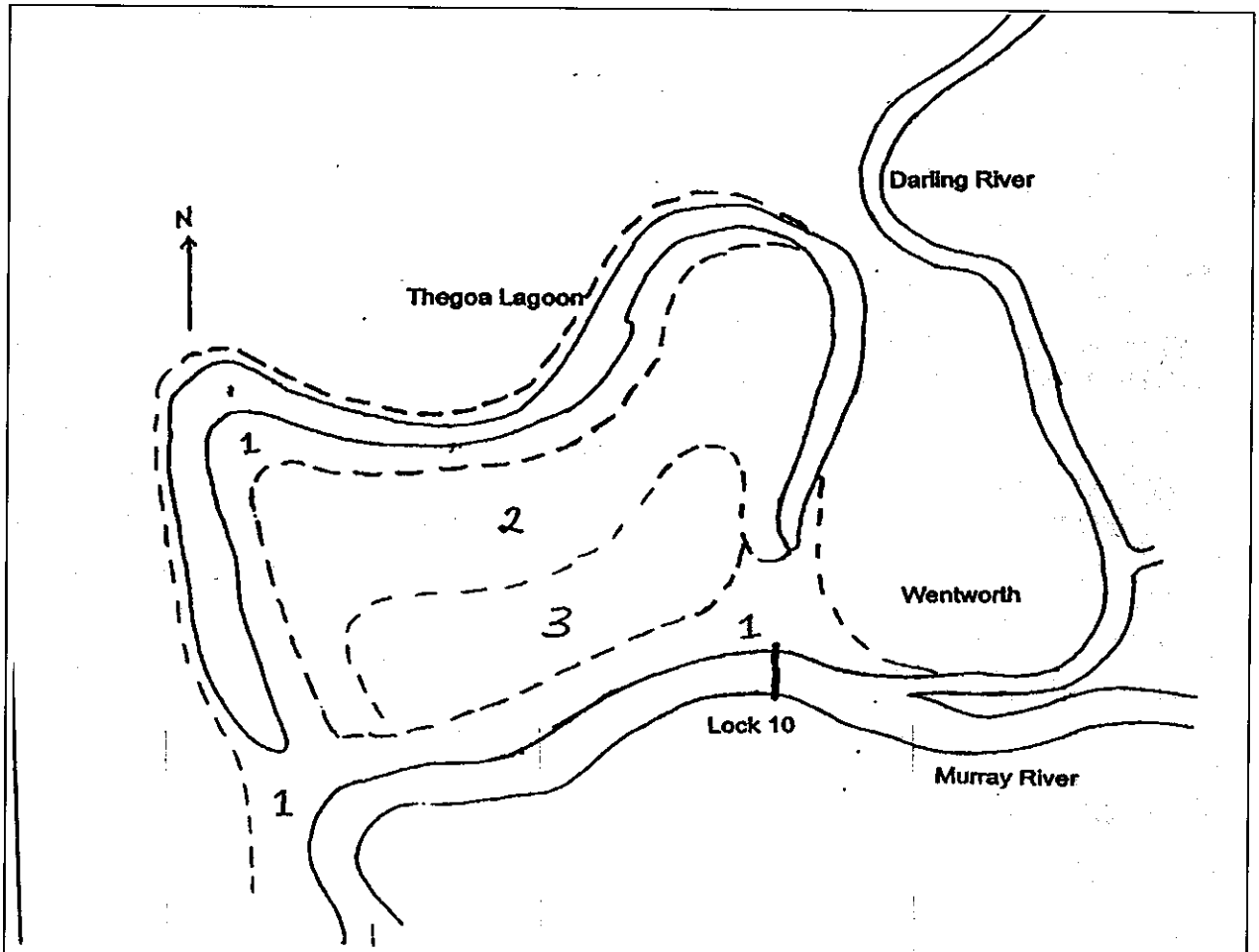

Figure 3: Vegetation communities at Thegoa Lagoon
1. River Red Gum open forest
2. Black Box open woodland
3. Chenopod shrubland

Each community has distinct shrub and groundcover species. The Chenopod community includes one locally common species Desert Glasswort, (*Pachycornia triandra*) listed as having a restricted regional distribution. The excessive number of vehicle tracks has degraded the vegetation within several areas, rubbish dumping, sand extraction and general disturbance. Pest plant species are also a problem in some areas. These areas will require active revegetation.

Very little aquatic vegetation exists within the lagoon due to the combined impact of the past inappropriate water regime and infestation with Common Carp *(Cyprinus carpio)*. Other strategies and actions will address these issues.

Objective

Rehabilitation and conservation of the natural vegetation of the area.

Strategies
- Encourage regeneration of native floodplain species.
- Identify areas requiring revegetation with local native species.
- Revegetate highly modified or degraded areas.

Actions
- Revegetate the tip site after landscaping [WSC] - PRIORITY ACTION
- Rehabilitate (under supervision and after undertaking the assessment outlined in Section 4.5.6) unnecessary tracks to encourage seed capture and water infiltration - [WSC/Dareton CWP] - PRIORITY ACTION
- Signage for major vehicle tracks and foot tracks [WSC] as per section 4.5.5.
- Assess and map floodplain area (as part of the general mapping of the area) to identify areas requiring revegetation [Dareton CWP/BEC] - PRIORITY ACTION

4.1.3 Native Fauna
The diverse habitats within the lagoon floodplain are in relatively healthy condition and provide an excellent example of a semi-arid riverine environment. The lagoon, in particular, supports a range of waterbirds. The occurrence and abundance of fauna species and the presence of key habitat areas has been identified in an Environmental Baseline Study (Luitjes & Smith, 1995).

The habitat value of some areas has been degraded by various activities, and feral species require control actions. Other strategies and actions will address these issues.

Objective
Greater understanding of the native fauna habitat value of the area.

Strategy
- Identify key wildlife habitat areas and restrict visitor access to specified areas.
- Increase recognition and public appreciation of native fauna occurring at the lagoon.

Actions
- Establish more frequent wildlife monitoring of the area for inclusion in the NSW Wildlife Atlas [NPWS].
- Increase recording of bird life via negotiation with Sunraysia Bird Observers and local community at various stages of lagoon flooding and drying cycle [NPWS/MWWG].
- Update an inventory of native fauna [NPWS].

4.1.4 Fishery Management
An aquatic fauna survey was conducted from November 1998 to February 2000 (Plummer et. al, 2000). The survey included sampling of the fish population within the lagoon. During two sampling events (Nov. 1998 and June 1999) a cumulative total of 10 fish species was recorded, (six native species and four exotic species).

Due to the lack of information on the fish communities of Thegoa Lagoon dating before 1998, it is difficult to ascertain whether the number of native species has declined. However, the presence of four exotic species including Common Carp (*Cyprinus carpio*) and Eastern Gambusia (*Gambusia holbrooki*) is likely to have impacted on the native fish population.

The best option for the management of the lagoon is to adopt a suite of actions that compliment the biological requirements of the endemic species. The biological pre-requisites of carp do not complement the natural regimes of aquatic ecosystems. The adoption of a hydraulic regime (wetting & drying) in conjunction with fish passage at the western confluence of the lagoon will enhance opportunities for native fin-fish species whilst reducing the capacity for European carp to populate the lagoon.

During the filling of the lagoon in 2003 following complete drying under drought condition, Murray Cod fingerlings were recorded in the rushes of the eastern inlet channel. The Murray

Darling Freshwater Research Centre undertook sampling during the re-filling and will prepare a report due in 2004.

Objective
Recovery of native fish populations within the lagoon.

Strategies
- Improve the hydrological management of the lagoon to maximise native fish passage between the lagoon and Murray River. NOTE - fish entering via the eastern regulator will be contained in Thegoa Lagoon as there is no access back to the river system except in flood events.
- Improve native fish habitat within lagoon.
- Assess control methods for carp, and other exotic fish species.

Actions
- Maintain adequate large woody debris (snags) within lagoon [MWWG]
- Investigate options and feasibility of re-snagging sections of the lagoon. [MWWG]
- Investigate options for fish breeding in the lagoon [NSW Fisheries]
- Provision of fish passage at the western confluence of the lagoon & the Murray River [NSW Fisheries]

4.1.5 Environmental Monitoring
Any management changes must incorporate adequate monitoring to allow their consequences to be assessed and reviewed. This will provide essential information for future management both at Thegoa Lagoon and at similar wetlands along the Murray River.

Objective
Assessment of the effects of management changes on the lagoon and floodplain environments.

Strategy
Develop an effective monitoring program to assess any changes in the environmental condition of the lagoon and to provide information for future management options.

Actions:
- Establishment of photo-points at selected sites across the floodplain to assess the rate and success of revegetation activities [DIPNR/NPWS/MWWG] - PRIORITY ACTION
- Maintain photopoints at selected sites across lagoon to assess the rate and success of riparian revegetation [MWWG]
- Establish regular surface water level monitoring and surveying of gauges [DIPNR/MWWG]
- Baseline assessment of water quality while the lagoon is low and when full [DIPNR/MWWG]
- Monthly monitoring of surface water salinity when the level falls below 1.0m [DIPNR/MWWG]
- Continued monitoring of groundwater levels, commenced April 2002, review 12-18 months.

4.2 Cultural Heritage

4.2.1 Aboriginal Heritage

Thegoa Lagoon is highly significant to the Aboriginal community because of its strategic location at the confluence of the two major rivers in south-eastern Australia. This being reflected in the many Aboriginal heritage sites including burials, middens, campsites and scar trees (canoe, coolamon, boundary and burial markers). The junction of the Murray and Darling Rivers was an important meeting and gathering place for Aboriginal people. Food and material resources were plentiful in the Red Gum woodland and saltbush floodplain around the lagoon. In addition, a major burial ground is located just downstream of the lagoon at Snaggy Bend.

Management of the area involves the Dareton CWP, Barkindji Elders Council (BEC) and Dareton Aboriginal Land Council (DALC). A Memorandum of Understanding clarifying the legislative basis of Aboriginal management of the area may be required.

Identification and proper management of the Aboriginal heritage is an integral part of the management of the area.

Objectives

Protection and recording of culturally significant sites.
Greater community understanding of the significance of the heritage sites in the reserve.

Strategy

- Protection of culturally significant sites.

Actions

- Prepare a Memorandum of Understanding between DIPNR, NPWS, WSC, Dareton CWP, BEC and DALC, clarifying the legislative basis of Aboriginal management of the area – PRIORITY.
- Implement site protection works as outlined in the Archaeological Assessment (Edmonds, 1995) [Dareton CWP/NPWS/BEC].
- Survey and record all new cultural sites [Dareton CWP/NPWS/BEC/DALC].
- Rotation of sites shown on tours to ensure individual sites are not stressed by over-visitation [Dareton CWP/BEC].
- Wentworth Shire Council to notify BEC, DALC and Dareton CWP prior to commencing any public works in the reserve [WSC].
- Train Aboriginal staff working at the Lagoon in the identification and recording of Aboriginal sites [NPWS, BEC, WSC, Dareton CWP, DALC] - PRIORITY ACTION.
- Provide lease-holders with details of Aboriginal sites on their holdings and necessary protection methods and advised these sites are protected under state legislation[Dareton CWP/NPWS/BEC/DALC] - PRIORITY ACTION.
- Identify and develop appropriate sites in the southern management area for public interpretation and visitation [Dareton CWP/NPWS/BEC/DALC].
- Undertake dating of sites to provide more detailed interpretive information for visitors [Dareton CWP/NPWS/BEC/DALC].

4.2.2 European Heritage

Although a thorough assessment of the cultural heritage of the reserve has not been completed, general observations have identified several significant sites including old building foundations, fence lines, rubbish and bottle dumps, ceramic scatters and shelters. Also, a large camp was established near the site of current cemetery during the construction of Weir and Lock 10 in 1920s.

Identification and proper management of the cultural heritage is integral to the management of the area.

Objectives
Protection and recording of heritage significant sites
Greater understanding of the significance of the heritage sites in the reserve.

Strategy
- Protection of sites.

Actions
- Survey and record heritage sites [WSC]
- Approach Wentworth and District Historical Society (WDHS) and encourage their involvement in heritage research and interpretation [WSC]
- Undertake documentary research about the history of the reserve [WSC/WDHS]
- Stabilise and fence sites as necessary [WSC/WDHS]
- Identify and develop appropriate sites in the southern management area for public visitation and interpretation [WSC/WDHS]
- Ensure co-ordination of Cultural Heritage information [All groups]

Cemetery
The reserve includes the original cemetery for Wentworth. Wentworth Shire Council engaged a heritage adviser and has developed a separate management plan for the cemetery. In particular, additional area will be required for future needs.

Objective
Preservation of heritage values of the cemetery.

Cemetery Management Plan – *complete at time of revision.*

4.3 Water Supply and Use

The natural hydrology of the lagoon has been modified by the build-up of Cadell Street to protect residents from floods in the 1950's. This prevented natural inflow of river water to the lagoon. Council placed a diversion pipe below the natural surface at this location to provide for inflows which in turn triggered licensing action by the then Water Commission. This inlet allows regulated flows from the Wentworth weir pool to enter the lagoon. The pipe has a capacity of approximately 16 megalitres per day, which is sufficient to meet current water demand.

Although the lagoon is classified as unregulated and therefore provides no water supply security, the eastern inlet had been operated until the early 1990's to maintain stable high water levels in the lagoon, giving a relatively secure water supply for consumptive water uses - stock and domestic needs and irrigation. Other beneficiaries of this water management have included tourism and recreation. In addition, the frequency of flooding and high river flows during the 1970s and 1980s was higher than the long term average, and this may have created a perception of water supply security.

As noted in Section 4.1.1, these water supply arrangements undermined the natural hydrologic requirements of the wetland environment by lessening the natural variability of water levels. In addition, given its location along the riparian fringe in a semi-arid landscape, the lagoon is subject to significant natural evaporation (up to 1 centimetre a day during summer). Approximately 90% of the water in the lagoon is lost to evaporation rather than domestic, stock or irrigation use. Consequently, maintaining high water levels in the lagoon is a highly inefficient method of providing reliable water supplies to consumptive users around the lagoon.

Thegoa Lagoon is an unregulated stream, from 1996, the Department of Infrastructure, Planning and Natural Resources (DIPNR) has allowed surplus water to enter the lagoon with the objective of re-establishing a more natural hydrology to rehabilitate the lagoon environment.

Water Supply Arrangements

The DIPNR has developed an interim water supply policy for Thegoa Lagoon for 1998 and 1999. Under this policy, the lagoon will continue to be filled naturally by flood inflows. This interim policy recognises the lagoon is not a permanently inundated watercourse and receives water from flood events and not from regulated flows. It seeks to implement the water management objectives and policies of the NSW Water Reforms and the Murray Darling Basin Ministerial Council Cap on Water Diversions.

Water Inflows to the Lagoon:

1. *Flood flows:*
All flood flows in the Murray and Darling Rivers will enter the lagoon by overtopping the western sill. This will occur when flows in the Murray River are 60,000 megalitres per day or greater. Flood flows in the Darling River generally occur between January and April, while those in the Murray River generally occur between August and December.

2. *Surplus flows:*
Water inflows through the eastern inlet regulator may occur during periods of surplus flow, ie. Flows in the Murray River surplus to consumptive requirement that cannot be stored in Lake Victoria, and all downstream requirements are met. The Murray Darling Basin Commission declares surplus flow periods. However, they usually occur when flows in the river exceed downstream demand (including minimum flows for South Australia), usually as a result of rainfall in the catchment. In addition, 10 megalitres per year may be diverted from the river to the lagoon for recreational purposes (as licensed to Wentworth Shire Council).

3. *Duration of inflows:*
Under flood conditions, the lagoon would be expected to fill (ie, hold water to the level of the western sill). Under surplus flow conditions, inflows would continue for the period of the surplus flow declaration, as advised by the Murray Darling Basin Commission. If filled by surplus flows, the lagoon would overflow back to the river over the western sill.

4. *Multiple inflows in one year:*
Multiple inflows in one year will be allowed into the lagoon if the conditions noted in (1) and (2) occurred more than once.

5. *Notification arrangements:*
Notification of flood flows and surplus flows into the lagoon will be through the community, State and Local Government members of the Thegoa Lagoon Management Steering Group.

Limitations to Access

Water extraction for irrigation use is allowed until lagoon water levels fall to a relative water level of 0.3m on the gauges installed in the lagoon. This minimum level was revised downward from 0.8m to 0.5m by the DIPNR in consultation with the Steering Group. *(In August 2003, Thegoa Lagoon irrigators advised by DIPNR Licensing Officers the cease to pump level is 0.3m).*

Temporary Transfer of Water Allocations

Under the NSW Water Reform policies, temporary transfers of regulated water cannot be made to unregulated streams such as Thegoa Lagoon. Such a transfer was made in 1997 before the Water Reform policies were implemented. This transfer highlighted several difficulties in delivering the small transferred volumes to diversion pumps while the lagoon water level was low.

- *Possible Environmental Water Allocation*

The risk of saline groundwater intrusions to the lagoon is potentially greatest if the lagoon dries fully. Although this risk has only been raised as a possibility, a minimum water level of 0.5m will be maintained in the lagoon, if possible. This will be reviewed, once the risk is clarified by continuing hydrogeologic monitoring and assessment. Options will be investigated for obtaining an environmental water allocation to maintain this minimum water level in the lagoon. Such an environmental water allocation, if available, would be for the sole purpose of protecting the lagoon from saline groundwater intrusions. It would not be available to surrounding water users.

Objective:
Implementation of Water Supply Arrangements and water in-flow conditions.

Strategies:
- Maintain and monitor water supply operation procedures.

Actions:
- Operate eastern regulator under interim supply arrangements [WSC/DIPNR]
- Monitor flood inflows to the lagoon [DIPNR].

4.4 Hydrogeology

Background
South-western NSW is subject to high saline water tables due to the prehistory and geology of the area, river regulation and broad catchment changes over the last 100 years. Thegoa Lagoon is particularly at risk from a high watertable because of its location between the Murray River, the Lower Darling River and the Great Anabranch of the Darling River. All of these watercourses surrounding the lagoon contribute significantly to groundwater seepage.

A recent review of groundwater data in the area identified high saline watertables around the lagoon. This study indicated the lagoon might be at risk from intrusion of saline groundwater if the lagoon is dried for an extended period.

Objective:
Clarification of the risk of saline groundwater intrusions into the lagoon.

Strategies:
- Obtain adequate hydrogeologic information for developing and implementing a hydrologic management regime, which rehabilitates the lagoon ecology and minimises any risk from saline groundwater intrusions.
- Ensure the lagoon is not kept 100% dry for more than 2 consecutive years, until further investigations have been completed.

Actions
- If possible, manage inflows to maintain a minimum water level of 0.5m, taking into account evaporation and irrigation usage - see Section 4.3 [DIPNR/MWWG].
- Install 3 piezometers. Two deep bores (20-25m) at N 6227098 E 581279 and N 62254658 E 584146 (one replaces a destroyed bore); One shallow bore (10m) N 6226458, E 581439 (DIPNR).
- Continued monitoring of groundwater levels and salinity, commenced April 2002, review 12-18 months (DIPNR/MWWG).

4.5 Land Management

4.5.1 Zoning

The lagoon reserve is currently zoned as "Rural" under Wentworth Shire Council's Local Environmental Plan. Although this zoning is suitable for the existing leases, it does not reflect the environmental and heritage significance of the area.

Objective

Re-zone the lagoon reserve to reflect conservation value.

Strategy

- Ensure appropriate zoning for the area.

Actions

- Rezone the area as a "Conservation Zone" with existing leases remaining as "Rural" [WSC] - PRIORITY ACTION.

4.5.2 Garden Waste Tip

The existing tip detracts from the aesthetics of the natural environment of the reserve and is a potential source of weed infestation to the area. Wentworth Shire Council has closed the tip and diverted garden waste disposal to more appropriate facilities. However, the tip has been used for many years and specific actions will be required to discourage illegal dumping. The tip area will also require active rehabilitation with landscaping and revegetation.

The tip has been used to dispose of domestic garden waste and does not contain any intractable waste material. Leachate from the area should be innocuous.

Objective

Rehabilitate the tip area to a natural condition.

Strategies

- Address unauthorised dumping of refuse.
- Rehabilitate site of existing tip.

Actions

- Reclaim rubbish tip area through filling, landscaping and revegetation with local native species [WSC] - PRIORITY ACTION.
- Monitor the site for regeneration of pest plants and control as necessary (refer to Section 4.5.5) [WSC].

4.5.3 Wentworth Western Wastewater Treatment Plant

The reserve includes the western sewage treatment plant for Wentworth, which was constructed above the 1956 flood level. The main problems with the plant are the impact on the aesthetics of the surrounding natural bushland, occasional discharge of effluent to the river and odour.

The Council has engaged a consultant to assess all options for future sewage treatment. The results of the consultancy recommended the removal of the sewage treatment plant from the floodplain, this is a priority action for Wentworth Shire Council for 2003-4.

4.5.4 Pest Plants and Animals

Infestations of weed species, such as Noogoora Burr *(Zanthium occidentale)*, African Boxthorn *(Lycium ferocissimum)*, Olive, Prickly Pear *(Opuntia sp.)*, and Peppercorn Tree *(Schina areira)* and Matchhead Plant *(Psilocaulon tenue),* occur in the open forest and woodland areas. Dumping of garden waste at the rubbish tip and illegally in other areas provides a source for additional infestations of exotic plants. Introduced species, such as Century Plant, may be

retained if they are of historical significance or associated with historic sites provided they do not pose a threat to the ecology of the lagoon and reserve.

Feral animals present in the reserve include rabbits, foxes, dogs and feral cats. Rabbits are having a serious impact on the integrity on Aboriginal heritage sites in sandy areas. Foxes, dogs and cats pose a constant threat to small native animals.

Objective
Control or where possible eradicate pest plant and animals from the reserve.

Strategies
- Develop and implement an effective program for weed and feral animal control appropriate for the pest species and their location
- Improve the timing of weed control activities to ensure maximum effect (for example before flowering)
- Cease and police dumping of garden refuse at the tip and elsewhere

Actions - Pest Plants
- Control the spread of Noogoora Burr by annual spraying prior to seed formation [WSC/Dareton CWP]. Around Log Bridge (the south-western section of the lagoon floodplain) as a priority. At the north-eastern section of the lagoon subsequently. Effective control will require several years of repeated and timely spraying.
- Continue annual weed control/removal programs [WSC]
- Monitor the reclaimed tip regularly for weed infestations and undertake control measures when necessary [WSC]

Actions - Feral Animals
- Plan and undertake a program for trapping domestic dogs, feral cats and foxes [Dareton CWP/NPWS/WSC/RLPB/Neighbours]
- Undertake a program for controlling rabbits [Dareton CWP/NPWS/WSC/BEC/DALC]
  This should be done mainly by gassing. Ripping may be possible at some sites under supervision by the NPWS and Barkindji Elders.

4.5.5 Public Access/Track Rationalisation
Numerous tracks have been established across the reserve with no planning or consideration of the impacts on environmental or cultural features. Most of these tracks are unnecessary. Rationalisation of these tracks would allow most to be closed and revegetated, and allow greater control over the impacts of visitor use of the reserve.

Objective
Rationalisation of the tracks and restriction of vehicle access

Strategies
- Identification and closure of unnecessary tracks
- Maintenance of main vehicular road system and walking/riding trails

Actions
- Identify tracks required by leaseholders and stakeholders [Dareton CWP/WSC/BEC/DALC]
- Identify primary vehicular access roads to be developed and maintained [Dareton CWP/WSC/BEC/DALC]
- Where appropriate, initiate rehabilitation of closed tracks by shallow ripping [Dareton CWP/WSC/BEC/DALC]

4.5.6 Visitor Facilities
The primary area for day visitation within the reserve will be along the river front, which has the aesthetic features and existing access to handle larger numbers of people. Day visitation facilities will be concentrated in this area with some interpretation material. Other areas of the

lagoon will have limited access via walking, cycling and horse-riding trails. Appropriate interpretation material will be located along these trails.

Objective
Planned distributions of access and use facilities within the reserve.

Strategies
- Direct recreational activity to river frontage (Southern management area)
- Develop visitor facilities at key sites in this area
- Plan and develop trail system

Actions
- Establish picnic facilities along Murray River [Dareton CWP/WSC]
- Develop maintenance program for facilities including rubbish removal [Dareton CWP/WSC]
- Establish trail system with appropriate interpretation material [Dareton CWP/WSC]
- Install warning and direction signs about the risk of falling tree limbs [Dareton CWP/WSC]

4.5.7 Riparian Fencing
During drying of the lagoon, sheep graze the regenerating plant growth. Hoof traffic causes compaction and breakdown of the soil cracking that normally allows additional plant germination and soil aeration.

Objective
Management of Thegoa Lagoon dry periods for vegetation and soil benefit.

Strategy
No grazing of domestic livestock on Thegoa Lagoon during drying cycles.

Action
Installation of riparian fencing, where needed, estimate of 2 kilometres [WSC]

4.5.8 Eastern regulator channel maintenance
Removal of cumbungi regeneration in connecting channel to allow adequate rate of flow during water replenishment.
Maintenance of eastern regulator to prevent leakage.

Action
Maintenance of eastern regulator, eastern connecting channel, removal of cumbungi by Wentworth Shire Council.

Figure 4 – The Changing face of Thegoa Lagoon (Photopoint 6, courtesy of MWWG)

November 2001

April 2002

July 2002

November 2002

4.6 Stormwater Drainage

The lagoon receives stormwater drainage from two areas: the Wentworth Gaol Reserve on the north-east side of the lagoon, and to a lesser extent, Cadell Street. This stormwater may include run-off from built-up areas and former rubbish tip sites, and occasionally wastewater from the domestic Water Treatment Plant. Wentworth Shire Council has accepted a Management Plan for the Gaol Reserve, which includes options for improving stormwater management. In addition, the Council has prepared a Stormwater Management Plan.

Objective
Adequate disposal of urban stormwater drainage and control of natural stormwater diversion within the Reserve

Strategy
- Minimise impacts of stormwater discharge to the reserve

Actions
- Investigate stormwater filtration options including assessment of cost and benefits of stormwater retention from the Gaol Reserve [WSC]

4.7 Environmental and Cultural Interpretation

Interpretation and education facilities are required to improve public awareness of the environmental and cultural significance of the lagoon and reserve. In particular, these facilities will focus on the wetland ecology and the Aboriginal and historical use of the area. Such interpretation facilities will highlight all the features of significance including Aboriginal heritage, historic heritage, wetland and floodplain ecology, and the proximity to the confluence of the two major rivers of the Murray-Darling Basin.

Objective
Interpretation facilities at the reserve explaining the ecology and Cultural Heritage significance of the area

Strategies
- Identify appropriate levels, intensity and locations of further interpretation facilities
- Develop appropriate interpretation facilities
- Investigate appropriateness of, and options for, a regional cultural centre

Actions
- Prepare and install interpretation boards at the entrance to the reserve and at the lock and river junction highlighting the Cultural heritage significance of the area and the type of sites present [Dareton CWP/NPWS/WSC/BEC/DALC/WDHS]
- Develop self-guided tour booklet outlining the cultural and ecological features of the area [Dareton CWP/MWWG/BEC/DALC/WDHS]

4.8 Promotion and Marketing

Promotion and marketing of the lagoon and reserve are needed for two reasons. In the short term, efforts will be directed to raising local appreciation of the lagoon and its significance. Over the longer term, promotion will focus on raising the profile of the area as a regional attraction.

Objectives
Greater understanding and appreciation of the features of the area among the local community
Promotion of the area as a regional feature of ecological and cultural significance

Strategies
- Develop a public identity for the lagoon
- Promote the lagoon as part of a regional circuit of ecological and cultural tourism features including Mungo National Park

Actions
- Investigate the origins of the lagoon's name [Dareton CWP/WSC/MWWG/BEC/DALC]
- Prepare media releases to publicise the work being done at the lagoon and increase community awareness of the management changes and objectives [All members of Steering Committee]
- Develop information brochures outlining the features of the area [Dareton CWP/WSC/BEC/DALC]
- Liaise with local and regional tourism organisations [Dareton CWP/WSC/BEC/DALC]

5. IMPLEMENTATION OF THE PLAN

Implementation of the management plan will be based on the four management areas as shown in Table 1.

Table 1: Management priorities in the four management areas

Section	Issues	Primary purpose	Management Priorities
Southern	• Main recreational and tourism use area	• General tourism and recreation access	• Develop adequate recreation and interpretation facilities
Western	• Contains major Aboriginal heritage sites • Native fish management	• Aboriginal heritage protection • Low impact interpretation facilities • Native fish management and access	• Develop system of walking tracks and interpretation material • Actions as per section 4.1.4
North-east	• Contains major Aboriginal heritage sites • Contains private leaseholdings	• Protection of Aboriginal heritage	• Protection of sites • Recording of any new sites
Central	• May contain heritage sites • Contains Council infrastructure • Management changes require long term planning and cost assessment	• Protection of heritage • Short term - Minimise aesthetic impact • Long term - Assess removal or modification of infrastructure	• Short-term mitigation of impacts • Planning and co-ordination of long term actions

New actions and actions not undertaken up until January 2003, are listed in the Action table (Table 2). Actions cover four categories.

1. Technical investigations will provide additional information about the lagoon environment and the threats it faces, and allow a greater understanding of the wetland as the basis for future management.

2. Monitoring will provide information on changes occurring in and around the lagoon as a result of existing processes and management actions. This will allow management to be reviewed and refined.

3. Management planning and actions will improve the co-ordination, effectiveness and efficiency of management arrangements.

4. On-ground works will bring into effect the management strategies outlined in the plan.

Table 2 is divided into 2 portions based on the primary external funding source the Lower Murray Darling Catchment Blueprint.
Actions deemed to be a "Priority" indicates the action need to be undertaken at a suitable time and are shown in italics in the following table (Table 2).

Table 2 Action Table

The actions listed below relate to components of the Management Plan that are compatible to the LMD Blueprint and it's potential funding sources

Issue	Actions	Resp group	est cost	funding avail	add'l fund req'd
Environmental Management					
4.1.1 Wetland rehabilitation	*Operate flow control structures to re-establish seasonal water level fluctuations*	WSC/DIPNR	0	0	0
	Annual review of regulator operation	WSC/DIPNR	0	0	0
	Investigate the benefits and options for replacing the western inlet/outlet structure	WSC/DIPNR /MWWG	0	0	0
4.1.4 Fish Management	Replacement of western inlet/outlet with culvert type structure to allow fish passage	NSW Fisheries WSC/MWWG/DIPNR	30,000	0	30000
	Maintain adequate snags within lagoon	NSW Fisheries WSC/MWWG/DIPNR	0	0	0
	Investigate options and feasibility of re-snagging sections of the lagoon	MWWG	0	0	0
	Investigate installation of carp control structure to prevent re-colonisation by mature carp	MWWG	2,000	0	2000
	Re-snagging sections of the lagoon Insert 1km @$3000/km)		3,000	0	3000
4.5.7	Riparian fencing - Estimated at 2km on Blueprint standard costing @$6500/km	WSC	13000	0	13000
			48,000	**0**	**48000**
4.1.2 Native Flora	*Revegetate tip site after landscaping*	**WSC**	2,000	0	2000
	Rehabilitate unnecessary tracks assessed under Section 4.5.6	**WSC/Dareton CWP**	3,000	0	3000
	Assess and map floodplain area to ID areas requiring revegetation	**WSC**	2,000	2,000	0
			7,000	**2,000**	**5000**
4.1.3 Native Fauna	Establish more frequent wildlife monitoring of the area for inclusion in the NSW Wildlife Atlas	**NPWS**	400	400	0
	Increase recording of birdlife via negotiation with Sunraysia Bird Observers	**NPWS**/MWWG	500	500	0
	Update an inventory of native fauna	**NPWS**	0	0	0
			900	**900**	**0**
4.5.4 Pest Management	Control of Noogoora Burr and other pest plant species by annual spraying prior to seed formation, Log Bridge priority, then north east section	**WSC**	5000	5000	0
	Monitor re-claimed tip for weed infestations & control	**WSC**	1000	1000	0
	Plan & undertake pest animal control program for feral cats, dogs & foxes	NPWS/**WSC**	5000	5000	0
	Undertake a program for controlling rabbits.	NPWS/**WSC**	3000	0	3000

			14000	**11000**	**3000**
4.1.4 Environmental Monitoring	*Establish photopoints at selected sites across floodplain to assess the rate and success of revegetation activities*	**DIPNR/NPWS**	1,000	1,000	0
	Maintain photopoints at selected sites across lagoon to assess the rate and success of riparian revegetation	**MWWG**	1,000	1,000	0
	Establish regular surface water level monitoring, survey gauges	**DIPNR**	1,000	1,000	0
	Baseline assessment of lagoon water quality while the lagoon is low and when full	DIPNR/MWWG	1,000	1,000	0
	Monthly monitoring of salinity when surface water level<1.0m	DIPNR/MWWG	1,000	1,000	0
	Continued monitoring of groundwater levels, commenced April 2002, review 12-18 months]	DIPNR/MWWG	2,000	2,000	0
			7,000	**7,000**	**0**
Subtotal environmental management			**76,900**	**20,900**	**56,000**
Issue	**Actions**	**Resp group**	**est cost**	**funding avail**	**add'l fund req'd**
4.2 Cultural Heritage					
4.2.1 Aboriginal	Implement site protection works as outlined in Archaeological assessment	**Dareton CWP/NPWS /BEC/DALC**	5,000		5000
	Train Aboriginal staff working at the lagoon in the ID and recording of Aboriginal sites	NPWS/BEC/ DALC/WSC/ Dareton CWP	2,000		2000
	Undertake dating of sites to provide more detailed interpretative information for visitors	BEC/DALC Dareton CWP/NPWS	5,000	0	5000
4.2.2 Heritage	Stabilise and fence sites as necessary	WSC/WDHS	1,000	0	1000
Subtotal cultural heritage			**13,000**	**0**	**13000**
4.3 Water Supply	Monitor flood inflows to the lagoon	DIPNR	1,000	1,000	0
	Operate eastern regulator under interim supply arrangements	DIPNR/WSC	0	0	0
			1,000	**1,000**	**0**
4.4 Hydrogeology	If possible, manage inflows to maintain a minimum water level of 0.5m, taking into account evaporation and irrigation usage	DIPNR/MWWG	0	0	0
	Install 3 piezometers Two deep bores (20-25m) at N 6227098 E 581279 and N 62254658 E 584146 (one replaces a destroyed bore); One shallow bore (10m) N 6226458, E 581439. DIPNR drilling cost $60/m	**DIPNR**	3,600		3600
	Continued monitoring of groundwater levels and salinity, commenced April 2002, review 12-18 months	DIPNR/MWWG			
			3600	**0**	**3600**

Subtotal water supply/use and hydrology			**4,600**	**1,000**	**3,600**
4.7 Environmental Education	Prepare and install interpretation boards at the entrance to the reserve, lock, and river junction highlighting the Cultural Heritage significance of the area and the type of sites present.	WSC/NPWS/ Dareton CWP /BEC/DALC	5,000		5000
	Develop a self-guided tour booklet outlining the cultural and ecological features of the area	MWWG/Dareton CWP /BEC/DALC	2,000	2,000	0
Subtotal interpretation/education			**7,000**	**2,000**	**5000**
TOTAL			**101,500**	**21,900**	**77,600**

Cost of Management Plan actions that have are NOT covered but Blueprint & have not occurred or not been superseded since plan development

Issue	**Actions**	**Resp group**	**est cost**	**funding avail**	**add'l fund req'd**
4.2 Cultural heritage - 4.2.1 Aboriginal	*Provide leaseholders with details on significant sites, protection and state legislation*	NPWS/Dareton CWP/ BEC/DALC	1,000	0	1,000
	Prepare a Memorandum of Understanding between NPWS, WSC, and Steering C'tee/WSC clarifying the legislative basis of Steering C'tee/WSC management of the area	NPWS/BEC /DALC/Dareton CWP/ WSC	0	0	0
	Survey & record newly ID historic sites	NPWS/Dareton CWP/ BEC/DALC	1,000	0	1,000
	Rotation of sites shown on tours to ensure individual sites not stressed by over visitation	Dareton CWP/BEC/ DALC	0	0	0
	Wentworth Shire Council to notify Dareton CWP prior to commencing any public works in the reserve	WSC	0	0	0
	Identify & develop appropriate sites on southern management area for public interpretation & visitation relates to interpretative signage	NPWS/Dareton CWP/ BEC/DALC	2,000	0	2,000
	Ensure coordination of cultural information	Dareton CWP/WSC/ WDHS/BEC/ DALC	500	0	0

4.2.2 Heritage	Survey & record historic sites	WSC	3,000	0	3,000
	Approach Wentworth & District Historical Society re involvement in heritage research	WSC/WDHS	0	0	0
	Undertake documentary research about the history of reserve	WSC/WDHS	2,000	0	2,000
	Identify & develop appropriate sites on southern management area for public interpretation & visitation	WSC/WDHS	2,000	0	2,000
4.5 Land Man't	*Re-zone area as Conservation with existing leases remaining Rural*	WSC	1,000	1,000	0
4.5.1					
4.5.2	*Reclaim rubbish tip site with, filling, landscaping, revegetation with local native species*	WSC	10,000	10,000	0
4.5.4	Continue annual weed control/removal programs	WSC	2,500		
4.5.5	Identify tracks used by leaseholders & stakeholders	WSC	0	0	0
	Identify primary vehicular access roads to be developed and maintained	Dareton CWP/WSC/ BEC/DALC	tba		
	Where appropriate initiate rehabilitation of other closed tracks by shallow ripping	WSC	2,000	2,000	0
4.5.6	Visitor facilities – picnic facilities & maintenance, trail system, interpretation material and falling tree branch warning signs	WSC Dareton CWP	10,000	5,000	5,000
4.5.8	Maintenance of eastern regulator, eastern connecting channel, removal of cumbungi by Wentworth Shire Council.	WSC	tba		
4.6 Stormwater drainage	Investigate stormwater filtration options including assessment of cost and benefits of stormwater retention from the Gaol Reserve	WSC	4,000	4,000	0
4.8 Promotion & Marketing	Investigate origins of the lagoon's name	Steering C'tee	0		
	Develop information brochures outlining the features of the area	WSC/Dareton CWP	4,000	0	4,000
	media releases to publicise work and management changes etc	all Steering C'tee	0	0	0
	liaison with local and regional tourism organisations	WSC/Dareton CWP	0	0	0
SUB TOTAL			**45,000**	**22,000**	**20,000**
Grand Total			**146,500**	**43,900**	**97,600**

5.1. Funding Current and On-going Works

Background

Current and planned activities to assist the management of the lagoon include the following.

- Wentworth Shire Council has employed a Tourist/Promotions Officer who will work with Steering Committee in implementing the management plan and developing programs.
- An aquatic fauna survey was completed and submitted to the MWWG by the Murray Darling Freshwater Research Centre in 2000.
- The Department of Infrastructure, Planning and Natural Resources is monitoring the piezometers around the lagoon and undertaking some water quality monitoring.

Small-scale works

Small scale works include the following.

- Interpretation material - signs, interpretative boards, information leaflets
- Site protection works - fencing
- Vegetation rehabilitation and regeneration
- Control of pest plants, particularly Noogoora Burr, and pest animals

Wentworth Shire Council and LMD Catchment Blueprint will meet funding for these activities.

External Funding

Lower Murray Darling Catchment Investment Strategy will fund natural resource components of this plan as outlined in the preceding tables (through the inclusion of the Thegoa Lagoon Management Plan in the Catchment Blueprint).
The timeframe for implementation is within 12 months of funding approval and contract sign off with Wentworth Shire Council.

Applications for funding may be sought from the following sources.

- Envirofund (amounts up $30,000 and compatible with LMDCM Blueprint)
- Environmental Trust
- NSW Heritage Incentives program
- Australian Institute of Aboriginal and Torres Strait Islander studies
- Aboriginal Affairs Discretionary Grants

APPENDIX: Previous studies

Edmonds, V. 1995, *An Archaeological Assessment of Thegoa Lagoon Reserve Wentworth, Western NSW.* Archaeological Consulting Services, Buronga.

Jonasson, P. 1995, *Water Management of Thegoa Lagoon: Discussion paper.* Department of Water Resources, Dareton.

Luitjes, K. and Smith, C. 1995, *Environmental Baseline Study: Thegoa Lagoon Reserve, Wentworth NSW.* Sunraysia Environmental, Mildura.

Plummer, N. McCarthy, B. Ellis, E. and Gawne, B. 2000, *Aquatic Fauna Survey of Thegoa Lagoon near Wentworth, NSW.* Murray Darling Freshwater Research Centre, Lower Basin Laboratory.

Rix, C. and Sammon M. 1995, *Tourism Baseline Study: Thegoa Lagoon Reserve, Wentworth NSW.* Thomsons Accountants and Advisers, Mildura.

Thegoa Lagoon Steering Committee 1999, *Draft management Plan for Thegoa Lagoon 1998 – 2001,* prepared by Don Reid, Dept of Land and Water Conservation.

Woolley, D. 1997, *Groundwater Condition at Thegoa Lagoon, Wentworth NSW.* Department of Infrastructure, Planning and Natural Resources, Parramatta.