LAKE WOLLUMBOOLA ESTUARY MANAGEMENT PLAN

FINAL REPORT

Prepared for:

SHOALHAVEN CITY COUNCIL
Bridge Road, NOWRA NSW 2541

Prepared by:

Kinhill Pty Ltd
ACN 007 660 317
Level 9, 201 Kent Street, SYDNEY NSW 2001
Telephone (02) 9911 0000, Facsimile (02) 9241 2900

March 2000

SM8007 Rev 0

Limitations Statement

The sole purpose of this report and the associated services performed by Kinhill is to produce an Estuary Management Plan in accordance with the scope of services set out in the contract between Kinhill Pty Ltd (Kinhill) and Shoalhaven City Council ('the Client'). That scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

In preparing this report, Kinhill has relied upon and presumed accurate certain information (or absence thereof) relative to the lake provided by government officials and authorities, the Client and others identified herein. Except as otherwise stated in the report, Kinhill has not attempted to verify the accuracy or completeness of any such information.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between Kinhill and the Client. Kinhill accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

EXECUTIVE SUMMARY

In November 1992, NSW Public Works commissioned Kinhill Engineers Pty Ltd (Kinhill) on behalf of Shoalhaven City Council to undertake an estuary management study for Lake Wollumboola.

The study was divided into three stages:

Stage 1: existing lake conditions and issues

Stage 2: management options and impacts

Stage 3: management plan for the lake.

This report summaries the outcome of each of the three stages of the study.

Lake Wollumboola is located 180 km south of Sydney and just to the north of Jervis Bay on the New South Wales south coast (Lat. 34° 57' S. Long. 150°46' E). It is a broad, shallow lake which intermittently opens to the ocean. The lake is one of about 60 estuaries in NSW that have an intermittently open entrance, however, Lake Wollumboola is acknowledged as a unique system in terms of its maturity, trapping efficiency, height above sea level and the complexity of ecological processes occurring with the lake.

Lake Wollumboola is used for swimming, water sports, boating, commercial and recreational fishing and other recreational activities. The catchment and foreshore are relatively undisturbed at present, with a surrounding forestry reserve, several protected wetlands and a large proportion proposed for inclusion in the NSW Jervis Bay National Park. Lake Wollumboola has been listed on the 'Directory of Important Wetlands in Australia' and is listed on the Register of the National Estate. The lake is not only of regional significance for fauna, but also of international significance as it provides important habitat for 23 internationally protected species. The coastal Little Tern breeding habitat is of regional, and national, significance (NPWS, 1997).

Development around the lake includes the town of Culburra on the north-eastern shore, and areas which support grazing. Additional development of the catchment is also planned, the first stage of this is currently the subject of a Commission of Inquiry.

The lake itself experiences occasional episodes of excessive seagrass growth, poor water quality and generation of strong odours, as a result of hydrogen sulphide release. Localised and less severe odours also occur as a result of seagrass decay. These odours affect nearby residents and visitors to the lake. There is a perception amongst some local residents and expressed in local community meetings that the problems are worsening.

Perceived problems in the lake occur under two sets of circumstances. First in times of drought, and second when the lake is opened to the sea, either naturally or artificially.

Shoalhaven City Council, through its Lakes and Estuaries Management Committee has instigated a lake management study to be undertaken with funding assistance from the State Government's Estuary Management Program. The study seeks to balance potentially competing uses of the lake and provides a framework for the decision making process.

Management options for the lake and their impacts have been assessed with the objectives of maintaining the lake's existing conservation and recreational values, reducing nutrient input to the lake, and controlling hydrogen sulphide emissions from its surface. Consideration was also given to social, economic, physical, biological and chemical characteristics of the lake which include aspects such as: air quality, aesthetic amenity, conservation values, land management, recreational amenity, commercial fishing, flooding and management costs. These factors were assessed to determine the opportunities and constraints for appropriate management options. A range of such options, broadly based on the identified opportunities and their economic viability, was then developed with the close participation of the local community.

Three base management options were considered for the lake:

- a permanently open entrance–with connection to a frequent water exchange point
- a permanently closed entrance–with a constructed control for excess water release
- maintaining the present entrance.

Further management measures were then considered which would modify and enhance the effectiveness of these three options. These included:

- water exchange by pumping
- a temporarily opened entrance
- salinity and level stabilisation by pumping
- dredging to increase the depth of the lake and remove high nutrient sediment
- macrophyte and algal harvesting

- re-suspension and export of sediment by jetting
- construction of a tidal weir
- culvert overflow.

All options were considered in appropriate combinations and their advantages and disadvantages identified. Each combination would also be supported by a series of measures. As these would be common to all options they are not considered as part of the assessment. These measures and program are as follows:

- maintenance of existing quality of runoff from the catchment
- inclusion of stormwater treatment for urban development
- prevention of illegal entrance openings
- program of community education
- research into conservation and heritage values
- institution of appropriate planning controls
- program of water quality monitoring
- restoration of foreshore and riparian vegetation
- management of potential acid sulphate soils.

The study recommends that the preferred approach is to implement management measures which reinforce the natural lake processes using non-engineering solutions. The preferred option is therefore the maintenance of the natural opening regime coupled with the initiation and management of the measures and programs listed above.

The responsibility for overseeing implementation of the management plan and its individual components lies with Shoalhaven City Council's Lakes and Estuaries Management Committee. The strategies and actions in the plan are oultined in Table 12.2 which has been included in the summary. Plan implementation should be monitored for its effectiveness and formally reviewed on an annual basis. A wide range of sources is available for funding various components of the overall management programs.

Many individual activities offer opportunities for community involvement and local groups should be encouraged to take a pro-active position in the management of their estuary and liaise regularly with local community representatives on the Lakes and Estuaries Management Committee and the Lake Wollumboola Estuary Management Taskforce.

Table 12.2 Actions, responsibilities, performance measures and targets for strategies

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
Odour					
OD1 Further Investigate the mechanisms controlling odour events.	• Initiate program of research into mechanisms controlling emission of hydrogen sulphide from Lake Wollumboola. • Assess further options for minimising odour problem.	**SCC, DLWC, Fisheries** **LWTF, SCC DLWC, Fisheries**	Occurrence and intensity of H2S emissions from lake.	Minimise number of odour events caused by human activity.	3-5 years
OD2 Investigate the effects on odour generation of algal harvesting during periods of low water level including the removal of decaying seagrass and macroalgae from the foreshore.	• Initiate sampling program to document water levels, seagrass and algal growth and decay and odour events. • Assess further options for minimising odour problem.	**SCC LWTF, DLWC, EPA, Fisheries** **LWTF, SCC DLWC, EPA, Fisheries**	Occurrence of localised odour events	Minimise number of odour events resulting from rotting seagrass and algae.	1-2 years
Community Support and Education					
ED1 Increase community awareness of the natural processes in the lake	• Establish extent and relevance of existing education material and programs available from Council and other sources. • Develop and implement public awareness and education programs (brochures, signs, print and electronic media, personal contact) to describe the ecological value of the lake. • Develop community brochure identifying problems associated with opening the lake prematurely and discussing natural cycles in the lake, including odour generation. • Prepare appropriate information for inclusion into a pamphlet on community environmental education issues. • Maximise distribution to the community.	**LWTF** (SCC, DLWC, NPWS, EPA, Fisheries, Waterways) **SCC** (LWTF, DLWC, NPWS, EPA, Fisheries, Waterways) **SCC** (LWTF, Community) **SCC** (LWTF, Community) **SCC** (LWTF, Community)	Awareness if impact of everyday activities.	Change in community practices adversely effecting the lake.	1-2 years

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
ED2 Provision of support for the principle of community involvement in the management of the lake	• During implementation of the Estuary Management Plan, maintain an action plan including progress in the form of a spreadsheet to be updated after each Task Force meeting and distributed to interested parties, including the media, on request.	SCC, DLWC	Community involvement in lake management.	Increase community involvement in lake management.	3-5 years
	• Develop a plan preferably using GIS to be used in conjunction with the spreadsheet based action plan, showing land and waterway uses and current planning and development activities occurring in the estuary and the catchment.	SCC			
	• Use the local media to publicise the Estuary Management Plan, results of monitoring programs and issues of concern as they arise.	SCC			
	• Utilise the Internet to display all the above.	SCC, DLWC			
Lake Entrance Management					
LE1 Minimise human intervention in the entrance opening regime	• Develop an Entrance Management Policy which clearly defines the opening regime of the lake (when, where, how). The policy should consider social and ecological factors such as odour, fisheries, aquatic ecology, water quality, aesthetics and flooding.	SCC (DLWC, DUAP, NPWS, Fisheries, EPA, LWTF)	Number of artificial openings by Council.	Reduction in number of artificial openings by Council.	1 year
	• Prepare a Review of Environmental Factors assessing the impacts of the entrance opening regime and obtain development approvals including a Crown Lands licence.				
	• Survey low-lying property and determine relationship between opening level and assets and the intervention necessary to protect assets.				
	• Introduce detailed recording of each entrance opening.				
	• Maintain signs to deter illegal openings.				
	• Establish a reporting system for when illegal entrance openings are attempted.				

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
Water Quality (Land Use Change)					
WQ1 Enhance the water quality monitoring program	• *Develop specific objectives for the monitoring program to ensure understanding of the lake's ecological processes is increased.*	*SCC (EPA, DLWC, LWTF)*	Dissolved oxygen, pH, salinity, turbidity, suspended solids, nutrients, chlorophyll-a and bacteria.	Establish appropriate water quality guidelines.	1-2 years
	• Monitor water quality in the lake, creeks and drains, under dry and wet weather conditions and varying water levels to establish water quality variability.	SCC (EPA DLWC, LWTF)			3-5 years
	• Establish appropriate site specific water quality guidelines for Lake Wollumboola considering the ecological variability operating in the lake.	SCC (EPA, DLWC, LWTF)			
WQ2 Maintain and enhance the condition of buffer zones (advocate vegetated buffer strips on both private and public lands)	• Survey and identify vegetation types and condition and bed/bank erosion along tributaries and around lake (possibly using methodology outlined in 'Rivercare', LWRRDC 03/95).	**DLWC** (SCC, LWTF Community)	Turbidity, suspended solids and nutrient levels in tributaries and lake.	Catchment runoff meets water quality guidelines (see Strategy WQ1).	3-5 years
(Could be carried out in conjunction with CE3)	• Prioritise areas according to condition and need, for example, amount of sediment and nutrient flow off adjacent land or rate of erosion, where present.	**DLWC** (SCC, LWTF, Community)	Bed and bank erosion rates.	Restoration of riparian vegetation and decrease in erosion rates.	
	• Review minimum widths necessary to intercept runoff and protect banks.	SCC (DLWC)		Continuous riparian wildlife corridor.	
	• Assess other factors influencing buffer widths including riparian wildlife habitat and viewscape.	**SCC** (NPWS, DLWC)			
	• Design erosion control and revegetation programs where required using local plant species.	**SCC, DLWC, NPWS**			
	• Continue planting programs with individuals, community groups, Council and agencies.	**LWTF, Community, SCC, DLWC, NPWS**			
WQ3 Maximise pollutant interception capacity between areas of land use change and the lake to reduce the risk	• Proponents of development to prepare estuary pollution risk map, showing the potential for any location within the development that, if	**Proponent** (SCC DLWC,)	Turbidity, suspended solids, nutrient levels and	Variation in quality of catchment runoff not exceeding that	3-5 years

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
of pollutant entry for new developments.	disturbed, will generate sediment (fine and coarse) or nutrient inflows to the lake. • Based on the risk mapping assess the extent of water quality control structures such as trash racks, sediment traps, artificial wetlands and other intercepting filters required to not increase existing sediment and nutrient loads to the lake. *In recognition of the sensitivity of the receiving environment and the cumulative impact of land use change adopt a precautionary approach to development within the catchment, including the suite of pollution controls, that takes into account the attributes of the site (for example, soils, slopes, distance to lake) so as to achieve appropriate goals such as no net increase in nutrients.* • For the areas of highest risk identified in the pollution risk map conduct an assessment of the consequences of failure of the required water quality controls. • *Assess the effectiveness of the water quality control structures post construction to see if goals are being met. If water quality goals are not being met, recommend ameliorative measures.*	**Proponent** (SCC DLWC, EPA) ***Proponent** (SCC, DLWC, EPA, LWTF)* ***Proponent** (SCC, DLWC, EPA, LWTF)*	gross pollutants. Turbidity, suspended solids, nutrient levels and gross pollutants.	established in WQ1 Variation in quality of catchment runoff not exceeding that established in WQ1	3-5 years
WQ4 Determine the feasibility of the inclusion of water quality control devices to reduce pollution loads from existing land uses.	• Conduct stormwater investigations estimating and/or measuring sediment and nutrient loads from urban, rural and forested sub-catchments and assess extent of sedimentation at stormwater outlets and creek mouths where necessary. • Assess feasibility and cost-effectiveness of modifying existing drainage lines and stormwater outlets and installing new water quality control structures. • If required, establish program to implement control structures and other measures. • If required, establish program to maintain	SCC (EPA) SCC SCC (EPA, DLWC)	Turbidity and nutrient levels at outlets and gross pollutants.	Catchment runoff meets water quality guidelines (see Strategy WQ1).	3-5 years

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
	pollution control structures.	SCC			
WQ5 Investigate the extent and management of acid sulfate soils	• Utilise acid sulfate soil planning maps in raising awareness of acid sulphate soil issues in the catchment.	SCC, DLWC	pH levels of runoff	pH levels of catchment runoff meet water quality guidelines (see Strategy WQ1).	1-2 years
Conservation Values/Ecology					
CE1 Complete further research into the hydrological and ecological processes at work in the lake and around its foreshores in order to identify appropriate conservation values	• Develop and implement monitoring program which involves mapping of habitats in and fringing the lake (including SEPP14 wetlands) and monitoring of associated faunal communities. Monitoring program should be integrated with water quality and lake entrance monitoring programs, to determine the major ecological processes operating. • Determine the principal energy paths and nutrient flows to understand the nutrient dynamics of the lake. • Assess the effect of the commercial and recreational fishery and birdlife on the nutrient dynamics and ecological processes. • Digitise habitat information and capture on GIS. • Prioritise habitats and areas in terms of regional significance and vulnerability to current and future threats.	**Fisheries, NPWS** (SCC, LWTF) **Fisheries, Waterways, SCC, DLWC** (Community) **SCC** (Fisheries, NPWS, DLWC, EPA, LWTF) **SCC** (Fisheries, NPWS, DLWC, EPA) **SCC**	Extent of each habitat type, species diversity	No net reduction in habitat extent. Maintain or enhance species composition and abundance (within limits of natural variability).	3-5 years
CE2 Conserve significant habitat values	• Continue program to protect breeding populations of the Little Tern and expand as necessary to incorporate actions from any recovery plans. • Implement management plan for the Green and Golden Bell Frog population at Culburra. • Investigate zoning of lakebed and foreshores to improve protection from inappropriate development activity.	**NPWS** DUAP **SCC, NPWS** **SCC, NPWS**	Habitat and population of species.	Maintain or increase habitat and population.	1-2 years

Strategy	*Action*	*Responsibility*	*Environmental Performance Measures*	*Target*	*Timeframe*
	• Develop management plans, if necessary, for protection of vulnerable habitats.	**SCC** (Fisheries, NPWS, Waterways, DLWC, LWTF)			
CE3 Restore foreshore vegetation communities and consider further management measures	• Using survey results from WQ2 design revegetation programs where required using local plant species, and erosion protection where required. • Continue planting program with individuals and community groups.	**SCC** (DLWC, NPWS, LWTF, Community) **LWTF, Community**	Extent of foreshore vegetation. Bank erosion rates.	Restoration of foreshore vegetation and decrease in erosion rates.	3-5 years
Recreation/Amenity					
RA1 Establish appropriate recreational usage areas to minimise conflicts with natural lake processes	• Survey location and intensity of current recreational and commercial use of the waterway and foreshore, including access to waterway and speed zones, document existing or potential conflicts between user groups. • Assess impacts of current waterway and foreshore use on the lake's environment. • Develop a plan for use of the waterway and foreshore complementary with protection of the lake's ecology. • Provide adequate signage and information brochures explaining zones and permissible uses and speeds within the lake.	**Waterways, SCC,** (LWTF, Community, DLWC, Fisheries) **Waterways, SCC** (LWTF, Community, Fisheries) **Waterways, SCC** (LWTF, Community, Fisheries) **Waterways** (SCC, LWTF, Community, DLWC, Fisheries)	Level of waterway usage. Distribution of aquatic habitats in relation to recreational usage areas.	Recreational usage that does not compromise the lake's natural processes.	1-2 years