Proposal for irrigated agriculture on the eastern shoreline of Lake Clifton, Waroona

Mr C A Evans

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 676
March 1993

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 29 March 1993.

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Summary and recommendations

In September 1990 the Water Authority of Western Australia referred to the Environmental Protection Authority four groundwater well licence applications for properties located on the eastern shoreline of Lake Clifton. The major environmental concern associated with these proposals was the potential for nutrient pollution of Lake Clifton and that this would threaten the stromatolites found there. These are formations of fine sediment bound by an algal mat and represent a modern day analogue of the earth's first life forms. There are only a few places on earth where these features remain.

In April of the following year, the Environmental Protection Authority reported to the Minister for the Environment on those proposals (Bulletin 512). On the basis of further information received from the proponents and the quite limited nature of the developments proposed, the Minister conditionally approved two of the four proposals.

Since then further enquiries regarding intensive horticulture on the eastern shoreline of Lake Clifton have come to the Environmental Protection Authority and in most instances people have been advised that their proposal was unlikely to gain the necessary environmental approval to proceed. It is the Environmental Protection Authority's view that high water and fertiliser using irrigated agricultural activities in this area would result in nutrients leaching into Lake Clifton. Evidence suggests that leaching could occur if intensive horticulture was developed in a catchment area out to 1km of the lake shoreline. It would be inappropriate under such circumstances for prospective horticulturalists to purchase land in this area with the intention of pursuing intensive horticultural activities.

In January 1993 the Environmental Protection Authority received an application to irrigate 2ha of asparagus on Lot 4 Service Road, Lake Clifton. The proponent, Mr C A Evans, proposes to irrigate a maximum area of 2ha and use low quantities of fertiliser and groundwater for irrigation. The ground to be irrigated consists of porous soils with a significant capacity to demobilise excess nutrients, has no defined surface drainage channels to Lake Clifton and is at its nearest point 300m from the shoreline of Lake Clifton. The Environmental Protection Authority therefore considers that the proposal, as outlined in correspondence from the proponent, is environmentally acceptable.

Recommendation 1

The Environmental Protection Authority concludes that the proposal for asparagus production at Lot 4 Service Road, Waroona is environmentally acceptable. In reaching this conclusion, the Environmental Protection Authority determined that the environmental issue that must be addressed is fertiliser use and nutrient management. Accordingly, the Environmental Protection Authority recommends that the proposal could proceed, subject to the Environmental Protection Authority's recommendations in this report.

Recommendation 2

The Environmental Protection Authority recommends that the -

- **total area of irrigation be limited to no greater than 2ha;**
- **total phosphorus application rates to be at no time greater than 45kg per hectare per annum;**
- **the western boundary of the area to be irrigated to be no less than 300m from the Lake Clifton shoreline; and**
- **proponent undertakes to ensure that there is no surface drainage between the area of irrigation and Lake Clifton.**

Recommendation 3

The Environmental Protection Authority recommends that matters relating to groundwater and fertiliser usage, revegetation and surface drainage management, be reported to the Environmental Protection Authority on a regular basis and to the satisfaction of the Environmental Protection Authority.

1. Introduction

Over recent years the Environmental Protection Authority has received many enquiries regarding horticultural development along the eastern shoreline of Lake Clifton. In April 1991 the Environmental Protection Authority assessed through a Consultative Environmental Review four horticultural proposals in this area. The major environmental concern in the assessment of these proposals was that high fertiliser requiring horticultural activities in this vicinity may contribute to the nutrient pollution of Lake Clifton. Consequently, only two of these proposals gained the necessary environmental approval sufficient to proceed.

Lake Clifton is a highly valued lake and is protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*, is subject to recommendations under the Conservation Reserves - Darling System 6 Study and is a major landscape feature of the Yalgorup National Park.

In January 1993 a proposal for 2ha of asparagus production at Lot 4 Service Road, Waroona (a property located on the eastern shoreline of Lake Clifton) was referred to the Environmental Protection Authority. That proposal is the subject of this report and recommendations.

2. The proposal

The proponent wishes to irrigate and fertilise land for asparagus production, although a small area may be under mixed vegetables for domestic consumption.

The proposal consists of the following elements -

- a total of 2ha under sprinkler irrigation;
- water use is to be approximately 5,000 to 6,000 kilolitres per hectare per annum;
- there will be a modest plantation programme on the western side of the irrigated area; and
- fertiliser use will be such that phosphorus and nitrogen use is equivalent to 43 and 45kg per hectare per annum, respectively. These nutrient application rates will be used for both asparagus and mixed vegetable production.

3. Assessment of the proposal

The Environmental Protection Authority has assessed the proposal on the basis of:

- the information provided in the well licence application;
- information provided by the proponent;
- comments received during consultation with relevant State agencies;
- previous recommendations to the Minister for the Environment on other similar proposals; and
- Lake Clifton, the nature of the Lake Clifton environment and the Environmental Protection Authority's knowledge of current irrigated agricultural practice and its environmental effects elsewhere on the Swan Coastal Plain.

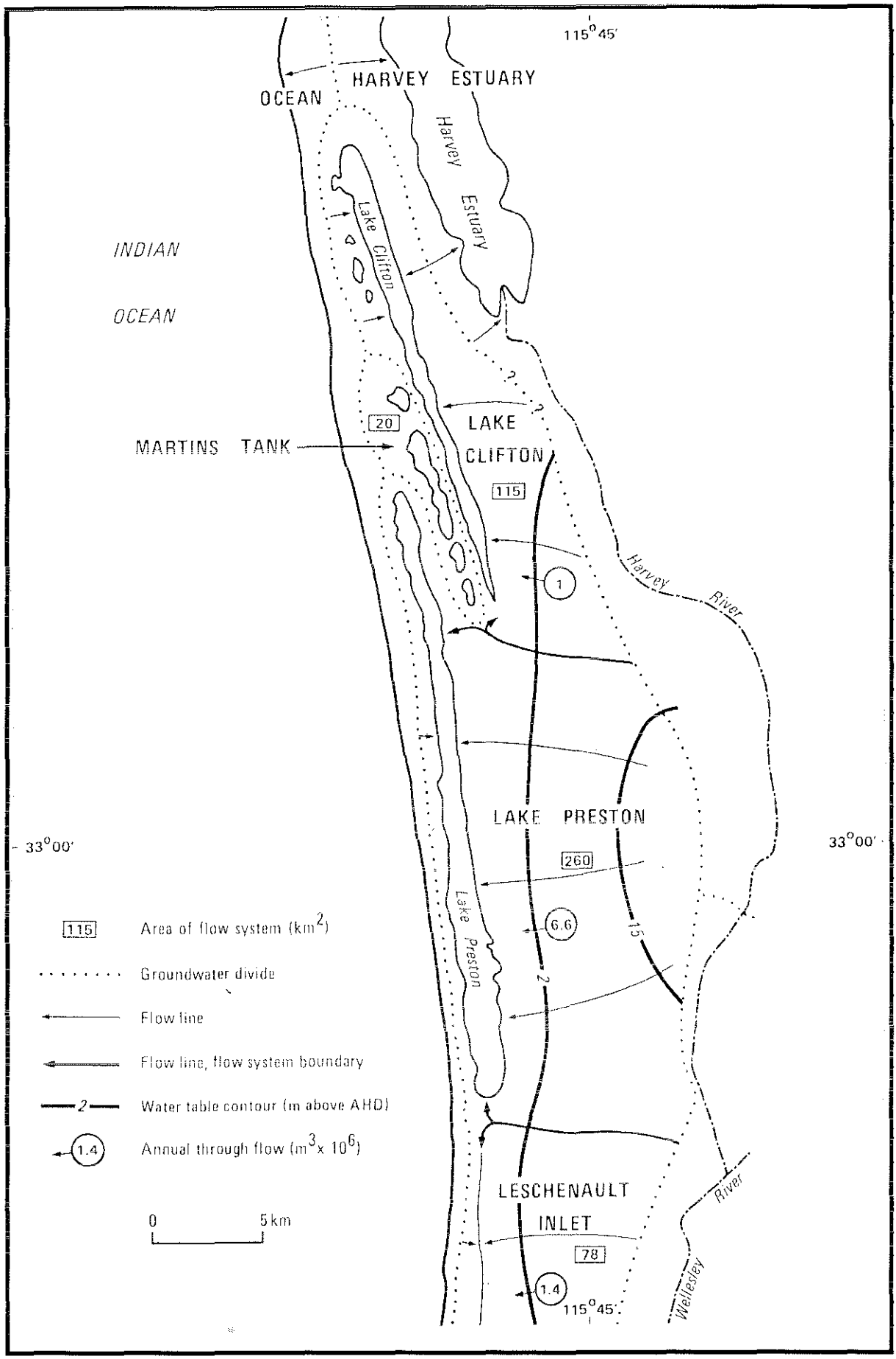

Figure 1: Groundwater divides near Lake Clifton (from Commander, 1988).

4. The existing environment

Lake Clifton is located on the western edge of the Swan Coastal Plain approximately 100km south of metropolitan Perth. This lake is one of 11 that form the Clifton-Preston lakeland system which in turn is part of the Yalgorup National Park. However, the Yalgorup National Park does not include much of the area surrounding the lake system. This is also the case with Lake Clifton where only the lake basin and the immediate foreshore are protected through National Park status. Lake Clifton is subject to recommendations under the Darling System - System 6 Study (Red Book - C54), is listed as a "Wetland of International Importance Especially as Waterfowl Habitat" under the Ramsar Convention and is protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*. It is recognised by the international scientific community for its living stromatolites.

The lake and groundwater systems in the vicinity of Lake Clifton are closely related. Groundwater flow is in a south-west direction with flows into the lake, while water loss is mostly through evaporation. In addition, the lake is not directly connected to the sea and consequently acts as a concentrating basin for inflowing nutrients and salts. This circumstance has created a body of hypersaline groundwater under the lake and enhances the accumulation of mineral nutrients, such as nitrogen and phosphorus.

An increase of nutrient levels in the lake has been reported and is thought to have caused an increase in the population of *Cladophora*, a benthic (bottom dwelling) macroalga. *Cladophora* has been noted to cover the stromatolites in late spring and summer, which may inhibit the growth of these structures during this time. At present, this covering is sufficiently light to be largely removed during autumn and winter due to wind-generated wave action.

The alga, *Cladophora*, has proliferated in other large wetland systems, such as the Peel-Harvey Estuary. Its growth and decay has considerably reduced the biological integrity of these systems.

This proposal for irrigated horticulture is located on Yoongarillup soil which forms part of the Spearwood Dune System. The soils adjacent to the shores of Lake Clifton are shallow (0-3m) and underlain by Tamala Limestone.

5. Environmental impacts associated with intensive horticulture

The growth of stromatolites, or thrombolitic microbiolites, appears closely linked to several aspects of the local environment, particularly those of the inflowing groundwater. The Lake Clifton Superficial Aquifer, from which the proposed groundwater abstraction will take place, is a relatively shallow lens of fresh water perched above saline water. On the eastern side, Lake Clifton shares a groundwater divide with the Harvey Estuary and River, with this divide approximately 1 to 1.5km from the lake (Commander, 1988). Therefore, high fertiliser using horticultural activities within 1km of the lake, where nutrients are able to leach into the groundwater and be transported to Lake Clifton, could contribute unacceptable nutrient loads to the lake and threaten the integrity of the microbial community.

Recent increases in the growth of the competitive alga species *Cladophora* in Lake Clifton have coincided with an increase in lake phosphate levels. However, the extent of nutrient movement from adjacent properties may be influenced by the following:

- shallow sands;
- depth to groundwater (1-3m);
- channelling and rapid movement of groundwater in limestone; and
- Spearwood soils and Tamala limestone have a significant capacity to adsorb and demobilise phosphate.

This proposal for intensive agriculture is located on Yoongarillup soil of the Spearwood Dune System. Land capability studies by the Western Australian Department of Agriculture claim that the soils with these properties have only a moderate capacity to support commercial market gardening in a manner which is environmentally sustainable and that this does not account for proximity to wetlands or shallow groundwater. The Department of Agriculture recently undertook soil analyses of Mr Evans' property and established that the soils have a phosphorus retention index capable of binding excess nutrients, including phosphorus. The phosphorus binding capacity of the soils are enhanced by their alkaline nature (pH ~ 8.5).

6. Conclusions and recommendations

The Environmental Protection Authority has assessed the proposal on the basis of the -

- crop type and low fertiliser application rates proposed;
- location of the irrigated area, especially the distance from the lake shoreline;
- nature of the soils and potential to demobilise phosphorus not taken up by the crop; and
- low water use proposed.

The Environmental Protection Authority considers that the proposal for irrigated horticulture at Lot 4 Service Road, Waroona is environmentally acceptable provided that fertiliser use is minimised according to details provided by the proponent and that overall management is in accordance with recommendations specified below.

In reaching this conclusion and in forming the following recommendations, the Environmental Protection Authority continues to record that intensive horticultural development requiring large quantities of fertiliser and irrigation water would be an environmentally unacceptable activity within 1km of the eastern shoreline of Lake Clifton.

Recommendation 1

The Environmental Protection Authority concludes that the proposal for asparagus production at Lot 4 Service Road, Waroona is environmentally acceptable. In reaching this conclusion, the Environmental Protection Authority determined that the environmental issue that must be addressed is fertiliser use and nutrient management. Accordingly, the Environmental Protection Authority recommends that the proposal could proceed, subject to the Environmental Protection Authority's recommendations in this report.

Recommendation 2

The Environmental Protection Authority recommends that the -

- **total area of irrigation be limited to no greater than 2ha;**
- **total phosphorus application rates to be at no time greater than 45kg per hectare per annum;**
- **the western boundary of the area to be irrigated to be no less than 300m from the Lake Clifton shoreline; and**
- **proponent undertakes to ensure that there is no surface drainage between the area of irrigation and Lake Clifton.**

Recommendation 3

The Environmental Protection Authority recommends that matters relating to groundwater and fertiliser usage, revegetation and surface drainage management, be reported to the Environmental Protection Authority on a regular basis and to the satisfaction of the Environmental Protection Authority.

The Environmental Protection Authority believes that any approval for a proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further considerations of the proposal should occur only following a new referral to the Environmental Protection Authority.

The Environmental Protection Authority's experience is that it is common for details of a proposal to alter as it is established or implemented. In many cases alterations are not environmentally significant or have a positive effect on the environmental performance of the project. The Environmental Protection Authority believes that such non-substantial changes, especially those which improve environmental performance and protection, should be provided for.

7. Reference

Commander, D.P. (1988) Geology and Hydrogeology of the Superficial Formations and Coastal Lakes between Harvey and Leschenault Inlets (Lake Clifton Project). Professional Papers, Report 23, Department of Mines, WA, pp. 37-50.

Environmental Protection Authority (1991) Proposals for irrigated agriculture on the eastern shoreline of Lake Clifton, Waroona. Report and recommendations of the Environmental Protection Authority. Bulletin 512, April 1991.