Rural subdivision of lot 6 Old Coast Road, City of Mandurah, within the catchment of Lake Clifton

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Tradevision Pty Ltd

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 819
June 1996

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 19 June 1996.

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Summary and recommendations

This report and recommendations provides the Environmental Protection Authority's advice to the Minister for the Environment on the environmental acceptability of the rural subdivision of Lot 6 Old Coast Road, within the catchment of Lake Clifton, City of Mandurah, Western Australia.

The proponent, Tradevision Pty Ltd, originally proposed to subdivide Lot 6 Old Coast Road into eleven lots ranging in size from 2 hectares (ha) to 6 ha each. During the public review period for the draft criteria, the proponent modified the proposal and now propose to subdivide Lot 6 into 9 lots averaging approximately 4 ha. This proposal has been assessed by the Environmental Protection Authority at the level of Consultative Environmental Review.

The proposal is located within the Lake Clifton catchment area. Lake Clifton is one of the most significant wetlands in Western Australia due to its international importance as a waterbird habitat and because it contains the largest known example of living microbialites[1] in a lake environment in the southern hemisphere. Lake Clifton is recommended for protection in the Environmental Protection Authority's System Six report of 1983 and is protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.

The Environmental Protection Authority is developing a set of environmental criteria to limit the environmental effects of changes to land use on private land within Lake Clifton's catchment in order to conserve the microbialites and the environmental processes which enable the microbialites to continue to exist. A draft of these criteria was published for public review (Environmental Protection Authority, Bulletin 788, November 1995).

The draft criteria were not used as the policy basis for the assessment of this proposal, rather the criteria provided the broad framework for the Environmental Protection Authority to assess the environmental acceptability of this proposal. This proposal was assessed on its merits by the Environmental Protection Authority using available information and pre-existing policy. The Environmental Protection Authority concluded that for this proposal the key environmental issues requiring detailed consideration were as follows:

Biophysical impacts

- Maintenance of water balance;
- Physical impacts on the microbialites, wetland vegetation, fringing vegetation and the dryland buffer; and

Pollution management

- Management of nutrients.

The public review component of the assessment was the 8-week review period of the draft environmental criteria for Lake Clifton (Environmental Protection Authority, Bulletin 788, 1995). This is consistent with section 40 subsection (3) of the *Environmental Protection Act* 1986-1994 which states that the form, content, timing and procedure of any environmental review shall be determined by the Environmental Protection Authority. Some of the issues identified in Bulletin 788 directly pertain to this proposal, thus some submissions received for Environmental Protection Authority Bulletin 788 also apply to this proposal. The Environmental Protection Authority, during its assessment has received the advice of government agencies, and has taken into account additional information supplied by other government agencies, the public and the proponent.

[1] The microbialite structures in Lake Clifton are thrombolites (having a "clotted" internal structure), but have traditionally been called stromatolites. To avoid confusion this Bulletin will use the generic term microbialites.

Conclusion

With respect to the key environmental issues and environmental objectives, the Environmental Protection Authority has concluded that the proposal can meet the Environmental Protection Authority's objectives subject to the implementation of the proponent's commitments and the Environmental Protection Authority's recommendations in this assessment report.

Recommendation Number	Summary of Environmental Protection Authority recommendations
1	The proposal can be managed to meet the Environmental Protection Authority's objectives, subject to the successful implementation of the proponent's commitments and the Environmental Protection Authority's recommended conditions and procedures.
2	Annual groundwater abstraction for this proposal should be constrained to the Environmental Protection Authority approved relationship between lot size (ha) and annual abstraction allowance (kL per year) as described by the hydrological model provided in Appendix 2, or any prospective changes to that model. Applying the current hydrological model to the average lot size of approximately 4 ha, water abstraction should not exceed 1000 kL per lot per year. The relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision.
3	High water using activities and high fertiliser using activities (eg. horticulture) are not permitted on these lots and the relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision.
4	Relevant government agencies should continue studies on the hydrology of Lake Clifton and the outcome of that work and any on-going monitoring should be used to further refine the hydrological model used in this assessment (Appendix 2). It may be necessary to change the amount of groundwater made available for human use in the catchment as a result of further work. A whole of catchment approach should be adopted to ensure the quality and quantity of fresh groundwater entering Lake Clifton will maintain the growth and function of the microbialites.
5	If the Minister for the Environment provides environmental clearance that the proposal may be implemented, then clearance be subject to the Conditions set out in section 6 of this report.

1. Introduction and background

1.1 The purpose of this report

This report and recommendations provides the Environmental Protection Authority's advice to the Minister for the Environment on the environmental acceptability of the Rural subdivision of Lot 6 Old Coast Road, within the catchment of Lake Clifton, in the locality known as Herron, City of Mandurah, Western Australia.

1.2 Background

1.2.1 Importance of Lake Clifton

Lake Clifton is one of the most significant wetlands in Western Australia due to its international importance as a waterbird habitat and because it contains the largest known example of living microbialites in a lake environment in the southern hemisphere. Lake Clifton is recommended for protection in the Environmental Protection Authority's System Six report of 1983 and is protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.

Lake Clifton is located about 100 kilometres (km) south of Perth and 25 km south of Mandurah on the western edge of the Swan Coastal Plain between the Peel-Harvey Estuary and the coast (Figure 1). The lake proper and much of the catchment to the west, north and south are within the Yalgorup National Park. However, for most of the eastern catchment only a narrow foreshore reserve is within the park, with the remainder of the land privately owned.

1.2.2 History of environmental criteria for Lake Clifton

Between 1991 and 1993 the Environmental Protection Authority assessed a number of proposals, mostly for horticultural purposes, in the Lake Clifton catchment because of concerns about their potential impacts on the lake and the microbialites. In December 1993 the Environmental Protection Authority endorsed a set of principles which would form the basis of a draft Strategy to address the environmental issues associated with new rural residential, horticulture and tourist developments in the catchment. These were approved in early 1996.

The purpose of the Strategy was to develop a set of environmental criteria which would form the basis of planning controls. The controls are necessary to manage the environmental effects of changes to land use on private land within Lake Clifton's catchment, in order to conserve the microbialites and the environmental processes which enable the microbialites to continue to exist.

The fresh groundwater that flows into the lake, while not directly important to microbialite growth, has two important indirect effects:

- it regulates lake salinity; and
- it provides carbonate and bicarbonate ions necessary for continued microbialite growth.

This aquifer is contained within the Spearwood landform which is typically sand over limestone. The limestone is high in calcium carbonate providing a rich supply of the carbonate and bicarbonate ions.

Whilst nutrients are essential for microbialite growth, excessive levels of nutrients will encourage the growth of other algal species. Algal blooms will reduce the amount of light reaching the microbialites, inhibiting or stopping growth.

Direct disturbance of the microbialites can inhibit growth through trampling of the microbialites, loss of fringing vegetation, erosion through trampling and increased water turbidity. Thus the most important environmental aspects are groundwater hydrology, water quality and direct disturbance.

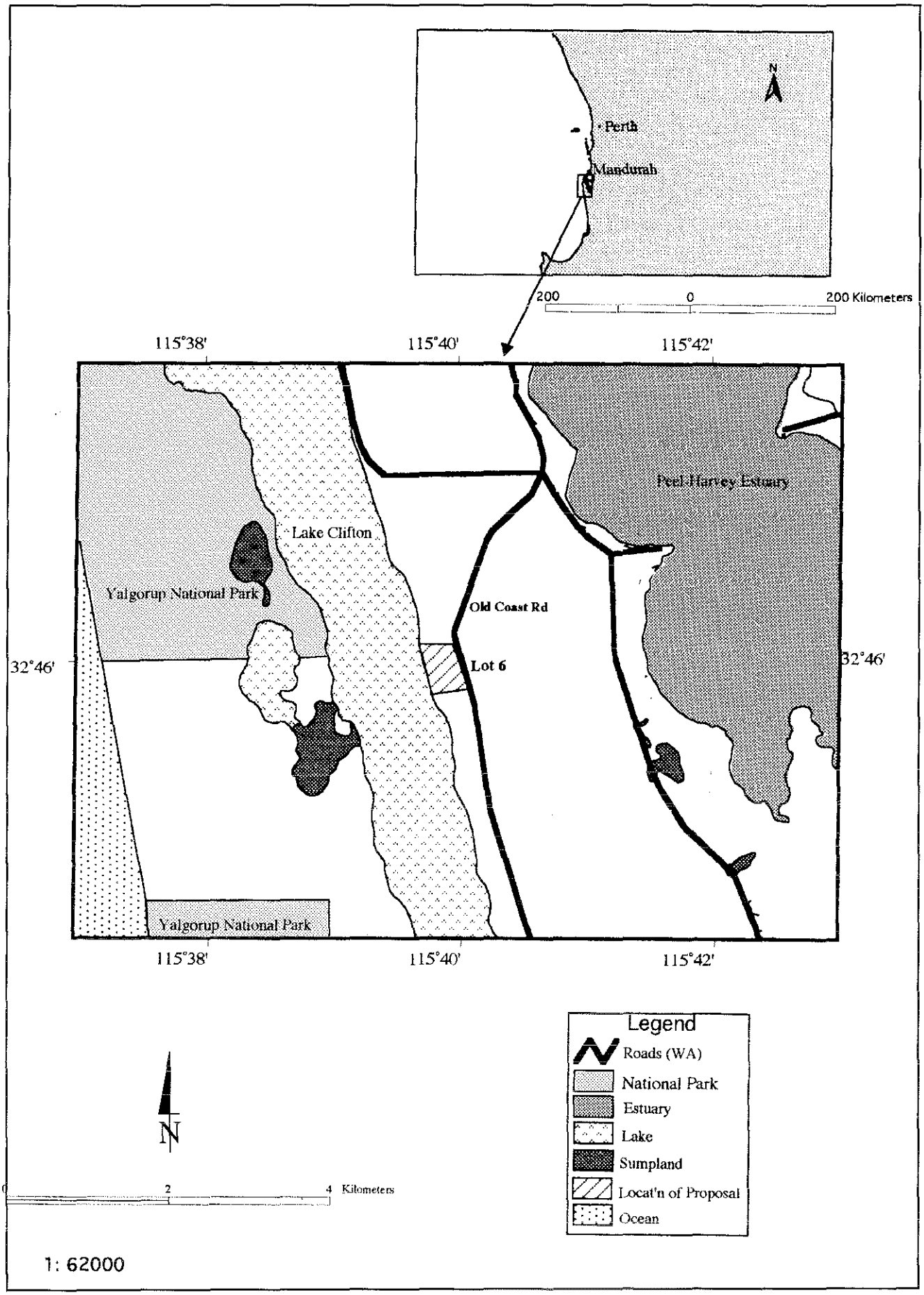

Figure 1. Lake Clifton. Location map.

Considerable consultation occurred in the development of the Strategy. The first draft of the Strategy was sent to key officers within the Department of Environmental Protection for comment in February 1994 and a revised draft was sent to key Government agencies for comment in April 1994 - (the then) Department of Planning and Urban Development, Water Authority of Western Australia, Western Australian Department of Agriculture, Department of Conservation and Land Management, CSIRO, City of Mandurah and Shire of Waroona.

A public meeting was organised by land owners, mostly from the Shire of Waroona, to discuss the draft Strategy in July 1994 and this meeting was attended by a representative of the Department of Environmental Protection.

In September 1994 the Environmental Protection Authority endorsed modifications to the December 1993 version of the Strategy, including a requirement that houses are setback 300 m from the lake, and minimum lot size for rural residential developments of 10 ha adjacent to the lake and 5 ha elsewhere. The key elements of the draft Strategy were released in September 1994 as a discussion paper for comment and copies were sent to all key government agencies, community groups and most land owners.

The Environmental Assessments Committee of the Environmental Protection Authority received an update of the Strategy in November 1994. Officers of key government agencies and representatives of land owners addressed the committee. The Environmental Protection Authority expressed concerns over the land use control approach adopted in the draft Strategy and requested that officers of the Department of Environmental Protection liaise with officers of (the then named) Department of Planning and Urban Development to resolve issues, most notably, minimum lot size and setbacks from the lake. No changes to the draft Strategy were endorsed.

Another draft of the Strategy was circulated to key agencies in February 1995 with important modifications: minimum lot size to be 5 ha, with lots adjacent to the lake to have a wide frontage to the lake; setbacks at least 100 m from Lake with at least 20 m from fringing wetland vegetation.

The Environmental Protection Authority received this proposal for the subdivision of Lot 6 Old Coast Road and four other referrals for rural residential developments in the Lake Clifton catchment which were all inconsistent with the draft Strategy. Level of assessment in all cases was set at Consultative Environmental Review.

During discussions of the draft Strategy, officers of the Ministry for Planning raised concerns that the Strategy was too proscriptive and that the specification of land use controls was the domain of the planning agencies. It was agreed that the emphasis of the Strategy should become one of setting environmental criteria which would form the basis of appropriate land use controls to be set through the planning process. This approach is seen as giving planners greater flexibility in dealing with developments in the catchment whilst ensuring the environment would be protected. With this in mind, the Strategy was renamed to become the draft criteria, ie. "Criteria of environmental acceptability for land use proposals within the catchment of Lake Clifton" (Environmental Protection Authority, Bulletin 788, 1995).

In June 1995 the Environmental Protection Authority agreed to assess all the proposed rural residential developments in the Lake Clifton catchment at the same time and to use the eight week public review period of the draft criteria for the five formal assessments. This is consistent with section 40 subsection (3) of the *Environmental Protection Act* 1986-1994 which states that the form, content, timing and procedure of any environmental review shall be determined by the Environmental Protection Authority.

The draft criteria were released in November 1995 following consultation with the Western Australian Planning Commission and the Ministry for Planning. The draft criteria were not used as the policy basis for the assessment of the five proposals (including this one). Instead, the best available scientific data were used, including some of the data used in Bulletin 788. Only existing Environmental Protection Authority positions were applied.

The development of the draft criteria complements two other studies currently being undertaken: the Yalgorup Lakes study by the Water Authority of Western Australia (now the Water and

Rivers Commission); and the Coastal and Lakelands Planning Strategy being carried out by the Ministry for Planning for the Western Australian Planning Commission.

1.2.3 Referral of proposal

In April 1995 the Western Australian Planning Commission referred a proposal to the Environmental Protection Authority for assessment, on behalf of the proponent, Tradevision Pty Ltd, to subdivide Lot 6 Old Coast Road, Herron (Figure 2). The Environmental Protection Authority set the level of assessment at Consultative Environmental Review.

Many of the issues identified during the development of the environmental criteria for Lake Clifton (Environmental Protection Authority, Bulletin 788) directly pertain to this proposal, thus some of the submissions received for Environmental Protection Authority Bulletin 788 also apply to this proposal. During the environmental assessment of this proposal the Environmental Protection Authority utilised information supplied by other government agencies, the public and the proponent.

1.3 Structure of this report

This document has been divided into seven sections.

Section 1 describes the historical background to the proposal and its assessment and explains the structure of this report. Section 2 briefly describes the proposal. Section 3 explains the method of assessment and provides an analysis of public submissions with the ultimate aim of identifying the key environmental issues to be evaluated in section 4.

Section 4 sets out the evaluation of the key environmental issues associated with the proposal. In each sub-section, the objectives of the assessment and the policy and technical framework relating to that issue are defined. The likely effect of the proposal, the advice to the Environmental Protection Authority from submissions, and the proponent's response to submissions are discussed. The adequacy of the response by the proponent is considered in terms of project modifications and environmental management commitments in achieving an acceptable outcome. The Environmental Protection Authority's analysis and recommendations with respect to the identified issues are contained in this section. Where inadequacies are identified, recommendations are made to achieve the environmental assessment objective.

Section 5 summarises the conclusions and recommendations. Section 6 describes the recommended environmental conditions. References cited in this report are provided in section 7.

2. Summary description of proposal

Lot 6 Old Coast Road has an area of 35.29 ha and is located east of Lake Clifton and west of Old Coast Road, approximately 100 km south of Perth (see Figures 1 and 2). Under the current City of Mandurah Town Planning Scheme No 1A the land is zoned Rural, however, the City of Mandurah has initiated a rezoning to Rural Residential via Amendment 234. The property is cleared parkland with stands of tuart, jarrah, marri, sheoak and peppermints.

The proponent, Tradevision Pty Ltd, originally proposed to subdivide Lot 6 Old Coast Road into 11 lots ranging in size from 2 hectares (ha) to 6 ha each. During the public review period for the draft criteria, the proponent modified the proposal and now propose to subdivide Lot 6 into nine lots averaging approximately 4 ha (Figure 2).

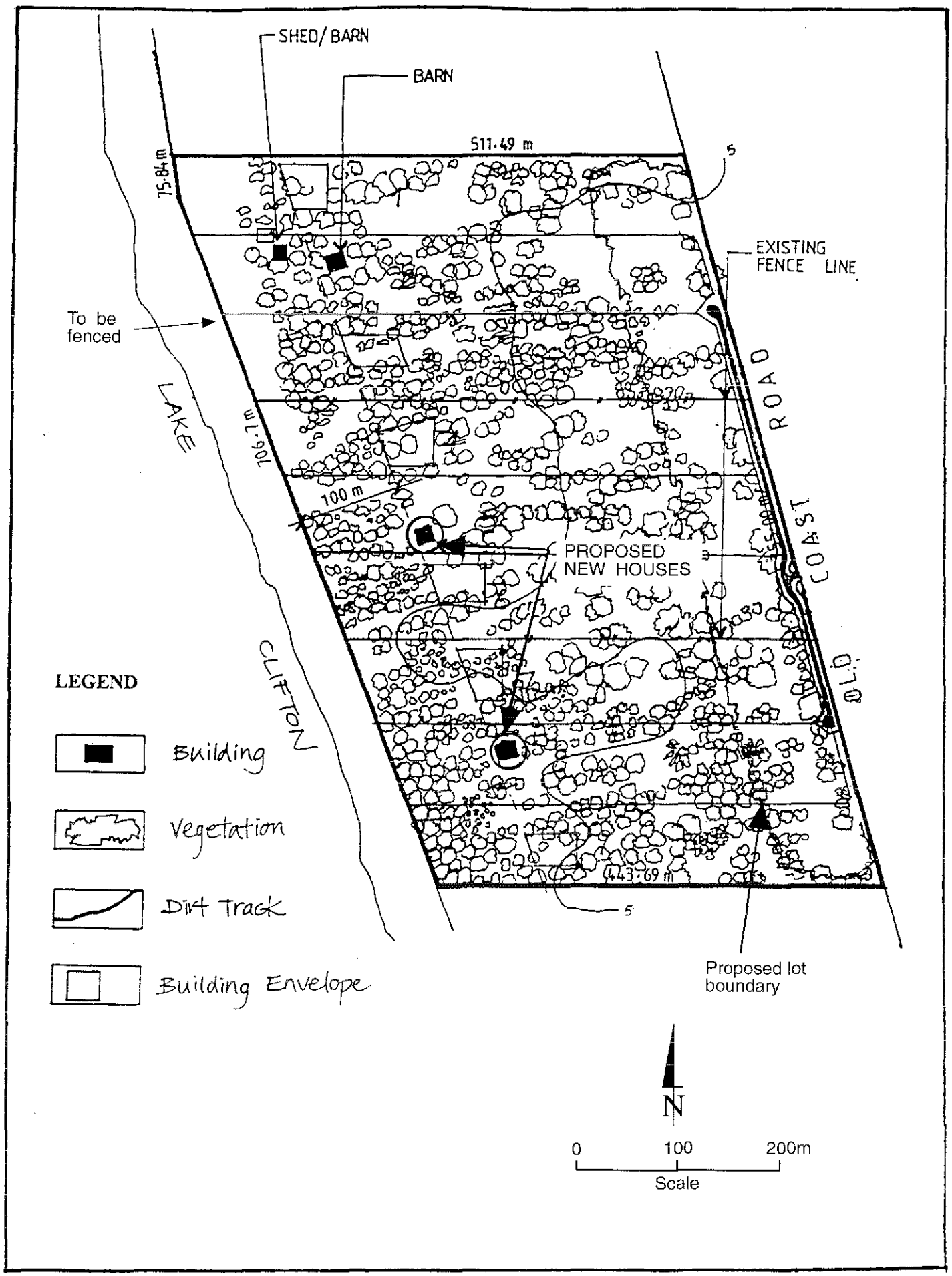

Figure 2. Lot 6 Old Coast Road. (Source: SJB Town Planners)

A service road running parallel to Old Coast Road would provide access to the lots. Access tracks from the service road will meander between trees so that felling of trees will not be required. Each lot would have a fenced frontage to Lake Clifton and would have a 2 000 m^2 building envelope. The building envelopes which are to be set back from the Lake frontage, would be positioned in a partially cleared area to reduce clearing.

Alternative effluent disposal systems (ie. alternatives to conventional septic systems) will be used on all lots and these are proposed to be set back 100 m from the western boundary. Horticultural uses will be limited to home use and the use of certain fertilisers will be prohibited. Livestock will be limited and each property will be required to have a 92 000 litre rainwater tank. The frontage to Lake Clifton will be fenced to prevent direct access.

3. Identification of environmental issues

3.1 Method of assessment

The purpose of environmental impact assessment is to determine whether a proposal is environmentally acceptable or under what conditions it could be environmentally acceptable.

The environmental acceptability of this proposal was assessed by the Environmental Protection Authority using the draft environmental criteria for Lake Clifton as the broad framework. However, this proposal was assessed on its merits using available information separate from the Environmental Protection Authority's consideration relating to the finalisation of the criteria. Only existing Environmental Protection Authority policy positions were applied in this assessment.

In this case the Environmental Protection Authority decided that a Consultative Environmental Review report was not required. The draft criteria (Environmental Protection Authority, Bulletin 788, 1995) had been released and this was used to seek submissions on the management of proposed developments within the catchment of Lake Clifton.

The Environmental Protection Authority agreed to use the eight week public review period of the draft criteria as the submissions period for this proposal. This is consistent with section 40 subsection (3) of the *Environmental Protection Act* 1986-1994 that states "...the Authority shall determine the form, content, timing and procedure of any environmental review required to be undertaken...". The submissions received were summarised and this process can add environmental topics which need to be considered in terms of the acceptability of potential environmental impact.

During the review period the proponent also made a submission both on the draft criteria and how the criteria pertained to this proposal.

By this stage in the assessment, 9 topics had been identified, of varying environmental significance. The Environmental Protection Authority considered all the topics and identified those issues that required further evaluation by the Environmental Protection Authority. Other topics were considered not environmentally significant or did not require further evaluation by the Environmental Protection Authority.

For each environmental issue, the environmental impacts of the proposal, and the proponent's environmental management commitments, were evaluated in the context of the Environmental Protection Authority's assessment objective and relevant policy and technical information. If the commitments achieve the assessment objectives, there is no need for the Environmental Protection Authority to make recommendations to the Minister for the Environment on that issue. Where the proposal has unacceptable environmental impacts, the Environmental Protection Authority can either advise the Minister for the Environment against the proposal proceeding or make recommendations to ensure the environmental acceptability of the proposal.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through the initial referral document, by officers of the Department of Environmental Protection utilising their own expertise and reference material, by

utilising expertise and information from other State government agencies, information provided by members of the public, and by contributions from Environmental Protection Authority members.

The Environmental Protection Authority recognises that further studies and research may affect the conclusions. Accordingly, the Environmental Protection Authority considers that 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 consideration of the proposal should occur only following a new referral to the Environmental Protection Authority.

3.2 Public and agency submissions

Comments were sought on the draft environmental criteria for Lake Clifton (Environmental Protection Authority, Bulletin 788, 1995) from the public, interest groups and local and State government agencies. During the public review twenty-one (21) submissions were received, being:

- 12 from members of the public;
- 4 from Government agencies;
- 3 from Local Government; and
- 2 from community groups.

The principal topics of concern raised in the submissions and relevant to this proposal were:

Biophysical Impacts

- Water balance;
- Physical impacts;

Pollution Management

- Nutrients;
- Conventional septic tanks;

Other

- Compensation;
- Monitoring land use controls;
- Agriculture vs rural residential development;
- Rural residential development; and
- Retrospectivity of criteria.

As part of the assessment of this proposal, the Environmental Protection Authority has only considered those topics raised in the submissions received which related to rural residential developments.

3.3 Review of topics

3.3.1 Identification of topics

Nine topics were raised during the environmental impact assessment process including those topics identified in the guidelines for the Consultative Environmental Review, subsequent consultations and the submissions described above which related to this proposal. The topics are as follows:

Biophysical Impacts

- Water balance;
- Physical impacts;

Pollution Management

- Nutrients;
- Conventional septic tanks;

Other

- Compensation;
- Monitoring land use controls;
- Agriculture vs rural residential development;
- Rural residential development; and
- Retrospectivity of criteria.

These topics are analysed below to identify issues requiring more detailed Environmental Protection Authority evaluation. The other topics are considered to be appropriately managed by the proponent's environmental management commitments or compliance with Department of Environmental Protection regulations and guidelines (see Table 1) and do not require further evaluation by the Environmental Protection Authority.

3.3.2 Identification of environmental issues

Biophysical impacts

Water balance

The proposal is for a 35.29 ha lot to be subdivided into nine lots with an average lot size of almost 4 ha each. Bores will be provided on each lot for human use. Changes to the water table and the flow of fresh groundwater could inhibit microbialite growth.

The potential impacts on the water table due to abstraction of groundwater need further evaluation by the Environmental Protection Authority, which is contained in section 4.1.

Physical impacts

Each of the proposed nine lots abuts the lake and physical disturbance may occur on each of the proposed lots as a result of installation of alternative waste water disposal systems and construction of homes and access roads. Direct trampling of microbialites, loss of fringing vegetation, erosion through trampling and increased water turbidity can all inhibit microbialite growth.

The potential for physical impacts on the microbialites, wetland vegetation, fringing wetland vegetation and dryland buffer requires Environmental Protection Authority evaluation. This is discussed in section 4.2.

Pollution Management

Nutrients

This proposal has the potential to export nutrients to Lake Clifton from waste water disposal systems, limited horticultural uses and keeping of livestock. Excessive levels of nutrients can encourage the growth of other algal species that would limit light penetration and thus inhibiting microbialite growth.

In Lake Clifton phosphorus is the limiting nutrient rather than nitrogen, therefore the possibility of phosphorus export to the lake requires further evaluation by the Environmental Protection Authority, which is discussed in section 4.3.

Conventional septic tanks

A public submission suggested that conventional septic tanks should not be permitted, however the proposal is for alternative waste water disposal systems to be used on all lots.

Further evaluation by Environmental Protection Authority is not required.

Other

Compensation

A submission raised the topic that restrictions on land use de-value the land and that compensation measures should be sought. Another submission suggested that government should purchase any land adjacent to the lake to "compensate" the owner for loss of productive land and another suggested it was unfair for land owners to give up the 150 m buffer area free.

This is a planning issue and can be adequately handled through the planning process. Further evaluation by the Environmental Protection Authority is not required.

Monitoring land use controls

A submission raised the topic that effectiveness of land use controls should be checked regularly.

The outcome of the formal environmental impact assessment process is legally enforceable Environmental Conditions set by the Minister for the Environment. These conditions, that may include commitments from the proponent, are audited by the Department of Environmental Protection. Further evaluation of this topic by the Environmental Protection Authority is not required.

Agriculture vs rural residential development

One submission suggested that horticulture has a greater potential to export nutrients to the lake than does rural residential development, as controls can be better implemented through planning controls. Conversely, another submission suggests that rural land uses have existed next to the lake and been in harmony with it for many years, and rural residential land uses are the problem.

The environmental impact assessment process does not allow the Environmental Protection Authority to recommend one land use as being preferable to another. Rather, the Environmental Protection Authority sets objectives and criteria for the land use being proposed. Further evaluation by the Environmental Protection Authority is not required.

Rural residential development

A submission raised the topic that it would be preferable if no more rural residential development be allowed in the catchment and where it does occur on the east, it should create a vegetated buffer.

The purpose of developing criteria of environmental acceptability for land use proposals within the catchment of Lake Clifton was to provide a basis for determining what land uses might be allowed in the catchment. Further evaluation by the Environmental Protection Authority of this topic is not appropriate in relation to this proposal.

Retrospectivity of criteria

A submission raised the topic that proposals already in the planning system should not be subject to criteria, including proposals currently subject to Consultative Environmental Reviews.

This proposal is being assessed on its merits using existing technical data and policy. The criteria are being used as a framework only. Further discussion by the Environmental Protection Authority regarding retrospectivity of the criteria is not required and is dealt with in the Environmental Protection Authority Bulletin containing the final criteria (to be released later this year).

3.3.3 Summary

Table 1 summarises the process used by the Environmental Protection Authority to evaluate the topics raised during the environmental impact assessment process. The table identifies the topics, the relevant proposal characteristics, and comments received from specialist government agencies and the public. If a topic is considered environmentally significant it becomes an issue and is further evaluated by the Environmental Protection Authority (as summarised in Table 2). section 4 of the report provides the detail of this evaluation.

TOPICS	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY'S COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Biophysical				
Water balance	35.29 ha lot to be subdivided into nine lots - average lot size of almost 4 ha each. Bores to be provided for human use. A water consumption limit of 1000 kL per lot per year, to be supplemented with rainwater tanks. *Trend described in Bulletin 788 indicates the smaller the lot size, the greater the change in water balance following development. EPA concluded that for a standard subdivision design using 1 500 kL per lot per year, changes to water balance became unacceptable below 5 ha.*	Given the data supplied in the draft criteria (Bulletin 788) minimum lot size should be set at 5 ha with no variation unless scientifically justified. (City of Mandurah) Support 5 ha minimum lot size with controls to prevent further subdivision. (Water and Rivers Commission) 5 ha lot size supported but this size is too large to be looked after properly (research in USA supports this view). Have "notional" lot size of 5 ha with living lot size of 2 ha eg. giving up foreshore land to CALM. 2 ha lots are generally not subdivided whereas larger lots often are. Avoid using lot size as this is a planning matter. Use "living unit" per hectare as this is what causes the impact. Planners can use criteria to design subdivisions accordingly. (Yalgorup Lakes NLP advisory group)	Setting of minimum lot size is the province of the planning agencies and not the EPA. No variation to less than 5 ha as it is difficult to justify "innovative" design. Any research on this matter should be carried out outside Lake Clifton catchment. Water abstraction should be monitored to ensure no excess usage.	Impact on the water table due to extraction of groundwater requires EPA evaluation.
Physical impacts	The frontage of Lake Clifton will be fenced to prevent direct access. Stock to be allowed up to fence line.		Stock be allowed up to property boundary to control fire.	Physical impacts on the microbialites, wetland vegetation, fringing wetland vegetation and dryland buffer requires EPA evaluation.
	All nine lots abut the lake.	Width of lot should be specified and not left in vague terms. Wide lots increase chance of building envelopes being closer to lake and increase pressure for further subdivision. (City of Mandurah)		
	Building envelope setback 100 m from western boundary. Physical disturbance caused by construction of homes and access roads. *The draft criteria proposed a 150 m buffer area from edge of lake where building envelope and stock should be excluded.*	Prefer 200 m setback as per recommendations in Davies and Lane (1995) study - measured from edge of wetland and not lake. (CALM)	Buffer area currently being used by existing owners for a variety of uses and restrictions unfair. Support 150 m setback with at least 100 m buffer from edge of Vasse soils and not 20 m. Building envelopes to be allowed as close as 100 m with effluent systems and any vegetable gardens back 150 m.	
Pollution				
Nutrients	Fertiliser use limited to approved organic fertilisers.	Risk of nitrogen leaching into lake should be considered. (Waters and Rivers Commission)		Phosphorus is the limiting nutrient, thus phosphorus export to the lake requires EPA evaluation.
	Horticulture - general - Horticultural uses will be limited to home use.		Intensive horticulture should not be permitted.	
	Stocking rates - Will be limited consistent with stocking rates as advised by Agriculture Western Australia.	Difficult to monitor, especially no importation of feed. Using area of cleared land to set stocking rates encourages clearing of land. (Shire of Waroona)	No stock should be allowed for uncleared lots. This would decrease the nutrient export and allow for smaller rural-residential lots. Stocking rates recommended are unreasonable.	

Table 1: Identification of issues requiring Environmental Protection Authority evaluation.

TOPICS	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY'S COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Conventional septic tanks	Alternative waste water disposal systems with nutrient removing capacity will be used on all lots and will be set back at least 100 m from lake.		Conventional septic tanks should not be permitted.	Subdivision does not propose to use septic tanks. Further evaluation by EPA not required.
Other				
Compensation		Restrictions on land use, including buffer area de-value land and compensation measures sought. (Yalgorup Lakes NLP advisory group) Land adjacent to lake which is part of buffer should be purchased by government to "compensate" owner for loss of productive land. (Shire of Waroona)	It is unfair for land owners to give up the 150 m buffer area free.	This is a planning issue and can be adequately handled through the planning process. Further evaluation by the EPA is not required.
Monitoring land use controls			Effectiveness of land use controls should be checked regularly.	The outcome of the formal environmental impact assessment process is legally enforceable Environmental Conditions that are audited by the DEP. Further evaluation of this topic by the EPA is not required.
Agriculture vs rural residential development			Horticulture has a greater potential to export nutrients to lake than does rural-residential development as controls can be better implemented through planning controls. Rural land uses have existed next to the lake and been in harmony with it for many years. Rural-residential land uses are the problem.	This assessment process does not allow the EPA to recommend one land use over another. Rather, the EPA sets objectives and criteria for the land use being proposed. Further evaluation by the EPA is not required.
Rural residential development		Prefer no more rural residential development in catchment but where it occurs on the east should create vegetated buffer. No rural residential to west of lake. (CALM)		Environmental criteria have been developed to determine what land uses might be allowed in the catchment. Further evaluation by the EPA is not required.
Retrospectivity of criteria			Proposal already in the planning system should not be subject to criteria including proposal currently subject to CERs.	This proposal is being assessed on its merits using existing technical data and policy. The criteria are being used as a framework only. Further evaluation by the EPA is not required.

Table 1: Identification of issues requiring Environmental Protection Authority evaluation.

4. Evaluation of key environmental issues

4.1 Maintenance of water balance

4.1.1 Objective

The Environmental Protection Authority's objective is to ensure that on an annual basis the quantity of fresh groundwater entering Lake Clifton following development is as close as possible to that entering the lake before development.

4.1.2 Policy information

The precedent of past assessments in the catchment provides a policy framework for consideration of this issue. The Environmental Protection Authority provided advice on the Mt John Wood proposal and subsequent amendment at the level of Informal Review with Public Advice (Appendix 1). The Environmental Protection Authority advised that a subdivision to create 25 ten ha lots would be acceptable provided that water allocation was either 650 kL per lot per year unmetered, or 1000 kL per lot per year metered.

4.1.3 Technical information

The microbialites of Lake Clifton are structures which have similar chemical composition to limestone. The algae that build them have critical growth requirements which are:- a constant source of carbonate and bicarbonate ions; minimal levels of nutrients; and light. The freshwater that flows into the lake is not directly important to microbialite growth as most of the fresh water in Lake Clifton comes from direct rainfall, however it is indirectly important because it regulates salinity and provides carbonate and bicarbonate ions necessary for continued microbialite growth.

Rural residential developments can lead to a significant change to the existing water balance caused by:

- clearing of deep rooted native vegetation (less evapotranspiration);
- revegetation where lots are already cleared of native vegetation;
- greater runoff of stormwater from hard surfaces (roads and buildings) and subsequent greater recharge to groundwater; and
- water abstraction for human purposes.

Changes to water balance in Lake Clifton which would lead to either an increased or decreased net rate of recharge to the aquifer could affect microbialite growth.

The Water Authority of Western Australia (now Water and Rivers Commission) has developed a policy for allocating water in the catchment of Lake Clifton. The catchment is comprised of three subcatchments and this proposal falls within the Island Point subarea. The Water Authority has determined the water balances for each subcatchment and have allocated 750 kL per ha per year of groundwater for human purposes on a sustainable yield basis for the Island Point subarea.

The Department of Environmental Protection produced a technical report showing how change in lot size may affect the overall water balance for a standard subdivision design, due to the combined effects of clearing, revegetation and groundwater abstraction (this report was included as Appendix 3 of Bulletin 788, 1995). A trend was observed which indicated that as lot size decreased, there was a greater change in water balance following development (Figure 3). The Environmental Protection Authority concluded that for a standard subdivision design using

1500 kL per lot per year of groundwater for human purposes, changes to water balance became unacceptable below 5 ha (Environmental Protection Authority, Bulletin 788, 1995). However, the Environmental Protection Authority went on to say that lot sizes below 5 ha may be possible, where the variables which cause water balance changes are set at what would be expected for 5 ha lots.

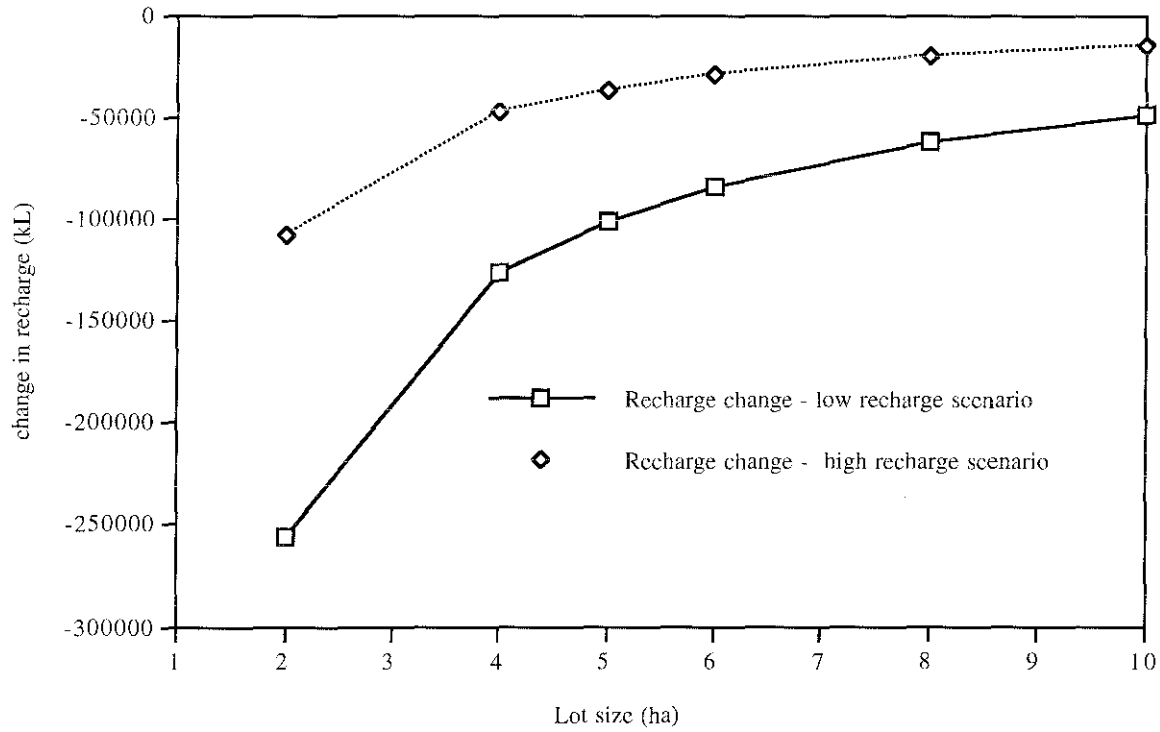

Figure 3. Change in groundwater recharge as a function of lot size following subdivision for land cleared of native vegetation prior to development

Continuing from this work, Appendix 2 of this report further explores the relationship between water balance and subdivision design. The study used the 5 ha/1500 kL per lot per year standard and examined how lot size would vary when water abstraction also varied, other variables kept constant. It would be expected that as groundwater abstraction is reduced below 1500 kL, a lot size of less than 5 ha would produce the same change in water balance as the 5 ha/1500 kL standard, all other variables being kept constant (Figure 4).

4.1.4 Comments from key government agencies and public submissions

The comments from the submissions pertained to minimum lot size, however as explained above there is a relationship between lot size and the amount of water available for human use.

Two submissions suggested that the setting of minimum lot size was the domain of the Ministry for Planning.

Three submissions supported a 5 ha minimum lot size. The first, from the City of Mandurah, stated that there should be no variation to this size unless it was scientifically justified. One from a conservation group suggested that experimentation with smaller lots should be conducted outside the Lake Clifton catchment. The third, from the Water and Rivers Commission supported the 5 ha minimum lot size and suggested there should also be controls in place to prevent further subdivision.

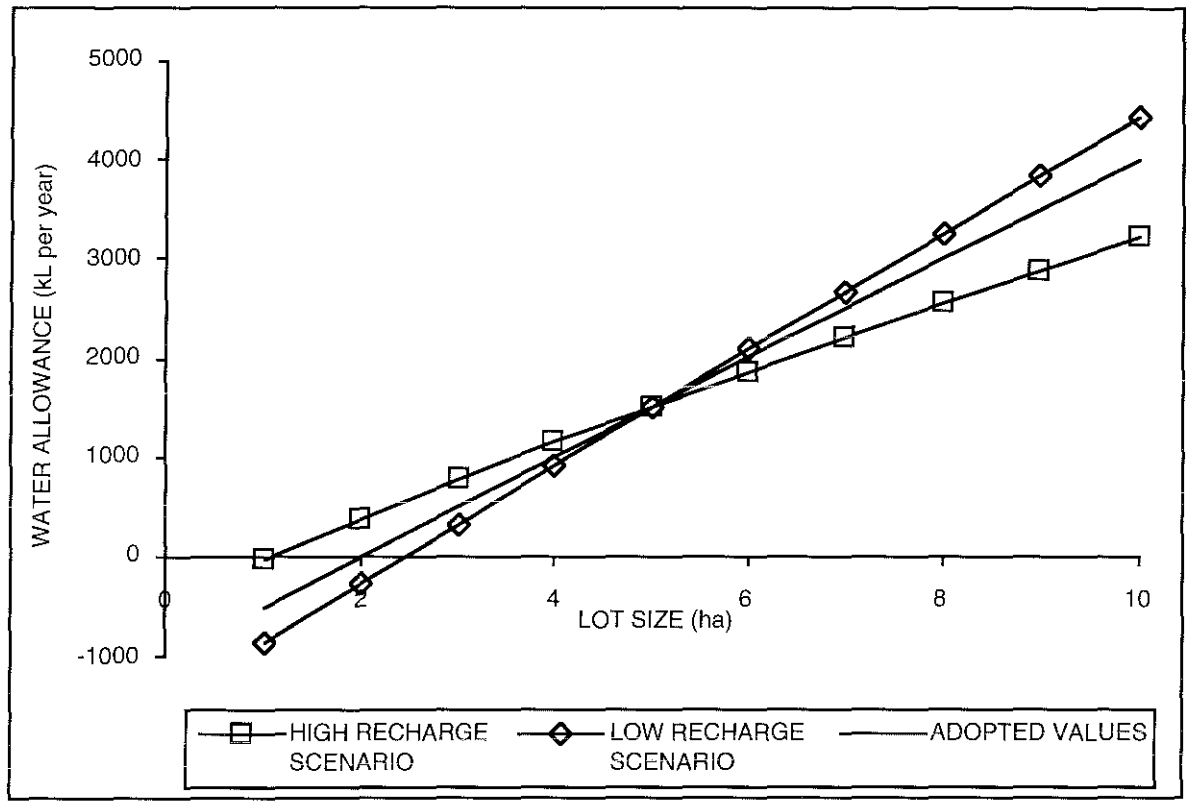

Figure 4: Water usage versus lot size based on 5 ha/1500 kL per lot per year (see Appendix 2).

The Yalgorup Lakes National Landcare Project advisory group also supported the 5 ha minimum lot size, but suggested there should be some scope for variation through innovative lot design.

One conservation group was concerned that water abstraction should be monitored to ensure no excess usage.

4.1.5 Proponent's response

The original proposal was to subdivide Lot 6 into 11 lots ranging in size from 2 ha to 6 ha each. During the public review period for the draft criteria, the proponent modified the proposal and now proposes to subdivide Lot 6 into nine lots averaging approximately 4 ha (Figure 2). A water abstraction limit will be imposed of 1000 kL per lot per year, plus rainwater tanks, will be required as part of the development (Commitment 1).

The subdivision will be designed to minimise the removal of natural deep rooted vegetation through the following means (Commitments 2 & 3):

- the proposed building envelope for each of the nine lots is 2 000 m^2 and wherever possible this will be positioned so that no trees are removed;
- the access road will be located where there is currently a 20 m wide cleared area adjacent to Old Coast Road (Figure 2);
- the parallel service road will meander around trees, and if a tree is required to be removed, a new tree of the same species will be planted elsewhere;
- access tracks to each building envelope will meander between trees;
- no clearing of trees outside the building envelope; and
- the keeping of stock will not result in the removal or damage of trees or result in soil degradation and dust pollution.

4.1.6 Environmental Protection Authority Evaluation

The changes to water balance from clearing of native vegetation will be adequately managed through the proponent's commitments 2 and 3.

The proponent has made a commitment to limit water abstraction to 1000 kL per lot per year (Commitment 1). Following advice from the Department of Environmental Protection on water balance change following development (refer Appendix 2), the comments contained in public submissions and the environmental criteria developed in Bulletin 788, the Environmental Protection Authority concludes that an acceptable change in water balance is that which would occur in a standard subdivision where the lot size is 5 ha and the water abstracted is 1500 kL per lot per year (see Figure 4).

Annual groundwater abstraction for this proposal should be constrained to the Environmental Protection Authority approved relationship between lot size (ha) and annual abstraction allowance (kL per year) as described by the hydrological model provided in Appendix 2, or any prospective changes to that model. Applying the current hydrological model to the average lot size of approximately 4 ha, water abstraction should not exceed 1000 kL per lot per year. The relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision. **(Recommendation 2)**

High water using activities and high fertiliser using activities (eg. horticulture) are not permitted on these lots and the relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision. **(Recommendation 3)**

The Environmental Protection Authority recognises that water balance and water abstraction for human purposes is a significant issue for the whole Lake Clifton catchment. Work is required to further refine the hydrological model used in this assessment (Appendix 2). The hydrological model is based on the best data currently available, however work being carried out as part of the Yalgorup Lakes National Landcare Project is likely to lead to further refinement of the hydrological model. The Yalgorup Lakes National Landcare Project study will carry out monitoring of the groundwater in the Lake Clifton catchment, and it is likely that on-going monitoring will continue after the study is completed. The Environmental Protection Authority believes that on-going monitoring of the groundwater quality and quantity entering Lake Clifton is essential. The hydrological model as described in this bulletin (Appendix 2) should be reviewed and if necessary, water abstraction allowance in the Lake Clifton catchment adjusted accordingly.

The Environmental Protection Authority recommends that relevant government agencies should continue studies on the hydrology of Lake Clifton and the outcome of that work and any on-going monitoring should be used to further refine the hydrological model used in this assessment (Appendix 2). It may be necessary to change the amount of groundwater made available for human use in the catchment as a result of further work. A whole of catchment approach should be adopted to ensure the quality and quantity of fresh groundwater entering Lake Clifton will maintain the growth and function of the microbialites. **(Recommendation 4)**

4.2 Physical impacts

4.2.1 Objective

The Environmental Protection Authority's objective is to reduce as far as practicable direct impacts on the microbialites, wetland vegetation, fringing wetland vegetation and the dryland buffer.

4.2.2 Policy information

The precedent of past assessments in the Lake Clifton catchment provides a policy framework for consideration of this issue. The Environmental Protection Authority provided advice on the Mt John Wood proposal and subsequent amendment at the level of Informal Review with Public

Advice (Appendix 1). The Environmental Protection Authority advised that the 300 m setback from Lake Clifton proposed in the development was acceptable.

4.2.3 Technical information

As mentioned in section 4.1.3, the microbialites of Lake Clifton have three critical growth requirements of a constant source of carbonate and bicarbonate ions, minimal levels of nutrients and adequate light. Microbialites may be destroyed and growth would be inhibited by direct physical impacts such as trampling. Loss of fringing vegetation and erosion through trampling by humans or livestock are likely to increase water turbidity.

Physical damage to microbialites in a rural residential development can be reduced by a number of management measures including wide lot frontages; setbacks from the lake for building envelopes and irrigation areas; and keeping stock away from the lake.

The Environmental Protection Authority investigated physical impacts on the microbialites and vegetated lake buffer in the draft criteria for Lake Clifton (Environmental Protection Authority, Bulletin 788, 1995). The following conclusions were made:

- lot sizes adjacent to the lake should be as large as possible, and should be designed to minimise the number of lots directly abutting the lake by having the longest side of each lot facing the lake;
- building envelopes should not be located on the Vasse landform type, should be set back at least 150 m from the high water level of the lake, and should be set back at least 20 m between the edge of the Vasse landform and/or freshwater wetland; and
- stock should be excluded from the area of the lot between the building envelopes and the lake.

Approximately 70 to 80 m of the western side of Lot 6 is in the Vasse Estuarine Landform.

4.2.4 Comments from key government agencies and public submissions

The City of Mandurah suggested that the width of lots should be specified and not left in vague terms as wide lots increase the chance of building envelopes being closer to the lake and increase pressure for further subdivision.

Two submissions related to the use of the 150 m buffer between the building envelope and the high water level of the lake. One submission suggested that stock should be allowed up to the property boundary to control fire and another points out that the area is currently being used by existing owners for a variety of uses and restrictions would be unfair.

The other three submissions were concerned with the width of the setback recommended, with one suggesting building envelopes should be allowed as close as 100 m whilst another suggested a 100 m setback from the edge of the Vasse soils. The Department of Conservation and Land Management would prefer a 200 m setback as per recommendations in Davies and Lane (1995) and that the setback should be measured from the edge of the wetland rather than the lake.

4.2.5 Proponent's response

The original proposal was to subdivide Lot 6 into 11 lots, with three 6 ha lots adjacent to Lake Clifton and eight 2 ha lots fronting Old Coast Road. Following public submissions regarding water balance as discussed in section 4.1, the proponent modified the proposal and now proposes to subdivide Lot 6 into nine lots, each abutting the lake (Figure 2).

Building envelopes will be setback 100 m from the western boundary of Lot 6 as shown in Figure 2 (Commitment 4) and this setback would also allow for the 20 m setback from the Vasse landform. To protect the microbialites from direct trampling the western boundary of each lot will be fenced (Commitment 5). To discourage the public and land owners from abusing the buffer area west of Lot 6 the owners will erect professionally written signs advising

of the significance of the microbialites (Commitment 6). Stock will be allowed up to the fence line.

4.2.6 Environmental Protection Authority Evaluation

The Environmental Protection Authority acknowledges that the original proposal was modified during the assessment process to become more environmentally acceptable in terms of water abstraction requirements (as discussed in section 4.1). Whilst all nine lots now abut the lake, the subdivision design as shown in Figure 2 can be justified by the commitments made by the proponent to protect the lake, such as fencing and education through signs.

The majority of the property is parkland cleared and could prove a fire hazard in summer. This hazard would be reduced by the proposal for stock to be allowed up to the western fence line.

The western boundary of Lot 6 will be fenced. It is up to 70 m from the high water level of the lake, and combined with the 100 m setback for building envelopes, the subdivision provides adequate setbacks from Lake Clifton and the Vasse landform.

The proponent has made a number of commitments in order to achieve the Environmental Protection Authority's objective for this issue.

The Environmental Protection Authority has concluded that the commitments made by the proponent meet the objectives in relation to reducing direct physical impacts on the microbialites, wetland vegetation, fringing wetland vegetation and the dryland buffer.

Pollution management

4.3 Management of nutrients

4.3.1 Objective

The Environmental Protection Authority's objective is to ensure that phosphorus export to Lake Clifton from land uses in the catchment is reduced as far as practicable.

4.3.2 Policy information

The precedent of past assessments in the Lake Clifton catchment provides a policy framework for consideration of this issue. The Environmental Protection Authority provided advice on the Mt John Wood proposal and subsequent amendment at the level of Informal Review with Public Advice (Appendix 1). The Environmental Protection Authority advised that a subdivision to create 25 ten ha lots would be acceptable provided that domestic waste treatment be through systems approved by the Health Department with an acceptable phosphorus retention capacity and that appropriate controls be applied to the number of stock.

4.3.3 Technical information

As discussed in sections 4.1.3 and 4.2.3, the microbialites of Lake Clifton have critical growth requirements which include adequate light and minimal levels of nutrients. Whilst nutrients are essential for microbialite growth, excessive levels of nutrients will encourage the growth of other algal species. Algal blooms will reduce the amount of light reaching the microbialites, inhibiting or stopping growth.

The major sources of nutrients from rural residential developments are from domestic effluent disposal, domestic gardens and stock. In Lake Clifton phosphorus is the limiting nutrient rather than nitrogen.

Septic tanks produce around 3.5 kg of phosphorus per year (human effluent and phosphorus detergents), and 18 kg of nitrogen per year (Gerritse et al, 1992). Work carried out by the

Water Authority in Kwinana and Canning Vale where secondary treated effluent was allowed to recharge the superficial aquifer via treatment ponds built directly on different soil types, showed that Spearwood soils were very poor at removing nutrients from the effluent as it leached through to the water table, and that most of the nutrients reached the water table (Ho et al, 1992).

Nutrients from stock (horses and sheep) should not pose a risk to the lake provided that the feed is produced on the lot and no supplementary feeding of stock is carried out. If stocking rates are determined in this manner, it is expected that the nutrient balance on the lots (excluding human sources) will be maintained with no export of nutrients.

The Environmental Protection Authority concluded in Bulletin 788 that future rural residential developments should be required to install "alternative effluent systems" which use amended soil with high nutrient retaining capacities to treat human effluent. It was also concluded that domestic gardens are not considered to be a major concern provided that adequate land use controls are applied through the planning process to exclude commercial horticultural activities. The Environmental Protection Authority also concluded that stock should only be allowed to control fire risk from uncontrolled growth of grasses, and at stocking rates for dry pasture, with no importation of feed to be allowed.

4.3.4 Comments from key government agencies and public submissions

The Water and Rivers Commission suggested that the risk of nitrogen leaching into lake should also be considered.

A conservation group suggested that intensive horticulture should not be permitted.

The Shire of Waroona suggested that stocking rates and the requirement for no importation of feed are difficult to monitor and that using the area of cleared land to set stocking rates encourages clearing of land.

Other submissions suggested that no stock should be allowed for uncleared lots as this would decrease the nutrient export and allow for smaller rural-residential lots, and that the stocking rates recommended are unreasonable.

4.3.5 Proponent's response

Alternative waste water disposal systems with nutrient removing capacity will be used on all lots and will be set back at least 100 m from western boundary of Lot 6, or at least 20 m from the Vasse landform, whichever is the greater (Commitment 7).

To limit the amount of nutrients entering Lake Clifton, the proponent has made the following commitments:

- horticultural uses will be limited to home use (Commitment 8);
- use of fertiliser will be limited to approved organic fertilisers and will not be used within 20 m of the Vasse soil landform (Commitment 9); and
- the number of any stock allowed per lot will be restricted consistent with stocking rates as advised by Agriculture Western Australia (Commitment 10).

4.3.6 Environmental Protection Authority Evaluation

In Lake Clifton phosphorus is the limiting nutrient rather than nitrogen, therefore it is phosphorus levels that must be restricted. Other concerns raised in the submissions such as monitoring of stocking rates and importation of feed are addressed by the proponent's commitments.

The proponent has made a number of commitments to reduce the potential for nutrient export from the subdivision. These include using alternative waste water disposal systems with nutrient removing capabilities (Commitment 7), limiting horticultural use (Commitment 8),

limiting fertiliser use (Commitment 9) and limiting the number of stock allowed (Commitment 10).

The Environmental Protection Authority has concluded that the environmental management commitments made by the proponent achieve the Environmental Protection Authority's objective of ensuring that phosphorus export to Lake Clifton is reduced as far as practicable.

5. Conclusions and recommendations

5.1 Overall conclusion

Following review of the proponent's documentation, the issues raised in the public submissions, advice received from government departments, relevant literature and the proponent's environmental management commitments, the Environmental Protection Authority concludes on the information currently available, that the proposal by Tradevision Pty Ltd to subdivide Lot 6 Old Coast Road can be managed to meet the Environmental Protection Authority's objectives.

5.2 Specific recommendations

Noting the conclusion reached, the Environmental Protection Authority submits the following recommendations to the Minister for the Environment.

Recommendation 1

That the Minister for the Environment note that the Environmental Protection Authority has concluded that the proposal can be managed to meet the Environmental Protection Authority's objectives, subject to the successful implementation of the proponent's commitments and the Environmental Protection Authority's recommended conditions and procedures.

Recommendation 2

The Environmental Protection Authority recommends that annual groundwater abstraction for this proposal should be constrained to the Environmental Protection Authority approved relationship between lot size (ha) and annual abstraction allowance (kL per year) as described by the hydrological model provided in Appendix 2, or any prospective changes to that model. Applying the current hydrological model to the average lot size of approximately 4 ha, water abstraction should not exceed 1000 kL per lot per year. The relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision.

Recommendation 3

The Environmental Protection Authority recommends that high water using activities and high fertiliser using activities (eg. horticulture) are not permitted on these lots and the relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision.

Recommendation 4

The Environmental Protection Authority recommends that government should continue studies on the hydrology of Lake Clifton and the outcome of that work and any on-going monitoring should be used to further refine the hydrological model used in this assessment (Appendix 2). It may be necessary to change the amount of groundwater made available for human use in the catchment as a result of further work. A whole of catchment approach should be adopted to ensure the quality and quantity of fresh groundwater entering Lake Clifton will maintain the growth and function of the microbialites.

Recommendation 5

The Environmental Protection Authority recommends that if the Minister for the Environment provides environmental clearance that the proposal may be implemented, clearance be subject to the Conditions and Procedures set out in section 6 of this report.

6. Recommended environmental conditions

Based on the assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

PROPOSAL:	RURAL SUBDIVISION OF LOT 6 OLD COAST ROAD, HERRON, WITHIN THE CATCHMENT OF LAKE CLIFTON.
PROPONENT:	TRADEVISION PTY LTD

This proposal may be implemented subject to the following conditions:

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Consultative Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

The environmental management commitments were published in Environmental Protection Authority Bulletin 819 (Appendix y) and a copy is attached.

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of the detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

ISSUES	ENVIRONMENTAL OBJECTIVE	EVALUATION FRAMEWORK	PROPONENT'S COMMITMENTS	EPA RECOMMENDATION
Biophysical				
Water balance	On an annual basis the quantity of fresh groundwater entering Lake Clifton following development is as close as possible to that entering the lake before development.	DEP study shows relationship between water balance and lot design (Appendix 2); most lots already parkland cleared and some re-vegetation likely; little opportunity for extra recharge.	Limit water consumption to 1000 kL per lot per year, to be supplemented with rainwater tanks.	Annual groundwater abstraction for this proposal should be constrained to the Environmental Protection Authority approved relationship between lot size (ha) and annual abstraction allowance (kL per year) as described by the hydrological model provided in Appendix 2, or any prospective changes to that model. Applying the current hydrological model to the average lot size of approximately 4 ha, water abstraction should not exceed 1000 kL per lot per year. The relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision. High water using activities and high fertiliser using activities (eg. horticulture) are not permitted on these lots and the relevant government agency(s) should ensure that appropriate mechanisms are in place prior to finalisation of the subdivision. Government should continue studies on the hydrology of Lake Clifton and the outcome of that work and any on-going monitoring should be used to further refine the hydrological model used in this assessment (Appendix 2). It may be necessary to change the amount of groundwater made available for human use in the catchment as a result of further work. A whole of catchment approach should be adopted to ensure the quality and quantity of fresh groundwater entering Lake Clifton will maintain the growth and function of the microbialites.
Physical impacts	Direct impacts on the microbialites, wetland vegetation, fringing wetland vegetation and dryland buffer should be minimal.	Restrictions to apply to lots adjacent to Lake Clifton - larger lots adjacent to lake and 150m buffer zone/setback for effluent disposal systems.	Frontage to lake will be fenced. Building envelope will be setback 100 m from western boundary.	The proponent's commitments are considered adequate.
Pollution				
Nutrients	Phosphorus export to the lake from land uses in the catchment should be minimal.	Septic tanks, stock and ancillary land uses are sources of phosphorus.	All lots will use alternative waste water disposal systems. Only approved organic fertilisers to be used. Horticultural uses limited to home use. Stock limited to rates as advised by Agriculture Western Australia.	The proponent's commitments are considered adequate.

Table 2: Summary of Environmental Protection Authority recommendations.

4 Time Limit on Approval

The environmental approval for the proposal is limited.

4-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

5 Compliance Auditing

To help determine environmental performance and compliance with the condition, periodic reports on the implementation of the proposal are required.

5-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme agreed to by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 The Water and Rivers Commission, Western Australian Planning Commission and the City of Mandurah will ensure that groundwater abstraction on the subdivided lots shall not exceed the water abstraction limit, determined by the current hydrological model as 1000 kL per lot per year, or any future limit as determined by prospective changes to the model.

2 The Western Australian Planning Commission and the City of Mandurah will implement appropriate planning measures to prohibit high water using activities and high fertiliser using activities and to implement proponent commitments 3, 7, 8, 9 and 10.

3 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

4 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

7. References

Environmental Protection Authority (1995) Criteria of environmental acceptability for land use proposals within the catchment of Lake Clifton: Report and recommendations of the Environmental Protection Authority. Bulletin 788. Environmental Protection Authority, Perth, Western Australia.

Davies, P. M., and Lane, J. A. K. (1995) Guidelines for designs of effective buffers for wetlands on the Swan Coastal Plain. Report to Australian Nature Conservation Agency, Canberra.

Gerritse, R. G., Adeney, J. A. & Bates, L. E. (1992) Nutrient Inputs from Various Land Uses on the Darling Plateau in Western Australia: Results of a survey. Report No 92/3, April 1992, CSIRO, Perth, Western Australia.

Ho, Goen E., Gibbs, Robyn A., Mathew, Kuruvilla and Parker, William F. (1992) Groundwater Recharge of Sewage Effluent through Amended Sand. Water Research, 36(3) pp. 285-293.

Appendix 1

Informal Review with Public Advice for Mt John Wood

Chief Executive
Department of Planning and Urban Development
469-489 Wellington Street
PERTH WA 6000

85803
Your ref: TP 91.132
Our ref: Mr Garry Middle
Enquiries: crn 52128 & 52703

ATTENTION: BRETT FLUGGE

PROPOSED DEVELOPMENT - PT MURRAY 721 & 1390 MT JOHN ROAD

I write in response to the above proposed development and offer the following advice and comments.

1. General comments

As the subject land is within the Peel-Harvey Catchment, the Scheme Amendment that accompanies this development must be consistent with the Statement of Planning Policy for that region. A further constraint on development is that this land abuts the internationally significant wetland Lake Clifton, and Yalgorup National Park. Consequently, additional controls need to be applied, and the proposed Scheme Amendment goes a long way to addressing the environmental issues associated with these constraints.

In general, the provision of the Amendment are acceptable to the Authority. There are, however, a few issues that require additional comment.

2. Land use controls

The Authority's position has been that it does not normally support rural subdivisions, but that if they are to proceed in the Peel-Harvey catchment the minimum lot size should be 20 hectares with land uses restricted to broadacre dryland grazing. The land-use management controls proposed for this land are acceptable provided they can be successfully implemented in the long term.

3. The proposed Rural Subdivision - Scheme amendment provisions

i) On-site effluent systems (2b)

Sub-section (iii) should be re-worded to allow only alternative systems approved by the Health Department with an acceptable phosphorus retention capacity to be used on the lots.

ii) Stormwater drainage

There is no need for the Environmental Protection Authority to be involved in this issue, but adequate controls should be in place to ensure the nutrient stripping aspects are implemented.

Environmental
Protection Authority

1 Mount Street Perth
Western Australia 6000
Telephone (09) 222 7000
Facsimile (09) 322 1598

iii) Landuses other than Residential (2d)
The primary purpose of these proposed lots should be residential. Additional uses should not be permitted.

iv) Stocking rates (2e)
The building envelope will be at most 4000 square metres, and the allowance of two horse equivalent of stock seems excessive. One horse equivalent would be preferable.

4. Special Rural lots
These lots should be developed in a manner consistent with the Peel-Harvey Statement of Planning Policy.

5. Public consultation
One of the issues raised as part of an appeal on level of assessment on this project was that, given the importance of Lake Clifton, the public should be given the opportunity to have an input into the development. The Minister for the Environment dismissed this part of the appeal on the grounds that a limited public consultation would be carried out as part of the Authority's deliberation regarding this proposal. That limited public consultation has now been completed. However, should your Department decided that this proposal should be the subject of a re-zoning, then further public comment can be sought, thus minimising public concern regarding the perceived lack of public consultation.

Subject to the above advice and comments, the above proposed development would be environmentally acceptable.

Yours sincerely

R A D Sippe
DIRECTOR
EVALUATION DIVISION

11 February 1992

cc: BSD Consultants Pty Ltd, Peel Preservation Group (inc), City of Mandurah, Conservation Council, Waterbird Protection Group

AN ENVIRONMENT WORTH PROTECTION

Chief Executive Officer
City of Mandurah
PO Box 210
MANDURAH WA 6210

Your ref: 18/16/203
Our ref: TP 91.132: 70652
Enquiries: Garry Middle
222 7103

ATTENTION: Colin Summerville

CITY OF MANDURAH TOWN PLANNING SCHEME NO 1, AMENDMENT NO 203 - AREA 7, LAKES CLIFTON

I write regarding the above proposed development referred to the Authority on 1 November 1993 where level of assessment was set at Informal with Public Advice. The following advice and comment is offered.

History of the proposal

This original proposal, referred to the Authority in November 1991, had level of assessment set at Informal with Public Advice. This level was set because the proposed management measures adequately addressed the key environmental issues, and could be be enforced through the City of Mandurah's Town Planning Scheme.

As you are aware, the proponent has requested three changes to the original provisions, which are the subject of Amendment 203 to the City of Mandurah's Town Planning Scheme. The Amendment was referred to the Authority, and level of assessment set at Informal with Public Advice. This level of assessment was set based on:

- information provided by the proponent and other interested parties;
- a judgement based on this information that the changes, with minor modifications, would be environmentally acceptable; and
- the willingness of Council officers to accept the Authority's advice.

Provision of bore water

Lake Clifton is internationally important as a waterbird habitat and because it contains the largest know example of living microbialites in a lake environment in the southern hemisphere (400 ha in a 8km long reef). It is one of only two lakes in the world where these stromatolite-like structures occur in hyposaline water, and has been listed under the Ramsar Convention as having international importance. Lake Clifton, its fringing vegetation and the catchment to the west are contained within Yalgorup National Park, which is an area subject to System 6 recommendations. It is also a wetland protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.

Lake Clifton is a sink for groundwater and has a complex hydrology involving freshwater inflow from direct precipitation and groundwater, and water loss through evaporation. The thin wedge of fresh groundwater that flows into the lake is important for the survival of the microbialites as it regulates lake salinity. The groundwater also provides carbonate and bicarbonate ions (from the limestone) necessary for continued stromatolite growth.

Development in the area needs to ensure:

- water balance to the lake is maintained;
- water quality of the lake is protected; and
- impacts on the fringing vegetation are minimised.

In support of the case for bores, the proponent made the point that the key issue in managing the water and protecting the stromatolites was maintaining the water balance. That is, the aim should be not to change (either increase of decrease) the amount to freshwater entering the lake. Subsequent advice suggests that a reduction in fresh water entering the lake would certainly be a problem, but it is not so clear whether an increased in the freshwater flow would be a problem as well.

The proponent argued that the land to be developed is mostly covered with native vegetation, and that clearing the land to provide service roads, fire breaks and building envelopes would result in a net increase in the fresh water recharging the aquifer through decreased evapo-transpiration rates. This would result in an increase in fresh water flowing into the lake. It is argued, therefore, that by allowing residents to have bores some, if not all, of this extra recharge will be removed restoring the water balance close to predevelopment levels.

Increasing the size of the building envelopes will also lead to further clearing and further recharge.

The proponent has provided some figures on expected increased water recharge and expected water useage following development . Whilst there are some obvious uncertainties with some of the assumptions used in the calculations of total recharge and extraction, it is highly likely that there will be a net recharge of freshwater. These figures have been checked by officers of the Authority and the Water Authority.

In the absence of evidence to the contrary, it would seem difficult to opposed the use of bores provided that extraction rates are conservative. This can be ensured by including a provision in the Town Planning Scheme that water useage be set at 1 000 kilolitres per lot per year, meters on the bores are installed, and controls on land uses which prohibit high water using activities are implemented. The Scheme already has the provisions to prohibit intensive land uses. The proponent has indicated that meters will be provided at his expense.

Increased size of building envelopes

The Authority is less supportive of this proposal. The apparent reason for the request is to allow residents to locate stables well away from houses. Increasing the size of the building envelopes to 1 ha could signal to future residents that more intensive, high water and fertliser using activities are acceptable. These activities would be undesirable on these lots. A compromise solution would be to permit two building envelope areas where requested. The combined building envelopes for house and stables should be a maximum total size of 5 000 square metres.

Fencing requirements

The Authority has no comments to offer on the changes to fencing requirements.

Strategy for the management of developments within the Lake Clifton catchment
The Authority is concerned about managing developments within the catchment of Lake Clifton, as the catchment is coming under increasing pressure for development, and there are clear signs that the water quality in the lake is deteriorating. The Environmental Protection Authority is currently drafting a strategy for the catchment which will address the management issues, and Council will be fully consulted prior to its finalisation. It would be desirable that the key elements of the strategy are included in Town Planning Scheme No 2 and the Rural Strategy.

Subject to the above advice and comments, the proposed changes to the development would be environmentally acceptable. Should you require further information regarding these matters please contact Garry Middle on (09) 222 7103.

Yours sincerely

R A D Sippe
DIRECTOR
EVALUATION DIVISION

30 November 1993

CC: Department of Planning and Urban Development
Water Authority of Western Australia;
Ms Linda Moore
Conservation Council
Peel Preservation Society
Shire of Waroona
Community Catchment Centre
Department of Conservation and Land Management

Am 203 Clifton advice 301193 GMi

Appendix 2

Water use and lot size for a standard special rural subdivision

Prepared by the Department of Environmental Protection for the Environmental Protection Authority

1. Introduction

The Environmental Protection Authority recently released a Bulletin entitled "Criteria of environmental acceptability for land use proposals within the catchment of Lake Clifton" (EPA, 1995). Special Rural developments were identified as being a land use within the catchment which required special management to avoid unacceptable impacts on the lake. One of the main issues of concern was maintenance at pre-development levels of the groundwater flows into the lake (ie. water balance) following development.

Maintenance of groundwater flows into the lake is seen as critical for the survival of the microbialites. Microbialites are limestone structures built by algae to provide themselves with a safe habitat. In order that these structures can continue to grow a constant supply of carbonate and bicarbonate ions is required. This is provided from the in-flowing groundwater.

Much of the soil within the catchment is underlain with limestone at or near the surface. Rain falling within the catchment infiltrates through the sand and the limestone dissolving some of the limestone on the way to the aquifer. This carbonate and bicarbonate-rich, mostly fresh, groundwater then makes its way to the lake.

It is crucial, therefore, that this supply of groundwater is maintained. Recent evidence from a study co-ordinated by the Water and Rivers Commission indicates that the freshwater aquifer containing the carbonate and bicarbonate-rich water is very thin, as little as four meters thick in some places. Human abstraction poses the greatest threat to the continued movement of this groundwater.

Appendix 3 of the EPA Lake Clifton bulletin showed the relationship between lot size and changes to water balance following the development of a parcel of land for special rural purposes. As land is developed, recharge to the aquifer can increase through run-off from additional hard surfaces (roads tracks and buildings) and through the clearing of native vegetation to provide for the houses, building envelopes and roads. This is balanced through the abstraction of groundwater for human purposes and, for land already cleared of native vegetation, re-vegetation as owners seek to improve the amenity of their properties.

A mathematical model was set up to show what happens to the water balance following development, and the Appendix concluded that, based on a typical subdivision design, the change in water balance became unacceptable below 5 ha.

These calculations showed that the amount of groundwater abstracted for human purposes was one of the main contributors to the change in water balance. As a follow-up to this work in the EPA's Lake Clifton Bulletin, it was decided to explore the relationship between lot size and the amount of water used for human purposes further. The work used the 5 ha/1500 kL change in water balance as the environmentally acceptable standard. It would be expected that as groundwater abstraction is reduced below 1500 kL, a lot size of less than 5 ha would produce the same change in water balance as the 5 ha/1500 kL standard, all other variables being kept constant.

The calculations in this Appendix show that relationship. The results shown here are only for land cleared or parkland cleared prior to development as these are the results relevant to the proposal assessed in this bulletin.

2. The relationship between lot size and groundwater abstraction for a typical special rural subdivision - for land cleared of native vegetation prior to development

2.1 Introduction

The base formula used here is derived from Appendix 3 of the EPA original Lake Clifton Bulletin (EPA, 1995). The symbols used in the equation represent the following:

R = recharge (litres per year);

r_n = recharge rate of variable n (for example, for native vegetation areas and hard surfaces);

ΔR = change in recharge (litres per year);

ET = evapotranspiration rate (litres per year);

W = groundwater abstraction (litres per year);

A = area of land to be subdivided (hectares);

a = area of each lot (hectares);

$\sqrt{a}$ = length of one side of the lot assuming lot is square (metres);

2.2 The derivation of the equation showing the relationship

Using the equation from Appendix 3 of the EPA Lake Clifton Bulletin (EPA, 1995):

ΔR = [R(p) - ET(rehab) - W + R(pvte)] x A/a

= [(500 + 3.5 $\sqrt{a}$) % diff recharge/100 x 0.900

- (4000 x % diff recharge/100) x .900 - 1500 + (1500 x recharge pvte/100)] x A/a

Now, let W = water used for human uses

and r_n = the respective recharge variables

= [(500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900 - W + (W x r_3 /100)] x A/a

or, taking the total area out of the equation

$\Delta R/A$ = [(500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900 - W + (W x r_3 /100)] x 1/a

Solving for a lot size of 5 ha and groundwater abstraction of 1500 kL per lot per year, for both high and low recharge scenarios

$\Delta R/A$ = -403 - low recharge scenario

$\Delta R/A$ = -143 - high recharge scenario

It is now possible to set up a relationship between W (groundwater abstraction) and a (lot size) using the figure of $\Delta R/A$ for lot size of 5 ha and groundwater abstraction of 1500 kL per lot per year as a standard.

(a) low recharge scenario

$\Delta R/A$ = [(500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900 - W + (W x r_3 /100)] x 1/a

-403 = (500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900 - W + (W x r_3 /100)] x 1/a

Solving for W

-403 x a = (500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900 - W + (W x r_3 /100)

-403 x a - (500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 + (4000 x r_2 /100) x .900 = - W + (W x r_3 /100)

or

-403 x a - (500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 + (4000 x r_2 /100) x .900 = - W (1 - 1 x r_3 /100)

or

W = [403 x a + (500 + 3.5 $\sqrt{a}$) r_1 /100 x 0.900 - (4000 x r_2 /100) x .900]/(1 - 1 x r_3 /100)

simplifying

W = [403 x a + 4.5r_1 + 0.0315 $\sqrt{a}$ x r_1 - 36 x r_2]/(1 - 1 x r_3 /100)

(b) high recharge scenario

The equivalent equation is:

W = [142 x a + 4.5r_1 + 0.0315 $\sqrt{a}$ x r_1 - 36 x r_2]/(1 - 1 x r_3 /100)

2.2 Results

Table 1 and Figure 1 present, for a range of lot sizes, the results of calculations of groundwater abstractions which are equivalent to an abstraction of 1500 kL per year on a 5 ha lot using high and low recharge scenarios. A set of values lying between those extremes has been adopted for the purposes of assessing this proposal.

Table 1: The relationship between lot size and groundwater abstraction based on the 5 ha/1500 kL standard

LOT SIZE (ha)	WATER USE (kL per year)		
	HIGH RECHARGE SCENARIO	LOW RECHARGE SCENARIO	ADOPTED VALUES
1	-30	-858	-500
2	386	-264	0
3	771	326	500
4	1141	914	1000
5	1500	1500	1500
6	1852	2085	2000
7	2199	2670	2500
8	2542	3253	3000
9	2881	3837	3500
10	3217	4420	4000

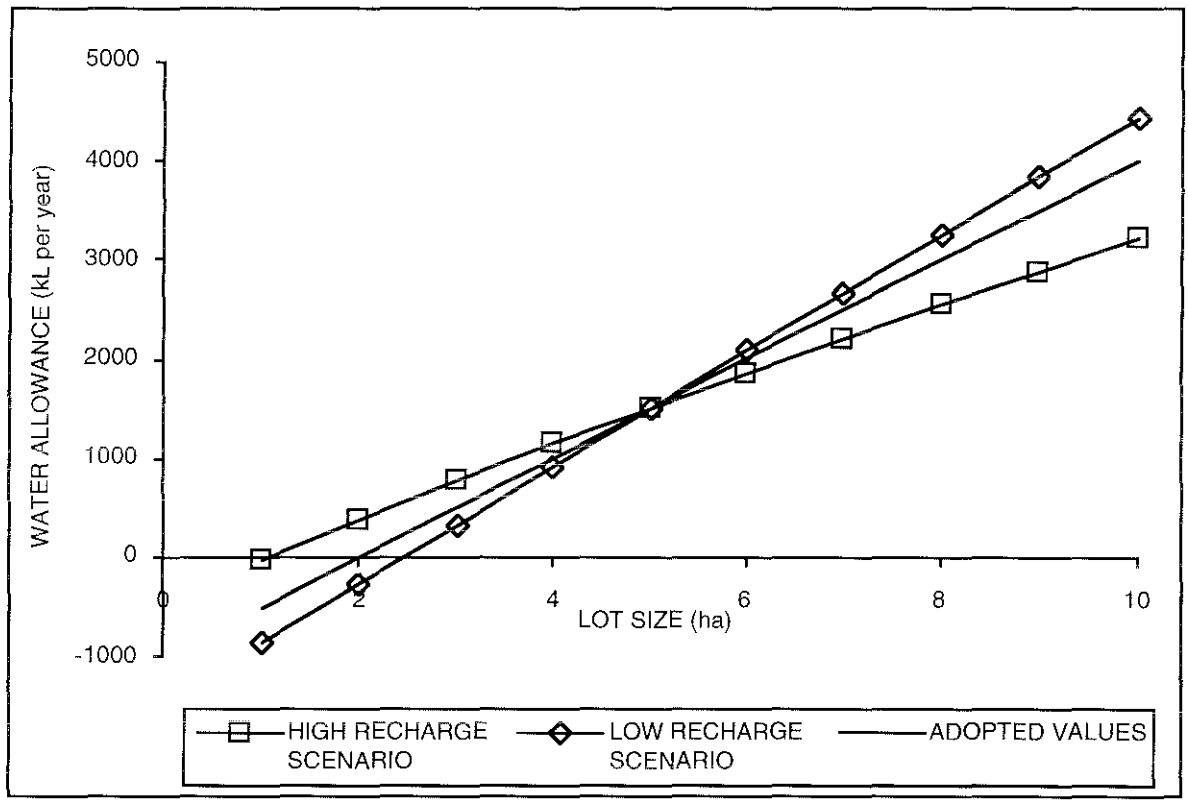

Figure 1: Water usage versus lot size based on 5 ha/1500 kL per lot per year.

2.3 Conclusion

The data indicate that groundwater abstraction and lot size should conform to the relationship:

$$W = (A - 2) \times 500$$

where W is the water abstraction allowance in kL per year
and A is the lot size in ha.

From this it follows that no groundwater abstraction should be allowed where the lot size is less than 2 ha and at an average lot size of 4 ha, abstraction of groundwater should not exceed 1000 kL per lot per year.

Appendix 3

Proponent's consolidated list of commitments

Consolidated list of proponent commitments:

Groundwater abstraction

1. A water abstraction limit will be imposed of 1 000 kL per lot per year, plus rainwater tanks, to be required as part of the development.

Clearing of native vegetation

2. The subdivision will be designed to minimise the removal of natural deep rooted vegetation through the following means:
    - the proposed building envelope (2 000 m^2) for each of the nine lots will be positioned so that wherever possible no trees are removed;
    - the access road will be located where there is currently a 20 m wide cleared area adjacent to Old Coast Road; and
    - the parallel service road will meander around trees, and if a tree is required to be removed, a new tree of the same species will be planted elsewhere.
3. Prior to the sale of any lots the appropriate planning mechanisms will be in place so that:
    - access tracks to each building envelope will meander between trees;
    - no clearing of trees occurs outside the building envelope; and
    - the keeping of stock shall not result in the removal or damage of trees or result in soil degradation and dust pollution.

Physical impacts on the microbialites, wetland vegetation, fringing wetland vegetation and the dryland buffer

4. Building envelopes will be setback 100 m from the western edge of Lot 6.
5. To protect the microbialites from direct trampling the western boundary of each lot will be fenced, prior to the sale of any lots, to the requirements of the City of Mandurah.
6. The owners will erect professionally written signs advising of the significance of the microbialites, on advice of the Department of Conservation and Land Management.

Management of nutrient export

7. Prior to the sale of any lots the appropriate planning mechanisms will be in place to ensure that alternative waste water disposal systems with nutrient removing capacity will be used on all lots and will be set back at least 100 m from western boundary of Lot 6 or 20 m from the Vasse landform, whichever is the greater.
8. Horticultural uses will be limited to home use and a small vegetable garden per lot.
9. Use of fertiliser will be limited to approved organic fertilisers and will not be used within 20 m of the Vasse soil landform.
10. The number of any stock allowed per lot will be restricted consistent with stocking rates as advised by Agriculture Western Australia.