Remlap Ranch Resort, Myalup

Greenvale Enterprises Pty Ltd

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 813
April 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 3 May 1996

Environmental Impact Assessment (EIA)
Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time(weeks)
27/11/95	Proponent Document Released for Public Comment	-
8/1/96	Public Comment Period Closed	6
22/1/96	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	2
14/2/96	Proponent response to the issues raised received	3
19/4/96	EPA reported to the Minister for the Environment	9

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Summary

This proposal by Greenvale Enterprises Pty Ltd involves the development of an equestrian oriented ranch resort of 64 strata lots of various sizes for residential, camp accommodation, equestrian and tennis facilities and short stay chalet accommodation. The short stay chalet accommodation is to be centred around an artificially created lagoon. The creation of the lagoon involves modifying a designated lake dampland lying in an area covered by the Lakes Environmental Protection Policy.

The dampland is a seasonally waterlogged wetland, which is in a degraded state as a result of past land use including filling, grazing and mineral sand mining activities. The restored environmental value of the lagoon is expected to result in a wetland assessment classification of 'Resource Enhancement' Category R (EPA Bulletin 686), which would correspond to its state prior to alteration.

The EPA notes the proponent's commitments in relation to dampland enhancement, and concludes that the proposed artificial wetland design and management is likely to improve the ecological functions of the wetland.

The proposal was referred to the Environmental Protection Authority in March 1993 in accordance with the provisions of the *Environmental Protection Act* (1986). Because of the potential impacts of the development in modifying a designated lake dampland lying in an area covered by the Lakes Environmental Protection Policy, the Environmental Protection Authority determined that the appropriate level of assessment for the proposal was a Consultative Environmental Review.

The Environmental Protection Authority identified the main environmental issues requiring detailed consideration as:

- impact on damplands;
- impact on vegetation and fauna.
- nutrient enrichment;
- surface water management;
- groundwater quality;
- groundwater abstraction; and
- mosquito management.

In evaluating these issues for the development as proposed, the Environmental Protection Authority concluded that:

- the creation of an artificial lagoon is likely to improve the ecological function of the wetland;
- the development would enhance the vegetation and fauna values;
- there would be limited nutrient output and nutrient enrichment of the lagoon and groundwater beneath the site from wastewater as wastewater treatment systems are to be installed;
- surface water runoff would be appropriately managed to maximise recharge;
- groundwater and lagoon water quality would be adequately maintained and regularly monitored by the implementation of an Environmental Management Plan;
- groundwater abstraction would have no adverse effects beyond the site boundary; and
- mosquitoes could be appropriately managed.

The Environmental Protection Authority has evaluated the Remlap Ranch Resort development and has concluded that the proposal is environmentally acceptable subject to the implementation of the proposed commitments and application of the recommended environmental conditions.

Recom-mendation Number	Summary of EPA recommendation
1	The Environmental Protection Authority recommends that the Remlap Ranch Resort development is found to be environmentally acceptable subject to the proponent's commitments in relation to the following: • increasing the number of dampland functions (as outlined in EPA Bulletin 686); • increasing remnant native vegetation and fringing native vegetation to maximise biological functions of the lake; • installing appropriate wastewater treatment; • implementing a contingency plan to protect lagoon water quality if monitoring indicates that there is an adverse impact on the water in the lagoon; • including in the strata title bylaws a provision to restrict the use of fertilisers on all landscaped and garden areas; • incorporating appropriate surface water runoff management; • monitoring the water quality of the lagoon and the groundwater through the implementation of an environmental management programme; and . • incorporating effective mosquito management. • detailed review of monitoring results and an audit of the performance of monitoring and management programmes after the first five years following construction of the development to determine if further monitoring is required.
2	The EPA recommends that if a decision is made that the proposal may be implemented, that the proposal be subject to the conditions set out in Section 6 of this report

1. Introduction and background

1.1 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 proposed Remlap Ranch Resort Development

1.2 Background

The Department of Planning and Urban Development (now the Ministry for Planning) referred the proposal by Greenvale Enterprises Pty Ltd to develop the Remlap Ranch Resort to the Environmental Protection Authority in March 1993 in accordance with the provisions of the *Environmental Protection Act* 1986-1994. The Shire of Harvey Town Planning Scheme requires an amendment to allow for the proposal to proceed. In view of the potential impacts of the development in modifying a designated lake dampland lying in an area covered by the Lakes Environmental Protection Policy, the Environmental Protection Authority determined that the appropriate level of assessment for the proposal was a Consultative Environmental Review. The Consultative Environmental Review document was prepared on behalf of the proponent by LeProvost Dames and Moore and was released for public comment over a period of six weeks from 27 November 1995 to 8 January 1996. Environmental approval by the Minister for the Environment is required before the planning decision can be made. Figure 1 indicates the location of the proposed resort.

1.3 Structure of the report

This document has been divided into 7 Sections as follows.

- Section 1 describes the historical background to the proposal and its assessment, and describes the structure of this report.
- Section 2 briefly describes the proposal (more detail is provided in the proponent's Consultative Environmental Review document).
- Section 3 explains the method of assessment and provides an analysis of public submissions.
- Section 4 sets out the evaluation of the key environmental topics associated with the proposal. In each sub section, the objective of the assessment is defined, the likely effect of the proposal, the advice to Environmental Protection Authority from government agency and public submissions presented, and the proponent's response to these submissions. The adequacy of the response by the proponent has been 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 identified issues are contained in this section.
- Section 5 summarises the Authority's conclusions and recommendations.
- Section 6 describes the Authority's recommended environmental conditions.
- Section 7 cites documents used in the preparation of this report.

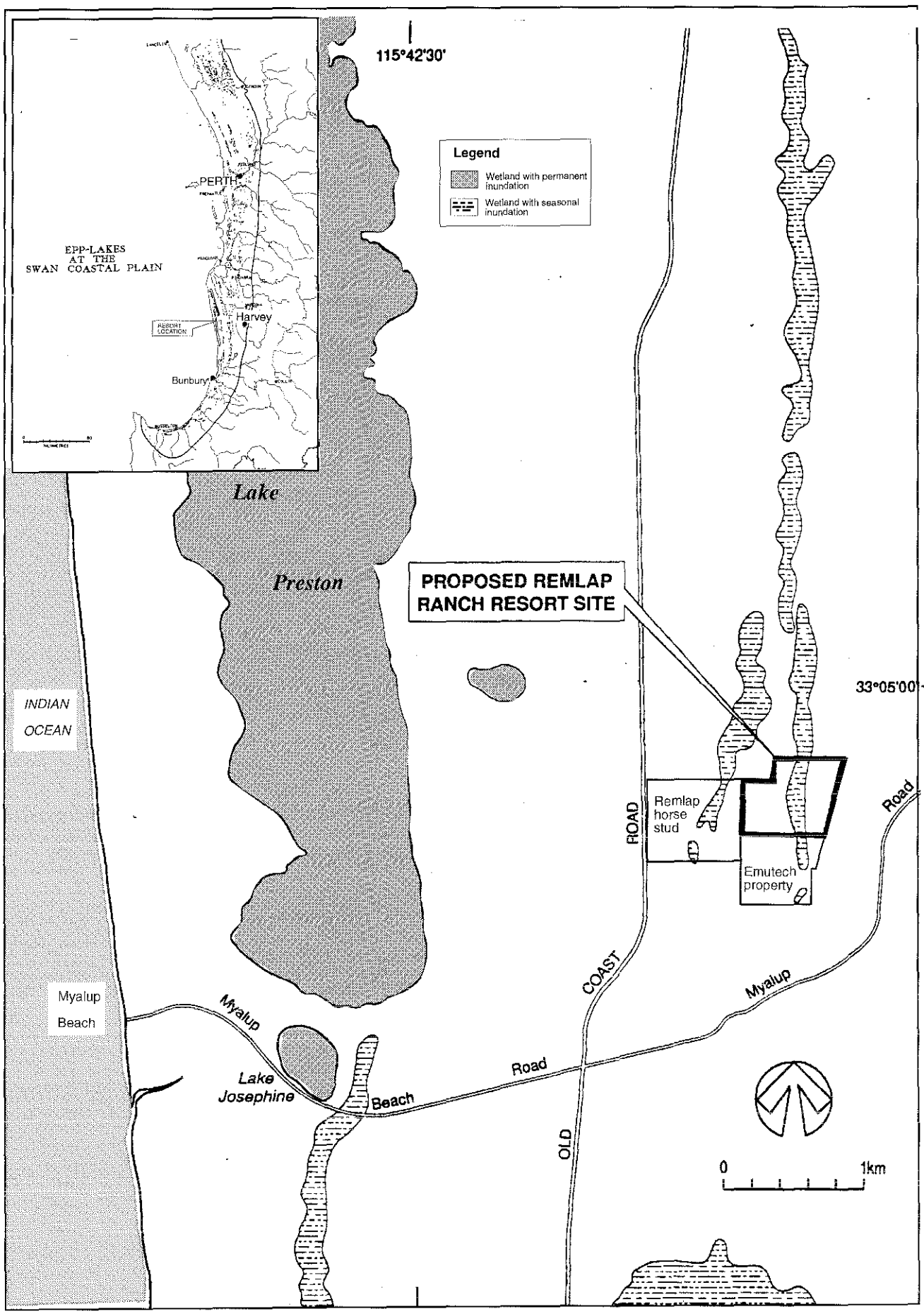

Figure 1. Location plan — Remlap Ranch Resort.

2. The proposal

The Remlap Ranch Resort is located at Lot 7 Old Coast Road, Myalup (Figure 1). Myalup is located approximately 120 km south of Perth and 35 km north of Bunbury.

The Proponent also owns both the Remlap Horse Stud located on the western side of the site and the Emutech Property located on the southern side of the site.

The proposal, as outlined in the Consultative Environmental Review document is proposed to be developed in two stages. Stage 1 involves the lagoon construction and stage 2 involves the resort development.

The main components of the proposal are shown in Figure 2, and include:

- a lagoon proposed to be created through the excavation of the existing degraded dampland to a depth of 2 metres. The lagoon is proposed to have 3 islands with the central island connected to both shores of the lagoon by a pedestrian bridge. Short stay chalet accommodation (Lots 11 to 60) are proposed to be situated in groups of 5 to 7 lots around the lagoon.
- 64 strata lots of various sizes for residential, short stay chalet accommodation, camp accommodation, equestrian and tennis facilities. The proposed arrangement of these strata lots is as follows:
  - residential: 12 larger lots (lots 1 to 10, 63 and 64) ranging in area from 0.815 to 1.82 ha with provision for horses;
  - short stay chalet accommodation: 50 smaller lots (Lots 11 to 60) of 1200 square metres;
  - camp accommodation: A single lot (Lot 61) having dormitory accommodation for 40 persons and a single tennis camp lot (Lot 62) having accommodation for 40 persons; and
  - administration building and manager's residence located on the eastern boundary of the proposed irrigation area between Lots 7 and 8.

The proponent has prepared a table that summarises the potential environmental issues associated with the development proposal, proposed management to ameliorate these impacts, and the predicted outcome (Table 1).

A proposed amendment to the Shire of Harvey Town Planning Scheme No. 10 (Amendment 56) to allow for this development to proceed was advertised in the Government Gazette on 11 March 1994. This scheme amendment will allow for:

- rezoning of Lot 7 Old Coast Road, Myalup from 'General Farming' to 'Restricted Use - Short Stay Chalet Park, Stables, Residential Accommodation, Recreation and Horse Agistment'; and

- amendment to the scheme text by adding to Appendix 7 - Schedule of Restricted Uses, Lot 7 Old Coast Road, Myalup and restricting the use of the land to permit Short Stay Chalet Park, Stables, Residential Accommodation, Recreation and Horse Agistment.

Amendments to this scheme and environmental approval by the Minister for the Environment are required before approval for the provision of strata titles to the site is granted by the Minister for Planning.

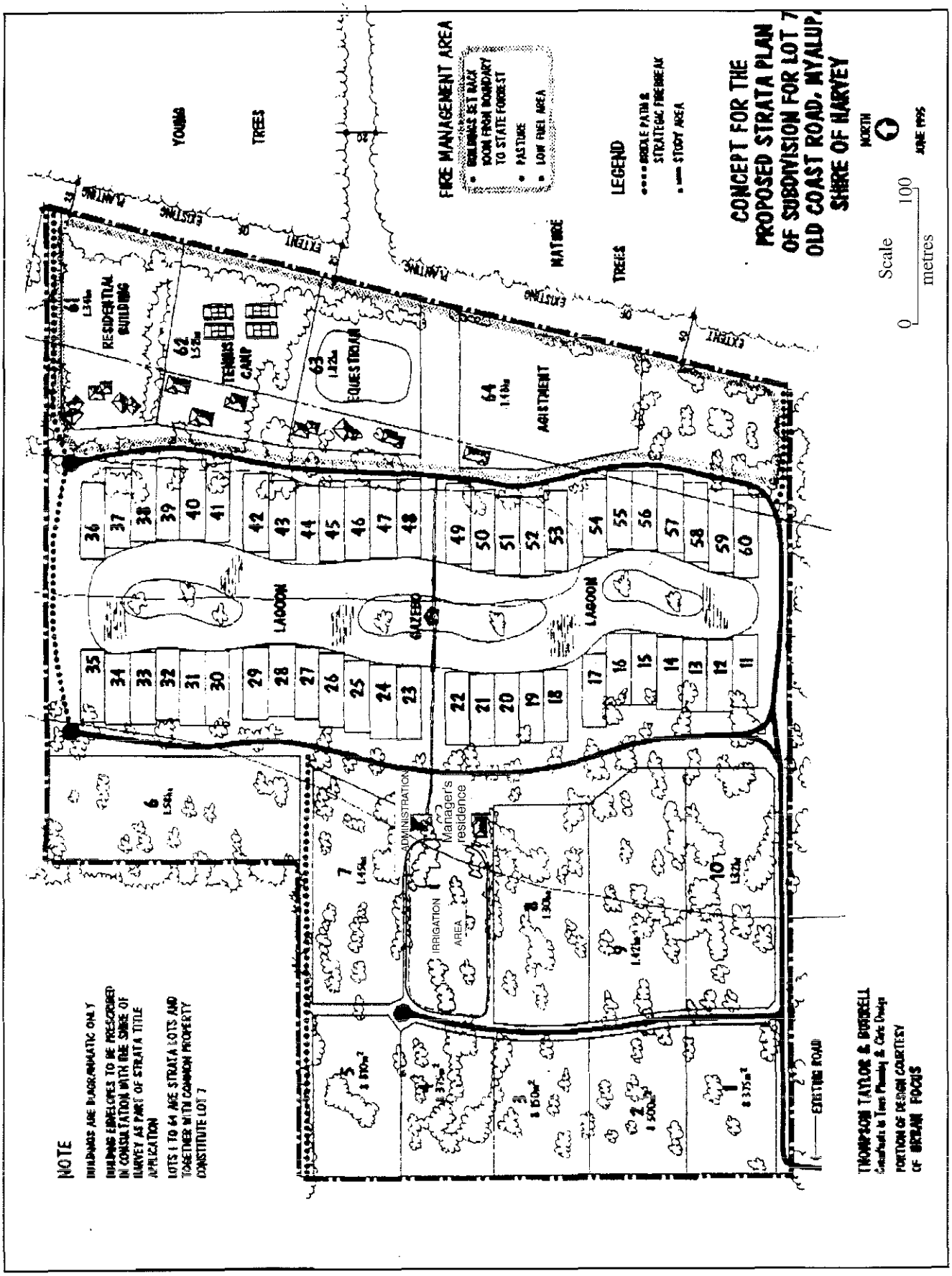

Figure 2. Site development plan — Remlap Ranch Resort (Source: LeProvost Dames and Moore 1995).

TABLE 1

SUMMARY OF ADVICE TO THE ENVIRONMENTAL PROTECTION AUTHORITY

CATEGORY	TOPIC OF CONCERN	PRESENT STATUS	PROPOSED ACTION	PROPOSED MANAGEMENT	PREDICTED OUTCOME
Physical	Groundwater Abstraction	Current use low-moderate	To utilise WAWA approved total of 38,800 L per annum. Additional bore to be installed.	Use of dry landscaping techniques and planting of native species. Groundwater levels to be monitored.	No groundwater use impacts on other users adjacent to the site. Water use within allowable limits.
	Spoil Disposal	None	Lagoon to be created with a cut and fill operation. Spoil spread and compacted over proposed development areas. Topsoil separately stockpiled and reused.	Runoff and sediment contained in lagoon basin. Spoil area levelled and seeded. Use of silt traps as appropriate. Suspended solids settled out.	No erosion or sedimentation.
	Drainage and Stormwater Disposal	Soils possess high permeability and assist infiltration of rainfall. No current need for stormwater disposal.	Incorporation of water sensitive urban design principles to reduce runoff.	Groundwater and lake water quality monitored.	Drainage and runoff effects to be minimal.
	Modification/loss of EPP Lakes dampland through creation of lagoon.	Dampland extremely degraded. In reality dry pasture for most of the year.	Creation of lagoon to simulate natural wetland processes and function as a self-maintaining aquatic system.	Landscaping of islands and banks to be suitably graded to allow establishment of fringing vegetation and littoral zones. Preservation and replanting of vegetation as required.	Net gain - a significantly enhanced permanent wetland feature created.

TABLE 1

SUMMARY OF ADVICE TO THE ENVIRONMENTAL PROTECTION AUTHORITY

CATEGORY	TOPIC OF CONCERN	PRESENT STATUS	PROPOSED ACTION	PROPOSED MANAGEMENT	PREDICTED OUTCOME
Pollution	Groundwater and lake water contamination	Relatively high concentrations of total iron and total phosphorus present in groundwater	Creation of well vegetated (fringing and littoral zone) wetland feature to act as nutrient sink.	Efficient use of fertilisers through appropriate landscaping. Monitoring of water (groundwater and lagoon) quality.	Nutrient contamination expected to be minimal.
	Effluent Disposal	Not applicable	Installation of advanced environmentally benign package waste treatment systems. Alcoa red mud amended irrigated disposal area west of lagoon.	Ongoing management.	No contamination from effluent disposal or nil contamination of either surface or groundwater.

TABLE 1

SUMMARY OF ADVICE TO THE ENVIRONMENTAL PROTECTION AUTHORITY

CATEGORY	TOPIC OF CONCERN	PRESENT STATUS	PROPOSED ACTION	PROPOSED MANAGEMENT	PREDICTED OUTCOME
Biological	Habitat loss	Marginal existing habitat value.	Diverse habitats to be created.	Additional native planting. Controlled human use and access of wetland surrounds. Permanent on-site management present.	Substantial gain in habitat.
	Loss of native flora	Predominance of pasture and nuisance species.	Preservation of some suitable native species as appropriate.	Additional planting as required using indigenous species.	Substantial net increase in fringing wetland species.
	Fauna	Marginal benefit during spring/early summer.	Permanent waterbody with island refuges and vegetated littoral zones.	Controlled human use of surrounds. Permanent on-site management.	Increase in waterbird usage. Possible introduction-colonisation by other fauna e.g. long necked tortoise.
Social	Landscape Values	Open seasonal pasture landscape - no significant value.	Creation of tourist attraction centred on vegetated wetland.	Ongoing management of improvements.	Creation of landscape interests. Net gain in visual landscape value.
	Recreation/Public Access	Restricted private land.	Creation of access and public facilities.	Ongoing management presence.	Net increase in recreation and controlled public access.

3. Identification of issues

3.1 Description of methodology

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

A set of administrative procedures has been defined (refer to flow chart in Appendix 1) in order to implement this method of assessment.

The first step in the method is to identify the environmental topics to be considered. A list of topics (or possible issues) is identified by the Environmental Protection Authority through the preparation of guidelines that are referred to relevant agencies for comment prior to being finalised.

In the next main step these topics are considered by the proponent in the Consultative Environmental Review both in terms of identifying potential impacts as well as making project modifications or devising environmental management strategies. The Consultative Environmental Review document is prepared in accordance with the Environmental Protection Authority's guidelines, and is then checked to ensure that each topic has been discussed in sufficient detail by the proponent prior to release for government agency and public comment. The submissions received are summarised by the Department of Environmental Protection on behalf of the Environmental Protection Authority. This process can add environmental topics that need to be considered in terms of the acceptability of potential environmental impact.

Proponents are invited to respond to the issues raised in submissions. Appendix 2 contains a summary of the issues raised in submissions and the proponent's response to those issues. A list of submitters appears in Appendix 3. Three submissions were received, of which two were from government agencies and one from a member of a conservation group. The proponent's revised commitments following their response appear in Appendix 4.

This information, namely the Guidelines, the proponent's Consultative Environmental Review, the submissions and the proponent's response to these issues, are then subjected to analysis by the EPA. Each environmental topic is reviewed to determine if it represents an issue requiring further evaluation by the EPA. For each environmental issue, an objective is defined and an appropriate evaluation framework is identified.

The expected environmental impact of the proposal, with due consideration to the proponent's commitments to environmental management, is then evaluated against the assessment objective. The Environmental Protection Authority then determines the acceptability of the environmental impact. Where the proposal, as defined by the proponent, 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 preparation of the Consultative Environmental Review document by Department of Environmental Protection officers 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 proposal from the public, community groups, and local and State government agencies. During the public submission period, 3 submissions were received. A summary of these submissions was forwarded to the Proponent for response. The Proponent also received copies of the full submissions from each State Government agency. Submissions received by the Environmental Protection Authority were within the following categories:

- 1 from a conservation group; and
- 2 from State and other government agencies

The principal topics of concern raised in public submissions included:

- impact on damplands;
- impact on vegetation and fauna;
- nutrient enrichment;
- groundwater quality; and
- mosquito management.

The Environmental Protection Authority has considered the submissions received and the proponent's response as part of the assessment of this proposal.

3.3 Review of topics

Based upon the EPA Guidelines, the proponent's Consultative Environmental Review, and public submissions the following topics were identified as primary concerns of the Environmental Protection Authority in assessing the proposal. These are identified in Table 2. These topics are listed below and those representing issues requiring further evaluation by the EPA are identified.

BIOPHYSICAL IMPACTS

Impact on damplands:

> Impact on a degraded wetland which is included within the Lakes EPP to create an artificial lagoon.
>
> This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.1.

Impact on native vegetation and fauna:

> Impact on permanent and fringing vegetation around the dampland through the excavation of the wetland and construction of the chalet development.
>
> This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.2.

POLLUTION ISSUES

Nutrient Enrichment:

> Nutrient enrichment of the lagoon and groundwater through effluent disposal of wastewater from development and nutrient runoff into the lagoon.
>
> This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.3.

Surface Water Management:

> Management of stormwater runoff.

Table 2. Identification of topics and issues which require Environmental Protection Authority evaluation.

TOPICS	PROPOSAL CHARACTERISTICS	GOVERNMENT AGENCY'S COMMENTS	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Biophysical impacts				
Impact on damplands	Creation of artificial lagoon in Lakes EPP area.	DEP concern regarding impact on EPP lake	Concern regarding impact on EPP lake	Requires evaluation by the EPA.
Impact on native vegetation and fauna	Proposal will involve the clearing of some native vegetation around artificial lagoon, but will involve replanting native vegetation around the artificial lagoon, which will result in an increase in permanent vegetation. Greater habitat diversity to encourage water bird and fauna use.	DEP notes existing site is a degraded pasture.	Concern over winter wetlands as significant bird breeding sites, disturbance of wading birds, and retention of remnant vegetation	Requires evaluation by the EPA.
Pollution issues				
Nutrient management	Waste water treatment for site by packaged treatment systems is proposed. Land use has potential to produce nutrient input.	Licence required from Health Dept. of WA. DEP concern regarding potential for nutrient enrichment of EPP lake	Nutrient enrichment of lagoon waters.	Requires evaluation by the EPA.
Surface water runoff management	Stormwater runoff from hard surfaces.	DEP concern regarding potential nutrient runoff into EPP lake		Requires evaluation by the EPA.
Groundwater quality	Use of groundwater by development, and potential impact on adjacent land users.	DEP concern regarding high phosphorus concentration of groundwater and potential to cause lagoon eutrophication and nutrient transport to neighbouring properties.	Concern over responsibility for monitoring after 3 year period expires, increased nitrogen levels, and nutrient contamination of Lake Preston	Requires evaluation by the EPA.

Table 2. Identification of topics and issues which require Environmental Protection Authority evaluation (cont'd).

Social surroundings				
Groundwater abstraction.	Irrigation and potable water supply requirements, and potential impact on adjacent land users..	Licence required for bore from Water and Rivers Commision.		Requires evaluation by the EPA.
Public access	New road extension requirement to allow for public access to the site.	Approval of Shire of Harvey required.		Topic covered by Shire of Harvey planning requirements. Does not require detailed evaluation by the EPA.
Mosquito management	Proposal involves excavation of lake which may create a mosquito habitat	HDWA concerned over mosquitoes breeding, and potential for Ross River virus in lake.	Concern over mosquito control program and use of insecticides	Requires evaluation by the EPA.
Potable water	Groundwater treatment by aeration and chlorination to produce potable water for resort residents.	Approval of HDWA required.		Topic covered by HDWA requirements. Does not require detailed evaluation by the EPA.

This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.4.

Groundwater Quality:

Potential impact on groundwater quality as a result of proposed land use.

This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.5.

SOCIAL SURROUNDINGS

Groundwater Abstraction:

Potential impact on groundwater quantity as a result of groundwater abstraction.

This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.6.

Public Access:

Public access to the development through the construction of an access road.

This issue is considered to be adequately addressed by the proponent, and in planning requirements of the local authority. This does not warrant detailed assessment by the Environmental Protection Authority.

Mosquito management:

Potential mosquito problem through the construction of a lagoon, and consequent impact of insecticides.

This topic requires the Environmental Protection Authority's evaluation which is contained in Section 4.7

Potable water:

Treatment of groundwater to provide potable water for resort residents.

This topic is considered to be adequately addressed by requirements of the Health Department of WA and compliance with the "Australian Drinking Water Guidelines". This does not warrant detailed assessment by the Environmental Protection Authority.

4. Evaluation of issues

The Environmental Protection Authority has considered the topics raised during the environmental impact assessment process including matters identified in public submissions. Table 2 summarises the topics raised, the characteristics of the proposal and the comments received in order to identify issues warranting evaluation. The Environmental Protection Authority (EPA) has evaluated the following key environmental topics arising from this proposal, based on existing information and advice from other Government agencies:

- impact on the damplands;
- impact on the native vegetation and fauna;
- nutrient enrichment;
- surface water management;
- groundwater quality;
- groundwater abstraction; and
- mosquito management.

The EPA considers that other topics raised during the environmental impact assessment process can either be appropriately managed by the proponent in accordance with their environmental management commitments (Appendix 4), or are issues which should be dealt with by the proponent in concert with other agencies.

In giving advice regarding the environmental acceptability and management requirements for the Remlap Ranch Resort, the Environmental Protection Authority has assessed the above key environmental issues in relation to the proposal outlined by Greenvale Enterprises Pty Ltd.

4.1 Impact on the damplands

4.1.1 EPA objective

The Environmental Protection Authority's objective is to ensure that key wetland functions on the site are retained or enhanced as a result of the development.

4.1.2 Policy framework

Environmental Protection (Swan Coastal Plain Lakes) Policy 1992

The purpose of this policy is to protect the environmental values of lakes on the Swan Coastal Plain. In December 1992 the dampland was surveyed by the EPA. The EPA concluded that it met the water permanency criteria and was listed for inclusion in the Policy. This Policy states that there should be no filling, mining, drainage into or out of and effluent discharge into these lakes.

Environmental Protection Authority Bulletin 686 (1993) "A Guide to Wetland Management in the Perth and Near Perth Swan Coastal Plain Area ."

This bulletin provides a framework for identification of management objectives in the defined region to ensure their natural and human use values are maintained or improved. The wetland evaluation method contained in this document is based on wetlands having a number of human and natural use attributes which determine the environmental value of the wetland. There are 5 management categories as follows:

- Category H: High conservation, where these wetlands score highly on both natural and human use attributes.
- Category C: Conservation, where these wetlands primarily score highly on the natural attributes scale.
- Category O: Conservation and recreation, where these wetlands score highly on the human use scale.
- Category R: Resource enhancement, where these wetlands score moderately on both natural and human use attributes.
- Category M: Multiple use, where these wetlands score poorly on both natural and human use attributes.

4.1.3 Technical information

Gutteridge Haskins and Davey Pty Ltd (1994) Proposed Reinstatement of the Denigrated Wetland Area for Remlap Ranch Resort in Myalup.

A wetland assessment was undertaken on behalf of the proponent by Gutteridge Haskins and Davey Pty Ltd in July 1994 of the dampland. The document described the proposed rehabilitation of the wetland on the site.

4.1.4 Comments from key government agencies

The Department of Environmental Protection (DEP) expressed concern that the proposed development will involve the excavation of the dampland, which is included within the Lakes EPP Policy, and is contrary to the intent of this policy.

4.1.5 Comments from public submissions

One submission expressed concern that the development is about modification of an EPP wetland, and is likely to totally destroy the existing dampland and create an artificial wetland that will require constant maintenance. It was also claimed that the existing dampland is already modified wetland and probably has an ecological function in the heavily modified environment surrounding the area. The submission expressed doubt that the artificial wetland would result in a better wetland for conservation given the proposed use of the new wetland.

4.1.6 Response from the proponent

The proponent points out in its response that:

- the wetland will be modified to create an artificial lagoon. The resulting environmental quality and ecological value of the lagoon following this modification are considered to be significantly greater than the existing environmental values of the dampland.

- short and long term management undertakings, such as strata titling of lots and a formal management arrangement to maintain the natural elements of the development will ensure that the environmental values of the lagoon are enhanced (Commitment 9, Appendix 4).

- a commitment has been made to implement the artificial wetland design with minimal construction impacts; retention of native vegetation; replacement of vegetation removed as a result of the construction of the resort; planting of littoral vegetation around the lagoon, but keeping fringing areas of shallow water sedge or reeds to a minimum; landscaping of lagoon and banks; amending the lagoon bottom to encourage invertebrate activity; controlling public access to island habitats, and a commitment to prepare an environmental management programme to monitor groundwater and lagoon water quality and monitor vegetation and wetland enhancement (Commitments 1 to 7, 16, 17 and 18 to 21, Appendix 4).

- The dampland has, at best, limited value in winter only, as it is dry and heavily grazed by stock in summer.

- an artificial wetland already exists immediately to the south of the development site. To the proponent's knowledge, this wetland has not required constant maintenance and provides a valuable drought refuge for ducks and waders during summer. The proposed artificial lagoon has been specifically designed to function as a natural wetland system with low maintenance requirements.

4.1.7 EPA's evaluation and conclusions

The dampland is a seasonally waterlogged wetland, which is in a degraded state as a result of past land use including filling, grazing and mineral sand mining activities. It is estimated that 50% of the dampland has been modified and 50% of the natural vegetation cover removed. The dampland classification is 'Multiple Use' ie Category M (EPA Bulletin 686).

An artificial lagoon is proposed to be created by excavating the existing dampland to a depth of 2 metres. The proposed lagoon is expected to improve the biological function of the lake and create a balanced 'self maintaining' wetland. The DEP expects the restored environmental value

of the lagoon to result in a wetland assessment classification of 'Resource Enhancement' Category R (EPA Bulletin 686).

The EPA notes the proponent's commitments in relation to dampland enhancement, and concludes that the proposed artificial wetland design and management is likely to improve the ecological functions of the wetland.

4.2 Impact on native vegetation and fauna

4.2.1 EPA objective

The Environmental Protection Authority's objective is to:

- conserve existing and increase permanent and fringing vegetation; and
- encourage water bird use and have other fauna recolonise the new environment.

4.2.2 Policy framework

Environmental Protection (Swan Coastal Plain Lakes) Policy 1992

See Section 4.1.2.

Environmental Protection Authority Bulletin 686 (1993) "A Guide to Wetland Management in the Perth and Near Perth Swan Coastal Plain Area."

See Section 4.1.2.

4.2.3 Technical information

Remlap Ranch Resort CER document (LeProvost Dames and Moore, 1995)

A site survey undertaken by the proponent, during preparation of the CER document, found that the existing property includes degraded vegetation of the Yoongarillup Association, which includes wetland vegetation and several woodland associations. The degradation of vegetation is attributed by the proponent to past sand mining, livestock grazing and filling of the dampland.

The degraded nature of the wetland was not considered by the proponent to warrant a site fauna survey. From ecological advice received and examination of aerial photographs the dampland may support some waterbird life in winter.

Gutteridge Haskins and Davey Pty Ltd (1994) Proposed Reinstatement of the Denigrated Wetland Area for Remlap Ranch Resort in Myalup.

See Section 4.1.3.

4.2.4 Comments from key government agencies

DEP notes that the existing site is in a degraded state as a result of past land use.

4.2.5 Comments from public submissions

One submission expressed concern that no fauna survey had been carried out and that winter wetlands are now recognised as significant breeding sites for waterbirds. It was claimed that the number of chalets, a walking bridge, proposed other uses of the surrounding land and recreational activities will disturb wading birds.

It was also stated that the proponent should be required to retain all remnant vegetation, particularly the area in the north eastern corner of the site.

4.2.6 Response from proponent

The proponent in their response pointed out the following:

Impact on vegetation:

- The Proponent is committed to the conservation of existing native vegetation on the site where appropriate and possible, and all native vegetation removed will be replaced. The portion of the dense thicket of *Agonis flexuosa, Astartea fascicularis, Eucalyptus rudis, Melaleuca rhaphiophylla* and *Oxylobium lanceolatum* occurring in the north east corner that is removed, as a result of the development, will be replaced with species common to the Yoongarillup Plain. It is estimated that the mature artificial wetland should result in a net gain of the combined area of permanent wetland and fringing vegetation compared to the extent of the current Remlap dampland vegetation (Commitments 3 to 6 and 17, Appendix 4).

- The Proponent is committed to controlling or restricting public access to the island habitats (Commitment 16, Appendix 4).

- The proponent will prepare an Environmental Management Plan to monitor the success of vegetation establishment (Commitment 20, Appendix 4).

Impact on fauna:

- Although winter wetlands are recognised as breeding sites for waterbirds and it is cited in Appendix C of the CER document that the site "may be used by some waterbirds when inundated in winter", the level of use is likely to be low due to the extremely degraded and artificial nature of the dampland. The Proponent also stated that no open water was observed by them, during site visits conducted in May and June 1995, and no waterbirds were sighted. No fauna survey was conducted by the proponent because it was obvious to them that very little natural wildlife habitat occurred within the dampland.

- The proponent is committed to prevent waterbird disturbance (through restricted public access to the island habitat) and undertakes to encourage awareness of the ecological value of waterbird habitat through the "provision of interpretative signs to inform occupiers of the value of wetland processes and conservation of fauna habitats". It is considered unlikely by the Proponent, that the daily activities of the Remlap Ranch Resort will disturb wading birds to any significant extent. The concept of the resort is to provide accommodation in a rural setting centred around an artificial wetland, designed to maximise natural values. As the natural values of the artificial wetland are the primary attraction of the resort, it is in the proponent's interest to prevent disturbance of waterbirds as far as possible (Commitment 16, Appendix 4).

- The proponent is committed to encourage water bird use and have other fauna recolonise the new environment (Commitment 7, Appendix 4).

4.2.7 EPA's evaluation and conclusions

Vegetation:

The EPA notes that the existing dampland is a seasonally waterlogged wetland, which is in a degraded state as a result of past land use including filling, grazing and mineral sand mining activities. It is estimated that 50% of the natural vegetation cover has been removed.

The EPA notes the proponent's commitments in relation to re-establishing native vegetation on site, and has concluded that there will be a significant increase in permanent and fringing vegetation.

Fauna:

It is noted that the development site is presently in a degraded state, and that the site is unlikely to be a significant habitat for native fauna.

It is expected that during construction any fauna that are on the site will find refuge in those areas of dampland vegetation being retained. On completion of construction, the EPA concludes that there will be greater habitat diversity, which should encourage water bird use and allow other fauna present to recolonise the new environment created.

4.3 Nutrient management

4.3.1 EPA objective

The Environmental Protection Authority's objective is to prevent nutrient enrichment of the lagoon and groundwater by wastewater.

4.3.2 Policy framework

Treatment of Sewage and Disposal of Effluent and Liquid Waste Regulations

The Health Department of Western Australia (HDWA) has primary responsibility for the management of sewage treatment and effluent disposal in Western Australia. These regulations identify acceptability criteria with which treated waste water must comply before it is permitted to be discharged.

4.3.3 Technical information

Remlap Ranch Resort CER document (LeProvost Dames and Moore , 1995)

The CER states that a septic tank and leach drain or a waste treatment system is proposed to be used for sewage and waste disposal on lots 1 to 10, 63 and 64 (lots with 3 bedroom dwellings ranging in size from 8150 square metres to 1.82 ha). Waste water originating from the remaining lots is proposed to be treated by effluent disposal/wastewater treatment systems. A projected peak population of 350 people is anticipated.

Soils of three different types occur across the site and are identified in the CER as being highly permeable and capable of retaining minimal phosphorus loads.

Semeniuk, V., (1990) "The Geomorphology and Soils of the Yoongarillup Plain in the Mandurah to Bunbury Coastal Zone, South - Western Australia: A Critical Appraisal. Journal of the Royal Society of Western Australia 73: pp. 1 - 7.

This document describes the geomorphology and soils of the Yoongarillup Plain in the Mandurah to Bunbury coastal zone, and in particular, the soil on which the proposed resort development is located. The site comprises two geomorphic units which relate to the topography. These units are the:

- Yoongarillup Plain: The low lying dampland and remaining land west of the site belong in the Yoongarillup Plain, which extends longitudinally parallel to the coast between Mandurah and Bunbury, is approximately 5 km wide with the Quindalup Dune System to the west and the Spearwood Dune System to the east, and is characterised by shallow yellow and brown sands over marine limestone.
- Spearwood Dune System: The eastern ridge of the site belongs to the Spearwood Dune System which is characterised by deep yellow sands over limestone associated with the Karrakatta Association.

4.3.4 Comments from key government agencies

The Health Department of WA (HDWA) has not yet given approval to the proposed wastewater effluent system. To get this approval the proponent needs to:

- demonstrate that the site is suitable for onsite effluent disposal;
- carry out testing to prove the effective life of the amended soil;
- carry out testing for the phosphorus retention capabilities of the amended soil and replace or establish a new disposal area if it proves ineffective;
- establish management responsibility for the system and establish a maintenance program to carry out the following:
  - monthly maintenance;
  - quarterly sampling of BOD_5/Suspended Solids and;
  - bacteriological counts and annual analysis of the Phosphorus Retention Index (PRI) of the amended soils in the irrigation areas.

HDWA suggested that it may be worthwhile in considering the above requirements to install instead a wastewater treatment system with nutrient removal capabilities in the unit.

The DEP expressed concern that the proposed development has the potential to cause nutrient enrichment of the lagoon which is an EPP wetland.

4.3.5 Comments from public submissions

One submission stated that sewage and waste disposal should be carried out using the bioMax or an equivalent system and the proposed alternative septic tank and leach drains for lots 1 to 10, 63 and 64 is unacceptable in view of potential water quality impacts within the lagoon.

4.3.6 Response from the proponent

The proponent in their response pointed out that:

- the approval of the wastewater effluent disposal method is required by the Health Department. The Health Department had indicated that they had no objections to the proposal in principle, provided that specific requirements could be met as a detailed development proposal required through the Planning process.

- there is no commitment to using a bioMax or an equivalent waste treatment system for lots 1 to 10, 63 and 64. The proponent considers there is an adequate horizontal separation of 2 metres achievable between the nominated septic systems and the artificial wetland; further the groundwater flow is westwards ie away from the artificial wetland for lots 1 to 10; the use of red mud for amendment and the planting of nutrient retaining vegetation on the common effluent disposal area is anticipated to prevent nutrient contamination of the lagoon and groundwater by wastewater (Commitments 12 and 13, Appendix 4).

A contingency plan is also to be provided by the proponent in the event of a sewage pump station malfunction (Commitment 14, Appendix 4).

The proponent proposes that:

- lots 1 to 10, 63 and 64 each have a small garden bed of nutrient retaining native vegetation as an effluent disposal method to prevent nutrient enrichment of groundwater from the leach drains;
- all other lots have as their effluent disposal method, a common irrigation area (from the waste water treatment plant packages) located between lots 7 and 8 (Figure 2) and west of the lagoon with nutrient retaining vegetation; and

- phosphorus loss being prevented from these effluent disposal areas by soil amendment using red mud with a 99% adsorption rate of total phosphorus and significant utilisation of total nitrogen being claimed by the proponent, which will limit nutrient output in the development.

(Commitments 12 and 13, Appendix 4)

An EMP is to be provided by the proponent which incorporates a contingency plan in the event that water quality in the lagoon declines (Commitment 20, Appendix 4).

4.3.7 EPA evaluation and conclusions

The EPA notes that the existing dampland has low capacity to efficiently strip nutrients, and has a low phosphorus absorbing capacity. There is therefore potential for nutrient enrichment of the lagoon and groundwater to occur by wastewater contamination.

The EPA notes the proponent's commitments to amend the soils and improve nutrient retention capacity through red mud amendment of these areas; planting native vegetation and the use of wastewater treatment systems complying with the requirements of the HDWA. The EPA considers that the implementation of these commitments are adequate to ensure that excessive amounts of nutrient will not lead to nutrient enrichment of the lagoon and groundwater beneath the site.

4.4 Surface water management

4.4.1 EPA objective

The Environmental Protection Authority's objective is to minimise impact on the natural groundwater levels, manage surface water runoff and maximise recharge to the aquifer.

4.4.2 Policy framework

Department of Planning and Urban Development, the Water Authority of WA and the Environmental Protection Authority (1993) Planning and Management Guidelines for Water Sensitive Urban (Residential) Design.

These guidelines were prepared to assist in the implementation of water sensitive design with the objectives of managing water balances, maintaining and where possible enhancing water quality, encouraging water conservation, maintaining water related environmental values and maintaining water related recreational and cultural values.

4.4.3 Technical information

Remlap Ranch Resort CER document (LeProvost Dames and Moore , 1995)

The CER states that stormwater runoff to prevent nutrient entering the lagoon will be managed using vegetated swales positioned between each chalet to intercept surface runoff from the grassed and hard paved areas at the rear of each chalet.

4.4.4 Comments from key government agencies

The DEP was concerned about the potential nutrient runoff into the lake, which is an EPP wetland.

4.4.5 Response from proponent

The proponent in their response pointed out that a commitment has been made to ensure surface water, such as in stormwater or irrigation runoff is proposed to be minimised and recharge to the aquifer maximised by:

- the lots and roads having grassed swale drains, culverts and dispersion into landscaped areas;
- roads being of crushed limestone construction to aid infiltration of rainfall; and
- runoff from building roofs collected in holding tanks and dispersed onto landscaped areas.

(Commitment 11 Appendix 4).

4.4.6 EPA evaluation and conclusions

The EPA considers that surface water from irrigation and stormwater flows needs to be retained on site to avoid off-site pollution.

The EPA notes the proponent's commitments to use grassed swale drains, culverts, dispersion into landscaped areas, provision of crushed limestone access roads to encourage recharge to the aquifer, collection from buildings and dispersion of runoff which is expected to avoid direct surface runoff into the lagoon.

The EPA notes the proponent's commitment in relation to surface water management and has concluded that the surface water management as proposed to minimise impact on the natural groundwater levels, manage surface water runoff and maximise recharge to the aquifer is environmentally acceptable.

4.5 Groundwater quality

4.5.1 EPA objective

The Environmental Protection Authority's objective is to ensure that the groundwater quality beneath the site is protected.

4.5.2 Policy framework

"National Water Quality Management Strategy - Australian Water Quality Guidelines for Fresh and Marine Waters" Australia and New Zealand Environment and Conservation Council (1992)

These guidelines specify indicators for the protection of fresh water aquatic ecosystems.

4.5.3 Technical information

Deeney A. C. 1989. Geology and groundwater resources of the superficial formations between Pinjarra and Bunbury, Perth Basin. Geological Survey of WA , Report 26, Professional Papers: pp 31 - 57.

This document describes the geology and hydrogeology of the superficial formations of the coastal plain between Pinjarra and Mandurah, and in particular the hydrogeological formations on which the proposed resort development is located. The site comprises two hydrogeological formations in vertical succession, these being the:

- superficial formation occurring from ground level to 30 metres below the surface, which is of Quaternary age and consists mainly of sand overlaying calcarenite.

- Leederville Formation occurring from a depth of 30 to 150 metres below ground level, which is of Cretaceous age and is composed of interbedded sandstone, siltstone and shale.

Groundwater is described as being predominantly of the sodium chloride type, with high iron content requiring treatment before use as potable water.

Report Remlap Ranch Resort Soil and Groundwater Investigation (LeProvost Dames and Moore 1995)

Information contained in this report was presented in the CER document. The report provided groundwater quality analyses for site boreholes and indicated that:

- total iron concentrations were high when compared with the criteria in the "Australian Water Quality Guidelines for Fresh and Marine Waters"; and
- phosphorus concentrations on the eastern side of the dampland have the potential to cause eutrophication in shallow open water bodies.

4.5.4 Comments from key government agencies

The DEP:

- notes the high phosphorus concentration of the groundwater on the eastern side of the dampland and the potential to cause eutrophication in shallow open water bodies; and
- expressed concern at the potential for nutrient transport to adjacent land users.

4.5.5 Comments from public submissions

Concern was expressed in a submission regarding:

- who will take responsibility after the 3 year monitoring period has expired for the groundwater and lagoon water and for the longer term impacts and the remedial action required if there are adverse environmental impacts;
- levels of nitrogen that will be released into the environment. The proponents will only 'encourage' residents to use native plants and slow release fertilisers. An environmental condition should be imposed to ensure that this does happen;
- the proponent is unable to guarantee water quality criteria levels proposed will be achieved; and
- future nutrient contamination of Lake Preston/Yalgorup National Park (Locality C54 "The Darling System - System 6 Report") which lies approximately 2 km to the west of the site is likely to occur since regional groundwater flow is from east to west.

4.5.6 Response from the proponent

The proponent in their response pointed out that:

- responsibility will be taken to monitor groundwater for a 5 year period following construction (Commitment 18, Appendix 4) .
- the responsibility for the longer term impacts and the remedial action required if there are adverse environmental impacts (ie after 5 years) is addressed through the proponent's commitments to "prepare and implement an Environmental Management Plan (EMP) for the management of the lagoon, and to submit the draft EMP to the DEP and CALM for approval prior to implementation" (Commitment 18 and 20, Appendix 4). The lots are to be strata titled and environmental responsibility will be transferred to the strata company when it comes into operation.
- a commitment has been made to ensure that the preservation of existing vegetation, use of dry landscaping methods, and planting of species native to the site will occur, wherever

possible and as appropriate, with the advice of CALM and to the satisfaction of the DEP (Commitment 17, Appendix 4).

- a commitment has been made to ensure that the groundwater and wetland water quality are monitored and maintained to the specified indicators for the protection of fresh water aquatic ecosystems in the "Australian Water Quality Guidelines for Fresh and Marine Water", for 5 years following construction. Following the 5 year monitoring period, maintenance of water quality of the wetland will be further addressed by the proponent undertaking to prepare and implement an EMP for management of the artificial wetland (Commitments 18, 20 and 21, Appendix 4).
- there is virtually no possibility of nutrient transport from the Remlap Ranch Resort to the Lake Preston/Yalgorup National Park because of the following:
  - nutrient load from the Remlap Ranch Resort is expected to be far less than the current heavy stocking rates;
  - if a plume of significant nutrients were to be identified it would take more than 25 years for the plume to reach Lake Preston;
  - groundwater monitoring bores have been installed on the western boundary of the site for the purpose of detecting any nutrient flow westward off the site so that appropriate action may be taken in the event that nutrients are detected; and
  - over such a long period of time the biological activity in the soil would remove part of a nutrient plume, and the effects of changes in land use and impact of other land use activities would far outweigh any concern to Lake Preston that the Remlap Ranch Resort would impose.
- a commitment has been made to restrict the use of fertilisers by implementing a Nutrient Management Plan (NMP) which will:
  - recommend use of low water/nutrient requirement grass/vegetation types;
  - provide management strategies to minimise nutrient export from the chalet sites;
  - provide an annual fertiliser application audit; and
  - restrict fertiliser applications on garden and landscaped areas.

  (Commitment 9, Appendix 4).
- a commitment has been made in relation to the lagoon water to:
  - retain phosphorus in the vegetation surrounding the wetland making eutrophication unlikely to occur in the lagoon and the groundwater, and monitoring lagoon water quality to give early warning of the onset of eutrophication;
  - install three additional groundwater bores on the site property boundary to monitor groundwater quality entering and leaving the property;
  - limit general algal growth by the low levels of total nitrogen present in the groundwater; and
  - meeting the "Australian Water Quality Guidelines for Fresh and Marine Waters" specified quality indicators for the protection of fresh water aquatic ecosystems.

  (Commitment 18, Appendix 4).
  - remedy any deterioration in the lagoon water quality such as in the occurrence of algal blooms, malodours, odour complaints and other nuisance symptoms (eg midges, weed growth, etc); and
  - establish vegetation around the foreshore and islands.

  (Commitment 20 and 21, Appendix 4).
- a commitment has been made to determine whether further monitoring is warranted after 5 years following construction of the development, by auditing of monitoring and management programme results (Commitment 22 and 23, Appendix 4).

4.5.7 EPA evaluation and conclusions

The EPA notes that the groundwater beneath the site has high total iron and phosphorus concentrations and that the concentration of phosphorus has the potential to cause eutrophication in shallow open water bodies. The lagoon can be considered as a surface expression of the groundwater, in that in addition to receiving water directly from rainfall on the surface, it is also received from seepage from the shallow unconfined aquifers in this region.

The EPA notes that the high levels of phosphorus in the groundwater are expected to be retained in the vegetation surrounding the wetland, general algal growth will be limited by low levels of total nitrogen present in the groundwater, restrictions are to be placed on fertiliser usage, groundwater quality leaving the site boundary is to be monitored, and a contingency plan will be implemented if deterioration of the groundwater or lagoon water quality occurs.

The EPA notes the proponent's commitments in relation to ensuring that eutrophication of the lagoon will be prevented and algal growth limited in the lagoon, and the protection of groundwater beneath the site and has concluded that this issue can be appropriately managed by the proponent through the implementation of commitments.

4.6 Groundwater abstraction

4.6.1 EPA objective

The Environmental Protection Authority's objective is that there are no adverse groundwater quantity impacts beyond the site boundary.

4.6.2 Policy framework

Rights In Water Irrigation Act (1914)

The Water and Rivers Commission (WRC) has primary responsibility for the management of water resources and licensing of bores in Western Australia.

4.6.3 Technical information

Remlap Ranch Resort CER document (LeProvost Dames and Moore, 1995)

The CER states that:

- the proposed development is anticipated to require 38,800 kilolitres of water per annum (allowing for full resort capacity of 350 persons at 200 litres per day per person or 70 kilolitres per day, and allowing for irrigation at an abstraction rate of 200 kilolitres per day);
- lagoon water levels are predicted to decline 150 mm on a worst case scenario of a summer period of 200 days;
- there is likely to be a calculated draw down of: 100 mm at 200 m from the bore, or 200 mm at 35 m from the bore; and
- the proponent will monitor the groundwater and lagoon water levels at quarterly intervals, reporting results annually to the DEP and WRC for a period of 5 years following completion of the development construction, so as to ensure that there are no adverse groundwater impacts beyond the site boundary.
- The nearest adjacent property owner's bores as indicated in the CER, will probably be those of the proponent (depending on the final site bore location), which are located in the adjacent:
    - Emutech Property in which there is a single bore approximately 50 metres south of the development site boundary; and

- Remlap Ranch Stud in which there is a single bore 440 metres west of the development site boundary.

4.6.4 Comments from key government agencies

A licence is required by the WRC for groundwater abstraction.

4.6.5 Response from the proponent

The proponent in their response pointed out that responsibility will be undertaken to:

- monitor the groundwater and lagoon water levels at quarterly intervals, reporting results annually to the DEP and WRC for a period of 5 years following completion of the development construction, so as to ensure that there are no adverse groundwater impacts beyond the site boundary (Commitment 19 Appendix 4).
- reduce site groundwater abstraction if adjacent property owner's bores suffer a reduction in groundwater levels or a quantity reduction (Commitment 20 and 21, Appendix 4);
- monitor the site bore abstraction rate and rainfall received, including reporting to the DEP on whether the drought predictions made in the CER were accurate (Commitment 20 and 21, Appendix 4).

4.6.6 EPA evaluation and conclusions

The EPA notes that the proponent proposes to establish a bore to the superficial aquifer to provide an irrigation and potable water supply for the resort development. A licence from the Water and Rivers Commission is proposed to be obtained.

The EPA considers that groundwater abstraction is unlikely to have a significant impact on adjacent property owner's bores.

The proponent's commitment is considered adequate by the EPA to ensure that there are no adverse groundwater quantity impacts beyond the site boundary.

4.7 Mosquito management

4.7.1 EPA objective

The Environmental Protection Authority's objective is to manage the mosquito population so as not to cause a health risk to the public or resort residents and adversely affect other flora and fauna.

4.7.2 Technical information

Remlap Ranch Resort CER document (LeProvost Dames and Moore, 1995)

The CER indicates that lots 1 to 60 chalets are each proposed to be situated around the lagoon and have in front of their patios facing the lagoon, an inter-connecting boardwalk/decking, with the front of the boardwalk/decking overhanging the lagoon.

The CER states that:

- the lagoon edge treatment is proposed to be 50% vegetation fringing habitat with 50% chalet frontage with decking; and
- no swimming or direct water contact activities will be permitted by the proponent.

4.7.3 Comments from key government agencies

The Health Department of WA in their submission stated that the fringing areas of shallow water fringing reeds and sedges is to be kept to a minimum. Proliferation of reeds and sedges will create a significant breeding site for the mosquito species *Coquillettidia sp. nr. linealis* which can be a vector of Ross River Virus especially during epidemics. This species is active from October to April when water levels would be receding. As Ross River Virus is seasonally active in the area during Spring, resort clients should be advised of this during this period and in school holiday periods when there is an epidemic.

The DEP expressed concern at the buffer distance between the lagoon and the lot 1 to 60 chalets.

4.7.4 Comments from public submissions

One submission pointed out that a mosquito control programme had not been allowed for by the proponent and should be included in management commitments. Chemical insecticides should not be used on the lagoon. Substantial setbacks with a vegetated buffer should be maintained around the waterbody.

4.7.5 Response from the proponent

The proponent in their response stated that:

- mosquito management will be addressed in the Environmental Management Plan (EMP), which the Proponent is committed to prepare and implement. It is considered unlikely by the Proponent that the artificial wetland will experience any mosquito plagues or detrimental effects associated with mosquitoes. It is envisaged that the primary method of prevention to be included in the EMP is the maintenance and control of fringing vegetation surrounding the artificial wetland together with:
  - managing and maintaining optimum lagoon water quality;
  - keeping fringing areas of shallow water sedge or reeds to a minimum;
  - managing and maintaining the lagoon shoreline to prevent the formation of small isolated pockets or pools of water allowing mosquito larvae to hatch and mature;
  - monitoring the lagoon and surrounds for mosquito presence, breeding sites, and level of annoyance expressed by resort residents and visitors; and
  - contacting and obtaining permission from the local authority and Health Department of WA to use insecticides in the event of mosquitoes becoming a severe problem.

  (Commitment 20, Appendix 4).
- the advice of the Health Department of WA through relevant brochures will be made available to guests staying at the Remlap Ranch Resort. This will be further addressed in the EMP (Commitment 20, Appendix 4).

4.7.6 EPA evaluation and conclusions

The EPA notes that construction of the lagoon has the potential to create a health risk for the public or residents of the proposed resort and adversely affect other flora and fauna if not adequately managed and considers that there is an inadequate buffer distance between the lagoon and chalets.

The EPA notes that the proponent has undertaken commitments to address mosquito management in detail as part of the proposed Environmental Management Programme, with the primary method of prevention being the maintenance and control of fringing vegetation surrounding the artificial wetland and a to implement a contingency plan in the event that the mosquitoes become a severe problem.

The proponent's commitment to implement a mosquito monitoring and management plan to ensure that there is minimal:

- annoyance or health risk to resort residents;and
- adverse affect on other flora and fauna;

from mosquitoes is considered environmentally acceptable.

5. Conclusions and recommendations

5.1 Conclusion

The Environmental Protection Authority concludes that the proposal by Greenvale Enterprises Pty Ltd to construct the Remlap Ranch Resort development is environmentally acceptable subject to the proponent's commitments and the Environmental Protection Authority's recommendation.

In reaching this conclusion the Environmental Protection Authority identified the main environmental issues (or factors) requiring consideration as:

- impact on the damplands;
- impact on the native vegetation and fauna;
- nutrient enrichment of the lagoon and groundwater;
- surface water management;
- maintenance of groundwater quality;
- groundwater abstraction and effect on adjacent property bores; and
- mosquito management of lagoon.

The Environmental Protection Authority believes that these issues are adequately addressed by the commitments made by the proponent, and the proponent's response to the issues raised in public submissions. Table 3 provides a summary of the EPA's views on these key environmental issues.

The proponent has made a number of environmental management commitments to ameliorate the impacts arising from this proposal. These commitments are included in Appendix 4. The Environmental Protection Authority considers that while the proponent should be required to implement all of the commitments, compliance with commitment numbers 1 -7, 9, 11 - 13, and 17 - 23 should be audited by the Department of Environmental Protection.

The Environmental Protection Authority is satisfied that, using information currently available, the following recommendations may be made to the Minister for the Environment.

5.2 Recommendations

Recommendation 1:

The Environmental Protection Authority recommends that the Remlap Ranch Resort development be found to be environmentally acceptable subject to the proponent's commitments in relation to the following:

- **increasing the number of dampland functions (as outlined in EPA Bulletin 686);**

Table 3. Summary of environmental issues and Environmental Protection Authority conclusions.

ISSUES	OBJECTIVE	EVALUATION FRAMEWORK	PROPONENT'S COMMITMENT	EPA RECOMMENDATION
Biophysical impacts				
Impact on Wetlands	Key wetland functions retained or enhanced.	Enhancement of wetland functions.	Create an artificial lagoon to maximize biological functions and be self maintaining.	Issue adequately managed by proponent's commitments.
Impact on native vegetation and fauna	Increase the native vegetation and fauna values of the site.	Protection of vegetation and fauna and their habitat	Increase permanent and fringing vegetation and greater habitat diversity. Monitoring included as part of EMP.	Issue adequately managed by proponent's commitments.
Pollution issues				
Nutrient management	Prevent nutrient enrichment by wastewater of the lagoon and groundwater.	No nutrient loss to groundwater.	Waste water treatment systems to be installed and nutrient retaining vegetation planted on effluent disposal area.	Issue adequately managed by proponent's commitments.
Surface water runoff management	Stormwater runoff to be minimised.	Minimise stormwater runoff to lagoon and maximise recharge to aquifier.	Lots and roads to have grassed swaled drains and culverts with dispersion into landscaped areas.	Issue adequately managed by proponent's commitments.
Groundwater quality	Ensure lagoon water and groundwater quality beneath the site is protected.	No eutrophication to occur in lagoon. No algal growth to occur in lagoon.	Monitoring of groundwater and of fertiliser use through Nutrient Management Plan, included as part of EMP. Eutrophication to be prevented by retaining phosphorus in vegetation wetland. Low levels of total nitrogen in groundwater to be maintained, so as to prevent algal growth.	Issue adequately managed by proponent's commitments.

Table 3. Summary of environmental issues and Environmental Protection Authority conclusions (cont'd).

Social surroundings				
Groundwater abstraction	No adverse groundwater impacts beyond site boundary.	Minimise the effect of groundwater abstraction.	Monitor the groundwater levels of nearby properties to ensure no adverse impact as part of the proposed EMP.	Issue adequately managed by proponent's commitments.
Mosquito management	Manage the mosquito population so as not to cause a health risk to the public or resort residents and adversely affect other flora and fauna.	Minimise the number of mosquitoes breeding.	Prevent mosquitoes breeding by maintaining and controlling fringing vegetation surrounding lagoon as part of the proposed EMP	Issue adequately managed by proponent's commitments.

- **increasing remnant native vegetation and fringing native vegetation to maximise biological functions of the lake;**
- **appropriate wastewater treatment;**
- **implementing a contingency plan to protect lagoon water quality if monitoring indicates that there is an adverse impact on the water in the lagoon;**
- **including in the strata title bylaws a provision to restrict the use of fertilisers on all landscaped and garden areas.**
- **surface water runoff management;**
- **monitoring the water quality of the lagoon and the groundwater through the implementation of an environmental management programme;**
- **mosquito management; and**
- **detailed review of monitoring results and an audit of the performance of monitoring and management programmes after the first five years following construction of the development to determine if further monitoring is required.**

Recommendation 2:

The EPA recommends that if a decision is made that the proposal may be implemented, that the proposal be subject to the conditions 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: REMLAP RANCH RESORT, MYALUP (828)

CURRENT PROPONENT: GREENVALE ENTERPRISES PTY LTD

This proposal to construct the Remlap Ranch Resort at Myalup 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 public submissions, provided that the commitments and environmental management measures are not inconsistent with the conditions or procedures contained in this statement.

A schedule of environmental management commitments to be audited by the Department of Environmental Protection was published in Environmental Protection Authority Bulletin 813 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.

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, periodic reports on progress in implementation of the proposal are required.

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

Procedure

1 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.

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

7. References

Australian and New Zealand Environment and Conservation Council (1992) Australian Water Quality Guidelines for Fresh and Marine Waters.

Deeney A. C. (1989). Geology and groundwater resources of the superficial formations between Pinjarra and Bunbury, Perth Basin. Geological Survey of WA , Report 26, Professional Papers: pp 31 - 57.

Department of Conservation and Environment (1983). Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority. The Darling System - System 6. Part II: Recommendations for Specific Localities. Report 13. Department of Conservation and Environment. Perth, Western Australia.

Department of Planning and Urban Development, the Water Authority of WA and the Environmental Protection Authority (1993) Planning and Management Guidelines for Water Sensitive Urban (Residential) Design.

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Environmental Protection Authority (1993) A Guide To Wetland Management in the Perth and Near Perth Swan Coastal Plain Area. Bulletin 686.

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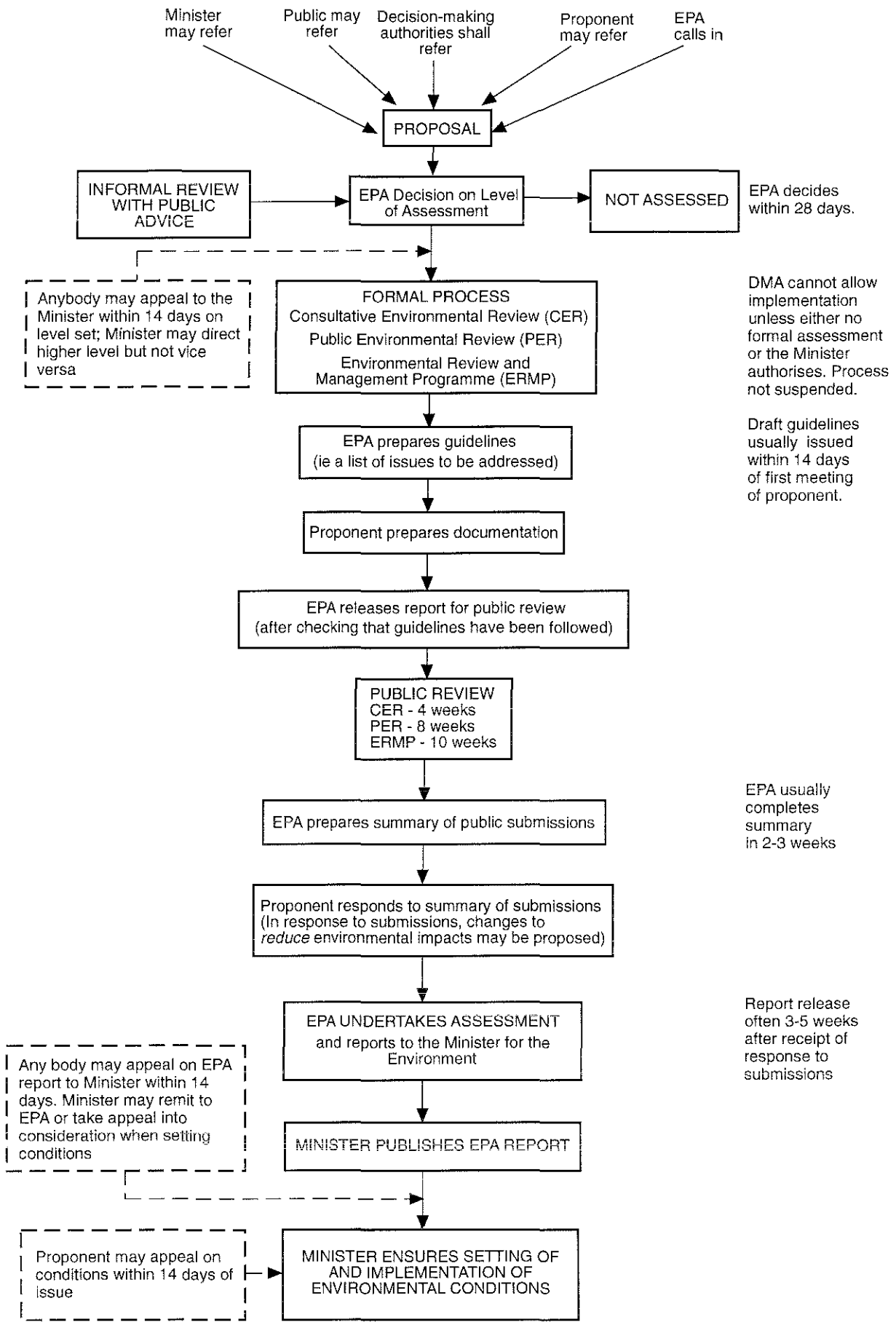
Appendix 1

Environmental impact assessment flow chart

EIA PROCESS FLOW CHART



Appendix 2

Summary of public submissions and the proponent's response

REMLAP RANCH RESORT, MYALUP

CONSULTATIVE ENVIRONMENTAL REVIEW

PROPONENT'S RESPONSE TO ISSUES RAISED IN PUBLIC SUBMISSIONS

This document forms Greenvale Enterprises Pty Ltd principle responses to submissions to the Consultative Environmental Review (CER) for the proposed Remlap Ranch Resort, Myalup.

The responses are to the issues and comments in public submissions to the CER, summarised in the Department of Environmental Protection's (DEP) correspondence to the proponent dated 12 January 1996. For ease of reference, the comments and responses are numbered in accordance with the DEP correspondence.

1. IMPACT ON WETLANDS

1.1. The development is about modification of an EPP wetland to be compatible with residential and holiday developments. The development will totally destroy the existing dampland and create an artificial wetland that will require constant maintenance. The existing dampland is already modified wetland and probably has an ecological function in the heavily modified environment surrounding the area. It is doubtful that the artificial wetland will result in a better wetland for conservation given the proposed use of the new wetland.

Response:

This issue was addressed in Sections 4.2.7, 5.1 and 5.8 of the Consultative Environmental Review (CER) and the Proponent is committed to implement the artificial wetland design described according to the commitments 1 to 7, 14, 15 and 16 to 18.

We regard the stated issue as exhibiting an extraordinary misconception of the true nature of the existing dampland, and a significant underestimate of the potential environmental value of the proposed artificial wetland. In its present state, the dampland has, at best, limited value in winter only. In summer it is a dry and heavily grazed paddock.

The wetlands to the north are substantially more valuable and in good condition by contrast.

The proposed wetland (or lagoon) will provide: a permanent waterbody, appropriate bathometry, island refuges, and fringing vegetation and littoral zones which will create a habitat and summer refuge for waterbirds. We do not believe this potential value can be discounted owing to the intended use and purpose of the overall Remlap Ranch Resort.

On the issue of maintenance, an artificial wetland (much less well designed to that which is proposed) already exists immediately to the south. To our knowledge, this wetland has not required constant maintenance and provides a valuable drought refuge for ducks and waders during summer. The proposed artificial wetland has been specifically designed to function as a natural wetland system with as low maintenance requirements as possible, and preferably none at all.

2. IMPACT ON VEGETATION AND FAUNA

2.1. Concern was expressed that no fauna survey had been carried out and that winter wetlands are now recognised as significant breeding sites for waterbirds.

Response:

This issue was addressed in Section 3.1.6 and Appendix C of the CER. Although winter wetlands are recognised as breeding sites for waterbirds and it is cited in Appendix C that the site "may be used by some waterbirds when inundated in winter", the level of use is likely to be

low due to the extremely degraded and artificial nature of the dampland. It should be noted that no open water was observed during site visits conducted in May and June 1995, and no waterbirds were sighted. No fauna survey was conducted because it was obvious that very little natural wildlife habitat occurred within the dampland.

2.2. The number of chalets, a walking bridge, proposed other uses of the surrounding land and recreational activities will disturb wading birds.

Response:

This issue is addressed in Section 4.2.4 of the CER. The Proponent is committed to prevent waterbird disturbance (Commitment 14) through restricted public access to the island habitat. The Proponent also undertakes to encourage awareness of the ecological value of waterbird habitat (under Section 6.2.4 of the CER) through the "provision of interpretative signs to inform occupiers of the value of wetland processes and conservation of fauna habitats".

It is unlikely that the daily activities of the Remlap Ranch Resort will disturb wading birds to any significant extent. The concept of the resort is to provide accommodation in a rural setting centred around an artificial wetland designed to maximise natural values. As the natural values of the artificial wetland are the primary attraction of the resort it is in the Proponent's interest to prevent disturbance of waterbirds as far as possible.

2.3. The proponent must be required to retain all remnant vegetation, particularly the area in the north eastern corner of the site.

Response:

This issue is addressed in Section 4.2.3, 5.7, 6.1.1 and Commitments 3 to 5 and 15 of the CER. The Proponent is committed to the conservation of existing native vegetation on the site where appropriate and possible, and all native vegetation removed will be replaced. The portion of the dense thicket of *Agonis flexuosa, Astartea fascicularis, Eucalyptus rudis, Me la leuca rhaphiophylla* and *Oxylobium lanceo latum* occurring in the north east corner that is removed, as a result of the development, will be replaced with species common to the Yoongarillup Plain. It is estimated that the mature artificial wetland should result in a net gain of the combined area of permanent wetland and fringing vegetation compared to the extent of the current Remlap dampland vegetation.

3. NUTRIENT ENRICHMENT

3.1. Sewage and waste disposal must be carried out using the bioMax or an equivalent system. The proposed alternative septic tank and leach drains for lots 1 to 10, 63 and 64 is unacceptable.

Response:

The Proponent is not committed to using a bioMax or an equivalent waste treatment system for lots 1 to 10, 63 and 64. No objections have been raised by the Health Department of Western Australia or the Water and Rivers Commission to using a septic tank and leach drain for sewage and waste disposal on these lots. Adequate horizontal separation between the nominated septic systems and the artificial wetland can be achieved. Groundwater flow is away from the artificial wetland for lots 1 to 10.

3.2 Approval by the Health Department of WA (HWDA) of the proposed wastewater effluent system has not yet been given.

The proponent to get this approval further needs to:

- **demonstrate that the site is suitable for onsite effluent disposal;**
- **carry out testing to prove the effective life of the amended soil;**
- **carry out testing for the phosphorus retention capabilities of the amended soil and replace or establish a new disposal area if it proves ineffective;**
- **establish management responsibility for the system and establish a maintenance program to carry out the following: monthly maintenance; quarterly sampling of BOD_5/Suspended Solids and**

bacteriological counts and annual analysis of the phosphorus retention index (PRI) of the amended soils in the irrigation areas.

It may be worthwhile in considering the above requirements to install instead a wastewater treatment system with nutrient removal capabilities in the unit.

Response:

The consultants for the Proponent have previously received advice in writing from the Health Department indicating that sufficient information is provided in the CER for the Health Department not to be opposed to the proposed development concept or use of onsite wastewater disposal as proposed. The Health Department has in addition indicated that before support can be given for a specific development plan including scale of development, various outstanding details referred to in previous correspondence relating to the wastewater systems, effluent disposal area and detail of surface contours and groundwaters and groundwater depth are required.

However, in the most recent correspondence (see attached fax dated 5 February 1996) the Health Department states that "This Department is not opposed to rezoning for the intended purposes of progressing of the Consultative Environmental Review for the proposal, subject to the final scale of development and method of wastewater disposal being dependent on the outstanding details being acceptable to this Department." This confirms an earlier recorded conversation with the Health Department expressing the position that the Health Department had no objections to the proposal in principle and that the specific requirements of the Health Department could be met as a detailed development proposal at the time of development approval through the Planning system.

It is our view that this information clarifies the points raised in the Health Department's formal response to the CER review, that the Health Department does require the additional information indicated in their submission, but that this information is not needed as part of the environmental approvals procedure through Part IV of the Environmental Protection Act and can be dealt with at the detailed development approval stage of the project.

4. GROUNDWATER QUALITY

4.1. Monitoring of the groundwater and lagoon water is to take place for 3 years after completion of construction. Who will take responsibility after this period has expired for the longer term impacts and the remedial action required if there are adverse environmental impacts?

Response:

The management of the artificial wetland following the three year monitoring period is addressed under Commitment 18 of CER whereby the Proponent undertakes to "prepare an Environmental Management Plan (EMP) for the management of the lagoon, and to submit the draft EMP to the DEP and CALM for approval prior to implementation. The Proponent undertakes to implement the approved EMP, including: monitoring the water quality; implementing a contingency plan in the event that water quality in the wetland declines; and monitoring the success of vegetation establishment around the foreshore and on the islands, to the satisfaction of the DEP with the advice of CALM".

This issue will therefore be addressed in the EMP. Ultimately it will be the Proponent/owner of the Remlap Ranch Resort at the time when impacts might occur that will be responsible for any impacts and subsequent remedial action. Project management is addressed in Section 6.3 and Commitment 8 of the CER.

4.2. Concern was expressed about the levels of nitrogen that will be released into the environment. The proponents will only 'encourage' residents to use native plants and slow release fertilisers. An environmental condition should be imposed to ensure that this does happen. The proponent is also unable to guarantee that even the water quality criteria levels proposed will be able to be achieved.

Response:

The Proponent is committed to ensure that the preservation of existing vegetation, use of dry landscaping methods, and planting of species common to the Yoongarillup Association throughout the site will occur, wherever possible and as appropriate, with the advice of CALM and to the satisfaction of the DEP. This issue is addressed under Commitment 15 of the CER.

The Proponent is committed to ensure that the groundwater and wetland water quality will be monitored and maintained to criteria specified in the Australian Water Quality Guidelines for Fresh and Marine Water and the Australian Drinking Water Guidelines for 3 years following construction as addressed in Sections 4.2.5, 5.3, 6.2.2 and Commitment 16 of the CER. Following the three year monitoring period maintenance of water quality of the wetland will be further addressed under Commitment 18 of the CER whereby the Proponent undertakes to prepare and implement an EMP for management of the artificial wetland.

4.3. Future nutrient contamination of Lake Preston/Yalgorup National Park (Locality C54 The Darling System - System 6 Report) which lies approximately 2 km to the west of the site is likely to occur since regional groundwater flow is from east to west?

Response:

There is virtually no possibility of nutrient transport from the Remlap Ranch Resort to the Lake Preston/Yalgorup National Park.

In attempting to predict the potential impact of nutrient transport to Lake Preston/Yalgorup National Park during the preparation of the CER, the following assumptions were considered:

- if the site is managed according to the CER and the proposed EMP then the nutrient load from the Remlap Ranch Resort is expected to be far less than the current heavy stocking rates;
- the hydraulic gradient of the groundwater body, the depth of the aquifer, the permeability of the soil and subsoil, and distance between the project site and Lake Preston indicate that if a plume of significant nutrients were to be identified it would take more than 25 years for the plume to reach Lake Preston; and
- groundwater monitoring bores have been installed on the western boundary of the site for the purpose of detecting any nutrient flow westward off the site so that appropriate action may be taken in the event that nutrients are detected.

Over such a long period of time the biological activity in the soil would remove part of a nutrient plume, and the effects of changes in land use and impact of other land use activities would far outweigh any concern to Lake Preston that the Remlap Ranch Resort would impose.

5. MOSQUITO MANAGEMENT

5.1. Mosquito control program has not been allowed for and should be included in management undertakings. Chemical insecticides should not be used on the lagoon. Substantial setbacks with a vegetated buffer should be maintained around the waterbody.

Response:

Mosquito management will be addressed in the EMP which the Proponent is committed to prepare and implement under Commitment 18 of the CER.

It is considered unlikely that the artificial wetland will experience any mosquito plagues or detrimental effects associated with mosquitoes. Under compliance with the CER and EMP the artificial wetland is designed and will be managed to simulate natural wetland processes and function largely as a self-maintaining system. Generally mosquitoes only pose a problem when a wetland becomes eutrophic and/or reeds and sedges proliferate providing breeding habitat. It is envisaged that the primary method of prevention to be included in the EMP is the maintenance and control of fringing vegetation surrounding the artificial wetland.

5.2. Keeping fringing areas of shallow water sedge or reeds to a minimum is required. Proliferation of reeds and sedges will create a significant breeding

site for the mosquito species *Coquillettidia sp. nr. linealis* which can be a vector of Ross River Virus especially during epidemics. This species is active from October to April when water levels would be receding.

Response:

Mosquito management will be addressed in the EMP which the Proponent is committed to prepare and implement under Commitment 18 of the CER.

As discussed above, it is considered unlikely that the artificial wetland will experience any mosquito plagues or detrimental effects associated with mosquitoes. It is envisaged that the primary method of prevention to be included in the EMP is the maintenance and control of fringing vegetation surrounding the artificial wetland.

5.3. Ross River Virus is seasonally active in the area during Spring. Resort clients should be advised of this during this period and in school holiday periods when there is an epidemic.

Response:

On the advice of the Health Department relevant brochures will be made available to guests staying at the Remlap Ranch Resort. This will be further addressed in the Environmental Management Plan.

6. OTHER ISSUES

6.1. Environmental conditions imposed on this development must be included in the strata title documents.

Response:

The conditions placed on the project as part of eventual environmental approval will be legally binding. It is therefore questionable as to whether the suggestion raised in issue 6.1 is appropriate, and may be a matter for the Minister for Planning to consider.

Appendix 3

List of submitters

Conservation Council of Western Australia Inc.
Health Department of Western Australia
Shire of Harvey

Appendix 4

Consolidated list of proponent's commitments

PROPONENT'S COMMITMENTS

The commitments given by Greenvale Enterprises Pty Ltd in the Consultative Environmental Review and following consideration of the public submissions upon the Consultative Environmental Review are as follows:

The following commitments are made by the proponent for the construction, completion and ongoing management of the Remlap Resort development.

LAGOON CONSTRUCTION

(1) The lagoon will be designed and constructed according to the principles and guidelines specified in this document, to the requirements of the DEP.

(2) The proponent shall ensure that construction of the lagoon will be undertaken by a cut and fill operation employing appropriate site supervision and management procedures so as to minimise construction impacts (including noise, dust, erosion, spread of weeds, soil contamination), to the requirements of the DEP and the Shire of Harvey.

(3) At all times prior to, and during construction the proponent will ensure that existing endemic vegetation is retained wherever possible and appropriate, with the advice of CALM and to the satisfaction of the DEP.

(4) The proponent will replace all native wetland vegetation removed by construction of the lagoon, using appropriate species (sedges, reeds, groundcover, shrubs and trees) of the Yoongarillup Association wherever possible, with the advice of CALM and to the satisfaction of the DEP.

(5) The proponent will ensure that at least 50% of the lagoon shoreline/perimeter is established with appropriate fringing vegetation, on the advice of CALM and the Health Department of WA to the requirements of the DEP,

(6) The proponent will landscape the islands and lagoon banks to appropriate grades according to specific site context, but not exceeding a slope of 20% (1 in 5) in any instance, for the purpose of establishment of fringing vegetation, with the advice of CALM and to the requirements of the DEP.

(7) The proponent will amend selected portions of the newly excavated lagoon bottom with 0.2m (approximate and indicative only) organic material (taken from the topsoil organic layer removed during construction on site) in order to encourage invertebrate colonisation and biological activity, with the advice of CALM and to the requirements of the DEP.

PROJECT MANAGEMENT

(8) The proponent will appoint a resort/property manager/caretaker upon completion of construction of the Remlap Resort development (stage 2), to oversee post construction commitments and management undertakings. Project management of the lagoon construction phase (stage 1) will be directed by the owner/proponent of the property, with the advice of Consultants.

(9) The proponent will include in the by-laws of the Strata Company to be formed by the lot owners, provision for the implementation of an Environmental Management Plan (EMP) and Nutrient Management Plan (NMP). The NMP will include the following components:

- recommendations for low water/nutrient requirement grass/vegetation types;
- restriction of fertiliser applications on all garden and landscaped areas;
- management strategies to minimise nutrient export from the chalet sites; and
- an annual fertiliser application audit.

The NMP will be formulated in conjunction with, and to the requirements of, the DEP.

BUSHFIRE PREVENTION

(10) The proponent will implement a minimum 100 m development set-back from the State Forest pine plantation for all structures/buildings, to the requirements of CALM and the Bush Fires Board of Western Australia.

DRAINAGE RUNOFF POTENTIAL

(11) The proponent will ensure that, at the time of construction, swale drains and culverts shall be incorporated in appropriate positions (e.g. between chalets and roads, etc.), so as to divert drainage from the artificial lagoon, to the requirements of the DEP and the Shire of Harvey.

SEWAGE AND EFFLUENT DISPOSAL

(12) The proponent will install

- a bioMax C10 AWTS (or equivalent treatment system) or a septic tank and leach drain to serve lots 1 to 10, 63 and 64; and
- bio Max AWTS (or equivalent treatment system) to all other site buildings;

for sewage treatment to the requirements of the Health Department and the DEP.

(13) The proponent will amend the soil of the common effluent disposal area and plant with nutrient retaining vegetation during construction, with the advice of the Health Department and to the requirements of the DEP.

(14) The proponent will produce a contingency plan to ensure the lake is not contaminated in the event of a sewage pump station malfunction.

GENERAL CONSTRUCTION WORKS

(15) The proponent will construct the development limiting the hours to those acceptable to Council.

HABITAT CONSERVATION

(16) The proponent will ensure that in the operation of the Remlap Resort facility public access to the island habitats is either controlled or restricted as appropriate so as to minimise impact on fauna habitats.

(17) The proponent will ensure that there will be preservation of existing endemic vegetation, use of dry landscaping methods, and planting of species common to the Yoongarillup Association throughout the site, wherever possible and as appropriate, with the advice of CALM and to the requirements of the DEP.

GROUNDWATER AND LAGOON WATER QUALITY MONITORING PROGRAMME

(18) The proponent will monitor groundwater and lagoon quality quarterly for a period of five years following completion of the development's lagoon construction and will present the findings of the monitoring to the WRC and DEP annually. Three additional groundwater bores will be installed on the property boundary to monitor quality of groundwater entering and leaving the property.

(19) The proponent will monitor groundwater levels each quarterly period for five years following completion of the development's lagoon construction, and present the findings to the WRC and DEP annually.

(20) The proponent will prepare an EMP for the management of the lagoon to the requirements of the DEP and CALM prior to commencement of construction.

The EMP will undertake, but not be limited to:

(i) groundwater and lagoon water quality monitoring and reporting;

(ii) a contingency plan in the event that groundwater or lagoon water quality declines;

(iii) monitoring and reporting on the success of vegetation establishment around the foreshore and on the islands;

(iv) wetland enhancement by increasing the number of wetland functions as outlined in EPA Bulletin 686;

(v) monitoring of the wetland enhancement, including reporting to the DEP five years after completion of the lagoon construction;

(vi) mosquito monitoring;

(vii) a contingency plan in the event that mosquitoes become a severe problem;

(viii) monitoring the impact of site groundwater abstraction on groundwater levels at nearby properties;

(ix) a contingency plan in the event that site groundwater abstraction causes any reduction in the groundwater levels at nearby properties. The contingency plan is to include reduction of the site groundwater abstraction to an acceptable quantity such that no nearby property bore suffers a decline in groundwater levels or a quantity reduction;

(x) monitoring the site bore abstraction amount and rainfall received, including reporting to the DEP on whether the drought predictions made in the CER were accurate.

(21) The proponent will implement the approved EMP to the requirements of the DEP on advice of CALM.

(22) The proponent will prepare and submit to the DEP a detailed review of monitoring results and audit the performance of monitoring and management programmes after the first five years following construction of the development to determine whether further monitoring is warranted.

(23) Findings of the detailed review of environmental performance will be undertaken to the requirements of the DEP.