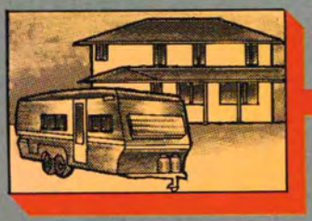
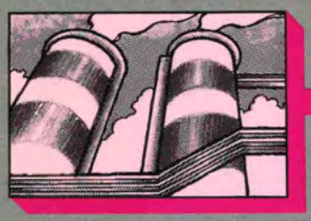
Environmental Guidance for Land Use and Development in Southern Western Australia





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1. INTRODUCTION

The purpose of this statement is to ensure the environmental protection of the major natural systems in the South Coast area (See Figure 1) whilst providing environmental guidance to facilitate development for people involved in the use, development and management of land. This means matching land use and development to the assimilative capacity of the environment. (Assimilative capacity relates to the ability of the environment to absorb or accept impacts without suffering unacceptable degradation.)

In this document, the terms land use, land use development and development refer to the purpose for which land is being used (eg conservation, forestry, agriculture, human settlement, industrial etc) and conversion of land from one use to another. The term environmental effect/impact refers to the change in the state of the environment caused by any form of land use.

Guiding statements can identify, ahead of proposed development, potential environmental concerns and/or constraints and can provide an environmental framework for developers. They may allow developers to integrate environmental concerns, such as site selection, into the planning of proposed developments so that impact of the environment on the proposal can be taken into account. (Examples of aspects of the environment that may have an impact on a proposal are mosquito nuisance, poor site drainage precluding use of the septic tanks, existing major sources of noise such as airports, odour problems or, on the beneficial side, factors such as landscape quality, good agricultural soils, vegetation, views and other aesthetic considerations.) In addition, guiding statements allow planners to include environmental considerations as an important component of land use plans.

In examining the interactions between various types of land use proposals (developments) and the environment, the key elements are:

1. the existing environmental conditions, both within and beyond the immediate site (eg problems in an estuary may be caused by activities within its catchment, perhaps hundreds of kilometres away);
2. the type of development being proposed and its environmental effects;
3. identification of the most important of these effects;
4. the match between the proposed land use and the suitability of the land for that use, taking account of the existing environmental conditions and the key environmental effects;
5. the extent of environmental management required to make the development environmentally acceptable, and
6. the commitment of all those involved to reach the standard of environmental management so required.

Where there is a good match between the proposed land use and the suitability of land for that use, much less management effort (and therefore cost) will be required to make the land use environmentally acceptable. A good match is likely to simplify the process of environmental impact assessment.

At some point it should become evident to a developer that the level of management (and consequently cost) required at a particular site could become so high as to indicate that the proposed land use would not be sensible at that location. In these circumstances it would be more appropriate to find an alternate location for the proposal that would provide a satisfactory balance between environmental conditions and development impacts. The approach shown in Figure 2 will go a long way towards ensuring that developers can consider existing environmental conditions and the consequent environmental management requirements at an early stage in their project. Clearly, this would expedite project timing and facilitate its successful completion.

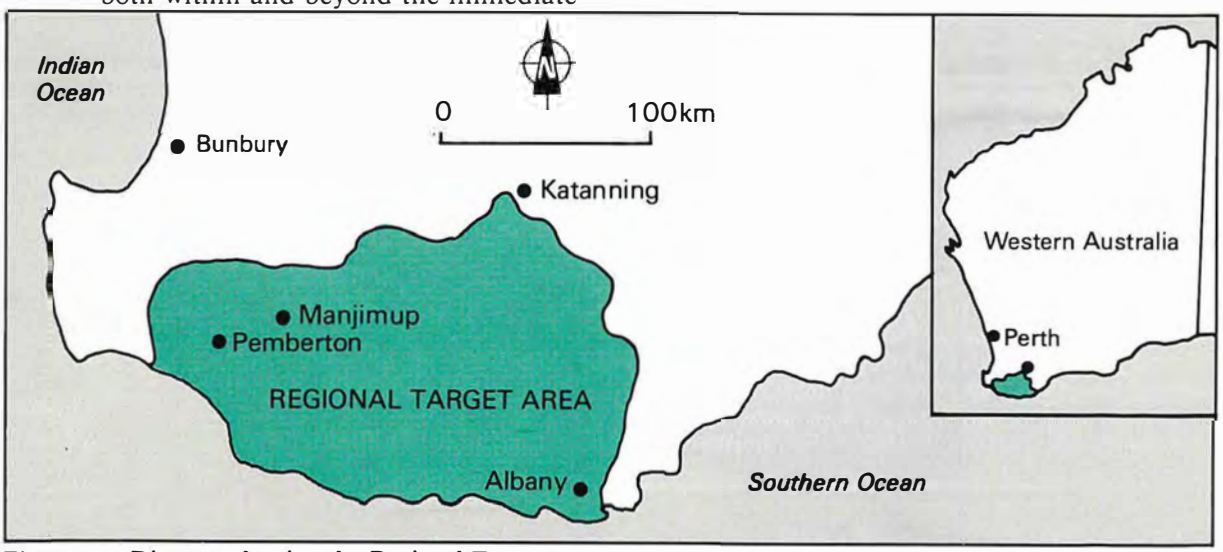


Figure 1. Diagram showing the Regional Target Area

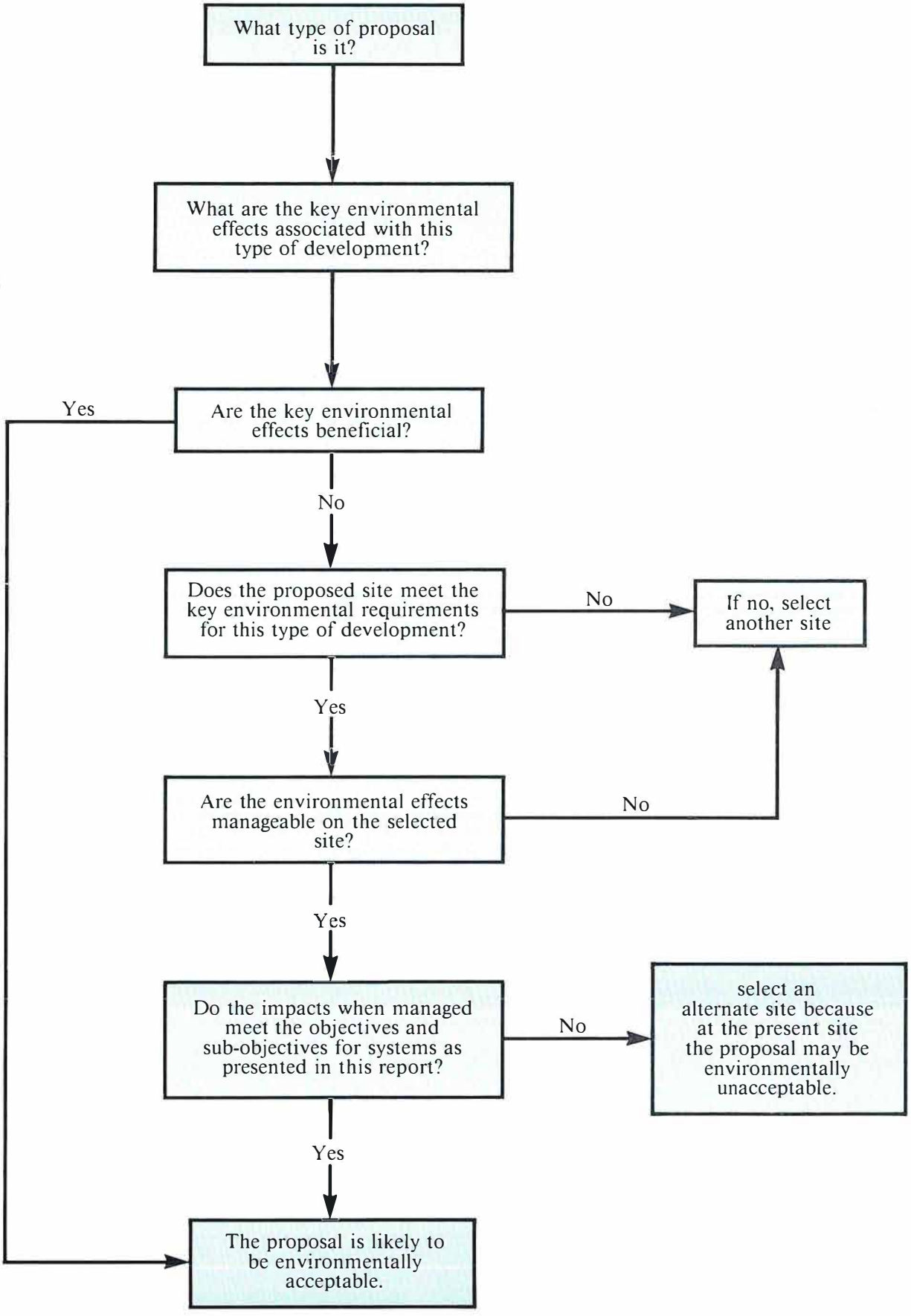


Figure 2. Development Type, Land Suitability, Environmental Impact Assessment (EIA) Flowchart

2. FRAMEWORK

Recent initiatives including the McLean Forest Project and WA Chip and Pulp Company Pty, woodchip proposals, the management proposals for the Peel-Harvey Estuarine System and the State Conservation Strategy have reinforced the need for effective environmental guidelines to be developed for certain areas of the State.

In particular, the pollution problems in the Peel-Harvey Estuary and estuaries and embayments on the south coast, such as Wilson Inlet, Princess Royal Harbour and Oyster Harbour, indicate the need to examine the interactions between land uses and the environment, on a scale large enough to encompass the estuaries' catchments*. The objectives are to protect the environment of whole catchments and to provide guidance to developers on how to make their proposals environmentally acceptable.

All land managers, both public and private, share the responsibility for securing the long-term productive viability and environmental protection of a catchment. Production and protection will be assisted by sound land use planning within an effective environmental framework.

In this document, broad statements of environmental direction are made. The statements provide a basis for land resource planning in a sound environmental management framework, and are consistent with the World, National and State Conservation Strategies, as indicated by the following excerpts from the Strategies:

(a) *"to maintain essential ecological processes and life support systems"* (World Conservation Strategy, 1980, Section 1.7).

In day to day terms this means looking after soil, water, and air and all those elements or activities that affect these. For example, all forms of plants and trees play a vital role in maintaining the quality of the soil, water and air systems, while various forms of human activities lead to the clearing of vegetation which produces negative effects on these systems.

(b) *"to preserve genetic diversity"* (World Conservation Strategy, 1980, Section 1.7).

It is important to retain a sufficient amount of all remaining species to ensure their survival. They function as a pool of genetic stock and as a source of potential benefit for humankind for medicines, agricultural species and improving stock of all kinds.

(c) *"to ensure the sustainable utilisation of species and ecosystems"* (World Conservation Strategy, 1980, Section 1.7).

In day to day terms this means that natural living resources such as species and ecosystems† (and the non-living resources upon which they depend) can be used only in such a way that their capacity to regenerate or replenish is not exceeded. The notion of sustainability obviously needs to be considered in differing time frames for different natural resources.

(d) *"to maintain and enhance environmental qualities"* (National Conservation Strategy of Australia, 1984, Section 18).

In practical terms Australians recognise:

- the importance of their environment;
- that environmental conditions have become degraded; and
- that if the above objectives are to be achieved there is a responsibility to rectify and prevent this degradation.

The National Conservation Strategy for Australia proposes (and the Western Australian Conservation Strategy endorses) statements of principle as guides towards meeting the above objectives, several of which are particularly relevant to this document and are reproduced here:

* *The catchment of an estuary is all the land from which water drains into that estuary. It is evident that land uses and activities in catchments can cause pollution in estuaries many kilometres away.*

† *An ecosystem is a community of organisms (both plants and animals) and associated chemical and physical parts of the environment. Hence, a forest ecosystem consists of all the trees, undergrowth, leaf litter, fungi, bacteria, large and small fauna, soils, rocks etc.*

(e) *"integrate conservation and development"* (National Conservation Strategy of Australia, 1984, Section 24).

A good example of this is where the development proceeds and there is obvious environmental gain of some sort eg setting aside a foreshore reserve through land zoning or subdivision, or siting plantations on degraded land to reclaim it.

(f) *"retain options for future use"* (National Conservation Strategy of Australia 1984, Section 24).

An example of this is the Basic Raw Materials Planning initiative by the State Planning Commission that will ensure the long-term availability of hardrock, sand, limestone etc and prevent sterilisation of these resources by allowing exploitation ahead of other land uses. This is a sensible sequential use of land. Another example is that of the System Redbooks (EPA, 1975, 1976, 1980, 1983) in which many of the recommendations are designed to preserve options for future generations.

(g) *"focus on causes as well as symptoms"* (National Conservation Strategy of Australia 1984, Section 24).

This is the thrust of the management strategy which is being proposed for the Peel-Harvey Estuarine System. Treating the symptoms by weed harvesting alone has had some success but it is an expensive and largely a cosmetic measure. On the other hand, catchment management addresses the source of the excessive nutrients, thereby reducing the problems occurring downstream in the estuary. Another example is that it is generally easier and cheaper to control pollution at a discharge point (eg a stack or pipe outlet) rather than by treating enormous amounts of air or water in the receiving body.

3. THE REGIONAL TARGET

The South Coast estuaries and their catchments (Figure 1) are the focus of this report. The South Coast of Western Australia has many attractions including its forests, rivers and estuaries. As population pressures increase, competition for the natural resources of the region is intensifying. Studies have shown that systems such as the Wilson Inlet, Princess Royal Harbour, Oyster Harbour and their hinterlands are already experiencing environmental stress as indicated by nutrient enrichment within the estuary water body. This enrichment is at present not as severe as that currently occurring in the Peel-Harvey System but it is heading that way.

There is a direct relationship between coastal catchment soil types, land use practices and the nutrient status of estuaries. Soil types and land use practices similar to those in the Peel-Harvey Catchment occur in the catchments of the South Coast estuaries. One of the major factors that has contributed to the magnitude of the problems in the Peel-Harvey System is the extent of clearing (presently around 80 per cent cleared) and agriculture that has occurred within its coastal catchment. The combination of clearing and agriculture in this area means that there is a requirement for drainage and large applications of fertiliser. This, in turn, leads to larger amounts of nutrient-rich water entering the streams and estuaries.

In addition to the direct costs resulting from the land and water degradation that inevitably follow excessive clearing, other environmental costs are incurred by such action. For instance, in parts of the State, such as the wheatbelt, clearing has been so extensive that in some local authority areas very little of the original vegetation remains. For example, the Shire of Tammin has only 7 per cent of its original native vegetation cover remaining. These small remnants, the bulk of which (80 per cent) is on private land, are the only indigenous vegetation that remains in the area and are now extremely important because they preserve genetic diversity of plants and animals and also maintain essential ecological processes.

Considerable clearing has already occurred and is continuing to occur in the catchment areas of the South Coast estuaries (see Figures 1, and 3). Ongoing clearing has become an environmentally sensitive issue.

Within the broad region encompassing the South Coast catchments (see Figures 1, and 3) there are various development proposals which have the potential for environmental impact.

These include:

- agriculture and intensive horticulture;
- aquaculture proposals;
- effluent disposal, eg from abattoirs, wool scourers, tanneries etc;
- provision of infrastructure in particular utilities such as roads, powerlines, Telecom facilities, satellite dishes, rail etc;
- tourism and recreation;
- urban and industrial development; and
- water resource developments.

Many of these activities could produce environmental benefits provided they are properly managed. In this context, two essential aspects of appropriate management are:

- the matching of land use with suitable land that can sustain the activity without causing undue environmental degradation; and
- the provision of broad environmental objectives (directions) ahead of development to provide guidance to proponents to enable them to establish activities in an environmentally acceptable manner and to select appropriate development sites.

In establishing environmental objectives to guide development in the various natural systems within Southern Western Australia, a number of key environmental issues needs to be examined. These issues are discussed in the following section, and environmental objectives are identified to protect the environment and to guide development.

NOTES

SATELLITE PHOTOGRAPH OF TARGET AREA SHOWING EXTENT OF CLEARING

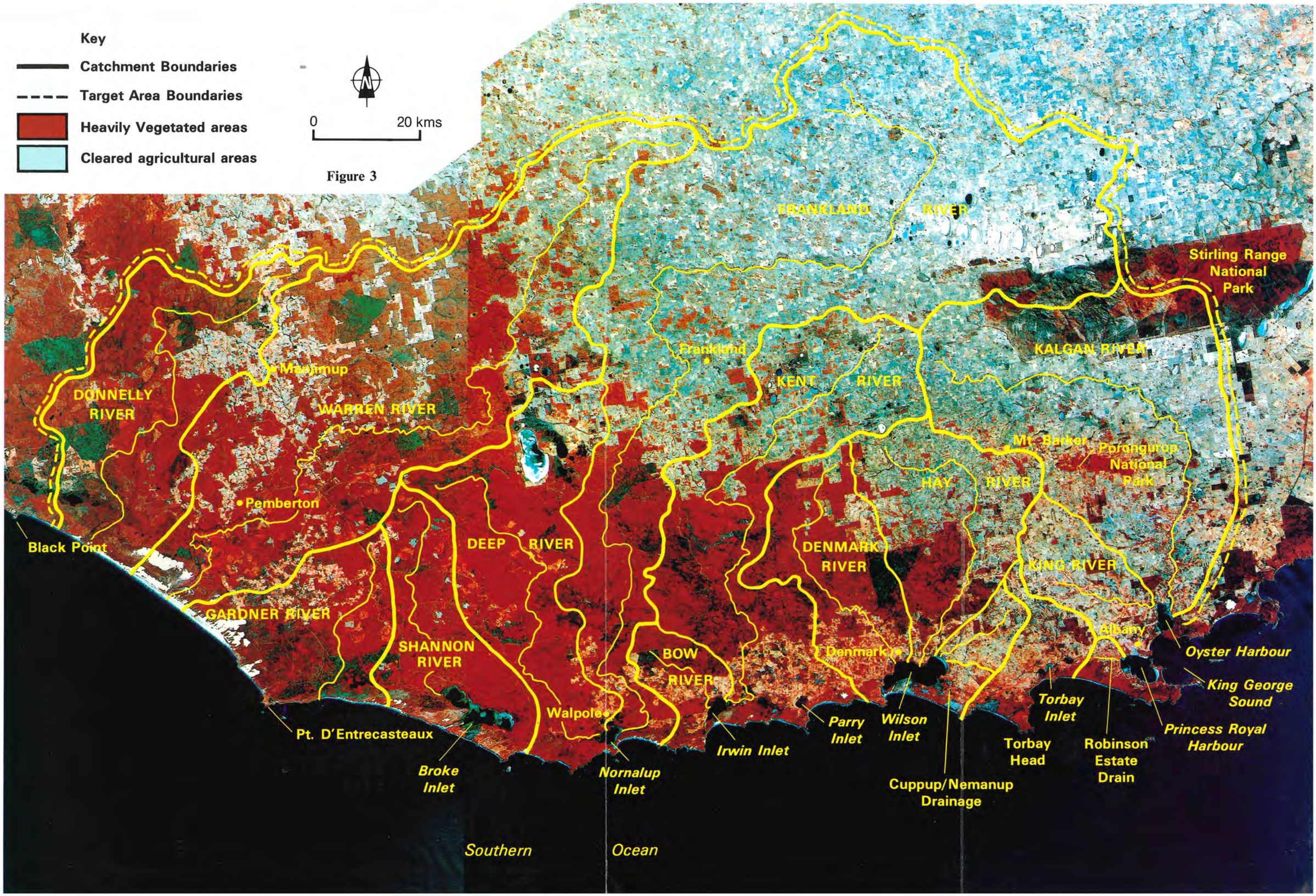


Figure 3

4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

WATER RESOURCES.

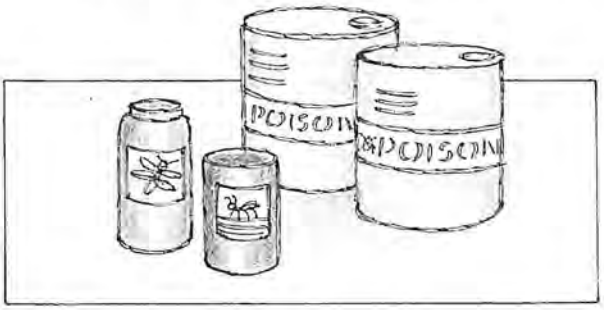
Water Quality in Streams, Rivers and Estuaries

Water is important to Western Australians as an essential component of ecosystems, for water supply, agriculture,industry, recreation, and amenity. Good quality water is essential for these activities and is a limited resource in Western Australia. Degradation of water quality reduces options and involves costs either in rectification of the problems or in the provision of alternatives. Many forms of land use have the potential to affect the quality (which includes quantity) of water resources.

Interactions Between Land Use and Water Quality

Water quality is affected by what occurs on the land in the catchment. Obvious factors affecting water quality include:

- pesticides and other chemicals;



- nutrients from agricultural fertilisers;
- nutrients from point sources of pollution (eg piggeries, abattoirs, landfill sites);
- nutrients, heavy metals, detergents, greases, fats, from sewage;
- pollutants from general industry;
- particulates (eg sands and clays from land erosion resulting from improper grazing);
- salt released from salt-affected land resulting from excessive clearing;
- urban drainage; and
- uncontrolled recreational use.

Factors affecting quantity of water include:

- damming of water courses;

- groundwater extraction;
- changes to land use such as:
  - clearing and planting of trees;
  - land drainage schemes;
  - developments that intercept ground and surface waters; and
- disruption of natural drainage.

ENVIRONMENTAL OBJECTIVE FOR WATER QUALITY

Objective: ***To maintain or improve existing water quality in water systems (ie groundwater, streams, rivers, wetlands, lakes and estuaries) in the Region. For most water bodies, water quality is defined in terms of the waters being visibly clean and demonstrably healthy within the context of identified beneficial use.***

NOTES

4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

REMNANT NATIVE VEGETATION

Importance of Remnant Native Vegetation

Since the earliest days of European settlement, removal of native vegetation has been an ongoing process in the development of a strong agricultural industry in Western Australia. Certain of the schemes of land release for agriculture required clearing to be carried out as a condition of release and ongoing tenure, and as a result, clearing has drastically altered the face of the Southern part of Western Australia (see Figure 3).

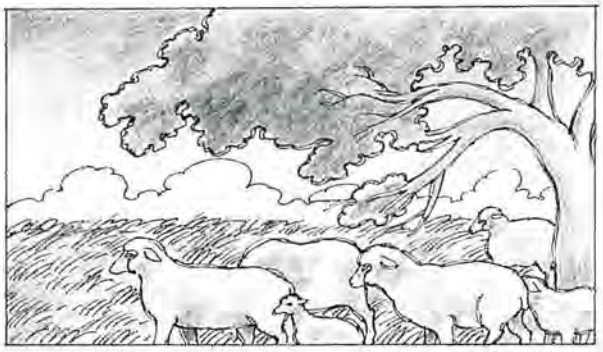
The total area of the State is some 260 million hectares (2.6 million square kilometres). The breakdown into land categories for the whole of Western Australia and for the area of the South West (including Esperance, Ravensthorpe and Westonia Shires) is shown in Table 1 (Department of the Premier and Cabinet, 1984).

Table 1. Categories of Land in South-Western Australia (the South West Land Division plus Esperance, Ravensthorpe and Westonia Shires), and total for W.A. (Dept of the Premier & Cabinet, 1984).

LAND CATEGORY	SOUTH WEST Area (mill.ha)	SOUTH WEST Per cent Total	ALL WA Area (mill.ha)	ALL WA Per cent Total
Agriculture	17.5	59	19	7.5
Pastoral Lease	2.0	7	95	38
Vacant Crown Land	2.9	10	108.5	43
State Forest	2.0	7	2.0	0.8
National Parks	1.1	4	4.6	1.8
Nature Reserves (vested in WAWA)	0.8	2.7	9.7	3.8
Road Reserve (estimated)	0.5)	1.7		
Other Reserves:				
• Unvested	0.3)	1.0	Not available	
• Vested in local authorities	0.21)	0.7		

At the same time as remnant native vegetation has been cleared, the inherent value of vegetation has become more appreciated by society. It has been known for some time that the conservation of native vegetation on farming properties has a number of benefits. These include:

- providing shade and shelter for stock;
- providing a barrier against wind and water erosion;
- assisting as a control factor in preventing salinity, and
- acting as a drought refuge.



The increasing awareness of the vulnerability of native vegetation has been reinforced by realisation that major land uses such as grazing, agriculture, urban and industrial development are diminishing vegetation species diversity throughout the State. The consequences of this as stated in the State Conservation Strategy are:

"In the wheatbelt approximately 60 per cent of the species of medium sized mammals have disappeared since European settlement (Kitchener et al., 1980).

From more than 7 000 native vascular plant species recorded in Western Australia (Conservation and Environment Council, 1983), 1 024 species are listed as rare or threatened, 83 per cent of these being from the South West (Leigh et al., 1981). It is unclear whether the rate of extinction has changed: for some groups it may have decreased in the last 20 to 30 years. However, in most groups of plants and animals, the numbers of some rare species are still declining and discrete populations are still being lost." (State Conservation Strategy, 1987, p. 4).

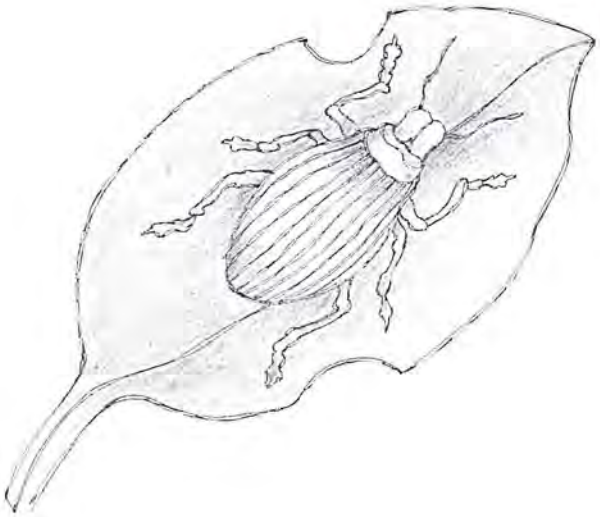
Now all existing remnant native vegetation is important, and it should be managed to ensure its retention.

Interactions Between Land Uses and Remnant Native Vegetation

Remnant native vegetation is affected by what occurs on the land and obvious factors are:

- direct loss of vegetation from:
  - clearing to accommodate development;
  - clearing to provide raw material for industry (eg woodchipping, timber production);
  - fire;

  - provision of infrastructure (eg roads, other services, water supply dams), and
  - disease.
- degradation (reduction in amount and/or quality on or adjacent to remnant native vegetation) from:
  - grazing and stock access;
  - human access;
  - fire;
  - pollution;
  - soil erosion;
  - salinisation;
  - land use development;
  - provision of infrastructure;
  - inadequate or inappropriate management on or adjacent to remnant native vegetation; and
  - introduction of disease and pests.



ENVIRONMENTAL OBJECTIVE FOR REMNANT NATIVE VEGETATION

On the basis of the preceding, the following objective is the most appropriate long-term environmental protection direction for remnant native vegetation:

Objective: ***To retain and manage remnant native vegetation.***

4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

PLANTATIONS ON FARMLANDS

Importance of Plantations

Plantations have generally been regarded as a land use established to provide an economic return. With careful selection of locations for plantations and appropriate planning, species selection and management, plantations may also be valuable tools to remedy or prevent environmental degradation both within the immediate area of the plantation and off site. Hence plantations can be established purely for economic return, purely for land reclamation purposes (where economic benefit accrues from improvement of the degraded land rather than from the forest products) or a combination of these. Environmental degradation problems that may be reduced or remedied by the appropriate establishment of plantations include:

- land affected by salinity, erosion, excessive wind as a result of overclearing;
- nutrient enrichment as a result of excessive fertiliser application, point sources (eg piggeries, abattoirs) and clearing can be reduced by using trees as biological filters (to lower the water table and to take up excess nutrients); and
- spoil dumps, tailings ponds, excavation sites, waste disposal sites, or other derelict land can be reclaimed by establishing plantations.

The above examples are instances where a major reason for establishment of the plantation could be environmental reclamation alongside any economic benefits.

Plantations can also yield a direct economic benefit as well as an environmental benefit, for example:

- provision of visual and air quality buffers in industrial areas in which selective harvesting could occur (eg Kemerton aluminium smelter site); and
- replanting of over-cleared farming areas where trees may produce a better economic return than the existing agriculture.

In all instances, species selection and plantation planning should satisfy the prime reason for the establishment of the plantation, namely reclamation, economic or a combination of these two.

Until recently, in Western Australia, plantations for commercial purposes were almost exclusively restricted to pine plantations. However, in the last few years the commercial value of eucalypt plantations has been recognised.

Within Southern Western Australia there are already proposals (both Government and private) for the establishment of plantations. There is obvious merit in these where they would be of environmental benefit and would facilitate the retention of native vegetation or the reclamation of degraded land and improve water quality.

Siting plantations where they will have environmental as well as economic benefits is highly desirable and is a good example of where a private activity, the growing of plantations, can result in enormous public benefit from the reclamation of degraded land or reduction of salinity.

4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

Interactions Between Plantations and Environmental Elements of Concern

It is evident that there are some instances where interactions between plantations and the environment would not be beneficial and these instances can be seen as constraints on the establishment of plantations.

Plantations would be unlikely to be beneficial in the following cases:

- where clearing of existing remnant native vegetation would be required and would be in conflict with the environmental objective on remnant native vegetation (refer to Environmental Objectives for Remnant Native Vegetation); and
- where the high planting density of plantations may result in the consumption of large amounts of water in catchments feeding freshwater streams of value.

Plantations of trees on previously cleared land will be found, in general, to be environmentally acceptable, and indeed may provide an enhancement of existing environments.

It is the view of the Environmental Protection Authority that:

- the environmental impacts of plantations can be made wholly beneficial by appropriate selection of sites and that if this is done then there should be no environmental concerns from the removal of trees at the time of harvesting; and
- wastes from sawmilling operations should be environmentally acceptable for the production of woodchips for either local or export use.

The Commonwealth environmental agency has indicated that provided the EPA has no problems with the transport or pollution related to the harvesting, chipping and export of plantation resource, an application for export approval will need to be made but detailed environmental assessment is unlikely. This would be relevant to both private and State land.

ENVIRONMENTAL OBJECTIVE FOR THE ESTABLISHMENT OF PLANTATIONS

Objective: ***Establish plantations to optimise environmental and economic benefits.***

4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

RESIDENTIAL LAND USES

Discussion

Residential land uses include all forms of development in which humans may live, whether for extended periods or just for a few nights. The term therefore includes urban townsites, special rural and rural smallholdings, recreational and tourist accommodation and caravan parks.

These forms of development are part of the human environment and, unless properly sited and adequately managed, they have the potential to have a considerable impact upon the environment. This is particularly so within the target region because of its abundant environmental assets. The most obvious impacts are visual, the direct loss of portions of the biophysical environment, and pollution and erosion. These developments effectively foreclose options for other land uses.

It is desirable to match land use to environmental capacity (land suitability) so that, where practicable, the development blends in with the natural features of the area and essential infrastructure such as roads, waste disposal and effluent disposal have a minimal effect on the environment. This approach also means that essential natural resource commodities (such as limestone, sand) that are in limited supply are not covered over by development and made unavailable to people. It also means that good quality productive soils can be kept in production instead of being sub-divided for urban residential development or into smaller uneconomic farming units.

ENVIRONMENTAL OBJECTIVE FOR RESIDENTIAL LAND USES

Objective: ***Ensure that all residential development is carried out in keeping with maintaining the sustainability and quality of environmental systems.***

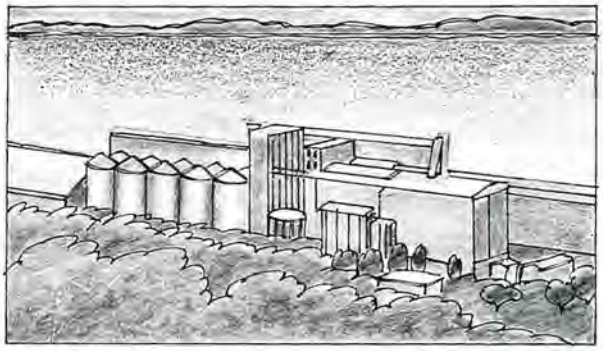
NOTES

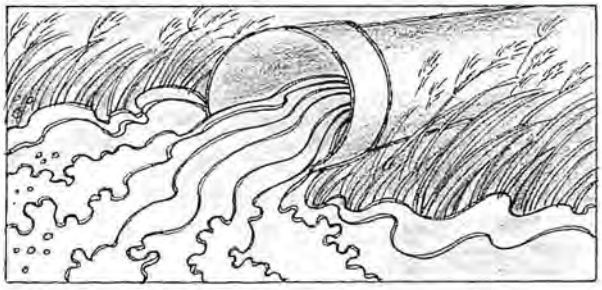
4. KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

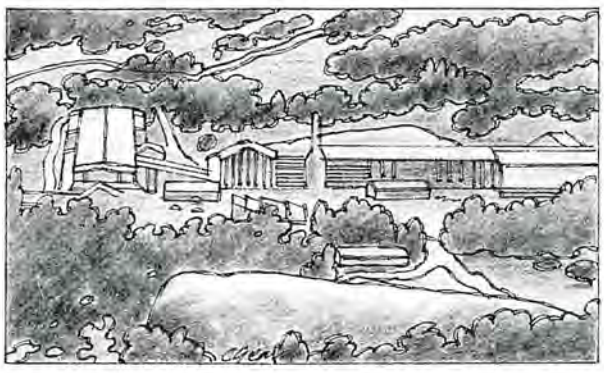
INDUSTRIAL LAND USES

Discussion

Industrial land uses may have direct impacts like those of residential development but also have the potential for impact from pollution of air and water. Industrial developments may produce emissions of a sustained, low impact nature but may also have the possibility of a single, high impact event with consequent risks to people. These latter aspects are being addressed by risks and hazards assessments. With industrial development it is again important to take account of suitability of land for that particular use, as well as the effect of exclusion of other uses.







Industrial development is an important component of the Western Australian economy, and makes a significant contribution to our standard of living and quality of life. A suitable general environmental direction for industrial areas is:

> "to ensure that the environmental impact of industry is not so great that the industrial area becomes unsuitable for industrial use, and that industry is so controlled that it does not have excessive impacts on the environment within the industrial area itself (in terms of its beneficial use), or regular or excessive impacts on people or the environment outside the industrial area."

The above direction is based on the assumption that an agreed beneficial use for an industrial area is "industry". A corollary to this is that an appropriate area surrounding this should have a designated beneficial use as a "buffer zone" to protect the industrial area from other constraining land uses and areas beyond the buffer from the influence of industry. "Beneficial Use" is a term which essentially means allocating "the best use of an area for the overall benefit of the community". Hence some areas may be designated for industry, and others for housing or other purposes.

Similarly, some water bodies may be designated for drinking water, some for swimming and others for boating or other non contact uses.

The Authority has adopted use of the "beneficial use" concept as being the most effective approach to determining land use whilst allowing the setting and achievement of environmental objectives.

ENVIRONMENTAL OBJECTIVE FOR INDUSTRIAL LAND USES

Objective	***Ensure that the impacts of industrial developments do not exceed the assimilative capacity of the receiving environment and are adequate to safeguard the population.***

NOTES

5. SUMMARY OF OVERALL OBJECTIVES WITHIN THE TARGET AREA

WATER QUALITY

Objective: *To maintain or improve existing water quality in water systems (ie groundwater, streams, rivers, wetlands, lakes and estuaries) in the Region. For most water bodies, water quality is defined in terms of the waters being visibly clean and demonstrably healthy within the context of the identified beneficial use.*

REMNANT NATIVE VEGETATION

Objective: *To retain and manage remnant native vegetation.*

PLANTATIONS ON FARMLANDS

Objective: *Establish plantations to optimise environmental and economic benefits.*

RESIDENTIAL LAND USES

Objective: *Ensure that all residential development is carried out in keeping with maintaining the sustainability and quality of environmental systems.*

INDUSTRIAL LAND USES

Objective: *Ensure that the impacts of industrial development do not exceed the assimilative capacity of the receiving environment and are adequate to safeguard the population.*

NOTES

6. OBJECTIVES AND SUB-OBJECTIVES FOR THE KEY ISSUES

WATER QUALITY

Objective: ***To maintain or improve existing water quality in water systems (ie groundwater, streams, rivers, wetlands, lakes and estuaries) in the Region. For most water bodies water quality is defined in terms of the waters being visibly clean and demonstrably healthy within the context of identified beneficial use.***

Sub-Objectives

1) manage nutrient inputs to rivers, wetlands, estuaries and groundwater so that symptoms of nutrient enrichment do not occur. Such symptoms may commonly include:
    - large amounts of algae or other water plants;
    - unpleasant odours;
    - bacterial scums on water surface;
    - loss of sea-grasses and other rooted aquatic vegetation; and
    - loss of potable water.

The symptoms will vary in different systems.

2) manage salinity levels in rivers, wetlands, estuaries and groundwater so that adverse impacts of salinisation, such as the following, do not occur:
    - loss of potable water resources;
    - loss of fresh and brackish water habitats and their plants and animals;
    - loss of fringing vegetation of water bodies; and
    - loss of natural and agricultural vegetation in the catchments of water systems.

3) manage all other potential inputs (eg heavy metals, pesticides, organic wastes, discharges at elevated temperatures) to avoid adverse impacts, such as:
    - contamination of aquatic animals and plants to a point that would threaten human consumption or the survival of the organisms;
    - contamination of waters to a point that would threaten human or animal consumption;
    - discolouration; and
    - de-oxygenation and production of odours.

4) manage the rate of soil loss into rivers, wetlands and estuaries so that siltation of these surface waters and associated adverse effects such as accelerated erosion, smothering of vegetation, flooding and deposition are minimised.

NOTES

6. OBJECTIVES AND SUB-OBJECTIVES FOR THE KEY ISSUES

REMNANT NATIVE VEGETATION

Objective: ***To retain and manage remnant native vegetation.***

Sub-Objectives:

1. Maximise retention of native vegetation on all lands and review proposals that would require clearing in the context of the identified values.
2. Manage all existing remnant native vegetation, so retained, to encourage continuance and regeneration.
3. Work co-operatively with adjacent land holders, vesting authorities, local Soil Conservation Committees and community interest groups, to maximise the value of the above retained areas and other areas of native vegetation (in accordance with the identified values) and to optimise management costs.
4. Re-establish vegetation (trees) on already over-cleared land. If this is in the form of plantations, then establish in the context of the objective and sub-objectives for Plantations (refer Plantations).
5. Where desirable, encourage planting of appropriate vegetation to establish connections between islands of existing remnant native vegetation.

Additional Sub-Objectives for Proponent Government Agencies and/or Agencies in whom Land is Vested

6. Retain all existing native vegetation on Crown land, Land Act Reserves and all other publicly controlled lands, within presently overcleared agricultural areas.
7. Minimise changes in purpose or vesting or approval of leasing arrangements where approval would be detrimental to the intent of the above sub-objectives.
8. Progressively review the vesting of reserves where any permissible development might be detrimental to the intent of the above sub-objectives.
9. Ensure that new linear reserves (eg road, rail, powerlines etc) are of sufficient width to allow for long-term requirements for the utility and the retention of significant buffers of native vegetation, in perpetuity.

NOTES

6. OBJECTIVES AND SUB-OBJECTIVES FOR THE KEY ISSUES

PLANTATIONS ON FARMLANDS

Objective ***Establish plantations to optimise environmental and economic benefits.***

Sub-Objectives

1. Establish plantations on already cleared land.
2. Optimise site selection to ensure soil conservation.
3. Optimise site selection for plantations to ensure water conservation.
4. Optimise siting of plantations to produce, protect or enhance faunal habitat.

NOTES

6. OBJECTIVES AND SUB-OBJECTIVES FOR THE KEY ISSUES

RESIDENTIAL LAND USES

Objective: ***Ensure that all residential land uses are carried out in keeping with maintaining the sustainability and quality of environmental systems.***

Sub-Objectives

1. Determine the suitability of land for residential uses, based on the criteria identified for the particular land use and the objective and sub-objective statements applying to other elements of the biophysical environment.
2. Evaluate existing degraded land to determine its suitability for residential development, taking account of both on-site and off-site factors.
3. Ensure that adequate buffers are provided and retained between residential land uses and industrial development, reserves, National Parks and other land where this is appropriate.
4. Ensure that all infrastructure, including sewage discharges, is sited in accordance with sub-objective No. 1 above and the environmental effects for each infrastructure component.

   (Infrastructure includes all utilities such as roads, rail, Telecom facilities, powerlines, sewerage schemes, waste disposal sites etc.)

NOTES

6. OBJECTIVES AND SUB-OBJECTIVES FOR THE KEY ISSUES

INDUSTRIAL LAND USES

Prescriptive guidelines for industrial land uses in the Kwinana area were developed as part of the assessment of the Liquid Petroleum Gas facility assessment (EPA Bulletin 257). They can be modified slightly to become a valuable guide for industrial developments in general, and are reproduced in this report in the Appendix. Prescriptive guidelines are more detailed than the sub-objectives and are designed to address the "how to's" rather than the "what".

Objective: ***Ensure that the impacts of industrial development do not exceed the assimilative capacity of the receiving environment and are adequate to safeguard the population.***

Sub-Objectives

1. Determine the suitability of land for industrial use, based on the environmental effects identified for that land use and the sub-objective statements applying to other elements of the biophysical environment.
2. Evaluate existing degraded land to determine its suitability for industrial development, taking account of both on-site and off-site factors.
3. Ensure that all aspects of industrial development are planned and managed in such a way that human safety and welfare are not jeopardised and so environmental systems are maintained in accordance with the sub-objectives for water and remnant native vegetation.
4. Ensure that adequate buffers are provided and retained between residential and industrial land uses and between industrial development, reserves, national parks and other land, where this is appropriate.
5. Ensure that infrastructure is sited in accordance with sub-objective No. 1 above and the environmental effects identified for each infrastructure component.

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APPENDIX

PRINCIPLES OF INDUSTRIAL LOCATION,
MANAGEMENT AND CONTROL

APPENDIX Principles of Industrial Location; Management and Control

(Modified from Environmental Protection Authority, 1986)

1. Principles for Location of Industry

1.1 Industry which has the potential for adverse impacts on people or on the environment should only be located where its impacts can be assimilated or controlled. This may be achieved by siting within a properly designated and managed "industrial zone", the beneficial use of which is recognised by the community as industrial. In certain instances this may necessitate a remote location.

1.2 An "industrial zone" should contain only industry, and should also be separated from residential areas by an appropriate buffer zone.

1.3 The environmental impacts of industry should be restricted to the "industrial zone" and "buffer zone". Excursions of excessive impacts beyond the buffer zone should be rare, and should only result from atypical events (either within the industrial plant or of the environment).

1.4 Land use in the "buffer zone" should be such that it does not impact adversely on residential areas.

1.5 Land use in the "buffer zone" should be sufficiently resilient to withstand impacts from the "industrial zone".

1.6 The location of particular industries within an industrial zone should be such that impacts on other industries fall within prescribed standards for environmental risk and ongoing environmental impact.

2. Principles of Project Approval

2.1 Each new project with the potential for significant environmental impacts, or amendment to any existing project that would increase its environmental impact, should be subject to environmental impact assessment. (In some more remote country areas particular types of developments requiring assessment may be prescribed by the EPA.)

2.2 It is the responsibility of the proponent to demonstrate that any proposal will not impose more than an acceptable level of risk or impact to the environment or to the health and wellbeing of the community.

2.3 A proposed new industry, or alteration to an existing industry should be designed to ensure that its environmental performance is appropriate to the prescribed standards for the zone in which it is proposed or located, and for its particular location within that zone.

2.4 Any new industry, or alteration to an existing industry should have adequate management procedures to control performance to specified levels for both the regular operation and for contingency events.

2.5 Whenever a new project is assessed, consideration should also be given to the cumulative impact with existing industries in the region.

3. Principles of Environmental Management by Industry

3.1 New industry should be constructed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial use.

3.2 The operation of any industry should be managed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial use.

3.3 Industry should conduct periodic reviews to ensure that it retains the ongoing capacity to control performance to specified levels for both regular operation and for contingency events. Such reviews should be subject to assessment of their environmental acceptability.

4. Principles of Monitoring and Regulation

4.1 Each industry should monitor its environmental impacts to ensure that they do not exceed the standards set for the beneficial use of the area impacted.

4.2 Industry should be required to advise Government of the likely environmental consequences as soon as practicable after the occurrence of any unforeseen event such as an accidental discharge.

4.3 Standards of performance should be enforced such that beneficial use criteria are met.

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GARRY L. DUFFIELD, Government Printer, Western Australia

Environmental Guidance for Land Use and Development in Southern Western Australia

ENVIRONMENTAL PROTECTION AUTHORITY
Perth
Western Australia

BULLETIN 319 No. 1
March 1988.

Regional Target Area

Figure 1

Introduction

The purpose of this statement is to ensure the environmental protection of the major natural systems in the South Coast area (See Figure 1) whilst providing environmental guidance to facilitate development for people involved in the use, development and management of land. This means matching land use and development to the assimilative capacity of the environment. (Assimilative capacity relates to the ability of the environment to absorb or accept impacts without suffering unacceptable degradation).

In this document, the terms land use, land use development and development refer to the purpose for which land is being used (eg conservation, forestry, agriculture, human settlement, industrial etc) and conversion of land from one use to another. The term environmental effect/impact refers to the change in the state of the environment caused by any form of land use.

Guiding statements can identify, ahead of proposed development, potential environmental concerns and/or constraints and can provide an environmental framework for developers. They may allow developers to integrate environmental concerns, such as site selection, into the planning of proposed developments so that impact of the environment on the proposal can be taken into account. (Examples of aspects of the environment that may have an impact on a proposal are mosquito nuisance, poor site drainage precluding use of septic tanks, existing major sources of noise such as airports, odour problems or, on the beneficial side, factors such as landscape quality, good agricultural soils, vegetation, views and other aesthetic considerations). In addition, guiding statements allow planners to include environmental considerations as an important component of land use plans.

In examining the interactions between various types of land use proposals (developments) and the environment, the key elements are:

1. the existing environmental conditions, both within and beyond the immediate site (eg problems in an estuary may be caused by activities within its catchment, perhaps hundreds of kilometres away);
2. the type of development being proposed and its environmental effects;
3. identification of the most important of these effects;
4. the match between the proposed land use and the suitability of the land for that use, taking account of the existing environmental conditions and the key environmental effects;
5. the extent of environmental management required to make the development environmentally acceptable; and
6. the commitment of all those involved to reach the standard of environmental management so required.

Where there is a good match between the proposed land use and the suitability of land for that use, much less management effort (and therefore cost) will be required to make the land use environmentally acceptable. A good match is likely to simplify the process of environmental impact assessment.

At some point it should become evident to a developer that the level of management (and consequently cost) required at a particular site could become so high as to indicate that the proposed land use would not be sensible at that location. In these circumstances it would be more appropriate to find an alternate location for the proposal that would provide a satisfactory balance between environmental conditions and development impacts. The approach shown in Figure 2 will go a long way towards ensuring that developers can consider existing environmental conditions and the consequent environmental management requirements at an early stage in their project. Clearly, this would expedite project timing and facilitate its successful completion.


Figure 2

Framework

Recent initiatives including the McLean Forest Project and WA Chip and Pulp Company Pty woodchip proposals, the management proposals for the Peel-Harvey Estuarine System and the State Conservation Strategy have reinforced the need for effective environmental guidelines to be developed for certain areas of the State.

In particular, the pollution problems in the Peel-Harvey Estuary and estuaries and embayments on the south coast, such as Wilson Inlet, Princess Royal Harbour and Oyster Harbour, indicate the need to examine the interactions between land uses and the environment, on a scale large enough to encompass the estuaries' catchments*. The objectives are to protect the environment of whole catchments and to provide guidance to developers on how to make their proposals environmentally acceptable.

All land managers, both public and private, share the responsibility for securing the long-term productive viability and environmental protection of a catchment. Production and protection will be assisted by sound land use planning within an effective environmental framework.

In this document, broad statements of environmental direction are made. The statements provide a basis for land resource planning in a sound environmental management framework, and are consistent with the World, National and State Conservation Strategies, as indicated by the following excerpts from the Strategies:

(a) "to maintain essential ecological processes and life support systems" (World Conservation Strategy, 1980. Section 1.7).

In day to day terms this means looking after soil, water, and air and all those elements or activities that affect these. For example, all forms of plants and trees play a vital role in maintaining the quality of the soil, water and air systems, while various forms of human activities lead to the clearing of vegetation which produces negative effects on these systems.

(b) "to preserve genetic diversity" (World Conservation Strategy, 1980, Section 1.7).

It is important to retain a sufficient amount of all remaining species to ensure their survival. They function as a pool of genetic stock and as a source of potential benefit for humankind for medicines, agricultural species and improving stock of all kinds.

(c) "to ensure the sustainable utilisation of species and ecosystems" (World Conservation Strategy, 1980, Section 1.7).

In day to day terms this means that natural living resources such as species and ecosystems† (and the non-living resources upon which they depend) can be used only in such a way that their capacity to regenerate or replenish is not exceeded. The notion of sustainability obviously needs to be considered in differing time frames for different natural resources.

* *The catchment of an estuary is all the land from which water drains into that estuary. It is evident that land uses and activities in catchments can cause pollution or estuaries many kilometres away.*

† *An ecosystem is a community of organisms (both plants and animals) and associated chemical and physical parts of the environment. Hence, a forest ecosystem consists of all the trees, undergrowth, leaf litter, fungi, bacteria, large and small fauna, soils, rocks etc.*

(d) "to maintain and enhance environmental qualities" (National Conservation Strategy of Australia, 1984, Section 18).

In practical terms Australians recognise:

- the importance of their environment;
- that environmental conditions have become degraded; and
- that if the above objectives are to be achieved there is a responsibility to rectify and prevent this degradation.

The National Conservation Strategy for Australia proposes (and the Western Australian Conservation Strategy endorses) statements of principle as guides towards meeting the above objectives, several of which are particularly relevant to this document and are reproduced here:

(e) "integrate conservation and development" (National Conservation Strategy of Australia, 1984, Section 24).

A good example of this is where the development proceeds and there is obvious environmental gain of some sort eg setting aside a foreshore reserve through land zoning or subdivision, or siting plantations on degraded land to reclaim it.

(f) "retain options for future use" (National Conservation Strategy of Australia 1984, Section 24).

An example of this is the Basic Raw Materials Planning initiative by the State Planning Commission that will ensure the long-term availability of hardrock, sand, limestone etc and prevent sterilisation of these resources by allowing exploitation ahead of other land uses. This is a sensible sequential use of land. Another example is that of the System 6 reports (EPA, 1975, 1976, 1980, 1983) in which many of the recommendations are designed to preserve options for future generations.

(g) "focus on causes as well as symptoms" (National Conservation Strategy of Australia 1984, Section 24).

This is the thrust of the management strategy which is being proposed for the Peel-Harvey Estuarine System. Treating the symptoms by weed harvesting alone has had some success but it is an expensive and largely a cosmetic measure. On the other hand, catchment management addresses the source of the excessive nutrients, thereby reducing the problems occurring downstream in the estuary. Another example is that it is generally easier and cheaper to control pollution at a discharge point (eg a stack or pipe outlet) rather than by treating enormous amounts of air or water in the receiving body.

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The Regional Target

The South Coast estuaries and their catchments (Figure 1) are the focus of this report. The South Coast of Western Australia has many attractions including its forests, rivers and estuaries. As population pressures increase, competition for the natural resources of the region is intensifying. Studies have shown that systems such as the Wilson Inlet, Princess Royal Harbour, Oyster Harbour and their hinterlands are already experiencing environmental stress as indicated by nutrient enrichment within the estuary water body. This enrichment is at present not as severe as that currently occurring in the Peel-Harvey System but it is heading that way.

There is a direct relationship between coastal catchment soil types, land use practices and the nutrient status of estuaries. Soil types and land use practices similar to those in the Peel-Harvey Catchment occur in the catchments of the South Coast estuaries. One of the major factors that has contributed to the magnitude of the problems in the Peel-Harvey System is the extent of clearing (presently around 80 per cent cleared) and agriculture that has occurred within its coastal catchment. The combination of clearing and agriculture in this area means that there is a requirement for drainage and large applications of fertiliser. This, in turn, leads to larger amounts of nutrient-rich water entering the streams and estuaries.

In addition to the direct costs resulting from the land and water degradation that inevitably follow excessive clearing, other environmental costs are incurred by such action. For instance, in parts of the State, such as the wheatbelt, clearing has been so extensive that in some local authority areas very little of the original vegetation remains. For example, the Shire of Tammin has only 7 per cent of its original native vegetation cover remaining. These small remnants, the bulk of which (80 per cent) is on private land, are the only indigenous vegetation that remains in the area and are now extremely important because they preserve genetic diversity of plants and animals and also maintain essential ecological processes.

Considerable clearing has already occurred and is continuing to occur in the catchment areas of the South Coast estuaries (see Figures 1 and 3). Ongoing clearing has become an environmentally sensitive issue.

Within the broad region encompassing the South Coast catchments (see Figures 1 and 3) there are various development proposals which have the potential for environmental impact.

These include:

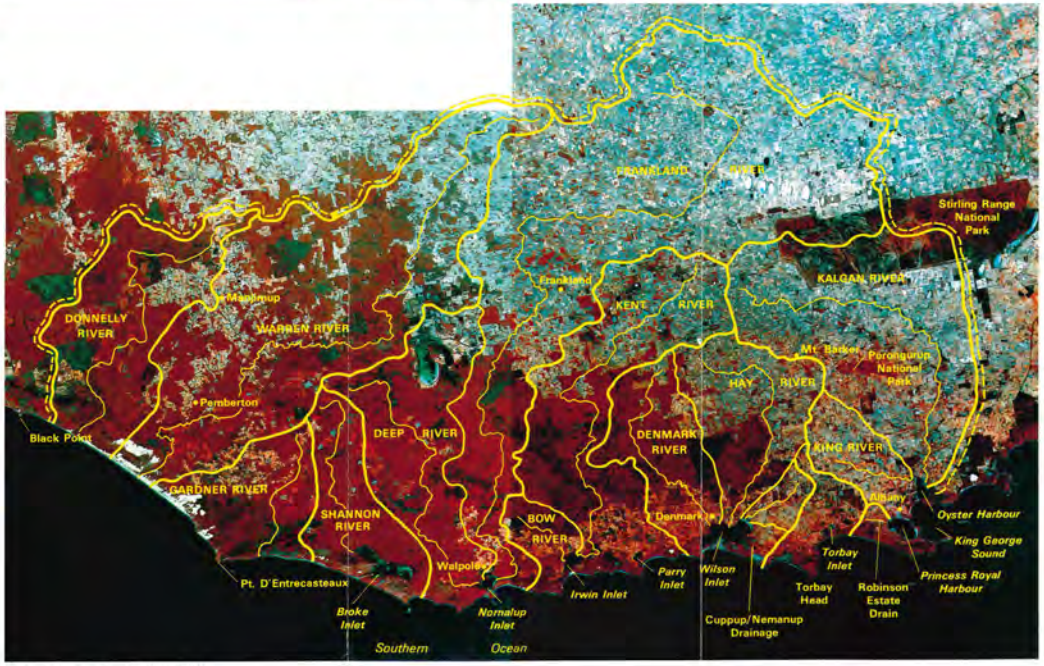
- agriculture and intensive horticulture;
- aquaculture proposals;
- effluent disposal, eg from abattoirs, wool scourers, tanneries etc;
- provision of infrastructure in particular utilities such as roads, powerlines, Telecom facilities, satellite dishes, rail etc;
- tourism and recreation;
- urban and industrial development; and
- water resource developments.

Many of these activities could produce environmental benefits provided they are properly managed. In this context, two essential aspects of appropriate management are:

- the matching of land use with suitable land that can sustain the activity without causing undue environmental degradation; and
- the provision of broad environmental objectives (directions) ahead of developments to provide guidance to proponents to enable them to establish activities in an environmentally acceptable manner and to select appropriate development sites.

In establishing environmental objectives to guide development in the various natural systems within Southern Western Australia, a number of key environmental issues needs to be examined. These issues are discussed in the following section, and environmental objectives are identified to protect the environment and to guide development.

Satellite Photograph of Target Area showing extent of clearing



Date of satellite photography: December 1981/January 1984.

Summary of Overall Objectives within the Target Area

WATER QUALITY

Objective

To maintain or improve existing water quality in water systems (ie groundwater, streams, rivers, wetlands, lakes and estuaries) in the Region. For most water bodies, water quality is defined in terms of the waters being visibly clean and demonstrably healthy within the context of identified beneficial use.

REMNANT NATIVE VEGETATION

Objective

To retain and manage remnant native vegetation.

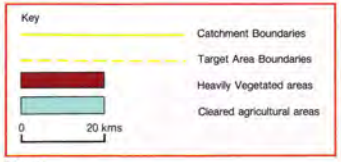


Figure 3

INDUSTRIAL LAND USES

Objective

Ensure that the impacts of industrial developments do not exceed the assimilative capacity of the receiving environment and are adequate to safeguard the population.

RESIDENTIAL LAND USES

Objective

Ensure that all residential development is carried out in keeping with maintaining the sustainability and quality of environmental systems.

PLANTATIONS

Objective

Establish plantations to optimise environmental and economic benefits.

KEY ENVIRONMENTAL ISSUES IN SOUTHERN WESTERN AUSTRALIA.

Water Resources

Water Quality in Streams, Rivers and Estuaries

Water is important to Western Australians as an essential component of ecosystems, for water supply, agriculture, industry, recreation, and amenity. Good quality water is essential for these activities and is a limited resource in Western Australia. Degradation of water quality reduces options and involves costs either in rectification of the problems or in the provision of alternatives. Many forms of land use have the potential to affect the quality (which includes quantity) of water resources.

Interactions Between Land Use and Water Quality

Water quality is affected by what occurs on the land in the catchment. Obvious factors affecting water quality include:

- pesticides and other chemicals;
- nutrients from agricultural fertilisers;

- nutrients from point sources of pollution (eg piggeries, abattoirs, landfill sites);
- nutrients, heavy metals, detergents, greases, fats, from sewage;
- pollutants from general industry;
- particulates (eg sands and clays from land erosion resulting from improper grazing);
- salt released from salt-affected land resulting from excessive clearing;
- urban drainage; and
- uncontrolled recreational use.

Factors affecting quantity of water include:

- damming of water courses;
- groundwater extraction;
- changes to land use such as:
  - clearing and planting of trees;
  - land drainage schemes;
  - developments that intercept ground and surface waters, and
- disruption of natural drainage.

Remnant Native Vegetation

Importance of Remnant Native Vegetation

Since the earliest days of European settlement, removal of native vegetation has been an ongoing process in the development of a strong agricultural industry in Western Australia. Certain of the schemes of land release for agriculture required clearing to be carried out as a condition of release and ongoing tenure, and as a result, clearing has drastically altered the face of the Southern part of Western Australia (see Figure 3).

The total area of the State is some 260 million hectares (2.6 million square kilometres). The breakdown into land categories for the whole of Western Australia and for the area of the South West (including Esperance, Ravensthorpe and Westonia Shires) is shown in Table 1 (Department of the Premier and Cabinet, 1984).

Table 1: Categories of Land in South-Western Australia (the South West Land Division plus Esperance, Ravensthorpe and Westonia Shires), and total for W.A. (Dept. of the Premier & Cabinet, 1984).

LAND CATEGORY	SOUTH WEST Area (mill.ha)	SOUTH WEST Per cent Total	ALL W.A. Area (mill.ha)	ALL W.A. Per cent Total
Agriculture	17.5	59	19	7.5
Pastoral Lease	2.0	7	91	38
Vacant Crown Land	2.9	10	100.5	43
State Forest	2.0	7	2.0	0.8
National Parks	1.1	4	4.6	1.8
Nature Reserves (vested in WAWA)	0.8	2.7	9.7	3.8
Road Reserve (estimated)	0.5	1.7		
Other Reserves:				
• Unvested	0.3	1.0	Not available	
• Vested in local authorities	0.2	0.7		

At the same time as remnant native vegetation has been cleared, the inherent value of vegetation has become more appreciated by society. It has been known for some time that the conservation of native vegetation on farming properties has a number of benefits. These include:

- providing shade and shelter for stock;
- providing a barrier against wind and water erosion;
- assisting as a control factor in preventing salinity, and
- acting as a drought refuge.

The increasing awareness of the vulnerability of native vegetation has been reinforced by realisation that major land uses such as grazing, agriculture, urban and industrial development are diminishing vegetation species diversity throughout the State. The consequences of this as stated in the State Conservation Strategy are:

"In the wheatbelt approximately 60 per cent of the species of medium sized mammals have disappeared since European settlement (Kitchener et al., 1980).

From more than 7 000 native vascular plant species recorded in Western Australia (Conservation and Environment Council, 1983), 1 024 species are listed as rare or threatened, 83 per cent of these being from the South West (Leigh et al., 1981). It is unclear whether the rate of extinction has changed: for some groups it may have decreased in the last 20 to 30 years. However, in most groups of plants and animals, the numbers of some rare species are still declining and discrete populations are still being lost." (State Conservation Strategy, 1987, p. 4).

Now all existing remnant native vegetation is important, and it should be managed to ensure its retention.

Interactions Between Land Uses and Remnant Native Vegetation

Remnant native vegetation is affected by what occurs on the land and obvious factors are:

- direct loss of vegetation from:
  - clearing to accommodate development;
  - clearing to provide raw material for industry (eg woodchipping, timber production);
  - fire;

  - provision of infrastructure (eg roads, other services, water supply dams); and
  - disease.
- degradation (reduction in amount and/or quality on or adjacent to remnant native vegetation) from:
  - grazing and stock access;
  - human access;
  - fire;
  - pollution;
  - soil erosion;
  - salinisation;
  - land use development;
  - provision of infrastructure;
  - inadequate or inappropriate management on or adjacent to remnant native vegetation; and
  - introduction of disease and pests.

Industrial Land Uses

Discussion

Industrial land uses may have direct impacts like those of residential development but also have the potential for impact from pollution of air and water. Industrial developments may produce emissions of a sustained, low impact nature but may also have the possibility of a single, high impact event with consequent risks to people. These latter aspects are being addressed by risks and hazards assessments. With industrial development it is again important to take account of suitability of land for that particular use, as well as the effect of exclusion of other uses.

Industrial development is an important component of the Western Australian economy, and makes a significant contribution to our standard of living and quality of life. A suitable general environmental direction for industrial areas is:

"to ensure that the environmental impact of industry is not so great that the industrial area becomes unsuitable for industrial use, and that industry is so controlled that it does not have excessive impacts on the environment within the industrial area itself (in terms of its beneficial use), or regular or excessive impacts on people or the environment outside the industrial area."

The above direction is based on the assumption that an agreed beneficial use for an industrial area is "industry". A corollary to this is that an appropriate area surrounding this should have a designated beneficial use as a "buffer zone" to protect the industrial area from other constraining land uses and areas beyond the buffer from the influence of industry. "Beneficial Use" is a term which essentially means allocating "the best use of an area for the overall benefit of the community". Hence some areas may be designated for industry, and others for housing or other purposes.

Similarly, some water bodies may be designated for drinking water, some for swimming and others for boating or other non contact uses.

The Authority has adopted use of the "beneficial use" concept as being the most effective approach to determining land use whilst allowing the setting and achievement of environmental objectives.

Residential Land Uses

Discussion

Residential land uses include all forms of development in which humans may live, whether for extended periods or just for a few nights. The term therefore includes urban townsites, special rural and rural smallholdings, recreational and tourist accommodation and caravan parks.

These forms of development are part of the human environment and, unless properly sited and adequately managed, they have the potential to have a considerable impact upon the environment. This is particularly so within the target region because of its abundant environmental assets. The most obvious impacts are visual, the direct loss of portions of the biophysical environment, and pollution and erosion. These developments effectively foreclose options for other land uses.

It is desirable to match land use to environmental capacity (land suitability) so that, where practicable, the development blends in with the natural features of the area and essential infrastructure such as roads, waste disposal and effluent disposal have a minimal effect on the environment. This approach also means that essential natural resource commodities (such as limestone, sand) that are in limited supply are not covered over by development and made unavailable to people. It also means that good quality productive soils can be kept in production instead of being sub-divided for urban residential development or into smaller uneconomic farming units.

Plantations on Farmlands

Importance of Plantations

Plantations have generally been regarded as a land use established to provide an economic return. With careful selection of locations for plantations and appropriate planning, species selection and management, plantations may also be valuable tools to remedy or prevent environmental degradation both within the immediate area of the plantation and off site. Hence plantations can be established purely for economic return, purely for land reclamation purposes (where economic benefit accrues from improvement of the degraded land rather than from the forest products) or a combination of these. Environmental degradation problems that may be reduced or remedied by the appropriate establishment of plantations include:

- land affected by salinity, erosion, excessive wind as a result of overclearing.
- nutrient enrichment as a result of excessive fertiliser application, point sources (eg piggeries, abattoirs) and clearing can be reduced by using trees as biological filters (to lower the water table and to take up excess nutrients); and
- spoil dumps, tailings ponds, excavation sites, waste disposal sites, or other derelict land can be reclaimed by establishing plantations.

The above examples are instances where a major reason for establishment of the plantation could be environmental reclamation alongside any economic benefits.

Plantations can also yield a direct economic benefit as well as an environmental benefit, for example:

- provision of visual and air quality buffers in industrial areas in which selective harvesting could occur (eg Kemerton aluminium smelter site); and
- replanting of over-cleared farming areas where trees may produce a better economic return than the existing agriculture.

In all instances, species selection and plantation planning should satisfy the prime reason for the establishment of the plantation, namely reclamation, economic or a combination of these two.

Until recently, in Western Australia, plantations for commercial purposes were almost exclusively restricted to pine plantations. However, in the last few years the commercial value of eucalypt plantations has been recognised.

Within Southern Western Australia there are already proposals (both Government and private) for the establishment of plantations. There is obvious merit in these where they would be of environmental benefit and would facilitate the retention of native vegetation or the reclamation of degraded land and improve water quality.

Siting plantations where they will have environmental as well as economic benefits is highly desirable and is a good example of where a private activity, the growing of plantations, can result in enormous public benefit from the reclamation of degraded land or reduction of salinity.

Interactions Between Plantations and Environmental Elements of Concern

It is evident that there are some instances where interactions between plantations and the environment would not be beneficial and these instances can be seen as constraints on the establishment of plantations.

Plantations would be unlikely to be beneficial in the following cases:

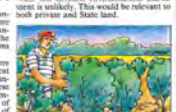
- where clearing of existing remnant native vegetation would be required and would be in conflict with the environmental objective on remnant native vegetation (refer to Environmental Objectives for Remnant Native Vegetation); and
- where the high planting density of plantations may result in the consumption of large amounts of water in catchments feeding freshwater streams of value.

Plantations of trees on previously cleared land will be found, in general, to be environmentally acceptable, and indeed may provide an enhancement of existing environments.

It is the view of the Environmental Protection Authority that:

- the environmental impacts of plantations can be made wholly beneficial by appropriate selection of sites and that if this is done then there should be no environmental concerns from the removal of trees at the time of harvesting; and
- wastes from sawmilling operations should be environmentally acceptable for the production of woodchips for either local or export use.

The Commonwealth environmental agency has indicated that provided the EPA has no problems with the transport or pollution related to the harvesting, chipping and export of plantation resource, an application for export approval will need to be made but detailed environmental assessment is unlikely. This would be relevant to both private and State land.



Environmental Objective for Water Quality

To maintain or improve existing water quality in water systems (ie groundwater, streams, rivers, wetlands, lakes and estuaries) in the Region. For most water bodies, water quality is defined in terms of the waters being visibly clean and demonstrably healthy within the context of identified beneficial use.

Sub-Objectives

1. manage nutrient inputs to rivers, wetlands, estuaries and groundwater so that symptoms of nutrient enrichment do not occur. Such symptoms may commonly include:
   - large amounts of algae or other water plants;
   - unpleasant odours;
   - bacterial scums on water surface;
   - loss of sea-grasses and other rooted aquatic vegetation; and
   - loss of potable water.

   But the symptoms will vary in different systems.
2. manage salinity levels in rivers, wetlands, estuaries and groundwater so that adverse impacts of salinisation, such as the following, do not occur:
   - loss of potable water resources;
   - loss of fresh and brackish water habitats and their plants and animals;
   - loss of fringing vegetation of water bodies; and
   - loss of natural and agricultural vegetation in the catchments of water systems.
3. manage all other potential inputs (eg heavy metals, pesticides, organic wastes, discharges at elevated temperatures) to avoid adverse impacts, such as:
   - contamination of aquatic animals and plants to a point that would threaten human consumption or the survival of the organisms;
   - contamination of waters to a point that would threaten human or animal consumption;
   - discolouration; and
   - de-oxygenation and production of odours.
4. manage the rate of soil loss into rivers, wetlands and estuaries so that siltation of these surface waters and associated adverse effects such as accelerated erosion, smothering of vegetation, flooding and deposition are minimised.

Environmental Objective for Remnant Native Vegetation

To retain and manage remnant native vegetation.

Sub-Objectives

1. Maximise retention of native vegetation on all lands and review proposals that would require clearing in the context of the identified values.
2. Manage all existing remnant native vegetation, so retained, to encourage continuance and regeneration.
3. Work co-operatively with adjacent land holders, vesting authorities, local Soil Conservation Committees and community interest groups, to maximise the value of the above retained areas and other areas of native vegetation (in accordance with the identified values) and to optimise management costs.
4. Re-establish vegetation (trees) on already over-cleared land. If this is in the form of plantations, then establish in the context of the objective and sub-objectives for Plantations (refer Plantations).
5. Where desirable, encourage planting of appropriate vegetation to establish connections between islands of existing remnant native vegetation.

Additional Sub-Objectives for Proponent Government Agencies and/or Agencies in whom Land is Vested

6. Retain all existing native vegetation on Crown land, Land Act Reserves and all other publicly controlled lands, within presently overcleared agricultural areas.
7. Minimise changes in purpose or vesting or approval of leasing arrangements where approval would be detrimental to the intent of the above sub-objectives.
8. Progressively review the vesting of reserves where any permissible development might be detrimental to the intent of the above sub-objectives.
9. Ensure that new linear reserves (eg road, rail, powerlines etc) are of sufficient width to allow for long-term requirements for the utility and the retention of significant buffers of native vegetation, in perpetuity.

Environmental Objective for Industrial Land Uses

Prescriptive guidelines for industrial land uses in the Kwinana area were developed as part of the assessment of the Liquid Petroleum Gas facility (EPA Bulletin 257). These guidelines have been modified and are reproduced below in the Appendix.

Ensure that the impacts of industrial developments do not exceed the assimilative capacity of the receiving environment and are adequate to safeguard the population.

Sub-Objectives

1. Determine the suitability of land for industrial use, based on the environmental effects identified for that land use and the sub-objective statements applying to other elements of the biophysical environment.
2. Evaluate existing degraded land to determine its suitability for industrial development, taking account of both on-site and off-site factors.
3. Ensure that all aspects of industrial development are planned and managed in such a way that human safety and welfare are not jeopardised and so environmental systems are maintained in accordance with the sub-objectives for water and remnant native vegetation.
4. Ensure that adequate buffers are provided and retained between residential and industrial land uses and between industrial development, reserves, national parks and other land, where this is appropriate.
5. Ensure that infrastructure is sited in accordance with sub-objective No. 1 above and the environmental effects identified for each infrastructure component.

Environmental Objective for Residential Land Uses

Ensure that all residential development is carried out in keeping with maintaining the sustainability and quality of environmental systems.

Sub-Objectives

1. Determine the suitability of land for residential uses, based on the criteria identified for the particular land use and the objective and sub-objective statements applying to other elements of the biophysical environment.
2. Evaluate existing degraded land to determine its suitability for residential development, taking account of both on-site and off-site factors.
3. Ensure that adequate buffers are provided and retained between residential land uses and industrial development, reserves, National Parks and other land where this is appropriate.
4. Ensure that all infrastructure, including sewage discharges, is sited in accordance with sub-objective No. 1 above and the environmental effects for each infrastructure component.

(Infrastructure includes all utilities such as roads, rail, Telecom facilities, powerlines, sewerage schemes, waste disposal sites etc.)

Environmental Objective for the Establishment of Plantations

Establish plantations to optimise environmental and economic benefits.

Sub-Objectives

1. Establish plantations on already cleared land.
2. Optimise site selection to ensure soil conservation.
3. Optimise site selection for plantations to ensure water conservation.
4. Optimise siting of plantations to produce, protect or enhance faunal habitat.

APPENDIX

Principles of Industrial Location, Management and Control (Modified from Environmental Protection Authority, 1986)

- **Principles for Location of Industry**
  - Industry which has the potential for adverse impacts on people or on the environment should only be located where its impacts can be assimilated or controlled. This may be achieved by siting within a properly designated and managed "industrial zone", the beneficial use of which is recognised by the community as industrial. In certain instances this may necessitate a remote location.
  - An "industrial zone" should contain only industry, and should also be separated from residential areas by an appropriate buffer zone.
  - The environmental impacts of industry should be restricted to the "industrial zone" and "buffer zone". Excursions of excessive impacts beyond the buffer zone should be rare, and should only result from atypical events (either within the industrial plant or of the environment).
  - Land use in the "buffer zone" should be such that it does not impact adversely on residential areas.
  - Land use in the "buffer zone" should be sufficiently resilient to withstand impacts from the "industrial zone".
  - The location of particular industries within an industrial zone should be such that impacts on other industries fall within prescribed standards for environmental risk and ongoing environmental impact.
- **Principles of Project Approval**
  - Each new project with the potential for significant environmental impacts, or amendment to any existing project that would increase its environmental impact, should be subject to environmental impact assessment. (In some more remote country areas particular types of developments requiring assessment may be prescribed by the EPA).
  - It is the responsibility of the proponent to demonstrate that any proposal will not impose more than an acceptable level of risk or impact to the environment or to the health and wellbeing of the community.
  - A proposed new industry, or alteration to an existing industry should be designed to ensure that its environmental performance is appropriate to the prescribed standards for the zone in which it is proposed or located, and for its particular location within that zone.
  - Any new industry, or alteration to an existing industry should have adequate management procedures to control performance to specified levels for both the regular operation and for contingency events.
  - Whenever a new project is assessed, consideration should also be given to the cumulative impact with existing industries in the region.
- **Principles of Environmental Management by Industry**
  - New industry should be constructed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial use.
  - The operation of any industry should be managed such that it satisfies both the conditions set at project approval, as well as the general requirements of the zone's beneficial use.
  - Industry should conduct periodic reviews to ensure that it retains the ongoing capacity to control performance to specified levels for both regular operation and for contingency events. Such reviews should be subject to assessment of their environmental acceptability.
- **Principles of Monitoring and Regulation**
  - Each industry should monitor its environmental impacts to ensure that they do not exceed the standards set for the beneficial use of the area impacted.
  - Industry should be required to advise Government of the likely environmental consequences as soon as practicable after the occurrence of any unforeseen event such as an accidental discharge.
  - Standards of performance should be enforced such that beneficial use criteria are met.

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