The future of Perth coastal waters: Have your say

A discussion paper addressing environmental values, environmental quality objectives and draft environmental quality management zones

Discussion Paper

ion Authority

CSIRO

The future of Perth coastal waters: Have your say

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October 1998

Foreword

I am pleased to present to you this discussion document on environmental values, environmental quality objectives and where they should apply. This paper has been produced with the help of community representatives with interest in and knowledge of Perth coastal waters. Their input has been extremely valuable in identifying the major issues and editing the document for readability and clarity. I wish to thank them for their support and input into this document.

Your views are a vital element in this process and I would welcome any comments that you may wish to make on issues raised in the document or other issues you believe to be relevant. The discussion paper will be open for comment until 18 December 1998.

To assist you in making your comments I would urge you to consider what you want the environmental quality of Perth coastal waters to be in 5 years, 10 years and for future generations. As you consider this issue it is important to remember that we must balance protection, improvement and use of the environment.

To help you give feedback we have included a questionnaire including a number of maps for you to identify these areas. Please consider these carefully and provide us with your views.

The outcome of this consultation will be the Environmental Protection Authority's Position Paper on Environmental Values, Environmental Quality Objectives and draft environmental quality management zones.

It is important that once we have established these values and objectives that we manage the environment to meet these objectives. Where the objectives are not met we will set in place environmental management to reach them.

The next step in this process involves the identification of indicators for environmental quality and the definition of criteria for assessing these indicators.

We look forward to your comments so that we can be assured of setting the objectives for environmental quality of Perth coastal waters at levels which are desired by the Western Australian people.

Bernard Bowen

Bernard Bowen

Chairman
Environmental Protection Authority

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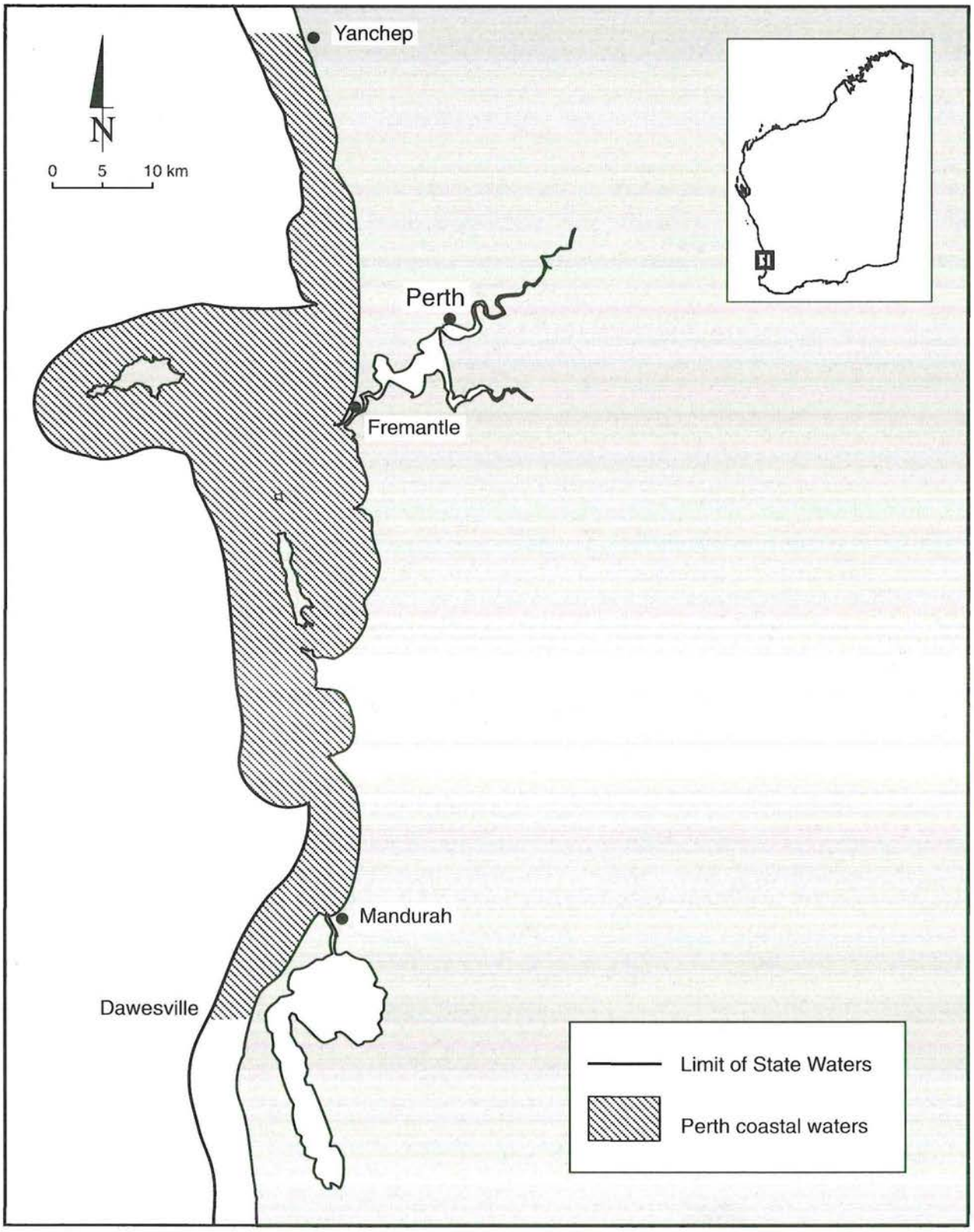


Figure 1. Map showing Perth coastal waters.

1. What is this about?

You are being asked to help in the environmental management of Perth coastal waters — the coastal waters from Yanchep to Dawesville (Figure 1). You can help by having your say as part of a public involvement process conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) on behalf of the Western Australian Environmental Protection Authority (EPA).

In particular, we are asking for your answers to any or all of three key questions:

1. ***What do you want Perth coastal waters to be like and what do you want to be able to do safely in these waters? (determine environmental values);***
2. ***In order to protect your values, what goals should be set for the quality of the water, sea floor, plants, animals and other living things along this section of coast? (determine environmental quality objectives); and***
3. ***Remembering the need to balance protection, improvement and use of the environment, where should different values and objectives apply along the coast? (determine draft boundaries for environmental quality management zones).***

Your input will form the basis of a report to the EPA. This report will guide environmental management in Perth coastal waters by making recommendations on environmental values, environmental quality objectives and draft boundaries for environmental quality management zones. The EPA will then prepare a position statement on these issues.

You can use this document to help you complete the enclosed feedback survey or prepare more detailed comments by:

- **gaining a quick overview**
  read only Section 2 for a very quick summary of the issues (read pages 3 to 7);
- **picking and choosing issues to consider in more depth**
  use the pointers in Section 2 to find more information on issues that interest you in Sections 3 and 4 (read pages 7 to 18 and select from pages 19 to 29); and
- **reading about all of the issues in more depth**
  read Sections 3 and 4 completely for a more extensive explanation of the public participation process (read pages 7 to 29).

Your input is critical. CSIRO will report your comments to the EPA as guides to improving environmental management in Perth coastal waters and as suggestions for conducting similar efforts at other places along the State's coast. You can track how your views have influenced environmental management in Western Australia by obtaining copies of all documents from the Department of Environmental Protection (DEP) or by visiting the DEP's web site at http://www.environ.wa.gov.au

Environmental values

An agreed set of environmental values determines what our environmental management needs to protect. Environmental values will vary among groups of people, and they will change over time.

Broadly speaking, environmental values include:

- natural qualities of the environment; and
- our uses of the environment.

Environmental quality objectives

Environmental quality objectives are specific goals that are set to help us achieve the level of environmental quality needed to protect the agreed environmental values. Some objectives help us protect the natural environment itself, and some help us protect our use of the natural environment.

When considering environmental quality objectives, it is important to remember that some goals may be difficult to reach in some places. By choosing to set objectives that are not easily achieved, we accept that it will take time and effort to achieve our goals.

Environmental quality management zones

Certain activities or interactions among activities may stop us from achieving all our environmental quality objectives and protecting all our environmental values at certain places. One aid in managing these differences in environmental quality is to know that they occur in zones marked by boundaries.

Although natural systems and the effects of human activities may cross artificial borderlines, boundaries and zones are useful. For example, they show us where the environmental quality is good enough for swimming, fishing or boating, or they show us where we are trying to improve environmental quality. In addition, zones provide a focus for monitoring to detect improvements or degradation in environmental quality, with managers responding to any changes by taking the appropriate actions.

Figure 2. Key definitions for the issues to be discussed.

2. How can I have my say quickly?

The examples presented here suggest how environmental quality might be treated in Perth coastal waters. The key to having an influence on this issue is to make as many relevant comments on each suggestion as possible. You are also welcome to add new suggestions that you feel are important.

Please remember that this process focuses on the management of human activities that can affect environmental quality, including the purity of the water, condition of the sea floor, and health of plants and animals. A high quality environment provides benefits such as protection of nature, safe places for recreation, attractive coastal waters and edible seafood.

Activities that affect environmental quality include treated wastewater coming from pipelines (point sources), runoff or contaminated groundwater coming from catchments (diffuse sources) and contaminants released from ships. Ultimately, your comments on how to manage these pressures can influence management of other potentially detrimental activities (e.g. fishing, tourism and coastal development), but your immediate influence will be greater if you focus on the specific issues given here.

You can help by commenting on three key parts of a management system (see the definitions in Figure 2 or the full description of the management approach on pages 13 to 18 in Section 3):

1. Environmental values;
2. Environmental quality objectives; and
3. Draft environmental quality management zones.

2.1 Environmental values

The Environmental Protection Authority believes there is an expectation by Western Australians that they will be able to:

- recreate in marine waters without risking illness or infection;
- consume seafood in the knowledge that it is safe to do so; and
- enjoy the benefits of a healthy, abundant and diverse natural environment.

Accordingly, four environmental values are provided as examples as the 'default settings', that is, these values exist in all of the State's marine waters (see also pages 19 and 20 in section 4). However, there may be cases where these particular environmental values may not be appropriate for a particular portion of the State's marine waters (for example, a shipping port within the confines of a port facility).

Four environmental values are provided as examples for Perth coastal waters (see also pages 19 and 20 in Section 4):

i. **Ecosystem protection;**

ii. **Recreation and aesthetics;**

iii. **Fishing and aquaculture; and**

iv. **Industrial water supply.**

The first of these environmental values is a fundamental value because it embodies the inherent characteristics of the natural system. Protection of these inherent characteristics is fundamental because our uses ultimately depend on the natural system.

The other three values refer to our use of coastal waters. Our use of the coastal environment includes recreational activities such as tourism, boating, recreational fishing, collecting seafood, swimming, surfing, snorkelling, diving, learning about natural history, watching whales, beachcombing and photographing sunsets. Our enjoyment of many activities will be decreased if the aesthetics or attractiveness of our environment is diminished by human activities that discolour the water, produce unwanted smells, or create surface slicks of oil or grease. A clean environment is also important if commercial fishing and aquaculture are to continue to produce edible seafood. In order to support our way of life, industries use coastal waters for shipping and industrial operations like cooling, heating and evaporative processes.

In this public involvement process, you are asked to comment on issues related to maintaining an environment of sufficient quality for these values to be protected. As you prepare your comments, please remember that all of our activities in coastal waters will have to be managed carefully to ensure they do not cause unacceptable environmental change. Such management is dealt with as part of fisheries management, conservation management, coastal planning and other processes that complement this one.

2.2 Environmental quality objectives

Five environmental quality objectives are provided as examples for Perth coastal waters (see also pages 20 and 21 in Section 4):

i. **Maintain biodiversity;**

ii. **Maintain ecosystem integrity;**

iii. **Maintain aquatic life fit for human consumption;**

iv. **Maintain recreational values; and**

v. **Maintain aesthetic values.**

These five examples are related to the values of ecosystem protection, recreation and aesthetics, and fishing and aquaculture. If these environmental quality objectives are achieved and the associated values are protected, then the requirements for protecting the industrial water supply value would also be met.

These objectives set out the goals of maintaining environmental quality at a level that:

i. ensures each naturally occurring type of marine life is found in sufficient numbers to survive within Perth coastal waters;

ii. balances the need to support healthy communities of living things in relatively undisturbed states with the inevitable effects of human activities (see the next section on environmental quality management zones, page 17 in Section 3 and pages 22 to 28 in Section 4);

iii. yields aquatic life that is fit for human consumption except in small, designated areas (see Special Purpose Zones below and pages 22 to 28 in Section 4);

iv. allows people to engage in recreational activities such as boating, fishing, swimming, snorkelling, diving and surfing in all of Perth coastal waters except small, designated areas (see Special Purpose Zones and pages 22 to 28 in Section 4);

v. retains the attractiveness or aesthetics of Perth coastal waters except in small, designated areas (see Special Purpose Zones and pages 22 to 28 in Section 4).

2.3 Draft environmental quality management zones

Four environmental quality management zones are provided as examples for Perth coastal waters (see also pages 22 to 28 in Section 4):

i. Sanctuary Zone;

ii. General Use Zone;

iii. Buffer Zone; and

iv. Special Purpose Zone.

The four zones presented here differ in their balance of human use and protection of natural values. One or a few human uses dominate in Special Purpose Zones, whereas full preservation of natural values and strict control of human use dominates in Sanctuary Zones. The four zones will also vary markedly in size and number. Special Purpose Zones are expected to be small and relatively few in number. Buffer Zones are expected to be very few in number and slightly larger than Special Purpose Zones. Sanctuary Zones will vary in size and number depending on the region in which they are located. The bulk of Perth coastal waters is expected to be in a General Use Zone where human activities and healthy, natural systems co-exist. People can expect the size and number of Buffer Zones and Special Purpose Zones will not increase with time, and they can also expect other zoning schemes, including those for marine conservation, fisheries management and coastal planning will be consistent with these zones.

We propose some **hypothetical** draft boundaries and zones to generate discussion (Figures 3a and 3b). The scenario presented here has the majority of Perth coastal waters classified as one or more General Use Zones with smaller Special Purpose and Buffer Zones associated with existing uses. This scenario is not drawn to scale, and it represents only one example of a balance between protection and use of the marine environment. You are asked to give your view of an appropriate balance and make any comments that would help us understand the reasons for your choice of boundaries. These reasons may include both benefits and costs. As you make comments, it is important to remember that the relatively broad zoning scheme discussed here will eventually be applied to other sections of the Western Australian coast, be linked to other types of zoning, and be linked to more detailed management at local levels.

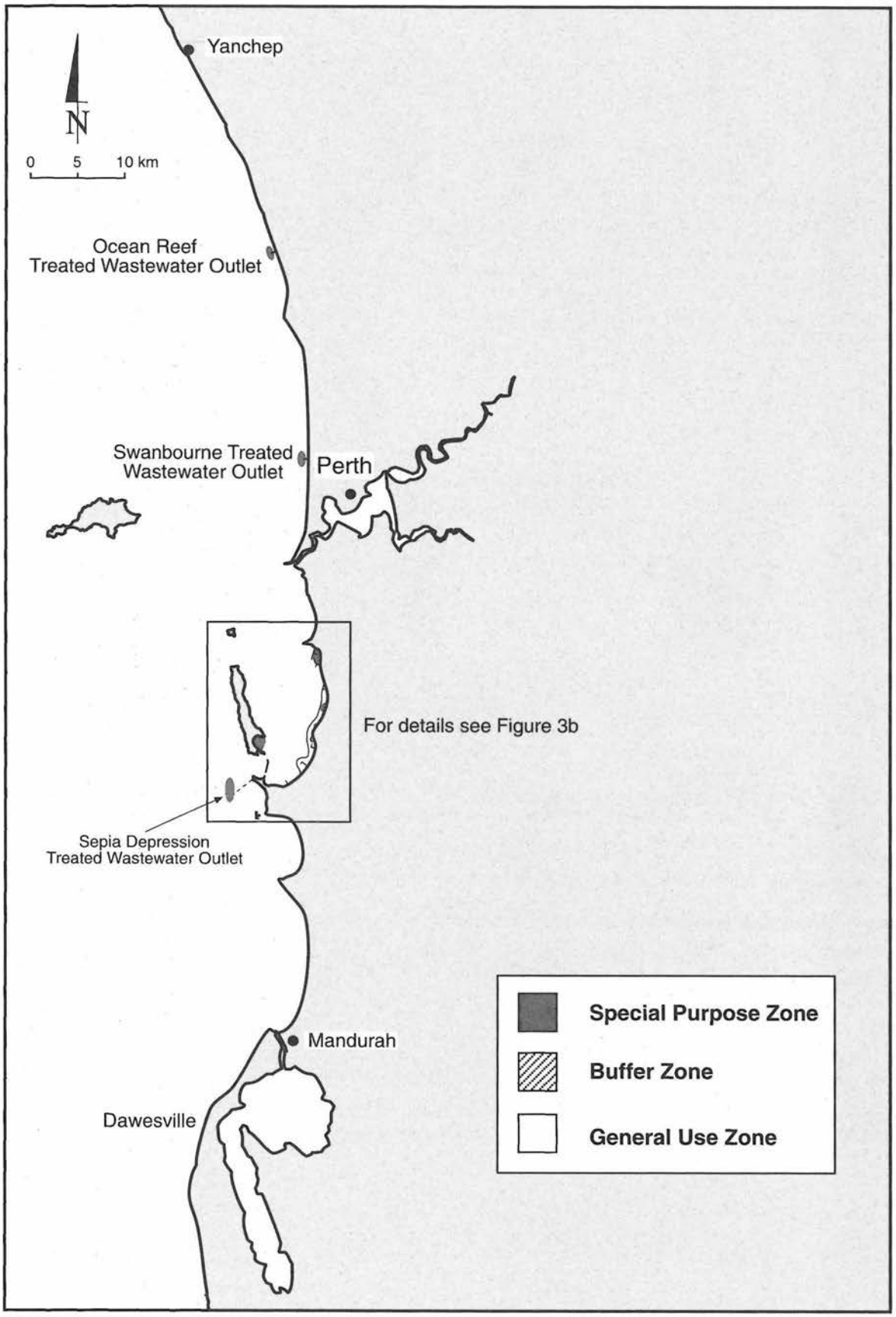


Figure 3a. Examples of Special Purpose and Buffer Zones in all of Perth coastal waters. In this scenario, all other waters will be General Use Zones, and there are no Sanctuary Zones.

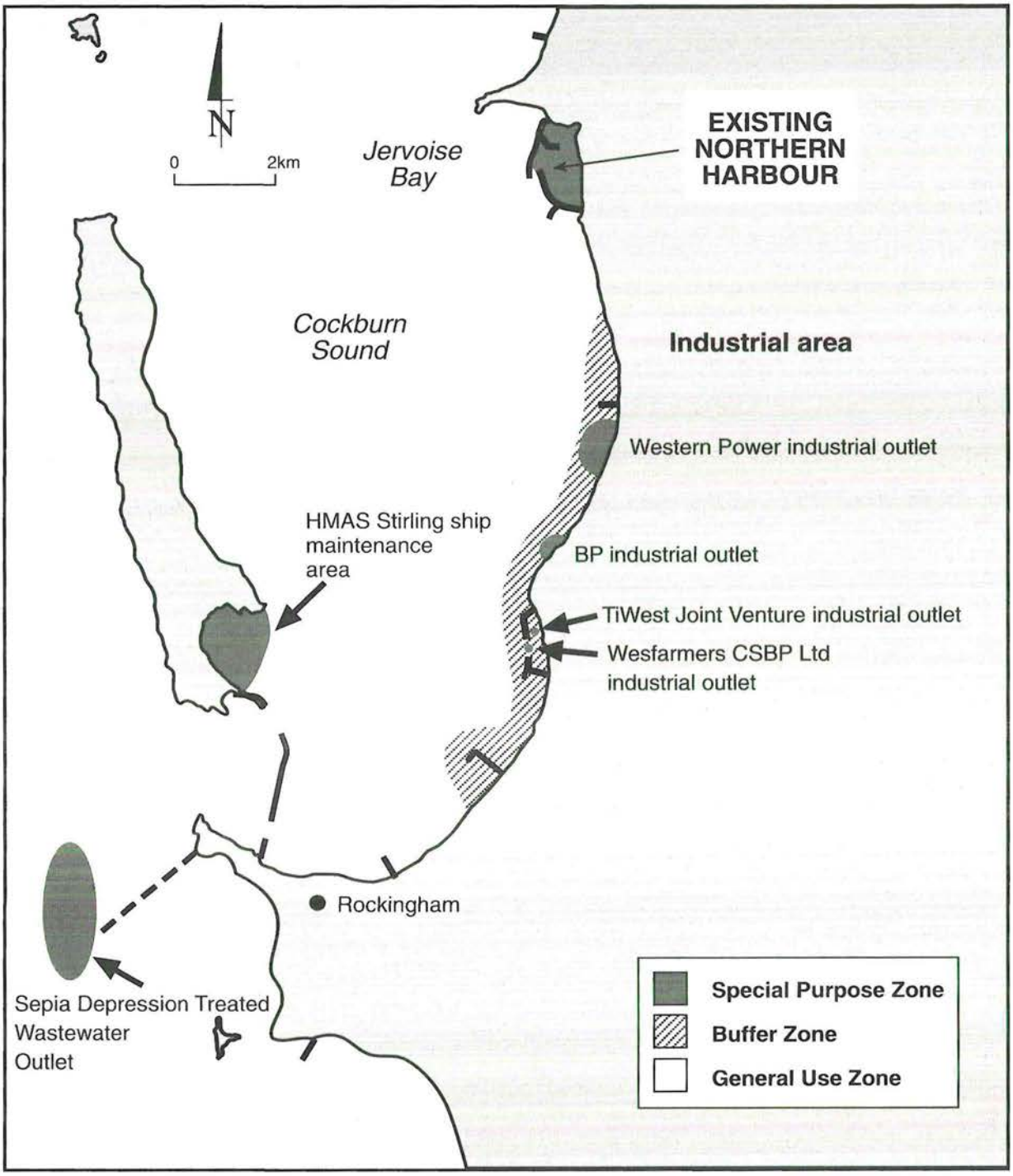


Figure 3b. Examples of Special Purpose and Buffer Zones in Cockburn Sound.
In this scenario, all other waters will be General Use Zones, and there are no Sanctuary Zones.

2.4 How can I help?

Your input will form the basis for our report to the EPA. By Friday, 18 December 1998, we would like you to:

1. think about the environmental values, environmental quality objectives, draft boundaries and environmental quality management zones proposed in this discussion paper;
2. focus on what you want done to balance protection, improvement and use of the marine environment;
3. give us your thoughts on what you want done by:
   - completing the enclosed feedback survey;
   - making changes to the boundaries on the maps and providing the reasons for your changes; and
   - submitting any other comments or questions you may have.

You can use the enclosed reply paid envelope, mail the feedback survey and any written submissions to the EPA or send in comments by e-mail. The addresses for submissions are:

postal address:

Environmental Protection Authority
Perth Coastal Waters
Management and Consultative Process
PO Box K822
PERTH WA 6842

e-mail address:

perth_coastal_waters@environ.wa.gov.au

Please remember, the deadline for submissions is Friday, 18 December 1998.

What next?

At this point, you can fill out the enclosed feedback survey or send us your more detailed comments. If you are interested in more information, please read some or all of the following sections before providing your comments.

3. I want to know more

3.1 What is CSIRO's role?

The CSIRO part of the public involvement process is guided by five principles:

- use existing materials, such as scientific reports and maps;
- make it easy for the community to provide comments;
- provide feedback to participants in response to their input;
- evaluate, and if necessary, modify the process as it progresses; and
- make information gathered during the process freely available to all.

The CSIRO part of the process involves producing this discussion paper and the CSIRO report to the EPA, seeking comments on the discussion paper at two times, and evaluating the public involvement process itself (Figure 4). The effectiveness and fairness of the public involvement process are being tracked by two Stakeholder Reference Groups and a group of Key Stakeholders (Table 1).

These two groups have already had some input to the process. Workshops with the Key Stakeholders and review of an initial draft discussion paper by the Key Stakeholders and the Stakeholder Reference Groups have improved the clarity and focus of this discussion paper.

This discussion paper is meant to help you contribute to the public involvement process. It provides background on worldwide changes in environmental management and those that are occurring in Australia and Western Australia. In particular, it sets out current thinking about key changes in the management of Perth coastal waters and asks for your comments.

Table 1. Key Stakeholders and members of the Stakeholder Reference Groups (SRGs).

Key Stakeholders	Groups represented on the SRGs
Australian Marine Conservation Society	Coastal action groups
Coastal Waters Alliance	Commonwealth interests (Defence
Conservation Council of Western Australia	Conservationists
Department of Conservation & Land Management	Diving interests
Department of Resources Development	Local government
Fisheries Western Australia	Marine environmental groups
Fremantle Port Authority	Recreational fishing groups
Kwinana Industries Council	Residents action groups
Marine Parks & Reserves Authority	Sailing clubs
RECFISHWEST	Surf life saving interests
South West Group	Surfing interests
Water Corporation	Tourism interests
Water & Rivers Commission	Youth
Western Australian Tourism Commission	

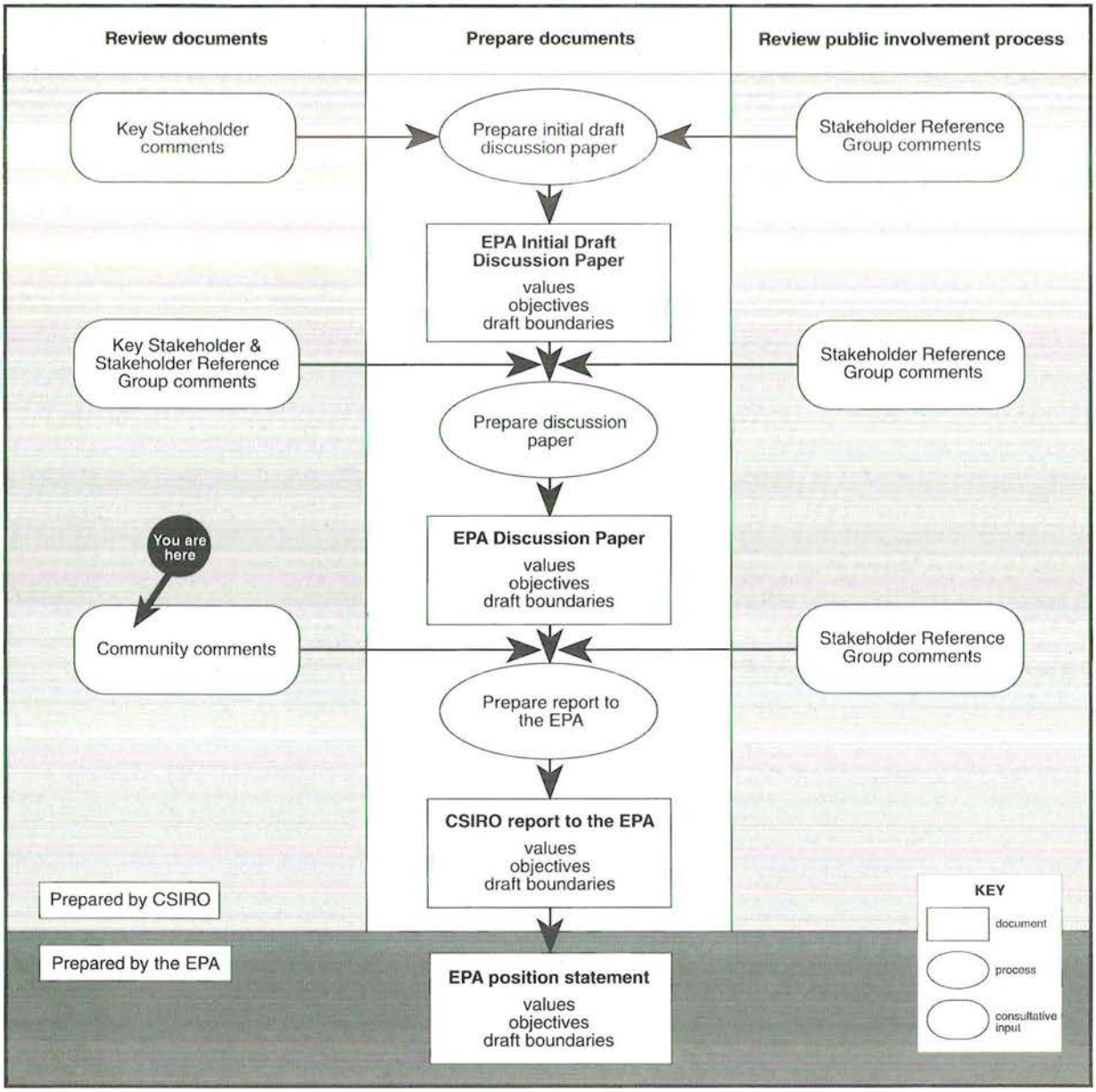


Figure 4. Public involvement process.

3.2 Why go to all this trouble?

Concern for the health of marine and coastal environments and a desire to improve the way we interact with these environments is driving this public involvement process and other changes to environmental management in Western Australia, Australia and other nations. The coast is a special place that is loved and enjoyed by many people, but our actions put pressure on coastal environments. Balancing these pressures with protection of the environment poses a challenge to environmental management. Simple suggestions like stopping all pressures on coastal waters or manipulating the natural system to help it cope with all of our activities are seldom feasible and often lead to other problems. A clear idea of what we want our environment to be like, a commitment to managing our activities to reach these goals, and full community participation will be needed if we are to protect our marine and coastal environments and provide for quality of life now and in the future.

Concern for marine and coastal environments

Marine and coastal environments receive pressures from many activities and from interactions among activities. Some pressures on coastal waters arise from large-scale activities, such as coastal development, commercial fishing, mining, shipping, and industrial or domestic waste discharge. Although they are easy to see, these activities are not always simple to manage. Pressures from less obvious activities are even more difficult to manage. Activities undertaken by individuals or small groups fall within this category. For example, the sheer numbers of recreational fishers may put more pressure on coastal environments than commercial fishing, and the unmanaged activities of individual tourists may cause more damage than larger numbers of people in appropriately managed tourist groups. Other pressures, such as certain types of pollution, are difficult to manage because they originate from large areas of land or they enter coastal waters along broad areas rather than through pipes. For example, oil from roads, sediment from improper clearing of land and nutrients from overuse of fertilisers can be carried to coastal waters by stormwater runoff or contaminated groundwater. All of these inputs can cause undesirable changes in environmental quality. Two examples will illustrate the challenges facing environmental managers.

Shipping is a valuable and visible activity in our marine and coastal waters, and, like all human activities, it has associated environmental issues. For example, paint containing tributyltin (TBT) reduces the growth of plants and animals on ship's hulls. Unfortunately, TBT leaches from the paint into the water, and paint chips enter the environment when the ships are repainted. We know that it takes very little TBT to kill or interfere with the breeding of some animals. We also know that TBT can continue to cause problems for years after it enters the environment because it disappears slowly once it collects in sediment. The ability to affect a variety of animals at low concentrations and a tendency to persist in the environment make TBT a chemical of concern.

Simply banning TBT would stop inputs and, ultimately, eliminate the threats to marine life, but it may lead to other undesirable effects. Without TBT or a replacement, ships' hulls are fouled by more plants and animals. Increased fouling not only decreases the efficiency of ships, which will ultimately raise the cost of goods, but it may also increase the risk of introducing marine pests. Managers have tried to avoid the economic and ecological problems associated with a total ban on TBT by banning its use on small boats, setting a limit on the rate at which TBT leaches from paint, and instituting controls where ships are repainted. These efforts have decreased the amount of TBT entering the environment. In addition, research to develop a replacement with fewer undesirable side effects is showing promising results.

Groundwater represents a good example of the problems to be faced in managing less obvious environmental problems. Groundwater is a key resource in the Perth area that is collected in catchments extending several kilometres inland. Materials placed on or in the soil can enter the groundwater and be transported to the coast. Groundwater and any associated contaminants may enter the coastal waters along broad fronts at many places. For example, nitrogen, a nutrient found in garden and agricultural fertilisers, can be transported to coastal waters in groundwater. Some nitrogen is necessary for healthy marine plant life, but too much can cause excessive growth of some plants, loss of other plants and a variety of associated problems. To reduce nitrogen inputs to coastal waters, we need to manage both broad-scale land use and industrial inputs to minimise contamination of groundwater (eg Figure 5).

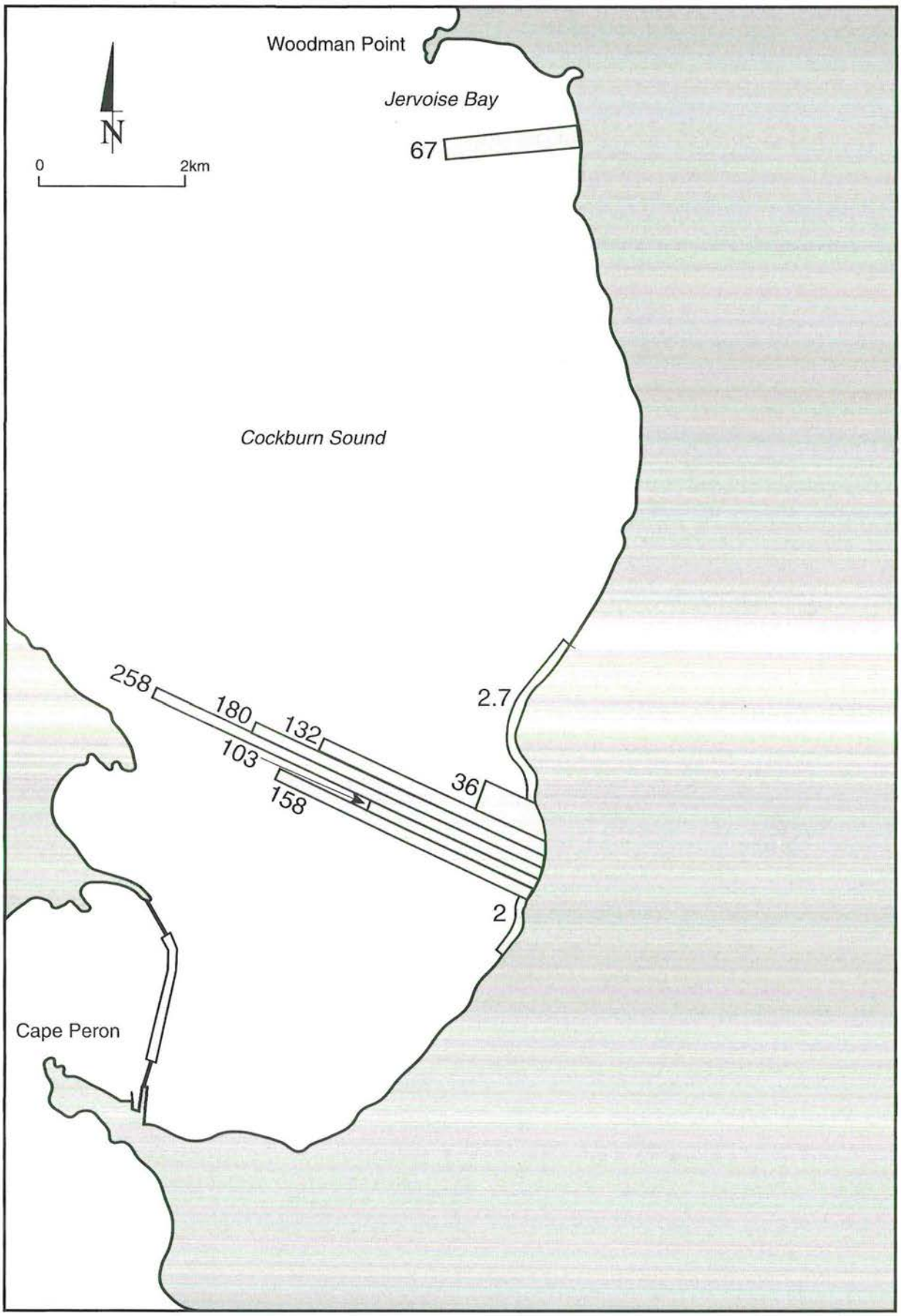


Figure 5. Estimated inputs of nitrogen carried into coastal waters by groundwater from the Tamala Limestone (DEP 1996). Numbers are tonnes of nitrogen seeping from one kilometre sections of the coast during a year. During 1994, nitrogen from all groundwater sources accounted for about 70% of the nitrogen entering Cockburn Sound, but inputs have declined since that time.

Many other examples could have been used, but the key point is that coastal waters act as a big 'sink' where multiple pressures generated by maritime, industrial, urban and rural activities accumulate and interact. This complexity poses a challenge to effective management of coastal waters that will only be overcome if everyone bears some responsibility.

Concern about environmental management

Western Australia is not alone in its attempts to improve management of coastal waters. The recently released series of documents dealing with Australia's Oceans Policy summarises global and national concerns and actions (see Appendix A for more information).

One key change is to assign responsibility for marine and coastal waters to nations and States (Figure 6). Australia is now responsible for the use and management of approximately 16 million square kilometres of ocean, the Exclusive Economic Zone. This area is about twice the size of the continent. Western Australia is responsible for its State Waters, which extend to at least three nautical miles offshore from its 12 500 kilometre coastline (a total area of over 69 000 square kilometres).

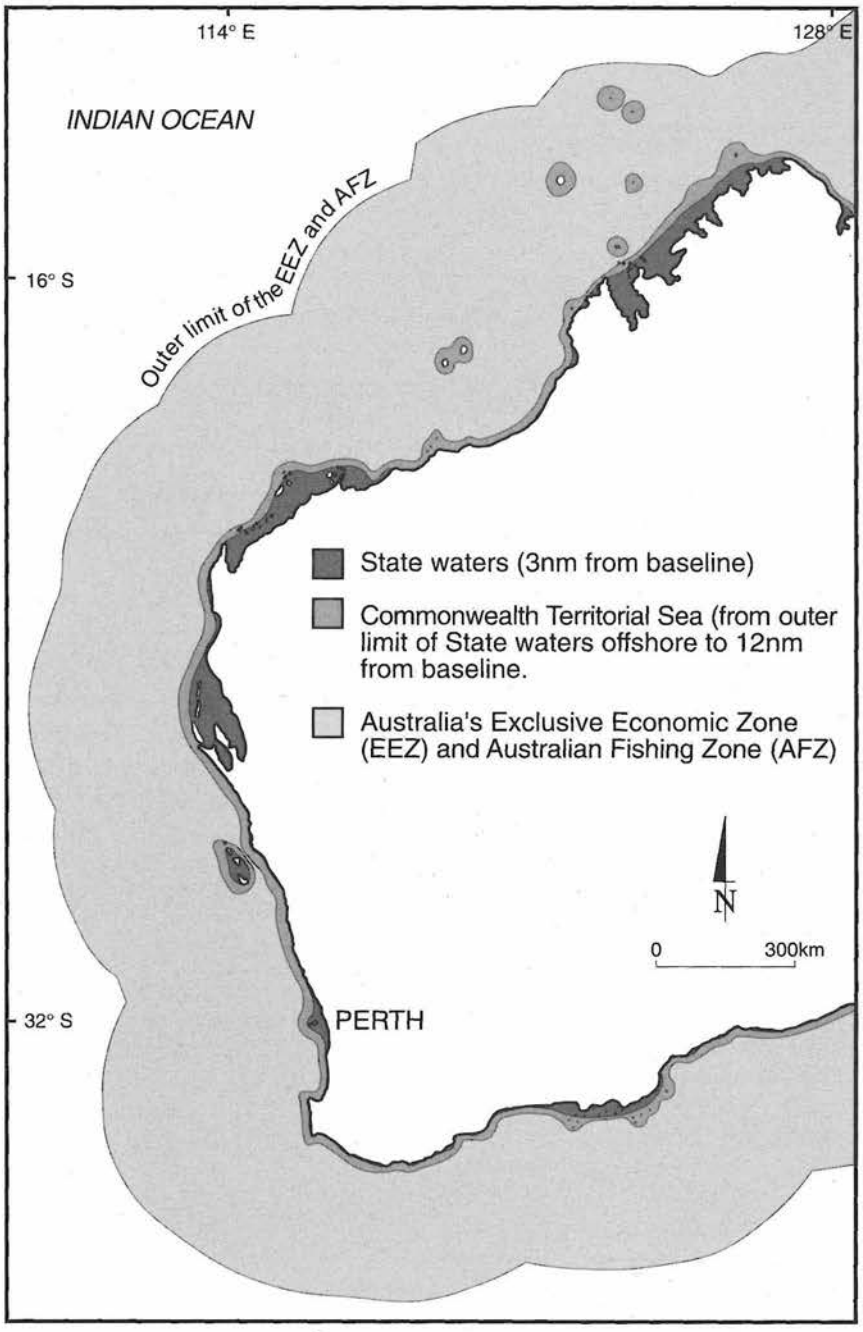


Figure 6. Jurisdiction in the coastal and marine waters off Western Australia. Australian State Waters are the responsibility of Western Australia.

As part of their responsibilities, Australia and other nations have supported several United Nations initiatives. These initiatives call for management based on a scientific understanding of the condition of natural systems; the conservation of plants, animals and other living things in nature; and the control of pollution carried from the land to the sea.

Within Australia, we have recognised the need to improve management of our marine and coastal environments. Over the past eight years, thirty-four inquiries or reports on Australia's coastal and marine environments generated 266 recommendations related to improving coastal management (Zann and Early 1998). By having your say, you can help make this public involvement process a successful step in Western Australia's efforts to make improved environmental management of coastal waters something we do rather than something we debate.

3.3 How does this relate to other changes in Western Australia's marine environmental management?

Environmental Protection Policy for Western Australia's marine waters

A recently released Draft Environmental Protection Policy (EPP) lays out the broad basis for management in all of Western Australia's coastal waters (a copy of the draft EPP is available from the DEP and it can be viewed on the DEP's web site, http://www.environ.wa.gov.au).

The Environmental Protection Authority believes there is an expectation by Western Australians that they will be able to:

- recreate in marine waters without risking illness or infection;
- consume seafood in the knowledge that it is safe to do so; and
- enjoy the benefits of a healthy, abundant and diverse natural environment.

Accordingly, the EPP has been prepared with these 'default settings' in mind. However, there may be cases where these particular environmental values may not be appropriate for a particular portion of the State's marine waters (for example, a shipping port within the confines of a port facility).

Key elements in the Draft Environmental Protection (State Marine Waters) Policy include:

1. commitment to a primary objective of preserving, protecting and enhancing all environmental values;
2. incorporation of important management trends like:
   - assigning responsibilities for management more clearly;
   - coordinating management among all those with responsibilities;
   - focusing on long-term objectives and forward planning;
   - considering the effects of multiple uses and their interactions (cumulative impacts);
   - considering the full cost of all uses, including all environmental effects;
   - managing and monitoring according to responses of natural ecosystems;
   - testing management predictions and continually reviewing and improving management; and
   - encouraging community participation.

Overall, the trend is to move beyond a short-term focus on the obvious environmental impacts of single projects to a consideration of the cumulative environmental consequences of multiple activities and their interactions throughout the ecosystem over longer time periods. In order to meet this challenge, the responses of natural systems need to form the basis for coordinated management responses, continual efforts to learn and improve, and full participation by the community. Our ability to manage in this way will not be perfect, but imperfection should not prevent us from trying.

In summary, the EPP establishes environmental values for Western Australia's marine waters, sets out the broad management objective of protecting those values and lays out a broad program for achieving this goal. In recognition of the variation in marine environments and the range of human activities along the Western Australian coast, the EPP acknowledges the need to coordinate State, local and regional environmental management plans as the way to achieve the primary objective. This discussion paper deals with a regional approach for Perth coastal waters.

Annex for Perth coastal waters

The natural environments and human uses of coastal waters vary greatly along the coast of Western Australia. In response to these differences, the EPA will develop annexes to the EPP for sections of the coast (Figure 7 and Appendix B). Annexes will contain further details on localised environmental management, and, in turn, they may need to be supported by even more detailed management plans that are developed in coordination with other State agencies, local government or catchment management groups. Annexes and other environmental management plans must be consistent with the values and broad objectives set by the EPP.

This discussion paper describes some of the key elements in the annex for Perth coastal waters. It will be the first annex to be developed; similar efforts will follow for other regions.

3.4 What are the key aspects in Western Australia's approach to managing the quality of its marine and coastal waters?

An understanding of how Western Australia will manage the quality of its marine and coastal waters may help you formulate your input to the public involvement process. The approach is based on the steps shown in Figure 8.

1. Principles

Principles guide our choices and actions. The principles proposed for management of marine waters in Western Australia link to those being promoted internationally and nationally. Key principles include:

a. a clean, healthy and safe environment is the basis for our long-term survival and

Suggestions regarding input

As you read this discussion paper and formulate your comments, it will be important to remember four things.

1. **Your comments will help with the preparation of an environmental management plan for Perth coastal waters.**
2. **This annex for Perth coastal waters focuses on management of activities that have the potential to affect environmental quality. Environmental quality includes the quality of the water, sediments, and communities of living things along with some aspects of the quality of human life (e.g. providing safe places for taking seafood, recreation and enjoying the coast). Important pressures to be considered in detail include treated wastewater coming from pipelines (point sources), contamination from catchments (diffuse sources) and contaminants released from ships. In addition to affecting this annex and the EPP, your input will help to coordinate, influence and support other management processes. These other processes will deal with important issues such as planning (e.g. how much development and where should it be), conservation (e.g. the location and management of marine parks or reserves), extractive industries (e.g. the amount and location of mining and dredging) and fishing (e.g. the type, amount and location of commercial or recreational fishing and aquaculture).**
3. **The annex looks at all of Perth coastal waters so your input will be most effective if you look beyond localised environmental problems.**
   Goals related to improving existing environmental quality in degraded areas are important, but everyone also needs to look ahead and make decisions that will maintain the high quality of the broader Perth coastal waters.
4. **The annex is meant to look ahead over a period of about seven years. After this time, the management approach will be reviewed, revised and improved.**

You have a stake in the environmental quality of Perth coastal waters, and you are encouraged to submit any comments that you have. The suggestions given here and elsewhere in this document may help you have the greatest influence on this process and future processes.

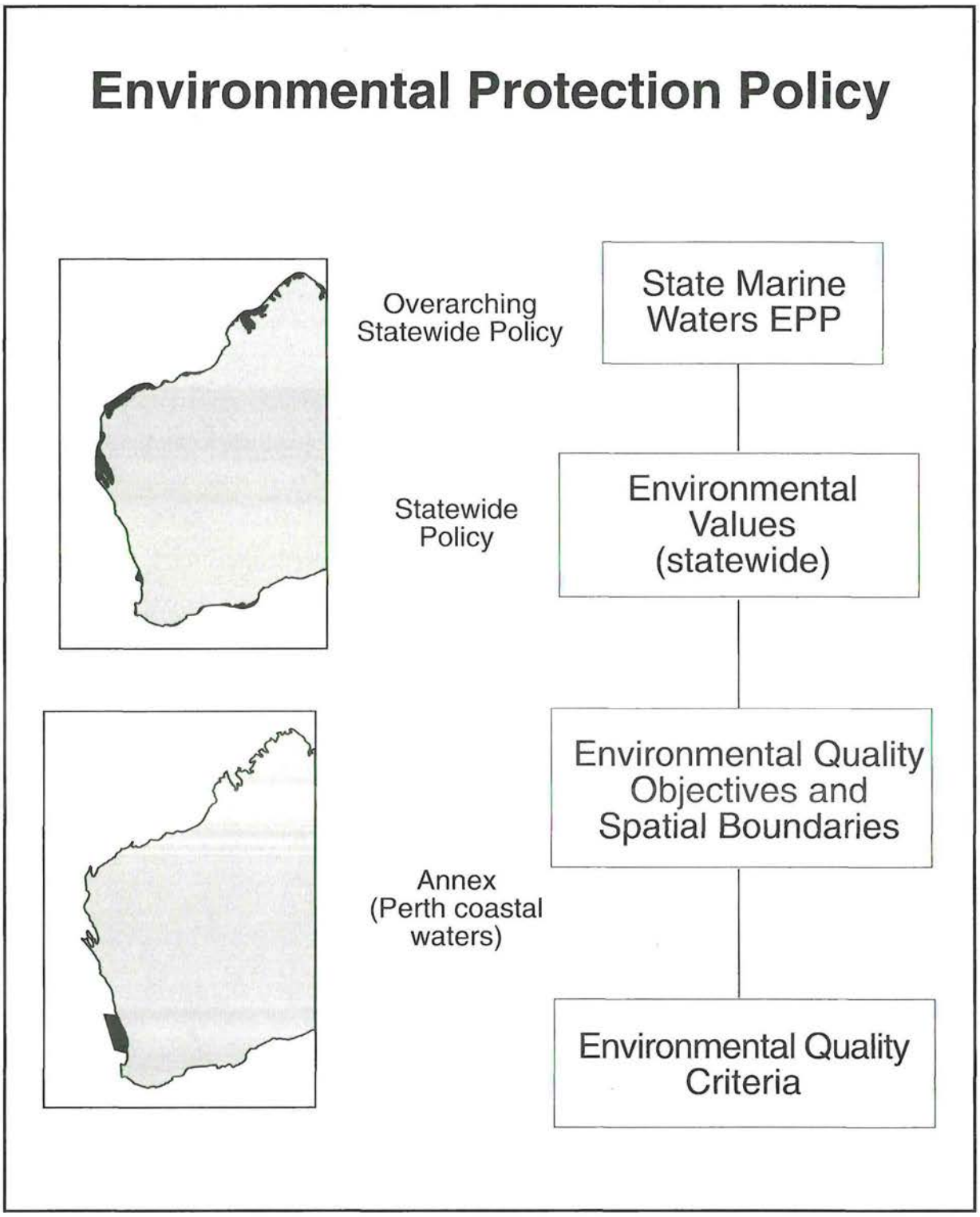


Figure 7. Relationship between the Environmental Protection Policy for Western Australia's marine waters and local annexes such as that for Perth coastal waters.

enjoyment (natural systems support our activities);

b. decision-making should effectively combine long-term and short-term environmental, economic, social and equity considerations (ecologically sustainable development, resource sharing and intergenerational equity).

c. environmental management should incorporate scientific understanding so that we use appropriate signals from natural systems to guide and trigger our management actions (science-based ecosystem management);

d. decision-making should involve the public and encourage them to care for the environment as a collective responsibility (participatory management);

e. decision-making should prevent major impacts on the environment even if we are uncertain about the likelihood of the impact (precautionary management);

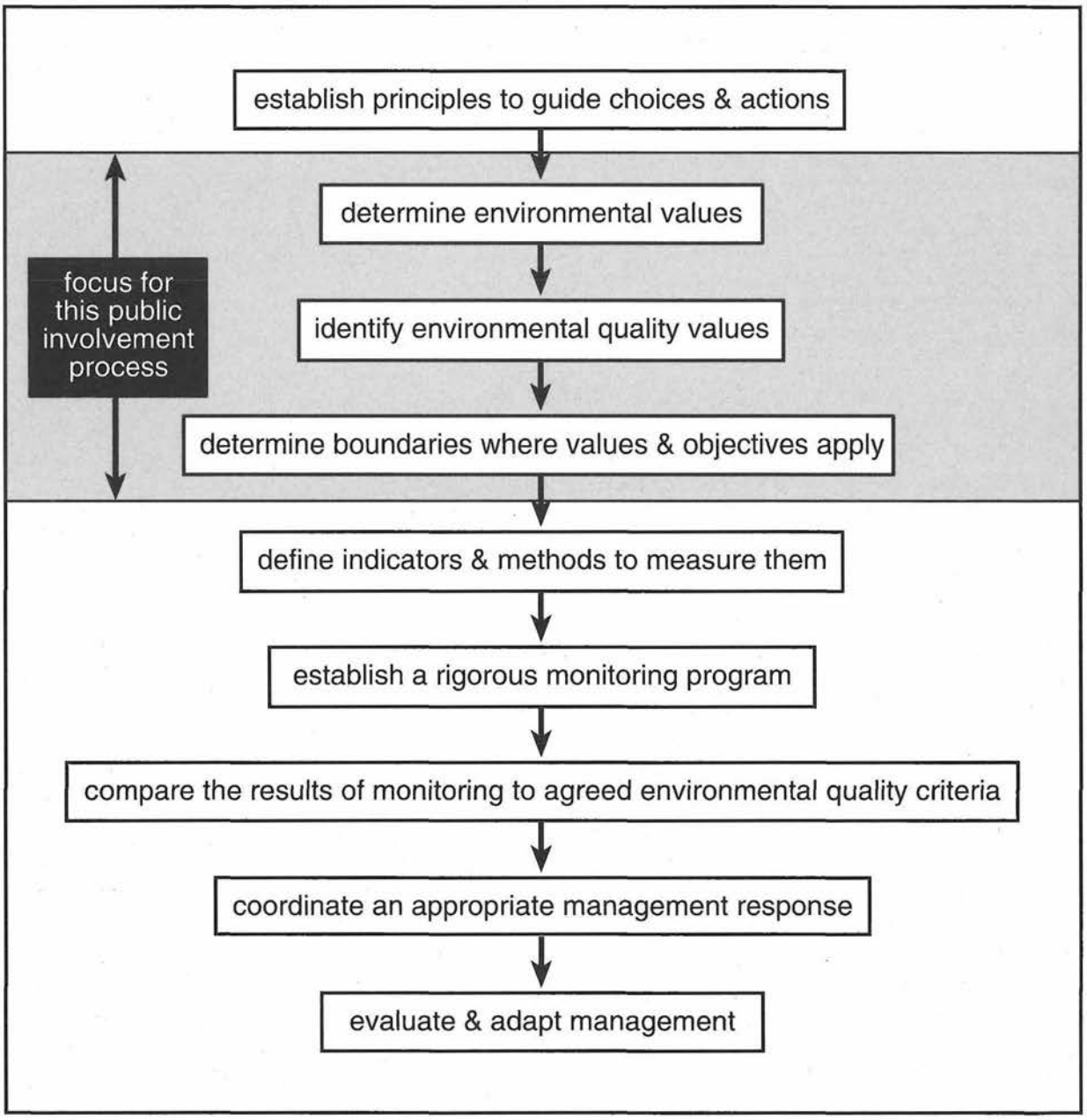


Figure 8. Steps in the management of Perth coastal waters.

f. environmental management should require those who use the environment to show that they can avoid or detect and successfully manage likely impacts (anticipatory management);

g. environmental management should recognise that nothing is certain, so continual review and improvement are needed to reduce uncertainty (adaptive management);

h. decisions about human activities should be based on the full cost of using the environment, including the costs of consuming resources, disposing of waste, managing impacts and reducing opportunities for other users or future generations (full cost allocation); and

i. those who gain by using the environment should pay their fair share of the total costs (user pays).

2. Environmental values

Environmental values provide an important context for other aspects of management. An agreed set of values represents a 'big picture' that will help us as we find our way through the complexities of day-to-day environmental management.

In the past, our environmental management focused on protecting 'beneficial uses', but this focus has been expanded to more clearly recognise that natural systems have values that are not directly related to our uses. Although these inherent values of natural systems are recognised, values are still derived from the viewpoint of people, and this link leads to two key consequences. Values vary among groups of people, and values will change over time.

This document presents examples of two broad types of environmental values. It discusses 1) inherent natural or ecological characteristics of the environment (fundamental values) and 2) our uses of the environment (utilitarian values).

Fundamental values

Natural or ecological characteristics represent fundamental values, and they include:

- the physical and chemical properties of our environment;
- the variety of plants, animals and other living things (biodiversity);
- the quantities of plants, animals and other living things (numbers or abundance and weights or biomass); and
- the interactions among plants, animals and other living things and between them and their non-living surroundings (ecosystem function).

In many cases, the reason it is important to protect these natural characteristics is clear because we see a direct link to one or more of our activities. For example, the chemical properties of water can affect people's health and some plants and animals provide food. Natural characteristics of marine waters that are not yet directly linked to an existing activity also require protection, because they are important in the natural system and they may become important to people in the future. In general, protection of fundamental values should take precedence over protection of human uses because valued human activities tend to be dependent on a healthy environment rather than vice versa.

Utilitarian values

Our uses of the environment also represent things of value, but these values tend to have an associated environmental cost. Valuable products come from tourism, commercial fishing, aquaculture, shipping and other industries that use coastal waters. People also want to be able to swim, surf, snorkel and dive without getting sick (primary contact recreation); go boating and fishing in safety (secondary contact recreation); and enjoy beautiful sunsets and the sight of whales and other marine life. Furthermore, people want to be able to eat the seafood they catch or collect without worrying about their health. As you determine your environmental values, please remember that, according to the principles listed earlier, use of the environment should be ecologically sustainable.

As part of ecologically sustainable use, coastal waters will be used in industrial processes. The return of this water to the coastal environment is part of many processes. Returning the water is often desirable because other means of disposal may cause problems such as increased salt content in soils. Use of the discharged water as a means of disposing waste is an activity that needs to be carefully managed. In fact, minimising waste through more efficient production, recycling and re-use should be a priority.

In the foreseeable future, everyone will produce and dispose of some waste. Despite the inevitability of discharging waste, the type, amount, level of pre-treatment and location of

such discharges should always be considered and justified. Coastal waters may be a place where we can dispose of some wastes without causing unacceptable changes in a natural system, but this decision needs to be made carefully. The knowledge and tradeoffs involved in such decisions represent important challenges to effective environmental management.

3. Environmental quality objectives

An environmental quality objective typically specifies a condition of the environment that needs to be reached or maintained to ensure that one or more environmental values are protected. An environmental quality objective may also include a description of the type and amount of change to be permitted by the community. Thus, environmental quality objectives represent goals for management that are chosen to protect environmental values.

Environmental quality objectives are related to one or more environmental values. Objectives linked to ecological values take precedence because they protect essential characteristics of natural systems. Objectives linked to human uses are negotiated in an effort to balance existing and future uses according to a range of ecological, economic, political and social factors. When considering environmental quality objectives, it is important to remember that some goals may be difficult to reach with current technology. Having such challenging objectives is fine if everyone recognises the effort and time that will be needed to achieve them.

4. Environmental quality management zones

Balancing protection and ecologically sustainable use of the environment becomes somewhat easier if the environment is divided into zones. Boundaries for environmental quality objectives and environmental values perform this role. Everyone has a stake in determining these boundaries because our quality of life ultimately depends on a balanced approach to allocating different levels of environmental quality to different zones.

Establishing effective boundaries is not a simple process because natural systems and the effects of human activities will not be contained by artificial borderlines. This is particularly true in the dynamic waters off our coast. Nevertheless, boundaries are extremely useful. For example, they signal where it is suitable or where people want it to be suitable to swim, boat, fish or undertake other uses of the environment. Boundaries also provide guidelines for sampling programs designed to detect undesirable changes in the natural system. Research and consistent review of management should lead to improved use of boundaries and zones in the future.

> *Please note*
>
> **The issues discussed below are provided as background information. They are not the primary focus at this time, but they will form the basis for future public involvement process.**

5. Indicators

Indicators act as signposts along the track to achieving environmental quality objectives and protecting environmental values. Indicators may be direct measurements of environmental values or environmental quality objectives. More typically, however, they are measurements of characteristics or properties that are related to environmental values and environmental quality objectives (indirect indicators). To be effective, we must be able to interpret how changes in indirect indicators translate into changes in system characteristics or changes in environmental values or environmental quality objectives. For example, counts of faecal coliforms in water are used to indicate that people who swim in these waters are safe from faecal pollution. These bacteria are not the only cause for concern, but such counts have become accepted as a simple and sufficiently reliable indicator of the levels of other bacteria and viruses.

The choice and use of direct or indirect indicators will always lead to questions and debates about whether they will provide an early warning of environmental damage and whether they will be sufficient to protect complex natural systems. The principles listed earlier state that this uncertainty must not be allowed to forestall environmental protection (precautionary management), and that uncertainty must be explicitly addressed by management plans (anticipatory management). In addition, uncertainty can be decreased by accumulating knowledge from research, monitoring and review of management (adaptive management).

6. Monitoring

Environmental management that is based on the way a natural system responds to the pressures of multiple uses relies on monitoring. A key to effective monitoring is to have agreement on the rules before playing the game. Methods to measure indicators must be standardised and agreed so that the results can be used in comparisons without the need for debate about the value of an indicator at any given place or time. Indicators must be measured as part of an agreed and rigorous program designed to detect changes. In addition, an agreed set of analyses and interpretations must be applied to the results of monitoring, and the results must be linked to agreed management actions.

A perfect monitoring program would be able to detect and identify different types of changes. For example, monitoring should be able to differentiate between natural change and changes caused by human activities. In addition, monitoring should not only detect a large change (catastrophic change) or an abrupt change (acute change), but it should also provide an early warning of gradual change (chronic change). It is important to remember that our knowledge of natural systems and their interactions with human activities can never be perfect so it may take some time and effort to learn how to monitor effectively. Furthermore, monitoring programs will cost money so there will be a need for innovative ways to use resources effectively.

7. Environmental quality criteria

The effectiveness of management is judged by comparing measurements of indicators to environmental quality criteria. Environmental quality criteria act as benchmarks for indicators and triggers for management actions when measurements of one or more indicators suggest that management will not achieve its objectives. Criteria are derived from the best available knowledge, and they may be a single number (e.g. a count of faecal coliform bacteria) or a description of a key comparison (e.g. a comparison of seasonal cycles). Whenever possible, criteria represent an objective interpretation of technical information, although some criteria will be set according to more subjective evaluations. In all cases, criteria should be explicit to eliminate arguments about whether any particular criterion is or is not met. In addition, the management response to a failure to meet any criterion should be appropriate to the situation. For example, the appropriate management response may be to look for the cause of the failure.

8. Management response

Management responses represent the key step in any management approach. Western Australia aims to use adaptive management involving measurement of indicators, comparisons with criteria, triggering management actions and improvements to the management system driven by continual research and monitoring. In deciding on a management response, it is necessary to judge the acceptability and significance of a change in the environment. A given management response must be appropriate to the type and size of change. Management responses may include pursuing more information or altering one or more uses of the environment. In general, degrading natural values or not meeting objectives will be unacceptable.

Suggestions regarding input

Your input to Western Australia's management approach is important. Although the core concepts are not likely to change significantly due to their wide acceptance at the international and national levels, it is important that these concepts make sense to everyone. In addition to filling out the feedback survey, please consider the following questions:

1. **Are there aspects of the approach that require further explanation?**
2. **Overall, are you satisfied with the approach?**
3. **How could the approach be improved? and**
4. **Are there any unnecessary elements in the approach?**

4. What are some detailed examples of environmental values, environmental quality objectives and draft environmental quality management zones for Perth coastal waters?

The primary purpose of this discussion paper is to elicit your views on how the initial steps in the management approach described above should be applied to Perth coastal waters. Please remember that the focus is on management of human activities that have the potential to affect environmental quality. Environmental quality includes the quality of the water, sediments, and communities of living things, as well as the benefits derived from a clean environment (e.g. having suitable places for recreation, experiencing coastal environments and taking seafood). The focus in this document is on managing pressures such as treated wastewater coming from pipelines (point sources), runoff or contaminated groundwater coming from catchments (diffuse sources) and contaminants released from ships. Ultimately, your input to this process will help coordinate, influence and support management applied specifically to other potentially detrimental activities (e.g. fishing, tourism and coastal development). The key to having an influence on the current process is to identify as many relevant issues as possible.

Your comments on three key elements in the management approach will be most useful. The elements of interest are:

1. **Environmental values;**
2. **Environmental quality objectives; and**
3. **Draft environmental quality management zones.**

4.1 Environmental values

An agreed set of environmental values determines what our environmental management needs to protect. Environmental values will vary among groups of people, and they will change over time. The choice of values will be influenced by your input.

Broadly speaking, we value:

- **natural qualities of the environment (fundamental values); and**
- **our uses of the environment (utilitarian values).**

Four examples of environmental values are provided for Perth coastal waters:

i. **Ecosystem protection;**

ii. **Recreation and aesthetics;**

iii. **Fishing and aquaculture; and**

iv. **Industrial water supply.**

The first of these environmental values is a fundamental value in that it embodies the inherent characteristics of the natural system; the other three values refer to our use of coastal waters (utilitarian values). Protection of the inherent characteristics of the natural system is fundamental because our uses ultimately depend on the natural system. These values echo those found in the Draft Environmental Protection (State Marine Waters) Policy (EPP).

i. Ecosystem protection

Placing value on ecosystem protection signals a desire to protect, or where the environment is degraded, to improve all the inherent components and processes of any ecosystem found in Perth coastal waters. Such ecosystems include sandy beaches, seagrass meadows, rocky reefs, and the marine plants and animals associated with them. These ecosystems also include functional processes such as the spread of early life history stages due to currents, food chains, and other dynamic interactions among marine life and between them and their non-living surroundings. The structure and function of Perth's coastal ecosystems support a variety of human activities.

ii. Recreation and aesthetics

Recreation and aesthetics (the attractiveness of the environment) represent a variety of valued human activities with an emphasis on enjoyment, relaxation or appreciation of the environment by individuals or groups. For example, recreational uses include tourism, boating, recreational fishing, collecting seafood, swimming, surfing, snorkelling and diving. The attractiveness of the environment will be diminished by human activities that discolour the water, produce unwanted smells, or cause surface slicks of oil or grease. In this document, the focus is on providing the environmental quality needed for these uses. The uses themselves may also cause damage, and they need to be managed as part of other appropriate management approaches to meet the environmental quality objectives.

iii. Fishing and aquaculture

In this document, commercial fishing and aquaculture represent two valuable uses of coastal environments that depend heavily on a clean and healthy environment. Providing such an environment is the goal of the Perth coastal waters annex to the EPP. It is recognised that these uses may lead to environmental degradation, therefore they require management by other agencies. For example, fishing can lead to over-harvesting, damage to habitats or injury to animals caught accidentally.

iv. Industrial water supply

In order to support our way of life, industrial water supply is a value which provides industrial operations like cooling, heating and evaporative processes. In the Perth coastal waters annex to the EPP, the focus is on maintaining water of sufficient quality for industrial water supply. As stated previously, return of water to the environment is considered acceptable, but using the water to dispose of waste is something to be managed and minimised rather than valued. The industrial water supply value will not be discussed in detail because it is considered to be protected if the other three values are protected.

4.2 Environmental quality objectives

Environmental quality objectives are specific goals that are set to help us achieve the level of environmental quality needed to protect the agreed environmental values. Some objectives help us protect the natural environment itself, and some help us protect our use of the natural environment.

When considering environmental quality objectives, it is important to remember that some goals may be difficult to reach in some places. By choosing to set objectives that are difficult to achieve, we must accept that it will take time and effort to reach these goals.

Examples of environmental quality objectives have been provided for the values of ecosystem protection, recreation and aesthetics, and fishing and aquaculture. If these environmental quality objectives are achieved at the level needed to protect the associated values, then the requirements for protecting the industrial water supply value would also be met.

The five environmental quality objectives are:

i. **Maintain biodiversity;**

ii. **Maintain ecosystem integrity;**

iii. **Maintain aquatic life fit for human consumption (includes molluscs);**

iv. **Maintain recreational values; and**

v. **Maintain aesthetic values.**

i. Maintain biodiversity

Maintaining biodiversity is an environmental quality objective related primarily to the fundamental value of ecosystem protection. Biodiversity is defined as the variety of living things found in nature. The goal would be to protect biodiversity throughout Perth coastal waters. In practice, this means that all viable groups of each naturally occurring organism will not be lost in Perth's waters due to large-scale impacts or the cumulative effects of smaller impacts. Two points to note about this objective are:

- in some relatively small areas, some marine life may be lost but not to the extent that populations are threatened; and

- the introduction of organisms not normally found in Perth coastal waters is not considered to increase biodiversity

ii. Maintain ecosystem integrity

The maintenance of ecosystem integrity is also a key to protecting ecosystems. Ecosystem integrity is defined as the ability of a natural system to support and maintain a balanced, interacting and adapting community of living things with characteristics comparable to its undisturbed state. Thus, the maintenance of ecosystem integrity relies on the maintenance of both structure (e.g. variety and quantity of living things) and function (e.g. food chains). It is important to remember that ecosystem integrity does not depend on the survival of every living thing because the functional processes of ecosystems provide alternatives that allow the system to cope with some losses.

All human uses affect ecosystem integrity to some degree, therefore their effects must be managed. At this point, the best available management tool is to divide the area to be managed with boundaries that define spatial zones. The level of change in ecosystem integrity will vary among zones. Your input on the size and placement of zones will help determine the balance among protection, improvement and use of the environment (see the next section on draft environmental quality management zones).

iii. Maintain aquatic life fit for human consumption (includes molluscs)

An environmental quality objective related to both the fishing and aquaculture and recreational and aesthetic values calls on management to maintain aquatic life that is fit for human consumption, including mussels, other molluscs and other animals that filter their food from the water. This environmental quality objective would apply to all Perth coastal waters except for small, designated areas where there are public health concerns (see Special Purpose Zones). This objective relates to 'fishable' in the 'beneficial use' terminology.

It may be necessary to complement this broad objective with finer scale management plans that differentiate among the different types of seafood. For example, it may be safe for people to catch and eat fish in certain areas where they should not take filter-feeding molluscs. This differentiation is based on how fish and filter-feeding molluscs interact with contaminants that pose a threat to human health.

iv. Maintain recreational values

An environmental quality objective related to the recreational and aesthetic value calls on management to maintain recreational values. Recreational values include secondary contact recreation (e.g. boating and fishing) and primary contact recreation (e.g. swimming, snorkelling, diving and surfing). It is proposed that this environmental quality objective applies to all Perth coastal waters except small, designated areas where the environmental quality is unsuitable (see Special Purpose Zones). For example, swimming above a treated wastewater outlet may be unsafe. Finer scale management may be necessary to indicate areas where secondary contact recreation is safe, but primary contact recreation is inadvisable.

v. Maintain aesthetic values

The final environmental quality objective states that management will maintain the aesthetics or attractiveness of Perth coastal waters as described in the recreation and aesthetics value. This objective would apply to all of Perth coastal waters except for small, designated areas (see Special Purpose Zones). Thus, the public should not expect human activities to discolour the water, cause slicks on the water's surface or produce unwanted smells in most of Perth coastal waters.

4.3 Draft environmental quality management zones

Certain activities or interactions among activities may stop us from achieving all our environmental quality objectives and protecting all our environmental values at certain places. One aid in managing these changes in environmental quality is by knowing that they occur in zones marked by boundaries.

Although natural systems and the effects of human activities may cross artificial borderlines, boundaries and zones are useful. For example, they show us where the existing environmental quality is good enough for swimming, fishing or boating, or they show us where we are trying to improve environmental quality. In addition, zones provide a focus for monitoring to detect improvements or degradation in environmental quality, with managers responding to any changes by taking the appropriate actions.

In general, boundaries around zones will be defined according to what changes are acceptable. A change is defined in relation to natural or agreed background conditions. In the examples presented here, little change will be permitted in most areas, and changes that are allowed will be small. Changes will be detected by comparing measurements of agreed indicators made with standard methods to agreed criteria. Indicators, methods and criteria will not be simple to develop, but they will be developed using the best available information. In addition, they will be continually improved as we use research and monitoring to learn more about managing our interactions with the coastal environment.

Specific indicators and criteria that distinguish acceptable and unacceptable changes will be defined later, but five key environmental attributes and two human uses are used as examples:

1. purity of the water (water quality);
2. condition of the sea floor (sediment quality);
3. quantities of plants, animals and other living things (numbers or abundance of organisms and weights or biomass of organisms);
4. variety or number of types of living things (biodiversity);
5. interactions among living things and between them and their non-living surroundings (function of the ecosystem, e.g. maintenance of food chains);
6. taking or growing seafood; and
7. recreation and aesthetic uses.

In the examples presented here, these attributes and uses are used to define four broad zones for the State's coastal waters. These zones will need to be integrated with other zoning plans, including those for marine conservation, fisheries management and coastal planning. **The four proposed environmental quality management zones are:**

i. **Sanctuary Zone;**
ii. **General Use Zone;**
iii. **Buffer Zone; and**
iv. **Special Purpose Zone.**

i. Sanctuary Zone

Sanctuary Zones are natural or pristine areas where there is essentially no waste discharge or degradation of environmental quality due to human activities that take place in the marine environment or in the associated catchments. Thus, people should expect no detectable changes in any of the attributes and uses, and they would not expect Special Purpose, Buffer or General Use Zones to be placed inside Sanctuary Zones. Because the environment is essentially pristine, all human activities could be undertaken safely in this zone, but they may need to be strictly controlled to prevent impacts.

Due to the level of human influence in Perth coastal waters, examples of such zones are not included in here, but you should feel free to suggest some. Sanctuary Zones may be found elsewhere along the Western Australian coast, but generally, such areas will be small and rare anywhere in the world because humans have some impact on most coastal waters.

ii. General Use Zone

In General Use Zones, water and sediment quality may change, but the changes are limited by environmental quality criteria to ensure that there are no changes beyond natural variability in quantities of living things (abundance/biomass of

biota), variety of living things (biodiversity) or the functioning of the ecosystem. Special Purpose and Buffer Zones may be established within General Use Zones. Monitoring of indicators and comparisons to environmental quality criteria will ensure that the quality of the water, sediment and living things outside any Special Purpose Zones is sufficiently high for people to enjoy recreation, fishing, aquaculture and an attractive environment (aesthetics). Other management plans, including those applied to conservation, fishing and coastal development, may be needed to resolve issues arising from conflicts among uses and losses of living things or other effects on the natural system not related to environmental quality.

iii. Buffer Zone

Buffer Zones will primarily be located adjacent to activities with less significant impacts than those in Special Purpose Zones or around areas with multiple Special Purpose Zones (e.g. a major industrial site). These two situations illustrate the key role for Buffer Zones. Buffer Zones will primarily mark areas of potential concern that the community wants monitored relatively closely. Concerns may arise because of uncertainty regarding the impacts of a single activity or a combination of activities.

Water quality, sediment quality and the quantities of living things (abundance/biomass of biota) may change in Buffer Zones, but the changes are limited by environmental quality criteria with the aim of ensuring that there are no changes beyond natural variability in the variety of living things (biodiversity) or the functioning of the ecosystem. Monitoring of indicators and comparisons to environmental quality criteria will also ensure that the quality of the water, sediment and living things outside Special Purpose Zones is safe for human use. Like Special Purpose Zones, Buffer Zones are not meant to occupy large areas or threaten the integrity of an ecosystem, and a key goal will be to use any available improvements in management to reduce the number and size of these zones. More specific information on conditions in Buffer Zones may be specified as part of management at a finer scale.

iv. Special Purpose Zone

In a Special Purpose Zone, the community may allow activities that prevent us from achieving some or all environmental quality objectives. This choice means that we may not protect some or all environmental values. These zones were formerly termed 'Exclusion Zones'.

It is reasonable for the community to expect Special Purpose Zones to occupy a small portion of the environment. As they become available, improvements in management should be used to reduce the size and number of these zones.

Special Purpose Zones may be declared around harbours, industrial activities or waste discharges where quantities of contaminants prevent achievement of certain environmental quality objectives and protection of certain environmental values. Outside Special Purpose Zones, contaminants should be at levels where they are no longer of concern. Thus, Special Purpose Zones should mark a conservative estimate of where a given activity will have a significant effect.

Changes in all seven broad indicators are unlikely to occur in any single Special Purpose Zone. The exact details of what will or will not change in any Special Purpose Zone will vary and should be specified in licensing conditions and local management plans.

Summary of the zonation scheme

In summary, the four zones presented here differ in their balance of human use and natural values. One or a few human uses dominate in Special Purpose Zones, whereas full preservation of natural values and strict control of human use dominate in Sanctuary Zones (Table 2). The four zones will vary in size and number. Special Purpose Zones are expected to be small and relatively few in number. Buffer Zones are expected to be very few in number and slightly larger than Special Purpose Zones. Sanctuary Zones will vary in extent and number depending on the region in which they are located. The bulk of Perth coastal waters is expected to be in one or more General Use Zones where human activities and healthy, natural systems co-exist.

In the General Use and Buffer Zones some change is acceptable in water and sediment quality. These changes will not be so great as to cause change in the other attributes and to prevent uses. However, in the Buffer Zone a moderate change will be accepted in the biomass/abundance of some species provided there is no change in biodiversity and ecological function.

Levels of acceptable change in these zones will be developed through the identification of indicators and setting of criteria. The extent of change will depend on the nature of the attributes to be protected.

	Attributes and uses	Sanctuary Zone	General Use Zone	Buffer Zone	Special Purpose Zone
Attributes	Natural water quality	no change	low change	moderate change	high change
	Natural sediment quality	no change	low change	moderate change	high change
	Natural abundance/biomass	no change	no change	low change	high change
	Natural biodiversity	no change	no change	no change	high change
	Natural ecological	no change function	no change	no change	high change
Uses	Recreation (e.g. swimming) and aesthetics	yes	yes	yes	no

Table 2 Potential level of changes in attributes and resultant allowable uses within draft environmental quality management zones.

Creating and maintaining zones by defining appropriate boundaries will not be easy. Initial choices will be affected by the need to accommodate existing and future uses, and, importantly, the need to halt or reverse degradation of our coastal waters. Maintaining boundaries will rely on diligent implementation of monitoring and the other elements of environmental management.

A slightly different approach to defining environmental values and boundaries can be found in a report from the Perth Coastal Waters Study (Hillman et al. 1995). Parallels can be drawn between the two approaches (Appendix C).

Examples of draft boundaries and zones

Examples of draft boundaries and zones are shown to generate discussion (Figures 9a and 9b). The scenario presented here confirms that the majority of Perth coastal waters is of high quality because it is classified as one or more General Use Zones. The scenario also has smaller Special Purpose and Buffer Zones associated solely with existing uses. The Special Purpose and Buffer Zones are notional, so they should only be considered as indicative of any future zoning. In addition, this scenario represents only one example of how to balance protection and use of the marine environment. As you consider the balance you want to have and the comments you want to make, please remember:

- the relatively broad zoning scheme discussed here is meant to apply to other sections of the Western Australian coast, and it will need to be complemented by management at more localised levels; and
- tradeoffs will need to be made whenever boundaries are chosen.

Important tradeoffs can be illustrated by considering the discharge of treated wastewater. The tradeoffs involved in effective management of wastewater are a matter of concern for most of us in the Perth area because everyone produces household wastewater that typically enters one of the treatment systems (e.g. Woodman Point, Figure 10). Everyone would like to dispose of wastewater without causing a major change in the environment, but this is not a simple task. The terrestrial environment around Perth cannot support wholesale disposal through septic systems or irrigation, and ocean disposal is another option. The effects of treated wastewater on coastal ecosystems and associated human activities will depend on the quantity of wastewater released and the level of treatment before discharge (Figure 11). Improved treatment leading to smaller areas of influence is feasible, but it costs money. In addition, tight boundaries around the treated wastewater outlet will require increased monitoring to check for unacceptable changes. This increased management will also generate costs. The costs of improved treatment and management are likely to be passed on to each of us through an increase in rates.

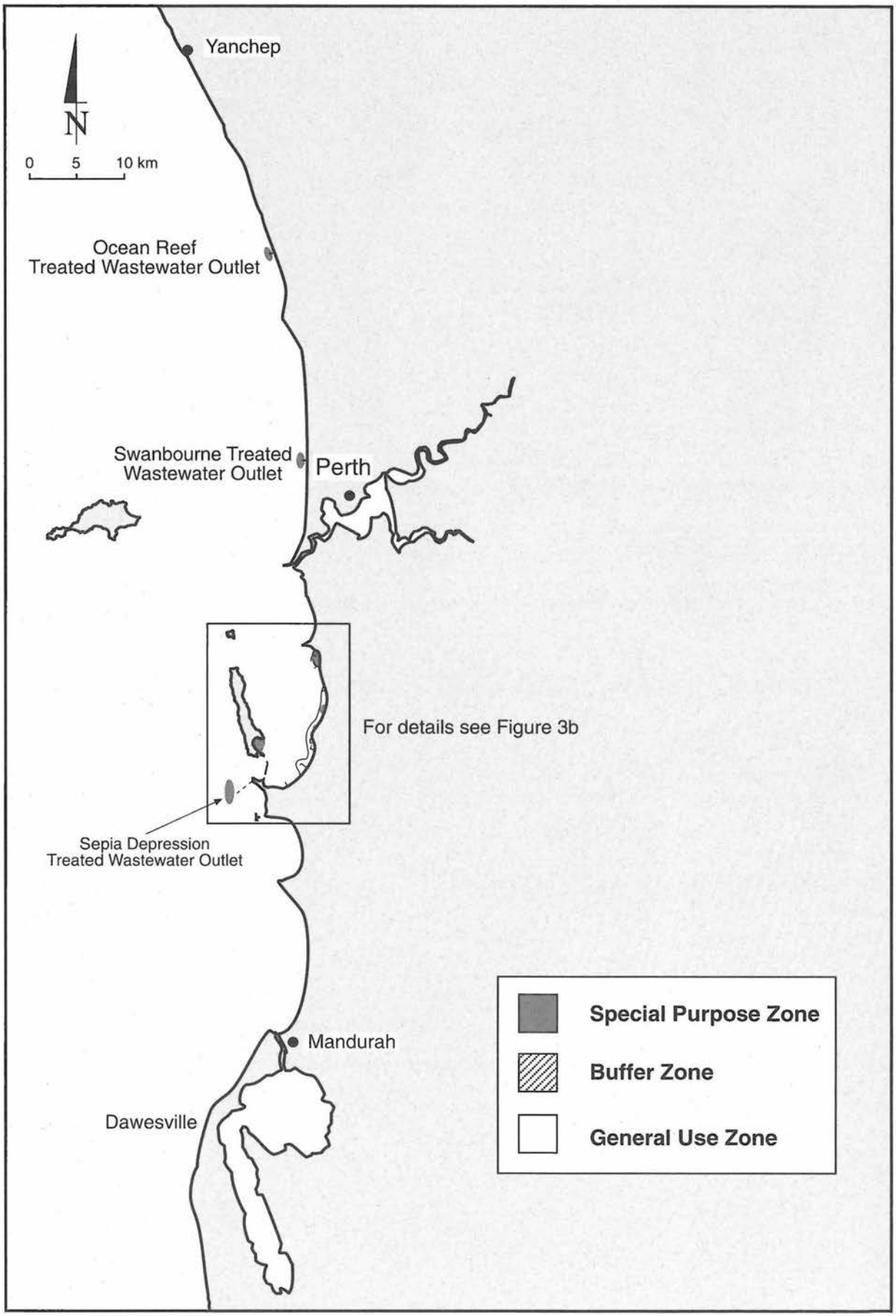


Figure 9a. Examples of Special Purpose and Buffer Zones in all of Perth coastal waters.
In this scenario, all other waters will be General Use Zones, and there are no Sanctuary Zones.

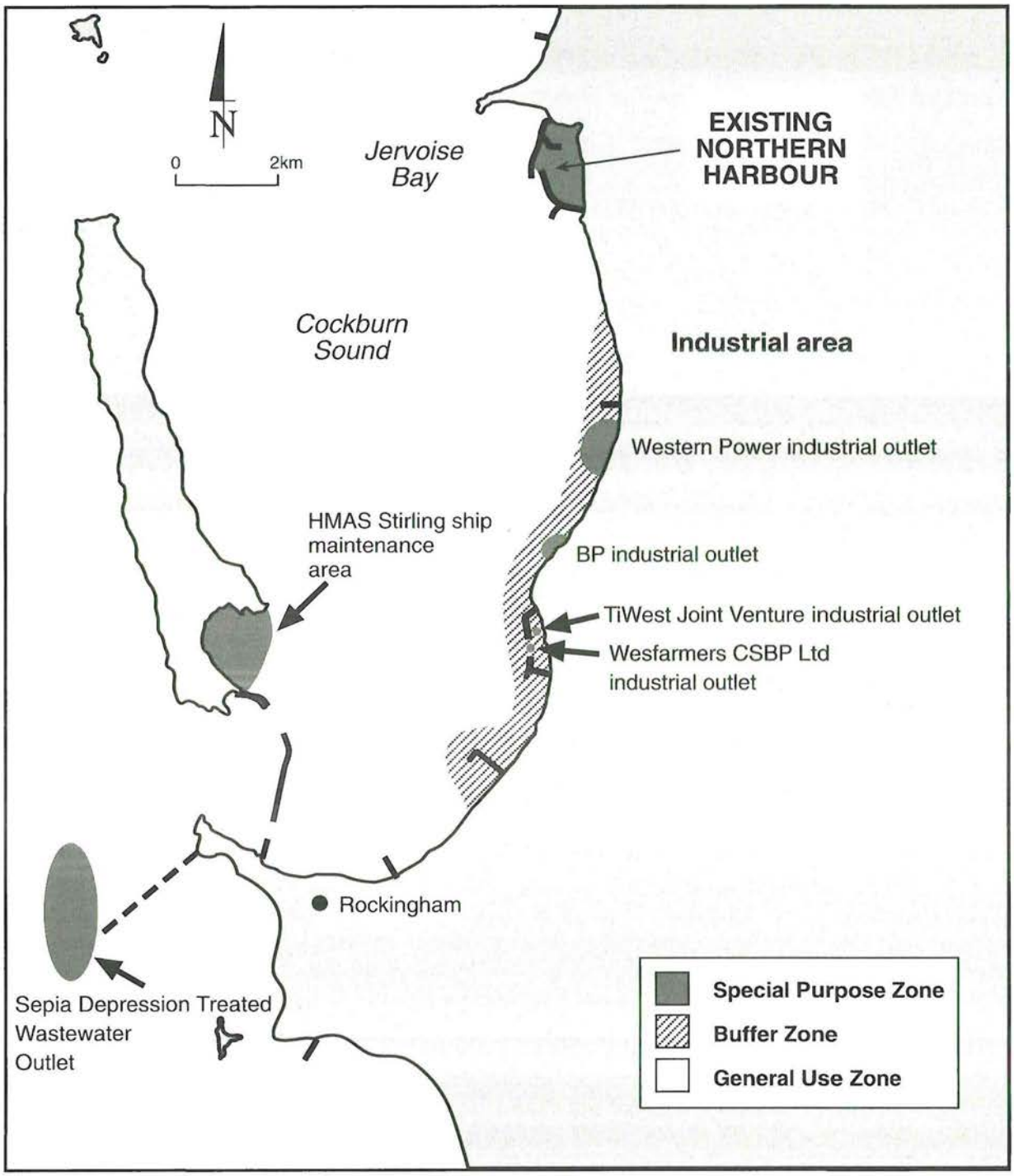


Figure 9b. Examples of Special Purpose and Buffer Zones in Cockburn Sound.
In this scenario, all other waters will be General Use Zones, and there are no Sanctuary Zones.

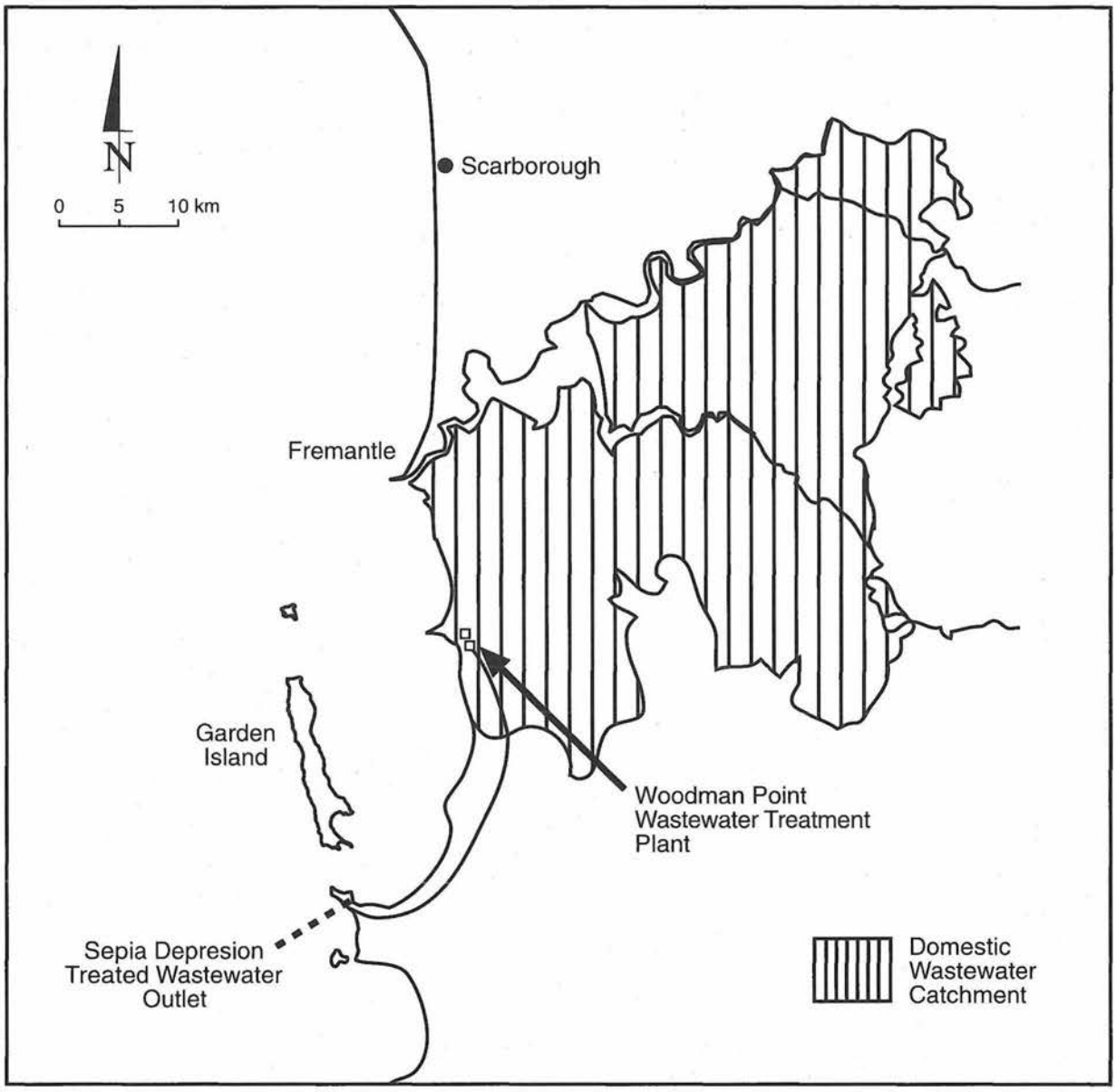


Figure 10. Catchment of the Woodman Point Wastewater Treatment Plant.

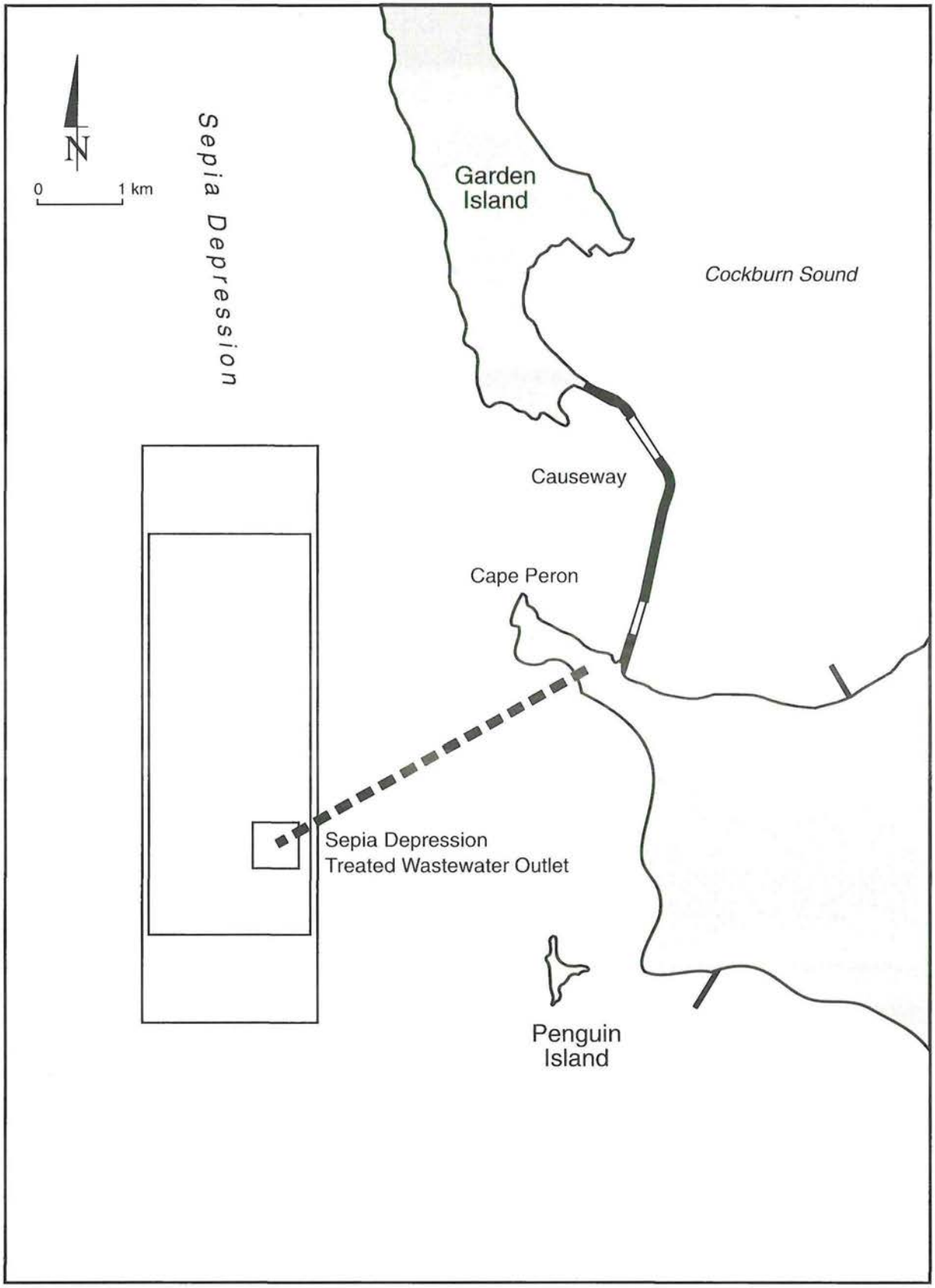


Figure 11. Areas of influence around a wastewater outlet with changes in level of treatment. Areas of influence indicate a very conservative estimate of where it will not be safe to swim. outer area = area of influence for existing amount of effluent with primary treatment; middle area = area of influence for more effluent with secondary treatment for seven-eighths of it; inner area = area of influence for the increased effluent flow with secondary treatment for all of it; (Figure from the Water Corporation, DA Lord and Associates and Environmental Drafting Services.)

Suggestions for input

As you consider environmental values, environmental quality objectives, draft boundaries and zones, it is important to remember that tradeoffs must be made. In essence, we cannot go back to a pristine environment, but we must move toward ecologically sustainable development.

Other questions that you may like to consider include:

1. Are there elements in the proposed management that require further explanation?
2. Do you agree with the proposed approach for managing Perth coastal waters?
3. Do you think that the examples of environmental values cover all the things we should protect? Can you suggest changes?
4. Are the five examples of environmental quality objectives appropriate? What, if any, changes would you make?
5. Will the system of four zones meet your needs in terms of managing multiple use?
6. Do you have any other concerns about the proposed approach? and
7. What outcomes should we be aiming for in determining our environmental values, environmental quality objectives, boundaries and environmental quality management zones for Perth coastal waters?

5. How can I help?

Your input will form the basis for our report to the EPA. By Friday, 18 December 1998, we would like you to:

1. think about the environmental values, environmental quality objectives, draft boundaries and environmental quality management zones proposed in this discussion paper;
2. focus on what you want done to balance protection, improvement and use of the marine environment; and
3. give us your thoughts on what you want done by:
   - completing the enclosed feedback survey;
   - making changes to the boundaries on the maps and providing the reasons for your changes; and
   - submitting any other comments or questions you may have.

You can mail the feedback survey and any written submissions to the EPA in the reply paid envelope or to the postal address below. If you prefer, you can send your comments to the e-mail below.

postal address:

Environmental Protection Authority
Perth Coastal Waters
Management and Consultative Process
PO Box K822
PERTH WA 6842

e-mail address:
perth_coastal_waters@environ.wa.gov.au

Please remember, the deadline for comments is Friday, 18 December 1998.

Appendix A.

Examples of laws and policies driving improvements in coastal and marine environmental management

Coastal and marine environments are under pressure around the world. Australia has recognised this challenge and is responding by developing Australia's Ocean Policy (information available at http://www.environment.gov.au/marine/oceans). This policy will establish the principles and major directions for understanding, using and caring for Australia's oceans. The policy will be consistent with international and national and state policy and legislation designed to improve coastal and marine management.

International

1. *United Nations Convention on the Law of the Sea* (came into force in 1994, available for signatures from 1982, process begun in 1958):
   - establishes responsibilities for living and non-living resources in the seas (Australia has responsibilities for one of the largest areas in the world, over 16 million square kilometres or more than twice the size of the continent);
   - establishes obligations for nations claiming these rights, including ensuring that development is sustainable; and
   - recognises the need to consider all uses in an integrated fashion.
2. *World Commission on Environment and Development* (1987; also called the *Brundtland Report*):
   - lays down a basis for sustainable, multiple use management that does not compromise options for future generations;
   - recognises that the global oceans are linked, regional resources tend to be shared by different jurisdictions and the major threats to sustainability in coastal waters arise from land-based activities; and
   - promotes improved management of the oceans.
3. *United Nations Conference on Environment and Development* (1992; includes the *Earth Summit, Rio Declaration, Agenda 21* and *Convention on Biodiversity*):
   - recognises a need for management based on natural divisions between ecosystems rather than jurisdictional divisions, i.e. the need to manage according to the way natural systems of plants, animals, micro-rganisms and their non-living surroundings behave rather than according to the way we use politics or legislation to carve up the world;
   - calls for management that:
     — is unified across the globe, its regions and its subregions (integrated)
     — applies to all uses (multiple use);
     — does not delay actions that prevent damage to the environment due to uncertainty about potential effects (precautionary); and
     — makes proponents demonstrate they can discover undesirable outcomes quickly, implement effective corrective measures without delay, and review and improve management efforts continually (anticipatory and adaptive); and
   - recognises that use of resources and environmental protection are inseparable.
4. United Nations Environment Program Global Program of Action for the Protection of the Marine Environment from Land-Based Sources of Pollution (1995)
   - recognises the immense influence land-based activities can have on the oceans (an estimated 80% of the pollution in the oceans arises from land-based activities)
   - promotes an integrated approach to dealing with both point sources and diffuse sources of pollution

National

Australia has adopted and adapted much of the thinking outlined above.

1. *The Offshore Constitutional Settlement* (1979):
   - links to the United Nations Convention on the Law of the Sea; and
   - establishes Commonwealth and State responsibilities for the waters off Australia.
2. *The Intergovernmental Agreement on the Environment* (1992):
   - lays out guidelines for implementing ecologically sustainable development; and
   - establishes a Commonwealth—State consultation and coordination mechanism.
3. *The National Strategy for Ecologically Sustainable Development* (1992):
   - enhances individual and community well-being by following a path of economic development that safeguards the welfare of future generations;
   - provides for equity within and between generations;
   - protects biological diversity and maintains ecological processes and systems; and
   - integrates economic, environmental and ocial considerations in decision-making.
4. *The Commonwealth Coastal Policy* (1995):
   - embraces the principles of ecologically sustainable development and multiple use management; and
   - adopts a user pays approach.
5. *The National Strategy for the Conservation of Australia's Biological Diversity* (1996):
   - acknowledges that we share the earth with many other life forms that have intrinsic value and warrant our respect, whether or not they are of benefit to us;
   - acknowledges the core objectives and guiding principles of the National Strategy for Ecologically Sustainable Development;
   - recognises that conservation of biodiversity provides significant cultural, economic, educational, environmental, scientific and social benefits; and
   - places the responsibility to conserve biodiversity in natural environments on all stakeholders.
6. *Australia and New Zealand Environment and Conservation Council National Guidelines for Fresh and Marine Water Quality* (undergoing revision):
   - applies the principles listed above to protecting water quality; and
   - promotes a coordinated approach from the national level through the State or Territory level to the regional or catchment level (a tiered approach).

State

Western Australia has engaged with these international and national processes and acted to complement them with initiatives such as:

1. *A State Conservation Strategy for Western Australia* (1987);
2. *Review of Coastal Management in Western Australia* (1995);
3. *New Horizons: the way ahead in marine conservation and management* (1998); and
4. the *Draft Environmental Protection (State Marine Waters)* Policy (available for public comment until 4 September 1998).

Appendix B.

Description of the Perth Coastal Waters Management and Consultative Process

The *Perth Coastal Waters Management and Consultative Process* essentially began in 1990. The first step in the process comprised two scientific studies that underpin the development of a management annex for Perth coastal waters (Figure B1).

One study, the *Perth Coastal Waters Study* was sponsored by the Water Corporation of Western Australia at the request of the Western Australian Environmental Protection Authority. The overall goal of the study was to determine the loads of nitrogen contained in treated wastewater that can be discharged into Perth's coastal waters while maintaining environmental values (Lord and Hillman 1995). Given this aim, the study examined the oceanography of most of Perth's coastal waters, but the bulk of the data was collected near the three existing treated wastewater outlets.

Seven objectives were defined in order to achieve the Study's goal (Lord and Hillman 1995):

1. determine regional circulation patterns with particular focus on exchange of coastal waters with offshore waters;
2. determine circulation patterns and flushing characteristics in the vicinity of the existing treated wastewater outlets (Sepia Depression, Swanbourne and Ocean Reef);
3. determine advection and diffusion patterns of treated wastewater discharged from existing outlets with a focus on nutrients (including nitrogen);
4. determine the nature and extent of changes associated with increased nitrogen loads, including:
   - stimulation of primary production;
   - effects of increased productivity on:
   - — light attenuation in the water column;
   - — seagrass productivity;
   - — macroalgal productivity; and
   - — selected trophic processes;
5. combine the understanding of physical and ecological processes in an integrated ecological model;
6. develop a system of environmental criteria for:
   - assessing environmental conditions at each study site; and
   - defining ecological indicators of change; and
7. propose and develop a marine monitoring program for use in:
   - tracking changes associated with increases in wastewater discharge; and
   - correcting any unacceptable changes.

The second major study was the *Southern Metropolitan Coastal Waters Study*. This work was sponsored by the Department of Environmental Protection, and it focused on the southern coastal waters, from Fremantle to Mandurah. Its primary aims were to:

1. develop an understanding of the cumulative impacts and long-term environmental consequences of contaminant inputs to the southern metropolitan coastal waters of Perth; and
2. facilitate the development of a comprehensive environmental management strategy for the southern metropolitan coastal waters of Perth.

The study produced information on:

1. the distribution of coastal resources and uses of the coastal environment;
2. oceanographic processes;
3. oceanographic models;
4. contaminant and nutrient inputs;
5. physical, chemical and biological water quality (including presence of microbes);
6. oxygen flux from the sediment;
7. light attenuation and changes in light attenuation;
8. toxicant distributions in sediments and organisms;
9. distributions of foreign organisms;
10. seagrass health and growth;
11. phytoplankton, zooplankton and their interactions;
12. benthic invertebrate fauna;
13. larval fish assemblages in seagrass;
14. ecological modelling;

15. remote sensing as a tool to monitor water quality; and
16. management tools.

Management improvements will be built on the basic information provided by these two studies. A key part of the process to develop management is public involvement. The public involvement process contains two main steps:

1. development of environmental values, environmental quality objectives and draft boundaries; and
2. development of environmental quality criteria and review of draft boundaries.

Changes to management must fit within the bounds set by the State Environmental Protection Policy. In fact, the values and broad objectives that apply to Perth coastal waters are likely to apply to all sections of the coast. Specific boundaries will be developed in the annex pertaining to Perth coastal waters with the recognition that licensing conditions, conservation plans, fisheries management plans, local management plans and other complementary approaches must exist or be developed before implementation is complete.

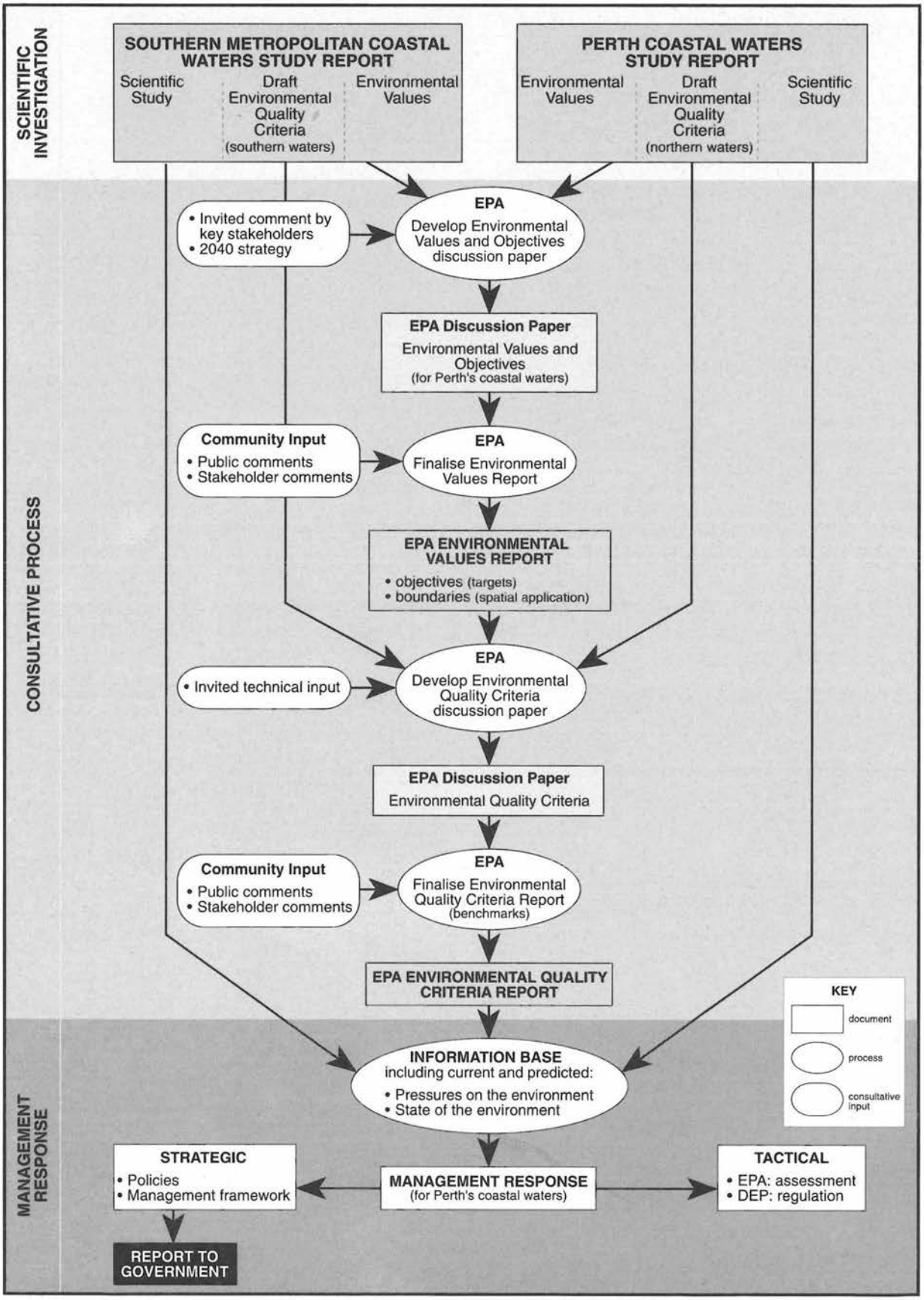


Figure B1. Overall process for development of strategic management for Perth coastal waters.

Appendix C.

Links between the Perth Coastal Waters Management and Consultative Process and the Perth Coastal Waters Study

Most of the concepts presented in the *Perth Coastal Waters Management and Consultative Process* were developed as part of the *Southern Metropolitan Coastal Waters Study* (sponsored by the Western Australian Department of Environmental Protection). The *Perth Coastal Waters Study* (sponsored by the Water Corporation of Western Australia at the request of the Western Australian Environmental Protection Authority) discussed values and management targets for Marmion Lagoon (Hillman *et al.* 1995).

The *Perth Coastal Waters Study* did not address zoning because Marmion Marine Park was considered to be one zone. Although the approach taken in the *Perth Coastal Waters Study* differs from that in the *Perth Coastal Waters Management and Consultative Process*, parallels can be drawn between the two approaches.

The environmental values in the two studies are similar but not exactly the same (Table C1). Recreation and aesthetics are combined in the *Perth Coastal Waters Management and Consultative Process*. The *Perth Coastal Waters Study* did not consider aquaculture or industrial use to be values for Marmion Lagoon.

Environmental quality objectives were never explicitly set in the Perth Coastal Waters Study, but some equivalent ideas can be extracted if we examine the zoning proposed in both processes (Table C2). The matching presented here assumes:

- the changes of concern are those listed under each level;
- change from a 'natural state' or from an 'acceptable state' are synonymous;
- human activities tend to draw their support from a natural system and have an environmental cost;
- 'mixing zone' and 'Special Purpose Zone' are synonymous;
- both water and sediment quality will need to be considered;
- both abundance and biomass of organisms need to be considered;
- 'ecological integrity' and 'ecological function' are synonymous; and
- uses are the same in both studies.

The zones do not match exactly. The greater number of zones in the *Perth Coastal Waters Study* will require finer scale management and more resources to ensure objectives are met. The *Perth Coastal Waters Study* describes two pairs of zones that are essentially the same according to the broad indicators used here (Levels 1 and 2 and Levels 5 and 6) and an extra zone where biodiversity is lost (Level 7). Finally, Levels 4–7 in the *Perth Coastal Waters Study* indicate that human uses will be considered unsafe before the abundance/biomass of biota changes, whereas the opposite view is taken for Buffer Zones in the *Perth Coastal Waters Management and Consultative Process*.

Table C1. Links between Environmental Values.

Perth Coastal Waters Management & Consultative Process	*Perth Coastal Waters Study*
Ecosystem Protection	Conservation of flora & fauna
Recreation & Aesthetics	Contact recreation
	Aesthetic/landscape values
Fishing & Aquaculture	Fishing
Industrial water supply	Nil

Table C2. Links between zoning in the *Perth Coastal Waters Management and Consultative Process* and levels of protection in the *Perth Coastal Waters Study* (Hillman *et al.* 1995).

Broad indicator	PCWMCP Sanctuary Zone	PCWS Level 1	PCWS Level 2	PCWMCP General Use Zone	PCWS Level 3	PCWS Level 4	PCWS Level 5	PCWS Level 6	PCWMCP Buffer Zone	PCWS Level 7	PCWS Level 8	PCWMCP Special Purpose Zone
Natural water quality	✔	✔	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘
Natural sediment quality	✔	✔	✔	✘	✘	✘	✘	✘	✘	✘	✘	✘
Natural abundance/biomass	✔	✔	✔	✔	✔	✔	✘	✘	✘	✘	✘	✘
Natural biodiversity	✔	✔	✔	✔	✔	✔	✔	✔	✔	✘	✘	✘
Natural ecological function	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✘	✘
Recreation & aesthetics safe	✔	✔	✔	✔	✔	✘	✘	✘	✔	✘	✘	✘
Fishing & aquaculture safe	✔	✔	✔	✔	✔	✘	✘	✘	✔	✘	✘	✘

PCWMCP = *Perth Coastal Waters Management and Consultative Process*; PCWS = *Perth Coastal Waters Study*;
✔ = natural state or safe state unchanged; ✘ = natural state or safe state changed; not all changes that are permitted will occur in any given zone; bands of shading indicate similar zones.

Bibliography

Australia and New Zealand Environment and Conservation Council. 1992. *Australian Water Quality Guidelines for Marine and Freshwaters*. Australia and New Zealand Environment and Conservation Council, Melbourne. 222 pp.

Commonwealth of Australia. 1994. *National Strategy for Ecologically Sustainable Development*. Australian Government Publishing Service, Canberra.

Department of Conservation and Environment (now Department of Environmental Protection). 1987. *A state conservation strategy for Western Australia: a sense of direction*. Department of Conservation and Environment (now Department of Environmental Protection), Perth. 19 pp.

Department of Conservation and Land Management. 1998. *New Horizons: the way ahead in marine conservation and management*. Department of Conservation and Land Management, Perth. 20 pp.

Department of Environmental Protection. 1996. *Southern Metropolitan Coastal Waters Study (1991—1994): final report*. Department of Environmental Protection, Perth. 288 pp.

Donaldson, B., I. Eliot and R.C. Kay. 1995. *Review of coastal management in Western Australia: a report to the Minister for Planning*. Coastal Management Review Committee, Perth. 105 pp.

Environment Australia. 1998. *Australia's Oceans Policy — An issues paper: caring — using — understanding*. Environment Australia, Canberra. 96 pp.

Environment Australia. 1998. *Guidelines for establishing the national representative system of marine protected areas: draft version 2.0*. Department of the Environment, Canberra. 20 pp.

Greiner, R., M.D. Young, A.D. McDonald and M. Brooks. 1997. *Australia's Ocean Policy: Oceans Planning and Management Issues Paper 2: Management instruments for marine resource allocation and use*. Report to the Commonwealth Department of Primary Industries and Energy. Department of the Environment, Canberra. 48 pp.

Herriman, M., M. Tsamenyi, J. Ramli and S. Bateman. 1997. *Australia's Ocean Policy: International Agreements Issues Paper 7: International agreements*. Report to Environment Australia. Department of the Environment, Canberra. 144 pp.

Hillman, K., D.A. Lord, A.J. McComb and P. Lavery. 1995. *Perth Coastal Waters Study: environmental values*. Report to the Water Authority of Western Australia (now the Water Corporation of Western Australia). 19 pp.

Lord, D.A. and K. Hillman (editors). 1995. *Perth Coastal Waters Study: summary report*. Report to the Water Authority of Western Australia (now the Water Corporation of Western Australia). 140 pp.

Pitts, D. 1997. *Australia's Ocean Policy: Oceans Planning and Management Issues Paper 3: Best practice mechanisms for marine use planning*. Report to the Commonwealth Department of Primary Industries and Energy. Department of the Environment, Canberra. 58 pp.

Sainsbury, K., M. Haward, L. Kriwoken, M. Tsamenyi and T. Ward. 1997. *Australia's Ocean Policy: Oceans Planning and Management Issues Paper 1: Multiple use management in the Australian marine environment: principles, definitions and elements*. Report to Environment Australia. Department of the Environment, Canberra. 42 pp.

Saunders, D., C. Margules and B. Hill. 1998. *Environmental indicators for national state of the environment reporting — Biodiversity, Australia: State of the Environment (Environmental Indicator Reports)*. Department of the Environment, Canberra. 68 pp.

Ward, T., J. Alder, C. Margules, K. Sainsbury, D. Tarte and L. Zann. 1997. *Australia's Ocean Policy: Biodiversity Conservation Issues Paper 7: Biodiversity conservation. Report to Environment Australia*. Department of the Environment, Canberra. 54 pp.

Ward, T., E. Butler and B. Hill. 1998. *Environmental indicators for national state of the environment reporting — Estuaries and the Sea, Australia: State of the Environment (Environmental Indicator Reports)*. Department of the Environment, Canberra. 80 pp.

Zann, L.P. and O. Early. 1997. *Australia's Ocean Policy: Reviews and Recommendations Background Paper 4: Analysis of marine and coastal reviews and their recommendations in relation to development of an Oceans Policy for Australia*. Report to Environment Australia. Department of the Environment, Canberra.

Zann, L. and D.C. Sutton (editors). 1995. *The State of the Marine Environment Report for Australia: Technical Annex 2: pollution*. Department of the Environment, Sport and Territories, Canberra. 93 pp.

THE FUTURE OF PERTH COASTAL WATERS: FEEDBACK SURVEY

WE WELCOME YOUR COMMENTS on this Discussion Paper. *You can either **WRITE A SUBMISSION** providing feedback on issues of particular interest to you, or you can **FILL IN THIS SURVEY FORM. YOU MAY WISH TO DO BOTH.***

1. Which of the following activities do you do regularly - or would like to do regularly - (eg. *at least* once a month in summer) in or around the Perth coastal waters? Tick ☑ as many as apply.

- ☐ **Boating**
- ☐ **Swimming**
- ☐ **Surfing**
- ☐ **Diving/Snorkeling**
- ☐ **Fishing**
- ☐ **Collecting seafood/shellfish**
- ☐ **Looking for/watching marine wildlife**
- ☐ **Walking along the shore**
- ☐ **Enjoying the view**
- ☐ **Other, ...** What?

_____

_____

- ☐ **I don't do - or want to do - anything at the coast regularly**

☛ Turn to page 3 describing the proposed environmental values for Perth coastal waters.

2. Do you agree with the description of each of the ***environmental values***?

☛ Please circle your answer. **YES** **NOT SURE** **NO**

If **NO** or **NOT SURE**, why? _____

_____

_____

_____

_____

3. Are there any other ***environmental values*** that you would like to add?

☛ Please circle your answer. **YES** **NOT SURE** **NO**

If **YES** or **NOT SURE**, please explain. _____

_____

_____

_____

_____

☛ Turn to page 4 describing the proposed environmental quality objectives and answer Question 4 over the page.

4. Do you think the five ***environmental quality objectives*** are .....

☐ (A) **about right** ..... to protect your environmental values?

☐ (B) **too many** ..... to protect your environmental values?

or ☐ (C) **too few** ..... to protect your environmental values?

☛ Tick ☑ the appropriate box above.

If you ticked (B) or (C), please say why you think that _____

_____

_____

_____

☛ Turn to page 5 describing environmental quality management zones, and to Figures 3a & b on pages 6 & 7 showing examples of these zones.

5. Are the ***zones*** in these scenarios acceptable to you?

☛ Circle your answer **YES** **NOT SURE** **NO**

⇩

go to question 7

If you answered **NO** or **NOT SURE**, please **use all or some of the 3 maps** on the next pages to **change the zones or draw your own zones** and label them according to the type of environmental quality management you prefer (and then go on to Question 6).

6. Why did you make these changes? _____

_____

_____

_____

7. Please tick the category below that best describes your age.

☐ **Less than 25 years** ☐ **46 to 60 years**

☐ **25 to 45 years** ☐ **greater than 60 years**

8. Please note your gender. ☐ **female** ☐ **male**

9. What is your postcode? _____

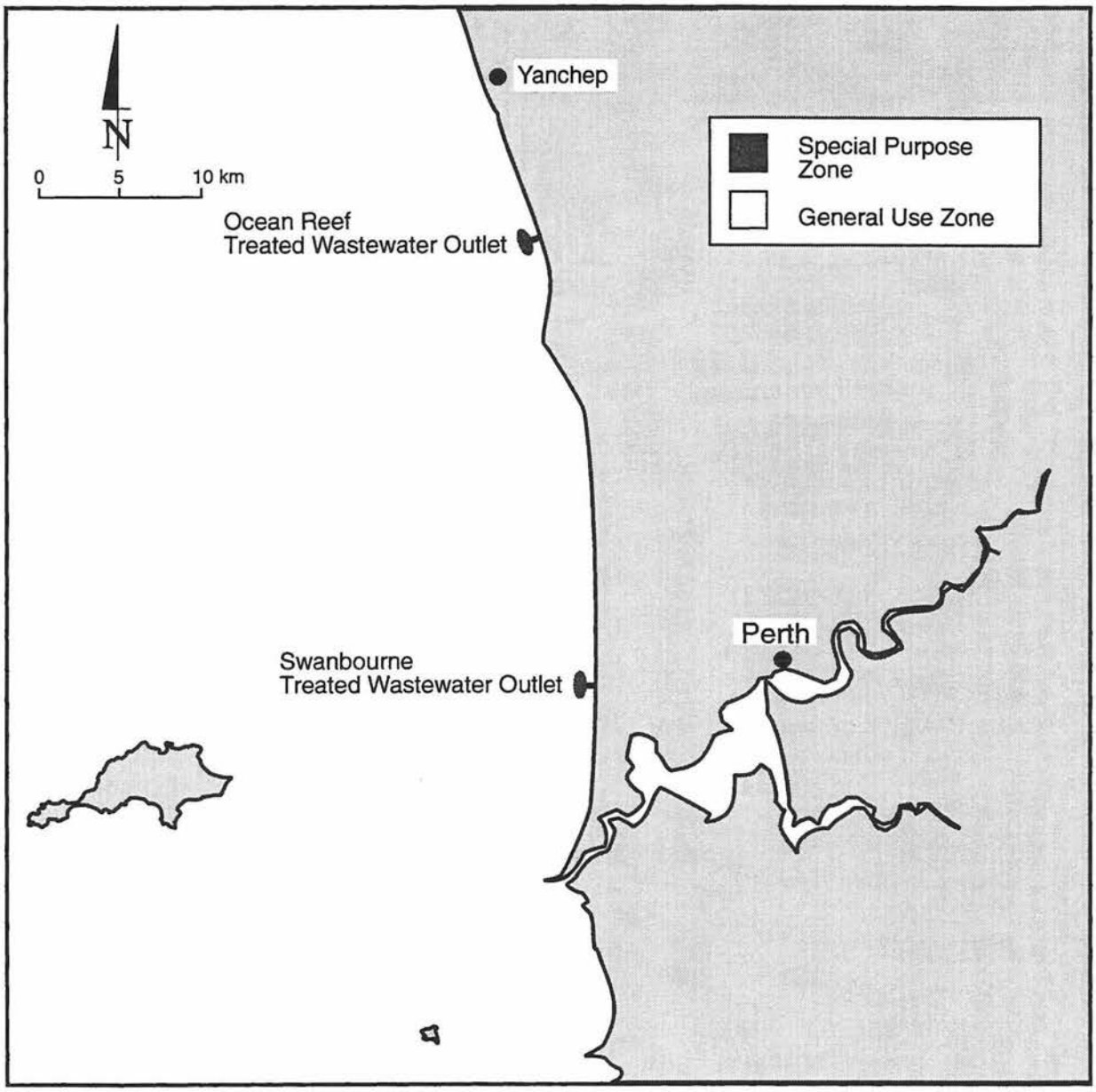
10. Would you be interested in receiving ongoing information on the process & initiatives for the management of Perth coastal waters in the future?

☛ Circle your answer **YES** **NO** If **YES**, please provide mailing details.

NAME: _____

ADDRESS: _____ **p/code** _____

☛ Feel free to attach any extra pages of comments



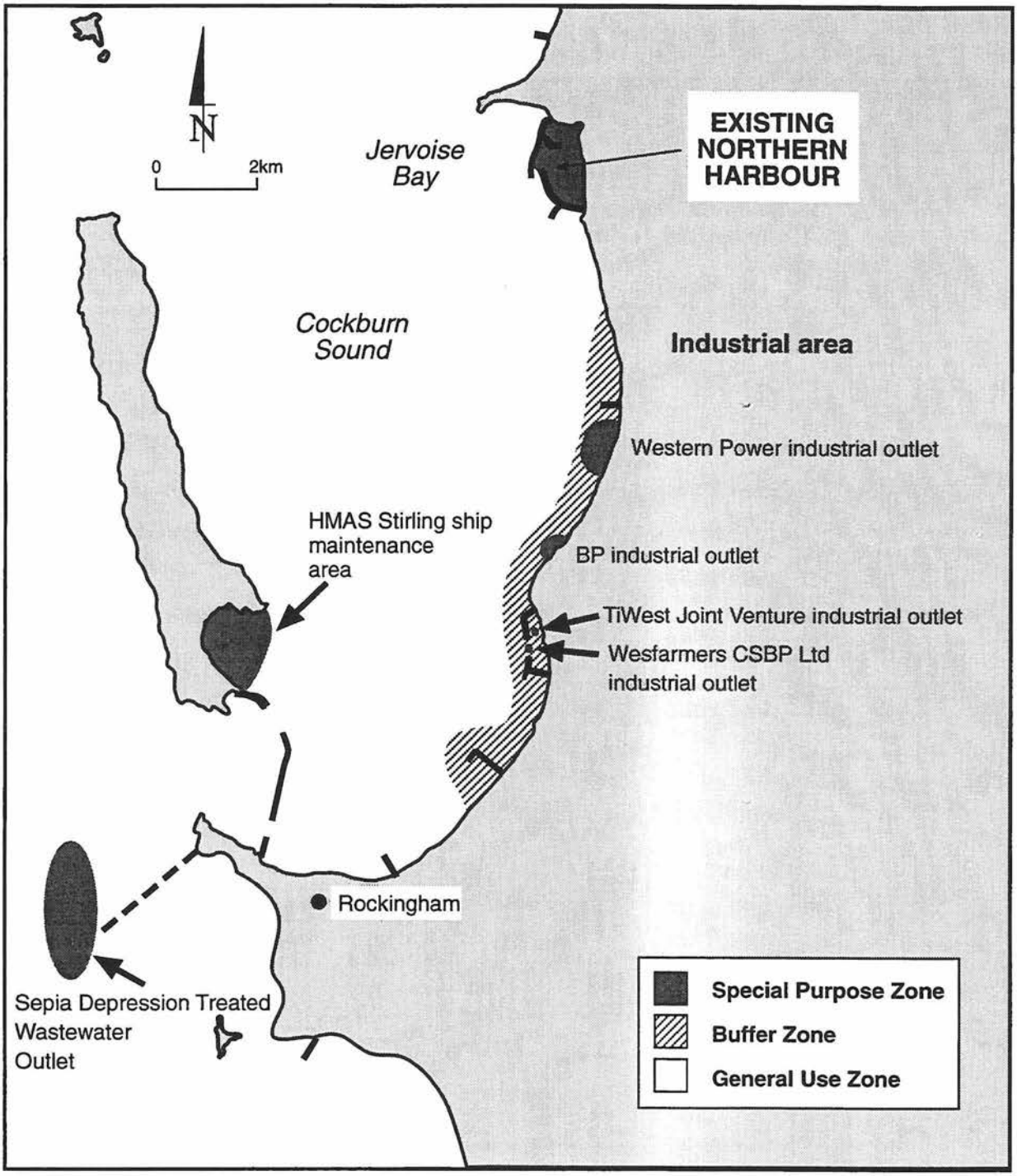
If you answered **NO** or **NOT SURE** to Question 5 on the questionnaire & **you want to comment on THIS MAP:**

- **change** the existing boundaries;

and/or

- **draw** your preferred boundaries and **number them** from the list below to show **what type of zone** you think they should be. Feel free to add any notes of explanation on the back of this page.

1 ..Special Purpose Zone
2 ..Buffer Zone
3 ..General Use Zone
4 ..Sanctuary Zone



If you answered **NO** or **NOT SURE** to Question 5 on the questionnaire & **you want to comment on THIS MAP:**

- **change** the existing boundaries;

and/or

- **draw** your preferred boundaries and **number them** from the list below to show **what type of zone** you think they should be. Feel free to add any notes of explanation on the back of this page.

1 ..Special Purpose Zone
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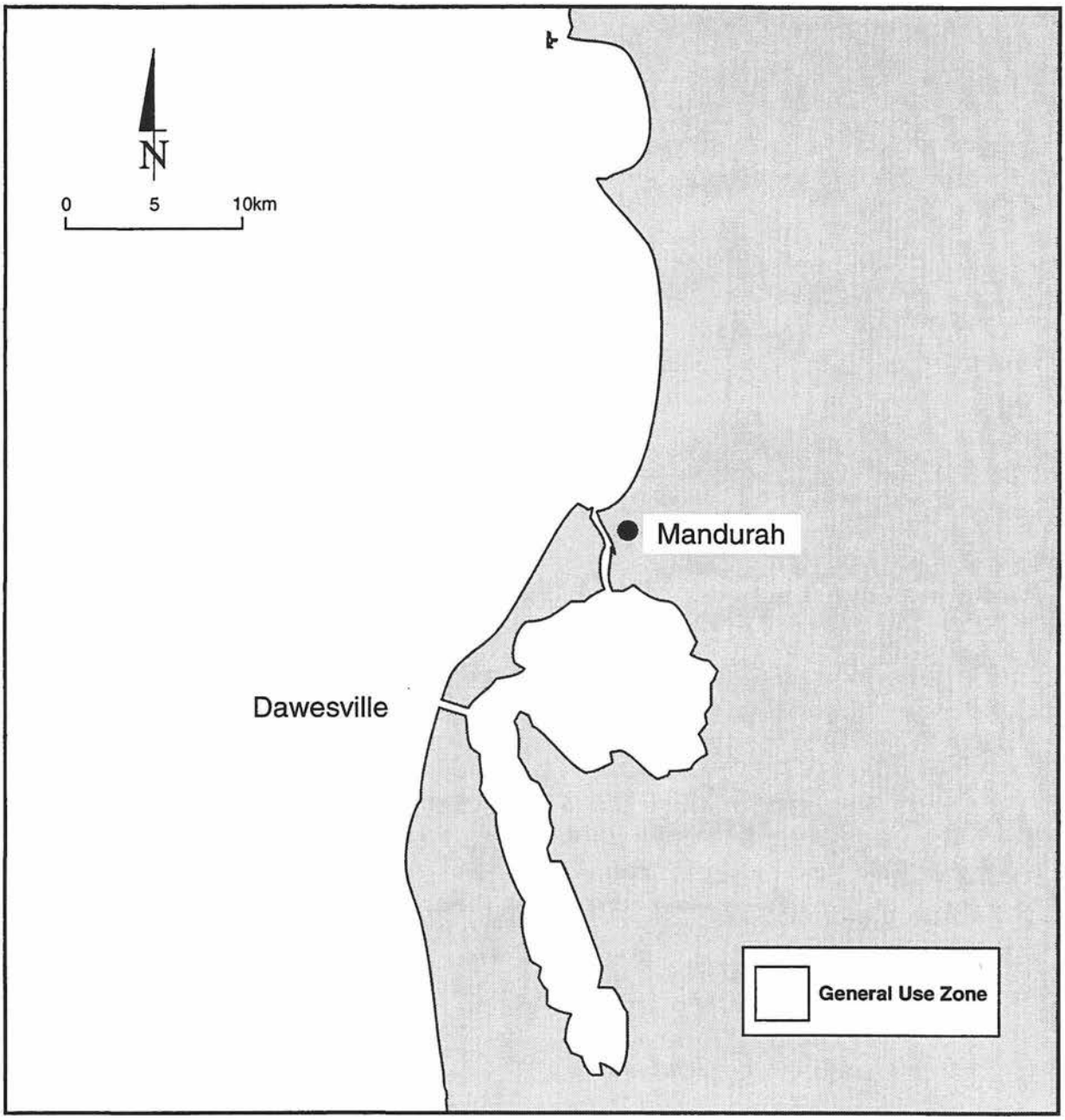

If you answered **NO** or **NOT SURE** to Question 5 on the questionnaire & **you want to comment on THIS MAP:**

☛ **draw** your preferred boundaries and **number them** from the list below to show **what type of zone** you think they should be. Feel free to add any notes of explanation on the back of this page.

1 ..Special Purpose Zone
2 ..Buffer Zone
3 ..General Use Zone
4 ..Sanctuary Zone

Suggested checklist for writing submissions

We need to start thinking about the way we will manage our use of the environment to protect the environmental values and achieve the environmental quality objectives that you have nominated. As well as answering the sorts of questions that are in the Feedback Survey, and providing us with other comments of importance to you, we would like to know your answers to the questions below or what you think about any of these issues.

Adaptive management

- Are you concerned that managing adaptively (i.e. consistently reviewing and improving management) will lead to problems, and what problems do you foresee?
- What sorts of activities, reports or other tangible evidence would assure you that we are learning to improve our management of Perth coastal waters?

Real action from the proposed changes

- Are you concerned that your input to the management of Perth coastal waters will not generate *real* action?
- What sorts of activities, reports or other tangible evidence would assure you that serious efforts are being made to address your concerns?

Please use the enclosed reply paid envelope to send any written submissions or mail to the following postal address or send us an e-mail at the address shown below.

postal address:	Environmental Protection Authority Perth Coastal Waters Management and Consultative Process PO Box K822 PERTH WA 6842
e-mail address:	perth_coastal_waters@environ.wa.gov.au

The future of Perth coastal waters: Have your say

A discussion paper addressing environmental values, environmental quality objectives and draft environmental quality management zones.

Information night

Do you require further explanation on any of the issues in this discussion document?

To assist you in making your comments you are invited to an information night hosted by CSIRO on behalf of the Environmental Protection Authority to be held on:

Wednesday 11 November 1998
7:00 - 8:30 pm
Auditorium
CSIRO Floreat.
(corner of Underwood Avenue and Brockway Road)

Mr Bernard Bowen, Chairman Environmental Protection Authority will open and chair the meeting.

Dr Charles Jacoby, CSIRO will make a presentation on the issues in the discussion paper.

Please RSVP on 9333 6000 (CSIRO) to reserve your place.

CSIRO

Environmental Protection Authority

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The future of Perth coastal waters: Have your say

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Discussion Paper

Environmental Protection Authority