



Pilbara Coastal Water Quality Consultation Outcomes:

Environmental Values and
Environmental Quality Objectives



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Environmental Values and Environmental Quality Objectives

Report from the Department of Environment
to the Environmental Protection Authority
and the Rangelands NRM Coordinating Group

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Executive summary

Background

The State Water Quality Management Strategy (Government of Western Australia, 2004) provides for the establishment of environmental values and environmental quality objectives as the goals for environmental quality management to protect the environment from the effects of waste inputs and pollution. The Strategy requires that thorough public consultation be undertaken to develop environmental values and environmental quality objectives prior to their submission to the Environmental Protection Authority (EPA) for review and endorsement, to guide environmental impact assessment and natural resources management.

The State Sustainability Strategy (Government of Western Australia, 2003) recommended that environmental values be identified and environmental quality objectives designated as the basis for environmental quality management for all of the State's marine ecosystems on a priority basis.

Between September and November 2004, the Department of Environment (DoE) ran a planned and targeted public consultation process to obtain comment on environmental values, environmental quality objectives and how they should be applied geographically within the State marine waters from Exmouth Gulf to Cape Keraudren. This region has long been recognised for its very high marine biodiversity and conservation values, its extensive mineral resources, and as a focus of rapidly increasing development pressures.

This report to both the EPA and Rangelands Natural Resource Management (NRM) Coordinating Group contains:

- a summary of the scope, conduct and outcomes of the public consultation process;
- a discussion of key stakeholder issues raised and how they were addressed in arriving at the recommendations of the report;
- recommendations for a set of Environmental Values, Environmental Quality Objectives and where they should apply throughout the region; and
- recommendations for the implementation of marine environmental quality management underpinned by state government policy and natural resource management mechanisms.

This report is submitted to the EPA in accordance with the State Water Quality Management Strategy process for establishing Environmental Values and Environmental Quality Objectives.

It is also part of a project entitled "Integrating community-derived marine quality objectives into regional planning, multiple-use management and ecologically sustainable development on the North West Shelf", conducted by the DoE on behalf of the Rangelands NRM Coordinating Group to support development of resource condition targets for the Rangelands NRM Region Strategy.

Public consultation process

Scope

The region of interest comprises State marine waters from Exmouth Gulf to Cape Keraudren. The primary aim of the consultation was to assess the level of community support for the environmental quality management framework proposed and, in particular, to seek public input on how the environmental quality objectives and their levels of ecological protection should be allocated spatially throughout the region so as to protect environmental values held by the community.

Conduct

Preparation for the public consultation was overseen by a broadly based Project Advisory Committee (refer Chapter 7). Vital Options Consulting was retained to facilitate the consultation and to report on input received from stakeholders and the community. The consultation centred on a discussion paper and maps showing a “notional plan” of Environmental Quality Objectives and Levels of Ecological Protection for the region. A wide range of communication strategies were employed to encourage the public to present their views and raise issues, both through written submission and participation in meetings. These included seven public information/discussion meetings and five half-day Stakeholder Reference Group Forums conducted in Port Hedland, Karratha, Onslow, Exmouth and Perth. Additional meetings were held on an opportunistic basis with stakeholders and interest groups to provide information and receive feedback. Views and issues raised at all these meetings were recorded for further analysis.

Participation

A total of 156 written submissions were received, 77% from Pilbara and Exmouth residents, businesses and community organisations, and the remainder from industrial and resource corporations, peak bodies, state and local government agencies.

About 190 people participated in the public meetings and stakeholder forums, mainly from the Pilbara and Exmouth regions, and otherwise mainly Perth-based professionals with active interests in the region. About one third participated as industry, business, and professional representatives, one third as commonwealth, state or local government agency representatives, and the remaining participants were from community organisations or were drawn from identifiable community sectors.

Response

The overall response from the public consultation was one of strong support for the permanent protection of environmental values associated with the ocean and with people’s social and spiritual life. The North West communities consulted want an end to avoidable pollution sources, wastes, contamination and discharges despoiling or compromising their own closely-held environmental values (Vital Options Consulting, 2005).

Social use values

A majority of respondents (77%) were unwilling to accept waste inputs anywhere that would make water quality unsuitable for social uses such as fishing and swimming.

Ecosystem health values

Community and stakeholder responses indicated strong support and recognition for the value of ecosystem health and the Environmental Quality Objective for maintenance of ecosystem integrity. This Environmental Quality Objective is spatially defined by allocating one of four different levels of ecological protection (Maximum, High, Moderate or Low) to each location throughout the ecosystem. The community recognised the need to assign different levels of ecological protection so as to facilitate the management of conservation values and multiple human uses, while protecting ecosystem integrity overall.

The community indicated that it wants to see the highest achievable levels of ecological protection applied and realized throughout the region. There was clear support for the adoption of the High Level of Ecological Protection goal as the minimum default setting across most of the region.

The majority of written responses (91%) wanted there to be some marine areas that are totally protected from waste inputs and maintained at a Maximum Level of Ecological Protection (i.e. pristine environmental quality) because of their high biological diversity and conservation value.

Opinion was evenly divided on whether effects on marine life from waste inputs would be acceptable in some areas (e.g. mixing zones about outfalls or inner port areas) in return for important uses and developments.

Of the written responses, 17% recorded their level of agreement/disagreement with the spatial allocation of Environmental Quality Objectives and Levels of Ecological Protection presented on maps in the public information kit. From this limited sample, a majority either “strongly agreed” or “agreed” with the areas depicted.

Revised plan

A revised plan of Environmental Quality Objectives and Levels of Ecological Protection has been prepared following consideration of comment received during the public consultation process. Most of the revisions relate to the Environmental Quality Objective for *maintenance of ecosystem integrity* and involve changes to the spatial allocation of its four Levels of Ecological Protection.

In revising the plan of Environmental Quality Objectives and Levels of Ecological Protection, the following steps were undertaken:

- respond to the key issues identified from analysis of comments and suggestions received during the consultation (Vital Options Consulting, 2005);
- incorporate recent changes in Marine Conservation Reserve boundaries and zoning schemes;
- ensure that the Environmental Quality Objectives and Levels of Ecological Protection allocated in Marine Conservation Reserve areas support management goals and long-term targets for water and sediment quality set out in Marine Conservation Reserve Management Plans; and
- include development projects which have received approvals from the Minister for the Environment since the consultation maps were prepared and up to the end of March 2006.

The recommended Environmental Quality Objectives, Levels of Ecological Protection and their spatial allocation are depicted in Maps 1-11. The changes made to the maps as a result of the consultation are described in Appendix 2. For the entire region there has been approximately 34% increase in the total area allocated maximum level of ecological protection, and approximately 37% increase in the total area allocated Moderate Level of Ecological Protection. Hence, there has been a reduction in the total area allocated High Level of Ecological Protection. The exact size of areas allocated a Low Level of Ecological Protection will be determined following detailed consideration of discharge characteristics.

Key issues raised

The consultant’s report (Vital Options Consulting, 2005) analysed public/stakeholder submissions and comments received during the consultation process and concluded that there are five categories of issues that need to be addressed in implementing an environmental quality management system for the marine waters from Exmouth Gulf to Cape Keraudren. The DoE response to these issues is summarized here, and is discussed in greater detail in the main report.

Levels of ecological protection

Issue: *The consultant's report identified the need to further clarify the meaning and application of the maximum level of ecological protection.*

Response: Where a maximum level of ecological protection has been assigned to a part of the marine environment, this identifies the target environmental condition for this area as essentially pristine, with no detectable change from natural background conditions and no effects on marine life as a result of waste inputs or contamination.

Issue: *Participants stressed the importance of working together with the Marine Parks and Reserves Authority and the Department of Conservation and Land Management (CALM) to ensure that the Levels of Ecological Protection and their spatial allocation are consistent with the long-term targets established in Marine Conservation Reserve management plans.*

Response: Following detailed consultation with CALM, the allocation of Levels of Ecological Protection issued for the public consultation has been revised to be consistent with the most recent boundaries, zones and ecological targets for formally proposed and existing Marine Conservation Reserves, as published in management plan documents up to the end of March 2006.

Issue: *A considerable number of respondents wanted the maximum level of ecological protection to cover more areas in proposed and existing Marine Conservation Reserves. Otherwise, there was a focus on extending the proposed areas of maximum level of ecological protection along the coastline of Map 2, particularly between Sherlock Bay (just west of the Sherlock River mouth) and Cape Cossigny.*

Response: The map revisions accommodate these comments.

Issue: *Several stakeholders expressed concern that maximum level of ecological protection areas may become 'no go' zones for industry.*

Response: The spatial plan of Environmental Quality Objectives and Levels of Ecological Protection does not either explicitly permit or disallow uses from an area. Rather it sets out goals for environmental quality. The DoE recognises, however, that maintaining a maximum level of ecological protection objective in an area will significantly constrain discharges and disturbances from commercial and land-use activities in the vicinity, and that it would be unreasonable to propose a maximum level of ecological protection adjacent to large existing commercial/population centres. For this reason the maximum level of ecological protection has not been allocated to areas identified for development in existing government-endorsed land-use plans.

In most areas allocated a maximum level of ecological protection, conservation is already explicitly recognised as the priority value (e.g. tropical arid zone mangrove areas identified as regionally-significant (EPA, 2001)) and there is a presumption against activities that could compromise the conservation values of these areas. Through the long-term targets in Marine Conservation Reserve management plans, allowance has been provided in some Marine Conservation Reserve zones for approved activities that may require small areas of ecological protection less than maximum.

Issue: *Some stakeholders argued for a moderate level of ecological protection in outer port areas and shipping approach channels instead of the proposed high level of ecological protection.*

Response: Areas within port limits are parts of functioning marine ecosystems. They possess important habitats and are used by many species of marine life. Several of these ports are located close to areas of outstanding biological biodiversity which have been included, or are proposed to be included, in the Statewide system of marine conservation reserves.

Surveys indicate that water and sediment toxicant concentrations are extremely low within port limits with the exception of inner areas about wharves, ship turning basins and coastal discharges. Careful management is required to ensure that any future toxicant discharges do not degrade areas of high water quality.

Beyond these inner port areas, the only significant, unavoidable anthropogenic influence is sediment mobilization by ships. While turbidity and suspended sediments would be monitored, the monitoring program may not be able to consistently resolve short term turbidity and suspended sediment pulses due to passing ships, and these indicators would not be used as triggers to manage general shipping into or out of a port. These indicators would be used in the context of an operational environmental management plan for large-scale dredging, where turbidity and suspended sediment effects are more significant and broadscale.

The community expects that elevations of contaminants and nutrients above natural background should be minimal in outer port areas, with no resultant biological effects. If these areas were designated with a moderate or low level of ecological protection then it would allow significant degradation of water and sediment quality, with resultant impacts on marine life. The level of ecological protection for shipping channels and surrounding areas beyond the inner confines of the ports has therefore been retained as high.

Environmental baselines and effective monitoring and reporting systems

Issue: *Consistent community and stakeholder feedback stressed the need for environmental baselines and a coordinated environmental monitoring and reporting system for the Pilbara marine environment to ensure that human uses and activities are managed and environmental values protected.*

Response: The North West Shelf Joint Environmental Management Study compiled an inventory of nutrient and contaminant inputs to the region from anthropogenic sources, and undertook a review of the fates, bioavailability and effects of the major contaminant types in tropical marine systems. In 2004, baseline water quality surveys were conducted to determine background concentrations of dissolved heavy metals and organic chemicals in marine waters of the region.

In 2005 the DoE conducted baseline marine sediment quality surveys to characterize natural background levels of toxicants in sediments.

In 2005 the DoE commissioned a literature/data review to assist in the establishment of 'early warning' indicators of stress in corals and coral communities associated with sedimentation, turbidity, light reduction, temperature and salinity.

These data are being used together with guidelines and approaches recommended by the Australian and New Zealand Water Quality Guidelines (ANZECC & ARMCANZ, 2000) to develop environmental quality criteria appropriate to the region. Once developed and approved by the EPA, the criteria will be used as formal benchmarks against which to assess the results of monitoring programs and as triggers for management actions designed to protect the environmental values of the region.

Implementation and governance for the Environmental Quality Management Framework

Issue: *Stakeholders and the public consistently requested more information on how the proposed Environmental Quality Management Framework would be formally implemented and governed.*

Response: The State Water Quality Management Strategy (SWQMS) sets out broad governance arrangements underpinning environmental quality management for marine and freshwater ecosystems. The SWQMS identifies the key role of the EPA in :

- signing off on the Environmental Values, Environmental Quality Objectives and Environmental Quality Criteria to be used in managing these ecosystems;
- auditing environmental performance (e.g. achievement of the Environmental Quality Objectives); and
- publicly reporting to Government.

The SWQMS also identifies specific policy mechanisms through which environmental quality management systems and their governance arrangements can be established for particular regions or parts of the environment.

This report recommends that a State Environmental Policy is the most effective implementation mechanism. A State Environmental Policy is a non-statutory, whole-of-government policy through which Environmental Values, Environmental Quality Objectives and Levels of Ecological Protection can be declared and spatially applied, Environmental Quality Criteria identified and appropriate environmental monitoring and management systems implemented.

Implementation would also occur through existing statutory processes under the *Environmental Protection Act 1986*, such as Ministerial Conditions on development approvals and license conditions on regulated discharges.

Adoption and application of an effective plan of environmental values and environmental quality objectives

Issue: *Issues were raised concerning the relationships between an environmental quality plan of environmental values and environmental quality objectives and other processes such as land-use and infrastructure planning, environmental impact assessment of development proposals, project approvals and regulation of existing activities. While there was a broadly-based aspiration for environmental policy to be incorporated into planning, there was also, in some quarters, a concern that environmental policy could constrain the highly dynamic nature of development proposals.*

Response: An environmental quality plan of environmental values and environmental quality objectives does not override government decision-making. It gives clear expression to the values of the broad community and its aspirations for maintaining a high level of marine environmental quality into the future. The Environmental Values and Environmental Quality Objectives provide guidance for the protection of the marine environment and should be taken into consideration for regional and land-use planning as well as the siting, design and management for specific development proposals. Through the environmental impact assessment process, development proposals and their effects would need to be described within the context of the Environmental Quality Management Framework, using technically sound arguments to show how the proposal has been configured to meet the Environmental Quality Objectives. The EPA would evaluate these arguments and provide advice to government. Likewise, regulation of waste discharges would be based on the two

principles of best practice, waste minimisation and meeting environmental quality objectives.

A formally-established, broadly-based and adequately resourced management council could more effectively coordinate monitoring programs, identify environmental trends, report publicly and guide management responses in priority areas of the region.

The Western Australian State of Environment reporting program would also allow for public reporting of marine environmental quality in terms of the achievement of Environmental Quality Objectives. This would provide a means of tracking cumulative impact and net environmental quality improvement or degradation over time.

Further consultation

Issue: *Cultural and spiritual associations with the marine environment were recognised as an Environmental Value to be protected from the effects of waste discharges and deposits. While the project sought and received feedback in respect of this Environmental Value, indigenous people expressed a desire for further engagement.*

Response: Indigenous input was received through written submissions, participation in public meetings and forums held at regional centres, and through small informal meetings. A regional indigenous forum in Onslow highlighted inland activities and land-uses as threats with potential to impact on the quality of rivers and drainage systems which ultimately flow to the marine environment.

It is recognised that further consultation is required to understand and respect the particular cultural and spiritual significance of the Exmouth-Pilbara coast and marine environments, and aspects that require protection from the effects of wastes, discharges and deposits. This report recommends to the Rangelands NRM Coordinating Group that it develop a better understanding of both indigenous and non-indigenous cultural and spiritual associations with the riverine, coastal and marine environments of the region, and the human-use threats to these values.

Issue: *Respondents expressed a desire for further involvement and consultation during development and implementation of the Environmental Quality Management Framework for the region.*

Response: Further public involvement and consultation would occur as part of the State Environmental Policy development process. A draft State Environmental Policy would address all of the elements for marine environmental quality management in the region, including:

- the Environmental Quality Objectives, Levels of Ecological Protection and their spatial application;
- environmental indicators, Environmental Quality Criteria, and their role in evaluation of monitoring results;
- roles and responsibilities for coordination and implementation, and
- public reporting of environmental performance.

The Minister would normally consult publicly on a draft State Environmental Policy prior to submitting it to State Cabinet for consideration and adoption on a whole-of-government basis.

Conclusions

The overall response from the public consultation was in favour of the permanent protection of environmental values associated with the marine environment and the maintenance of the highest possible environmental quality. The community wanted to see a marine environmental quality management framework formally established and effectively implemented in the region. Following an analysis of comments received, the key stakeholder issues were identified and are addressed in this report. On this basis, the notional plan of Environmental Quality Objectives and Levels of Ecological Protection distributed at the commencement of the consultation has been revised, and is presented here for endorsement by the EPA and the Rangelands NRM Coordinating Group, together with the following recommendations.

Recommendations

It is recommended that the EPA and the Rangelands NRM Coordinating Group:

1. note that the consultation process and preparation of this report have been undertaken in accordance with the State Water Quality Management Strategy No. 6 and the Rangelands NRM Region Strategy;
2. endorse the Environmental Values, Environmental Quality Objectives, Levels of Ecological Protection and their spatial allocation (as shown on Maps 1-11) as 'interim', to guide environmental impact assessment, waste discharge regulation and natural resource management, until they are more formally established through Government policy or other implementation mechanisms;
3. recognise that the most effective implementation mechanism is a State Environmental Policy and that a formally-established, broadly-based management structure would assist in coordinating monitoring programs, reporting publicly and guiding management responses in priority areas of the region;
4. recognise the need to establish a standard set of environmental quality indicators, criteria and standard monitoring procedures appropriate to the tropical marine ecosystems of the region to assess resource condition, provide early warning of change, and trigger management responses where necessary.

It is recommended that the EPA:

1. initiate the development of a State Environmental Policy for the entire State marine waters, and include the Environmental Values, Environmental Quality Objectives and Levels of Ecological Protection contained in this report for the marine waters from Exmouth Gulf to Cape Keraudren;
2. consider the most appropriate coordination mechanisms for managing marine environmental quality in the region.

It is recommended that the Rangelands NRM Coordinating Group:

1. note that the community-derived marine quality objectives contained in this report support the Resource Condition Target 17 of the Rangelands NRM Strategy and its associated Management Action Targets 18 and 23.
2. support the establishment of a standard set of environmental quality indicators, criteria and standard monitoring procedures appropriate to the tropical marine ecosystems of the region to assess resource condition, provide early warning of change, and trigger management responses where necessary.
3. extend the project 'Addressing human use threats to Cultural and Natural Resource Values on the Kimberley coast' to the Exmouth-Pilbara coast to develop a greater understanding of both indigenous and non-indigenous cultural and spiritual associations with the marine environment, and strategies to protect these values from threatening processes, including pollution.

1. Introduction

1.1 Purposes of the report

This document refers to the Environmental Protection Authority (EPA) a set of Environmental Values (EVs) and Environmental Quality Objectives (EQOs) for the State's marine waters from Exmouth to Cape Keraudren. These are recommended as the basis of an environmental quality management framework for the region to help manage and protect the marine environment from the effects of waste inputs and pollution.

The EVs and EQOs have been developed through extensive consultation with stakeholders and communities. Figure 1 shows the steps leading up to the submission of this report to the EPA for its review and consideration for formal adoption of the EVs and EQOs. This follows an agreed process as set out in the State Water Quality Management Strategy No. 6. (Government of Western Australia, 2004).

This document is also the key output of a Natural Heritage Trust (NHT) priority project of the Rangelands Natural Resource Management (NRM) Region, entitled "Integrating community-derived marine quality objectives into regional planning, multiple-use management and ecologically sustainable development on the North West Shelf". The project was conducted by the Department of Environment (DoE) on behalf of the Rangelands NRM Coordinating Group to support the development and implementation of the Rangelands NRM Region Strategy.

1.2 Basis in government policy

The Federal, State and Territory governments of Australia have committed to implement the National Water Quality Management Strategy (NWQMS), and the Western Australian Government has given effect to its commitment by developing the State Water Quality Management Strategy.

Implementation of the NWQMS is recognised as a key element in Natural Resources Management for Western Australia. This is affirmed in two bilateral agreements between the Commonwealth and Western Australian Governments: (a) to deliver the Natural Heritage Trust (signed December 2002), and (b) for the implementation of the Intergovernmental Agreement on a National Action Plan for Salinity and Water Quality (signed September 2003).

With respect to the marine environment, the most relevant parts of the NWQMS are the:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Guideline 4), and the
- *Australian Guidelines for Water Quality Monitoring and Reporting* (Guideline 7).

As a basis for applying Guidelines 4 and 7, the NWQMS calls for States to establish mechanisms for:

- clear definition of environmental values;
- a good understanding of links between human activity and environmental quality;
- setting of unambiguous management goals;
- identification of appropriate water quality objectives, or targets; and
- effective management frameworks, including cooperative, regulatory, feedback and auditing mechanisms.

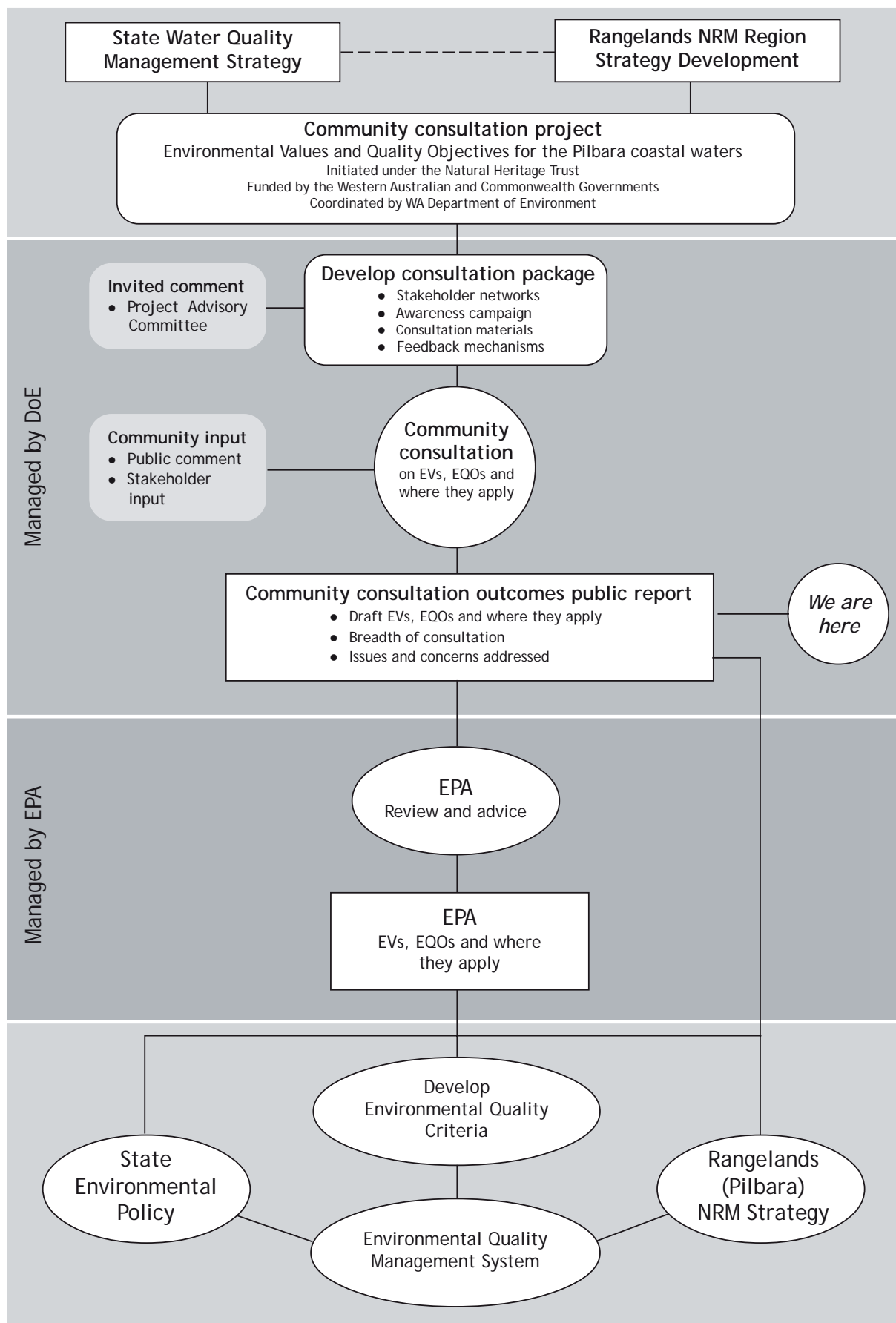


Figure 1. Pilbara Coastal Water Quality Consultation Process

In response to this, the Western Australian Government has established an implementation framework for NWQMS Guidelines 4 and 7, which sets out broad governance and auditing mechanisms that will apply in Western Australia. This implementation policy has been published as State Water Quality Management Strategy No. 6 (Government of Western Australia, 2004). It requires that the lead agency, through a thorough consultative process, develop draft environmental values, environmental quality objectives and environmental quality criteria (EQC) for review and endorsement by the EPA. Once the EVs, EQOs and EQCs have been established in this manner for a particular water resource, the lead agency is required to establish an environmental quality management system, including monitoring of agreed indicators, auditing against the EQOs and feedback to adaptive management. This process is also consistent with the EPA Position Statement on “Environmental Protection in Natural Resource Management” (Environmental Protection Authority, 2005a).

The State Sustainability Strategy (Government of Western Australia, 2003) specifically identified that “the Department of Environment is conducting a community consultation process to assist the Environmental Protection Authority in establishing an agreed set of environmental values and quality objectives for the coastal waters between Exmouth and Port Hedland to guide environmental impact assessment and management”.

In April 2004 the DoE provided a briefing to the EPA on the Pilbara Coastal Water Quality Consultation Project. The EPA affirmed its role in auditing Natural Resource Management and setting EVs and EQOs in Western Australia. The EPA noted that the outcomes of the Pilbara Coastal Water Quality Consultation Project will be referred to it for advice and endorsement of the recommended EVs and EQOs.

1.3 Characteristics of the region

The area under consideration comprises all of the State marine waters between Exmouth and Cape Keraudren (Figure 2), extending up to the high water mark. This area has an unusual setting, being the only marine ecosystem in Australia that is offshore from the arid tropics. The high marine biodiversity and recreational values of the area are recognised at a national and international level, and implementation of a system of marine conservation reserves is in progress. The text box (refer page 14) provides a summary of the region’s broad marine habitat types and associated biota. This is drawn largely from “A Representative Marine Reserve System for Western Australia” (Marine Parks and Reserves Selection Working Group, 1994).

The Pilbara region is undergoing rapid economic development across a range of marine-related industry sectors, including offshore oil and gas, ports, shipping, mining, minerals processing industries, solar salt production, aquaculture, commercial fishing and nature-based tourism.

A survey in 2001 of the region’s residents and stakeholders identified protection of marine life and maintenance of marine water quality as issues of concern (CSIRO & DEP, 2002). Marine ecosystems and valued community uses (such as recreation and fishing) may be adversely affected by a reduction in water quality due to waste discharges. It is important that an environmental quality management framework be developed to address these community concerns and to complement other measures such as ecologically sustainable fisheries management and the implementation of a system of marine conservation reserves.

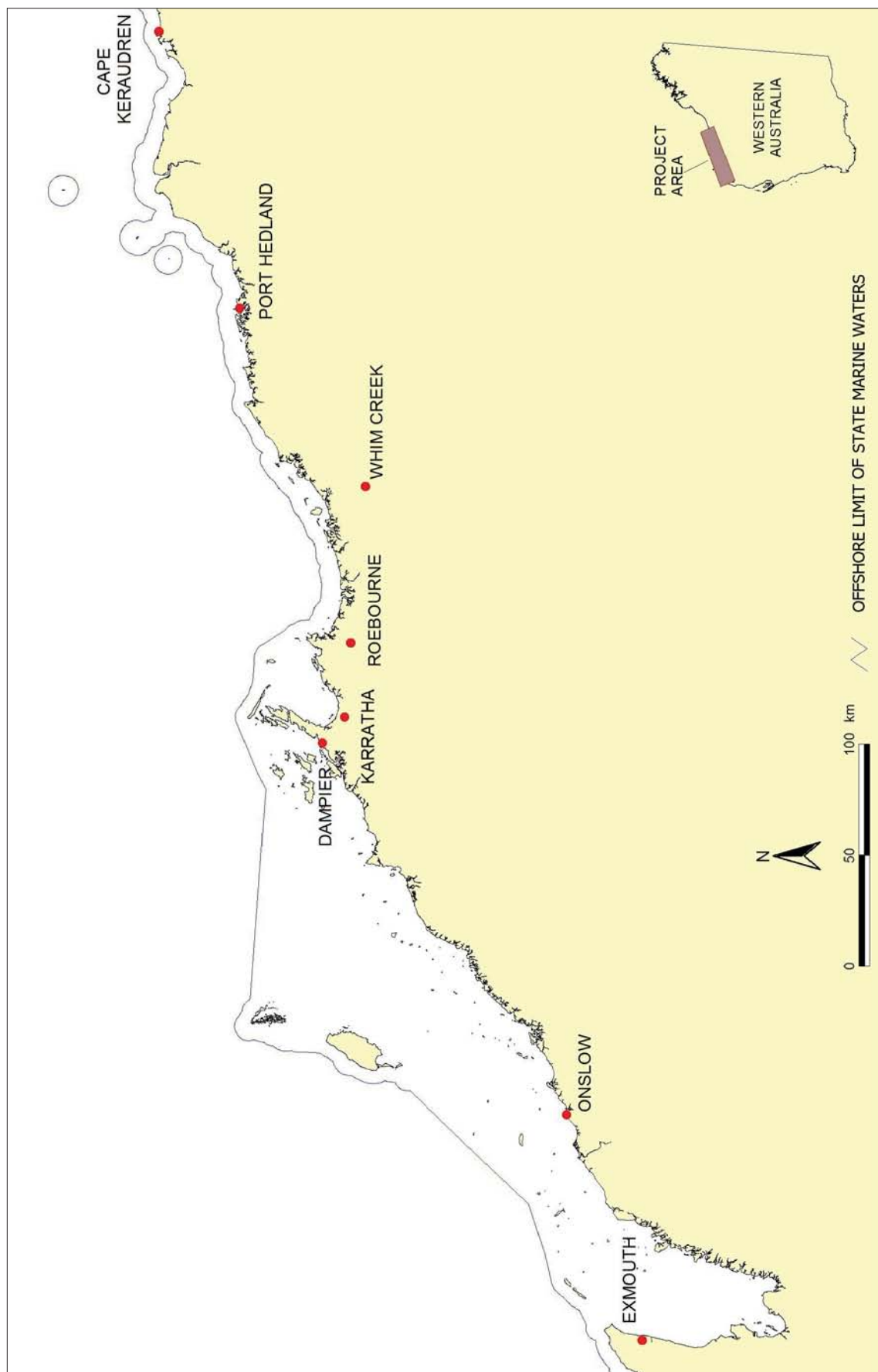


Figure 2. The marine and coastal region between Exmouth and Cape Keraudren.

Summary of Broad Marine Habitat Types and Associated Biota (Source: MPRSWG, 1994)

The Pilbara coast generally has low relief with gently sloping beaches, numerous headlands and many offshore islands. The inner, near-shore marine waters of the region are relatively turbid, being subject to disturbance from strong tidal flows and to episodic runoff from adjacent rivers. The mid to outer continental shelf waters are generally clear.

Mangroves

Mangroves are conspicuous and extensive in association with muddy substrates. They form wide forests in some parts of the mainland shore, and small but sometimes complex mangals are found in embayments, and on the sheltered shores of many offshore islands. There are few places in the world where mangals occur in arid conditions. In this regard, the mangals are of great scientific importance (Semeniuk, 1993). The whole mangrove system of the region is considered important in order to maintain nutrient cycles and productivity of the coastal zone.

Intertidal Flats

Extensive intertidal flats usually back fringing mangroves. Besides their rich and diverse faunas of burrowing invertebrates and their use as feeding areas for migratory birds, these intertidal flats are strongly linked to the functioning of the mangrove ecosystems.

Rocky Shores

In the central Pilbara, particularly the Dampier Archipelago, many shores are dominated by igneous rocks. Limestone shores are to be found in some places on the mainland coast, but more often on the coastal islands. The sloping, intertidal zone of these hard substrate coasts is dominated by the growth of rock oysters and associated fauna. Horizontal rock pavements are usually covered with algal growth and support diverse invertebrate faunas. The front edges of the rock platforms may bear coral growth and in many cases there is extensive coral reef development in the sublittoral zone. Due to clear water and moderate wave action, the floral and faunal composition and community structure of rock platforms on the offshore islands (such as Barrow, the Montebellos, the Muirons and the outer islands of the Dampier Archipelago) differ significantly to those of the inner islands and mainland shores, where waters are more turbid.

Coral Reefs

Coral reefs of the region include offshore coral banks and platform reefs of the West Pilbara, and extensive fringing reefs, such as those of the Dampier Archipelago, the Montebellos, the Muirons and other offshore islands. A wide variety of coral communities are found, ranging from inshore turbidity-adapted communities to clear-water coral communities offshore.

Seagrass Meadows and Algal Beds

Tropical seagrass meadows may occur in the shallows, in lagoons, mangrove swamps and around islands, but are not as extensive as off the west and south coasts of the State. Seagrass and algal beds are an important element of the region's ecosystems and they support a diverse fauna including herbivorous fishes, turtles and dugongs.

Marine Flora and Fauna

Although many of the marine species occurring on the North West Shelf are widespread across the Indo-West Pacific region, there is still a significant degree of local endemism. The fish, invertebrate and marine plant communities of the nearshore reefs, banks and tidal flats differ in composition from those of the shelf-edge atolls and offshore islands. These differences between inner and outer shelf biota are largely due to the very different habitats provided by the turbid waters inshore and the clear oceanic conditions offshore.

Exmouth Gulf

Exmouth Gulf is the largest embayment in the region. The waters of the Gulf are generally turbid. Its eastern and southern shores are dominated by mangal and mudflat habitats of great importance for nature conservation and for sustaining local fisheries. A range of mangrove species and mangal assemblages are present in the Gulf. Extensive seagrass beds may be found in shallow waters of the Gulf, which provide feeding habitat for turtles and dugongs. The shores and nearshore habitats of the western side of the Gulf are quite different to those of the east.

1.4 Relevance to the Rangelands NRM Region Strategy

The Western Australian Rangelands NRM Region Strategy (Rangelands NRM Coordinating Group, 2005) deals with the marine as well as the terrestrial environment. It provides an overview of the physical and biological components of marine biodiversity, priority areas for marine conservation and natural resources management, and the major uses and threats to marine biodiversity in the region. One of the major threats identified is declining water (including sediment and biota) quality.

Currently, marine water quality over much of the region is high. However there are areas with increased sedimentation and turbidity (e.g. due to major dredging in ports), toxicant contamination (e.g. due to urban sources, upstream mining or industry discharges), physico-chemical change (e.g. discharge of bitterns or heated effluent) or bacterial levels (e.g. due to domestic wastewater discharge). Moreover, with the rapid pace of human developments in the region, there is potential for further or more extensive decline in water quality unless these activities are carefully managed.

The Rangelands NRM Strategy identifies Resource Condition Targets for the long-term maintenance or improvement of marine environmental quality (RCT 17) and associated Management Action Targets (MAT 18 and 23) for the establishment of an integrated environmental quality monitoring and management framework with indicators and criteria to achieve the RCT. This DoE report presents the outcomes of a public consultation process and a resultant set of marine quality objectives for the Exmouth-Pilbara region as a contribution to achieving these targets.

1.5 A framework for managing environmental quality

The Environmental Protection Authority has developed an Environmental Quality Management Framework (EQMF) for the marine waters of Western Australia. The EQMF was first implemented for Perth's coastal waters and then in greater detail for Cockburn Sound (EPA, 2000; Government of Western Australia, 2005). The State Government has endorsed the progressive implementation of the EQMF for all of the State's marine waters on a priority basis (Government of Western Australia, 2003).

The EQMF is consistent with the NWQMS and the SWQMS. The key elements of the EQMF (shown in Figure 3) are Environmental Values (EVs), Environmental Quality Objectives (EQOs) and Environmental Quality Criteria (EQC).

Environmental Values are defined in the NWQMS as *“particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health, and which require protection from the effects of pollution, waste discharges and deposits.”* (ANZECC & ARMCANZ, 2000). The EVs reflect the importance that the community places on the marine environment for its intrinsic biodiversity and ecosystem functions, its recreational and cultural attributes, and its commercial and industrial uses. Five EVs from the NWQMS are relevant to marine waters and are shown in Table 1. The ecosystem health value is fundamental because healthy ecosystems support and sustain life. The other four environmental values represent specific human benefits or uses that rely on a clean, healthy environment; collectively, they are referred to as social-use values. Note that the latest revision of the Australian and New Zealand Water Quality Guidelines (ANZECC & ARMCANZ, 2000) recognises that water resources have important cultural and spiritual value for people, and this EV has been added into the EQMF.

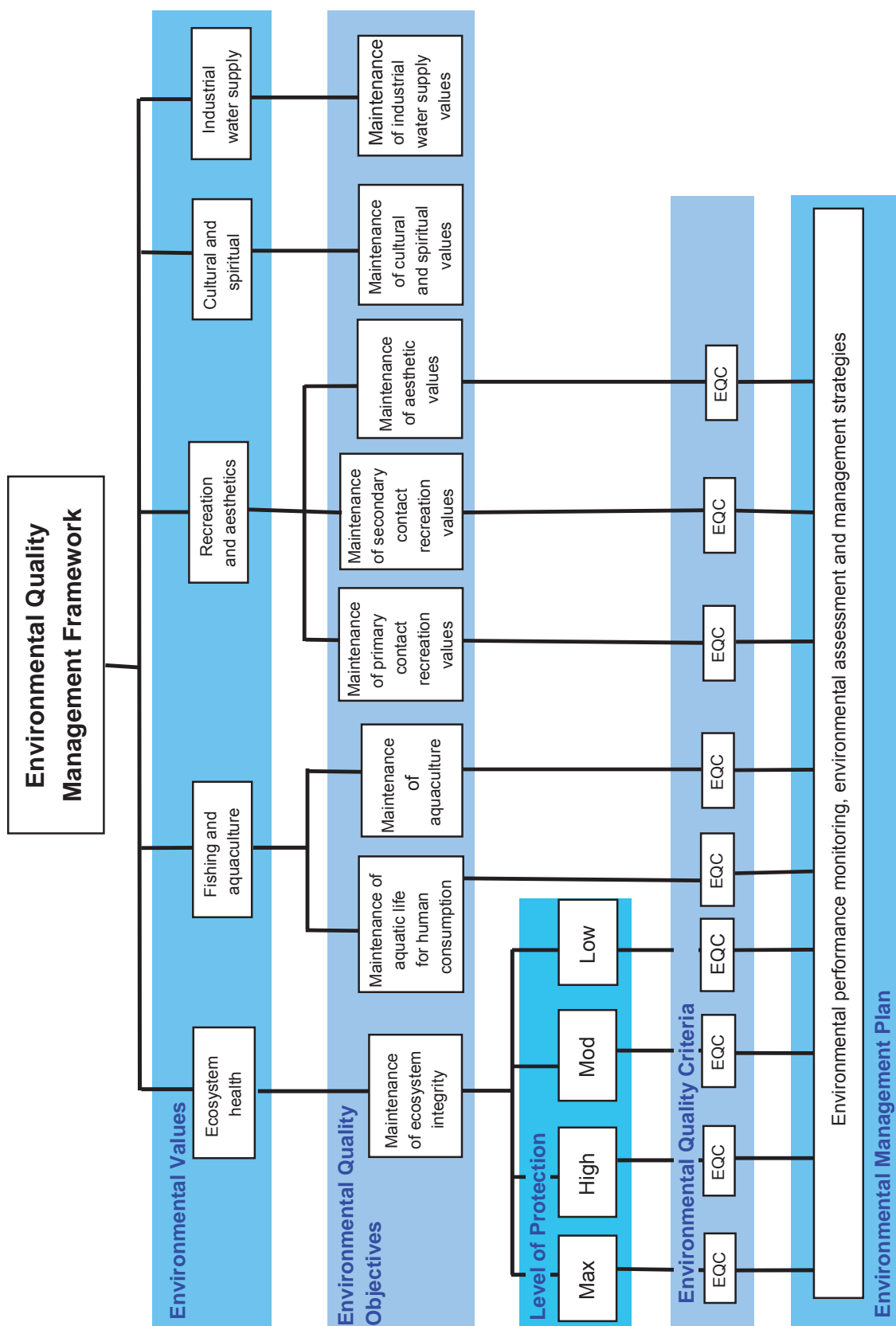


Figure 3 Environmental quality management framework for the marine waters of Western Australia.

Table 1. Environmental Values and Environmental Quality Objectives for the marine waters of Western Australia.

| Environmental Values | Environmental Quality Objectives |
|--|---|
| Ecosystem Health (ecological value) | Maintain ecosystem integrity This means maintaining the structure (e.g. the variety and quantity of life forms) and functions (e.g. the food chains and nutrient cycles) of marine ecosystems. |
| Recreation and Aesthetics (social use value) | Water quality is safe for recreational activities in the water (e.g. swimming). Water quality is safe for recreational activities on the water (e.g. boating). Aesthetic values of the marine environment are protected. |
| Cultural and Spiritual (social use value) | Cultural and spiritual values of the marine environment are protected. |
| Fishing and Aquaculture (social use value) | Seafood (caught or grown) is of a quality safe for eating. Water quality is suitable for aquaculture purposes. |
| Industrial Water Supply (social use value) | Water quality is suitable for industrial supply purposes. |

For each EV, one or more EQOs may be defined (see Table 1). The EQOs are more specific than the values and represent management goals for maintaining environmental quality to protect particular aspects of the EVs from the effects of wastes. For example, the EQO to maintain water quality such that it is safe for swimming is a management goal linked to the EV of *recreation and aesthetics*.

As shown in Figure 3, the EQO for *maintenance of ecosystem integrity* has four different levels of ecological protection (LEPs), each representing a different environmental quality condition (described in Table 2). One or other of these LEPs is applied to each part of the ecosystem in such a way that the general integrity of the ecosystem is maintained. This allows for management of conservation values and multiple uses (some with localised effects) while still maintaining the broad structure and function of the ecosystem. Clearly, setting a Moderate or Low LEP over large areas would not protect ecosystem integrity overall. Conversely, it would be unreasonable to propose an area of Maximum LEP adjacent to major existing development or population nodes.

Table 2. Levels of ecological protection linked to the Environmental Quality Objective for *maintenance of ecosystem integrity* and the corresponding environmental quality conditions.

| Level of Ecological Protection | Environmental Quality Condition (Limit of acceptable change) | |
|--------------------------------|---|---|
| | Contaminant concentration indicators | Biological indicators |
| Maximum | no contaminants – pristine | no detectable change from natural variation |
| High | very low levels of contaminants | no detectable change from natural variation |
| Moderate | elevated levels of contaminants | moderate changes from natural variation |
| Low | high levels of contaminants | large changes from natural variation |

In practice, the achievement of an EQO (or a LEP) will be judged from an assessment of monitoring data. The environmental quality indicators selected for monitoring will relate to the EQOs/LEPs and to the pressures (e.g. types of waste inputs) that threaten their achievement. For each environmental indicator monitored, an environmental quality criterion (EQC), either descriptive or quantitative, will be required as a benchmark against which the monitoring data can be compared to determine whether the EQO/LEP has been met. If the EQO/LEP is deemed not to be met, then this signals the need for remedial management action (e.g. reduction of waste discharge) in order to achieve the desired management goal.

For example, to determine whether the swimming-related EQO is met, an appropriate bacteriological measure of water quality would be monitored if there was a risk of human faecal contamination. The bacteriological monitoring results would be assessed against national health guidelines (EQC) and, if these were exceeded, the matter would be referred to the Health Department, the source investigated and the issue managed.

A comprehensive set of EQC has yet to be formally established by the EPA for the Pilbara coastal waters. The Department of Environment has recently conducted investigations of background water and sediment quality in the region for a range of potential contaminants. These regional background data are being used, together with the guidelines and approaches from the Australian and New Zealand Water Quality Guidelines (ANZECC & ARMCANZ, 2000), to develop water and sediment quality criteria appropriate to the region. The criteria will be used to assess and guide development of existing and future monitoring programs in the region.

2 Public consultation process

Between September and November 2004, the DoE ran a carefully planned and targeted public consultation process to obtain comment on EVs, EQOs, LEPs and how they should apply geographically within the State marine waters from Exmouth Gulf to Cape Keraudren.

The development of the consultation process was overseen by an independently-chaired Project Advisory Committee comprised of government and community members (refer Chapter 7). Vital Options Consulting was retained by the DoE to facilitate, report on and summarise community and stakeholder comment provided in response to the public consultation program.

The public consultation process directly contacted and networked representatives of all known stakeholder interests, through a combination of written and telephone invitations, an information kit, via website access, e-mail broadcasting, media announcements, targeted or invited presentations, public meetings and stakeholder reference forums. Every person contacted was invited to submit a written response confirming their views, either by way of a brief questionnaire, or by using a more comprehensive questionnaire accompanied by maps depicting a 'notional Plan' (spatial allocation) of EQOs and LEPs. The notional plan recognised pre-existing policies for land-use, marine environmental protection and marine conservation. While the questionnaire formed the basis of most written responses, some organisations (mainly agencies, peak bodies and industrial corporations) chose to make contributions by letter.

Considerable effort was expended and a range of consultation mechanisms used to secure reasonably comprehensive, representative participation across all the identified interest groups and community sectors. In addition to the questionnaire and written responses, the consultation included five half-day Stakeholder Reference Forums (to which industry, port authority, agency and community representatives were invited) and nine public information/discussion meetings, held in centres in the region and in Perth. Active participation and constructive public input was consistently received from all sections of the community. It is the issues raised through these various consultations that have been considered in preparing recommendations to the Environmental Protection Authority and the Rangelands NRM Coordinating Group.

Full details of the public consultation process are provided in the consultant's report (Vital Options Consulting, 2005) which contains:

- an account of the breadth and level of consultation undertaken,
- an analysis and summary of community input and opinion received, and
- an assessment of key issues and outcomes requiring priority attention.

The consultant's report is available from the DoE library on request or may be downloaded from the website <http://pilbaracoastalwaters.environment.wa.gov.au>.

A peer review of the public consultation process was prepared by the independent Chairman of the Project Advisory Committee (Woodley, 2005) and is reproduced in Appendix 1.

3 Public consultation outcomes

3.1 Level of community response

Community response to the *Pilbara Coastal Water Quality Consultation* was received as formal written submissions or as issues raised and recorded at the Stakeholder Reference Forums and Public Information/Discussion Meetings.

One hundred and fifty six written submissions were received in total, of which 77% came from Pilbara and Exmouth residents and businesses. The geographic spread was fairly evenly distributed from west to east of the region, with the major sources being Exmouth, Port Hedland and the Karratha/Dampier/Wickham/Roebourne area. The majority of submissions (68%) came from private individuals. A further 15 were from small business (10%), five were from industry and resource corporations (3%), four were from various peak bodies (2%), 11 were from local and state government agencies (7%), and 15 were from a range of other community organisations and groups (10%).

The aggregate response from the Stakeholder Reference Forums and public meetings was drawn from a broadly representative cross-section of the whole community of interest. About 190 people directly participated in these meetings, mainly from the Pilbara and Exmouth regions, and otherwise mainly Perth-based professionals with active interests in the region. About one third participated as industry, business, and professional representatives, one third as commonwealth, state or local government agency representatives, and the remaining participants were from community organisations or were drawn from identifiable community sectors.

3.2 Broad community views

The great majority of community and stakeholder written responses indicated support for a well-integrated regional plan of environmental quality objectives.

Environmental values were held as personal priorities and also seen by many respondents as constituting the future basis for regional development. Sustainable industries and developments for the coastal waters between Exmouth and Cape Keraudren are accepted, provided that they are consistent with protecting the environmental values.

The uses most commonly identified by respondents as providing benefit to the region were those associated with recreation and the environment: recreational boating, tourism and enjoyment of unspoilt coastal and marine environments (Vital Options Consulting, 2005). Each of these uses was selected by 66% of respondents or greater. All of the major industrial uses listed in the questionnaire were also recognised as being important to the region, with none being actively listed by less than 39% of respondents.

Most respondents (91%) want there to be some marine areas that are totally protected from waste inputs and maintained at a pristine quality level (Figure 4).

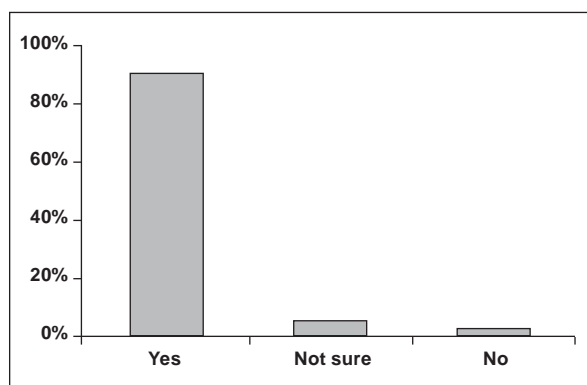


Figure 4. Response to the survey question: Are there areas in the coastal waters of the Pilbara that you think should be totally protected from waste inputs?

A majority of respondents (77%) were unwilling to accept waste inputs anywhere that would make water quality unsuitable for social uses such as fishing and swimming (Figure 5).

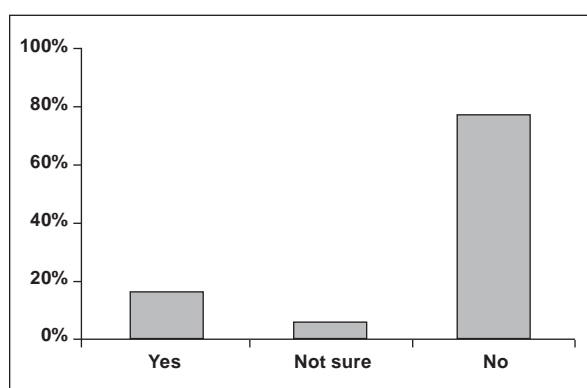


Figure 5. Response to the survey question: Are there areas of the coastal waters where you would accept waste inputs making water quality unsuitable for social uses such as swimming and fishing?

However opinion was fairly evenly divided on whether effects on marine life from waste inputs in some localized areas would be acceptable in return for important uses and developments (Figure 6).

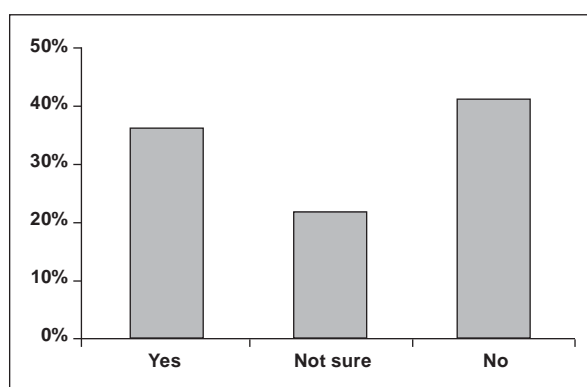


Figure 6. Response to the survey question: Are there some areas of the coastal waters where you are prepared to accept some effects on marine life from waste inputs in return for important uses and developments?

3.3 Revised spatial plan of environmental quality objectives and levels of ecological protection for the Pilbara Coastal Waters

A notional plan of EQOs, LEPs and their spatial allocation throughout the region was widely circulated as a key part of the consultation package (Department of Environment, 2004) to trigger debate and feedback from the public.

The plan has been revised subsequent to the consultation process as depicted in Maps 1-11 and a summary of the revisions made for each map is given in Appendix 2.

Revision of the plan has provided, over the entire region, approximately 34% increase in the total area allocated Maximum LEP, and approximately 37% increase in the total area allocated Moderate LEP. There has been a reduction in the total area allocated High LEP. The exact size of areas allocated a Low LEP will be determined following detailed consideration of discharge characteristics, but cumulatively they will account for a very low percentage of region's area.

The steps undertaken in revising the plan were to:

- respond to the key issues identified from analysis of community and stakeholder feedback (Vital Options Consulting, 2005);
- incorporate recent changes in marine conservation reserve (MCR) boundaries and zoning schemes;
- ensure that the EQOs and LEPs allocated in MCR areas support the goals and long-term targets for water and sediment quality set out in MCR Management Plans; and
- include development projects which have received approvals from the Minister for the Environment since the consultation package was prepared and up to the end of March 2006. Proposals which have not received Ministerial approval are not included.

The revised plan of EQOs, LEPs and their spatial allocation throughout the region is submitted to the EPA and Rangelands NRM Coordinating Group for consideration and endorsement.

4 Key stakeholder issues and how these are addressed

Much of the discussions centred on how the environmental quality management framework would be formally established for the region, and the need for an “on the ground” environmental management system (EMS) for applying it.

The consultant's report (Vital Options Consulting, 2005) analysed public/stakeholder comments received during the consultation process and concluded that there are five categories of issues that need to be addressed in implementing an environmental quality management system for the marine waters from Exmouth Gulf to Cape Keraudren. These issues relate to:

- Levels of Ecological Protection;
- Environmental baselines and effective monitoring and reporting systems;
- Implementation and governance for the Environmental Quality Management Framework;
- Adoption and application of an effective plan of EQOs and LEPs; and
- Further consultation.

The following sections contain the response of the DoE to the key issues raised in the consultant's report.

4.1 Levels of ecological protection

The consultant's report (Vital Options Consulting, 2005) recommended that:

- the meaning and application of the term '*maximum level of ecological protection*' be further explained;
- DoE consult further with the Marine Parks and Reserves Authority and CALM to ensure that, within marine conservation reserves, the recommended EQOs and LEPs are consistent with long-term targets set in Marine Conservation Reserve management plans; and
- DoE note the strong community support for the use of a maximum LEP category and give consideration to community suggestions of areas where this category might apply, while also noting the concerns of several stakeholders that such areas may amount to 'no go' areas for industry.

These matters, and the issue of deciding which level of ecological protection should apply in outer port areas and shipping approach channels, are addressed below.

The meaning and application of Maximum Level of Ecological Protection.

The EV for Ecosystem Health recognises the intrinsic value of naturally diverse, sustainable marine ecosystems. This EV has a corresponding EQO to "maintain ecosystem integrity", which means to maintain the natural structure and functions of marine ecosystems. There was general community understanding of the need to further describe the ecosystem integrity EQO in terms of different levels of ecological protection that could be applied to different areas of marine ecosystems. This was seen as a practical and auditable way of setting an objective for maintenance of ecosystem integrity while allowing for some discharge of waste to the marine environment in certain areas and under strictly controlled conditions.

The four LEPs for ecosystem integrity are referred to as 'maximum', 'high', 'moderate' and 'low'. Each of these levels of protection corresponds to a different target environmental quality condition (see Table 2), which is further defined in terms of quantitative or qualitative benchmarks for selected environmental quality indicators. Monitoring data for these indicators are assessed against the corresponding benchmarks (criteria) to determine whether the target environmental quality condition has been achieved.

Where the Maximum LEP has been assigned to an area of the marine environment, this signals that the target environmental quality condition for this area is an essentially pristine condition with no change from natural background conditions (e.g. water and sediment quality) as a result of waste inputs, and no detectable effects on marine life. In this case the environmental quality criteria need to be derived from appropriate unimpacted reference site data from the region. As indicated in the consultation kit, it is considered appropriate and reasonable to set a 'maximum' level of protection for marine areas which are recognised for their high conservation values and are not adjacent to existing major development or population centres.

The Maximum LEP is based on the National Water Quality Management Strategy guidelines for fresh and marine water quality (ANZECC & ARMCANZ, 2000), which recognise various levels of ecosystem condition, including condition 1 ecosystems, with high conservation and ecological values. ANZECC & ARMCANZ (2000) recommends, for condition 1 ecosystems, a criterion or management goal of 'no change beyond natural variability for biological indicators, physical and chemical stressors and toxicants in water and sediments'.

Some respondents have taken the Maximum LEP to represent a maximum level of regulation over effluent discharges. This interpretation emphasises an 'end-of-pipe' management approach, whereas the EQMF emphasises the achievement of an environmental quality objective. Since the environmental quality conditions required by a Maximum LEP are pristine conditions, there

would generally be a presumption against waste discharges in an area assigned this level of protection.

Stakeholders and the public wanted to be sure that the application of the EQMF within MCRs would be compatible with management goals, targets and monitoring requirements established in MCR management plans.

The Western Australian Government has established the Marine Parks and Reserves Authority (MPRA) to oversee the development of a statewide system of marine conservation reserves (MCRs) and their ongoing management by the Department of Conservation and Land Management (CALM).

The EPA prepares environmental protection policies, evaluates environmental impacts of development proposals and advises the Minister for the Environment. The DoE administers environmental regulations and licenses waste discharges. These responsibilities apply throughout Western Australia, including its MCRs.

The MCR management plans identify long-term targets for use in a management context to maintain or enhance the conservation values of each MCR zone. For attributes such as water quality, sediment quality and coral health condition, the targets are, in many respects, similar in intent to the Levels of Ecological Protection. For the EQMF developed by the EPA to apply within MCRs, it is essential that the LEPs are consistent with the targets established in MCR management plans.

Currently there are three areas within the region which have been established, or are in the process of being established, as MCRs. They are:

- the Montebello-Barrow Islands Marine Conservation Reserves (established);
- the Muiron Islands Marine Management Area (established); and
- the Dampier Archipelago-Cape Preston Marine Conservation Reserves (proposed).

There are two types of proposed or established MCRs in the region: Marine Parks and Marine Management Areas. Conservation is clearly the priority purpose in Marine Parks, and other prescribed uses and activities are to be allowed only at levels that are consistent with maintaining or restoring conservation values (CALM Act, 1984). In Marine Management Areas the marine environment is to be managed and protected so it may be used for conservation, recreation, scientific and commercial purposes (CALM Act, 1984).

The DoE and CALM are working together to ensure that long-term targets for ecological values in MCR management plans and the recommended LEPs for this region are consistent. For example, the mapping of LEPs in proposed and existing MCRs for the region has been revised as shown in Maps 3, 4 and 6. Table 3 presents the correspondence between MCR long-term targets and the LEPs. The LEPs allocated in MCR zones should always be interpreted in terms of the MCR targets for those zones.

Where an interim MCR management plan has been published and the formal management plan is not yet available, the LEPs have been set to agree with targets in the interim management plan. They will be adjusted as necessary in accordance with Table 3 to reflect any change in targets as management plans are formalised and periodically reviewed. For environmental impact assessment, regulation or environmental management purposes, the LEPs in MCR areas should always be considered in conjunction with the relevant long-term targets in the management plans.

Table 3. Long-term targets in marine conservation reserve management plans and corresponding levels of ecological protection.

| MCR Categories and Zones | CALM Act MCR Management Plan Targets for Water and Sediment Quality | DoE recommended Levels of Ecological Protection |
|---|---|--|
| Marine Park | | |
| Sanctuary | No change from background ^Ω levels, as a result of human activity | Maximum |
| Special purpose (conservation) | No change from background ^Ω levels, as a result of human activity | Maximum |
| Recreation | No change from background ^Ω levels, as a result of human activity | Maximum |
| Special purpose (pearling or aquaculture) | No change from unimpacted background ^Ω levels, except in areas approved by the appropriate government regulatory authority. The area not meeting ANZECC guidelines is not to exceed 1% (by area) of these zones. | Maximum, except in areas approved to have lower levels of ecological protection. |
| General use | No change from unimpacted background ^Ω levels, except in areas approved by the appropriate government regulatory authority. The area not meeting ANZECC guidelines is not to exceed 1% (by area) of these zones. | Maximum, except in areas approved to have lower levels of ecological protection. |
| Marine Management Area | | |
| Conservation [#] | No change from unimpacted background ^Ω levels, except in areas approved by the appropriate government regulatory authority. The area not meeting ANZECC guidelines is not to exceed 1% (by area) of these zones. | Maximum, except in areas approved to have lower levels of ecological protection. |
| Commercial (aquaculture) | No change from unimpacted background ^Ω levels, except in areas approved by the appropriate government regulatory authority. The area not meeting ANZECC guidelines is not to exceed 1% (by area) of these zones. | Maximum, except in areas approved to have lower levels of ecological protection. |
| Multiple Use/ Unzoned [§] / Unclassified | Maintained in a natural state, except for areas where some level of acceptable change is approved by the appropriate government regulatory authority | High except in areas approved to have lower levels of ecological protection. |

^Ω background conditions are determined from an appropriate unimpacted reference site, as per the environmental quality management framework referred to in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000)

[§] quantitative targets for geomorphology, water quality, sediment quality and marine habitats in the unzoned areas of Marine Management Areas will be developed in consultation with stakeholders prior to finalisation of the MCR management plan, or early in the life of this management plan. This process will include additional habitat mapping to more accurately define the extent of marine habitats.

[#] for Conservation Zones in the Muiron Islands Marine Management Area the target is “no change from unimpacted background” and the Level of Protection is “Maximum”.

Note: areas in Marine Parks which are within 5 km of existing or approved (March 2006) major development centres are treated in this document as “Slightly disturbed (Condition 2) ecosystems where the management goal is no change in biodiversity” (ANZECC and ARMCANZ, 2000). For these areas the targets are a prescribed high level of water/sediment quality (with no effects on marine life) and the allocated Level of Ecological Protection is High. This is a slightly different approach compared to areas in Marine Parks that are greater than 5 km from major development centres, and for which a Maximum LEP applies, but is not inconsistent with the “biological targets” for the MCR.

The overall outcome is that there has been a significant increase in areas within Marine Parks recommended for a Maximum LEP, whereas little change has occurred within Marine Management Areas (see Appendix 2 and Maps 3, 4 and 6).

At a working level, CALM and DoE have agreed to adopt the LEPs as outlined above on an interim basis, subject to review and revision, if necessary, within three years. CALM and DoE are continuing to refine the general procedures and benchmarks for assessing environmental quality monitoring data to determine whether the LEPs and management targets are being met in MCRs.

There was considerable support amongst respondents for extending application of the Maximum LEP.

In the notional plan issued with the Public Consultation Kit, a Maximum LEP was allocated to:

- zones of very high conservation value within MCRs;
- regionally significant arid zone mangrove areas of very high conservation value (Guideline 1 areas identified in EPA (2001)); and
- areas of very high conservation value, recognised as worthy of consideration for marine reservation (Marine Parks and Reserves Selection Working Group, 1994).

There was substantial support for extending application of the Maximum LEP to cover more areas in proposed and existing MCRs. This has been addressed through discussions between DoE and CALM, as summarised above. Otherwise, there was a particular focus on the coastline of Map 2, with seven different submissions all suggesting various ways to extend the proposed areas of Maximum LEP along that coastal sector. Based on the community input, the area between Sherlock Bay and Cape Cossigny has been changed from a High to a Maximum LEP.

Several stakeholders expressed concern that Maximum LEP areas may become 'no go' zones for industry.

The spatial plan of EQOs and LEPs does not either explicitly permit or disallow uses from an area. Rather it sets out goals for environmental quality. The DoE recognises, however, that maintaining a Maximum LEP objective will significantly constrain discharges and disturbances from commercial and land-use activities, and that it would be unreasonable to propose an area of Maximum LEP adjacent to large *existing* commercial/population centres. For this reason the Maximum LEP has not been allocated to areas identified for industrial infrastructure development in existing government-endorsed land-use plans.

Areas recommended for Maximum LEP occupy approximately 18% of the overall region. For most of these areas (e.g. Marine Parks under the CALM Act and regionally-significant tropical arid zone mangrove areas (EPA, 2001)), conservation is already formally recognised as the pre-eminent value, and other activities are not to be such as to compromise conservation values. For Special Purpose (pearling and aquaculture) zones and General Use zones in Marine Parks, and for Marine Management Areas, allowance has been provided through the long-term targets in particular MCR management plans for approved activities that may require small areas of lower ecological protection.

Once they are endorsed, the EPA will use the EQOs and LEPs to assist in providing environmental advice to Government in relation to development proposals. That advice will include an evaluation of the degree to which any given proposal is likely to meet the EQOs and LEPs in the plan.

Some stakeholders sought a Moderate Level of Ecological Protection in outer port areas and shipping approach channels, instead of the proposed High Level of Ecological Protection.

The Pilbara region has some of Australia's largest export ports. Access to these ports requires shipping channels which are developed and maintained by dredging.

Areas within port limits are parts of functioning marine ecosystems. They possess important habitats (e.g. mangroves, corals, seagrass, intertidal flats) and are used by many species of marine life (including whales, dugongs, turtles and fish). Several of these ports are located close to areas of outstanding biological biodiversity which have been included, or are proposed to be included, in the Statewide system of marine conservation reserves.

Water and sediment surveys indicate that toxicant concentrations are generally extremely low within port limits, with the exception of inner areas about wharves, ship turning basins, coastal discharges and some dredge spoil dump sites. Careful management is required to ensure that any future toxicant releases are avoided or minimised, and that they do not degrade areas of high environmental quality.

In contrast, the suspension of marine sediments into the water by propellor backwash and turbulence from vessels transiting the ports is very difficult to manage. Ship movements add to natural levels of turbidity and suspended sediment stirred up by tidal currents and wave energy.

The composition, diversity and abundance of natural marine biological communities varies in response to natural turbidity and suspended sediment levels, which generally decrease from inshore to offshore. It has been argued by some respondents that the added influence of ships transiting the port may also have localised effects on marine communities and that this should be reflected in the plan of EQOs and LEPs.

This influence has been recognized in areas about wharves, jetties and ship turning basins where there is enhanced potential for a range of *uncontrolled* contaminant inputs (e.g. shedding of antifouling paints) in addition to turbidity and sediment mobilization during ship berthing. These areas have been allocated a Moderate LEP.

Beyond these inner port areas, the only significant, unavoidable anthropogenic influence is sediment mobilization by ships. As a result, the surrounding environment would experience a series of turbidity pulses of short term duration which would subsequently be dispersed due to the action of wind and tidal currents. While turbidity and suspended sediments would be monitored, the monitoring program may not resolve these short term turbidity and suspended sediment pulses and they would not be used as triggers to manage general shipping into or out of a port. These indicators would be used in the context of an operational environmental management plan for dredging, where effects on turbidity and suspended sediment are more chronic and broadscale.

The community expects that elevations of contaminants and nutrients above natural background should be minimal in outer port areas, with no resultant biological effects. If these areas were designated with a Moderate or Low LEP then it would allow significant degradation of water and sediment quality, with resultant impacts on marine life. The LEP for shipping channels and surrounding areas beyond the inner confines of the ports has therefore been retained as High.

4.2 Environmental baselines and effective monitoring and reporting systems

There was strong community feedback on the need for environmental baseline data, effective environmental monitoring and reporting systems. These were viewed as essential to characterise the natural biodiversity and environmental quality of the Pilbara marine environment and, in particular, to manage areas potentially subject to impacts from human uses and activities.

The following subsections discuss the need, document what has been done by the DoE to address that need, and indicate the next steps required to develop a coordinated monitoring system.

4.2.1 The need for coordinated monitoring and reporting systems

Monitoring should quantify change occurring in the environment and should strive to distinguish between natural change and change caused by human activities. Monitoring should include indicators that can provide sub-lethal, early warning signs of an emerging threat to achieving the environmental quality objectives. Where monitoring indicates an unacceptable change in environmental quality due to human activities, this should trigger an adaptive management response.

Several localized (and largely unrelated) marine quality monitoring programs exist around specific coastal infrastructure and industrial facilities, but there is currently no strategy for integration of such monitoring programs for the marine waters between Exmouth Gulf and Cape Keraudren. Strategic monitoring needs to be risk-based, and considered in the light of environmental values, threats to these values, and where these threats occur in the region. Under the State Water Quality Management Strategy (Government of Western Australia, 2004) lead agencies have the responsibility to coordinate development of integrated environmental management and monitoring strategies.

Key elements to be addressed in an integrated monitoring strategy for the region include:

- *Identification of key threats to environmental quality* and potential impact areas for routine monitoring;
- *Coordination* between different organizations, data sharing and collation of monitoring data to ensure the best environmental management return for investment;
- *Baseline* monitoring to characterise the biodiversity, quality and natural variability of the environment prior to potentially disturbing influences;
- Ongoing monitoring of appropriate *reference* areas or sites, selected for (and maintained in) their natural state to provide a reference condition against which similar (but modified) areas can be compared;
- Selection of an agreed set of *environmental indicators and criteria* (e.g. light attenuation, sedimentation) based on cause-effect pathways linking key threatening processes (e.g. dredging) to sublethal responses of the key marine habitats (e.g. corals, seagrass);
- Adoption of *standard operating procedures* for monitoring and analysis of data; and
- *Communication of results* to stakeholders and the public.

Regular public reporting of the environmental condition, management actions, and whether these actions are resulting in the desired environmental outcomes is a vital element in the EQMF. Several levels of reporting are required, ranging from concise EQO report cards that can be understood by everyone at a glance, through to more technical forms of reporting. It is also important that the reporting for each area is in a form that can be readily converted to meet sub-regional as well as regional reporting requirements. This is to avoid duplication of effort and maximise the benefits of investment in data collection.

4.2.2 What has been done to address the need

- *Identification of key threats to environmental quality*

Key threats to environmental quality have been identified through environmental impact assessments of development proposals and associated monitoring programs.

The North West Shelf Joint Environmental Management Study (CSIRO and DEP, 2002) compiled an inventory of nutrient and contaminant inputs to the region from anthropogenic sources, and undertook a review of the fates, bioavailability and effects of the major contaminant types in tropical marine systems.

- *Water Quality and Sediment Quality Baseline Monitoring*

Only a few sampling programs have attempted to characterise unimpacted background chemical concentrations for the marine waters and sediments of the North West Shelf (e.g. Mackey, 1984; Brunskill *et al*, 2001). Most water and sediment quality monitoring programs focus around specific developments or activities, and often use commercial laboratories that are not equipped to measure at the analytical limits required to resolve *actual* background concentrations for most contaminants.

In 2003 the DoE and the CSIRO jointly undertook baseline water quality surveys in and around the Dampier Archipelago and Port Hedland to determine dissolved concentrations of heavy metals (such as cadmium, copper and mercury) and organic chemicals (such as petroleum hydrocarbons) in marine waters. From the results of high resolution seawater analyses, Wenziker *et al* (2004) reported that the coastal waters at most sites are of very high quality, with no organic chemicals detected in any of the samples and dissolved concentrations of metals approaching those found in the open ocean. Localised elevations of some metals were detected in inner port areas.

In 2005 the DoE conducted a marine sediment quality survey to characterize natural levels of toxicants at five key localities along the North West Shelf (Port Hedland, Dampier Archipelago, Onslow, Ashburton River Mouth and Exmouth Gulf) and current background quality in the inner harbour area of the Port of Dampier. The suite of contaminants analysed included a range of heavy metals, metalloids and organic chemicals considered to be key contaminants of interest. The results of this survey have been reported in McAlpine *et al* (2006) and show that sediment quality is generally very good, with only slight elevations of some metals in inner Dampier Port. Arsenic concentrations appear to be naturally elevated across the region.

The water quality and sediment quality baseline data are being used together with guidelines and approaches recommended by the Australian and New Zealand Water Quality Guidelines (ANZECC & ARMICANZ, 2000) to develop environmental quality criteria appropriate to the region. Once developed and approved by the EPA, the toxicant criteria will be used as formal benchmarks against which to assess the results of monitoring programs and as triggers for management actions designed to protect the environmental values of the region.

- *Selection of indicators for marine habitat integrity and condition*

The DoE commissioned the Australian Institute of Marine Science to conduct a literature/data review of 'early warning' indicators of change in corals and coral communities in response to stress (Gilmour *et al.*, 2006). The key stressors considered were turbidity, sedimentation, temperature and salinity. Activities such as dredging, reclamation and wastewater discharges, as well as extreme natural events, may cause elevated levels of these stressors. The information provided by this review will be used to design monitoring programs for corals, coral communities and their dependent ecosystems. The aim of the monitoring will be earlier detection and more timely management of the effects of key threatening processes associated with infrastructure development and waste discharges in the tropical waters of Western Australia.

- *Standard monitoring procedures*

Adoption of standard monitoring procedures (sampling, analytical and reporting methods) will help to eliminate much of the avoidable variation between data sets collected by different organisations contributing to a strategic monitoring program.

A manual of standard operating procedures has been developed for monitoring in Cockburn Sound (Environmental Protection Authority, 2005b). It includes procedures for monitoring approximately 300 physico-chemical parameters in marine waters, pore waters and sediments, plus nine biological parameters and a range of aesthetic parameters. Many of these methods would be transferable to tropical marine waters and sediments of the North West Shelf, although

further standard monitoring procedures would need to be developed and added for particular environmental indicators (e.g. coral health condition) relevant to the region.

4.2.3 Next steps in development of an environmental monitoring strategy

In order to plan and develop a more effective, integrated, risk-based monitoring strategy for the region, the following steps would need to be undertaken:

- review existing environmental quality monitoring programs;
- develop a set of priority environmental indicators appropriate to the regional environmental setting and the threatening processes in the region;
- establish EQC for these priority environmental indicators;
- set up cooperative agreements to coordinate monitoring and share monitoring data;
- establish guidelines for public reporting of shared data;
- institute a set of environmental quality reference sites in areas unimpacted by human activities (e.g. reference sites in MCRs would be established in consultation with CALM); and
- encourage and support further research to underpin the development of indicators and criteria along key ecological cause-effect pathways.

4.3 Implementation and governance for the Environmental Quality Management Framework

Further information was sought on the basis in government policy and proposed mechanisms for implementation of the EQMF to the region.

4.3.1 Basis in government policy

The basis in endorsed government policy for implementing the marine EQMF has been clearly highlighted and described in Section 1.2. The State Water Quality Management Strategy No. 6 (Government of Western Australia, 2004) sets out broad governance arrangements underpinning environmental quality management for marine and freshwater resources and ecosystems. The SWQMS identifies the key role of the EPA in :

- signing off on the EVs, EQOs and EQC to be used in managing these ecosystems;
- auditing environmental performance (e.g. achievement of the EQOs); and
- publicly reporting to Government.

4.3.2 Implementation mechanisms

The SWQMS identifies various mechanisms for implementing environmental quality management systems for particular areas or parts of the environment. These include statutory Environmental Protection Policy (EPP), non-statutory government policy, and policy of the Environmental Protection Authority. Experience has shown that an appropriate implementation mechanism for strategic marine environmental quality management is a State Environmental Policy (SEP).

A SEP is a non-statutory instrument, developed in its first stage by the EPA under the provisions of the Environmental Protection Act 1986. The Minister is required to consult publicly on a draft SEP and, once satisfied that all issues have been addressed, submits it to State Cabinet for consideration and adoption on a whole-of-government basis. The non-statutory nature of the SEP is well-suited to implementation of the EQMF, which encourages participation of a wide

range of community sectors, open sharing of information, and a cooperative management approach. An SEP can also be used to inform the application of existing statutory processes (e.g. environmental impact assessment, regulation of waste discharges) but does not create a new one. Further details of the SEP initiation and development process can be found in an explanatory document (Environmental Protection Authority, 2004).

The State Environmental (Cockburn Sound) Policy (Government of Western Australia, 2005) is the first SEP implemented in Western Australia and is for the protection and management of marine environmental quality. This SEP has been used to:

- declare EQOs, LEPs and their spatial application to Cockburn Sound;
- give effect to the EQCs and their role in evaluation of monitoring results and feedback to adaptive management;
- identify roles and responsibilities for coordination and implementation of environmental quality management in the Sound; and to
- require annual public reporting of environmental performance.

It is recommended that the EPA initiate development of a SEP that will generically apply to all of the marine waters of the State. For certain priority areas (where community consultation and focused technical investigations have been carried out) the SEP will include more detailed guidance on the implementation of an EQMF. It is proposed that the Pilbara coastal waters be one of these priority areas.

Bearing in mind that the Pilbara region is very large, with widely-separated population centres, and is remote from Perth, implementation of an environmental quality management system (EMS) will require:

- whole-of-government commitment and stakeholder cooperation;
- strong links to the Rangelands NRM Region Strategy;
- establishment of one or more coordinating bodies with clearly defined roles and broad representation, which fosters cooperative partnerships between conservation, industry and community interests as well as government agencies;
- further development of technical and environmental management capacity in the region to support the coordination and integration of environmental monitoring and reporting;
- consistent application of statutory mechanisms (e.g. environmental impact assessment, licencing, regulations) to support protection of the EVs and meeting of the EQOs; and
- regular reporting to the community on marine health condition, performance against the EQOs and management strategies and actions to address issues arising.

The EMS would be developed by or on behalf of the lead agency. The views and knowledge of regional stakeholders, community groups and relevant government agencies would be sought as input to a draft EMS, prior to finalisation. The overarching goals of the EMS would be to:

- protect the environmental values of the region;
- integrate management of the marine environment with management of land and sea-based human activities, particularly those which generate wastes, discharges and deposits;
- ensure coordination of an appropriate program of monitoring, evaluation and reporting on environmental performance against the EQOs;

- foster research and investigations required to fill critical gaps in understanding and improve marine environmental management;
- ensure that pressures on environmental quality are adequately characterised; and
- devise management actions and strategies to ensure that all EQOs are met in the long term.

4.4 Adoption and application of an effective plan of EQOs and LEPs

The effectiveness of the EQMF and its relationship with regional planning, development strategies, environmental impact assessment and licencing processes were topics raised by participants to the consultation.

The Western Australian Government is committed to protecting and enhancing environmental quality while maintaining economic and social development (Government of Western Australia, 2004). Once the community-derived EVs, EQOs and LEPs have been adopted as whole-of-government policy they will need to be considered in regional and sustainable-use planning, and by all government agencies and statutory authorities with responsibilities that could impact on marine environmental quality. These include the following:

- Environmental Protection Authority
- Department of Environment
- Marine Parks and Reserves Authority
- Department of Conservation and Land Management
- Western Australian Planning Commission
- Department for Planning and Infrastructure
- Department of Fisheries
- Health Department
- Department of Industry and Resources
- Port Authorities
- Local Governments

The establishment of a SEP with clearly stated and auditable environmental quality objectives will provide a catalyst for greater coordination across Government agencies and authorities involved in planning and natural resource management.

Many respondents held the view that development legislation, industry policy and land-use planning has not, in the past, sufficiently recognised the need for protection of EVs.

A major reason for this may be that the EVs and EQOs had not previously been clearly defined following public consultation, and recommended for establishment within the framework of government policy. Integration of the EVs and EQOs into these processes would include the following steps:

- At the early stages of development of strategies and plans for industry or land-use, the relevant authority should ensure that detailed studies are conducted to characterise the receiving marine environment and predict impacts of alternative strategies on marine environmental values. These predicted impacts should be reported publicly and the studies made available to the EPA. When providing its advice to Government on such policies and plans, the EPA will consider how the EVs are impacted.

- At the early stages of developing relevant State Agreement Acts, advice should be sought from the EPA on the implications of the draft legislation for marine environmental values.
- Environmental monitoring and management plans for ports should be designed on the basis of the EVs, EQOs and LEPs established for these areas.

A key issue raised during the consultation concerned the flexibility of the EQMF and its ability to accommodate major new developments that may be approved by government in the future.

The environmental quality management plan of EVs, EQOs and LEPs does not override government decision-making. It gives expression to current community aspirations for what the marine environmental quality should be in the future. The plan provides guidance for the design and siting of sustainable developments. Project design should be based on best practice waste avoidance or minimisation, so as to maximise the consistency in predicted environmental performance with the plan. The EPA, in assessing a proposal needs to know to what extent the proposal would be consistent with the EQMF plan for the region. That information will be made available as part of EPA's advice to government. Government will make the final decision as to whether a proposal should proceed.

Many respondents were strongly of the view that industries and development centres should improve the quality of their discharges and management practices.

All proposed and existing activities should be managed to a level such that the environmental quality objectives will be maintained or met within specified timeframes. Environmental management should focus on detecting early-warning signs of change in environmental quality and stress on marine biological communities. If these are detected, then detailed investigations should occur to identify the cause, locate the source and to assess the risk to environmental values. If the risk is assessed as significant, then remedial management actions will be required.

4.5 Further consultation

Indigenous people expressed a desire for further engagement and consultation.

Consistent with the National Water Quality Management Strategy, cultural and spiritual associations with the marine environment were recognised explicitly as an Environmental Value to be protected from the effects of waste discharges and deposits.

The consultation project made significant efforts to establish contact with, and seek feedback from, indigenous peoples and organisations, in recognition of the importance of interpreting EVs in the specific cultural context of the region. Indigenous input was received through written submissions, participation in public meetings and forums held at regional centres, and through small informal meetings.

A regional indigenous forum in Onslow provided detailed comment on the project, particularly highlighting the threats to environmental quality from inland activities, including those with potential to impact on the quality of rivers and drainage systems which ultimately flow to the marine environment. Some of the threats referred to included:

- contamination of watercourses from mining practices and carting of mineral concentrates;
- seepage from disused mine sites, rubbish dumps and septic systems;
- spraying of nuisance weeds (such as Parkinsonia) with herbicide, as well as
- erosion and stream contamination from pastoral activities.

Further engagement and consultation should focus on gaining a better understanding of local indigenous values and how these can be translated in terms of the EVs and EQOs and reflected in the EQMF for the Exmouth-Pilbara coast. The Rangelands Region NRM investment planning process is currently considering a project proposal entitled “Addressing human use threats to cultural and natural resource values on the Kimberley coast” which would involve consultation with key indigenous elders and organisations. It is recommended to the Rangelands NRM Coordinating Group that subsequent investment extend this project to the Exmouth-Pilbara coast. It is recommended to EPA that, during preparation of the draft SEP, attention be given to further consultation with both indigenous and non-indigenous communities with respect to the recognition of the cultural and spiritual EV.

Respondents from a range of sectors expressed a desire for further consultation during development and implementation of the EQMF for the region.

Further public consultation would occur during the development of a draft SEP for the implementation of the EQMF. A draft SEP would bring together all of the elements for marine environmental quality management in the region, including:

- the EQOs, LEPs and their spatial application;
- environmental indicators, EQCs and their role in evaluation of monitoring results;
- roles and responsibilities for coordination and implementation, and
- public reporting of environmental performance.

The Minister would normally consult publicly on the draft SEP prior to submitting it to State Cabinet for consideration and adoption on a whole-of-government basis.

5 Conclusions

The overall response from the public consultation was in favour of the permanent protection of environmental values associated with the marine environment and the maintenance of the highest possible environmental quality. The community wanted to see the marine environmental quality management framework formally established and effectively implemented in the region. Following an analysis of comments received, the key stakeholder issues were identified and have been addressed in this report. On this basis, the notional plan of EQOs and LEPs distributed for public comment at the commencement of the consultation has been revised, and is presented here for review and endorsement by the EPA and the Rangelands NRM Coordinating Group, together with the following recommendations.

6 Recommendations

It is recommended that the EPA and the Rangelands NRM Coordinating Group:

1. note that the consultation process and preparation of this report have been undertaken in accordance with the State Water Quality Management Strategy No. 6 and the Rangelands NRM Region Strategy;
2. endorse the EVs, EQOs, LEPs and their spatial allocation (as shown on Maps 1-11) as “interim”, to guide environmental impact assessment, waste discharge regulation and natural resource management, until they are more formally established through Government policy or other implementation mechanisms;
3. recognise that the most effective implementation mechanism is a State Environmental Policy (SEP) and that a formally-established, broadly-based management structure would assist in coordinating monitoring programs, reporting publicly and guiding management responses in priority areas of the region;

4. recognise the need to establish a standard set of environmental quality indicators, criteria and standard monitoring procedures appropriate to the tropical marine ecosystems of the region to assess resource condition, provide early warning of change, and trigger management where necessary.

It is recommended that the EPA:

1. initiate the development of an SEP for the entire State marine waters, and include the EVs, EQOs and LEPs contained in this report for the marine waters from Exmouth Gulf to Cape Keraudren;
2. consider the most appropriate coordination mechanisms for managing marine environmental quality in the region.

It is recommended that the Rangelands NRM Coordinating Group:

1. note that the community-derived marine quality objectives contained in this report support the Resource Condition Target 17 of the Rangelands NRM Strategy and its associated Management Action Targets 18 and 23.
2. support the establishment of a standard set of environmental quality indicators, criteria and standard monitoring procedures appropriate to the tropical marine ecosystems of the region to assess resource condition, provide early warning of change, and trigger management responses where necessary.
3. extend the project “Addressing human use threats to Cultural and Natural Resource Values on the Kimberley coast” to the Exmouth-Pilbara coast to develop a greater understanding of both indigenous and non-indigenous cultural and spiritual associations with the marine environment, and strategies to protect these values from threatening processes, including pollution.

7 Acknowledgments

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Many groups and individuals provided valuable input to the consultation process through written submissions, participation in meetings and forums, and out-of-session discussions. These inputs came from a wide range of sectors including the general community, indigenous interests, conservation groups, industry, port authorities, peak bodies and all levels of government.

Simon Woodley provided independent peer review of the consultation process and editorial advice on the final draft of this report.

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8 References

ANZECC & ARMCANZ (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. National Water Quality Management Strategy Paper No 4, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT.

Brunskill, G J, Orpin, A R, Zagorskis, I, Woolfe, K J and Ellison, J (2001). "Geochemistry and particle size of surface sediments of Exmouth Gulf, North West Shelf, Australia." *Continental Shelf Research*. 21 (2): 157-201.

CSIRO Marine Research and Department of Environmental Protection (2002). *North West Shelf Joint Environmental Management Study. Interim Report*. June 2002. p140.

CALM (2004). *Indicative Management Plan for the proposed Montebello/Barrow Islands Marine Conservation Reserves*. Department of Conservation and Land Management, Perth, p101.

Department of Environment (2004). *Pilbara Coastal Water Quality – Have Your Say*. Public Consultation Kit. Department of Environment, Perth.

Environmental Protection Authority (2000). *Perth's Coastal Waters. Environmental Values and Objectives*. Environmental Protection Authority, Perth.

Environmental Protection Authority (2001). *Guidance Statement for protection of tropical arid zone mangroves along the Pilbara coastline*. Environmental Protection Authority Guidance for the Assessment of Environmental Factors. No.1, April 2001, p15.

Environmental Protection Authority (2004). *State Environmental Policies (SEPs) – An Explanatory Document*. November 2004, p4.

Environmental Protection Authority (2005a). *Environmental Protection in Natural Resource Management*. Environmental Protection Authority Position Statement No. 8, October 2005, p23.

Environmental Protection Authority (2005b). *Environmental Quality Criteria Reference Document for Cockburn Sound (2003-2004)*. Environmental Protection Authority Report 20, January 2005, p86.

Gilmour J P, Cooper T F, Fabricius K E and Smith L D (2006). *Early warning indicators of change in the condition of corals and coral communities in response to key anthropogenic stressors in the Pilbara, Western Australia*. Report from Australian Institute of Marine Science to Western Australian Department of Environment, p101.

Government of Western Australia (2003). *Hope for the Future. The Western Australian State Sustainability Strategy*. Department of Premier and Cabinet, Perth.

Government of Western Australia (2004). *State Water Quality Management Strategy No. 6: Implementation Framework for Western Australia for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Monitoring and Reporting (National Water Quality Management Strategy)*. Report No. SWQ6, Department of Environment, Perth.

Government of Western Australia (2005). *State Environmental (Cockburn Sound) Policy 2005*. Western Australia, State Environmental Policy Series 01, p30.

Mackey D (1984). *Trace metals and the productivity of shelf waters off north west Australia*. Aust. J. Mar. Freshw. Res., 35, 505-516.

McAlpine K, Masini R, Sim C and Daly T (2006). *Background quality of the marine sediments of the Pilbara coast*. Marine Technical Series 1, Department of Environment, Perth.

Marine Parks and Reserves Selection Working Group (1994). *A Representative Marine Reserve System for Western Australia*. Report of the Marine Parks and Reserves Selection Working Group. Department of Conservation and Land Management, Perth.

Rangelands NRM Coordinating Group (2005). *A Strategy for Managing the Natural Resources of Western Australia's Rangelands*. A draft for public comment and review. Produced by Rangelands NRM Coordinating Group, Canning Vale, p275.

Semeniuk V (1993). *The mangrove systems of Western Australia. Presidential address*. J. Roy. Soc. West. Aust. 76: 99-122.

Vital Options Consulting (2005). *Having a Say. Community Input and Opinion Received on the Proposed Pilbara Coastal Water Quality Plan*. A report on the Department of Environment Public Consultation Process 28 September-26 November 2004. Vital Options Consulting. March 2005.

Wenziker K J, McAlpine K W, Apte S C and Masini R J (2004). *Background Quality for Coastal Marine Waters of the North West Shelf, Western Australia*. Interim Technical Report, November 2004. North West Shelf Joint Environmental Management Study. CSIRO and Department of Environmental Protection, p41.

Woodley S (2005). *Peer Review of Pilbara Coastal Waters Public Consultation Process*. Report to the Department of Environment, S & J Woodley Pty Ltd, p4.

9 Glossary

The following acronyms are used in this report:

| | |
|---------|--|
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| ARMCANZ | Agriculture and Resource Management Council of Australia and New Zealand |
| CALM | Department of Conservation and Land Management |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DEP | Department of Environmental Protection (a precursor of the DoE) |
| DoE | Department of Environment |
| DoIR | Department of Industry and Resources |
| EMS | Environmental Management System |
| EPA | Environmental Protection Authority |
| EPP | Environmental Protection Policy |
| EQC | Environmental Quality Criteria |
| EQMF | Environmental Quality Management Framework |
| EQO | Environmental Quality Objective |
| EV | Environmental Value |
| LEP | Level of Ecological Protection |
| MAT | Management Action Target |
| MCR | Marine Conservation Reserve |
| MPRA | Marine Parks and Reserves Authority |
| MPRSWG | Marine Parks and Reserves Selection Working Group |
| NHT | Natural Heritage Trust |
| NRM | Natural Resource Management |
| NWQMS | National Water Quality Management Strategy |
| PAC | Project Advisory Committee |
| RCT | Resource Condition Target |
| SEP | State Environmental Policy |
| SWQMS | State Water Quality Management Strategy |

Appendix 1

Peer review of the Pilbara Coastal Water Quality Consultation Process

Peer review of Pilbara Coastal Water Quality Consultation Process

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 - 3.5 Meetings and other processes conducted
4. Assessment of the Comprehensiveness and Adequacy of the Consultation Process
5. Reference

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1. Introduction

The Department of Environment has commissioned this review on the comprehensiveness and adequacy of the Pilbara Coastal Water Quality Consultation process. The review is based on the author's participation in the Project Advisory Committee, individual discussions with the public consultation consultant and the Department, and attendance at two Stakeholder Reference Group Forums (Port Hedland and Perth) during the consultation process. In addition draft reports on the public consultation process were provided for information.

2. Background to public consultation process

The Department of Environment used the following strategy for the development and conduct of the Pilbara Coastal Water Quality Public Consultation Process:

1. established a Project Advisory Committee (PAC) with an independent chair and stakeholder representatives from government and non-government sources
2. appointed a specialist consultant, Vital Options Consulting (VOC), to advise, develop and carry out the public consultation process
3. appointed an in-house team to support the project.

2.1 Role of PAC

The main role of the PAC is to provide advice, at key phases of the project, to the Project Team with respect to the design and implementation of the public/stakeholder involvement process (PIP), having particular regard for enhancing:

1. the efficiency, effectiveness and comprehensiveness of the process
2. the quality, readability and impact of draft public consultation documents
3. access of the PIP to a wider range of community and stakeholder representatives and groups
4. strategies and means of communication with the public and stakeholders appropriate to the demographics of the Pilbara region.

The PAC provided advice at a number of meetings over the period April-October 2004. This advice was incorporated into the final materials and processes used for the public consultation.

2.2 Design of the consultation process

As a starting point, VOC applied the following set of principles developed for the conduct of public consultation processes (Jacoby *et al* 1999):

- the program will use existing materials
- the program will be inclusive
- the program will provide specific mechanisms for feedback to participants
- The organisation and contents of the initial draft discussion paper will be reviewed by key stakeholders as soon as practicable
- the program will be evaluated as it progresses
- information gathered in the public involvement process will be freely available to all

In designing the public consultation process, VOC and the Department followed the general

model set out in WA State Government guides on consulting with citizens (Consulting Citizens: A Resource Guide. Department of Premier and Cabinet April 2002 <http://www.citizenscape.wa.gov.au/>).

The emphasis of the public consultation process decided by the Department and the consultant was to **Inform**, **Consult** and to the degree possible **Involve** the participants in the process (refer Public Participation Spectrum p.4 in the above mentioned guide).

VOC used the following basic steps that are recommended for effective public participation:

1. Identify the issues
2. identify the aim and objectives of the consultation
3. identify the stakeholder and citizens that should be involved
4. choose appropriate methods
5. conduct the process
6. analyse the results
7. provide feedback to the participants.

A consultation plan was developed and discussed with the PAC at a series of meetings from April to October 2004. Suggested amendments were taken up in revised versions. PAC provided advice on stakeholder contacts, purpose and content of the materials, and other strategic advice.

3. Public consultation process

3.1 Goal and objectives

The goal and objective of the public consultation process was “to obtain public and stakeholder feedback on analysis, alternatives and/or decisions regarding the EVs and EQOs and their recommended spatial application”

3.2 Method and materials

The range of processes and methods chosen were consistent with national and state commitments in relation to the development of water quality EVs and EQOs. A comprehensive list of stakeholders was drawn up and checked with the PAC and other sources in the Pilbara region. Consultation was primarily with community interest groups, (including indigenous, recreation and conservation interests), user industries and industry groups, land managers, local government and representatives of State government agencies in the Pilbara and in the Perth metropolitan area.

The materials chosen were appropriate to the objective and the range of stakeholders. The use of a Public Consultation Kit inviting community input on the subject was appropriate, accessible to most respondents and widely distributed. The detailed maps produced seem to have been an effective tool for people to use to identify areas that were important to them. The website was also available to those with internet access. Approximately 900 kits were distributed.

The methods for communicating and consulting with the stakeholders and general public were comprehensive and appropriate. VOC and the Department used the following variety of methods to contact the public and provide them with opportunities to respond:

- advertisements, promotions and invitations

- Public Information sessions (9)
- Stakeholder Reference Groups forums (5)
- Facilitated public meetings
- Telephone contacts
- Use of community facilitators
- use of key informants
- use of PAC advice
- website (<http://Pilbaracoastalwaters.environment.wa.gov.au>)
- Email

A more detailed listing of this comprehensive process can be found in the report by Vital Options Consulting.

3.3 Stakeholders approached

Significant effort went into the identification of key stakeholder groups and their representatives to ensure comprehensive coverage of the consultation process. The range of stakeholder groups approached was very comprehensive and included the following broad stakeholder groupings as a guide:

- Agriculture/pastoral
- Community: Economic Development
- Community: Environmental – advocacy & hands-on care
- Community: Social/Cultural
- Education / Research / Training
- Fishing – amateur
- Fishing – professional
- Government
- Indigenous – land council & community
- Industry – ports & manufacturing & mineral resources
- Industry – other specific industries where relevant eg pearling / mariculture
- Local Government
- Recreation: diving / swimming / boating
- Tourism – industry & ‘consumers’
- Unaffiliated.

3.4 Levels of engagement

Because of the range of opportunities offered for stakeholders and others to contribute to the process, the levels of engagement varied from input through peak bodies and regional groups to individual submissions. This seems to have been a very diligent approach to ensuring as

far as possible that all interested people were able to find a suitable vehicle for making a submission or comment. The range of opportunities are contained in the VOC report and are summarized in part 3.2 of this report (Methods and Materials)

3.5 Meetings and other processes conducted

Every effort seems to have been made within the constraints of time and resources to provide opportunities for interested people to attend public meetings or Stakeholder Reference Groups. A comprehensive account of these processes is contained in the VOC report. Perhaps the only criticism of these processes has been the comment that public meetings held during the working day precluded some people from attending, who might have come at another time. However the range of alternative methods for providing input should have countered that criticism.

4. Assessment of the comprehensiveness and adequacy of consultation process

I have assessed the comprehensiveness and adequacy of the consultation process using the following criteria

- The range of stakeholders involved and appropriateness
- The timing and methods of consultation
- accessibility and appropriateness of materials prepared
- clarity of objectives and messages
- responses to the opportunities provided

Conclusions

My conclusions are that:

1. the Department has diligently undertaken a public consultation process following appropriate best practice guidelines, using an experienced consulting firm and seeking expert advice from an advisory committee including members from community and indigenous interests and government agencies with responsibilities for planning, industry and resources development, fisheries, conservation and environment.
2. the range of stakeholders and community bodies contacted and invited to participate was wide ranging and comprehensive;
3. the timing and methods chosen were appropriate to contacting a diverse range of stakeholders and people over a large and remote area and providing them with different opportunities to respond
4. the level of responses has been satisfactory, although the timing of some of the public meetings during the day precluded some participants from attending.
5. the approach to Aboriginal communities was culturally appropriate although the capacity of some communities to respond was limited and further contact may be necessary
6. all public responses were accepted, even where the subject was outside the scope of the Pilbara Coastal Water Quality consultation
7. the range of media used was excellent and the range of opportunities for input by stakeholders was very comprehensive

8. the conduct and facilitation of public and other meetings was done in a professional manner.
9. the consultation framework used was appropriate to the purpose.
10. the process followed was appropriate to the time, resources and objectives.

In summary, it is my view that the Pilbara Water Quality Consultation Process has been very comprehensive and more than adequate in seeking and obtaining public views on the development of Environmental Values and Environmental Quality Objectives for the Pilbara Coastal Area.

Reference

Jacoby et al 1999 Perth Coastal waters public involvement process: Environmental Values, Environmental Quality Objectives, draft Environmental Quality Zones. Vol. 1 CSIRO Perth

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Appendix 2

Revisions to the spatial plan of environmental quality objectives and levels of ecological protection for the Pilbara Coastal Waters

Revisions to the spatial plan of EQOs and LEPs for the Pilbara Coastal Waters

This Appendix explains how, and to what extent, the notional plan of EQOs and LEPs has been revised following consideration of feedback obtained from the consultation process. The revised plan remains consistent with the EQMF and the general principles outlined in the discussion paper (Department of Environment, 2004) while responding to the broad thrust of public comment and opinion received. It is this revised plan of EQOs and LEPs for the region that is submitted to the EPA and the Rangelands NRM Coordinating Group for endorsement.

In revising the plan of EQOs, the following steps were undertaken:

- respond to the key issues identified from analysis of community and stakeholder comment (Vital Options Consulting, 2005);
- incorporate recent changes in marine conservation reserve (MCR) boundaries and zoning schemes;
- ensure that the EQOs and LEPs allocated in MCR areas support the goals and long-term targets for water and sediment quality set out in MCR Management Plans; and
- include development projects which have received approvals from the Minister for the Environment since the consultation package was prepared and up to the end of March 2006. Proposals which have not received Ministerial approval are not included.

Most respondents were opposed to having some marine areas with water quality unsuitable for social uses such as recreation and fishing. The revised plan of EQOs provides for the protection of social-use values (see Table 1, main report) everywhere throughout the Pilbara marine region except at four very small locations (shown in red on the maps). These are generally associated with treated sewage wastewater discharges, where there could be localised human health risks.

Most of the revisions relate to the EQO for “maintenance of ecosystem integrity” and involve changes to the spatial allocation of its four levels of ecological protection – maximum, high, moderate and low - which are described in Table 2 of the main report. Given the vast extent of the region under consideration, the primary emphasis here has been given to the allocation of Maximum, High and Moderate LEPs to areas which (cumulatively) will account for more than 99% of the area of the region.

Locations of marine discharges with Low LEP areas are noted on the maps. The exact size of the Low LEP areas will be determined following detailed consideration of discharge characteristics. With effluent treatment, discharge siting and design to acceptable standards, the surrounding areas with a Low LEP, if necessary at all, should generally be very localised. A possible exception to this may be the large volume discharge of hypersaline bitterns from solar salt production facilities. To resolve this will require further investigations into the flow regimes and ecological effects of bitterns.

The changes (from the notional plan) in spatial allocation of the LEPs are described below for each of the maps.

Map 1 (Port Hedland to Cape Keraudren), Map 7 (Port Hedland)

The only changes for the LEPs in Map 1 are those at Port Hedland, which are shown in more detail on Map 7.

At Port Hedland (Map 7) the area of Moderate LEP in the inner harbour has been extended in recognition of Ministerial approvals for the Fortescue Metals Group and Hope Downs iron ore export proposals which include shipping wharves and additional dredged areas in the

Port Hedland inner harbour. Depiction of an appropriate area of Moderate or Low LEP for the Dampier Salt bitterns discharges at Port Hedland will require further investigation into the flow regime and ecological effects of bitterns.

Map 2 (Cape Lambert to Port Hedland)

The major change for Map 2 is the addition of an area of Maximum LEP in coastal marine waters between Sherlock Bay (just west of the Sherlock River mouth) and Cape Cossigny, encompassing a series of barrier islands including Depuch Island. Multiple respondents marked this as an area that they wanted protected to the highest level. The area joins two Maximum LEP areas already proposed in the notional plan. Changes in areas of Moderate LEP have been made for Cape Lambert (see comments on Map 8 below).

Map 3 (Cape Preston to Cape Lambert), Map 8 (Cape Lambert) and Map 9 (Mermaid Sound)

Some broadscale changes have been made for the area between Cape Preston and Cape Lambert (Map 3). The proposed Marine Parks of the east and west Dampier Archipelago (CALM, 2005) have a Maximum LEP everywhere except for areas of the Marine Parks within 5 km of the major, existing development node (including facilities near Dampier and the Burrup Peninsula) which would remain as a High LEP. Increased areas of Moderate LEP are shown for the ship turning basins at Cape Lambert and Mermaid Sound inner port facilities, and these are described below in the context of Maps 8 and 9. Similarly, areas of Moderate LEP would be included about inner port facilities at Cape Preston, once the configuration of this approved iron ore export project was finalised.

At Cape Lambert (Map 8) the Moderate LEP areas centred on the ore carrier and tanker ship turning basins have been extended radially by 250 m. The Moderate LEP area to the east of the major jetty has been replaced with High LEP, as this area is no longer used as a dredge spoil dump area. Likewise the Moderate LEP area about a former pearl hatchery discharge has been replaced with High LEP.

In Mermaid Sound (Map 9) the Moderate LEP areas centred on ship turning basins associated with Dampier Salt, Pilbara Iron, Dampier Port Authority and Woodside shipping facilities have been extended radially by 250 m. Inshore of these turning basins, adjacent to the Burrup Peninsula coast, a 200 m wide strip of High LEP has been included in view of the diverse and unusual coral communities which are associated with the subtidal rocky substrate. An elongated area of Moderate LEP has been included adjacent to the northern coast of King Bay to encompass harbours and breakwaters for maritime service vessels. In Hampton Harbour the Moderate LEP area for the tugboat pen and turning basin area has been extended radially by 250m. At the existing dredge spoil dump area off East Lewis Island a 200m strip of High LEP adjacent to the island has been recommended to provide protection to the rocky, subtidal habitat adjacent to the island. Depiction of an appropriate area of Moderate or Low LEP for the Dampier Salt bitterns discharge into Nickol Bay will require further investigation into the flow regime and ecological effects of bitterns.

Map 4 (Barrow-Montebello Islands)

Changes to Map 4 include revisions to the Montebello-Barrow Islands MCR boundaries and zoning scheme approved by State Government in 2004. The statutory port areas at Barrow and Varanus Islands have been excluded from the MCR. The spatial allocation of Levels of Ecological Protection has been changed as follows:

- the whole of the Montebello Islands Marine Park and the Barrow Island Marine Park has been assigned Maximum LEP, consistent with long-term management targets from the Interim Management Plan (CALM, 2004) for these MCRs;

- An area of notionally assigned Maximum LEP over the Barrow Shoals has been changed to High LEP to reflect a change in the MCR zoning for that area (i.e. the removal of the proposed Barrow Shoals Conservation Area Zone). Note that a High LEP is an objective for water/sediment quality such that there are no resultant effects on marine life.

Map 5 (Ashburton River to Cape Preston) and Map 10 (Onslow)

In areas of Map 5 where there is overlap with Maps 4 and 3, the spatial allocation of Levels of Ecological Protection is as described for those maps. At Onslow (Map 10) the Moderate LEP area centred on the Onslow Salt ship turning basin has been extended radially by 250 m. Depiction of an appropriate area of Moderate or Low LEP for the Onslow Salt bitterns discharge via Middle Creek will require further investigation into the flow regime and ecological effects of bitterns.

Map 6 (Exmouth Gulf) and Map 11 (Exmouth)

There are no changes to the spatial allocation of the Maximum and High LEP for Exmouth Gulf. Map 11 has been changed to include the Exmouth Marina Village system of canals backing the outer harbour, and these canals have been assigned a Moderate LEP.

Summary

The revised plan for the entire region has provided approximately 34% increase in the total area allocated Maximum LEP, and approximately 37% increase in the total area allocated Moderate LEP. There has been a reduction in the total area allocated High LEP. The exact size of areas allocated a Low LEP will be determined following detailed consideration of discharge characteristics.

References

CALM (2004). *Indicative Management Plan for the proposed Montebello/Barrow Islands Marine Conservation Reserves*. Department of Conservation and Land Management, Perth, p101.

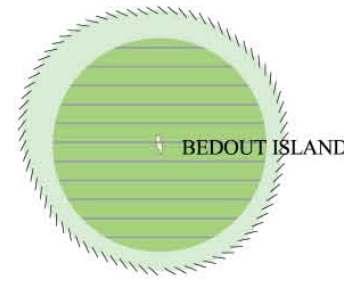
CALM (2005). *Indicative Management Plan for the proposed Dampier Archipelago Marine Park and Cape Preston Marine Management Area*. Department of Conservation and Land Management, Perth, p146.

Department of Environment (2004). *Pilbara Coastal Water Quality – Have Your Say*. Public Consultation Kit. Department of Environment, Perth.

Vital Options Consulting (2005). *Having a Say. Community Input and Opinion Received on the Proposed Pilbara Coastal Water Quality Plan*. A report on the Department of Environment Public Consultation Process 28 September-26 November 2004. Vital Options Consulting. March 2005.

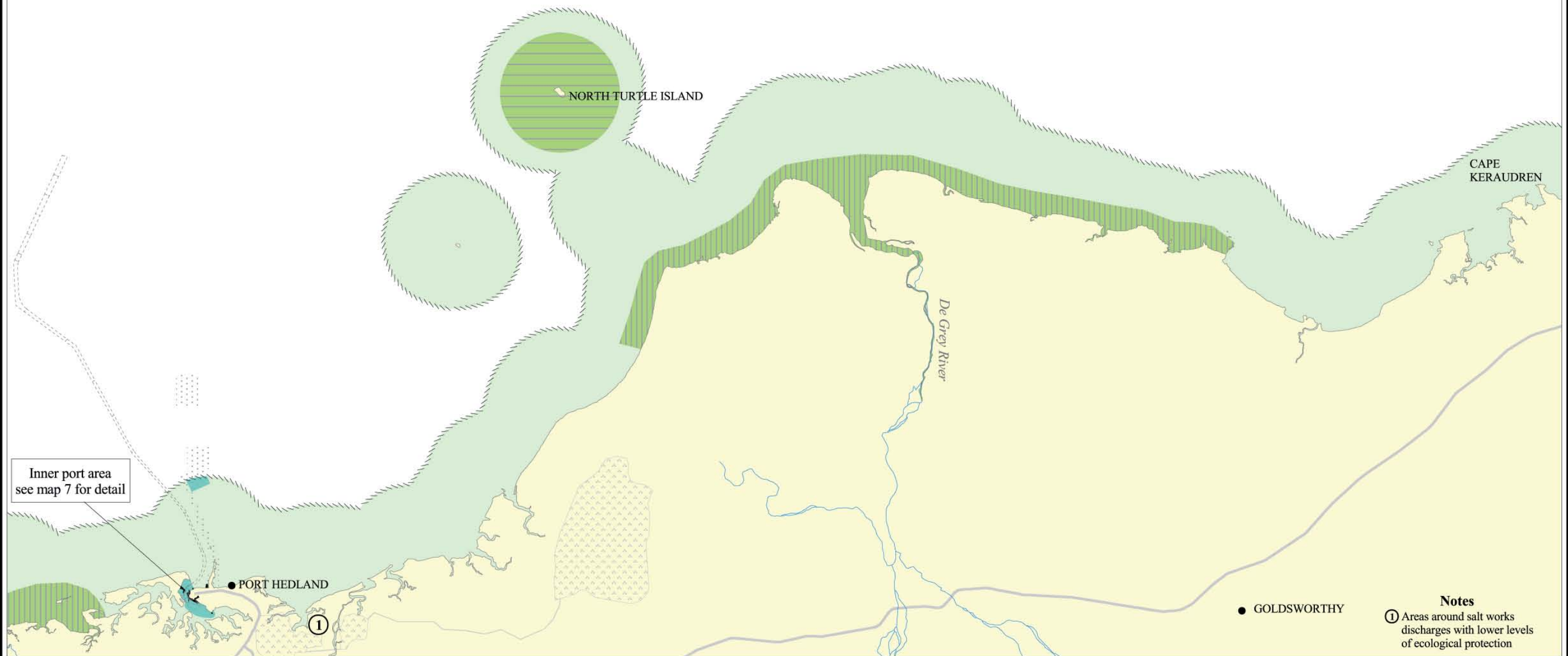
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Map 1: Port Hedland to Cape Keraudren



ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

- Ecosystem Health Value* - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area
- Social Use Values* - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing)



| Levels of Ecological Protection | | | |
|---------------------------------|---------------|----------|----------|
| Maximum | High | Moderate | Low |
| (Dark Green) | (Light Green) | (Blue) | (Yellow) |

| | |
|-------------------------------|------------------------|
| Limit of state coastal waters | Dredged Channel |
| Salt Works | Coastal Infrastructure |
| Dredge Spoil Dump Area | |

| |
|---|
| Regionally significant arid zone mangrove areas (EPA, 2001) |
| Worthy of consideration for marine reserve (CALM, 1994) |

| |
|---|
| Regionally significant arid zone mangrove areas (EPA, 2001) |
| Worthy of consideration for marine reserve (CALM, 1994) |

0 20 km

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Map Produced: March 2006

Notes
① Areas around salt works discharges with lower levels of ecological protection

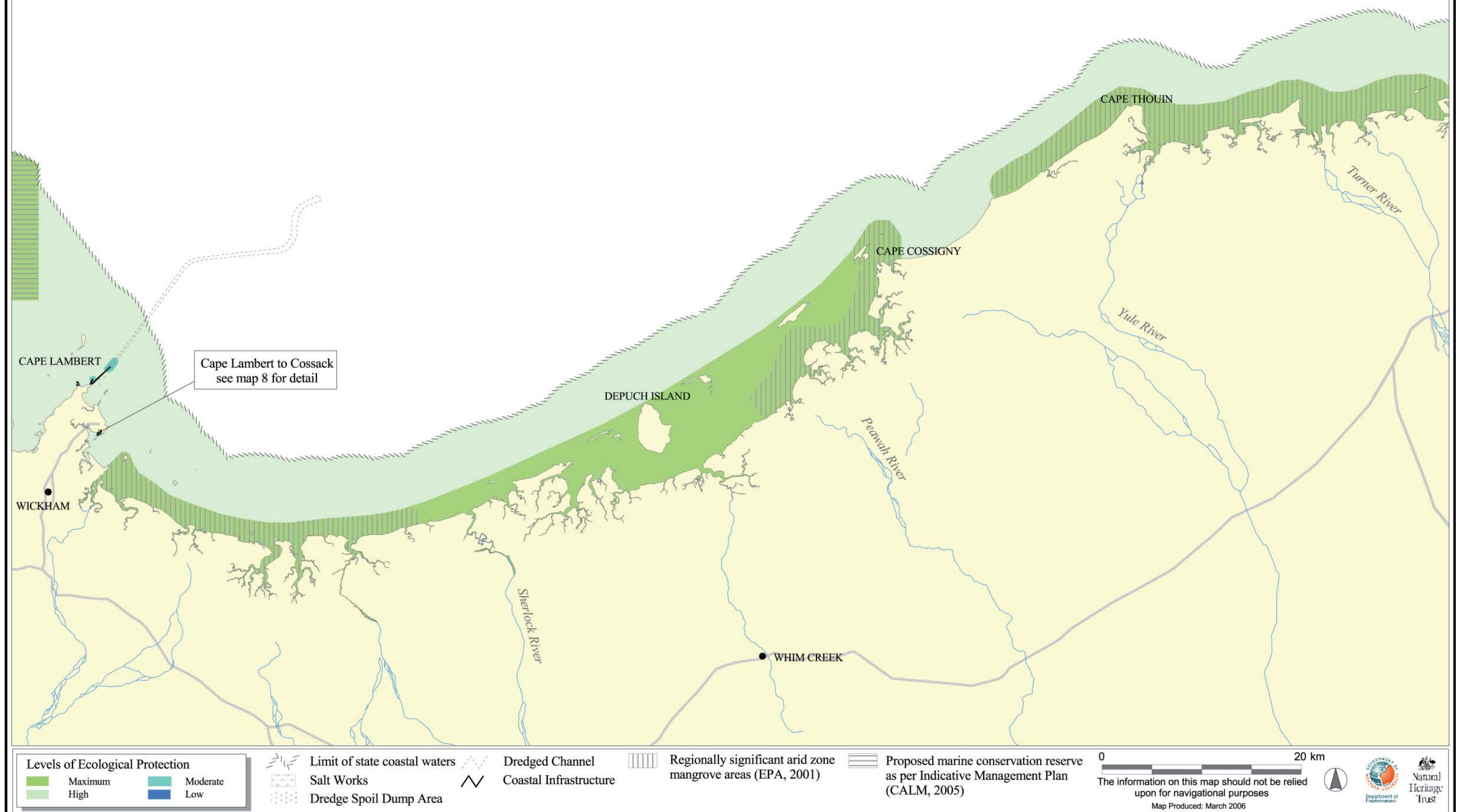


Pilbara Coastal Water Quality Consultation Outcomes Recommendations to EPA (March 2006) Map 2: Cape Lambert to Port Hedland

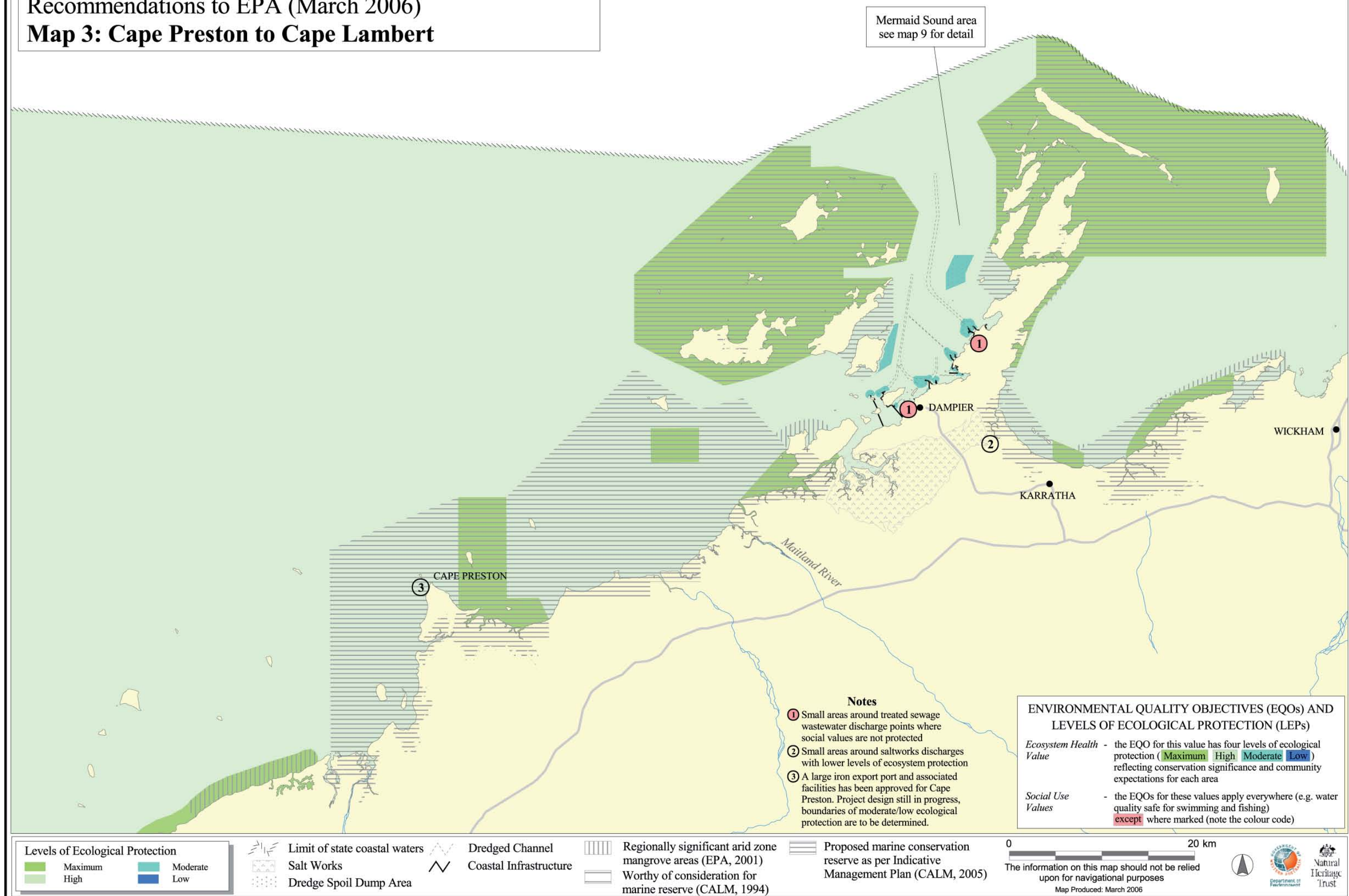
ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

Ecosystem Health Value - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area

Social Use Values - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing)



Pilbara Coastal Water Quality Consultation Outcomes
Recommendations to EPA (March 2006)
Map 3: Cape Preston to Cape Lambert



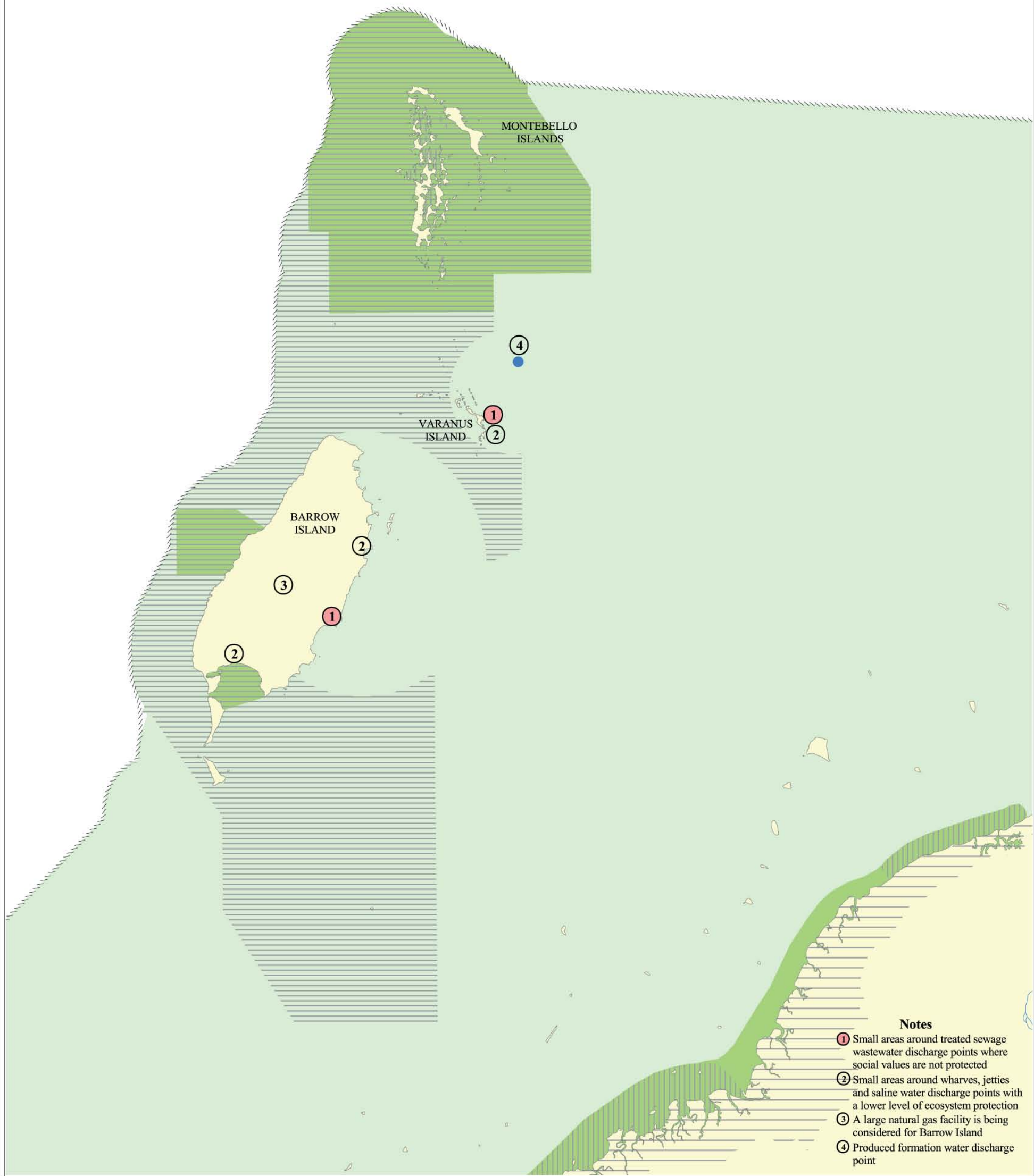
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Map 4: Barrow - Montebello Islands

ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

Ecosystem Health Value - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area

Social Use Values - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing) except where marked (note the colour code)



- Notes**
- ① Small areas around treated sewage wastewater discharge points where social values are not protected
 - ② Small areas around wharves, jetties and saline water discharge points with a lower level of ecosystem protection
 - ③ A large natural gas facility is being considered for Barrow Island
 - ④ Produced formation water discharge point

Levels of Ecological Protection

| | |
|---|--|
| Maximum | Moderate |
| High | Low |

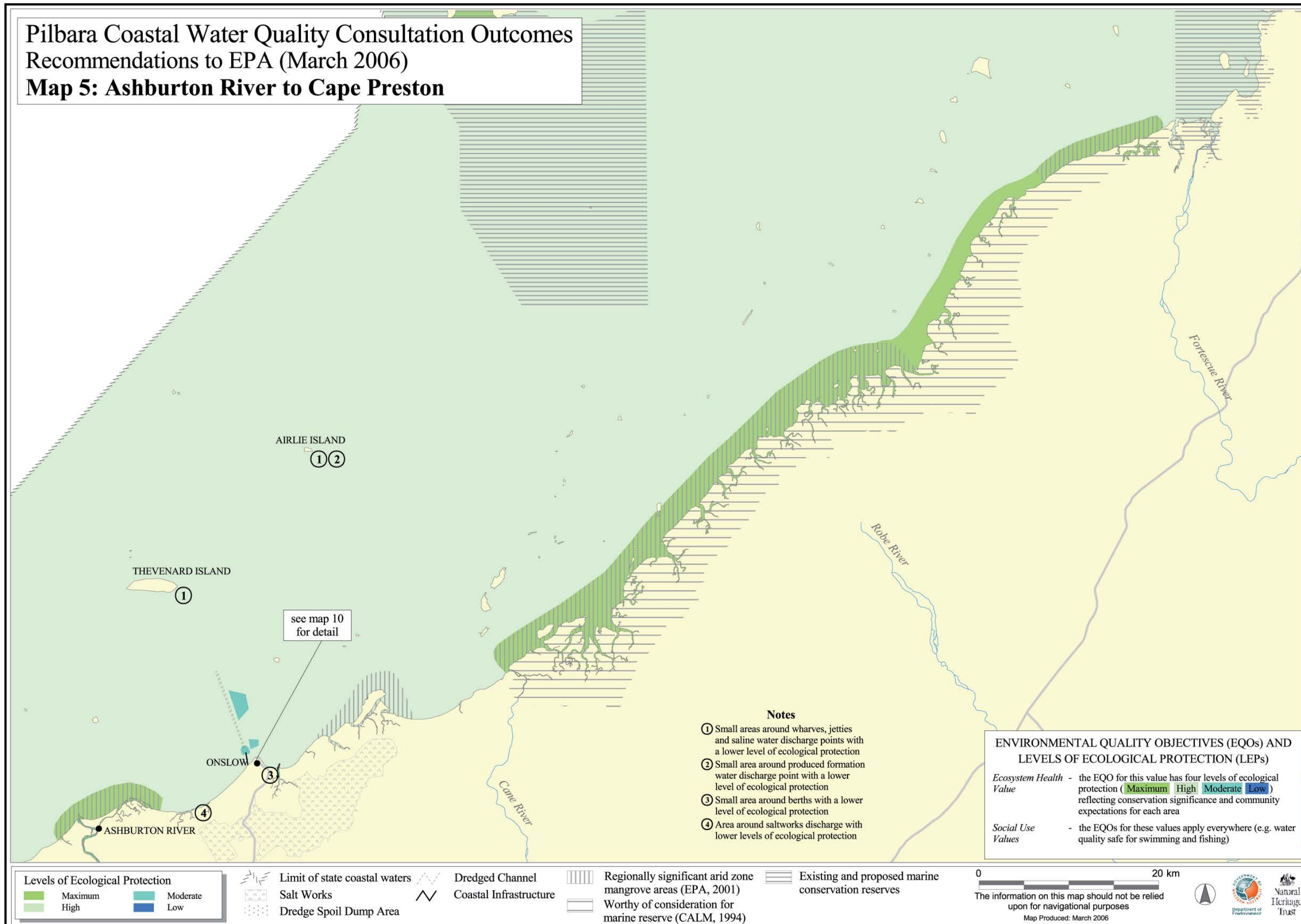
- Limit of state coastal waters
- Salt Works
- Dredge Spoil Dump Area
- Dredged Channel
- Coastal Infrastructure
- Regionally significant arid zone mangrove areas (EPA, 2001)
- Worthy of consideration for marine reserve (CALM, 1994)
- Marine Conservation Reserve

0 5 10 15 20 km

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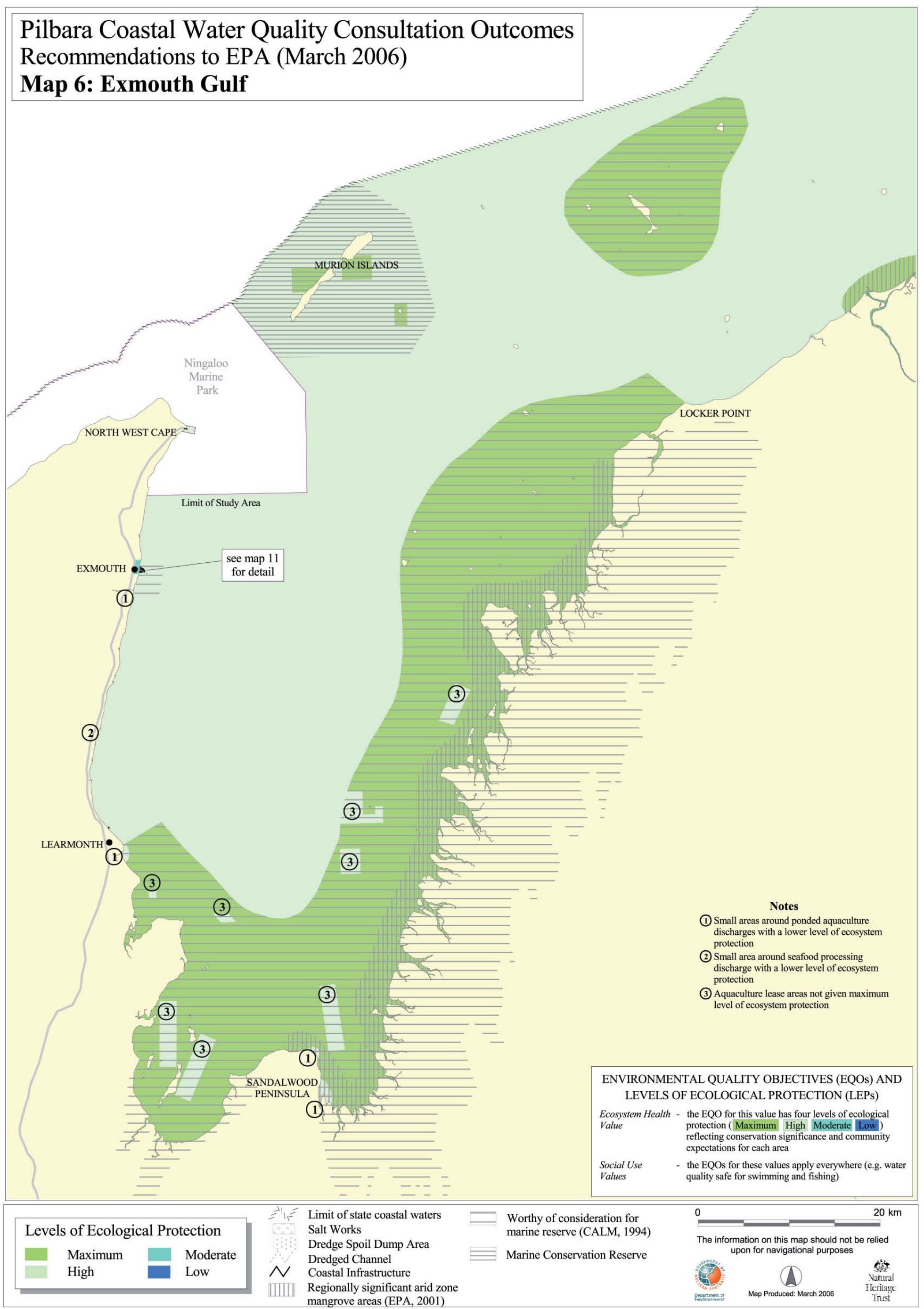
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Map 5: Ashburton River to Cape Preston



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Map 6: Exmouth Gulf

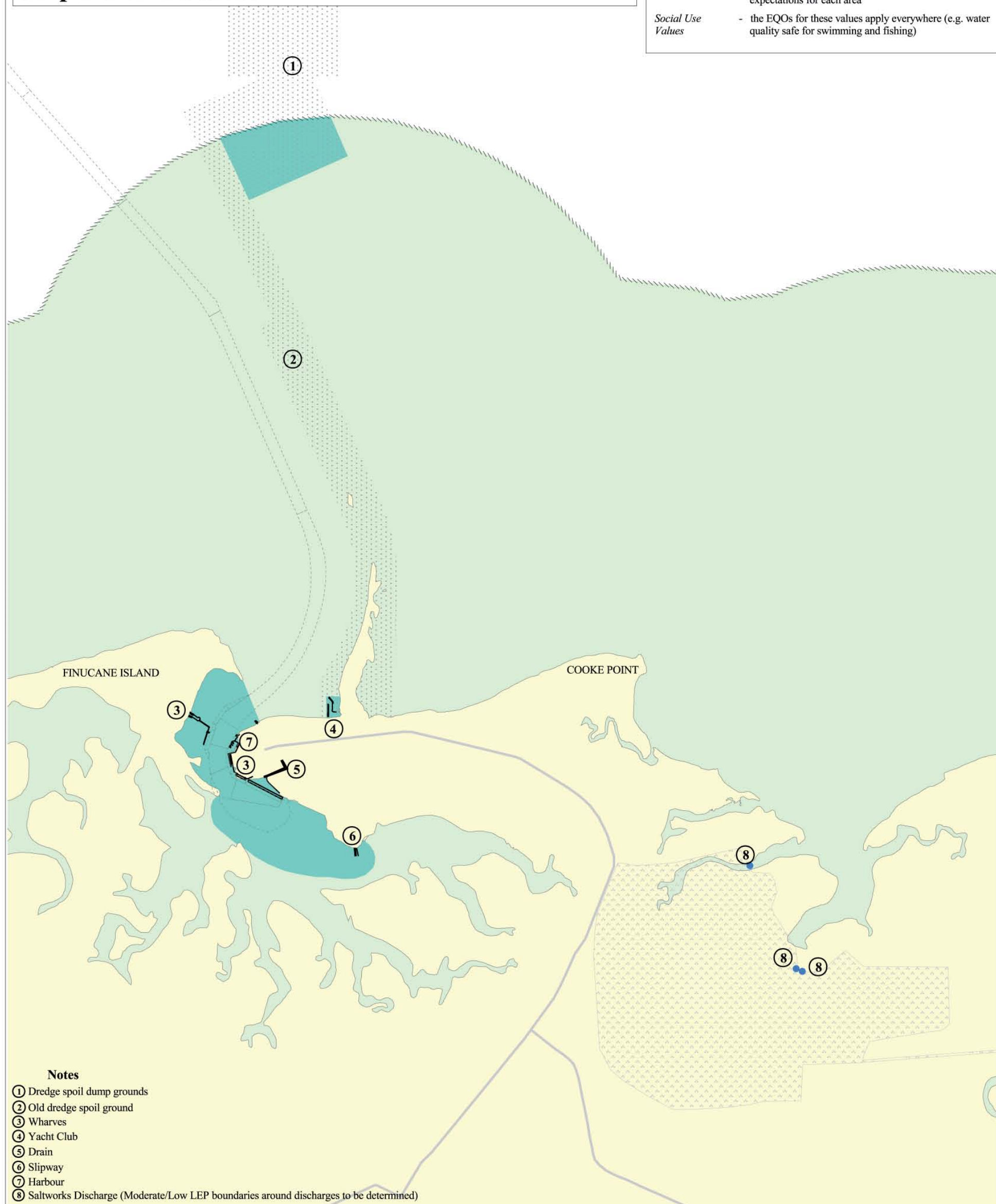


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Map 7: Port Hedland

ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

- Ecosystem Health Value* - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area
- Social Use Values* - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing)



Notes

- ① Dredge spoil dump grounds
- ② Old dredge spoil ground
- ③ Wharves
- ④ Yacht Club
- ⑤ Drain
- ⑥ Slipway
- ⑦ Harbour
- ⑧ Saltworks Discharge (Moderate/Low LEP boundaries around discharges to be determined)

Levels of Ecological Protection

- Maximum
- High
- Moderate
- Low

- Limit of state coastal waters
- Salt Works
- Dredge Spoil Dump Area
- Dredged Channel
- Coastal Infrastructure

0 3 km

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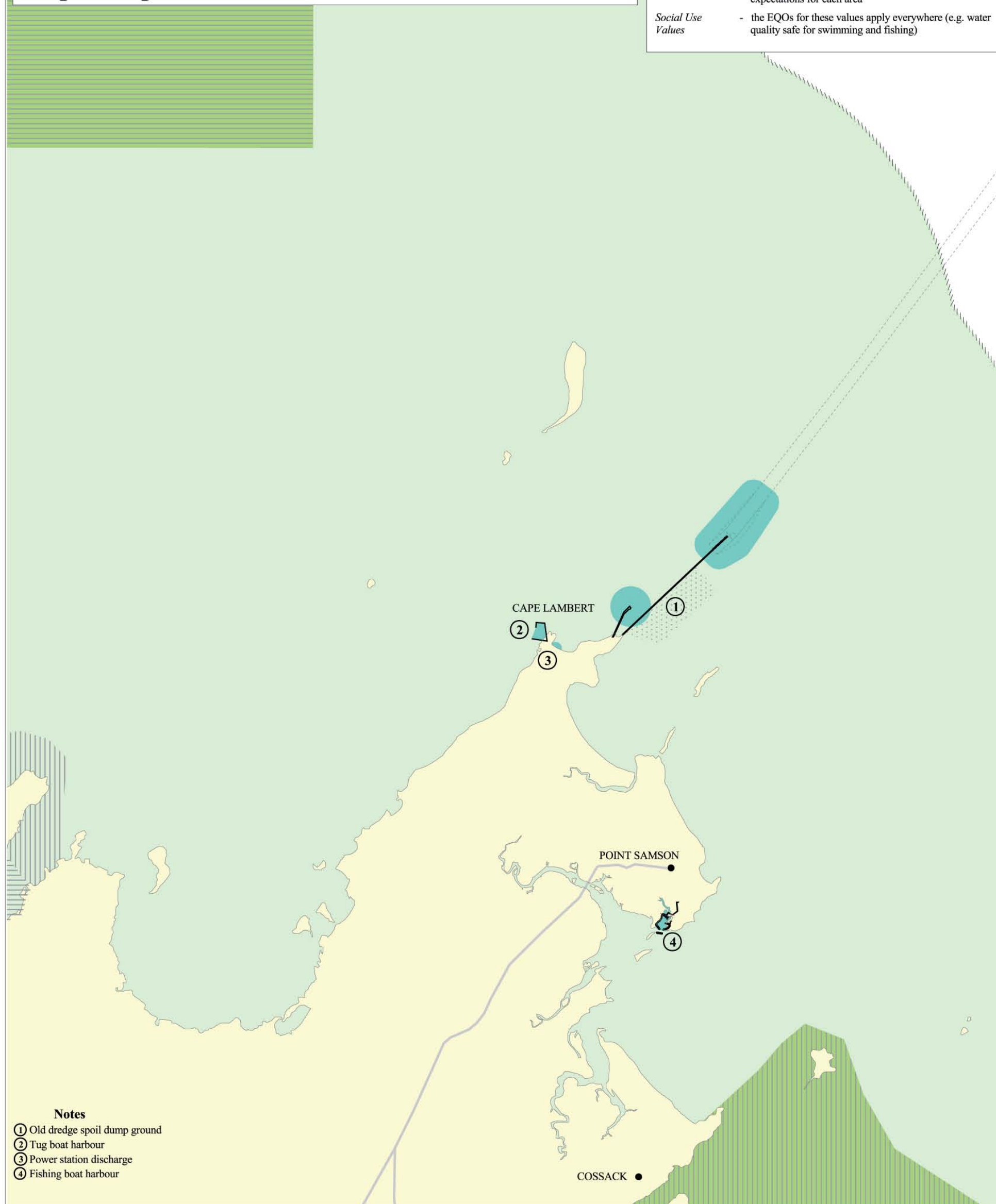


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Map 8: Cape Lambert

ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

- Ecosystem Health Value* - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area
- Social Use Values* - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing)



Notes

- ① Old dredge spoil dump ground
- ② Tug boat harbour
- ③ Power station discharge
- ④ Fishing boat harbour

Levels of Ecological Protection

- | | |
|---------|----------|
| Maximum | Moderate |
| High | Low |

- Limit of state coastal waters
- Salt Works
- Dredge Spoil Dump Area
- Dredged Channel
- Coastal Infrastructure
- Regionally significant arid zone mangrove areas (EPA, 2001)

Proposed marine conservation reserve as per Indicative Management Plan (CALM, 2005)

0 3 km

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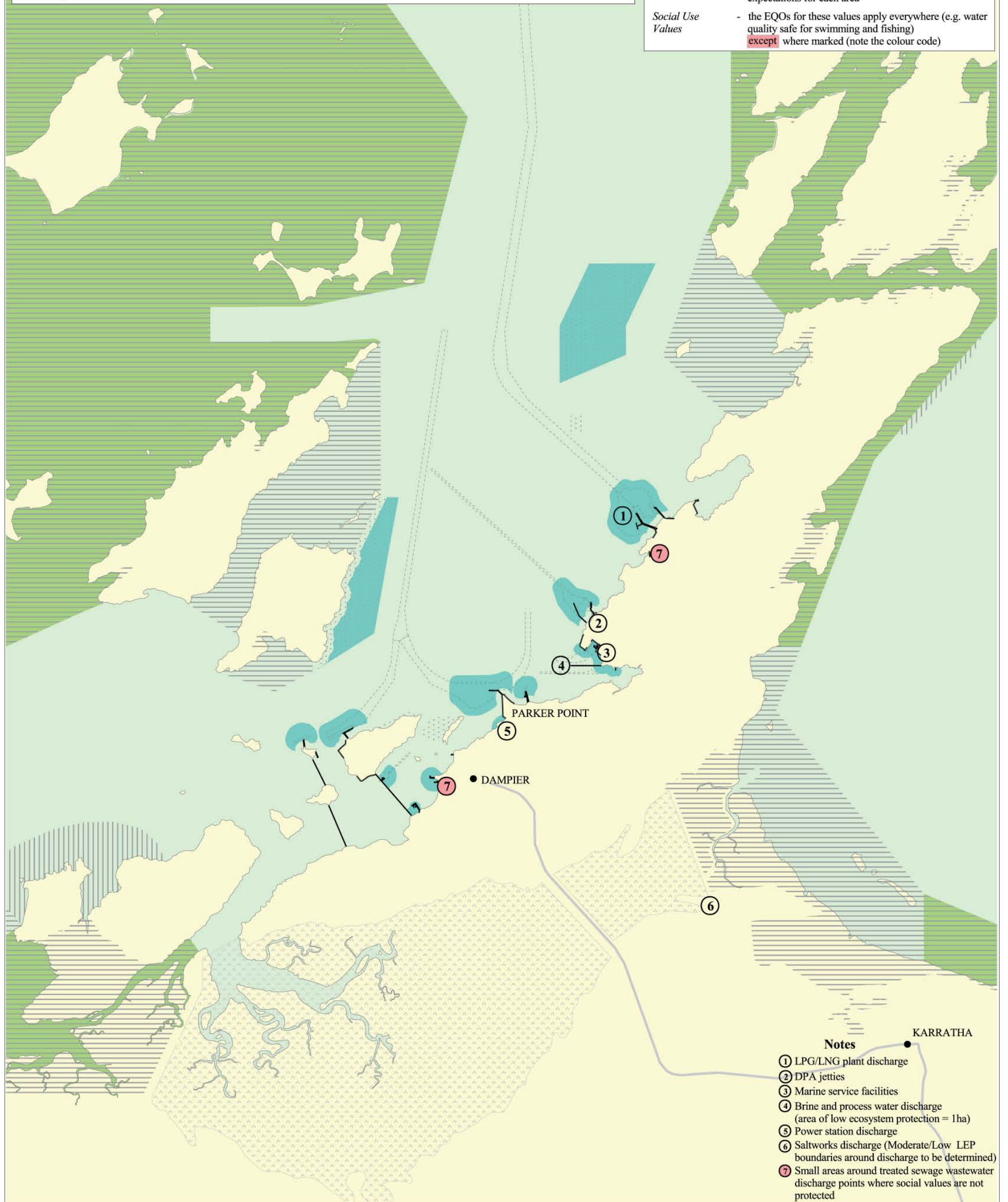
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Pilbara Coastal Water Quality Consultation Outcomes Recommendations to EPA (March 2006) **Map 9: Mermaid Sound**

ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

- Ecosystem Health Value* - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area
- Social Use Values* - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing) **except** where marked (note the colour code)



Notes

- ① LPG/LNG plant discharge
- ② DPA jetties
- ③ Marine service facilities
- ④ Brine and process water discharge (area of low ecosystem protection = 1ha)
- ⑤ Power station discharge
- ⑥ Saltworks discharge (Moderate/Low LEP boundaries around discharge to be determined)
- ⑦ Small areas around treated sewage wastewater discharge points where social values are not protected

Levels of Ecological Protection

- | | |
|---------|----------|
| Maximum | Moderate |
| High | Low |

- Limit of state coastal waters
- Salt Works
- Dredge Spoil Dump Area
- Dredged Channel
- Coastal Infrastructure
- Regionally significant arid zone mangrove areas (EPA, 2001)

- Proposed marine conservation reserve as per Indicative Management Plan (CALM, 2005)

0 5 km

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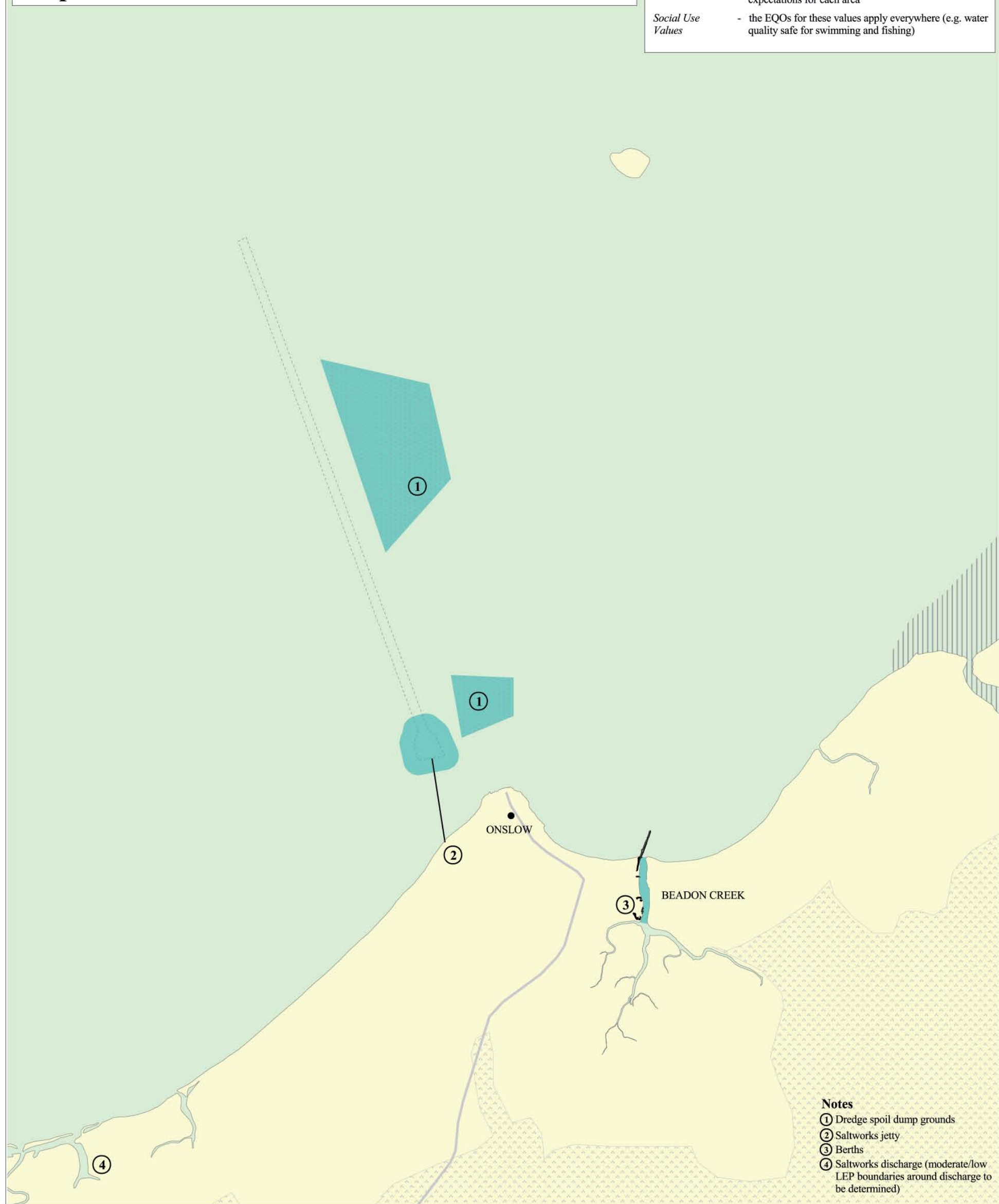


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Map 10: Onslow

ENVIRONMENTAL QUALITY OBJECTIVES (EQOs) AND LEVELS OF ECOLOGICAL PROTECTION (LEPs)

- Ecosystem Health Value* - the EQO for this value has four levels of ecological protection (Maximum High Moderate Low) reflecting conservation significance and community expectations for each area
- Social Use Values* - the EQOs for these values apply everywhere (e.g. water quality safe for swimming and fishing)



Notes

- ① Dredge spoil dump grounds
- ② Saltworks jetty
- ③ Berths
- ④ Saltworks discharge (moderate/low LEP boundaries around discharge to be determined)

Levels of Ecological Protection

- | | |
|---------|----------|
| Maximum | Moderate |
| High | Low |

- Limit of state coastal waters
- Salt Works
- Dredge Spoil Dump Area
- Dredged Channel
- Coastal Infrastructure
- Regionally significant arid zone mangrove areas (EPA, 2001)

0 3 km

The information on this map should not be relied upon for navigational purposes

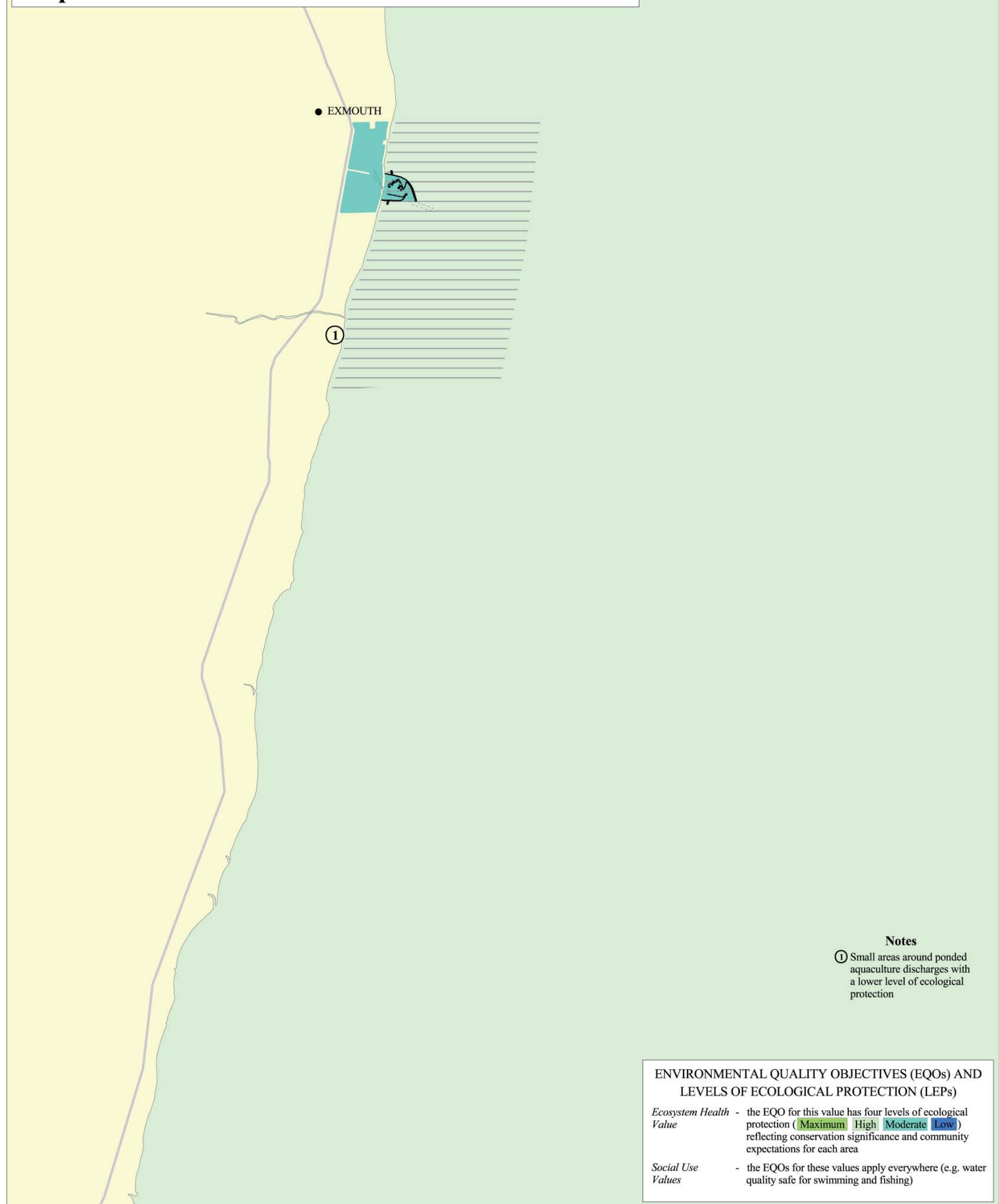


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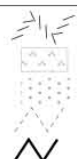
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Map 11: Exmouth



Levels of Ecological Protection

| | |
|---------|----------|
| Maximum | Moderate |
| High | Low |



Limit of state coastal waters
Salt Works
Dredge Spoil Dump Area
Dredged Channel
Coastal Infrastructure



Worthy of consideration for
marine reserve (CALM, 1994)

0 3 km

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