# Oakajee Deepwater Port - Concept
# Shire of Chapman Valley

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## Department of Resources Development

**Advice to the Minister for the Environment from the Environmental Protection Authority under Section 16(e) of the *Environmental Protection Act 1986***

**(This is not an assessment of the Environmental Protection Authority under Part IV of the *Environmental Protection Act 1986*)**

**Environmental Protection Authority**
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## Summary

The Department of Resources Development has prepared a concept plan for the proposed Oakajee deepwater port as part of a strategic review of industrial land and port infrastructure for the Mid West Region. The Government has requested early advice on the environmental matters associated with the port concept to assist in detailed planning for the region. To facilitate the process of regional planning, the Minister for the Environment has sought the EPA's advice on the deepwater port concept, pursuant to Section 16(e) of the *Environmental Protection Act 1986* (the Act).

The report hereunder provides the Environmental Protection Authority's (EPA) environmental advice to the Minister for the Environment regarding a concept to develop a deepwater port near Oakajee, 23 km north of Geraldton.

This report considers the deepwater port concept plan, environmental factors likely to be important, additional aspects of the proposal and environmental management and procedures.

- **Factors**

The EPA in formulating its view recognises that, at this stage, it is dealing only with a strategic concept. Based upon the information available and recognising that only limited new environmental studies were undertaken for this review, the EPA has identified the following important environmental factors:

(a) vegetation communities and rare and priority flora;
(b) shoreline stability;
(c) marine fauna;
(d) seagrass;
(e) macroalgae;
(f) introduced marine organisms;
(g) marine water and sediment quality;
(h) dust;
(i) noise and vibration;
(j) public health and safety;
(k) heritage; and
(l) recreation.

- **Management and studies**

Against each of the above environmental factors, a set of environmental objectives has been established. Considerable attention has been paid to environmental management if the proposal is to be implemented. This includes environmental management standards and integration with the proposed Oakajee Industrial Estate.

The EPA has recommended that a range of studies and investigations will be required for the implementation of a port proposal as indicated below.

An Environmental Management Plan will be required, which considers but is not limited to, the following plans and studies:

- Coastal Management Plan;
- Marine Management Plan;
- Port Safety Plan;

- Air Quality Management Plan.

In addition the following plans will also be required:

- Heritage Management Plan;
- Recreation Plan.

- **Advice to the Minister for the Environment**

The EPA has made a number of recommendations for management and further studies, as outlined in Sections 3 (Important Environmental Factors) and 5 (Environmental Management and Related Studies) of this Report. If these measures are implemented, and subject to study results, implementation of the port concept is capable of being managed so as not to compromise the EPA's objectives.

An important consideration in the development of a port in the Oakajee locality will be the availability of quarry material for the construction of the port breakwaters. The quarrying of material for construction purposes has not been addressed in this report but will be the subject of a separate referral to the EPA under Part IV of the *Environmental Protection Act*. The siting and operation of a hard-rock quarry (or quarries) and an appropriate transport corridor from the quarry sites to the industrial estate and proposed port, are matters requiring further environmental evaluation.

It is noted that a specific port proposal and related investigations for the Oakajee locality has been referred to the EPA by the Minister for Resources Development. That proposal will be subject to a formal assessment by the EPA at Public Environmental Review level and a report for this purpose is in preparation through the Department of Resources Development.

In addition, a concept plan for the Oakajee Industrial Estate has also been referred to the EPA for review. The industrial estate is the subject of a separate EPA report.

- **Recommendations to the Minister for the Environment**

Recommendation 1

> That the Minister for the Environment notes the important environmental factors and the EPA's objective for each factor as set out in Section 3 (Important Environmental Factors) of this report and the studies suggested to gain further environmental information.

Recommendation 2

> That the Minister for the Environment notes the EPA's advice on meeting the EPA objectives for the important environmental factors, environmental management considerations and suggested studies.

Recommendation 3

> That the Minister for the Environment notes that the quarrying and transport of materials for the breakwater construction will be referred to the EPA for consideration under Part IV of the *Environmental Protection Act.*

Recommendation 4

> The Minister for the Environment notes that a future port proposal in the Oakajee locality would be subject to assessment under Part IV of the *Environmental Protection Act.*

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## Tables



## Appendices

## 1. Introduction

The Department of Resources Development has prepared a concept plan for the proposed Oakajee deepwater port, 23 km north of Geraldton (refer Figure 1, Appendix 1) as part of a strategic review of industrial land and port infrastructure for the Mid West Region. The Government has requested early advice on the environmental matters associated with the port concept plan to assist in detailed planning for the proposal. To facilitate the process of regional planning, the Minister for the Environment has sought the EPA's advice on the deepwater port concept, pursuant to Section 16(e) of the *Environmental Protection Act 1986* (the Act).

### 1.1 Definition of Section 16(e)

Section 16(e) of the *Environmental Protection Act 1986,* in relation to the functions of the Environmental Protection Authority (EPA), enables the Minister for the Environment to receive advice on environmental matters referred to the Authority.

The Minister, by letter to the Chairman of the EPA dated 28 February 1997, has requested environmental advice on the concept of a deepwater port in the Oakajee locality north of Geraldton. The Minister has similarly sought advice on a concept plan for an industrial estate landwards of a possible port. That advice is being prepared separate from this report.

The Department of Resources Development has had prepared a document titled "*Oakajee Deepwater Port Concept*" (Welker Environmental Consultancy, 1997). That document has been reviewed by the EPA and by a number of government agencies (refer Appendix 2) whose statutory or other responsibilities might be relevant to a port development.

### 1.2 Limitations of the Report

This report has been prepared on the basis of the documentation supplied by the Department for Resources Development, the work undertaken for that document, and the views and comments of the agencies consulted and other references. This report is based upon the information available at the time of writing.

The advice to the Minister for the Environment provided in this report is prepared pursuant to Section 16(e) of the *Environmental Protection Act 1986.* Under no circumstances should this advice be considered as a formal assessment of a proposal under Part IV of the *Environmental Protection Act 1986.* The EPA reserves the right to assess formally under that Part any proposal for a specific port in the Oakajee locality.

### 1.3 Definitions

The following explicit definitions are used in this Report:

| | | |
|---|---|---|
| "Port Authority" | - | For the purpose of this report, it has been assumed that the proposed port will be managed by a "Port Authority", which may be either a statutory authority or a corporate authority to be determined by Government. |
| "Port Area" | - | The port area is assumed to cover the region between the Buller and Oakajee Rivers, 1 km inland and approximately 4 km's offshore - to about the 25 m depth contour (refer to Figure 2, Appendix 1). |
| Environmental Management System | - | The Environmental Management System (EMS) is the environmental management plans and procedures required to implement the proposal. Environmental management principles, such as those adopted in the voluntary interim Australian Standards ISO 14000 series, should be adopted with appropriate monitoring and auditing to ensure compliance.<br>The environmental management plans and environmental management procedures should adopt quality assurance principles such as those adopted in Australian Standard ISO 9000 series. |
| Environmental Management Plan | - | A plan which documents all the environmental plans, procedures, management and commitments. The EMP forms part of the EMS. |

## 2. The Deepwater Port Concept

The Western Australian government has indicated support for a major iron based industry to be located within an industrial estate at Oakajee, 23 kms north of Geraldton (Figure 1, Appendix 1). A proposal for a steel mill, by An Feng Kingstream Resources, was to be established at Narngulu east of Geraldton but more recently the Government has being investigating the potential for the development to be located as part of a future Oakajee Industrial Estate. If this were to happen, a new deepwater port would be required to service the requirements of the steel mill and industries locating in the industrial estate . It has also been indicated that a deepwater port at Oakajee could provide harbour infrastructure which would enhance the long-term economic development of Geraldton and associated regions.

The EPA has been asked by the Minister for the Environment to advise on concept plans for both a deepwater port and an industrial estate in the Oakajee vicinity. At the same time, the Minister for Resources Development has formally referred to the EPA a proposal to establish a port at Oakajee. The EPA under Section 40 of the *Environmental Protection Act* has set a level of assessment for this proposal at Public Environmental Review (PER).

The idea of a deepwater port near Oakajee stems from investigations in the early 1980's when a feasibility study was undertaken for the siting of a bauxite/alumina industry near Geraldton for the Mitchell Plateau Joint Venture.

That project's viability hinged on the development of a new deepwater port in the Geraldton region. Early studies identified possible sites for such a port at Georgina, Bradley and Boolarra, south of the Greenough River mouth, at Bonniefield north of Dongara, and at Oakajee. The port requirements were made specific at the time for the import of raw bauxite and the export of alumina product.

The Oakajee locality was identified from a combination of site characteristics as the preferred port site associated with an in-shore industrial estate, and hence studies through 1982-83 focused on this general location. In addition, the Geraldton Port Authority has moved to expand the Geraldton shipping capability by investigating deepwater harbour facilities.

In 1989, the consultant group "Port & Harbour Ltd" undertook a feasibility study examining Point Moore adjacent to Geraldton, Georgina and Oakajee (Port & Harbour Consultants, 1989). At the time the consultants identified Point Moore as the preferred site for the specific purposes required by the Geraldton Port Authority (refer Figure 1, Appendix 1).

That assessment was reviewed by Halpern Glick Maunsell in 1990 (Halpern Glick Maunsell, 1991), who determined that a port design should allow for the handling of ships up to 75,000 DWT (Panamax capacity). They concluded also in the light of costs identified during the study that a new port would only be feasible if developed in conjunction with a major industrial estate. Oakajee was identified as offering the best option for this purpose.

However, the Geraldton Port Authority commenced examining other port locations in more detail, which resulted in the proposal for a deepwater port to be located at Point Moore.

More recently, investigations were initiated into locating the An Feng Kingstream Resources steel mill at the proposed Oakajee Industrial Estate. The project is based upon a steel mill to produce up to 2.4 million tonnes per annum (tpa) of steel slab for export, in association with the importation of about 50,000 tpa of scrap steel. Other raw materials would also need to be imported.

There is also the prospect of the development of a hot briquetted iron (HBI) plant based on ore from Mount Gibson, and locating either at Oakajee, or at Moonyoonooka, east of Geraldton. This project will involve the fabrication of 2.1 million tpa of HBI for export.

To enable either of these projects to go ahead, a new deepwater port at least capable of handling a fully laden Panamax vessel would be required. If the Geraldton Harbour were to be

used, substantially smaller vessels than Panamax ships only could be accommodated. Such an arrangement would add substantially to the transportation costs related to either project.

The Oakajee port concept (Welker Environmental Consultancy, 1997) has suggested four port options in the Oakajee locality to be sited generally between the Oakajee and Buller Rivers. The port options are illustrated in Figures 2 and 3, Appendix 1. The options include the prospect of constructing a port using breakwaters up to 2.5 kms in length to a depth of 22.5 metres, or an in-shore option to be constructed over the present reef platform. The offshore breakwater design would require a mass armoured construction because the coastline is subject to high energy events, and the unloading and loading of large vessels requires relatively still harbour conditions.

The volume of breakwater material for the off-shore concept would be about 8 million tonnes of rock requiring a large quarry, or quarries, to be developed within a radius of 25 km. Preliminary investigations of sources for breakwater material have indicated that the 25 km radius contains significant resources of both limestone and igneous rock.

Table 1 lists the breakwater options, their length and material requirements.

The present concept suggests a service corridor of 100 m in width and 1.5 km in length, joining the port to the likely industrial estate.

**Table 1: Summary of Details of Port Options**

| Option | Length km | Dredge Spoil Volume (approx. million $m^3$) | Breakwater Quantity + (approx. million tonnes) |
|---|---|---|---|
| 1. Offshore Breakwater Concept | | | |
| 1.1 Intermediate dredging / breakwater | 1.75 | 0.5& (1.5) | 8 (8) |
| 1.2 Maximum dredging / minimum breakwater | 2.0 | 2.6& (4.7) | 6 (6) |
| 1.3 Minimum dredging / maximum breakwater | 2.5 | 0 | 13 |
| 2. Inshore Harbour Option | 1.0 | 8# | 4 |
| | | | |

(Source: Oakajee Deepwater Port Concept, February 1997)

& Harbour basin dredged to RL - 10.0m and export channel dredged to RL - 15.5m.
() Harbour fully dredged to RL - 15.5m
+ Assumes a 25m roadway to steel slab berth
# Includes excavated materials with dewatering.

## 3. Environmental Factors Likely to be Important

### 3.1 Important Environmental Factors

In the EPA's opinion and having regard for the views of government agencies indicated in Appendix 1 and other relevant information, the following are the environmental factors likely to be of importance in the development of a deepwater port at Oakajee:

(a) vegetation communities and rare and priority flora;
(b) shoreline stability;
(c) marine fauna;
(d) seagrass;
(e) macroalgae;
(f) introduced marine organisms;
(g) marine water and sediment quality;
(h) dust;
(i) noise and vibration;
(j) public health and safety;
(k) heritage;
(l) recreation.

These matters are discussed in Sections 3.2 to 3.13 inclusive, and summarised in Table 2.

### 3.2 Vegetation Communities and Rare and Priority Flora

**Aspects of vegetation communities and rare and priority flora**

The port concept envisages a corridor comprising about 15 hectares connecting the coast to the estate. In addition, the onshore facilities area (100-120 ha) is likely to be constructed within a sand blowout, immediately north of the causeway. A port development in this context, will affect the Oakajee coastal zone [1], particularly coastal vegetation communities and the shoreline.

The coastline in the Oakajee locality comprises a sandy beach with an inshore limestone reef platform. The onshore area comprises sandy dunes both vegetated and unstable of the Quindalup Dune System overlying Tamala Limestone which is exposed in places near the water's edge. The limestone forms an escarpment reaching up to about 80 metres above sea level, between 700 and 1000 metres inland.

In 1993 the consultant group Dames & Moore (Dames & Moore, 1993) on behalf of LandCorp, surveyed the coastal system mapping the dunes, the limestone ridge and their associated vegetation. Information on whether the flora was rare or significant was obtained from specimen samples examined by the Western Australian Herbarium, a Division of the Department of Conservation and Land Management.

While seven vegetation types were defined over the area no regionally significant vegetation types or communities were identified. However, it is foreseen that to clarify the issue of the flora types of the area a 'Spring Flora Survey' should be undertaken.

The Department of Conservation and Land Management has advised that at the broad strategic level of the survey for the concept plan, no specific conservation issues have been identified, although this may happen during specific investigations.

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[1] The coastal zone is defined, landward of the water's edge as the area extending one kilometre inland (Guidelines for Development of a Policy for the Coastal Zone, EPA, 1977.)

A similar survey was undertaken for the potential industrial estate. The port concept plan envisages that any proposed development will be accompanied by a rehabilitation and management plan involving the planting of locally endemic flora species. A weed control program would also be employed.

## Consideration

The area considered for assessment of this environmental factor is the proposed Oakajee Port and its adjacent terrestrial vegetation, extending approximately 1 km inland from the high tide level, between the Buller and Oakajee Rivers. This area lies within the Geraldton Sandplain Biogeographic Region (Thackway and Cresswell 1995).

With respect to this environmental factor, the EPA's objectives are both to maintain the abundance, diversity, geographic distribution and productivity of local vegetation communities and to protect declared rare and priority flora consistent with the provisions of the *Wildlife Conservation Act 1950.*

An objective of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 1996) is to ensure that effective measures are in place to retain and manage native vegetation, including controls on clearing.

In May 1995 the Western Australian State Government adopted the Remnant Vegetation Policy which discourages clearing where total remnant vegetation within a local government authority or sub-catchment is less than 20%. This policy is implemented under the *Soil and Land Conservation Act* by the Commissioner for Soil and Land Conservation.

The conclusion that can be drawn from the preliminary work is that it seems unlikely that significant flora and vegetation communities, and probably fauna, occur in the area. However, a port development in this locality will significantly alter an otherwise natural coastline.

If the port concept is implemented, the EPA would envisage that a Port Authority (refer Section 1.3) would be responsible for the management of the port area (refer Section 1.3) both on-shore and off-shore according to a foreshore landscape and rehabilitation plan, which could be integrated into a Coastal Management Plan for the locality. Management of the port area would involve the implementation of an Environmental Management Plan (EMP). As part of the EMP, a Coastal Management Plan may be required and could include additional studies such as a full survey and mapping of vegetation communities, including a spring flora survey.

The EPA notes that:

1. in preliminary surveys, no significant vegetation communities and no rare and priority flora were identified;

2. the vegetation communities are well represented elsewhere;

3. a full survey and mapping of vegetation communities, including a spring flora survey, will be undertaken.

In considering aspects of the vegetation communities at this locality, any future proponent should take account of, but not be limited to, the following:

1. full survey and mapping of vegetation communities, including a spring flora survey;

2. application to clear land would have to be made to the Commissioner for Soil and Land Conservation;

3. a foreshore landscape and rehabilitation plan, which could be integrated into a Coastal Management Plan ; and

4. development and implementation of an EMP, which would include the Coastal Management Plan, as a component.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to vegetation communities and rare and priority flora.

### 3.3 Shoreline Stability

#### Aspects of shoreline stability

The coastal waters and the shoreline in the Oakajee vicinity are subject to moderate to strong winds on shore winds throughout the year. During the strong storm winds, large waves and swell occur. The prevailing winds, mostly from the south south-west but which also range through east to north-west, can be moderate to strong in intensity, particularly in the summer. A port development in the locality would require a substantial breakwater system, with an inshore option needing less armouring.

Work has been undertaken on the bathymetry of the Oakajee area which shows the sea floor dropping from the shoreline to a depth of 5m about 900m from the shore, then to 20m at about 2.2 km. This configuration, combined with the wind events, results in a high wave energy environment with continuous surf and strong currents. As a result, sediment turbidity is often high (George, 1993).

Detailed examination of the coastal processes operating in the Oakajee locality has not been undertaken although a preliminary study by MP Rogers & Associates in 1996 suggests that the longshore transport of sandy sediment is likely to be minor, although turbid. The coast appears from historic aerial photographs to be subject to both accretion and erosion.

Coastal and shoreline stability appears to be assisted by the continuous nature of the reef platform which extends from about the water's edge seaward to near the 5m depth contour.

A detailed shoreline movement study has been initiated into the physical characteristics of the Oakajee coast including accretion, erosion and longshore sediment transport is underway.

#### Consideration

The area considered for assessment of this environmental factor is the coastal strip between the Buller and Oakajee Rivers.

With respect to this environmental factor, the EPA's objective is to maintain the stability of beaches.

The studies to date would suggest that because the coast is subject to strong winds and large waves, sand and seaweed can be expected to accumulate, under various conditions, on the outside of breakwaters particularly on the southern side. Engineering design and operational management will need to be considered to ensure there is a flow of sand in both north and south directions.

Both the offshore and inshore port options appear likely to require engineering solutions to manage sand accumulation, with a sand bypass being most likely. An offshore design involving a trestle construction over the beach platform leading to a solid breakwater farther offshore might reduce problems of longshore sand movement and seaweed accumulation. The Department of Resources Development has committed to investigating this option in the detailed design for the proposal.

Further work is also necessary into the prevailing oceanographic conditions so as to decide whether an offshore port development out to the 22.5m depth contour will be needed, or a

inshore port facility. The inshore option would require blasting and dredging of the present reef platform, as well as a perimeter breakwater, as indicated in Table 1.

The coast's dynamics in the Oakajee locality need further detailed investigation. Engineering solutions will need to be developed for management of sediment and to ensure the appropriate long-term management of coastal processes.

As discussed above, the Port Authority would be responsible for the preparation and implementation of a Coastal Management Plan which could incorporate sand and associated foreshore management as described in Section 3.2.1 above.

The EPA notes:

1. the preliminary results of the study of longshore sediment transport;

2. that detailed studies into the physical characterisation of the coast, including accretion, erosion and longshore sediment transport are underway;

3. the undertaking by the Department of Resources Development to investigate the option of a trestle construction over the beach platform during the detailed engineering design.

In considering aspects of the shoreline at this locality, any future port proponent should take account of, but not be limited to, the following:

1. detailed studies into the physical characterisation of the coast, including accretion, erosion and longshore sediment transport, and the provision of appropriate sand by-pass, based on the results of studies;

2. preparation of a Coastal Management Plan incorporating sand and foreshore management provisions, as part of the EMP.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to the maintenance of coastal stability.

## 3.4 Marine Fauna

### Aspects of marine fauna

The development of a port will significantly affect the current habitat and composition of the marine fauna.

The habitats and major biota assemblages offshore from the Oakajee locality have been surveyed by Alan Tingay & Associates (1997). In addition, earlier work on the marine areas of Geraldton and southward were studied by Monaghan Rooke & Robinson (1994).

These studies showed that while there were specific habitat attributes relevant to the Oakajee coast there were no specific biological communities distinct from those known from elsewhere on the central west coast. The marine waters in this regard have been generally described in a number of publications and the conservation aspects discussed in the 1994 report on '*A Representative Marine Reserve System for Western Australia* ' (Wilson et. al. 1994).

The work to date shows that both the inshore reef pavement and offshore reef remnants provide shelter and refuge for the various stages of the life cycle of the rock lobster. The seafloor habitats are illustrated in Figure 4, Appendix 1. The causeway and breakwater for the offshore option would extend approximately 2.5 km offshore, to the 22m contour.

Offshore from the Oakajee locality a number of whale species are known to have a migration route, and some other marine mammals such as dugong and seals occasionally visit the area. However, the construction of a port appears unlikely to interfere with either the movement or the habitat of marine mammals. The Department of Conservation and Land Management has not pointed to this factor as being relevant at this strategic stage.

### Consideration

The area considered for assessment of this environmental factor is the extent of the port area, approach channels and berthing areas.

With respect to this environmental factor, the EPA's objective is to maintain the abundance, species diversity and geographic distribution of marine fauna.

It is reasonable to expect that breakwaters for a major port will provide a new habitat form which will become available over time to the present suite of marine organisms to opportunistically occupy, and this may include the puerulus and juvenile stages of the rock lobster. Some adult animals may also find a new habitat in the deeper parts of the breakwater.

The attraction of a port for colonisation by marine animals will depend on the maintenance of water quality which is discussed in Section 3.8 (Marine Water and Sediment Quality).

Prior to more detailed investigations, the EPA is able to advise that the marine environment in the Oakajee locality is similar to that elsewhere on the mid west coast and no significant marine habitat are presently known at Oakajee. Should a port be developed, there will be a substantial change both to habitat and the composition of organisms at least during the construction phase. It is likely over time that the breakwater will provide a new habitat for recolonisation.

The Port Authority would be expected to be responsible for ongoing monitoring and management of the water body within the harbour and its adjacent waters to ensure that the marine environment is protected. These matters are also addressed in Section 3.8 (Marine Water and Sediment Quality).

The EPA notes that:

1. the marine environment in the Oakajee locality is similar to that elsewhere on the Mid West Coast;

2. no significant marine habitat and ecosystems is likely to be impacted;

3. the western rock lobster occurs widely in the region.

In considering aspects of marine fauna at this locality, any future port proponent should take account of, but not be limited to, the following:

1. a requirement and commitment to ongoing monitoring and management of the water body within the harbour and the port's adjacent waters.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to marine fauna.

## 3.5 Seagrass

### Aspects of seagrass

Seagrass provides an important habitat on much of Western Australia's coastline. However, offshore from the Oakajee locality bathymetric studies, seagrass mapping by the Fisheries Department in 1986 and the marine investigations by Alan Tingay & Associates (1997), have

not located any seagrass meadows. Nonetheless, a number of individual seagrass species exist associated with algal communities mainly on the reef pavement.

It is expected that these seagrasses will provide a rich localised habitat for some marine organisms. Oakajee Port concept plan indicates that an offshore harbour option with breakwater extending from the coastline will result in the removal of less than 30 ha of habitat which contains seagrass/algal communities. The inshore option would result in about 25 ha of this type of habitat being permanently removed.

### Consideration

The area considered for assessment of this environmental factor is the extent of the port area.

With respect to this environmental factor, the EPA's objective is to ensure the maintenance of abundance, species diversity and geographic distribution of seagrasses.

While seagrass meadows are important as habitat for a range of marine organisms elsewhere on the west coast of Western Australia, they have not been identified in the Oakajee vicinity. However, individual seagrasses do occur mixed with other macroalgal species. These associations may be affected to a limited degree by port development.

The EPA notes that:

1. there are no significant seagrass meadows in the Oakajee vicinity;

2. the seagrass/algal communities are well represented elsewhere.

In considering aspects of seagrass at this locality, it appears that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to seagrass.

## 3.6 Macroalgae

### Aspects of macroalgae (beach cast seaweed)

The Mid West coast of Western Australia provides habitat for substantial macroalgae communities. The algae itself provides habitat for marine animals, but also contributes significantly to seaweed which is cast up on the shoreline.

Kirkman and Kendrick (1997) have reviewed the ecological significance of this beach cast as it is recognised that the decomposition of the material provides nutrients and carbon to the water body. This is a vital nutrient recycling process for the coastal ecosystem. It is also known that some nutrients are contributed to the marine environment from ground water and river flows.

At present large amounts of seaweed accumulate on Oakajee beaches. A proposed port development will result in deflection of this material, and in places seaweed accumulation and hence the recycling of nutrients may be locally interrupted.

Detailed studies into the physical characterisation of the coast, including accretion, erosion and longshore sediment transport are underway and to determine the impact of the breakwater on nearby beaches. Studies will also be required to elucidate the incidence of seaweed accumulation, decomposition and movement.

### Consideration

The area considered for assessment of this environmental factor is the shoreline and marine environment between the Buller and Oakajee Rivers.

With respect to this environmental factor, the EPA's objective is to minimise interference with the process of nutrient and carbon cycling from beach cast seaweed.

Seaweed and related macroalgae accumulates significantly on the Oakajee beaches. This activity will be affected by a port development. However, it is vital for the marine ecosystem that management steps are taken to ensure that the normal recycling of nutrients within the marine water body remain largely unaffected by the development.

Investigations to identify the behaviour of seaweed and beach-cast is underway, and based on the results of these studies, measures implemented to manage the issue - this may include mechanical means or engineering design solutions.

In addition to the above, the EPA sees it likely that the accumulation of seaweed could cause offensive odours in the port area. Steps will be necessary to manage the movement and accumulation of seaweed, and to prevent offensive odours.

The EPA notes that:

1. detailed studies are being conducted into the physical characterisation of the coast, including longshore sediment transport and the studies of seaweed accumulation;

2. the additional investigations underway into the behaviour of seaweed and beach-cast to provide information to form a basis for a strategy to maintain nutrient recycling;

3. the availability of management measures for seaweed accumulation and distribution.

In considering aspects of beach cast seaweed at this locality, any future port proponent should take account of, but not be limited to, the following:

1. detailed studies being conducted into the physical characterisation of the coast, including longshore sediment transport and the studies of seaweed accumulation;

2. baseline monitoring of volumes and seasonal characteristics of seaweed accumulation;

3. investigation of the option of a trestle construction over the beach platform during the detailed engineering design;

4. application of management measures and the development of a strategy to manage seaweed accumulation, based on the results of monitoring and circulation studies.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to beach cast seaweed.

### 3.7 Introduced Marine Organisms

#### Aspects of introduced marine organisms

A concern with the development of a bulk cargo port in the temperate waters of the mid coast of Western Australia is that exotic marine organisms might be introduced from ships' ballast waters, or from hull fouling. Within Australian temperate waters a significant number of exotic marine pests have recently been recorded, including toxic dinoflagellates, the prolific seaweed *Undaria pinnatifida* and the Northern Pacific seastar *Asterias amurensis* in Tasmanian waters. In Cockburn Sound the Mediterranean colonising marine worm *Sabella spallanzanii* has established a presence.

No introduced marine organisms are recorded for the waters of the Oakajee locality. Similarly, regular monitoring of the Geraldton Port area has not identified any introduced marine organisms.

Ships require ballast to ensure they maintain stability while underway. Ships without cargo require significant amounts of ballast water which is usually taken-up at the port from which the ship has discharged its prior cargo.

As a new port, Oakajee would be developed to handle bulk cargoes and it is expected that ships will arrive in ballast with the prospect that exotic organisms could be introduced when the ballast water is discharged in the vicinity of the port. To reduce such risks the Australian Quarantine and Inspection Service (AQIS) has established an Australian Ballast Water Management Strategy which is being introduced through all main Australian ports with voluntary compliance by operators of foreign-going vessels. While this strategy is voluntary it is being monitored by port authorities.

In addition, the International Maritime Organisation is developing a mandatory ballast water management code which is likely to become part of the International Convention for the Prevention of Pollution by Ships 1973/78, known as the MARPOL Convention (ANZECC Strategy to Protect the Marine Environment, 1996). It is probable that such a code covering foreign-going vessels would be in place about the time a new port was established at Oakajee.

With respect to the cleaning of hulls, this is a prohibited activity within Australian waters except within approved dockside facilities where pollution control provisions are in place.

### Consideration

The area considered for assessment of this environmental factor is the extent of the port area.

With respect to this environmental factor, the EPA's objective is to minimise the risk of introduction of unwanted marine organisms.

Any port handling bulk cargoes is subject to potential contamination by exotic organisms from ballast waters, but studies in Australia of this risk are occurring - particularly through the CSIRO Centre for Research into Introduced Marine Pests - and, an Australian strategy to limit the discharge of ballast water near ports is in place.

In considering aspects of introduced marine organisms at this locality, any future proponent should take account of, but not be limited to, the following:

1. implementation within Australian ports of the Australian Ballast Water Management Strategy;

2. the development through the International Maritime Organisation of a mandatory ballast water management code;

3. regular monitoring of the port area for introduced marine organisms.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to management of the risk of introduction of exotic marine organisms.

## 3.8 Marine Water and Sediment Quality

### Aspects of Marine Water and Sediment Quality

The marine water quality in the Oakajee locality is regarded as pristine, as is most of the Western Australian coast. However, the clarity of the water is affected through natural high turbidity to which the biota has adapted.

The new harbour development will significantly affect the marine water quality should accidental discharges, spillages or other incidents likely to cause water contamination occur.

Oil spills and accidental discharges from ships are the most likely means of water contamination, but these will be controlled through port authority regulations and the MARPOL Convention.

With regard to the management of oil spills, Australia has in operation a 'National Plan to Combat Pollution of the Sea by Oil', implemented through the Australian Maritime Safety Authority (AMSA) in association with respective port authorities. Under that plan, about $35 million worth of equipment is available to respond to pollution within Australian waters. There are international arrangements also enabling access to additional equipment and expertise from overseas should a major oil spill incident arise (ANZECC 1996). Furthermore with the encouragement of ANZECC, AMSA has commenced development of a national plan to combat chemical spills from ships should spillage occur.

Another aspect of the Oakajee concept is that the port might be used for the handling of hazardous materials.

While each port is presently required to prepare a 'Port Safety Plan', it is reasonable to expect that a decision as to whether a new port at Oakajee is to cater for hazardous materials should be taken at an early date so that the 'Port Safety Plan' can be written to accommodate safety issues specific to the handling of hazardous goods. This matter is discussed further in Section 3.11 'Public safety'.

An additional matter needing to be addressed is minimisation of the risk of contamination of harbour waters through toxic chemicals arising from anti-fouling paint applied to ships' hulls. Presently under respective Australian state and Territory law, vessels under 25m in length may not be coated with anti-foulant containing the pervasive chemical tributyl-tin (TBT). However, ships in excess of 25m including most foreign-going vessels are coated with this chemical.

The recent '*Southern Metropolitan Coastal Waters Study*', (Department of Environmental Protection 1996) has demonstrated the pervasiveness of TBT. It is recommended in that report that the use of TBT as a ship's anti-foulant should be controlled further.

It is not practical under present international law to restrict access of foreign-going vessels to harbour other than for port safety reasons, but through the International Maritime Organisation, work is underway to encourage the use of 'environmentally benign' anti-fouling paints. These new paint products are designed to be effective only on contact and not to have residues which accumulate in either the water column or the sediments of the marine environment (ANZECC 1996).

Local water quality in the Oakajee port may be affected during the construction of a port due to the need to dredge the harbour basin. Early design work suggests a limited need to dredge if an offshore proposal is adopted, but there would be significant dredging accompanied by blasting of the sea floor if the inshore option was selected. This latter option could however be undertaken by initially enclosing with a perimeter breakwater the area to be dredged, thus limiting substantially turbidity contamination of the water column.

It is expected that any dredging either of the harbour basin or of a shipping channel, for whichever option is chosen, will be undertaken in accordance with the 'Draft Guidelines on the Disposal of Dredged and Excavated Material (ANZECC, 1997). In particular those guidelines take their genesis from the Australian *Environment Protection (Sea Dumping) Act 1981*, which provides compliance within Australian waters to the International Dumping Convention 1972 (London Convention). That convention seeks to prevent the dispersal into the water column of chemicals, specifically heavy metals, from ship sources and also from the dumping of dredged spoil.

Presently as the Oakajee waters and sediments are pristine, they are unlikely to be affected by chemical or heavy metal contamination. If a port is to be developed at Oakajee, an important task for the Port Authority will be to maintain the water and sediment quality within the

harbour and to ensure that cargo handling is undertaken efficiently and cleanly through best practice with no cargo overspill into the harbour waters.

### Consideration

The area considered for assessment of this environmental factor is the extent of the port area.

With respect to this environmental factor, the EPA's objective is to:

- meet the requirements of the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992);

- In the longer term, to consider management of the port's waters and sediments based on the environmental quality objectives (EQO's) and environmental quality criteria (EQCs) from the Southern Metropolitan Coastal Waters Study (1996), as they arise.

Although the EPA has not developed sediment criteria as yet, it recognises the need to develop criteria in the near future.

The development of a port in the waters of the Oakajee locality has the potential to significantly affect water quality. Any deterioration of water quality will effect the surrounding marine ecosystem.

The Port Authority should be responsible for the management of the water column both within the harbour precinct and the adjacent waters, over an area to be defined. It would be expected that the port management body' would maintain a monitoring and management plan for the water area under its control, and that spillages will be dealt with under the appropriate response strategy with a reporting provision to the EPA. The monitoring program could be included into the EMP. It is understood that early designs for the port do not include wastewater outfalls either from onshore facilities, or from ships' waste.

ANZECC has investigated Australian 'Port Reception Facilities for Waste Management' with the objective of ensuring that each port is appropriately provided with facilities to handle the kind of wastes which may be brought into the port. This includes means to handle the collection, storage and treatment of both bulk solid waste and noxious liquid substances. It is expected that a new port at Oakajee will comply with the ANZECC Guidelines for Port Reception Facilities (ANZECC 1996).

Similarly, the Port Authority would be expected to manage the operations within the harbour basin to ensure cargo is not spilt or discharged into the water body.

In considering aspects of marine water and sediment quality, any future proponent should take account of, but not be limited to, the following:

1. the Port Authority should be involved in the 'National Plan to Combat Pollution of the Sea by Oil', and to prepare a 'Port Safety Plan, which incorporates risk assessment;

2. the Port Authority should provide for ships' waste;

3. the Port Authority should ensure the efficient handling of cargoes to prevent overspill;

4. the regular monitoring of the harbour and the surrounding waters in accordance with the Marine Management Plan; and

5. collection of baseline data on water and sediment quality in the port area.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to marine water and sediment quality.

## 3.9 Dust

### Aspects of dust

Particulate matter may result from activities undertaken at the proposed industrial estate during construction, and as a consequence of on-going operations. Dust sources may include ship loading, stockpiling of materials, transport of material to and from the port, conveyors and construction of the port and associated access corridor.

The Port Concept area is located on the coast with little adjacent urban development. A number of semi rural dwellings occur to the south and east. The suburb of Dromond Cove occurs 6 km to the south. Generally the direction of prevailing winds is unlikely to cause a dust impact over residences/residential areas.

The WA Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1992, specifies an ambient dust limit (averaged over 24 hours) for land used predominantly for residential and rural purposes (Area C) of 150$\mu g/m^3$ with a standard (a concentration which is desirable not to exceed) of 90$\mu g/m^3$. Dust guidelines have been developed for and applied to development sites through Part V of the Act.

Through the incorporation into the construction phase of best management practices for the control of dust it is to be expected that particulate emissions will be reduced to a practical minimum.

### Consideration

The area considered for assessment of this environmental factor is the area surrounding the operational port area and transport corridor.

With respect to this environmental factor, the EPA's objective is to protect the surrounding land users such that dust emissions will not adversely impact upon their welfare and amenity or cause health problems and meet EPA Guidelines for Assessment and Control of Dust and Windborne Material from Land Development Sites (updated 1995), and the Environmental Protection (Kwinana) (Atmospheric Wastes) Policy 1992.

This factor will need to be considered further during the review of a specific port proposal. Any development is likely to take place within the framework of the Guidelines for the Assessment and Control of Dust and Windborne Particulates from Land Development Sites' (DEP 1995).

A major constructional activity which could cause dust, noise and vibration is the development of a quarry or quarries for rock material for the port breakwaters. The EPA understands that detailed geotechnical studies are underway to locate appropriate quarry sites. Once a quarry feasibility study is completed, and a decision is made to proceed with a port, a formal referral under the *Environmental Protection Act* of the quarry site and the transportation requirements to the port, will be made to the EPA.

In considering aspects of dust, any future proponent should take account of, but not be limited to, the following:

1. construction and management of a port to be undertaken so as to meet EPA guidelines for dust control - management and strategies could be incorporated in an Air Quality Management Plan;

2. determination of ambient dust levels;

3. referral of a proposal for quarry development to the EPA for consideration of a level of assessment.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to dust management.

## 3.10 Noise and vibration

### Aspects of noise and vibration

Oakajee is situated in a rural environment with low background noise levels. The most significant noise is presently from traffic along the North-West Coastal Highway. Where this is not a dominant influence, it is likely that night-time background noise levels under calm weather conditions are between 28 and 33 dB(A).

Noise levels for projects within Western Australia are subject to the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, which are currently the prescribed standard for noise under the Act . Subsequent regulations are likely to be in force in the event that implementation of a port proposal proceeds.

The maximum allowable noise levels during the most sensitive time for residences around the concept area would be in the range 35 to 40dB(A), dependent on additional adjustment for tonal components.

The relative remoteness of the Oakajee locality (3.5 km from the nearest residence) is advantageous for the development of a port. The application of best practice during construction should reduce problems associated with noise and vibration. However, these matters will need to be addressed further once more specific design proposals are available for consideration.

### Consideration

The area considered for assessment of this environmental factor is the extent of the port area and transport corridor, and surrounding area.

With respect to this environmental factor, the EPA's objective is to protect the amenity of nearby residents from noise and vibration impacts by ensuring that noise and vibration meet criteria in the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, and the proposed new Environmental Protection (Noise) Regulations (when promulgated).

The EPA would expect that the development of a port would be undertaken using best practice technology and involve the use of noise attenuated machinery.

The development of the port and its operation would need to comply with the *Noise Abatement (Neighbourhood Annoyance) Regulation 1979*, and the proposed *Environmental Protection (Noise) Regulations* (when promulgated).

The issue of noise and vibration will be further considered when geotechnical feasibility studies have been completed into quarry sites for breakwater material, and the quarry proposal is referred to the EPA.

The EPA notes that:

1. the proposed Oakajee port location is distant from sensitive properties;

2. the port will need to meet the requirements of the *Noise Abatement (Neighbourhood Annoyance) Regulation 1979*, and the proposed *Environmental Protection (Noise) Regulations* (when promulgated).

In considering aspects of noise and vibration, any future proposal should take account of, but not be limited to, the following:

1. use of best practice and noise attenuation during the development and operation of the port, as appropriate and defined by industry and government agencies;

2. referral of the quarry proposal to the EPA for consideration of a level of assessment.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to noise and vibration.

### 3.11 Public health and safety

#### Aspects of public health and safety

The relative remoteness of the Oakajee locality advantages the development of a port from the perspective of minimising risk to public health and safety. The closest residence is 3.5 kms and the distance to the nearest settlement - Drummond Cove - is 6 kms from the area. In addition, the most actively used recreational area is about 3 km from the likely port site.

Port construction and operation in this situation should not pose a direct harm to residents or to recreational users. A question however yet to be resolved is whether the port will be used for the handling of hazardous or intractable substances where restrictions to public access would be required.

It is expected that a port would be constructed to comply with all relevant statutory requirements. Moreover, in this context a modern port should be designed to withstand incidents arising from reasonably foreseeable natural and human influenced events. Contingency plans will need to be devised to minimise risk to life and property, and a 'Port Safety Plan' would need to be in place prior to port operation.

The EPA through Bulletins 611 and 627 (Environmental Protection Authority, 1992a and 1992b) has published information on acceptable levels of individual fatality risk. These include a standard of one in a million fatality per year or less in residential zones, and ten in a million for any industrial activity located in buffer areas between industrial facilities and residential areas. It is understood that no residential development will be located near the potential port, but the more specific proposal will clarify this aspect.

Although the EPA has not yet established any criteria for societal risk, it recognises the need to develop these criteria in the near future.

The Department of Minerals and Energy (DOME) has advised that public areas such as beaches would be expected to have a risk level of ten in a million. DOME will be involved in any decision to enable the handling of hazardous cargoes, and must assist in the preparation of a 'Port Safety Plan'. The Department of Transport has also indicated that it must be involved in the development of emergency response plans.

An associated issue that will need addressing during development of any specific proposal is the availability of the port and associated breakwater for recreational pursuits such as fishing and diving. It is reasonable to expect that the community may see such a large facility as a port in this locality as being available for recreational pursuits, but will need to understand the risks and hazards associated with such an enterprise. If the port is to be used for the handling of hazardous cargoes the risks will be even greater to public safety.

#### Consideration

The area considered for assessment of this environmental factor is the port area, transport corridor to industrial estate and adjacent recreational beach areas.

With respect to this environmental factor, the EPA's objective is to ensure risk is as low as reasonably achievable and complies with acceptable standards. The EPA's criteria for the assessment of the fatality risk of proposed hazardous and industrial developments are outlined in Bulletins 611 and 627

At this concept stage, that the development of a port would need to be undertaken to comply with all statutory requirements, but the matter of access to the port during normal operations for public recreation will need to be addressed.

The preparation of a 'Port Safety Plan' would be an appropriate point to seek the community's view on this issue.

The EPA notes that:

1. a decision is yet to be made as to the operational requirements of a new port, and whether it will be available for the handling of hazardous cargoes;

2. the port will be required to meet statutory requirements for the handling of dangerous and hazardous goods and relevant criteria relating to risk.

In considering aspects of public health and safety, any future proponent should take account of, but not be limited to, the following:

1. the development of a Port Safety Plan as part of the EMP, and which incorporates a risk assessment and response measures for accidents.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to public health and safety.

## 3.12 Heritage

### Aspects of heritage

The onshore area adjacent to the possible port sites has been surveyed as to ethnographic and archaeological sites (Tamora, 1996 and Quartermaine Consultants, 1997). The Aboriginal Affairs Department (AAD) has considered the Reports and has advised that a number of issues need to be addressed prior to development of a port in the area, specifically:

- wider consultation with some Aboriginal communities in the area to be sought;
- monitoring of a number of areas for burials and sub surface remains, during road and port construction; and
- consultation with the AAD to ensure compliance with the Aboriginal Heritage Act.

The Department of Resources Development, in response to questions from submissions, has committed to working with the AAD to ensure that Aboriginal heritage issues are properly addressed.

With respect to European history, no specific sites are known. Offshore in the Geraldton vicinity a number of small vessels have been wrecked from time to time but none is known to be of historic significance.

### Consideration

The area considered for assessment of this environmental factor are the nearshore marine and foreshore areas adjacent to the concept area.

With respect to this environmental factor, the EPA's objective is to comply with statutory requirements in relation to areas of cultural and historical significance.

Notwithstanding the onshore area will need further investigation from an Aboriginal heritage perspective, and information in this context should be provided directly to the Aboriginal Affairs Department.

The EPA notes that:

1. the commitment by the DRD to resolution of any Aboriginal heritage issues; and
2. the need for any future port development to comply with relevant statutory requirements for significant sites.

In considering aspects of heritage, any future proponent should take account of, but not be limited to, the following:

1. consultation with the AAD on Aboriginal heritage matters;
2. the need for any future port development to comply with relevant statutory requirements for significant sites; and
3. the development of a Heritage Management Plan, as required.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to heritage.

## 3.13 Recreation

### Aspects of recreation

The coastline in the Oakajee locality is subject to strong winds and sea conditions, as a result recreational pursuits are mostly limited to Coronation Beach 7 km to the north, and a few other places on an occasional basis.

The concept plan for a port development does not foresee the establishment of recreational facilities in the port locality, although itinerant recreation might be accommodated. The concept plan also indicates that public use in a recreational context might be precluded from a 1.5 km reserve on either side of a port.

It is recognised that the primary purpose of the port is for industrial use, however, it is considered likely that a port facility may create a demand for access to some port areas for various recreational activities such as fishing and small boat mooring.

A recreational plan should be prepared by the Port Authority in consultation with appropriate agencies and the community to make provision for low key recreational use, where appropriate and taking into consideration public safety.

### Consideration

The area considered for assessment of this environmental factor is the coastal strip between the Buller to Oakajee Rivers.

With respect to this environmental factor, the EPA's objective is not to compromise recreational uses of the area, as developed by planning agencies.

While recreation is not currently planned for in the Oakajee port at this concept stage, it seems likely that the community will seek some access for pursuits such as fishing, diving and perhaps surfing and windsurfing. It is similarly to be expected that the harbour waters would be required for recreational boating from time to time, even if only as a safe haven during difficult sea conditions.

The EPA notes:

1. the remoteness of current recreational areas from the general port site, but that there is likely to be the prospect that the community may seek some additional recreational opportunities;

2. that there are no recreational plans currently developed by planning agencies for the proposed port area; and
3. that a recreational plan is proposed to be developed for an area 3 kms north and south of the proposed port area.

In considering aspects of recreation, any future proponent should take account of, but not be limited to, the following:

1. the Port Authority to determine demand for access to areas of the port for recreational pursuits; and
2. the Port Authority, and other relevant agencies, to develop a recreational plan for the area which considers public safety issues and involves community consultation.

Should the above occur, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to recreation.

## 4. Other Issues

### 4.1 Quarry Siting and Management

An important aspect yet to be finalised in relation to the development of a port at Oakajee is the location of rock material for the breakwaters.

The Oakajee concept plan indicates that one or several quarries may be required to supply material for the construction of the breakwater, and that the quarrying of material will be the subject of a separate referral to the EPA for environmental assessment. The concept plan indicates that for the various port options described, the volume of material required could range from 4 to 13 million tonnes, as indicated in Table 1.

The EPA will provide separate advice to the Minister for the Environment on the quarries and transport of material from the quarry site(s), once the matter has been referred and assessed.

### 4.2 Commercial Fishing

The lobster industry provides the major marine economic resource for the Geraldton region. Data from the Fisheries Department, indicates that the Oakajee locality, as part of a larger Geraldton fisheries management block, contributes only modestly to the annual lobster fishery catch - perhaps up to $60,000 per year. The fisheries area north of Geraldton including the Oakajee locality provides 82% of the block's near shore catch. Other commercial fisheries in the area are understood to be minor.

The Fisheries Department has indicated that a decision to develop a port at Oakajee would affect the profitability of a commercial fishery, and that the Government should decide upon a mechanism to investigate, and if necessary compensate, for profits foregone.

### 4.3 Oakajee Industrial Estate - Infrastructure and Corridors

It is the EPA's view that the provision of infrastructure support for the industrial estate and port, should be considered through separate referral under section 38 of the Act, for example, rail to the industrial site and port.

The EPA is further of the view that a goal of Government in relation to the development of the Oakajee Industrial Estate and Port Concept's should be to limit the impact of infrastructure

corridors. This can best be achieved by multi-use corridors, including the provision for separation from sensitive land uses, which can in themselves be afforded recognition through planning amendment.

## 5. Environmental Management and Related Studies

If a decision is made by the Western Australian Government to proceed with a specific port development at Oakajee, it is likely that a Port Authority (refer Section 1.3) will be established which will have responsibility for harbour infrastructure and development.

The Port Authority will be expected to make a commitment to maintain and protect the environment and prevent pollution. The known factors relevant to that environmental management are set out in Section 3 (Important Environmental Factors).

The Port Authority for an Oakajee port will be responsible for the port's environmental management, and would be expected to prepare and implement an EMP, which may have a number of sub-plans as outlined in Section 5.1 (Environmental Management Plan).

### 5.1 Environmental Management Plan

Based on the information currently available, the Environmental Management Plan to be prepared and managed by the Port Authority should include, but not necessarily be limited to, the following:

1. Coastal Management Plan;
2. Marine Management Plan;
3. Port Safety Plan;
4. Air Quality Management Plan;
5. Heritage Management Plan; and
6. Recreation Plan.

### 5.2 Suggested Environmental and Related Studies/Actions

In addition, the following studies/plans and actions are suggested for implementation of a port proposal in the Oakajee locality:

**Studies/Actions:**

***Vegetation Communities and Rare and Priority Flora***

1. a full survey and mapping of vegetation communities, including a spring flora survey;
2. application to clear land would have to be made to the Commissioner for Soil Conservation;
3. a foreshore landscape and rehabilitation plan, which could be integrated into a Coastal Management Plan .

***Shoreline Stability***

1. detailed studies into the physical characterisation of the coast, including accretion, erosion and longshore sediment transport, and the provision of appropriate sand by-pass, based on the results of studies;

2. preparation of a Coastal Management Plan incorporating sand and foreshore management provisions.

*Marine Fauna*

1. a requirement and commitment to ongoing monitoring and management of the water body, and significant ecosystem components within the harbour and the port's adjacent waters.

*Macroalgae*

1. detailed studies being conducted into the physical characterisation of the coast, including longshore sediment transport and the studies of seaweed accumulation;

2. baseline monitoring of volumes and seasonal characteristics of seaweed accumulation;

3. investigation of the option of a trestle construction over the beach platform during the detailed engineering design;

4. application of management measures and the development of a strategy to manage seaweed accumulation, based on the results of monitoring and circulation studies.

*Introduced Marine Organisms*

1. implementation within Australian ports of the Australian Ballast Water Management Strategy;

2. the development through the International Maritime Organisation of a mandatory ballast water management code;

3. regular monitoring of the port area for introduced marine organisms.

*Marine Water and Sediment Quality*

1. the Port Authority should be involved in the 'National Plan to Combat Pollution of the Sea by Oil', and to prepare a 'Port Safety Plan, which incorporates risk assessment;

2. the Port Authority should provide for ships' waste;

3. the Port Authority should ensure the efficient handling of cargoes to prevent overspill;

4. the regular monitoring of the harbour and the surrounding waters in accordance with the Marine Management Plan; and

5. collection of baseline data on water and sediment quality in the port area.

*Dust*

1. construction and management of a port to be undertaken so as to meet EPA guidelines for dust control - management and strategies could be incorporated in an Air Quality Management Plan;

2. determination of ambient dust levels;

3. referral of a proposal for quarry development to the EPA for consideration of a level of assessment.

*Noise and Vibration*

1. use of best practice and noise attenuation during the development and operation of the port, as appropriate and defined by industry and government agencies;

2. referral of the quarry proposal to the EPA for consideration of a level of assessment.

*Public Health and Safety*

1. the development of a Port Safety Plan as part of the EMP, which incorporates a risk assessment and response measures for accidents.

*Heritage*

1. consultation with the AAD on Aboriginal heritage matters;

2. the need for any future port development to comply with relevant statutory requirements for significant sites; and

3. the development of a Heritage Management Plan, as required.

*Recreation*

1. the Port Authority to determine demand for access to areas of the port for recreational pursuits; and

2. the Port Authority, and other relevant agencies, to develop a recreational plan for the area which considers public safety issues and involves community consultation.

Under the Oakajee Industrial Estate concept, upon which the EPA is also preparing similar advice to the Minister, an Environmental Management Plan is to be prepared by the Estate Manager. There are likely to be some issues which need to be integrated into both plans, such as, risk management, recreational use and heritage. The EPA therefore envisages that the EMP for the industrial estate should be developed consistent, and preferably concurrent, with the Port Environmental Management Plan.

### 5.3 Environmental Management System

Environmental management principles, such as those adopted in the voluntary interim Australian Standards ISO 14000 series, should be adopted with appropriate monitoring and auditing to ensure compliance.

The environmental management plans and environmental management procedures should adopt quality assurance principles such as those adopted in Australian Standard ISO 9000 series.

## 6. Advice to the Minister for the Environment

The EPA has evaluated the environmental factors relevant to a port concept in the Oakajee locality and has set environmental objectives for each of the environmental factors.

The EPA advises that the development of a port at the Oakajee locality appears capable of being managed so as to not compromise the EPA's environmental protection objectives, subject to the undertaking of more intensive site investigations, and the preparation of detailed plans as outlined in this Report in Sections 3 (Important Environmental Factors) and 5 (Environmental Management and Related Studies).

Recommendation 1

That the Minister for the Environment notes the important environmental factors and the EPA's objective for each factor as set out in Section 3 (Important Environmental Factors) of this report and the studies suggested to gain further environmental information.

Recommendation 2

That the Minister for the Environment notes the EPA's advice on meeting the EPA objectives for the important environmental factors, environmental management considerations and suggested studies.

Recommendation 3

That the Minister for the Environment notes that the quarrying and transport of materials for the breakwater construction will be referred to the EPA for consideration under Part IV of the *Environmental Protection Act.*

Recommendation 4

That the Minister for the Environment notes that a future port proposal in the Oakajee locality would be subject to assessment under Part IV of the *Environmental Protection Act.*

**TABLE 2: RELEVANT FACTORS, EPA OBJECTIVE, POTENTIAL MANAGEMENT AND ADVICE TO MINISTER**

| IMPORTANT ENVIRONMENTAL FACTOR | RELEVANT AREA | EPA OBJECTIVE | LOCALITY ENVIRONMENTAL CHARACTERISTICS OR RELATED ASPECTS | POTENTIAL MANAGEMENT | ADVICE TO MINISTER ON ENVIRONMENTAL MANAGEMENT |
|---|---|---|---|---|---|
| **Vegetation Communities and Rare and Priority Flora** | Coastal Vegetation adjacent to the port.<br>The suggested site ranges over a position 2.5-3.5km south of the Oakajee River. 100-120ha of onshore facilities and a service corridor 1.5km wide will be required. | To maintain the abundance, diversity, geographic distribution and productivity of vegetation communities, and to protect declared rare and priority flora consistent with the provisions of the *Wildlife Conservation Act 1950.* | No regionally significant vegetation occurs in the locality. No declared rare or priority flora has been identified.<br>The coast is characterised by calcareous sand overlying limestone. There is a low risk of dieback spread.<br>Construction of service corridor may involve clearing approx. 5ha of mobile and stable dunes & 10ha of limestone ridge vegetation.<br>Onshore facilities are likely to occupy up to 100-120ha of mobile dune and 20ha of stable dunes habitat. | Development will artificially stabilise the mobile dunes. Elsewhere disturbed areas will need to be rehabilitated using locally endemic species. Weed control will need to be employed. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard vegetation communities and rare and priority flora.<br>While a coast largely unaffected by human activity will be subject to substantial development, no significant vegetation communities are likely to be affected adversely. The Port Authority could be required to establish an appropriate landscape rehabilitation and ongoing landcare management plan. (This should also involve measures to control dust during construction - see below). |
| **Shoreline Stability** | Coastal strip between the Buller and Oakajee Rivers.<br><br>The coast is subject to strong winds particularly from the south. Both erosion and accretion occur, and long-beach sand transport is part of the beach cycle. | To maintain the stability of beaches. | The present shoreline will be permanently changed by a port development. The coast at the preferred port locality presently offers few recreational opportunities.<br>The coast is highly 'active' resulting from a strong wind regime for much of the year, and beaches in the locality are subject to change including accretion and erosion.<br>Sand is expected to accumulate on both sides to the main breakwater in the offshore option, and a lesser amount for the inshore harbour option.<br>Further studies are underway to define shoreline movement and sediment transport. | Construction of a port is likely to effect longshore sand movement. An inshore harbour site may have a lesser effect on sand movement than an offshore facility comprising a substantial breakwater.<br>Further studies are underway including investigations into:<br>• ocean circulation and shoreline movement of sand;<br>• beach erosion and accretion, and<br>• sand management including sand bypass.<br>A coastal management plan for the locality will be necessary. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard shorelines stability.<br>The characteristics of the present shore will be permanently changed, and further investigations are underway into the coast's dynamics so as to develop engineering solutions to prevent erosion, and to ensure management of transported sand. These investigations remain imperative both to the adequate siting of a port, and for the longterm management of coastal processes.<br>The Port Authority could be made responsible to ensure preparation, and implementation of a coastal management plan. The plan should be open to community input and involvement and should address community recreational needs. |
| **Marine Fauna** | Extent of port area.<br><br>The suggested port would require construction of a breakwater up to 2km in length, and at its deepest, 140m at the base in 20m of water. A smaller internal breakwater would be necessary, accompanied by 18ha of reclaimed area. An inshore port option would require a breakwater of 1km and a dredged shipping channel. | To maintain the abundance, species diversity and geographic distribution of marine fauna. | Marine habitat is similar to that recorded in the 'Geraldton' offshore area, and along the coast generally. Reef and reef pavement provide shelter and refuges for puerulus, juvenile and adult rock lobster.<br>About 160ha of reef and limestone pavement may be permanently removed by breakwaters, harbour basin and reclaimed areas.<br>The inshore port option may see the loss of 115ha.<br>The inshore option will require extensive dredging, the offshore option less, but both would cause the loss of current marine fauna, flora and habitat. | The marine habitat in the vicinity of the port will be significantly changed, and the composition of the fauna will alter.<br>In terms of significant effect upon the western coast marine environment there is unlikely to be an observable impact.<br>Some species will utilise the breakwater as new habitat, and this may include rock lobster.<br>Current fish habitat will change, but the breakwater should provide habitat for recreational species.<br>Therefore the quality of the water body within and adjacent to the port will need to be monitored and managed.<br>Ships painted with toxic pervasive antifoulants like tributyl-tin should have restricted access to the port. (Under present international law it may not be possible to deny access, but incentive action is needed to encourage 'environmentally friendly' vessels).<br>It would be expected that the dredging and disposal of dredged material will be undertaken to accord with the relevant guidelines for pristine substrates in the 'Draft ANZECC Guidelines for the Dredging and Disposal of Spoil'. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to marine fauna.<br>While the port will locally have a significant effect modifying a presently pristine marine environment, thus changing the composition and numbers of marine fauna, the impact will be localised and not extend much beyond the port vicinity and access channel.<br>Some species including rock lobster may partly recolonise the breakwater. Recreational fishing may be advantaged.<br>Port Management could be made responsible for ongoing monitoring and management of the water body within the port and adjacent waters. Management steps to prevent port access to ships protected by pervasive marine toxic anti-foulant paints (eg TBT) would need to be strongly encouraged.<br>A port development involving dredging would need to accord with the relevant provisions for pristine substrates in the 'Draft ANZECC Guidelines on the Disposal of Dredged and Excavated Material'. |
| **Seagrass** | Extent of port area.<br><br>No seagrass meadows, but up to 30ha of habitat containing algal communities could be effected. | To maintain the abundance, species diversity and geographic distribution of seagrass. | No seagrass meadows have been identified in the general port locality. Some individual seagrass types will be removed (25-30ha) by the port development. | Seagrass meadows will not be impacted. Individual seagrass species in clumps or associated with algae will be lost, but may recolonise parts of the harbour basin. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to seagrass.<br>No seagrass meadows would be impacted by a port nor is it likely that seagrasses and associated algae communities would be adversely effected. |
| **Macroalgae** | Extent of port area.<br><br>Seaweed is prevalent on the coast where it contributes to nutrient recycling. | To minimise interference with the process of nutrient and carbon cycling from beach-cast seaweed. | Presently substantial amounts of seaweed accumulate on local beaches and are likely to be significant sources of nutrients and carbon for nearshore ecosystems. Some nitrogen input to the marine waters comes from groundwater. | The distribution of seaweed accumulating on beaches will change but the availability of nutrients and carbon should remain unaffected.<br>The accumulation of seaweed can cause offensive odours, and further investigations are necessary to determine how to reduce odours yet ensure that beach-cast (in particular) is returned to the marine ecosystem.<br>Monitoring will be necessary.<br>Seaweed drift and accumulation may pose operational problems for a port and further studies will be required. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to macroalgae.<br>The pattern of seaweed accumulation in the port locality will be altered and management steps will be required to ensure nutrients from this source are not lost to the marine environment.<br>Further studies are necessary to determine how to manage seaweed movement and accumulation, and to prevent offensive odours. |
| **Introduced Marine Organisms** | Extent of port area. | To minimise the risk of introduction of unwanted, non-indigenous marine organisms. | No introduced organisms observed to date. | Risk of ballast water and ships' hulls fouling introducing exotic marine organisms. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to introduced marine organisms.<br>The incidence, and the ongoing risk, of the introduction of exotic marine organisms from ships' ballast waters or from hull fouling, is under investigation by the CSIRO. The Australian Quarantine and Inspection Service (AQIS) has established an Australian Ballast Water Management Strategy which is being introduced through Australian ports with voluntary, but increasing, compliance by operators of foreign-going vessels. Hull cleaning is not permitted in Australian waters without port and environment agency approval. The AQIS Strategy includes ballast water handling guidelines. Concurrently the International Maritime Organisation is developing a ballast water management code which is likely to be introduced as part of the international convention to prevent pollution of the sea (MARPOL). This code covering all foreign-going vessels could be in place about the time a new port was established. |

| IMPORTANT ENVIRONMENTAL FACTOR | RELEVANT AREA | EPA OBJECTIVE | LOCALITY ENVIRONMENTAL CHARACTERISTICS OR RELATED ASPECTS | POTENTIAL MANAGEMENT | ADVICE TO MINISTER ON ENVIRONMENTAL MANAGEMENT |
|---|---|---|---|---|---|
| **Marine Water and Sediment Quality** | Extent of port area.<br><br>Marine water quality is near pristine.<br><br>Marine sediment is clean and unaffected by contamination. | To meet the requirements of the Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992).<br><br>Sediment criteria will be developed by the EPA.<br><br>In the longer term:<br><br>• to consider management of the port's waters and sediments based on the EQO's and EQC's from the Southern Metropolitan Coastal Waters Study (1996), as they arise. | The marine water quality is near pristine but high turbidity levels are common.<br><br>Sediment is contributed from time to time to the waters of the locality from the Buller and Oakajee Rivers, but it is unlikely to be chemically contaminated | Water quality may be potentially affected by oil spills, and accidental discharges from ships. Management techniques would need to be developed to minimise risks of this kind. Management will need to develop an accident response strategy.<br>During construction, and in the course of maintenance dredging either for an inside harbour or a more offshore facility, turbidity will affect local water quality. (The locality is subject to natural turbidity).<br>Modelling of harbour characteristics will demonstrate means to effect reasonable flushing of the harbour basin with the offshore harbour likely to have better flushing characteristics.<br>Wastewater both from onshore, and that generated within the harbour precincts, will need to be managed, as appropriate treated, and disposed to open water.<br>A water quality management plan, to include also the management of sediment, will be necessary.<br><br>Sediment in the harbour basin and shipping channel may become contaminated with antifoulant chemicals, particularly TBT if its use on ships is not limited.<br>The offshore harbour option is expected to have better flushing potential. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to marine water and sediment quality.<br>The water quality outside the harbour would need to be monitored and managed to ensure the quality is protected and the risk of contamination from spills or the inappropriate release of wastewater, is minimised.<br>The harbour basin will need to be modelled to ensure the design allows for adequate flushing.<br>The Port Authority would need to develop and implement a water and sediment management plan to include ongoing monitoring, wastewater treatment, accident response strategy and reporting provisions.<br><br>Sediment quality would need to be managed jointly with water quality management |
| **Dust** | Extent of port area and transport corridor.<br><br>Dust presently is minimal, although some sand dunes are mobile. Construction of a port will cause dust emissions if mitigation measures are not instituted. | To protect the surrounding land users such that dust emissions will not adversely impact upon their welfare and amenity or cause health problems and meet EPA Guidelines for Assessment and Control of Dust and Windborne Material from Land Development Sites (updated 1995), and the Environmental Protection Policy (Atmospheric wastes) (Kwinana). | The port locality is relatively remote (3.5km) from residences, and port development has the opportunity of being designed and constructed to minimise the emission of dust. | The application of best practice dust control in conjunction with dust minimisation design should mitigate against adverse impacts. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to dust.<br>A dust control program based on best management practices would need to be in place prior to any development/construction work affecting the landscape. The dust control program could be incorporated into a landcare management plan - as indicated above. |
| **Noise and Vibration** | Extent of port area and transport corridor.<br><br>Construction and operation of a port will cause noise and vibration if mitigation measures are not instituted. | To protect the amenity of nearby residents from noise and vibration impacts by ensuring that noise and vibration meet criteria in the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, and the proposed new Environmental Protection (Noise) Regulations (when promulgated). | The port locality is relatively remote (3.5km) from a noise sensitive premises. | The remoteness of the locality and the operation of best practice technology including noise attenuated machinery should minimise noise nuisance. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to noise and vibration.<br>The port locality is advantaged by being remote.<br>Noise reduction and control measures will need to be employed during any construction phase and an appropriate industry plan would need to be in place prior to the commencement of site activities causing noise. |
| **Public Health and Safety** | Port area and transport corridor to industrial estate, adjacent recreational beach areas. | To ensure risk is as low as reasonably achievable and complies with acceptable standards. The EPA's criteria for the assessment of the fatality risk of proposed hazardous and industrial developments are outlined in Bulletins 611 and 627. | The closest residence is 3.5km, and the nearest settlement -Drummond Cove- is 6km. Intensively used recreational areas are more than 3km from the locality.<br>The establishment of a port is likely to be accompanied by a community desire to use it for recreational purposes. | In the short-term port activity should not cause harm either to residents 3.5km away, or to recreational users. In the long-term if the port is used to handle hazardous substances, restriction to public access, recreation and other risk avoidance steps might be necessary.<br>An early decision on public access to breakwaters and the harbour basin for recreational use will be expected by the community.<br>A modern port of this kind should be designed for all contingencies with the goal to significantly minimise risk to life and property<br>During construction of a port and its land based components best practice risk minimisation techniques will need to be employed.<br>Construction and operation of the port would comply with statutory requirements. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to public health and safety.<br>The construction and operation of a port will be expected to comply with all relevant statutory requirements.<br>A modern port should be designed to withstand incidents arising from all reasonably foreseeable natural and human influenced events. Contingency plans will need to be devised to minimise risk to life and property.<br>An early decision on public access for recreational pursuits should be made.<br>Port design should provide for the adequate handling of hazardous materials into the long term.<br>The Port Authority must prior to commissioning of shipping operations have instituted a 'Port Safety Plan'.<br>Public access, including recreational uses of the port and its precincts might have to be restricted from time to time depending on port activity and risk assessment. The community should be both aware at the outset of this likelihood and involved in the preparation of the 'Port Safety Plan'. |
| **Heritage** | Marine and foreshore areas. | To comply with statutory requirements in relation to areas of cultural and historical significance. | Coastal ethnographic and archaeological site surveys are being finalised for the general locality. | On shore activities have the potential to disturb significant sites. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to heritage.<br>Any port development would be expected to comply with relevant statutory requirements for significant sites and implement a Heritage Management Plan. |
| **Recreation** | Coastal strip from the Buller to Oakajee Rivers. | The concept should not compromise recreational uses of the area, as developed by planning agencies. | Coastal orientated recreation (including fishing, surfing, swimming, diving, windsurfing) are commonplace north of the locality at Coronation Beach. Minimal recreation is observed in the proposed port locality. | The development of recreational facilities in the port locality is not planned, and if a inshore port facility is chosen, recreation might be precluded for 1.5km of coastline between the Buller and Oakajee Rivers. | At this strategic stage, it is likely that implementation of the port concept plan is capable of being managed so as not to compromise the EPA's objective with regard to recreation.<br>It is to be expected that the public will seek access to parts of the port for recreation, including fishing and diving. An early decision on access to port areas is necessary, and community participation in development of a 'Port Safety Plan' should be facilitated. A Recreation Plan should also be developed. |

**TABLE 2 (CONT.) : RELEVANT FACTORS, EPA OBJECTIVE, POTENTIAL MANAGEMENT AND ADVICE TO MINISTER**

# Appendix 1

## Figures

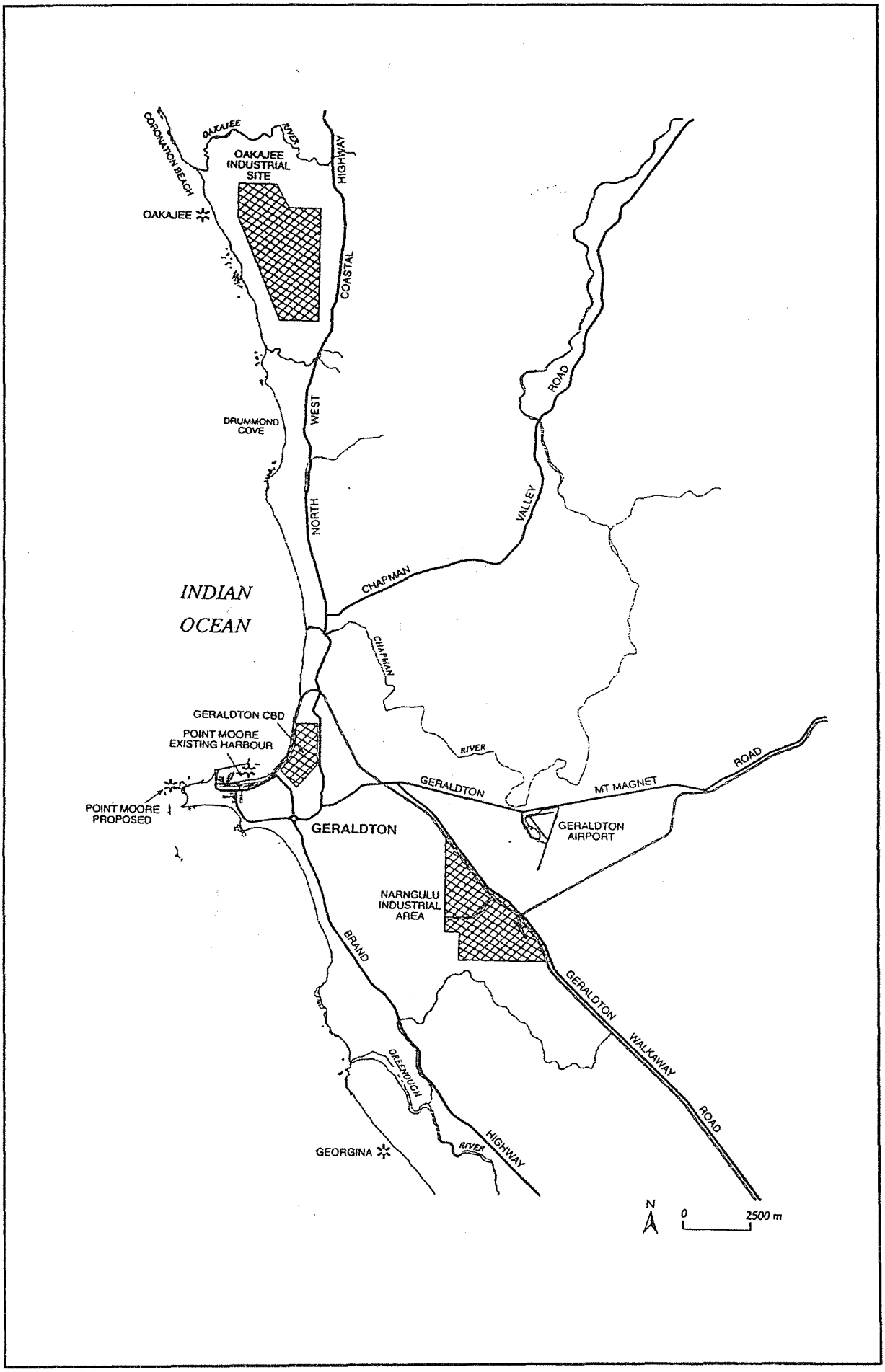


*Figure 1. Regional Location - Oakajee Deepwater Port Concept (Source: Geraldton Region Plan, Industry and Port Sites Study, 1996)*

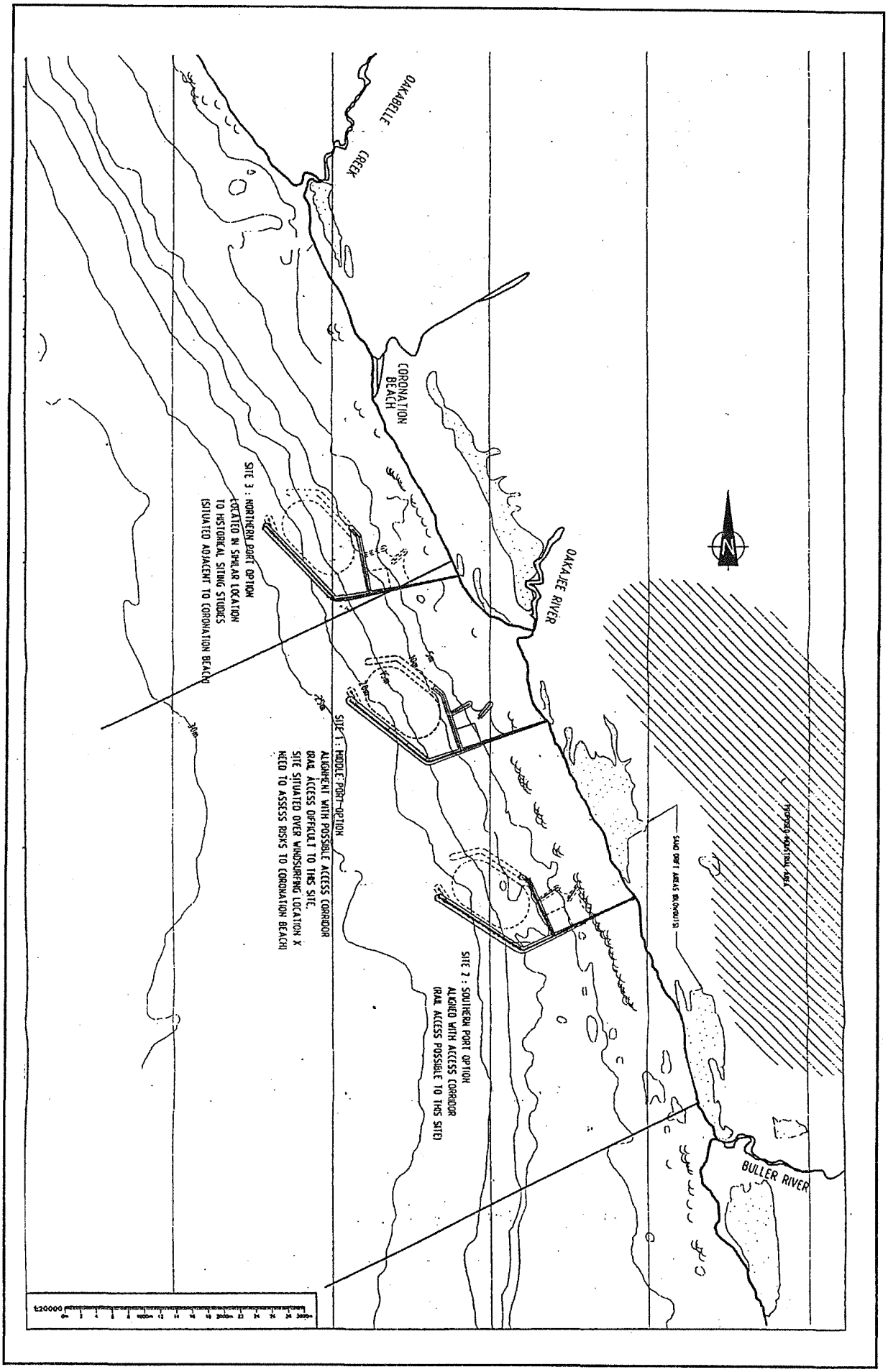


*Figure 2. Oakajee Deepwater Port Concept - Siting Options (Source: Oakajee Deepwater Port Concept, 1997)*

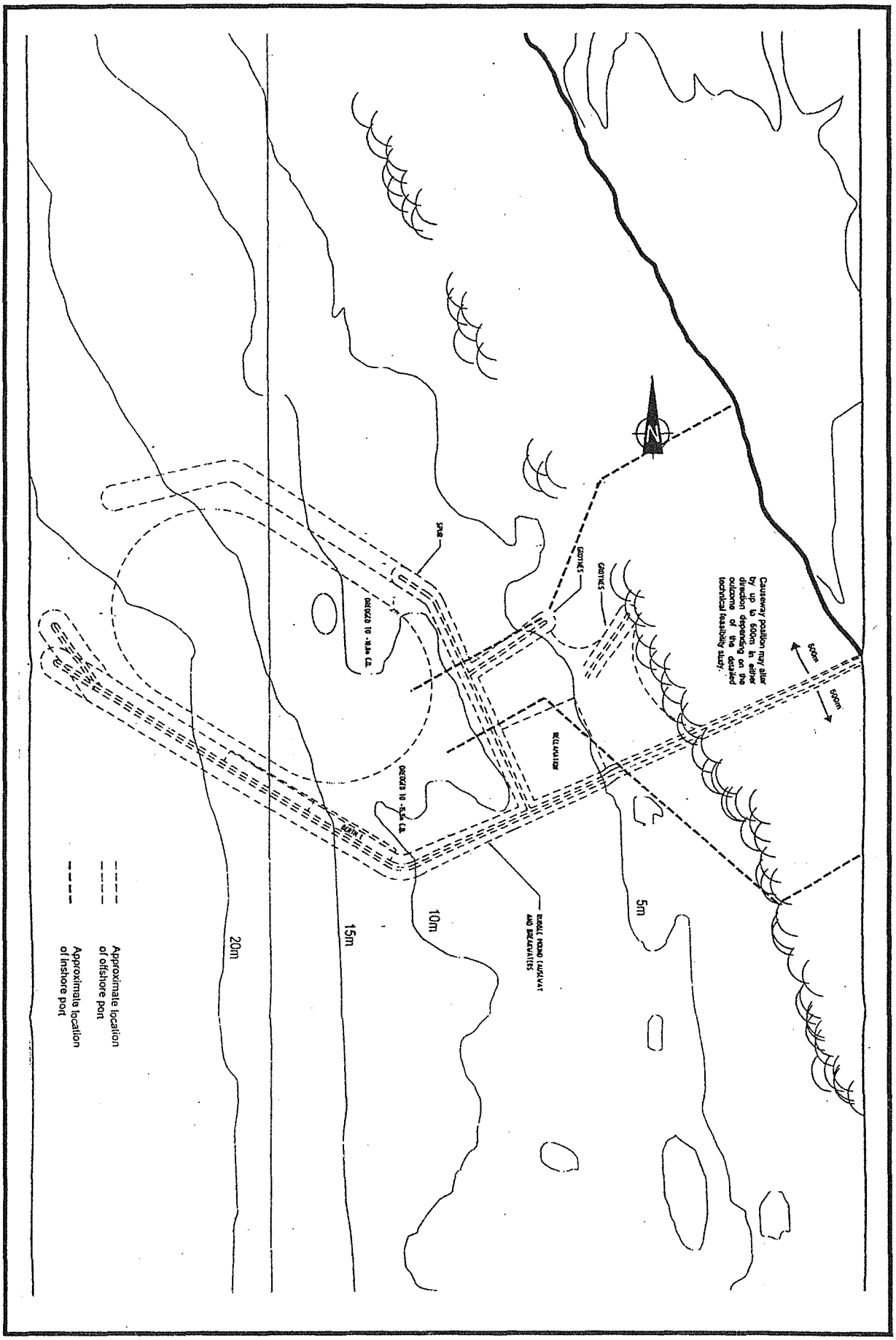


*Figure 3. Oakajee Deepwater Port Concept Outline - Offshore and Inshore Options (Source: Oakajee Deepwater Port Concept, 1997)*

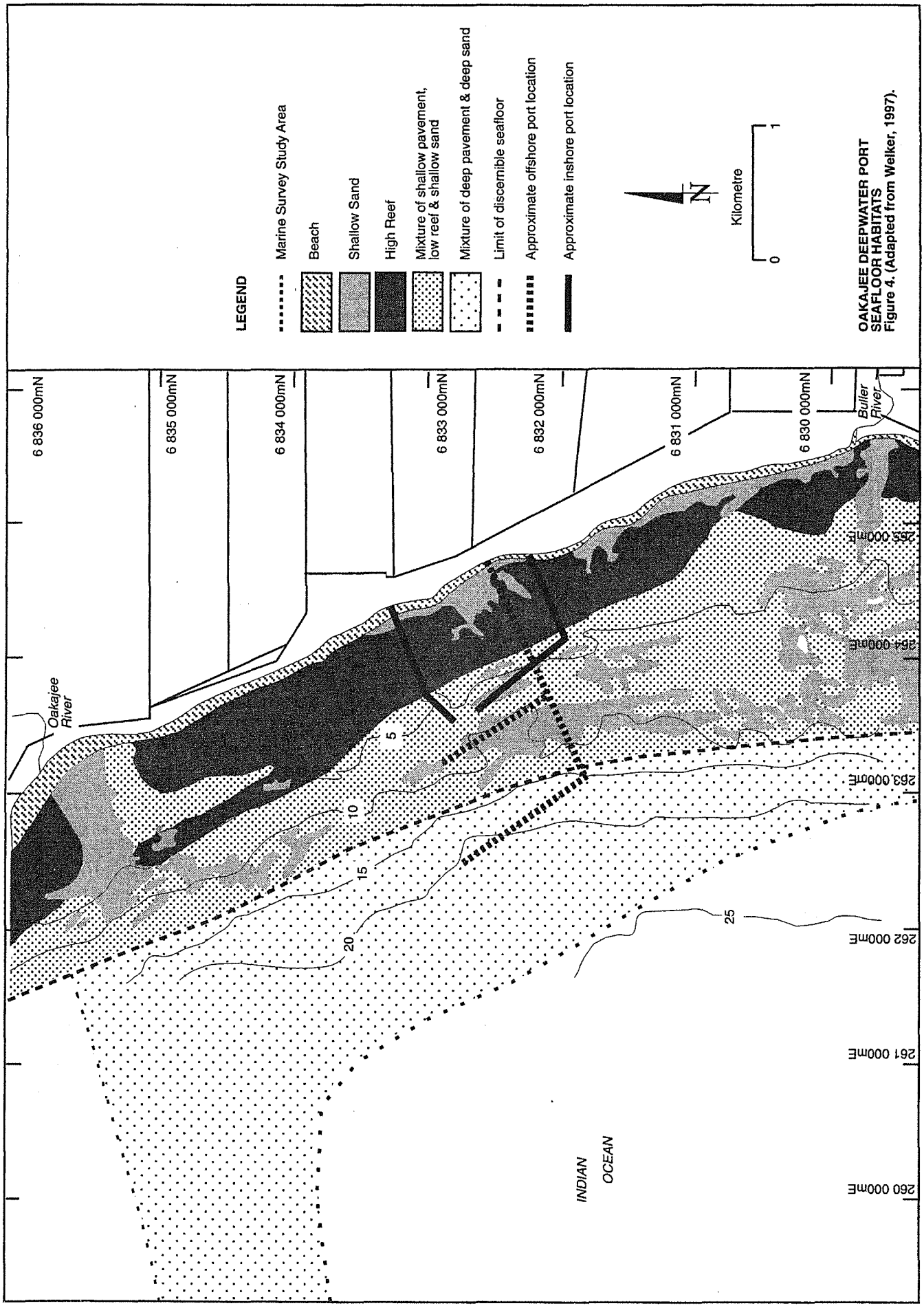


*Figure 4. Oakajee Deepwater Port - Seafloor Habitats (Source: Oakajee Deepwater Port Concept, 1997).*

## Appendix 2

## List of Government Agencies Consulted

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Aboriginal Affairs Department
Department of Conservation and Land Management
Department of Minerals and Energy
Department of Transport
Fisheries Department
LandCorp
Ministry for Planning
Main Roads Western Australia
Westrail

## Appendix 3

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