

**Metropolitan Region Scheme Amendment  
No. 1010/33 - Port Catherine**

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**Western Australian Planning Commission**

**Report and recommendations  
of the Environmental Protection Authority**

**Environmental Protection Authority  
Perth, Western Australia  
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## Summary and recommendations

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the proposed Metropolitan Region Scheme (MRS) Amendment 1010/33 – Port Catherine. The Port Catherine MRS Amendment has been initiated by the Western Australian Planning Commission (WAPC) to facilitate the redevelopment of the former South Coogee industrial area into the Port Catherine marina and residential estate.

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposed scheme amendment and on the conditions and procedures to which the proposed scheme amendment should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

### Relevant environmental factors

The EPA decided that the following environmental factors are relevant to the Amendment and required detailed evaluation:

- (a) Terrestrial flora;
- (b) Marine flora (seagrass);
- (c) Coastal Processes – foreshore (beach) and seabed;
- (d) Marine water and sediment quality;
- (e) Soil and groundwater contamination;
- (f) Construction impacts – dust, noise and vibration;
- (g) Railway noise;
- (h) Visual amenity; and
- (i) Long-term management

There were a number of other factors which were also relevant to the Amendment, however, the EPA was of the view that the information set out in Appendix 3 provided sufficient evaluation for these factors.

### Conclusion

The EPA has considered the proposed Port Catherine MRS Amendment initiated by the WAPC.

The EPA notes that if the proposal is implemented, there will be requirements for the preparation of detailed environmental management plans to meet environmental objectives for terrestrial flora, soil and groundwater contamination, noise from railway transport, and landscape amenity. The EPA also notes that vigilant on-going environmental management of coastal processes (beach and seabed) and marine water and sediment quality will be necessary to meet environmental objectives.

The EPA has concluded that implementation of the proposed Port Catherine MRS Amendment would be unlikely to compromise EPA objectives, provided that there is satisfactory implementation of the recommended environmental conditions as set out in Appendix 4 and summarised in Section 4.

### **Recommendations**

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the scheme amendment being assessed is the rezoning of the former South Coogee industrial area, together with a portion of the Owen Anchorage 'Waterways Reservation', to 'Urban' under the Metropolitan Region Scheme (together with a number of minor supporting amendments) to facilitate the remediation of the land and its redevelopment into the Port Catherine marina and residential estate;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that implementation of the proposed Port Catherine MRS Amendment would be unlikely to compromise EPA objectives, provided that there is satisfactory implementation of the recommended environmental conditions as set out in Appendix 4 and summarised in Section 4.
4. That the Minister imposes the conditions recommended in Appendix 4 of this report.

### **Conditions**

Having considered the amendment provisions proposed by the WAPC, and after assessment of the relevant environmental factors (as detailed in this report), the EPA has developed a set of recommended conditions to be imposed if MRS Amendment 1010/33 – Port Catherine is approved. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) Preparation and implementation of the following Management Programs and Plans:
  - Remedial Works Management Program;
  - Construction Management Program;
  - Waterways Environmental Management Program; and
  - Noise and Vibration Management Plan;
- (b) Resolution of the responsibilities for the on-going environmental management of the proposed marina.

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# 1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the proposed Metropolitan Region Scheme (MRS) Amendment 1010/33 – Port Catherine. The Port Catherine MRS Amendment has been initiated by the Western Australian Planning Commission (WAPC) to facilitate the redevelopment of the former South Coogee industrial area into the Port Catherine marina and residential estate.

MRS Amendment No. 1010/33 – Port Catherine was initiated by the WAPC in February 1999 and referred to the EPA in accordance with Section 33E of the *Metropolitan Region Town Planning Scheme Act 1959*. After considering the number of significant environmental issues raised by the proposal, including soil contamination, coastal impacts, remnant vegetation and seagrass meadows, the EPA set a level of assessment on the amendment proposal of ‘Scheme Assessed – Environmental Review Required’ in March 1999.

An Environmental Review document was prepared by the WAPC (*Port Catherine Environmental Review* (Western Australian Planning Commission, 2001)) and released for public comment from 20 November 2001 to 1 March 2002. Although approximately 350 submissions raised issues of a general environmental nature, 62 submissions raised environmental issues for which a response was warranted. Appendix 5 contains a summary of submissions and the response to these submissions from the WAPC. The summary of submissions and responses are included as a matter of information only and do not form part of the EPA’s report and recommendations. Issues arising from this process that have been taken into account by the EPA, appear in the report itself.

In compiling this report, the EPA has considered the environmental factors associated with the proposed scheme amendment, issues raised in the public submissions, specialist advice from the Department of Environmental Protection (DEP) and other government agencies, the response to submissions prepared by the WAPC and the research and expertise of EPA members.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the environmental factors relevant to the proposal. The Conditions to which the proposed scheme amendment should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice from the EPA, Section 6 presents the EPA’s conclusions and Section 7, the EPA’s Recommendations.

## 2. The proposed scheme amendment

The proposed scheme amendment that has been assessed by the EPA, and summarised in this report, is known as Metropolitan Region Scheme (MRS) Amendment No. 1010/33 – Port Catherine. The area where this amendment is proposed to occur is situated on the coast at Owen Anchorage, 4.5 kilometres south of Fremantle. The subject land is generally bounded by the disused, heritage listed South Fremantle Power Station and the freight railway line to the north, the limestone ridge within the Coogee Open Space area to the east, the Coogee Beach Reserve and northern edge of the Cockburn Waters residential estate to the south, and the western extent of the proposed ocean marina to the west (refer to *Figure 1: Aerial Photograph of the Amendment Area*).

The scheme amendment proposes the following changes to the MRS (refer to *Figure 2: Proposed MRS Amendments*):

- Rezone land from the ‘Industrial’ zone and the ‘Parks and Recreation’ reserve as well as an off-shore portion of Owen Anchorage to the ‘Urban’ zone;
- Re-align and extend the existing ‘Primary Regional Road’ reserve through an existing ‘Parks and Recreation’ reserve so that it deviates around the proposed ‘Urban’ zone. This will allow Cockburn Road to be diverted around the proposed ‘Urban’ zone;
- Rezone two portions of land to the ‘Industrial’ zone. One is a thin corridor of ‘Parks and Recreation’ reserve between Cockburn Road and the ‘Primary Regional Road’ reserve, and the other portion is a currently a combination of ‘Primary Regional Road’ and ‘Parks and Recreation’ reserves that will lie between the proposed new ‘Primary Regional Road’ alignment and the railway reserve;
- Rezone a narrow strip of ‘Railways’ reserve along the coast to the ‘Urban’ zone and a small portion of it to the ‘Primary Regional Roads’ reserve; and,
- Rezone a strip of land along the northern border of the railway reserve from ‘Industrial’ to ‘Parks and Recreation’.

The proposal involves rezoning the majority of the subject site from the ‘Industrial’ zone to the ‘Urban’ zone. The land currently zoned ‘Industrial’ is the former South Coogee industrial area, which is now vacant, largely devoid of vegetation, and contaminated from previous noxious industrial operations (refer to *Figure 3: Existing Environment*).

A detailed description of the proposed amendment, including a description of the existing environment within and surrounding the amendment area, potential environmental impacts and strategies for management of those impacts, is provided in the WAPC document: *Port Catherine Environmental Review* (Western Australian Planning Commission, 2001).

It is important to note that the proposed MRS Amendment is also accompanied by the Port Catherine Concept Plan (refer to *Figure 4: Port Catherine Concept Plan*). In its environmental assessment of the proposed new MRS zones and reserves, the EPA was mindful of the land uses that are proposed for these zones and reserves, as depicted in the Concept Plan.

The main characteristics of the proposal are summarised in Table 1 below.

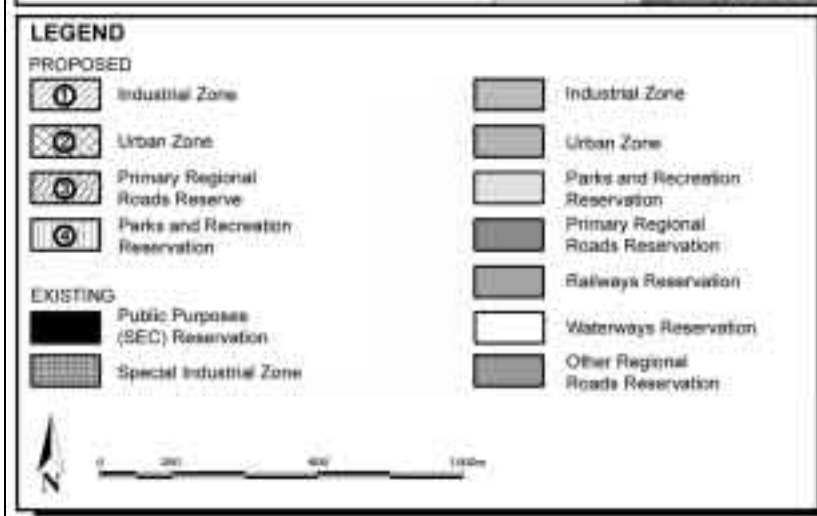
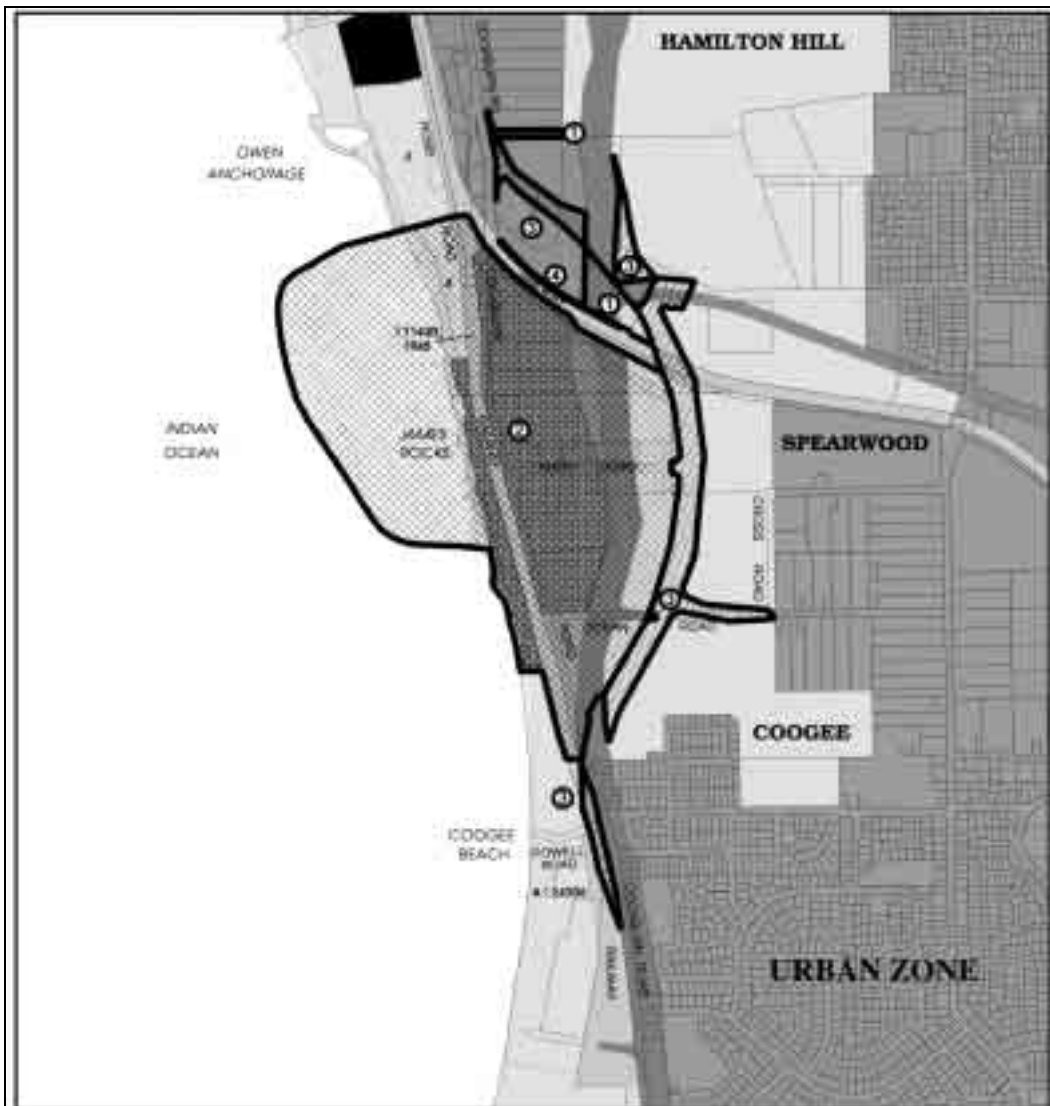
**Table 1 – Summary of key proposal characteristics**

<b>Element</b>	<b>Description</b>
Total area of land	Approximately 100 hectares
Existing land uses	Vacant industrial land Infrastructure (roads, railway, high voltage power lines etc.) Unconstructed road and railway reserves Beeliar Regional Park Coogee Open Space Foreshore reserve Waterways reserve
Local Government	City of Cockburn
Existing zoning or reservation under the Metropolitan Region Scheme	Industrial Zone (including Special Industrial Zone) Parks and Recreation Reserve Waterways Reservation Primary Regional Roads Reserve Other Regional Roads Reserve Railways Reserve
Proposed scheme modifications	<ul style="list-style-type: none"> <li>○ Rezone land from the ‘Industrial’ and ‘Parks and Recreation’ zones as well as an off-shore portion of Owen Anchorage to the ‘Urban’ zone;</li> <li>○ Re-align and extend the existing ‘Primary Regional Road’ reserve through an existing ‘Parks and Recreation’ reserve so that it deviates around the proposed ‘Urban’ zone. This will allow Cockburn Road to be diverted around the proposed ‘Urban’ zone;</li> <li>○ Rezone two portions of land to the ‘Industrial’ zone. One is a thin corridor of ‘Parks and Recreation’ reserve between Cockburn Road and the ‘Primary Regional Road’ reserve, and the other portion is a currently a combination of ‘Primary Regional Road’ and ‘Parks and Recreation’ reserves that will lie between the proposed new ‘Primary Regional Road’ alignment and the railway reserve;</li> <li>○ Rezone a narrow strip of ‘Railways’ reserve along the coast to the ‘Urban’ zone and a small portion of it to the ‘Primary Regional Roads’ reserve; and,</li> <li>○ Rezone a strip of land along the northern border of the railway reserve from ‘Industrial’ to ‘Parks and Recreation’.</li> </ul>
Proposed environmental management measures	<ul style="list-style-type: none"> <li>○ Preparation and implementation of the following Management Programs and Plans: <ul style="list-style-type: none"> <li>- Remedial Works Management Program;</li> <li>- Construction Management Program;</li> <li>- Waterways Environmental Management Program; and</li> <li>- Noise and Vibration Management Plan;</li> </ul> </li> <li>○ Resolution of the responsibilities for the on-going environmental management of the proposed marina.</li> </ul>





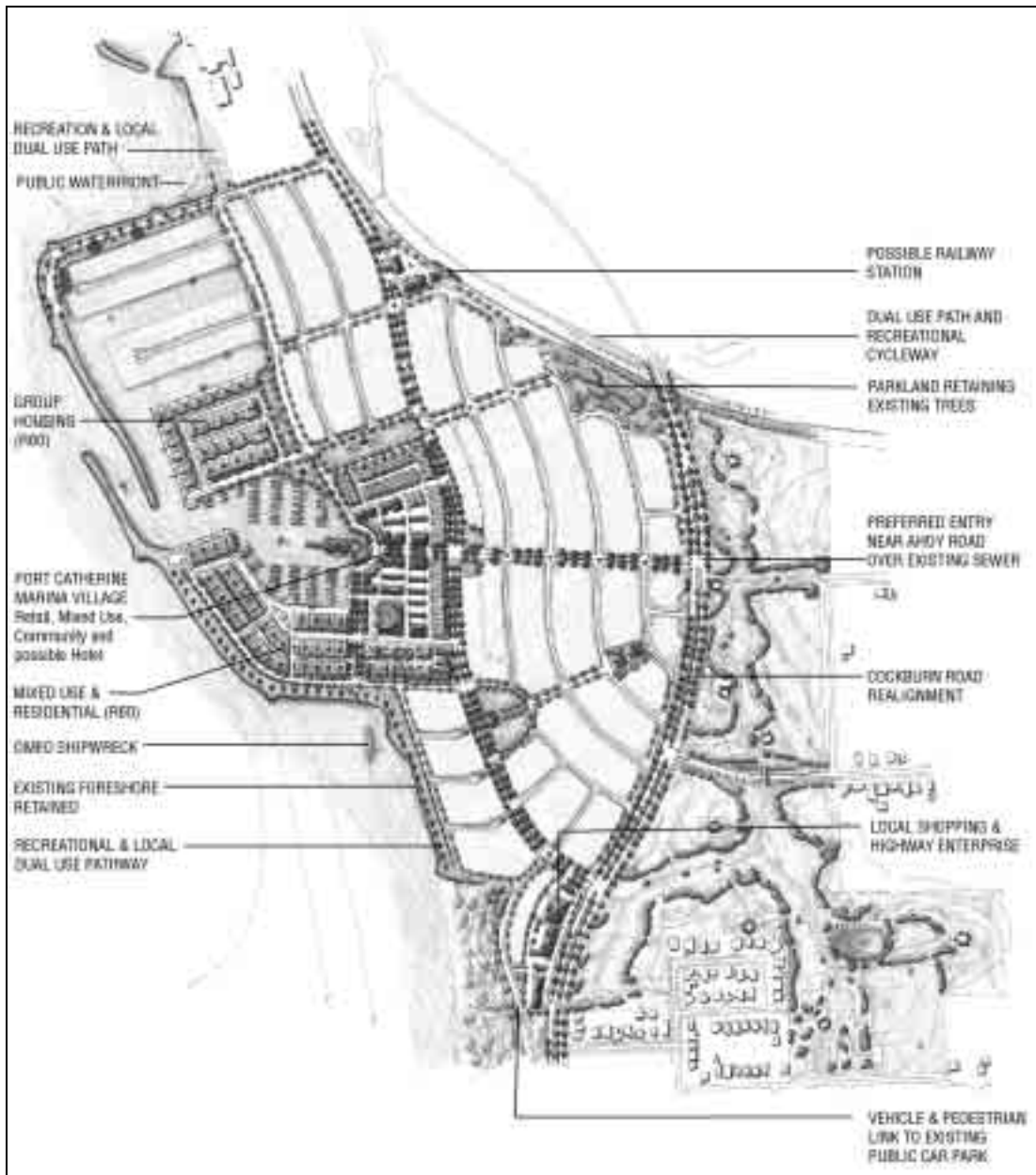
**Figure 1:** *Aerial Photograph of Amendment Area*



***Figure 2: Proposed Metropolitan Region Scheme Amendments***



***Figure 3: Existing Environment***



**Figure 4:** Port Catherine Concept Plan

### **3. Relevant environmental factors**

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposed scheme amendment and on the conditions and procedures to which the proposed scheme amendment should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The identification of relevant environmental factors requiring detailed evaluation in this report (see below) is summarised in Appendix 3. The EPA is of the view that the information in Appendix 3 is sufficient for those factors not discussed in detail below.

It is the EPA's opinion that the following environmental factors are relevant to the proposal and require detailed evaluation in this report:

- (a) Terrestrial flora;
- (b) Marine flora (seagrass);
- (c) Coastal Processes – foreshore (beach) and seabed;
- (d) Marine water and sediment quality;
- (e) Soil and groundwater contamination;
- (f) Construction impacts – dust, noise and vibration;
- (g) Railway noise;
- (h) Visual amenity; and
- (i) Long-term management

The above relevant factors were identified from the EPA's consideration and review of all environmental factors generated from the Environmental Review document, submissions received, and the characteristics of the proposed scheme amendment.

Details on the key environmental factors and their assessment are contained in Sections 3.1 - 3.9. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

#### **3.1 Terrestrial flora**

##### ***Description***

While largely cleared, approximately 9 hectares of native vegetation remains within the amendment area. Most of this vegetation occurs in fragmented patches and ranges in condition from 'Very Good' to 'Completely Degraded'. Implementation of the proposed MRS Amendment will lead to the clearing of the majority of this vegetation through the construction of the primary regional road, the proposed Port Catherine residential estate and development of the proposed new industrial zone (refer to *Figure 5:Vegetation Map*).

The most significant areas of native vegetation that would be cleared through implementation of the Amendment are associated with the proposed deviation of the 'Primary Regional Road' reserve through Beeliar Regional Park. This new road reservation would lead to the permanent loss of 3.2 hectares from the Park, of which, approximately 1.1 hectares contains native vegetation, and most of the remaining 2.1 hectares is a derelict quarry. Approximately 0.6 hectares of this vegetation to be removed from within Beeliar Regional Park is also identified for protection as part of Bush Forever Site No.247 (WAPC, 2000). Vegetation that would be removed from Beeliar Regional Park varies in condition from 'Good' to 'Degraded'.

To mitigate the effects of losing approximately 1.1 hectares of native vegetation from Beeliar Regional Park it is proposed to revegetate at least an equivalent area of bare land within the Bush Forever portion of Beeliar Regional Park, adjacent to the proposed Primary Region Road reservation.

The other main areas of native vegetation that would be cleared through implementing the Amendment consist of patches of coastal dune vegetation or Acacia scrub or heath ranging in condition from 'Good' to 'Completely Degraded'. These areas of vegetation occur in areas earmarked for part of the Port Catherine residential estate.

The only other notable area of native vegetation that would be impacted by the Amendment is a small patch (approximately 0.4 hectares) of Acacia scrub, in good condition, that has been identified as Floristic community 29b. The majority of this area of vegetation lies within the proposed new alignment of the 'Primary Regional Road' reserve.

### ***Submissions***

Several public submissions claimed that the patches of remnant vegetation within the site, although degraded, still had conservation significance. The coastal dunes, and associated patches of native vegetation, were specifically raised in several submissions. In response to these concerns, additional vegetation survey work was conducted, which led to the revision of the vegetation map (refer to Figure 5). The new vegetation map identifies approximately 4 hectares of beach and coastal dune vegetation, ranging in condition from very good to completely degraded, that was not addressed in the Environmental Review document.

Another issue raised in submissions was that the coastal dunes in the north of the amendment area are relatively tall compared to the other dunes of Owen Anchorage, and should therefore be given a higher conservation status.

Several submissions, including one from the Department of Conservation and Land Management (CALM), also raised the concern that the proposed 1.1 hectares of revegetation was insufficient compensation for the loss of 3.2 hectares from Beeliar Regional Park. The position taken by CALM is that compensation should be based on the area of regional open space being lost, not just on the area of native vegetation being lost.



### *Assessment*

The EPA's environmental objective for this factor is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.

With respect to the issue raised in submissions that the northern dunes and their vegetation are unique as a result of being higher than surrounding dunes, the WAPC has acknowledged this difference in height, but states that it does not affect the conservation value of the dunes. The EPA does not consider this to be a significant issue.

In general, given the fragmented and largely degraded nature of the native vegetation that would be impacted by implementing the Amendment, the EPA is of the view that its objective for terrestrial flora can be met through management of the proposal.

However, the EPA is of the view that the mitigation proposed by the WAPC for the loss of vegetation from Beeliar Regional Park (as a result of the proposed 'Primary Regional Roads' reservation) is insufficient for the following reasons:

- it only accounts for the amount of native vegetation that will be lost from Beeliar Regional Park (approximately 1.1 hectares) and not for the total area being lost from the Park (approximately 3.2 hectares);
- it is only proposed to revegetate an area adjacent to the proposed Primary Regional Road reservation, which may not be the best location for meeting conservation objectives; and
- it doesn't account for the loss of other areas of vegetation within the amendment area, such as the loss of approximately 4 hectares coastal dune vegetation and the loss of approximately 0.4 hectares of Floristic Community Type 29b. Floristic Community Type 29b is poorly reserved and has a conservation status of 'susceptible' (WAPC, 2001).

To address these matters, the EPA recommends that:

- an area greater than simply the area of vegetation to be cleared should be revegetated in a location acceptable to the Department of Conservation and Land Management, to mitigate the effect of the proposed reduction in area of Beeliar Regional Park;
- the proposed parkland areas along the southern boundary of the railway and along the outside of the eastern edge of the amendment area should include areas of native vegetation to mitigate the areas of coastal dune vegetation that will be cleared to make way for residential development. These areas should include the maximum area that can be retained from the patch of Floristic community 29b that lies south of the railway, partially along the proposed alignment of the 'Primary Regional Roads' reservation.

These strategies for mitigating impacts on terrestrial flora communities should be detailed in a Vegetation Management Plan that is to be prepared prior to the approval of any development or subdivision within the amendment area.



Figure 5: Vegetation Map

### ***Summary***

Having particular regard to the:

- (a) Fragmented and degraded nature of most of the native vegetation within the amendment area; and
- (b) The proposed areas of remnant vegetation that would be revegetated as part of the amendment;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **3.2 Marine flora (seagrass)**

### ***Description***

MRS Amendment No. 1010/33 proposes to zone approximately 30 hectares of the Owen Anchorage 'Waterways' reservation to 'Urban' to allow for the construction of the Port Catherine marina. Within this area, there is approximately 0.3 hectares of *Posidonia sinuosa* seagrass meadow which would be lost if the proposal is implemented. Of this 0.3 hectares, 0.27 hectares is dense seagrass (>75% cover) and 0.03 hectares is scattered seagrass (<25% cover) (refer to *Figure 6: Marine Habitats*).

The marina also has the potential to impact on seagrass outside of the amendment area. This impact can occur through sediment plumes created at the time of construction, impacts on the seabed from altered wave action or shading from increased algal growth. Two areas of seagrass occur in the vicinity of the marina, the first is a small patch of less than 0.2 hectares of dense seagrass located 130 metres south of the proposed marina, the second is a large and dense seagrass meadow located 275 metres to the south and beyond (refer to *Figure 6: Marine Habitats*). The proposed marina has been modified from previous designs to avoid impacting these areas.

The proposed marina would also remove up to 20 to 30 hectares of potential seagrass habitat from Owen Anchorage by virtue of its direct footprint and its impacts on the seabed surrounding it (for a distance of approximately 100 metres from the outer seawalls).

### ***Submissions***

A number of submissions questioned the acceptability of the proposed seagrass losses, and whether the cumulative impacts of these losses had been adequately considered. Another prominent issue was the loss of the potential for seagrass to regenerate in the area of the amendment. The calculation of the areas of seagrasses within Owen Anchorage was also disputed.

Also raised in submissions was the potential for seagrass outside of the marina to be impacted by the proposal, both at the time of construction and through the on-going existence of the marina.

### ***Assessment***

The EPA's environmental objective for this factor is to maintain the ecological function, abundance, species diversity and geographic distribution of seagrasses.

In the response to submissions the WAPC has revised its previous statement that total seagrass meadows in Owen Anchorage appear to have increased by approximately 500 hectares since 1965. As this area of 500 hectares excluded losses experienced in Owen Anchorage East, the WAPC has now stated that net seagrass gains could be substantially lower than 500 hectares. Despite this, the EPA does acknowledge that seagrass meadows in Owen Anchorage have shown significant areas of growth since 1965.

The proposed amendment will result in the direct loss of 0.014% of the total seagrass meadows currently in Owen Anchorage and 0.05% of *Posidonia sinuosa* meadows currently in Owen Anchorage. In the context that there are net gains in seagrass meadows occurring elsewhere in Owen Anchorage, this impact is considered small enough to not compromise the EPA's objective, cumulative or otherwise.

With respect to loss of seagrass habitat, the proposed marina would remove less than 0.45% of the potential seagrass habitat within Owen Anchorage. On this basis, this impact is considered so small that it would not compromise the EPA's objective, cumulative or otherwise. The EPA also recognises that the potential for seagrass to regenerate within or immediately adjacent to the location of the proposed marina is low.

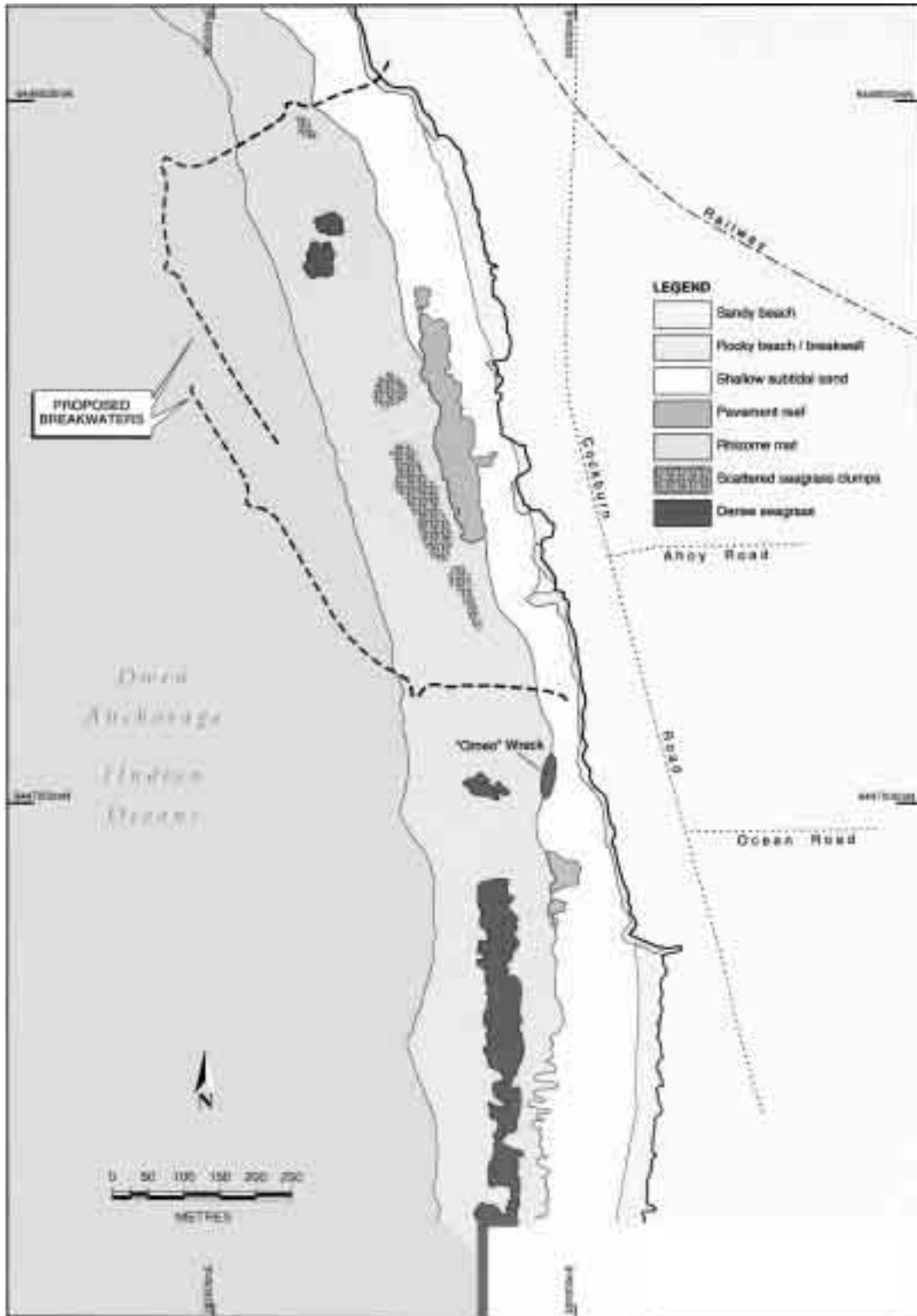
With respect to impacts of the proposed marina on seagrasses outside of the amendment area, the EPA is of the opinion that these impacts can be contained within 100 metres of the outer seawalls. Given that no existing seagrass occurs in this area (the closest being 130 metres to the south) this impact is also unlikely to compromise the EPA's objective for seagrass. Despite this conclusion, the EPA acknowledges that for these impacts to be contained within 100 metres of the marina, management during construction and on an on-going basis will need to be vigilant. To address this issue, it is noted that the WAPC proposes to prepare and implement a Construction Management Program and Waterways Environmental Management Program. These Programs are to contain provisions for potential impacts on nearby seagrass meadows to be monitored and managed during construction and in the future.

### ***Summary***

Having particular regard to the:

- (a) Relatively small area of seagrass and seagrass habitat that will be directly impacted by the proposed scheme amendment; and
- (b) The proposed mechanisms to protect nearby seagrass and seagrass habitat from indirect impacts,

it is the opinion of the EPA that the proposal can be managed to meet the EPA's environmental objective for this factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.



**Figure 6: Marine Habitats**

### **3.3 Coastal Processes – foreshore (beach) and seabed**

#### ***Description***

The proposed marina has the potential to modify the southerly movement of sand to Coogee Beach. This is expected to lead to the accumulation of sand along the northern edge of the marina, creating a new beach, and creating the potential for the flow of sand to Coogee Beach to be reduced. In addition to this, wave shadows formed adjacent to the southern seawall of the marina could cause erosion of the northern end of Coogee Beach.

It is proposed to manage the changes to beach dynamics at the northern end of Coogee Beach by piping sand from the north of the marina to the south of the marina. A sand bypassing pipeline is to be installed as part of the marina construction. It has also been proposed to establish a monitoring and management program that would allow for impacts of the marina on coastal processes to be managed on an on-going basis.

#### ***Submissions***

Several public submissions were received which expressed concern over the impacts the proposed amendment could have on coastal processes, particularly the erosion of Coogee Beach. A submission was also received from the Coastal Facilities Section of the Department for Planning and Infrastructure (DPI), which advised that the amount of sand required to maintain Coogee Beach is difficult to predict, and could exceed the amount nominated by the WAPC. DPI Coastal Facilities also advised that the proposed sand bypassing operation itself would need to be managed to avoid local impacts on beach users.

#### ***Assessment***

The EPA's environmental objective for this factor is to maintain the stability of beaches and ensure that no development has a significant impact on existing coastal processes, including off-shore sediment movement.

To comply with this objective, the WAPC prepared a coastal engineering study for the proposed amendment, which was used to model the impacts of the proposed marina on coastal stability. This modelling indicated that Coogee Beach is currently experiencing a small amount of net sand movement, and could therefore be slightly affected by a change to its sand supply regime. It has also been predicted that the proposed breakwater that would form the southern boundary of the proposed marina, may create a 'wave shadow' and rip currents that could erode the northern end of Coogee Beach.

To account for these potential impacts, the WAPC has proposed to install a permanent sand bypassing pipeline through the marina and has budgeted to pump up to 25,000m<sup>3</sup> of sand over the first five years from the north of the marina to the south of the marina. After the first five years it is proposed to hand over management of the marina to a more suitable long term management authority, together with a funding program. Sand bypassing would then continue to occur on an on-going basis as required.

The coastal engineering and modelling work has been reviewed by DPI Coastal Facilities. In response to its submission during the public review period, additional information was provided by the WAPC to allow further review of that work.

Although the exact extent of management that may be required as a result of the proposed marina has not been conclusively determined, DPI Coastal Facilities has now advised that the proposed monitoring and adaptive management approach, using sand bypassing options, can be used to acceptably manage impacts on coastal processes. Further to this, the EPA notes that the proposed management program needs to be prepared in detail, prior to development, and will require on-going implementation.

It is also noted that the monitoring and management program would need to address the potential environmental and social impacts arising from proposed management measures and contingency plans. For example, procedures for sand bypassing operations need to account for impacts on source areas and potential sediment plume impacts on receiving areas.

In addition to this, an adequate source of funding for implementing the required monitoring and management measures would need to be assured. This would need to include funding for the contingency options that may be needed after severe storms and other unpredictable events.

### ***Summary***

Having particular regard to the advice of the Coastal Facilities Section of the Department for Planning and Infrastructure, it is the opinion of the EPA that the proposed amendment can be managed to meet the EPA's environmental objective for this factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **3.4 Marine water and sediment quality**

### ***Description***

Implementation of the proposed amendment, and construction of the marina, has the potential to reduce the quality of the marine environment both within the proposed marina and in the waters surrounding it. This could occur as a result of the actual marina construction process, or through its on-going use.

The primary risks to the marine environment from the marina construction process are the creation of suspended sediment plumes that reduce light penetration, and the release of nutrients or contaminants into the water column from disturbing marine sediments.

The primary risks to the marine environment after construction are the prolonged retention of water and nutrients within the marina which could encourage excessive algae growth, and the potential for ongoing contamination of the marina from boating and other marina activities.

### ***Submissions***

Many submissions raised the general concern that water quality outside the marina will be impacted both during and after construction. A few submissions also questioned the methodology for predicting water quality within the proposed marina, whether the marina would have adequate flushing rates, and whether the proposed dredging and boating activities would pollute the water.

Several submissions also queried whether the proposed groundwater interception drain would simply shift the problems of the nutrient rich groundwater somewhere else.

### ***Assessment***

The EPA's environmental objective for this factor is to maintain or improve marine water and sediment quality consistent with the relevant Environmental Quality Objectives as defined in the Environmental Protection Authority document *Perth's Coastal Waters: Environmental Values and Objectives* (EPA, 2000).

It should be noted the document *Perth's Coastal Waters: Environmental Values and Objectives* (EPA, 2000) is a working document. As such, guidance in assessing this factor has also been taken from the *draft WA Guidelines for Fresh and Marine Waters* (EPA, 1993) and the *Southern Metropolitan Coastal Waters Study* (DEP, 1996).

To address the potential impacts from the marina construction process, it is proposed that procedures for monitoring and managing marine water quality will be detailed in a Construction Management Program prior to the commencement of development, and implemented at the time of construction. To control risks posed by sediment plumes, it is proposed to conduct daily visual monitoring during the relevant construction phases, and to monitor water turbidity at nearby seagrass meadows. Should turbidity levels reduce light reaching seagrass meadows to below the minimum requirements defined in the *Southern Metropolitan Coastal Waters Study* (DEP, 1996) the causing activity will cease until those minimum light requirements return.

To address the potential release of nutrients or contaminants during construction, the WAPC sampled sediment quality within the amendment area to determine the nature and extent of any contamination. This sampling revealed that the levels of contamination are low and can be readily managed by controlling the construction process. It is proposed to construct the outer seawalls of the marina prior to dredging the internal canals, as it is the dredging that will release the greatest amount of material into the water column. During dredging operations, temporary rock bunds or silt curtains will be installed across the marina entrance to ensure containment of suspended material. Soon after dredging operations cease, and after the larger suspended particulates have settled, the marina entrance will be opened to allow adequate flushing with outside waters so that acceptable water quality can be maintained.

To determine likely water quality within the marina after construction, i.e. during its operation phase, the WAPC undertook a dissolved inorganic nitrogen (DIN) modelling comparison between the proposed marina and the existing marinas of Success Harbour, Hillarys Boat Harbour and Jervoise Bay Northern Harbour. From this analysis it was predicted that the proposed marina would have comparable water quality to Hillarys and Success Harbours. Also, the modelled flushing times for the proposed marina were between those modelled for Success and Hillarys Harbours and less than half that of Jervoise Bay Northern Harbour.

The predicted water quality for the proposed marina is based on the operation of a subsurface cut-off drain immediately inland of the marina to reduce the flow of groundwater entering the marina (by reducing the groundwater head). This is required because the groundwater entering the coast in this region contains relatively high levels of nitrogen, which could lead to unacceptable levels of algal growth within the marina if it is not controlled. The nitrogen in the groundwater is a legacy from previous market gardening operations that have occurred inland of the amendment area.



The interception drain will need to be able to be operated during summer months, or as needed, for at least nine to twelve years. After this time nitrogen levels reaching the coast are expected to return to background levels. Water pumped from the drain will be used to irrigate nearby areas of public open space with the surplus re-injected back into the aquifer. Proposed sites for the re-injection bores have been strategically located so that the pumped water does not return to the marina and where they will not cause unacceptable levels of nitrogen elsewhere, particularly in coastal waters adjacent to the proposed marina (refer to *Figure 7: Effect of the Amendment and Groundwater Interception Drain on Groundwater Flow*).

With respect to the on-going threat of contamination entering the proposed marina, or surrounding marine environment, through marina and residential activities, a number of risks have been identified. These risks are stormwater inputs, boat spillages, leaching of boat materials and contaminated groundwater. Risks from stormwater, boat spillages and leaching have been investigated and are believed to be manageable through appropriate design and operation of the marina and the inclusion of facilities such as waste disposal and sewerage pumps. Groundwater contamination from previous industrial operations has been thoroughly investigated and examined using sampling and three-dimensional groundwater flow and contaminant transport modelling (refer to Section 3.5: *Soil and groundwater contamination*). The predicted contamination met DEP contaminated site assessment criteria (Department of Environmental Protection, 2000).

It is proposed to prepare and implement a detailed Waterways Environmental Management Program prior to the development of the proposed marina. The Waterways Environmental Management Program will require that the marine water and sediment quality, within the marina waterways, achieves the following Environmental Quality Objectives as defined in the Environmental Protection Authority document *Perth's Coastal Waters: Environmental Values and Objectives* (EPA, 2000):

- Maintenance of ecosystem integrity such that “moderate level” (E3) protection is met within the marina waterways;
- Maintenance of aquatic life for human consumption;
- Maintenance of primary contact recreational values;
- Maintenance of secondary contact recreational values; and
- Maintenance of aesthetic values

In meeting these objectives, the WAPC has agreed to apply the philosophy and approach suggested in the *Draft Environmental Quality Criteria Reference Document (Cockburn Sound)* (EPA, 2001). This approach will involve the ongoing comparison of water quality between the proposed marina and a suitable ‘pristine’ reference site to ensure that acceptable water quality is maintained.

### **Summary**

Having particular regard to the agreement of the WAPC to apply the approach and philosophy of the EPA’s draft Environmental Quality Criteria for Cockburn Sound, it is the opinion of the EPA that this scheme amendment could be managed to meet the EPA’s environmental objective for this factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

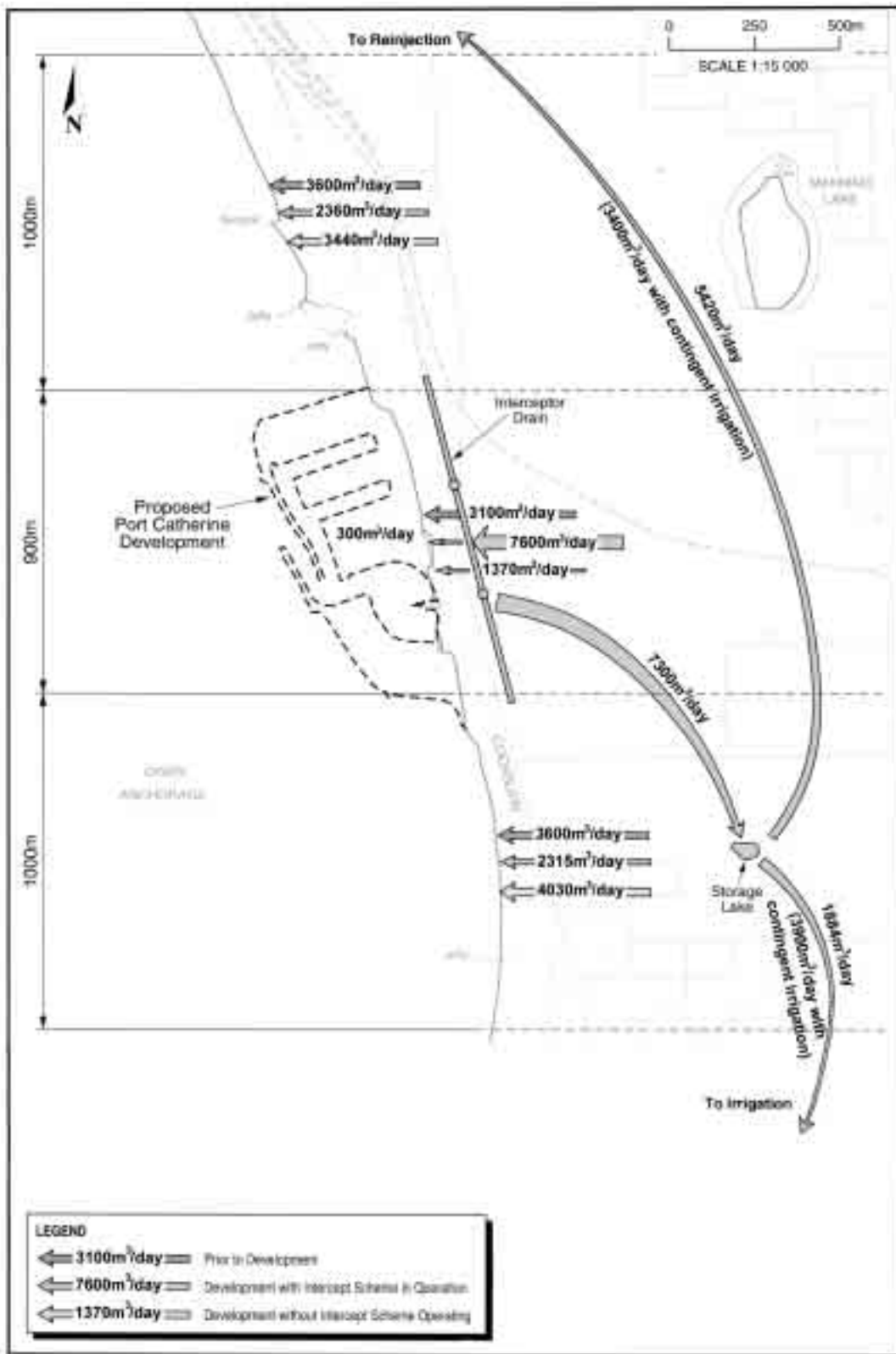


Figure 7: Effect of the Amendment and Groundwater Interception Drain on Groundwater Flow

### **3.5 Soil and groundwater contamination**

#### ***Description***

Previous industrial activities over much of the amendment area resulted in soil contamination including metals, hydrocarbons and pesticides. This Amendment will facilitate the clean up of this now disused industrial land, and its redevelopment for residential purposes.

The EPA has previously assessed the issue of soil and groundwater contamination over most of this site through Assessment No. 1004 – Bulletin 957, released in November 1999 (Environmental Protection Authority, 1999). That assessment involved the remediation of the government owned land in the Amendment area, and was subsequently approved by the Minister subject to conditions in April 2000. Through this MRS Amendment proposal the EPA has now considered the remediation of the non-government owned land, and how the remediation of the whole site will be integrated.

#### ***Submissions***

Many public submissions raised the soil contamination issue in a general sense. Nearly all of these supported the remediation of the land, but were non-technical in nature and did not specifically comment on the contamination assessment or remediation strategy. However, the submission from the Department of Health requested clarification on a number of the inputs into the Human Health Risk Assessment and indicated a possible threat from asbestos contamination that had not been addressed previously.

#### ***Assessment***

The EPA's environmental objective for this factor is to ensure that soil and groundwater quality at the site is acceptable to protect human health and the marine environment.

To address potential human health and environmental risks posed by contamination within the non-government owned land, the WAPC conducted a Site Contamination Assessment and Management Program, which involved the following elements:

- Soil and groundwater sampling to characterise contaminant concentrations in soil and groundwater;
- A Human Health Risk Assessment to determine the potential impact of contamination on the users of the land should it be developed for residential development;
- Fate and Transport modelling for all land within the amendment area, to assess the behaviour and movement of contamination, and to predict the potential impact on groundwater and its discharge into Owen Anchorage and the proposed marina;
- A Contamination Management Plan for areas identified as requiring remediation; and
- The integration of Port Catherine development contamination management strategy with the management of the surrounding government land within the amendment area.

The Human Health Risk Assessment and the Fate and Transport modelling identified a number of areas that would require remediation should the amendment be implemented. This remediation includes the removal of 3050m<sup>3</sup> of soils that exceed safe levels of contamination for human health, 227m<sup>3</sup> of wastes that have a negative aesthetic impact and 5000m<sup>3</sup> of uncontrolled fill (refer to *Figure 8: Soil Remediation*). These contaminated materials are to be disposed of off-site at approved landfill facilities.

Two small areas of sediments in the near shore area of the amendment site were also identified in the assessment to be contaminated. One area had elevated levels of arsenic, the other had elevated levels of chromium. For both these sites, the level of contamination was above the “Interim Sediment Quality Guidelines – Low” but below the “Interim Sediment Quality Guidelines – High” as defined in *Contaminated Site Assessment Criteria* (DEP, 2000). Should the proposed amendment proceed, this contamination would either be buried in-situ by approximately 7 metres of fill during marina construction, or transferred to the terrestrial portion of the proposed marina and buried. Both of these mechanisms would result in this contamination posing very little risk to human health or to the marine environment.

The nature and extent of contaminated groundwater beneath the site has been investigated through the construction and monitoring of 86 groundwater monitor bores and sampling from 17 offshore locations. It has been determined that residual contaminants from previous industrial operations at the amendment site do not dissolve freely into percolating rainwater or the underlying groundwater. Despite this, this amendment proposes the following strategies to ensure that groundwater contamination from previous industrial activities is managed:

- Source removal (removal of contaminated soils and uncontrolled fill);
- Free petroleum product floating on the groundwater will be recovered using skimmer bores;
- Natural renovation (soils and sediments on the site have substantial sorption capacities for trace metals in the groundwater);
- Monitoring and assessment through the preparation and implementation of a Groundwater Monitoring and Management Program; and
- Controls on future abstraction of groundwater as required.

Modelling of contaminated groundwater conducted by the WAPC has also shown that groundwater discharging into Owen Anchorage and the proposed marina will comply with water quality guidelines (even in the very long term) and will not affect the suitability of aquatic life for human consumption. To confirm this prediction, on-going marine water and sediment monitoring is to be undertaken as part of the implementation of the proposed Waterways Environmental Management Plan.

As mentioned previously in *Section 3.4: Marine Water and Sediment Quality*, groundwater in the region of the proposed amendment does contain a plume with elevated levels of nitrogen. This is not a result of previous industrial operations, but is a legacy from previous market gardening operations that have occurred inland of the amendment area. Since most of these market gardening operations have now ceased, nitrogen levels are expected to return to background levels within approximately 12 years. The impact of this elevated level of nitrogen on the proposed future users of the site will be managed by the proposed controls on groundwater abstraction, and impacts on the waterways of the proposed marina will be addressed by the use of a groundwater interception program (refer to *Section 3.4 Marine Water and Sediment Quality*).

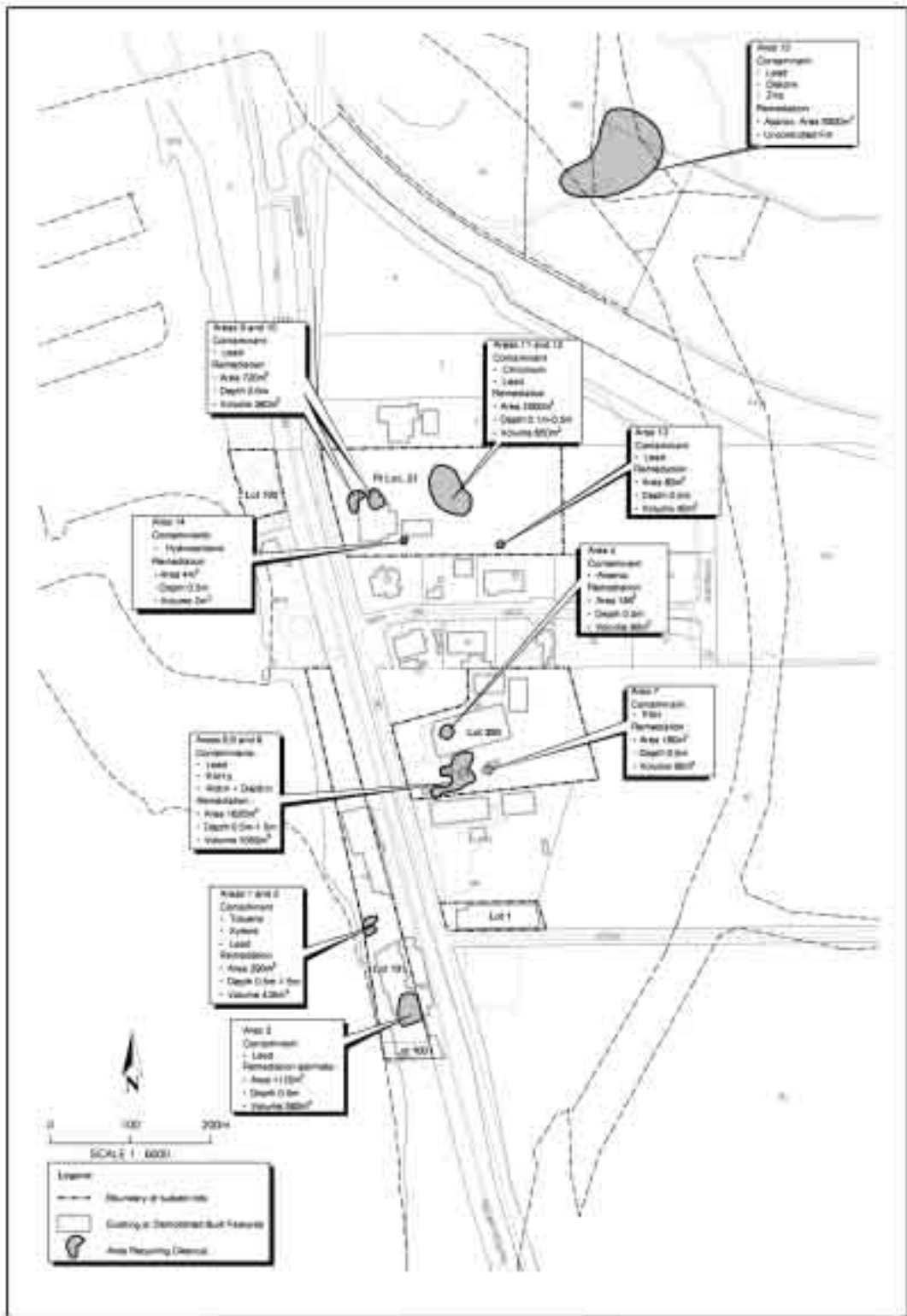


Figure 8: Soil Remediation

With respect to the issues raised in the submission from the Department of Health, the WAPC provided additional information regarding the Health Risk Assessment. The Department of Health has since advised that the Health Risk Assessment now meets its requirements. On the issue of managing the potential for asbestoses contamination, the WAPC is now proposing that an Asbestos Management Plan be prepared for the site. The Asbestos Management Plan would be prepared as part of a Construction Management Program that would detail how works over the site are to be conducted to control environmental and health impacts. It is proposed that the Construction Management Program would be prepared prior to approval to a subdivision or development proposal.

It is also proposed to prepare a Remedial Works Management Program prior to approval to a subdivision or development proposal. The Remedial Works Management Program will detail the process for the site to be cleaned-up and validated.

On the advice of the Department of Health and Department of Environmental Protection, the EPA is of the view that the preparation and implementation of the proposed Remedial Works and Construction Management Programs would ensure that the EPA objective is met for this site.

### ***Summary***

Having particular regard to the:

- (a) Extensive sampling and analysis conducted by the WAPC which indicates that impacts on the ecological function of Owen Anchorage is unlikely to be impacted by the contaminated material located at the site; and
- (b) The advice provided by the Department of Health on the suitability of the proposed remediation to meet human health criteria,

it is the opinion of the EPA that the proposed scheme amendment can be managed to meet the EPA's environmental objective for this factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **3.6 Construction impacts – dust, noise and vibration**

### ***Description***

The extensive earthworks proposed during the clean up of the site and the construction of the marina and new urban development has the potential to generate dust, noise and vibration that could impact on adjacent land uses.

### ***Submissions***

A few submissions were received which raised concern that dust, noise and vibration will negatively impact on the existing residents surrounding the amendment area during the construction of the Port Catherine project.

### ***Assessment***

The EPA's environmental objective for this factor is to ensure that dust, noise and vibration impacts resulting from activities associated with the construction of the project, do not adversely impact upon the welfare and amenity of nearby residents, by ensuring that they meet statutory requirements and acceptable standards.

Should the amendment be implemented, the WAPC has proposed that the management of remediation and construction activities would be detailed in a Remedial Works Management Program and Construction Management Program prior to approval to a subdivision or development application.

Management measures for noise generated during construction would include:

- Restricting the hours of operation for heavy equipment;
- Advising local residents of noise creating activities;
- Keeping a register of complaints so that additional management measures can be applied if significant impacts are generated; and
- Compliance with the *Environmental Protection (Noise) Regulations 1997*.

Management measures for dust generated during construction would include:

- Wind fencing;
- Site watering;
- Surface stabilisation; and
- Compliance with Environmental Impact Assessment Guidance No. 18: *Prevention of Air Quality Impacts from Land Development Sites* (EPA, 2000).

Management measures for vibration impacts generated during construction would include:

- Offer of a free structural inspection before the commencement of construction to owners of buildings in potentially affected properties in the Old Coogee area; and
- In the event of blasting activities, compliance with *Environmental Management of Quarries* (Department of Minerals and Energy, 1994).

The application of these management measures where required, should enable impacts on nearby residents from construction activities to be acceptably managed.

### ***Summary***

Having particular regard to the proposed management measures for controlling the construction impacts of noise, dust and vibration, it is the opinion of the EPA that the proposed scheme amendment can be managed to meet the EPA's environmental objective for this factor provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

### **3.7 Railway noise**

#### ***Description***

The proposal will place new residential development in close proximity to an existing dual gauge freight railway that services Fremantle Port. Current rail traffic is estimated to be a maximum of 2 movements per day based on advice from Fremantle Port Authority. The length of railway abutting the future residential area is 750 metres, with 300 metres located within a cutting. The proposed buffer between the railway track and proposed residential area varies from 90 metres to 30 metres, but is mostly 34 metres.

#### ***Submissions***

Several public submissions raised concerns over the assessment of potential railway noise on the amendment area. Concerns related to the potential for cumulative impacts of road and rail noise, insufficient height of the proposed noise mitigation bund and the lack of contingency options should impacts be greater than predicted.

A substantial submission was also received from the Fremantle Port Authority which raised two main issues. Firstly, that the environmental assessment did not adequately account for an anticipated substantial increase in rail traffic. Secondly, that wheel squeal from movement of trains around curves in the track had not been considered.

#### ***Assessment***

The EPA's environmental objective for this factor is to protect future residents from noise impacts by ensuring compliance with acceptable standards.

Although there are no regulatory criteria in Western Australia applicable to noise received from rail traffic, guidance is provided in draft EPA Guidance for Environmental Impact Assessment No. 14 (Version 3).

To address the issue of impacts from the existing railway line on the proposed residential estate, the WAPC has used file data of freight train noise emissions to model noise levels that would be received at the closest residences. Advice from the Department of Environmental Protection indicates that, in the context of EPA rating criteria (as per preliminary draft EPA Guidance for EIA No. 14 (Version 3) – Road and Rail Transportation Noise), average noise levels at the closest residences (30 metres) would be within manageable limits for up to 8 train movements per night.

In responding to the submission from the Fremantle Port Authority, the proponent argues that using a range of noise amelioration measures, including barriers, memorials on title, "quiet house" design requirements and possibly strategic buffers and other design options, acceptable noise levels could be maintained at the nearest residences even with 8 train movements per night or more. The WAPC has also suggested that the Port could use other noise control measures on its trains and railway, to allow a considerable amount of additional rail traffic.



With respect to ‘wheel squeal’ impacts, advice from the Department of Environmental Protection is that although the occurrence of wheel squeal cannot be quantified without on-site monitoring data, the radius of the track at this location suggests that it is unlikely to occur at unacceptable levels.

To manage the potential noise impacts on future residents of the amendment area, from rail and road sources, the WAPC has proposed the preparation and implementation of a Noise and Vibration Management Plan. This plan is to be prepared prior to approval of a subdivision or development application and will use on-site monitoring data to accurately determine noise levels and will describe appropriate strategies to effectively mitigate those levels.

In assessing this factor the EPA notes that noise levels from rail traffic received at the amendment site are largely determined by the number of train movements and there is uncertainty as to how many train movements that should be anticipated in the foreseeable future. However, it is noted that the subject railway is already constrained in other areas where it runs in close proximity to existing residential areas.

On balance, it is considered that noise mitigation measures available at the structure planning, design and construction stages of the proposed residential estate are extensive enough to minimise potential effects from rail traffic along the adjacent railway. Furthermore, it is considered that options are available to the operator of the railway that could allow traffic increases without significantly increasing noise impacts, such as improvements to locomotives.

### ***Summary***

Having particular regard to the range of noise mitigation measures that can be used to manage railway noise impacts on the proposed residential development, both from:

- i. Existing rail usage; and
- ii. A moderate increase in rail usage,

it is the opinion of the EPA that the proposed scheme amendment can be managed to meet the EPA’s environmental objective for this factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **3.8 Visual amenity**

### ***Description***

Should the proposed amendment be implemented, the main impacts on the visual amenity of the surrounding areas would be as follows:

- The view from the western side of the limestone ridge, which traverses the site, would change from mostly bare limestone or sandy terrain to a re-contoured and residential scene;
- Changes to the skyline viewed from the east would result from the proposed removal of some high parts from the ridge for the construction of the re-aligned Cockburn Road within the ‘Primary Regional Roads’ reservation. However, the proponent has predicted that the proposed residential development will not be visible from this direction (from the east);

- Views from the western and south-western parts of Beeliar Regional Park would be altered by replacing the vacant industrial land with a re-contoured built environment, and by introducing the proposed marina to the views of the near-shore area of Owen Anchorage;
- The landscape values of Coogee Regional Open Space would be impacted by a small reduction in the area of ‘Parks and Recreation’ reserve in this area;
- Creating a new parkland area to the east of the site where it is currently vacant and largely denuded, may offer an improved visual amenity.

### *Submissions*

Several submissions raised concern at the extent of impact the proposal would have on visual amenity. Most of these concerns related to potential impacts on the limestone ridge which traverses the site.

A submission from the Department of Indigenous Affairs commented on the value of the eastern face of the limestone ridge for its links to an aboriginal cultural myth. In addition to this, some public submissions claimed that the stark nature of this ridge does not significantly lessen its landscape value, and that the proposed excavation of the ridgeline would compromise its natural profile.

Public submissions also raised concern that impacts on visual amenity will reduce the value of Beeliar Regional Park. Some concern was also expressed that the loss of coastline from construction of the marina would impact on visual amenity.

### *Assessment*

The EPA’s environmental objective for this factor is for the visual amenity of the areas adjacent to the project to not be unduly affected by the proposed scheme amendment.

The EPA recognises that the limestone ridge traversing the site has significant landscape value, as indicated in many of the public submissions. However, it is considered that implementation of the proposed amendment will not significantly alter the integrity of ridge as a regional landscape feature. The proposed residential development on the west of the ridge will replace the current, largely denuded, landscape, but would not significantly compromise the limestone ridge itself. The residential development will also not be visible from the east.

The proposed deviation of Cockburn Road near the crest of the ridge would remove relatively small portions of the ridge but the roadway itself would largely be screened by bunding, revegetation and other parts of the ridge that will remain intact.

With respect to impacts on the visual amenity of Beeliar Regional Park, the EPA notes that the south western section of the Park has views of the amendment area. Under the proposed amendment, these views would mainly consist of a new residential estate over the former industrial land, the new alignment of Cockburn Road, and the proposed marina. As stated above, the EPA considers that altering the land use from the current, largely denuded, former industrial area, to residential development, does not significantly alter the integrity of the ridgeline, and therefore does not significantly alter the value of the landscape amenity. In assessing the impact of views of the proposed new alignment of Cockburn Road from Beeliar Regional Park, it is noted that the amendment site already includes Cockburn Road, and that there are other existing roads and infrastructure such as the railway and high voltage

powerlines. The view of the new Cockburn Road can also be reduced through bunding and screen planting. With respect to the views of the proposed marina from the Park, the EPA notes that foreshore commercial and industrial development is common in this region, and that views of the horizon and the remainder of the ocean will not be affected.

In assessing the impact of the proposed amendment on Coogee Regional Open Space, the EPA notes that the area to be removed from the 'Parks and Recreation' reserve is largely degraded, devoid of vegetation and has restricted access. On this basis it is considered that the proposed rehabilitated and landscaped public parklands adjacent to this area will provide effective mitigation for this reduction in area.

It is also noted that the proposal will involve the preparation of a Landscape Management Plan and Vegetation Management Plan. These plans will allow for impacts on the visual amenity of adjacent land to be minimised through the provision of public parklands, revegetated areas, and screen plantings.

### ***Summary***

Having particular regard to the:

- (a) The design of the proposed scheme amendment which largely preserves the integrity of the limestone ridge as a regional landscape feature;
- (b) The current low amenity value offered by the vacant, and largely denuded, former industrial land; and
- (c) The provision of new public parkland areas along the crest of the ridge,

it is the opinion of the EPA's that the proposed scheme amendment can be managed to meet the EPA's environmental objective for this environmental factor, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **3.9 Long-term management**

### ***Description***

The construction of the proposed marina and its operation will create a need for long term environmental management. As discussed in previous sections, the marina will have on-going impacts on marine water quality and coastal processes which will require on-going monitoring and management. The acceptability of this impact will largely be determined by the quality of that monitoring and management.

### ***Submissions***

In its submission, the Department for Planning and Infrastructure (Coastal Facilities Section) recommended that the agreement for the management of the marina must include details on the monitoring, maintenance and funding arrangements, and set-out the responsibilities of involved parties.

Public submissions also raised the issue of how on-going funding for marina management will be provided.

### ***Assessment***

The provision of adequate funding arrangements and appropriate management responsibilities are important aspects of this scheme amendment. It should be recognised that for the proposed Port Catherine marina to be environmentally acceptable, a management body will need to be in place which has the financial and technical resources and authority to monitor and control the potential environmental impacts.

The EPA is of the view that, prior to the approval of a Town Planning Scheme Amendment for the land over the proposed Port Catherine marina, the WAPC should resolve responsibilities for the on-going environmental management of the proposed marina. These responsibilities should be resolved to the satisfaction of the Environmental Protection Authority, such that a suitable entity, or entities, with adequate financial and technical resources and authority, will ensure that the objectives of the Waterways Environmental Management Plan will be achieved.

### ***Summary***

Having particular regard to the requirements for long term environmental management, it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives, provided that the Recommended Environmental Conditions, as set out in Appendix 4, are incorporated into the Metropolitan Region Scheme.

## **4. Conditions**

Section 48D of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposed scheme amendment and on the conditions and procedures to which the proposed scheme amendment should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions, the EPA's preferred course of action is to have the Responsible Authority, in this case the WAPC, propose environmental management measures to ameliorate the impacts on the environment. However, these proposed measures are not always sufficient to ensure that the EPA's objectives will be met. For this assessment, the WAPC prepared a set of environmental management measures, these were presented in the Environmental Review document.

Having considered the WAPC's environmental management measures, scheme provisions and the information provided in this report, the EPA has developed a set of recommended conditions. These recommended conditions are presented in Appendix 4, and are summarised below.

## **4.1 Recommended conditions**

Having considered the environmental management measures proposed by the WAPC, and after assessment of the relevant environmental factors (as detailed in this report), the EPA has developed a set of recommended conditions to be imposed if MRS Amendment 1010/33 – Port Catherine is approved. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

- (a) Preparation and implementation of the following Management Programs and Plans:
  - Remedial Works Management Program;
  - Construction Management Program;
  - Waterways Environmental Management Program; and
  - Noise and Vibration Management Plan;
- (b) Resolution of the responsibilities for the on-going environmental management of the proposed marina.

## **5. Other Advice**

Several issues were raised through the assessment of the amendment which, while not directly forming part of the EPA's assessment, were noted by the EPA.

A number of the submissions raised concerns with the potential loss of public access to beaches which currently exist within the amendment area, and the EPA is mindful that this issue appears to be of significant concern to the community.

The proposed amendment extends over 1.2 km of coastline. Although most of this coast has been modified by previous land uses, and has limited public access, several hundred metres of sand beach currently used by the public would be removed by the proposed marina development. However, the EPA notes that the proposed marina will provide for public access to extensive areas of the proposed marina and its breakwater, and the creation of a new beach to the north of the amendment area is anticipated to occur due to the trapping of sand by the northern breakwater. The marina precinct will also provide for a range of recreational and social activities.

Significant foreshore areas in the region of the proposed Port Catherine development, from South Fremantle to Cockburn Sound, have been historically modified due to industrial development and other commercial facilities. This has placed increasing pressure on this section of the coast in terms of achieving an appropriate balance between development and community access for recreational and social activities.

The challenge of balancing these competing uses for Cockburn Sound has been recognised in the work undertaken by the Cockburn Sound Management Council in the preparation of its draft Environmental Management Plan for Cockburn Sound and its Catchment. The EPA considers that it would be beneficial to extend the approach of multiple use planning recommended for Cockburn Sound by the Cockburn Sound Management Council, to eastern Owen Anchorage and its foreshore, should the Port Catherine marina be constructed. This approach would be beneficial in ensuring that future planning for land use and recreational activities in the area is undertaken in a manner which ensures an equitable and sustainable balance between the various competing factors.

An additional matter which is relevant to this MRS Amendment proposal, but has not been specifically addressed within this report, is risk impacts on the amendment area from the haulage of hazardous goods on the adjacent railway. The EPA has previously considered that new development next to this railway line should address the issue of risk associated with goods being carried on the railway. This was considered during the assessment of development at South Beach (EPA Bulletin 992 – MRS Amendment 1008/33).

In its consideration of railway risk at South Beach, the EPA advised that the present use of the railway should not be constrained by the proposed amendment or subsequent planning decisions, and that the proponent (WAPC) and local government should consider risk from the railway and undertake further investigations on the potential impacts. These investigations would then enable risk to be taken into account in the detailed land use planning for the site at a subsequent stage of the planning process. The EPA considers that this same advice is relevant to this MRS Amendment proposal.

## **6. Conclusions**

The EPA has considered the proposed Port Catherine MRS Amendment initiated by the WAPC.

The EPA notes that if the proposal is implemented, it will require the preparation of detailed environmental management plans to meet environmental objectives for terrestrial flora, soil contamination, noise from railway transport, and landscape amenity. The EPA also notes that if the proposal is implemented, it will require vigilant on-going environmental management of coastal processes (beach and seabed) and marine water and sediment quality, in order to meet environmental objectives.

The EPA has concluded that implementation of the proposed Port Catherine MRS Amendment would be unlikely to compromise EPA objectives, provided that there is satisfactory implementation of the recommended environmental conditions as set out in Appendix 4 and summarised in Section 4.

## **7. Recommendations**

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the scheme amendment being assessed is the rezoning of the former South Coogee industrial area, together with a portion of the Owen Anchorage ‘Waterways Reservation’, to ‘Urban’ under the Metropolitan Region Scheme (together with a number of minor supporting amendments) to facilitate the remediation of the land and its redevelopment into the Port Catherine marina and residential estate;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that implementation of the proposed Port Catherine MRS Amendment would be unlikely to compromise EPA objectives, provided that there is satisfactory implementation of the recommended environmental conditions as set out in Appendix 4 and summarised in Section 4.
4. That the Minister imposes the conditions recommended in Appendix 4 of this report.

# **Appendix 1**

## **List of submitters**

**Organisations:**

Coastal Facilities, Department of Planning and Infrastructure  
Cockburn, City of  
Coogee Beach Progress Association  
Coogee Coastal Action Coalition  
Conservation Council of WA  
Conservation and Land Management, Department of  
Fremantle Port Authority  
Friends of Manning Lake Bushland  
Health, Department of  
Indigenous Affairs, Department of  
Recfishwest  
Water Corporation  
Wetlands Conservation Society  
Windsurfing W.A

**Individual:**

Aplin, D Mr & Mrs  
Babel, Ann  
Black, Denis & Janice  
Burmas, Branko  
Burton, Kim  
Cassetai, Paul  
Collins, Father Denis  
Craddock, Brad  
Crook, Colin  
Dacunha, Nely  
Davies, Nancy & Ian  
Edmondson, Mary  
Fletcher, P & E  
Fogarty, Alan & Judy  
Gleeson, Thomas  
Hay, Brent & Samantha  
Hughes, Kelly  
Inman, Zoe  
Innes, Tracey  
Intveld, Geoffrey  
James, David  
Jenkins, Mary  
Jones, Keith  
Leggo, Dianne  
Mastaglia, F  
McGrath, Catherine  
Mihaljevich, Len  
Newitt, P & M  
O'Brien, Desmond  
Oliver, D Mr & Mrs



Payne, Gordon  
Pember, Kerry  
Pember, Ross  
Pietroniro, Nicola  
Poole, Robert & Elizabeth  
Poole, William & Estelle  
Raffa, Glenys  
Randles, Ian  
Retallack, Robert  
Spanbroek, Jason  
Smedley, Heather & John  
Smith, Daryll & Diane  
Tomasich, David  
Turnball, John  
Walshe, Patrick Mr & Mrs  
Warren, Rodney & Carol  
Washbourne, Audrey & Bob  
Wilson, Eric

## **Appendix 2**

### **References**

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## **Appendix 3**

**Summary of identification of relevant environmental factors**

**Appendix 3: Summary of Identification of Relevant Environmental Factors**

Preliminary Environmental Factors	Proposal Characteristics	Key Government Agency and Public Comments	Identification of Relevant Environmental Factors
<b>BIOPHYSICAL</b>			
Terrestrial Flora	<p>Approximately 9 hectares of native vegetation will be disturbed by the proposed amendment. Most of this vegetation occurs in fragmented patches and ranges in condition from very good to completely degraded. No species of Declared Rare or Priority Flora have been recorded at the site.</p> <p>Approximately 0.6 hectares of native vegetation will be lost from Bush Forever Site 247 and approximately 0.5 hectares will be lost from Beeliar Regional Park.</p> <p>It is proposed to revegetate an equivalent area of bare land within the Bush Forever Site 247 parts of Beeliar Regional Park to the areas of vegetation that will be lost from this Bush Forever Site and Beeliar Park, i.e. approximately 1.1 hectares will be revegetated.</p>	<p>CALM and others</p> <ul style="list-style-type: none"> <li>▪ The proposed 1.1 hectares of revegetation as compensation is insufficient. Compensation should take into account the total area of land being lost from Beeliar Region Park, not just the vegetated parts.</li> </ul> <p>Public submissions</p> <ul style="list-style-type: none"> <li>▪ The vegetation in the amendment area, although degraded, still has conservation significance and should be protected.</li> </ul>	<p>Considered to be a key environmental factor</p>
Terrestrial Fauna	<p>Low value fauna habit (scattered and degraded) will be impacted by the amendment south of the railway. The loss of better fauna habitat north of the railway, approximately 4 hectares in area, is unlikely to be significant due to the adjacent habitat protected within Bush Forever Site 247 and Beeliar Regional Park and also the proposed revegetation works.</p> <p>Four species of Threatened Fauna have either been recorded in the amendment area or are considered likely to occur there. For only one of these species, the Lined Burrowing Skink, does the amendment area contain any breeding habitat, and that species could not be located despite intensive searches. It is considered that better quality habitat for the Lined Burrowing Skink occurs outside the amendment area.</p> <p>The loss of habitat from the site is unlikely to affect the conservation status of any of these Threatened Fauna species.</p>	<p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ The amendment area, despite its degraded nature, supports a wide range of fauna and should be protected;</li> <li>▪ The fauna study is five years old and only included brief visits to the site, it may therefore not provide an accurate description of the sites fauna values including seasonal changes and migratory species.</li> </ul>	<p>The amendment area does not contain fauna habitat of significance. Not considered to be a key environmental factor.</p>

<b>Preliminary Environmental Factors</b>	<b>Proposal Characteristics</b>	<b>Key Government Agency and Public Comments</b>	<b>Identification of Relevant Environmental Factors</b>
Marine Flora	Approximately 0.3 hectares of seagrass meadow, and up to 20 to 30 hectares of potential seagrass habitat, will be lost by constructing the proposed marina.	Public Submissions <ul style="list-style-type: none"> <li>▪ The proposed marina will have a significant impact on the near shore areas of remaining seagrass, and seagrass within the Owen Anchorage East mapping zone;</li> <li>▪ Seagrass habitat needs to be protected to allow for regeneration;</li> <li>▪ Cumulative impacts of seagrass loss have not be addressed;</li> <li>▪ Seagrass outside of the marina area will suffer indirect impacts.</li> </ul>	Considered to be a key environmental factor
Marine Fauna	<p>The potential impacts on marine fauna relate mainly to the loss of around 40 hectares of benthic habitat from the construction of the marina and its associated footprint. Fauna habitat in the amendment area is considered to be low in value and is well represented in adjacent areas of Owen Anchorage. Some additional habitat would be created by the proposed sea-walls.</p> <p>There is very low potential for threatened marine fauna to occur in the amendment area.</p>	Public Submissions <ul style="list-style-type: none"> <li>▪ The proposal may impact on the diversity and geographic distribution of marine fauna within Owen Anchorage East.</li> </ul>	Impacts on marine fauna are not considered significant. Not considered to be a key environmental factor.
Coast - Dunes	The amendment will allow urban development over approximately 4 hectares, or a narrow stretch of 400 metres, of discontinuous foredune. These dunes contain patches of vegetation in degraded to good condition. The continuity of these dunes and their ecological linkages to other natural landscapes is severely limited by previous industrial activity. Similar dune systems are well protected in the region.	Public Submissions <ul style="list-style-type: none"> <li>▪ The coastal dune zone has been recognised as worth preserving in other parts of Perth and should be preserved here;</li> <li>▪ The amendment area contains the tallest remaining dunes in Owen Anchorage and not exist elsewhere;</li> <li>▪ The cumulative loss of dune systems in the region has not been addressed</li> </ul>	The environmental values of the dunes that would be impacted on by the amendment are considered low. Not a key environmental factor.
Coastal Processes – Foreshore (Beach) and Seabed	<p>The proposed marina will create a new barrier to the flow of sand in the surf zone, from the north, to Coogee Beach. This will lead to the accumulation of sand, and the creation of a new beach, north of the proposed northern breakwater.</p> <p>Wave shadows formed adjacent to the marina breakwaters could cause erosion to the northern part of Coogee Beach.</p>	Department of Planning and Infrastructure – Coastal Facilities Section <ul style="list-style-type: none"> <li>▪ the amount of sand required to maintain Coogee Beach is difficult to predict, and could be much more than the 25,000m<sup>3</sup> budgeted for in the proposal;</li> <li>▪ Sand bypassing from the north beach build-up must be designed in detail to avoid local nuisance from excavating and dumping sand on beaches. Wind blown</li> </ul>	Considered to be a key environmental factor

Preliminary Environmental Factors	Proposal Characteristics	Key Government Agency and Public Comments	Identification of Relevant Environmental Factors
	<p>It is proposed to manage changes to beach dynamics at the northern end of Coogee Beach by bypassing sand from the north of the marina. A sand bypassing pipe is to be installed as part of the marina construction.</p> <p>The proposed amendment extends over 1.2 km of coastline, and although most of this land has been modified by previous land uses, and has limited public access, several hundred metres of sand beach currently used by the public would be covered by the proposed marina development.</p>	<p>sand management is also essential;</p> <p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ The marina will erode Coogee Beach and leave a rocky environment;</li> <li>▪ The cumulative impacts of all proposals within Cockburn Sound and Owen Anchorage should be addressed;</li> <li>▪ Keep Coogee Beach and the adjacent coastline in its present state or return it to its natural state. Leave our beaches for future generations;</li> <li>▪ The project will ruin a large expanse of public beaches;</li> <li>▪ The location of the proposed marina coincides with the largest part of existing white sand beach and dune area.</li> </ul>	
Coast - Sea level	<p>Potential flooding of new urban areas can be avoided through minimum building level specifications.</p> <p>Erosion through sea level rises and storm surge events can be managed through the proposed sand bypassing mechanisms.</p>	<p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ Global warming may increase sea levels and increase erosion from north west storm events;</li> </ul>	Impacts of sea level changes can be readily managed through building approval processes. Not considered a key environmental factor.
<b>POLLUTION</b>			
Construction Impacts – Dust, Noise and Vibration	<p>The extensive earthworks proposed during the clean up of the site and the construction of the marina and new urban development has the potential to generate large amounts of dust, noise and vibration that could impact adjacent land uses.</p> <p>Management of impacts from remediation and construction activities will be detailed in a Remedial Works Management Program and Construction Management Program prior to development.</p>	<p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ Existing residents will be subject to many months of dust, noise and vibration.</li> </ul>	Considered to be a key environmental factor.
Marine Water and Sediment Quality	Marina construction is likely to cause suspended sediment plumes for a distance of approximately 100 metres from construction activities. Construction dredging is also likely to	<p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ There is concern that water quality outside the marina will be impacted during construction and for many years.</li> </ul>	Considered to be a key environmental factor

Preliminary Environmental Factors	Proposal Characteristics	Key Government Agency and Public Comments	Identification of Relevant Environmental Factors
	<p>release nutrients into the water column.</p> <p>After construction, nutrient rich groundwater may be retained for longer periods within the marina, thus increasing algal growth and decreasing water quality. This is to be managed by a groundwater interception drain that will divert much of the groundwater head away from the marina.</p> <p>Other inputs into the marina water during boating and urban activities may also reduce the water quality within and adjacent to the marina.</p>	<p>Short term sediment plumes during construction and long term dissolving limestone can impact marine environments;</p> <ul style="list-style-type: none"> <li>▪ The assessment of water quality for the proposed marina is based on a comparison with other marinas using fairly subjective criteria. Water quality assessment should aim to maintain protection compared to suitable reference site;</li> <li>▪ Flushing of the marina needs to be improved;</li> <li>▪ Dredging and boat use activities will pollute the water;</li> <li>▪ Will the proposed groundwater interception just move the nutrient pollution elsewhere.</li> </ul>	
Soil and Groundwater	<p>Historical industrial activities over much of the amendment area resulted in soil and groundwater contamination including metals, hydrocarbons and pesticides. To address this issue a Site Contamination Assessment and Management Program was conducted, which involved the following elements:</p> <p>Soil and groundwater sampling to characterise contaminant concentrations in soil and groundwater;</p> <p>A Human Health Risk Assessment to determine the potential impact of contamination on the users of the land should it be developed for residential development;</p> <p>Fate and Transport modelling for all land within the amendment area, to assess the behaviour and movement of contamination, and to predict the potential impact on groundwater and its discharge into Owen Anchorage and the proposed marina;</p> <p>A Contamination Management Plan for areas identified as requiring remediation; and</p> <p>The integration of Port Catherine development contamination management strategy with the management of the surrounding WAPC owned government land also within the amendment area (WAPC owned government land remediation has previously been assessed and approved by the Minister subject to conditions in April 2000 – EPA Bulletin 957, released 12 November 1999).</p>	<p>Department of Health</p> <ul style="list-style-type: none"> <li>▪ Past disposal of Fly/Coal Ash and PCB's is of concern, what remediation works will be carried out at these sites?;</li> <li>▪ Asbestos contamination has not been addressed;</li> <li>▪ Some aspects of the Health Risk Assessment inputs require clarification.</li> </ul> <p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ It is essential that soils are free from contamination, rubble and general waste.</li> </ul>	Considered to be a key environmental factor



<b>Preliminary Environmental Factors</b>	<b>Proposal Characteristics</b>	<b>Key Government Agency and Public Comments</b>	<b>Identification of Relevant Environmental Factors</b>
Railway Noise	An existing railway reserve runs along the northern boundary of the proposed new urban zone, which may cause noise impacts on proposed new residents.	<p>Fremantle Port Authority</p> <ul style="list-style-type: none"> <li>▪ The assessment of rail noise impacts is insufficient as it is based on too few rail movements;</li> <li>▪ No consideration has been given to wheel squeal due to track curvature;</li> </ul> <p>Public Submissions</p> <ul style="list-style-type: none"> <li>▪ There has not been any consideration of potential cumulative impacts of road and rail noise;</li> <li>▪ The proposed 1 metre high rail noise attenuation bund is insufficient for locomotive noise;</li> <li>▪ Reliance on two forms of noise amelioration is of concern as it leaves little margin for cost effective amelioration measures should the assumptions used in the modelling be found to be incorrect.</li> </ul>	Considered to be a key environmental factor
Railway Vibration	<p>An existing railway reserve runs along the northern boundary of the proposed new urban zone, which may have vibration impacts on proposed new residents.</p> <p>Potential vibration effects have been assessed by applying criteria from AS2670 – Part 2 1990, employing the perception criteria and also the criteria for possible structural damage. Effects are expected to be within acceptable limits.</p>	No submissions	Vibration impacts from the railway on the proposed new residential estate have been predicted to be within acceptable limits. Not considered to be a key environmental factor.
<b>SOCIAL SURROUNDINGS</b>			
Risk – Railway Transport	Railway freight transport may create risk impacts on the proposed urban development immediately adjacent to the railway.	No Submissions	Considered to be a key environmental factor – refer to <i>Section 5: Other Advice</i>
Visual Amenity	<p>On the western side of the limestone ridge that traverses the site, the landscape will change from degraded limestone terrain to a re-contoured built environment similar to the adjacent residential estate.</p> <p>From the east, changes to the skyline will result from the</p>	<p>Public Submission</p> <ul style="list-style-type: none"> <li>▪ The amendment fails to acknowledge that the primary value of the ridgeline stems from the fact that it is a largely unspoiled example of the Spearwood dune system in this region. The somewhat denuded and stark nature of the ridgeline does little to lessen its significant</li> </ul>	Considered to be a key environmental factor

Preliminary Environmental Factors	Proposal Characteristics	Key Government Agency and Public Comments	Identification of Relevant Environmental Factors
	<p>proposed removal of high parts of the ridge, however, it has been predicted that residential development will not be visible.</p> <p>The proposal also involves the development of a new parkland area that may improve the visual amenity in the east of the site.</p> <p>Views from some parts of Beeliar Regional Park will be altered by the amendment, introducing an urban area to the current vacant industrial land. Views of the near-shore environment will also be affected by the site of the proposed marina development.</p> <p>The amendment will also impact the landscape values of the Coogee Regional Open Space by reducing the area of Parks and Recreation reserve. The new parkland area in the east of the site is expected to compensate for this impact.</p>	<p>landscape value;</p> <ul style="list-style-type: none"> <li>▪ The extent of the proposed excavation of the ridgeline is of concern, removing 8 metres will compromise the natural profile of the ridge. The claim that views from the east will be protected cannot be substantiated;</li> <li>▪ The impact on the landscape will reduce the value of Beeliar Regional Park.</li> </ul>	
Cultural Heritage	<p>Two aboriginal ethnographic sites have been identified to be relevant to the proposed amendment, these are associated with the Indian Ocean, limestone ridge, Lake Coogee and other nearby lakes. With respect to these sites, and any new discoveries during construction, the requirements of the <i>Aboriginal Heritage Act 1972</i> will be complied with.</p> <p>With respect to non-aboriginal heritage, no known sites are located with the amendment area. Potential impacts on the Omeo shipwreck will be managed as part of the monitoring and management of coastal process as detailed in the Waterways Management Program.</p>	<p>Department of Indigenous Affairs</p> <ul style="list-style-type: none"> <li>▪ That existing conditional approvals given under the Aboriginal Heritage Act 1972 be adhered to;</li> <li>▪ The eastern face of the limestone ridge traversing the site should be protected;</li> </ul>	No known sites of cultural heritage value would be significantly impacted by the amendment. Not considered to be a key environmental factor.
<b>OTHER</b>			
Management	It has been recognised through the course of the environmental assessment that for many of the environmental issues identified, the acceptability of the impacts will be determined by how the development is managed in the long term. For the proposal to be environmentally acceptable, it will require a management body that has the financial and technical resources and authority to monitor and control the various environmental impacts of the	<p>Department of Planning and Infrastructure – Coastal Facilities Section</p> <ul style="list-style-type: none"> <li>▪ The agreement for the management of the marina must include details of the monitoring regime and maintenance and funding arrangements, and set-out the responsibilities of each party. Funding arrangement should include contingencies sufficient to cover</li> </ul>	Considered to be a key environmental factor

<b>Preliminary Environmental Factors</b>	<b>Proposal Characteristics</b>	<b>Key Government Agency and Public Comments</b>	<b>Identification of Relevant Environmental Factors</b>
	development. This is particularly the case for the management of water quality in the marina and management of the impacts on coastal processes.	occasional extreme storms; Public Submissions <ul style="list-style-type: none"> <li>▪ How will Cockburn Council fund the ongoing costs associated with the marina?</li> </ul>	

# **Appendix 4**

## **Recommended Environmental Conditions**

**STATEMENT THAT A SCHEME MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE ENVIRONMENTAL PROTECTION ACT 1986)**

**METROPOLITAN REGION SCHEME  
Amendment No. 1010/33 – PORT CATHERINE**

**Scheme Purpose:** To rezone an area in South Coogee from the Industrial zone, and the Parks and Recreation, Railways and Waterways reservations to the Urban and Industrial zone and the Parks and Recreation reservation.

**Responsible Authority:** Western Australian Planning Commission

**Responsible Authority Address:** Albert Facey House  
469 Wellington Street  
PERTH WA 6000

**Assessment Number:** 1263

**Report of the Environmental Protection Authority:** Bulletin 1060

Subject to the following conditions, there is no known environmental reason why the Metropolitan Region Scheme Amendment to which the above report of the Environmental Protection Authority relates should not be implemented.

**CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY INSERTION OF PROVISIONS IN SCHEME TEXT**

**1 Management Programs and Management Plan**

1-1 The following Management Programs and Management Plan are to be prepared in accordance with the specifications set out in Attachment 1 in the Minister for the Environment and Heritage's "Statement that a Scheme may be Implemented" No. [insert relevant Statement Number] published on [insert date], and shall be subsequently implemented in accordance with the provisions of those Programs and the Management Plan:

- Remedial Works Management Program;
- Construction Management Program;
- Waterways Environmental Management Program; and
- Noise and Vibration Management Plan.

## **2 Responsibilities for On-going Management**

- 2-1 Prior to the finalisation of a Town Planning Scheme Amendment for the land within the MRS amendment area, or the consideration of an application for subdivision or development within the amendment area (other than an application for consolidation or minor modification to existing boundaries), which ever occurs first, the Responsible Authority shall resolve responsibilities for on-going environmental management of the proposed marina, to the satisfaction of the Environmental Protection Authority, such that a suitable entity, or entities, with adequate financial and technical resources and authority, will ensure that the objectives of the Waterways Environmental Management Program, as set out in Attachment 1 in the Minister for the Environment and Heritage's "Statement that a Scheme may be Implemented" No. [insert relevant Statement Number] published on [insert date], will be achieved.

**ATTACHMENT 1 – OF STATEMENT THAT A SCHEME MAY BE IMPLEMENTED -  
METROPOLITAN REGION SCHEME AMENDMENT No. 1010/33: PORT CATHERINE**

**SPECIFICATIONS FOR MANAGEMENT PROGRAMS AND PLANS**

**1 Remedial Works Management Program**

- 1-1 Prior to approval of an application for subdivision or development within the amendment area, whichever occurs first, the Responsible Authority shall require the preparation of a Remedial Works Management Program for the amendment area, excluding the government land\* assessed by the Environmental Protection Authority and described within EPA Bulletin 957. Determination of an application, other than an application for consolidation or minor modification to existing boundaries will be subject to receipt of an acceptable Remedial Works Management Program. The Program will meet the following objective:
- To ensure remediation is consistent with the intended land use and protection of marine water quality.

The Remedial Works Management Program shall be prepared to the requirements of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Health Department of Western Australia, Water and Rivers Commission and the City of Cockburn.

The Remedial Works Management Program shall include:

1. Site Remediation Integration Plan
2. Public Safety Plan
3. Noise and Vibration Management Plan
4. Groundwater Monitoring and Management Program
5. Contaminated Material Transport Management Plan
6. Dust Management and Monitoring Plan
7. Contaminated Stormwater Management Plan
8. Site (soil and groundwater) Remediation Validation Plan
9. Detailed staging and planning of works

The elements of each plan are outlined below.

1-2 Site Remediation Integration Plan

The Site Remediation Integration Plan will describe a procedure to ensure that integration with the site remediation programs for the government land is achieved.

1-3 Public Safety Plan

The Public Safety Plan will describe procedures to prevent, where possible, unauthorised persons or members of the public from entering the site and placing themselves or workers at risk. It will also specify measures to prevent unauthorised removal of materials or equipment from the site. The plan will include details of the following:

- Fences surrounding areas under excavation to prevent unauthorised vehicular and pedestrian access to the pits and contaminated soils;
- Requirement for signage indicating that the sites are dangerous and that contaminated material is being excavated; and
- Immediate reshaping or backfilling of excavations following clean-up and validation, to render them safe.

#### 1-4 Noise and Vibration Management Plan for Remedial Works

A Noise and Vibration Management Plan for remedial works, will be prepared for noise and vibration. The Plan will include the following:

- Noise mitigation measures and monitoring, as appropriated, to comply with the Environmental Protection (Noise) Regulations 1997.
- Measures to keep machinery vibration to a minimum and comply with the Australian Standard 2670.2.
- Monitor vibration near residential areas.

#### 1-5 Groundwater Monitoring and Management Plan

The Groundwater Monitoring and Management Plan will be prepared to:

- Determine the distribution and number of groundwater monitoring bores.
- Determine the frequency of sampling events.
- Determine the groundwater quality parameters that will be tested for. It is anticipated these will include trace metals and chemical potability parameters that may affect its beneficial use (eg. salinity, hardness etc).
- Compare monitoring results with Contaminant Transport and Fate Assessment (CTFA) predictions.
- Assess the suitability of the groundwater for potential uses including garden irrigation and filling of swimming pools.
- Define abstraction control requirements and procedures based on the monitoring results.

#### 1-6 Contaminated Material Transport Management Plan

The Contaminated Material Transport Management Plan will be prepared to prevent inadvertent spreading of contaminated soils during excavation and transport. The plan will contain details of:

- Types and concentrations of contaminated materials to be transported.
- Excavation and loading methods proposed to prevent spread of contaminated material during excavation and transport.
- Vehicle washing systems with facilities for handling the wash water and/or the installation of ‘rumble strips’ to help dislodge dust and mud, as appropriate.
- Procedures for the monitoring, handling and disposal of potentially contaminated water arising from wheel-washing operations.
- Controls on vehicles for the transport of contaminated material in compliance with the *Environmental Protection (Controlled Waste) Regulations 2001* together with the *Dangerous Goods (Transport) Act 1998* (e.g. sealed tailgates fitted to trucks).
- Types and roadworthiness of vehicles.



- The routes for transport of wastes and the approvals from relevant authorities to use these routes.
- A consignment system with documentation and records to track all contaminated soil transported to landfill. The system will ensure that all materials are delivered to the appropriate landfill.
- A requirement for the truck driver to carry a material data sheet describing soil quality.
- Emergency Response Plan.

#### 1-7 Dust Management and Monitoring Plan

The Remedial Works Dust Management Plan will be prepared to ensure that dust emissions from the site meet acceptable standards. The plan will detail:

- Dust control measures to prevent transport of contaminated dust.
- Dust monitoring and reporting.
- Dust suppression with water sprays on access roads and operational areas.
- Dust suppression for stockpiles.
- Control of runoff water from contaminated dust suppression.
- Wind fencing as necessary to contain contaminated dust.
- Cleaning of machinery to prevent contaminated dust leaving the site.
- Collection of contaminated material collected from machinery during cleaning.

#### 1-8 Contaminated Stormwater Management Plan

The Contaminated Stormwater Management Plan will outline provisions for contaminated stormwater management during remedial works with the objective of preventing the spread of contamination via stormwater. It is unlikely that stormwater management will be necessary due to the permeable nature of sand throughout the site. The plan will outline the following:

- monitoring requirements in the event heavy rainfall occurs during remedial works (i.e. visual inspection for the presence of stormwater runoff); and
- contingency measures to be implemented in the unlikely event that stormwater runoff with the potential to cause contamination is observed.

#### 1-9 Site (soil and groundwater) Remediation Validation Plan

The Site (soil and groundwater) Remediation Validation Plan will be prepared with the objective of demonstrating compliance with site clean-up criteria defined in the Site Contamination Assessment and Management Plan (SCAMP) (Volume 3 of the Environmental Review). The plan will be prepared in general accordance with the guideline *Development of Sampling and Analysis Programs* (DEP Contaminated Sites Assessment Series, 2001). Validation will be achieved using the following data:

- Existing soil contaminant data.
- Records of visual observations collected during the program.
- A validation soil sampling and analysis program.

The sampling and analysis program will be undertaken to verify that soils remaining at the site comply with the risk derived soil clean-up criteria. Both residual soils in excavated areas and the soils used for backfill will be tested in accordance with procedures recommended by the guideline *Development of Sampling and Analysis Programs* (DEP 2001).

Excavation and fill samples will be tested as appropriate for the contaminants of concern associated with each remedied area.

Upon completion of the program, a Site (soil and groundwater) Remediation and Validation Report will be submitted to the DEP for verification. The report will include:

- Surveyed locations and dimensions of excavations.
  - Quantity and fate of excavated soil, including landfill receipts.
  - Records of observations of the excavations (including colour photography).
  - Results of the validation soil sampling and analysis program.
  - Data confirming that the quality of the imported backfill is acceptable.
- The Site (soil and groundwater) Remediation Validation Plan will require preparation of a report summarising validation sampling and analysis program results for submittal to the DEP.

1-10 Detailed staging and planning of works

This will comprise a program and schedule of specific tasks required to complete the proposed remedial works.

1-11 The Remedial Works Management Program shall be implemented to the satisfaction of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice from the Health Department of Western Australia, the Department of Environmental Protection, Water and Rivers Commission and the City of Cockburn, prior to the approval of a subdivision diagram or plan of survey.

\*The government land includes: lots 2, 3, 4, 13, 51, 78, 1755, 9474 Cockburn Road; lots 21, 22, 23, 27, 27/2, 31, 33, 34, 35, 36, 37 Ahoy Road; lot 38 King Street; lot 50 Ocean Road; Reserves 24306, 43701, 11430 and 1945, Town Lot 2076; lot 109.

## **2 Construction Management Program**

2-1 Prior to approval of an application for subdivision or development within the amendment area, which ever occurs first, the Responsible Authority shall require the preparation of a Construction Management Program. Determination of an application, other than an application for consolidation or minor modification to existing boundaries will be subject to receipt of an acceptable Construction Management Program. The Program will meet the following objectives:

- To protect the amenity of nearby residents from dust, noise, vibration;
- To address the issue of asbestos contamination;
- To minimize and mitigate disturbance to native vegetation and Beeliar Regional Park; and
- To prevent adverse impacts on marine water quality, flora and fauna and coastal processes.

The Construction Management Program shall be prepared to the requirements of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice from the City of Cockburn, the Department of Environmental Protection and the Department of Conservation and Land Management (Remnant Vegetation Management Plan only).

The Program shall include:

1. Management procedures and a monitoring program for the protection of marine water quality, flora and fauna within the vicinity of the marina including seagrass meadows;
2. Procedures for blasting (if required) during construction;
3. A Vegetation Management Plan to adequately mitigate the loss of native vegetation and the loss of portions of Beeliar Regional Park;
4. A Traffic Management Plan;
5. Contingency measures if monitoring reveals unacceptable impacts to marine flora and fauna;
6. Strategies for the management of changes to coastal processes in the vicinity of the marina during the construction phase;
7. Strategies for the management of dust, noise and vibration during construction; and
8. An Asbestos Management Plan (as detailed below).

2-2 The Asbestos Management Plan will meet the following objectives:

- To prevent inadvertent spreading of asbestos containing materials during the demolition of onsite buildings;
- To ensure workers, site visitors and the general public are protected from exposure to asbestos containing materials during demolition and construction;
- To ensure future site residents are protected from exposure to asbestos containing materials; and
- To ensure appropriate management of asbestos containing materials.

The Asbestos Management Plan shall be prepared to the requirements of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice from the Health Department. A copy of the Plan shall be provided to WorkSafe Western Australia.

The Plan shall include:

1. Identification of areas where asbestos is located.
2. Management procedures for the removal and disposal of asbestos containing material including asbestos buildings and any asbestos sheeting or pieces thereof.
3. Management procedures for the removal and disposal or insitu cover by at least 1m of clean soil of any soils containing visible asbestos fibre.
4. Air monitoring for asbestos during construction activities;
5. Handling, transport and disposal of asbestos according to occupational health and safety legislation and guidelines; and

The Asbestos Management Plan shall be implemented during construction, to the satisfaction of the Responsible Authority on the advice of the Department of Health.

- 2-3 The Construction Management Program shall be implemented to the satisfaction of the City of Cockburn and the Department of Environmental Protection, on the advice of the Department of Conservation and Land Management (Remnant Vegetation Management Plan only).

### 3 Waterways Environmental Management Program

3-1 Prior to approval of a Town Planning Scheme Amendment for the land within the MRS amendment area, or the consideration of an application for subdivision approval or development within the amendment area (other than an application for consolidation or minor modification to existing boundaries), which ever occurs first, the Responsible Authority shall require the preparation of a Waterways Environmental Management Program. The Program will meet the following objectives:

- Ensure that marine water and sediment quality, within the marina waterways, achieves the following Environmental Quality Objectives as defined in the Environmental Protection Authority document *Perth's Coastal Waters: Environmental Values and Objectives* (EPA, 2000):
  - Maintenance of ecosystem integrity such that a “moderate level” of protection is met within the marina waterways;
  - Maintenance of aquatic life for human consumption;
  - Maintenance of primary contact recreational values;
  - Maintenance of secondary contact recreational values;
  - Maintenance of aesthetic values;
- To ensure the protection of the coastline and beaches within the area of likely influence of proposals within the amendment area from adverse changes in coastal processes; and
- By using methods consistent with similar monitoring and research programs in adjacent and nearby waters, contribute to the understanding of marine water quality in eastern Owen Anchorage.

The Waterways Environmental Management Program shall be prepared to the requirements of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice from the City of Cockburn and the Department of Environmental Protection.

The Program shall include:

1. Identification of existing marine water and sediment quality;
2. Identification of factors affecting marine water and sediment quality;
3. Establishment of the Environmental Quality Criteria that are to be maintained within the marina waterways;
4. Measures to maintain marine water and sediment quality, including:
  - Design specifications for site drainage.
  - Design, maintenance and ongoing management specifications for the proposed groundwater extraction, reuse and re-injection facilities including contingency measures and management.
  - Provision for regular inspection of the marina waterways.
  - Prohibition of boats having antifouling paints containing tributyltin (TBT).
  - Prohibition of any discharge of sewage, hydrocarbons or litter from boats.
5. Provisions for ongoing monitoring and management of marine water and sediment quality including contingency measures to ensure that the Environmental Quality Objectives are achieved and maintained in the event that the relevant Environmental Quality Criteria are exceeded;

6. The marina water quality monitoring program will use methods consistent with, and where practicable, will be co-ordinated with similar monitoring programs in adjacent and nearby waters, and will thereby contribute to the understanding of marine water quality in eastern Owen Anchorage;
7. Provisions for ongoing monitoring and management of changes to coastal processes within the vicinity of the marina including contingency measures if monitoring reveals erosion or accretion of shorelines;
8. An Oil Spill Contingency Management Plan;
9. A Landscape Management Plan for the MRS Parks and Recreation reserve, immediately east of the amendment area; and
10. A Detailed staging and planning of measures.

3-2 The Waterways Environmental Management Program shall be implemented to the satisfaction of the Department of Environmental Protection in consultation with the Department of Planning and Infrastructure.

#### **4 Noise and Vibration Management Plan**

4-1 Prior to the approval of an application for subdivision or development within the MRS amendment area, whichever occurs first, the Responsible Authority shall require the preparation of a Noise and Vibration Management Plan. Determination of an application, other than an application for consolidation or minor modification to existing boundaries will be subject to the receipt of an acceptable Noise and Vibration Management Plan.

The Plan will meet the following objective:

- To protect the amenity of nearby residents from noise and vibration emissions from the Primary Regional Road and railway.

The Noise and Vibration Management Plan shall be prepared to the requirements of the Western Australian Planning Commission with the concurrence of the Environmental Protection Authority on advice from the Department of Environmental Protection.

The Plan shall:

1. Include predictions of noise and vibration levels from trains and road traffic;
2. Identify the appropriate criteria against which noise and vibration impacts in the amendment area should be measured; and
3. Show how noise-sensitive premises can be protected from adverse noise and vibration impacts from the adjacent rail line and vehicle traffic.

4-2 The Noise and Vibration Management Plan to be implemented progressively at each stage of subdivision and development to the satisfaction of the Responsible Authority on advice from the Department of Environmental Protection.

# **Appendix 5**

## **Summary of Submissions and WAPC Responses to Submissions**



**PORT CATHERINE ENVIRONMENTAL REVIEW  
RESPONSES TO PUBLIC SUBMISSIONS**

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This report constitutes the response of the Western Australian Planning Commission (WAPC) to environmental issues raised during the submission period undertaken for this Amendment.

The bolded words are an amalgamated summary, derived by the Department of Environmental Protection (DEP), of the environmental issues raised from the submissions. The WAPC response to these summaries follows each issue.

The Environmental Protection Authority's (EPA) assessment of the proposed Metropolitan Region Scheme (MRS) amendment, taking into account the information provided in the Environmental Review (ER), the public submissions and the WAPC responses thereto, will provide recommendations to the Minister for Environment who, providing the proposed amendment is determined to be environmentally acceptable, sets the conditions for inclusion in Schedule 1 of the MRS.

## **1.0 BEACH AND FORESHORE**

### **1.1 Erosion and Accretion**

- a. The quoted annual sand movement volumes are questioned because of the reliance on a small number of photogrammetric surveys of a single line on the shore. The annually active sandy shore is very close to the deep water of Owen Anchorage which has the potential to absorb significant volumes of sand out of the system under storm conditions. The simple process description does not explain the significant recession that has occurred at the Northern Dog Beach since 1994. Since 1994 there have been significant changes to the behaviour of other beaches that receive sand from Success Bank, in particular, Catherine Point has been eroding after many decades of accretion. The project must plan for the contingency of lower sand volumes feeding the beaches north of the development, this could mean that any necessary sand supply for the renourishment of Coogee Beach might need to be sourced from other places. This could be a particular concern for the northern end of Coogee Beach which will be deprived of all the sand it receives from the north by the development, which could be much more than the 5,000 cubic metres per year nominated in the ER.**

#### **WAPC Response**

Shoreline movement plans based on the photogrammetric mapping of the coastal vegetation line are widely used around the world in coastal engineering and management. The Department for Planning and Infrastructure (DPI) Coastal Facilities Branch (and its predecessors) have used this method on a number of marina development projects around Western Australia. Monitoring after construction has shown that the sediment fluxes predicted using the shoreline movement plans have been appropriate. In addition to the shoreline movement maps, beach and hydrographic

surveys have been used to determine the active height of the shoreline processes. This properly accounts for the deep nearshore waters of Owen Anchorage.

The recent lack of accretion of the Northern Dog Beach near Catherine Point is part of the overall process. The sand can accumulate in the shallow waters during periods of relatively calm conditions and then stormy periods can move the sand further offshore. The end result is that the sand movements and accumulations are not steady and uniform processes, but can vary markedly from season to season and year to year. This is the very reason that the shoreline movement maps are not used to estimate the sediment movements over small periods of time. As discussed in ER Section 3.1.4, the work for Port Catherine included the use of shoreline movement maps for 1942, 1976 and 1994. The data is separated by several decades and this ensures that it includes periods of calm and stormy conditions.

The shoreline movement data since 1994 indicates that there has been less advance of the coastal vegetation line between 1994 and 1999 than in the previous decades. In fact some areas experienced recession. This is most likely due to the stormy periods in 1996 and 1999 when storms appear to have moved sand from the upper portion of the active zone to deeper waters. This short term change is within the longer term changes that were assessed for the ER. The active heights used in the calculations include the deeper portion of the active zone. The sediment budgets have been revised to include the information for the period 1942 to 1999 and still show an average rate of accretion north of the Power Station and Catherine Point that is fully consistent with the calculations described in the ER.

Should the sand feed from the north be lower than predicted, then the rate of accumulation north of Port Catherine will be lower than predicted. Also, the amount of sand feed that would have reached Coogee Beach if Port Catherine was not present would be lower than predicted. The biggest impact on lower sand fluxes from the north would be on the rate of formation of the beach between Port Catherine and the Power Station. The prediction is that this beach will form over about 5 years. If it took slightly longer, this would not have an impact on the community.

As discussed in the ER Section 5.4.2, if the bypassing needs to be more than the 5,000m<sup>3</sup>/year that is nominated in the ER, and the required quantity is not available in the beach immediately north of Port Catherine, then the sand bypassing could be taken from the beach north of the Power Station. This beach is an animal exercise area and has formed over the last half century as a result of the Power Station and Robb Road Groynes.

The proposed Waterways Environmental Management Plan (refer ER Section 6) will provide for ongoing monitoring and management of changes to coastal processes and thereby ensure that the adjacent coastline and beaches are protected.

- b. In more recent years as the groynes and the power station became relatively saturated with sand, the natural transport southwards from Success Bank has started to return the beach to the wide sand strip it was originally. The most recent photograph shows the extent of this accretion such that without the proposed protuberance, most of the beach it is proposed to destroy will**

**continue to expand. The ER admits this situation but still states that “Coogee Beach has remained essentially stable – the present shoreline is now within 2m of its 1942 position”. Perhaps this is only true for the southern end of the beach adjacent to Woodman’s Point which has an accretion of sand northwards from Parmelia bank.**

### **WAPC Response**

As discussed in ER Section 5.4.2, the sandy beaches south of the Port Catherine site have received little sand feed from the northern beaches over the last half of a century because of the groynes at the Power Station, Robb Road, Catherine Point, Island Street and Douro Road. The Port Catherine development will continue to limit the feed of sand from the northern beaches. In other words, it will maintain the status quo.

Monitoring of the shoreline over the last decade shows that the Power Station and Robb Road Groynes are still effectively trapping longshore sediment transport. They have been trapping sand from the north for the last half-century. In this time, Coogee Beach initially receded up to 40 metres and this caused the beach alignment to change. With the new beach alignment, Coogee Beach is dynamically stable while experiencing little net movement of sand along the shore. Coogee Beach recedes and advances in response to variations in seasonal and inter-annual wave and water level conditions. Monitoring surveys have shown that the stormy winters in the last half of the 1990s caused recession of Coogee Beach back to the primary dune, and the calmer conditions of the past couple of years have resulted in the formation of a small foredune at the northern end of Coogee Beach.

As discussed in ER Section 5.4.2, with appropriate management the rate of sand supply to Coogee Beach from the northern beaches will not be affected by the Port Catherine development. Additional discussions with the DPI Coastal Facilities Branch, have supported this assessment.

It is proposed to monitor Coogee Beach as part of the Waterways Environmental Management Plan (refer ER Section 6) to ensure its protection from changes in coastal processes. The accumulation of sand to the north of the development will also be monitored and sand bypassing will be undertaken to continue the feed of sand to Coogee Beach. The Port Catherine development will maintain the status quo and not cause erosion of Coogee Beach.

- c. The experience with the previous large rock groyne project (South Fremantle power station) demonstrates that significant erosion of the main Coogee Beach will occur with construction of the proposed breakwaters.**

## WAPC Response

Refer to response to Submission 1.1(b).

- d. The engineering study does not give definite answers on the effects that the southern wall will have on the area from the Omeo wreck to Lot 101 (winter gouging of the wreck) and gouging out of Coogee Beach in the shadow of the groyne. What will happen to Coogee Beach with much larger groynes that are in much closer proximity to the beach? The breakwater will protrude at least 3 times further into the ocean than the powerhouse groynes. The marina will erode Coogee Beach and expose rocky ledges.**

## WAPC Response

The Omeo wreck currently experiences reflected wave energy from the Anchorage Butcher's Seawall. The Port Catherine development will upgrade this seawall and the new seawall will be designed to better absorb the wave energy and reflect less energy back onto the Omeo.

The marina breakwater will be more than 300m north of Coogee Beach and will also be designed to avoid any impact on the Omeo Wreck or risk of "gouging out of Coogee Beach in the shadow of the groyne. There will also be a program of beach monitoring and sand bypassing.

The movement of sand along the Owen Anchorage coastline is caused predominantly by the action of waves breaking on the shore: the breaking waves stir up the sand and when waves break with their crest at an angle to the shoreline, a current along the coast is formed. This current moves the sand suspended by the breaking waves along the coast and also causes sand to be moved over the seabed and along the coast.

Any breakwater or groyne extending out into the wave-breaking zone interrupts the movement of sand along the coast. If the structure extends seaward of the breaking zone then it will interrupt all of the sand movement along the coast. An even longer structure can still only stop 100% of the sand movement along the coast.

It is acknowledged and allowed for in the proposed coastal management strategy that the proposed Port Catherine development will interrupt all of the movement of sand along this section of the coast. The proposed sand bypassing will accommodate and manage this interruption to ensure that natural coastal processes are maintained. The sand bypassing will move sand to replace the movement of sand along this coast that is presently experienced.

As discussed in ER Sections 3.1.4 and 5.4.2, monitoring of the shoreline over the last decade shows that the Power Station and Robb Road Groynes are still effectively trapping longshore sediment transport. They have been trapping sand from the north for the last half-century. In this time, Coogee Beach initially receded up to 40 metres and this caused the beach alignment to change. With the new beach alignment, Coogee Beach is dynamically stable while experiencing little net movement of sand along the

shore. Coogee Beach recedes and advances in response to variations in seasonal and inter-annual wave and water level conditions. Monitoring surveys have shown that the stormy winters in the last half of the 1990s caused recession of Coogee Beach back to the primary dune, and the calmer conditions of the past couple of years have resulted in the formation of a small foredune at the northern end of Coogee Beach.

As discussed in ER Section 5.4.2, with appropriate management the rate of sand supply to Coogee Beach from the northern beaches will not be affected by the Port Catherine development. It is proposed to monitor Coogee Beach as part of the Waterways Environmental Management Plan (refer ER Section 6) to ensure its protection from changes in coastal processes. The accumulation of sand to the north of the development will also be monitored and sand bypassing will be undertaken to continue the feed of sand to Coogee Beach. The Port Catherine development will maintain the status quo and not cause erosion of Coogee Beach.

- e. Another groyne along the beach could have a major impact if the proposal to dredge both Success and Parmelia banks are taken into consideration. Clarification of the cumulative effects of all proposals within the Cockburn Sound and Owen Anchorage should be addressed and answered before approval is granted. The Sound cannot support another groyne or marina.**

#### **WAPC Response**

Cockburn Cement Limited is the proponent for long term dredging of shell sand deposits in Owen Anchorage. They have prepared an Environmental Review and Management Program to cover the proposed work. Detailed wave and shoreline measurements and modelling have been completed by Cockburn Cement and the results are included in their ERMP. This work shows that there will be little if any impact on the beaches of Owen Anchorage by the proposed dredging. A minor change in the net movement of sand at Explosives Jetty has been predicted by the work. Cockburn Cement has undertaken to monitor this beach and manage changes, should they occur.

As discussed in ER Section 5.4.2, the sandy beaches south of the Port Catherine site have received little sand feed from the northern beaches over the last half of a century because of the groynes at the Power Station, Robb Road, Catherine Point, Island Street and Douro Road. The Port Catherine development will continue to limit the feed of sand from the northern beaches. In other words, it will maintain the status quo.

As discussed in ER Section 5.4.2, the rate of sand supply to Coogee Beach from the northern beaches will not be affected by the Port Catherine development. It is proposed to monitor Coogee Beach as part of the Waterways Environmental Management Plan (refer ER Section 6) to ensure its protection from changes in coastal processes. The accumulation of sand to the north of the development will also be monitored and sand bypassing will be undertaken to continue the feed of sand to Coogee Beach. Therefore, the Port Catherine development will be managed so as not to cause adverse impact upon Coogee Beach.

- f. The ER indicates that there may be a need for “minor structures” to be constructed to protect Coogee Beach from erosion yet there is no detailed impact assessment for these structures. An analysis should be provided on the physical and visual impacts of these structures in a worst case scenario.**

#### **WAPC Response**

The "minor structures" to be constructed are two spur groynes each about 50 metres long. The spur groynes will be constructed at the same time and of the same limestone rock as the main breakwaters. They will be on the northern and southern breakwaters and will have only very minor visual impacts.

Their physical impact will be to prevent the loss of sand from the beach system by stopping sand being moved offshore along the breakwaters. By trapping sand on the landward side they will enhance the formation of a beach at this location. Such structures have been successfully incorporated into the breakwater design at marinas at other locations in WA, including Exmouth and Geraldton.

Prior to finalisation of the town planning scheme amendment, PCD will prepare a Waterways Environmental Management Plan (refer ER Section 6) that will provide detailed prescriptions for management of changes to coastal processes within the vicinity of the marina, and thereby ensure that the adjacent coastline and beaches are protected. The Waterways Environmental Management Plan will include detailed design consideration of the marina breakwaters.

- g. The proposed marina development, and any extension to Robb Rd groyne associated with it, will alter the rate of sediment transport along this portion of coast and may therefore impact on the valuable windsurfing location at Catherine Point. Catherine Point offers conditions for windsurfing that are rare for the Perth Metropolitan area and highly sought after, this could be affected by the proposal by reducing access to the beach and by altering the pattern, size or frequency of waves at Catherine Point or up to 500 metres offshore from it.**

#### **WAPC Response**

Catherine Point is located almost 2km north of the northern extent of the proposed Port Catherine marina. The accretion of sand north of the Power Station will have no impact on the nearshore wave and wind conditions off Catherine Point. The windsurfing conditions off Catherine Point will not be affected.

- h. The excessive accumulation of sand predicted to occur at the beach immediately north of the project as a result of the project will effectively inhibit any attempt to redevelop the power station and its breakwater for significant maritime related use.**



## **WAPC Response**

The development of the Power Station for maritime uses, such as a boat ramp, would be restricted by the movement of sediment along the coast even without the Port Catherine development. One of the opportunities for ongoing coastal management that is proposed in the Coastal Engineering Study for the ER (refer ER Appendix I) is for Robb Road Groyne to be progressively extended to capture sand moving along the coast from the north. Opportunities for maritime development at the Power Station would be considerably enhanced if the sand were trapped further to the north. Although sand trapping to the north of the Power Station is not specifically proposed as part of the Port Catherine development, it could readily be incorporated into the proposed coastal management strategy.

Prior to finalisation of the town planning scheme amendment, Port Catherine Developments Pty Ltd (PCD), as the developer of the Port Catherine Project, will prepare a Waterways Environmental Management Plan (refer ER Section 6) that will provide detailed prescriptions for management of changes to coastal processes within the vicinity of the marina, and thereby ensure that the adjacent coastline and beaches are protected. The Waterways Environmental Management Plan will include consideration of future opportunities for maritime related use of the old power station site.

- i. The concern that the proposal will cause erosion at Coogee Beach is heightened by the potential for additional impacts from global climate change. Not only from rises in sea level, which may have been considered by the ER, but also from additional erosion from north west storm events. The configuration and location of the proposed marina will make Coogee Beach vulnerable to increased north west storm events and any increase in the duration of the winter littoral drift cycle.**

## **WAPC Response**

The issues of global warming and climate change are complex and the work completed by the International Panel on Climate Change was used in the coastal engineering investigations for Port Catherine. The CSIRO has completed additional work on the likely regional changes that may result from climate change however this work is inconclusive with regard to changes in the wind and wave patterns for the Perth area. There are no reliable predictions concerning a possible increase in north-westerly storm activity. Consideration of global climate change in the engineering studies for the Port Catherine Project was fully consistent with the Draft State Coastal Planning Policy released by the WAPC in 2001.

- j. Global warming and the prediction that sea levels will increase by 0.6m in the next 100 yrs have not been accounted for.**

## **WAPC Response**

The WAPC Draft State Coastal Planning Policy recommends the use of an allowance for sea level rise of 0.38m over the coming 100 years, consistent with the latest results from the International Panel on Climate Change. This has been used in the coastal engineering work for Port Catherine.

### **1.2 Access and Recreation**

- a. Keep Coogee Beach and adjacent coastline in its present state or return it to its natural state. Leave our beaches for future generations.**

## **WAPC Response**

The Port Catherine development specifically avoids any disturbance to Coogee Beach and the adjacent dune system.

Coogee Beach is recognised as a popular recreational beach and is highly valued by the local community. Concerns were raised during informal reviews of earlier concept plans for the Port Catherine development regarding the potential loss of amenity of Coogee Beach. The proposed development was relocated northwards and reconfigured in specific response to community concerns so as to completely avoid disturbance to Coogee Beach and the associated dunes.. This change was made by PCD following detailed consultations on planning and environmental matters with respect to the previous concept and represented a substantial community gain in terms of the preservation and enhancement of public and environmental amenity.

As discussed in ER Section 5.4.2, with appropriate management the sand supply to Coogee Beach from the northern beaches will not be affected by the Port Catherine development. It is proposed to monitor Coogee Beach as part of the Waterways Environmental Management Plan (refer ER Section 6) to ensure its protection from changes in coastal processes. Sand bypassing will be undertaken to continue the feed of sand to Coogee Beach. Therefore, the Port Catherine development will be managed so as not to cause adverse impact upon Coogee Beach.

- b. The project ruins 3km of currently public accessible beach front.**

## **WAPC Response**

The amendment area extends over approximately 1.2km of the coastline, which represents 6% of the total coastal frontage within the City of Cockburn. Within the amendment area, approximately two-thirds of the coastal frontage (i.e. 800m) is former waterfront industrial land that has been substantially modified and is not formally available for public use. In addition to its lack of usability, the private ownership of parts of this land also creates a barrier to legal access to the adjoining coastline.

The northern 400m of the coastline in the amendment area is a sand beach. There are two additional areas of beach, being 70m and 60m long, further to the south. The remaining coastline in the amendment area is rock, mostly constructed seawall to protect old industrial sites from coastal erosion.

Of the sand beach, only 360m is vacant public land. However even this has limited accessibility, with users gaining informal access to the beach across land owned by Western Power that separates the beach from the adjoining road and pedestrian links. This land was formally used for disposal of flyash waste.

The 360m of public beachfront represents 4.2% of the 8.5km of public beachfront within the City of Cockburn.

The proposed development will provide 3km of public waterfront (including the breakwaters) that will include a diverse range of waterfront recreational experiences with improved accessibility for all sectors of the community. This will include better access and usability for the disabled, which currently does not exist within the City of Cockburn.

Features of the coastal access that will be provided by the project include public jetties and boardwalks throughout the project area; improved fishing opportunities from sea walls, jetties, boardwalks etc; disabled access to waterside areas, including fishing spots, bathing areas, boardwalks etc; enhancement of the beachfront environments; and retention of the heritage values of the Omeo Wreck.

The marina development will also result in the accumulation of sand to form a beach around 50m wide to the north of the northern breakwater. This beach will be sheltered during sea breeze conditions and is likely to become an additional regional recreational resource. It will have a public road and pedestrian interface.

- c. The small protected beach embayment between these headlands already provide a valuable asset to the community and should be enhanced by remediating the industrial areas behind them rather than destroying the headlands and beaches altogether.**

#### **WAPC Response**

Refer to responses to Submissions 1.2(a) and (b).

- d. No analysis was undertaken to see whether more marinas were required. No alternative location for a marina is assessed, is this the best location?**

#### **WAPC Response**

The demand for additional marina facilities in the metropolitan region was the subject of a recent assessment by MP Rogers & Associates. The report concluded that there is a pent-up demand for boat pens within the metropolitan area, with virtually all of the

existing facilities being completely full and having waiting lists. Most facilities also appear to have reached full development potential.

Based on statistics provided by the Coastal Facilities Branch of the DPI, the number of boats greater than 8m long, and hence likely to require a wet pen, has increased by approximately 100 boats per year over the past decade. Based on this trend, it is estimated that there will be a need for at least 1,000 additional wet pens in the metropolitan area over the next decade.

Opportunities to develop new marina facilities along the metropolitan coast are heavily constrained by environmental concerns. Port Catherine offers a rare opportunity to develop new marina facilities in a locality that is relatively unconstrained from an environmental perspective.

The original impetus for the Port Catherine project arose from City of Cockburn and Western Australian government initiatives to rehabilitate derelict coastal land previously used by noxious industry and to create a marine oriented residential community and regional focus. The Port Catherine Project Agreement of 1997 agreed the principles and commitments between the Government and PCD necessary to facilitate the remediation and development. As part of the project, the provision of boat pens and other public marina facilities is an important objective in meeting the recreational needs of the community as a whole.

- e. The proposed location of the marina does not represent a balanced outcome in relation to dune protection. The location of the proposed marina coincides with the largest part of existing white sand beach and dune area.**

#### **WAPC Response**

As discussed in ER Section 5.4.1, the remnant foredunes within the amendment area that will be removed by the Port Catherine development occupy a distance of 400m (discontinuous) along the coastline. The dunes are in a moderately to heavily degraded condition (refer to the response to Submission 3.0(i)) and have relatively low conservation value. It is acknowledged that the dunes in the northern part of the amendment area are higher than further to the north and south, however this does not affect their relatively low conservation value.

Good condition foredune is protected for about 3,600 metres south of the development in the Woodman Point Reserve and, to the immediate north of the South Fremantle Power Station, the beach, foredune and adjacent inland areas are reserved as Regional Open Space for a distance of 2,700 metres to Success Harbour. The 400m of dune that will be affected by the Port Catherine development is approximately 6% of this lineal extent.

The Port Catherine development specifically avoids any disturbance to Coogee Beach and the adjacent dune system, which comprises a popular recreational area to the south of the amendment area.

- f. There is no continuous foreshore access. On Australand’s brochure; beach access stops at the southern end of the development. We need continuous beach access. A continuous beach/promenade along the sea frontage of the development is far more “democratic”, people friendly and less damaging to a fragile coastline than a marina.**

#### **WAPC Response**

Refer to response to Submission 1.2(b).

- g. The Public Equity Statement provided in the ER suggests 2200 m of beach will be provided in the amendment area (or 350 m). However there is no new beach in the concept at all, just the retention of the existing northern tip of Coogee beach and the breakwaters in front of the former industry. There is no public benefit in replacing the good beaches and natural limestone features in the amendment area with a marina.**

#### **WAPC Response**

The figures describing waterfront access after development that are provided in the Public Equity Statement (ER Figure 2-3) are incorrect. There will not be any beaches within the amendment area. The correct figures with respect to waterfront and beach access are as follows.

The amendment area extends over approximately 1.2km of the coastline, which represents 6% of the total coastal frontage within the City of Cockburn. Within the amendment area, approximately two-thirds of the coastal frontage (i.e. 800m) is former waterfront industrial land that has been substantially modified and is not formally available for public use. In addition to its lack of usability, the private ownership of parts of this land also creates a barrier to legal access to the adjoining coastline.

The northern 400m of the coastline in the amendment area is a sand beach. There are two additional areas of beach, being 70m and 60m long, further to the south. The remaining coastline in the amendment area is mostly seawalls constructed to protect old industrial sites from erosion.

Of the sand beach, only 360m is vacant public land. However even this has limited accessibility, with users gaining informal access to the beach across land owned by Western Power that separates the beach from the adjoining road and pedestrian links. This land was formally used for disposal of flyash waste.

The 360m of public beachfront represents 4.2% of the 8.5km of public beachfront within the City of Cockburn.

The proposed development will provide 3km of public waterfront (including the breakwaters) that will include a diverse range of waterfront recreational experiences with improved accessibility for all sectors of the community. This will include better access and usability for the disabled, which currently does not exist within the City of Cockburn.

Features of the coastal access that will be provided by the project include public jetties and boardwalks throughout the project area; improved fishing opportunities from sea walls, jetties, boardwalks etc; disabled access to waterside areas, including fishing spots, bathing areas, boardwalks etc; enhancement of the beachfront environments; and retention of the heritage values of the Omeo Wreck.

The marina development will also result in the accumulation of sand to form a beach around 50m wide to the north of the northern breakwater. This beach will be sheltered during sea breeze conditions and is likely to become an additional regional recreational resource. It will have a public road and pedestrian interface.

To the south of the amendment area, the marina development will fully retain Coogee Beach and the associated dunes. The condition of the foreshore in the vicinity of the Omeo wreck will be enhanced with appropriate landscaping.

- h. The Public Equity Statement suggests there will be direct public access to canal waterways. The seawall of the marina, and the narrow space abutting it will be flanked by houses and may result in conflicts between users of the public breakwaters and the residents. This will not provide a better quality public environment than a traditional beach.**

#### **WAPC Response**

Refer to responses to Submissions 1.2(b) and 1.2(g).

Detailed planning consideration of managing any potential for conflict between users of the public breakwaters and the residents will be provided during consideration of the town planning scheme amendment, which includes extensive opportunities for public input and comment.

This situation in principle will be no different from anywhere else where public space adjoins private property.

- i. While public access to the proposed seawalls for recreational fishing is acknowledged, this in itself is not sufficient compensation for the loss of current access to the shoreline.**

#### **WAPC Response**

Refer to response to Submission 1.2(b). There is a net gain of public foreshore access.

Detailed planning consideration of public access and facilities for recreational fishing will be undertaken during consideration of the town planning scheme amendment, which includes extensive opportunities for public input and comment.

- j. The development should include public access to beaches.**

### **WAPC Response**

Refer to response to Submission 1.2(b) and 1.2(g). Public access to beaches is protected.

- k. The ER fails to consider the existing long, parallel groyne located in the southern half of the amendment area. The developer should be required to remove this structure, clean up the foreshore, and restore a dune environment.**

### **WAPC Response**

The groyne referred is presumed to be the Anchorage Butcher's seawall to the north of Coogee Beach, constructed to control erosion of the old abattoir. The Port Catherine development will upgrade this seawall over its southern half and will create a waterfront linear parkland, which will include passive walkways, cycle trails, picnic facilities, disabled fishing platforms and grassed parkland, etc.

Immediately south of it, the Coogee Beach and dune will be fully retained (refer to response to Submission 1.2(a)).

### **1.3 Dunes**

- a. The reservation along the coastal strip should not be forfeited, even if it is a narrow strip. The coastal dune reserve zone has been recognised as worth preserving in other parts of Perth and should be preserved here.**

### **WAPC Response**

The proposed Primary Regional Road (PRR) rezoning in the southern part of the amendment area abuts, but does not extend into, the Coogee Foreshore Reserve, protected as Bush Forever Site 341 (Refer ER Figure 3-8).

The foreshore land that is currently zoned Parks and Recreation within the amendment area has low conservation value, as discussed in responses to Submissions 1.2(e) and 3.0(i) and summarised below.

In the northern-most part of the amendment area, the foreshore strip and hinterland that is currently zoned Parks and Recreation comprises a substantially disturbed high foredune and land previously used by Western Power for flyash disposal. The dune slopes steeply to the beach to the west and to the dual use pathway to the east and includes blowouts and slopes both vegetated and eroded. The vegetated parts vary from dense stands of spinifex or grassland to isolated individual plants surrounded by loose sand, and from monospecific stands of established alien plants and mixed alien grasslands to mosaics of small areas of low heaths, low shrublands, sedgeland and grasslands of natives. Weeds are common to abundant and widespread. There is also at least one shrub of African Boxthorn, a declared pest plant.

The condition of the vegetation in the vegetated parts of the dune is assessed as under 30% very good - good and over 70% good – completely degraded, with areas of severe localised disturbance.

The larger part of this dune and hinterland comprises areas of sand that are highly disturbed and bare of vegetation.

Immediately south of the foregoing area, there is a coastal sliver of land that is currently zoned Parks and Recreation. This land comprises foreshore along previous industrial land that was used for a tannery, crayfish storage and tallow manufacture and is heavily disturbed. The vegetation is a mixture of alien weeds.

The entire area currently zoned Parks and Recreation is assessed as having low conservation value.

Also refer to response to Submission 1.2(b).

- b. Even if the marina component of the proposal was approved, a Parks and Recreation reserve could still be retained over the dunes linking the coastal foreshore on either side of the amendment site.**

#### **WAPC Response**

This is not part of the proposal. Refer to response to Submission 1.3(a).

- c. The development will result in the removal of approx. 400m of existing foredunes. These are the tallest remaining dunes in Owen Anchorage and whilst the vegetation is somewhat degraded, there are coastal species present. The ER fails to consider the cumulative loss of dunes in the region. Between the Fremantle Port and Woodman Point, only 60% of the original dune system remains. Low flat dunes are well represented, however, the taller dunes found in the amendment area do not exist elsewhere. Most of the remaining Quindalup dunes are located north of the river or south of Rockingham. As with everything coastal in Cockburn Sound, there is a genuine need to protect what remains.**

#### **WAPC Response**

Refer to response to Submission 1.2(e).

- d. The proposed location of the marina does not represent a balanced outcome in relation to dune protection. Considering the environments abutting the amendment area, a marina could feasibly be developed immediately north at the old Power Station without compromising any dunes. The Government has failed to present a balanced approach to dune protection, when clearly one was available.**



### WAPC Response

Refer to responses to Submissions 1.2(d) and 1.2(e).

- e. **The ER indicates that the northern dune in the amendment area is of limited intrinsic value and is not linked to the Spearwood dune association to the east (the ridgeline) yet we believe it does have intrinsic value and this has also been stated by Ecoscape, et al (1999).**

### WAPC Response

Refer to responses to Submissions 1.2(e) and 3.0(i).

- f. **The proposed urban zone south of the marina and west of the existing Cockburn Road Reserve (railway reserve) intrudes on the dunal system adjacent to Coogee Beach and therefore should be included in the Parks and Recreation Reserve, at least west of the existing dual use path.**

### WAPC Response

The proposed rezoning in the southern part of the amendment area abuts, but does not extend into, Bush Forever Site 341 (ER Figure 3-8). The Port Catherine development will specifically avoid disturbing this dune system, which is generally in good condition and forms part of the Coogee Beach Reserve.

The Port Catherine development was relocated northwards and reconfigured during the early stages of project planning, in specific response to community desires for the Coogee Beach Reserve to remain intact. Port Catherine Developments will continue to liaise closely with the City of Cockburn to ensure that the dunes are fully conserved and protected.

MP Rogers & Associates recently assessed the appropriate setback distance to provide an adequate coastal buffer based on the general guidelines in the draft *State Coastal Planning Policy* ((WAPC 2001), and the *Coastal Planning and Development in Western Australia – Towards a Policy Framework* (WAPC 1996). The MP Rogers & Associates report recommended a setback distance of 73m from the present day vegetation line. The current concept plan for the Port Catherine project encroaches within this recommended setback. PCD recognises and agrees that the current concept will need to be modified to ensure the development remains behind the recommended setback line, which will provide additional buffer to the Coogee Beach dunes.

Also refer to responses to Submissions 1.2(a) and 3.0(f).

## 2.0 MARINE ENVIRONMENT

### 2.1 Marine Water Quality

- a. **The assessment of water quality in the marina is based on a simple comparison with other marinas using fairly subjective criteria for what constitutes an unacceptable algal bloom. The water quality assessment should aim to maintain a moderate level of protection compared to a suitable base line such as a known, near pristine marine ecosystem of similar characteristics.**

#### WAPC Response

The strategy for assessing the likely water quality within the proposed Port Catherine marina was defined in consultation with the DEP and the EPA. It is significantly more detailed than previous water quality assessments for similar projects in Western Australia and involved the following:

- Three-dimensional hydrodynamic modelling was used to simulate the physical processes (eg. stratification, tides, baroclinic (density induced) and wind induced currents) and the resulting flushing regime within the proposed Port Catherine marina. The modelling results are described in ER Appendix V and are assessed in ER Appendix IV. They have been used to optimise the waterway design and to enable confident prediction of the marina water quality for environmental assessment of the proposal.
- Inputs of dissolved inorganic nitrogen (DIN) (the forms of nitrogen that are immediately available as a plant nutrient) from groundwater and seawater inflows were included into the hydrodynamic model, to simulate the dilution and flushing of the groundwater with ocean water and thereby estimate the usual DIN concentrations that will occur within and outside the proposed marina. These inputs were based on measured DIN concentrations and modelled groundwater flows using accepted hydrological parameters.
- The biological response to the usual DIN concentrations was predicted in terms of likely growth of algae and the potential for unacceptable phytoplankton blooms.

The complex and variable conditions that result in nuisance algal growth in the coastal environment have confounded the development of accurate and reliable models to simulate the biological response to elevated nutrient concentrations. Therefore, the biological response to the modelled DIN concentrations at Port Catherine was predicted through comparisons with modelled and measured DIN concentrations at existing marinas elsewhere in metropolitan Perth. For this purpose, measurement and comparative modelling of water quality in the following marinas was undertaken:

- Success Harbour, located at South Fremantle less than 4km north from Port Catherine.

- Hillarys Boat Harbour, located at Sorrento Beach approximately 25 km north from Port Catherine.
- Jervis Bay Northern Harbour, located in northern Cockburn Sound approximately 5km south from Port Catherine.

Success Harbour was compared because of its proximity and its similar location in terms of exposure and source water quality. Hillarys Boat Harbour is relatively remote and is located in the more pristine conditions of Marmion Marine Park, but was compared because previous hydrodynamic and water quality monitoring studies had been undertaken to enable a more quantitative comparison. Jervis Bay Northern Harbour was compared because it suffered a significant phytoplankton bloom in summer 1998/99 and has since been closely monitored.

In addition to assessing the DIN concentrations and the associated propensity for problem algal blooms, the flushing time of each marina was assessed as an important secondary determinate of water quality. As well as affecting the dilution of groundwater nutrients, efficient flushing with clear ocean water increases the water clarity and reduces the rate at which phytoplankton settle out to enrich the sediments.

Additional investigations that were conducted to support and interpret the modelling work included the following:

- Water quality (DIN and chlorophyll) was monitored in Owen Anchorage at the location of the proposed Port Catherine marina, and inside and outside each of the other marinas that were modelled, to derive water quality input and calibration values for the modelling.
- Historical data and other information describing the water quality at each marina were reviewed, to enable interpretation of the modelling results in light of the water quality achieved elsewhere.

The modelled water quality at Port Catherine was interpreted and assessed based on the foregoing, to confirm that the proposal satisfies the EPA's objectives for water quality.

The results of the work demonstrate that, with the proposed environmental management, the water quality in the Port Catherine marina will be similar to both Hillarys and Success Harbours.

The validity of the comparative assessment in the ER is based on a proviso that water quality in Success Harbour and Hillarys Boat Harbour is satisfactory for a coastal marina. Monitoring data and historical records support the generally held perception that Success Harbour and Hillarys Boat Harbour meet ecological and social objectives for acceptability of water quality with respect to nutrients and algal productivity (refer to ER Appendix IV).

It is submitted that the assessment of water quality through comparison with these existing marinas provides an outcome that is directly relevant to assessing the proposed marina development. It is also better understood by the public.

The proposed Waterways Environmental Management Plan (refer ER Section 6) will ensure adequate marine water and sediment quality within the marina waterways. As outlined in response to Submission 2.1(b), the water quality assessment criteria that will be proposed to assess the water quality in the proposed marina will be consistent with those formulated for use in Cockburn Sound (Draft EPP).

**b. The water quality assessment criteria formulated for use in Cockburn Sound (Draft EPP) should be used by the EPA to assess the water quality of the Port Catherine proposal.**

**WAPC Response**

The Port Catherine proposal is located in Owen Anchorage, which is the embayment north of Woodman Point. The draft Environmental Protection (Cockburn Sound) Policy 2001 and the associated draft Environmental Quality Criteria Reference Document (Cockburn Sound) do not apply directly to Owen Anchorage. However the philosophy and approach adopted by the EPA to derive the draft water quality criteria for Cockburn Sound are generally applicable to environmental protection of other waterways in Western Australia, including Owen Anchorage.

As described in ER Section 5.6.4, a Waterways Environmental Management Plan will be prepared prior to finalisation of the town planning scheme amendment, to the requirements of the WAPC and EPA on advice from the City of Cockburn and the DEP (refer Section 6.0: Management Measure 3). The Plan will describe, inter alia: water and sediment quality criteria that are to be maintained within the marina; ongoing monitoring and management of marine water and sediment quality; and contingency measures for timely and appropriate response to contingent events, including responses to possible temporary episodes of reduced water quality eg increasing groundwater extraction, seawater pumping to augment flushing.

It is appropriate to apply the philosophy and approach described in the draft Environmental Quality Criteria Reference Document (Cockburn Sound) to the derivation of criteria for assessing water and sediment quality within and adjacent to the Port Catherine marina.

The draft Environmental Quality Criteria Reference Document (Cockburn Sound) describes two types of Environmental Quality Criteria as follows:

- Environmental Quality Guidelines (EQG) are threshold values, which, if met, indicate “a high degree of certainty that the associated environmental quality objective has been achieved”.
- Environmental Quality Standards (EQS) are threshold values that indicate a level beyond which “there is a significant risk that the associated environmental quality objective is not achieved and a management response is triggered”.

The EQG defined in the draft Environmental Quality Criteria Reference Document (Cockburn Sound) with respect to phytoplankton growth for moderate protection of the

marine ecosystem is that the median (50<sup>th</sup> percentile) chlorophyll *a* concentration should not exceed 1.031µg/L. This concentration is the 95<sup>th</sup> percentile chlorophyll *a* concentration (i.e. it is exceeded 5% of the time) at a reference site in central Warnbro Sound, based on data collected at irregular intervals during summer between 1977/78 and 1993/94.

The EQG for phytoplankton blooms in marine waters requiring moderate protection is that the ambient (median for the area) chlorophyll *a* concentration should not exceed 2.41µg/L on more than one occasion during a summer period and the median chlorophyll *a* concentration at any one site over a summer should not exceed 2.41µg/L. The value of 2.41µg/L is three times the 80<sup>th</sup> percentile chlorophyll *a* concentration in central Warnbro Sound, based on the aforementioned data.

The EQS defined in the draft Environmental Quality Criteria Reference Document (Cockburn Sound) with respect to phytoplankton blooms for moderate protection of the marine ecosystem is that the ambient (median for the area) chlorophyll *a* concentration should not exceed 2.41µg/L on more than three occasions during a summer period and the median chlorophyll *a* concentration at any site over a summer should not exceed 2.41µg/L in two consecutive years.

EQC and EQS derived from central Warnbro Sound are not necessarily applicable to an assessment of water quality in a coastal marina. Chlorophyll *a* concentrations in nearshore waters are usually significantly greater than in offshore areas of an open embayment, without denoting unacceptable environmental quality. This is specifically acknowledged in the draft Environmental Quality Criteria Reference Document (Cockburn Sound)(EPA 2001). Similarly, chlorophyll *a* concentrations in a semi-enclosed marina are usually greater than in the adjacent nearshore waters, but again, this does not denote unacceptable environmental quality.

It is proposed that chlorophyll *a* and light attenuation measurements within and adjacent to the Port Catherine marina should be assessed through comparison with a suitable reference site in Warnbro Sound. The proposed EQG and EQS for chlorophyll *a* are recommended as follow:

- EQG with respect to phytoplankton growth (moderate protection) is that the median (50<sup>th</sup> percentile) chlorophyll *a* concentration should not exceed the 95<sup>th</sup> percentile chlorophyll *a* concentration at a suitable reference site(s) in Warnbro Sound.
- EQG for phytoplankton blooms (moderate protection) is that the median chlorophyll *a* concentration within and/or outside the marina during a summer period should not exceed three times the 80<sup>th</sup> percentile chlorophyll *a* concentration at a suitable reference site(s) in Warnbro Sound.
- EQS for phytoplankton blooms (moderate protection) is that the median chlorophyll *a* concentration within and/or outside the marina during a summer period should not exceed three times the 80<sup>th</sup> percentile chlorophyll *a* concentration at a suitable reference site(s) in Warnbro Sound on more than three occasions during a summer and in two consecutive years.

These proposed criteria are consistent with the philosophy and approach in the draft Environmental Quality Criteria Reference Document (Cockburn Sound) (EPA 2001).

- c. The comparisons to Hillarys and Success Harbours are problematic since Port Catherine is deeper.**

#### **WAPC Response**

The three-dimensional computer modelling of the hydrodynamics of the various harbours properly accounts for the differences in harbour depths. The modelling indicated that the deeper areas of Port Catherine and Jervoise Bay were not completely mixed throughout the water column. The effects of these partially mixed, deeper areas are properly shown in the results. The comparison of the resultant nutrient concentrations in the four harbours is appropriate. The resultant nutrient concentrations in Port Catherine will be similar to those in Hillary's and Success Boat Harbours and significantly less than in Jervoise Bay Northern Harbour.

- d. Concrete pipes spaced every twenty metres just off the ocean floor need to be installed to improve flushing.**

#### **WAPC Response**

Large pipes spaced every 20 metres just off the ocean floor and connecting the waterways with the ocean on the other side of the breakwater could result in slightly increased water exchange in some areas. However, they would also enable swell wave energy to be transmitted through the breakwater and reach the "protected" waterways. This wave activity would make boat moorings difficult and dangerous. The large number of pipes would not only be expensive but they would render the waterways ineffective as a harbour for small boats. The marina and waterways have good natural flushing characteristics and the pipes are not needed.

- e. We believe that the sediments in the area of the proposed marina are contaminated from the many noxious industries that used the site. Dredging for the proposed marina will disturb contaminated sediments thus causing significant water quality problems for Owen Anchorage.**

#### **WAPC Response**

These concerns are addressed in Sections 5.6.1 and 5.6.2 of the ER. The sediments to be dredged are essentially uncontaminated. Dredging will be carried out following completion of the breakwater and closure of the entrance to the harbour by a silt curtain so disturbed sediments will not escape from the harbour. The Construction Management Plan (refer ER Section 6) will specify monitoring and management procedures to prevent adverse impacts on marine water quality, flora and fauna and coastal processes.

- f. The proposal will bring many more power boats to the area, which leave traces of pollutants in the water and impact on the amenity and health of beach swimmers.**

**WAPC Response**

The Port Catherine development will provide for approximately 150 boats. As described in ER Section 6.0, a Waterways Environmental Management Plan will be prepared prior to the finalisation of the local town planning scheme amendment. The Plan will include provisions for ongoing monitoring and management of marine water and sediment quality, including timely and appropriate response to contingent events. Experience at existing non-commercial marinas in Western Australia and elsewhere in Australia indicates that appropriately designed and managed marinas do not suffer from poor water quality.

- g. Long-period waves may penetrate the north-facing harbour entrance and generate a surge problem.**

**WAPC Response**

The preliminary design of the north facing entrance, using the 100 year Average Recurrence Interval waves from the northwest, has shown acceptable surge penetration into the marina. The wave penetration has been calculated using proven coastal engineering methods accounting for diffraction and reflection. The preliminary design has 150 metres of breakwater overlap and will be validated in the detailed design stage using computer modelling of the wave penetration processes.

- h. Will the marina be provided with a wastewater pump out facility?**

**WAPC Response**

The marina facilities and associated amenities will be designed in consultation with relevant agencies, including the City of Cockburn and the DPI. A wastewater pump-out facility for vessels using the marina will be included.

- i. The following concerns were raised regarding the proposed groundwater interception drain that will be used to manage marina water quality by reducing the inflow of nitrogen rich groundwater:**

- 1) More information is required on the bore interception plan. How will it affect existing groundwater users? Will the water be suitable for irrigation? Has this method of groundwater recovery been successful elsewhere in the world?**

## WAPC Response

Existing groundwater quality at Port Catherine is detailed in ER Table 2 (Section 3.1.2). As described in ER Section 4.3.2, the 3D finite element model FEMWATER was used to specifically assess the potential for advection of contaminants in the groundwater at Port Catherine to the groundwater intercept drain. The results are detailed in ER Table 17 (Section 4.3.2) have shown that site contamination at Port Catherine will not cause the quality of the water captured by the intercept drain to ever exceed current irrigation water quality criteria, even over the long term.

Existing bore users will not be affected by the drain's operation. Groundwater modelling summarised in ER Figure 4-30 has shown that groundwater drawdown in the vicinity of the nearest operating bore will be less than 15cm. This drawdown is negligible relative to the thickness of the unconfined water table, which exceeds 20m. There will be no discernable impact on existing groundwater users.

With the drain operating, the predicted end of summer water table at Manning Lake is about 0.1m lower than the average end of summer water table. Draw down at the Market Garden swamps is also predicted to be less than 0.1m.

In addition, part of the captured drain water will be used to irrigate public parklands that are currently irrigated from local bores, which will reduce the demand on the superficial aquifer surrounding the existing bore users.

- 2) **If the recovered nitrogen enriched groundwater is re-used to irrigate parklands, wouldn't this be just transferring the problem to a site remote to the development? This would create the potential to develop algal blooms, especially at Manning Park Lake and Coogee Beach.**

## WAPC Response

The intercepted groundwater will be the same or similar quality to the groundwater currently extracted to irrigate Manning Park Lake and Coogee Beach. Both these areas are currently irrigated with local groundwater, which is nitrogen enriched. The likelihood and frequency of algal blooms at Manning Park will not be changed. The likelihood of algal blooms at Coogee Beach will actually reduce, due to the reduction in groundwater nitrogen inputs to Cockburn Sound that will derive from the groundwater reuse (refer to ER Section 4.3.2).

- 3) **The storage lake and re-injection bores should be located within the amendment area.**



### **WAPC Response**

The re-injection bores need to be located outside of the area of influence of the drain, to avoid recycling the water. As detailed in ER Section 4.3.2, the storage lake is located in a swale near the top of the ridge to provide safe storage with gravity flow to the irrigated parklands. The Waterways Environmental Management Plan (refer ER Section 6) includes the requirement that the preparation and implementation of a Landscape Management Plan for the Coogee Regional Open Space area, to ensure, among other things, that the lake will be landscaped to compliment recreational use of the Regional Open Space.

- 4) The impact on the ocean out from the re-injection bores has not been assessed, particularly the seagrass to the north of the amendment site.**

### **WAPC Response**

There is no seagrass in the nearshore area in the vicinity of the proposed reinjection bores. As stated in ER Section 4.3.2, until recently the nearshore waters adjacent to the proposed reinjection bores received a very substantial point source input of nutrients (up to 290kg/d of nitrogen) from wastewater discharged from the WA Meat Commission's Robb Jetty meatworks. In comparison, the reinjection bores will add 7.5kg/d of nitrogen (distributed along 2.3km of coastline), whilst coincidentally reducing the amount of nitrogen that is currently entering Owen Anchorage at Port Catherine by approximately 14.2kg/d (net reduction of 6.7kg/d of nitrogen to Owen Anchorage – refer ER Section 4.3.4). Therefore, the reinjection scheme will not cause adverse effect in the adjacent marine environment.

- 5) The ER states, “the [groundwater interception] drain will be used to extract sufficient groundwater so as to lower the local water table”. What will be the affect of lowering the water table on local bores?**

### **WAPC Response**

Refer to response to Submission 2.1(i)(1).

- 6) Pumping from an interceptor drain will affect groundwater supplies up to 3.5km east of the site (pg 6, Rockwater report in ER). This could have a disastrous affect on numerous bores and wells in the area from both drawdown and upconing of saltwater near the coast.**

### **WAPC Response**

Refer to response to Submission 2.1(i)(1).

**j. Groundwater entering Owen Anchorage must be improved.**

**WAPC Response**

As discussed in ER Section 4.2.4, the transport and fate of soil and groundwater contamination within the amendment area was assessed using the FEMWATER module of the United States Department of Defence, Groundwater Modelling System. All model input parameters and assumptions were conservative so as to simulate reasonable worst-case scenarios. A sensitivity analysis was undertaken to determine the effect of a range of parameter values on predicted groundwater flows and contaminant concentrations.

A detailed explanation of the modelling process, parameters, calibration and sensitivity is provided in ER Volume 3 (Appendix XI).

ER Table 16 presents predicted maximum contaminant concentrations in groundwater discharging into the marine environment. At all times the predicted maximum contaminant concentrations at the coast and predicted average contaminant concentrations in water intercepted by the proposed groundwater cut-off drain comply with the relevant DEP (2000) Water Quality Assessment Criteria.

In addition, the proposed management of groundwater entering the marina (refer ER Section 4.3) will mean that the project will achieve a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage in the groundwater. Current and previous studies have shown that large quantities of nitrogen are entering Owen Anchorage in groundwater seepage both within and outside of the Port Catherine site (refer ER Section 3.1.2). From this perspective, the proposed development will have a positive effect on Owen Anchorage by decreasing current groundwater nitrogen loadings to the ocean and therefore reducing the likelihood of seagrass outside the marina being adversely affected by nutrient enrichment.

**k. The water storage lake proposed to be located next to the rotary lookout will effectively resume more parks and reserves and impact upon existing residences. The scale in the ER in Fig 15 is incorrect, the capacity is to be 13,000m<sup>3</sup> so if the lake were approximately 5 metres deep then an area of approximately 2,600m<sup>2</sup> of bush reserve would be lost. The ER indicates that the storage lake is to be less than 200metres from existing residences, what impacts will arise?**

**WAPC Response**

The lake depicted in Figures 1 and 15 of the ER Summary, as with Figures 1.2 and 4.28 of the ER, is schematic and represents a surface area of approximately 4,000m<sup>2</sup> (the scale bar in Figure 15 and 4.28 is acknowledged to be incorrect). The 13,000m<sup>3</sup> of water would be contained by this lake if the mean depth was 3.25m, which equates to a lake with 1:6 sloping foreshore to 1.5m depth and having a maximum depth of 6.5m.

The lake would be approximately 120m from the nearest residence. No adverse social or environmental impacts are anticipated. It is anticipated that a landscaped lake at this location will be a popular recreational attraction, similar to other lakes in the region. The high water turnover will preclude algal or insect problems.

Creation of this lake would require the clearing of one stand of *Leptospermum laevigatum* shrubs (an alien plant,) and partial clearing of a second stand. The remainder of the vegetation is weedy grassland. There is no native vegetation in the area.

## 2.2 Seagrass

- a. **Analysis of ER Figures 3.6 and 3.7 indicates that the “ground-truthed” mapping process shows significantly less seagrass than was mapped by DA Lord and Assoc. The on site mapping carried out has excluded small clumps of existing and re-emerging seagrass. The ER indicates only 0.3 ha of seagrass loss. The total area of seagrass shown in Figure 3.6 is approximately 1.1ha, including scattered seagrass clumps. If smaller clumps were added, the figure would be even higher.**

### WAPC Response

As discussed in ER Section 3.2.3, Figure 3-6 shows the results of specific survey of the amendment area and surrounds by marine biologist divers. The survey “ground-truthed” aerial photographs to distinguish and map seabed habitat types.

Figure 3-7 shows regional mapping by DA Lord & Associates that was generated using aerial photographs. Habitats within the amendment area and surrounds were not “ground-truthed” by marine biological survey: surveys to “ground-truth” the photographs were conducted elsewhere but not within or near the amendment area. The areas within and adjacent to the amendment area that are mapped as seagrass habitat in Figure 3.7 but not in Figure 3.6 are not seagrass habitat. They are scattered seagrass clumps amongst dead seagrass rhizome mat and areas of algal wrack that cannot be distinguished from seagrass using aerial photography. Figure 3-6 is more accurate.

The area of approximately 0.3ha of seagrass within the amendment area is an estimate of the total area of seagrass, including seagrasses mapped as “scattered seagrass clumps.” As described in Section 5.3.1, the estimate includes approximately 0.27ha of seagrass within the dense seagrass beds (>75% cover) and 0.03ha of seagrass within the clumps of scattered seagrass (<25% cover).

- b. **The ER fails to assess the geographic distribution of nearshore seagrass in Owen Anchorage or the greater area of Cockburn Sound. These areas should be considered relevant in terms of the geographic distribution of seagrass. The seagrass that will be directly affected by the marina represents at least 25% of the remaining nearshore seagrass (1.1ha). Given the limited extent of remaining nearshore seagrass in Owen Anchorage and the virtual extinction of remaining nearshore seagrass in Cockburn Sound, it is important to retain**

**as much of the existing nearshore seagrass as possible, even that which is classified as scattered clumps or single plants. A more detailed mapping process is required.**

### **WAPC Response**

ER Section 5.3.1 assesses the loss of seagrass due to the Port Catherine development in terms of the geographic distribution of seagrass. As described therein, recent investigations of the historical and current distribution of seagrass in Owen Anchorage and Cockburn Sound have shown that, save for losses in the eastern part near old animal industry wastewater discharges, Owen Anchorage has not suffered the widespread decline in seagrass cover that occurred in adjacent Cockburn Sound (D.A. Lord & Associates *et al.*, 2000). On the Success and Parmelia Banks, which bound the northern and southern Owen Anchorage, the total seagrass cover has actually increased by approximately 500ha since 1965.

Eastern Owen Anchorage does appear to have suffered significant seagrass loss over the last half century, probably associated with high nutrient loads from the Coogee animal product industry discharges. The proposed Port Catherine marina is located in the specific loss area and now contains only a very small area of remnant seagrass within an area of dead seagrass rhizomes (refer ER Section 3.2.3). If it is assumed that seagrass cover in eastern Owen Anchorage was once as extensive as it currently is on Success Bank (approximately 40% cover), then historical seagrass cover in eastern Owen Anchorage may have been as high as 500ha rather than the current 250ha. Therefore, the net increase in total seagrass cover in Owen Anchorage may be only 250ha since 1965, not the 500 ha estimated by D.A. Lord & Associates *et al.*, 2000.

Loss of seagrass within the marina boundaries will be approximately 0.3ha. This is equivalent to:

- 1/70<sup>th</sup> of one percent of the total seagrass habitat (2,104.8ha) in Owen Anchorage
- 1/20<sup>th</sup> of one percent of the *Posidonia sinuosa* habitat (580.0ha) in Owen Anchorage
- 1/8<sup>th</sup> of one percent of the total seagrass habitat (245.9ha) in eastern Owen Anchorage (not including Success Bank and ParmeliaBank).
- 1/8<sup>th</sup> of one percent of the *Posidonia sinuosa* habitat (244.7ha) in eastern Owen Anchorage (not including Success Bank and ParmeliaBank).

The location and design of the proposed marina have specifically been reconfigured to minimise disturbance to seagrass habitat. In addition, the proposed management of groundwater entering the marina will mean that the project will derive a net benefit to seagrass habitat by achieving a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage in the groundwater.

The nearshore *Posidonia sinuosa* meadows in eastern Owen Anchorage are not ecologically distinct from those over a much wider geographic distribution and do not comprise a separate habitat.

- c. **The ER doesn't consider the loss of seagrass in context of the Owen Anchorage East mapping zone. In this zone there is only 20% remnant seagrass coverage and this is predominantly represented by a single species. It is critical in this area to protect the seagrass that remains to ensure seagrass regrowth can occur when conditions are favourable.**

**WAPC Response**

Refer to response to Submission 2.2(b).

It is acknowledged in ER Section 5.3 that seagrass losses have occurred in eastern Owen Anchorage. As also stated in Section 5.3, the loss of 0.3ha of seagrass habitat is equivalent to 1/8<sup>th</sup> of one percent of the remnant seagrass habitat in eastern Owen Anchorage (not including Success Bank and Parmelia Bank). This loss will be mitigated by the net benefit to seagrass habitat from a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage via the groundwater

- d. **The ER states that Owen Anchorage has not generally suffered the significant historical decline in seagrass habitat that befell Cockburn Sound, this is misleading, seagrass grew up to the shipping channel.**

**WAPC Response**

As discussed in ER Section 5.3.1, recent investigations of historical and current distributions of seagrass in Owen Anchorage and Cockburn Sound have shown that Owen Anchorage has not suffered the significant decline in seagrass cover that occurred in adjacent Cockburn Sound (D.A. Lord & Associates *et al.*, 2000). It is acknowledged that there have been some losses of seagrass meadows in eastern Owen Anchorage near to the historical animal industry discharges. On the Success and Parmelia Banks, which bound the northern and southern Owen Anchorage, the total seagrass cover has actually increased by approximately 500ha since 1965 (D.A. Lord & Associates *et al.*, 2000).

As discussed in response to Submission 2.2(b), seagrass loss over the last half century in eastern Owen Anchorage, probably associated with high nutrient loads from the Coogee animal product industry discharges, is estimated to be 250ha.

Therefore, the net increase in total seagrass cover in Owen Anchorage may be only 250ha since 1965, not the 500 ha estimated by D.A. Lord & Associates *et al.*, 2000.

In contrast, Cockburn Sound has suffered a net loss of 2,270ha of seagrass habitat (D.A. Lord & Associates *et al.*, 2000).

- e. **The dismissal of the elimination of the near shore seagrass as insignificant is not acceptable. With cessation of effluent discharge and the nitrogen "plume" from market garden fertilization due to decrease in 10 years the eastern grass would have a good prognosis.**

### WAPC Response

As described in ER Section 3.2.3 and shown in Figure 3.6, most of the shallow offshore seafloor within the amendment area is covered by extensive mats of dead *P. sinuosa* seagrass roots and rhizomes. The seagrass meadows are extinct and will not regenerate. The mats have low habitat value and will eventually erode and disappear due to wave action and biological activity.

Also refer to response to Submission 2.2(b) and (d).

- f. The ER acknowledges that the proposal doesn't comply with the draft Environmental Assessment Guidelines Nos. 22 and 29 with respect to cumulative loss of seagrass, this must be addressed. The seagrass in the amendment area should not be allowed to be destroyed for what is predominantly a reclamation project to establish a residential canal style development.**

### WAPC Response

Construction of the marina will result in the direct loss of a small (0.3ha) area of *Posidonia sinuosa* seagrass. This area is very small relative to the total area of seagrass and/or *Posidonia sinuosa* within Owen Anchorage (Refer to response to Submission 2.2(b)).

The current status of seagrass habitat in Owen Anchorage appears to be generally very healthy. Recent investigations comparing the historical and current distributions of seagrass in Owen Anchorage and Cockburn Sound have shown that Owen Anchorage has not suffered the significant decline in seagrass cover that occurred in adjacent Cockburn Sound (D.A. Lord & Associates *et al.*, 2000).

Table 19 in the ER shows that Success and Parmelia Banks, which bound Owen Anchorage, have actually experienced significant increases (by approximately 500ha) in seagrass cover since 1965. As discussed in response to Submission 2.2(b), seagrass loss over this period in eastern Owen Anchorage, probably associated with high nutrient loads from the Coogee animal product industry discharges, is estimated to be 250ha.

Therefore, the net increase in total seagrass cover in Owen Anchorage may be only 250ha since 1965, not the 500 ha estimated by D.A. Lord & Associates *et al.*, 2000.

Table 20 and Figure 3-7 in the ER show the current distribution of marine assemblages in Owen Anchorage.

The location and design of the proposed marina have specifically been reconfigured to minimise disturbance to seagrass habitat. In addition, the proposed management of groundwater entering the marina will mean that the project will derive a net benefit to seagrass habitat by achieving a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage in the groundwater.

It is concluded that the proposed amendment and marina construction is not contrary to the draft Environmental Assessment Guidelines Nos. 22 and 29 and will not compromise the EPA objective for marina flora.

- g. It is critical in this area to protect the seagrass that remains to ensure seagrass regrowth can occur when conditions are favourable. We disagree that there is “no regrowth potential” for the extensive rhizome mat in the amendment area and that the seagrass in these areas is “extinct”. There is insufficient knowledge relating to the potential for seagrass regrowth and what factors will influence this potential. Environmental conditions should be enhanced to the extent that the Owen Anchorage seagrass meadows can be restored to levels that have existed in living memory.**

#### **WAPC Response**

The location and design of the proposed marina have specifically been reconfigured to minimise disturbance to seagrass habitat.

As described in ER Section 3.2.3 and shown in Figure 3.6, most of the shallow offshore seafloor within the amendment area is covered by extensive mats of dead *P. sinuosa* seagrass roots and rhizomes. The seagrass meadows are extinct and will not regenerate. The remnant mats have low habitat value and will eventually erode and disappear due to wave action and biological activity.

Refer to response to Submission 2.2(b) with respect to the impact on seagrass habitat relative to the distribution of seagrasses in the area.

In addition, the proposed management of groundwater entering the marina (refer ER Section 4.3) will mean that the project will achieve a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage in the groundwater. Current and previous studies have shown that large quantities of nitrogen are entering Owen Anchorage in groundwater seepage both within and outside of the Port Catherine site (refer ER Section 3.1.2). From this perspective, the proposed development will have a positive effect on remaining Owen Anchorage seagrass habitat by decreasing current groundwater nitrogen loadings to the ocean and therefore reducing the likelihood of seagrass outside the marina being adversely affected by nutrient enrichment.

- h. There is concern that surrounding areas of seagrass will be affected during the construction of the marina, both from increased turbidity in the water and increased nutrient loads released from any disturbance of the existing sediments, especially in any storm events during construction.**

#### **WAPC Response**

These concerns are addressed in Sections 5.6.1 and 5.6.2 of the ER. The sediments to be dredged are essentially uncontaminated. Dredging will be carried out following completion of the breakwater and closure of the entrance to the harbour by a silt curtain

so disturbed sediments will not escape from the harbour. The Construction Management Plan (refer ER Section 6) will specify monitoring and management procedures to prevent adverse impacts on marine water quality, flora and fauna and coastal processes.

Based on an assessment of impacts to seagrass habitat near to various operating marinas in the metropolitan area (Hillarys, Mindarie, Two Rocks, Success Harbour), direct or indirect consequences to nearby seagrasses from marina construction will be limited to within 100m from the breakwater (Section 5.3.1). The nearest seagrasses at Port Catherine are 130m distant, with the nearest significant meadows being 275m away. Adverse effects to these habitats are not anticipated.

Visual monitoring of the adjacent waters of Owen Anchorage will be undertaken on a daily basis throughout the offshore construction program when turbidity plumes may be generated. The proposed monitoring and associated management will ensure appropriate protection of the seagrass meadows.

- i. There is concern regarding the impact from the construction of limestone groynes and breakwaters. Introducing such an alkaline substance into the ocean will surely cause destruction of life in the area (as in Jervoise Bay example).**

#### **WAPC Response**

Limestone is calcium carbonate of marine origin and is chemically the same as marine sediments in the area. The alkalinity of the coastal waters in the vicinity of the breakwaters will not significantly vary due to breakwater construction or operation.

The potential impacts to seagrasses resulting from construction of marine breakwaters were assessed in Section 5.3.1 in the ER, where existing marinas at Hillarys, Mindarie, Two Rocks and Success Harbour were reviewed to determine the long term survival of adjacent seagrass meadows. The results of this work showed that seagrass is generally excluded from a zone up to 100 metres wide around the outside of a breakwater. Possible causes of this impact are short-term shading by sediments generated during or following construction of the breakwater and/or altered seabed conditions generated by wave reflection from the completed breakwater.

Seagrass beyond 100m from the groynes appear to be unaffected by the presence of the breakwater.

The closest seagrass outside the Port Catherine marina is approximately 130m from the breakwater. The nearest area of extensive seagrass meadow is beyond 275m from the breakwater. These areas are beyond the zone of likely impacts from sediment plumes or wave reflection. Therefore, apart from the 0.3ha of seagrass within the marina boundaries, no seagrass elsewhere in Owen Anchorage is considered to be at risk from the construction or operation of the proposed marina.



- j. There is concern that the proposal will result in ongoing environmental impacts on the remaining areas of nearshore seagrass, affecting both existing seagrass and the potential for seagrass regrowth. The impact that changes in bathymetry will have on seagrass have not been assessed.**

**WAPC Response**

The Port Catherine development will cause accretion to the north of the northern breakwater. The accretion zone is not near seagrass meadows; this is shown on Figure 3.6 of the ER.

- k. Reported shoreline accretion will result in rapid changes to the bathymetry in the nearshore; the impact this will have on seagrass hasn't been assessed.**

**WAPC Response**

Refer response to Submission 2.2(j).

- l. The ER indicates that sand bypassing will be required as part of this proposal. Mechanically shifting sand to the south or dredging the marina mouth whilst allowing sand by-passing to occur naturally may well result in increased turbidity and sediment disturbances which could impact on the remaining nearshore seagrass areas south of the marina.**

**WAPC Response**

The turbidity impacts of the proposed sand bypassing have been assessed to be minor, localised and infrequent, without significant risk of impact on nearby seagrass meadows.

The proposed sand bypassing operations would be similar but of smaller magnitude to those completed each year at the Mandurah Ocean Entrance and at the Dawesville Channel. The experience gained at these sites indicates that there will be little turbidity created by the sand bypassing operations. The turbid plumes are generally around a hundred metres in extent and quickly dissipate when the bypassing stops.

The closest seagrass to the south of the Port Catherine marina is approximately 130m from the breakwater and more than 100m offshore. The nearest area of extensive seagrass meadow is beyond 275m from the breakwater.

In addition, sand bypassing operations at Port Catherine are only likely to be required once every 3 to 5 years (to be confirmed by foreshore monitoring). Consequently, the sand bypassing operations will be far less frequent than at Mandurah and Dawesville.

Prior to finalisation of the town planning scheme amendment, PCD will prepare a Waterways Environmental Management Plan that will set requirements for ongoing monitoring and management of changes to coastal processes within the vicinity of the marina, including monitoring and management of the sand bypassing operations. The

Waterways Environmental Management Plan (refer ER Section 6) will ensure adequate water and sediment quality within the marina waterways and the protection of the adjacent coastline and beaches from adverse changes in coastal processes.

- m. Seagrass 275m from the development has been mentioned. The seagrass located only 150m from the development should also be included in the report. Monitoring of all seagrass in the area needs to be addressed.**

#### **WAPC Response**

As detailed in ER Section 5.3.2 and shown in Figure 3.6, the closest seagrass outside the Port Catherine marina is approximately 130m from the breakwater. The nearest area of extensive seagrass meadow is beyond 275m from the breakwater.

As proposed in Section 5.6.1, daily visual monitoring of the adjacent waters of Owen Anchorage will be undertaken throughout the offshore construction program when turbidity plumes may be generated. The proposed monitoring and associated management will be defined in the Construction Management Plan (refer ER Section 6), which will specify procedures to prevent adverse impacts on marine water quality, flora and fauna and coastal processes.

### 3.0 TERRESTRIAL VEGETATION

The following concerns were expressed regarding the loss of natural bush/parkland with no replacement bush/parkland:

- a. **Small pockets of open space will be of little consequence for the preservation of the natural flora and fauna of the area. Small and isolated reserves do not have the ability to support species currently present. These areas are therefore not adequate compensation for the loss of regional open space.**

#### WAPC Response

As described in Sections 5.1 and 5.2 of the ER, the terrestrial environment at Port Catherine has been severely degraded following almost 90 years of continuous use by noxious industries and other land disturbing activities. South of the railway, the land proposed for Urban and Primary Regional Road (PRR) reservation does not contain any native vegetation communities or fauna habitats of significance.

Rehabilitating and landscaping the area of presently barren land within the Regional Open Space reserve on the eastern side of the Port Catherine amendment area, as shown in Figure 1 of the ER Summary, will significantly enhance the amenity of the eastern flank of the ridge and assist in achieving the north-south linkage concept promoted by the Beeliar Regional Park proposals for this locality. The proposal also conforms to the City of Cockburn's aspirations for a network of recreational trails through the ridge area.

The land proposed for PRR reserve north of the railway contains 0.59ha of regrowth shrubland which has low plant diversity and significant weed infestation but is part of Beeliar Regional Park and is nominated as regionally significant in Bush Forever (Site 247), together with 0.54ha of regrowth shrubland, also with low plant diversity and significant weed infestation, that is part of Beeliar Regional Park but was not nominated for protection in Bush Forever Site 247. Locating the roadway within the reserve so as to minimise vegetation disturbance will retain some of this remnant vegetation. Any necessary clearing of remnant *Acacia* shrubland within Bush Forever Site 247 and/or Beeliar Regional Park will be compensated through rehabilitation of at least a similar area from within the adjacent parts of the Site 247 that are currently devoid of vegetation. The Remnant Vegetation Management Plan will detail the proposed design and rehabilitation measures to minimise and compensate disturbance to remnant vegetation in Bush Forever Site 247 and Beeliar Park. The Remnant Vegetation Management Plan will be prepared as part of the Construction Management Plan, prior to approval for subdivision or development (refer to ER Section 6).

The rehabilitation of degraded land within the Bush Forever Site 247 will appropriately compensate for the loss of regrowth shrubland, some but not all of which is within Bush Forever Site 247 and all of which currently has low plant diversity and significant weed infestation. By focussing the rehabilitation effort within Bush Forever Site 247, we will avoid concerns relating to disaggregation of the conservation estate and thereby maximise the conservation benefit.

The proposed rehabilitation of nominated areas of cleared or disturbed vegetation will offset the loss of small areas of Acacia shrubland associated with the amendments and thereby ensure that the development does not compromise the EPA's objectives for protection of terrestrial vegetation, flora and fauna habitat.

**b. The vegetation and flora report is 5 years old and needs to be updated.**

**WAPC Response**

Ecological values would not have significantly changed since the surveys were conducted. Vegetation and flora having conservation value is, by definition, stable over the relatively long term and ecological values within the amendment area would not have increased since the surveys were conducted.

**c. The ridgeline on the eastern side of the development should be preserved. It supports fauna and dry vegetation flora.**

**WAPC Response**

As described in Sections 5.1 and 5.2 of the ER, the terrestrial environment at Port Catherine has been severely degraded following almost 90 years of continuous use by noxious industries and other land disturbing activities. South of the railway, the land proposed for Urban and Primary Regional Road (PRR) reservation does not contain any native vegetation communities or fauna habitats of significance.

Rehabilitating and landscaping the area of presently barren land within the Regional Open Space reserve on the eastern side of the Port Catherine amendment area, as shown in Figure 1 of the ER Summary, will significantly enhance the amenity of the eastern flank of the ridge and assist in achieving the north-south linkage concept promoted by the Beeliar Regional Park proposals for this locality. The proposal also conforms to the City of Cockburn's aspirations for a network of recreational trails through the ridge area.

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment (refer ER Section6).

**d. There should be no reduction in the total area of system six reserves as a result of this amendment.**

**WAPC Response**

Bush Forever has replaced System 6. Regardless, the System 6 values will be preserved, as follows.

The Coogee ridge, comprising the eastern part of the Port Catherine amendment area and across the ridge to the east, was originally set aside in 1963 by the (then) Metropolitan Region Planning Authority for the primary purpose of providing an odour buffer between residential areas and the noxious industries on Cockburn Road. In 1983, the Department of Conservation and Environment (DCE) proposed to include the Parks and Recreation “odour buffer” within System 6 Area M92 with a recommendation that the area be managed as a Regional Park and the need to link wetlands (e.g. Manning Lake with Market Garden Swamps to the south) by open space (DCE, 1983).

The Beeliar Regional Park proposal, published in 1992 after more than six years of scientific review and extensive public consultation, did not include the eastern part of the Port Catherine amendment area within the Regional Park; instead it proposed that “retention of open space linkages between Manning Lake, Coogee open space, the coast and the Market Garden Swamps should be a priority” (DPUD, 1992).

Whilst the Port Catherine development will reduce the area of the Coogee ridge that is currently zoned for “Parks and Recreation”, the proposed landscaping of parkland across the eastern side of the development will augment the ecological linkage value, which is now low, and thereby compensate for the loss. It will also incorporate the main vantage points that will provide panoramic views to the ocean and the coastline north and south of Port Catherine and will facilitate strong north-south and east-west recreational linkages. These outcomes are consistent with the original System Six requirements for Coogee Open Space. They also conform to the City of Cockburn’s aspirations for the area.

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment.

- e. **The relocation of 8 power poles to the north will cause destruction of native vegetation.**

#### **WAPC Response**

Existing 132kV transmission lines, which cross the site, will be relocated north of the railway line and to the eastern side of the Primary Regional Road reserve. This will improve the landscape amenity of the site. The preferred alignment is shown on ER Figure 5-7, where it follows the regional road in a north-south direction and then follows the railway cutting through the ridge to the west.

There is no existing native vegetation that would be affected by the relocated power poles along this alignment.

The railway corridor is a more appropriate location for the transmission line in this locality. The realignment along part of the eastern side of the PRR reserve will be screened by vegetation to be planted during the proposed landscaping of the Coogee Regional Open Space (Figure 1-2).

- f. The proposed alignment of the Primary Regional Road Reserve will remove a section of the railway reservation near Woodman Point Regional Park that currently acts as a buffer between the Park and Cockburn Road.**

### **WAPC Response**

The proposed PRR rezoning in the southern part of the amendment area abuts, but does not extend into, Bush Forever Site 341 (ER Figure 3-8). The Port Catherine development will specifically avoid disturbing this dune system, which is generally in good condition and forms part of the Coogee Beach Reserve.

The Port Catherine development was relocated northwards and reconfigured during the early stages of project planning, in specific response to community desires for the Coogee Beach Reserve to remain intact. Port Catherine Developments will continue to liaise closely with the City of Cockburn to ensure that the dunes are fully conserved and protected.

MP Rogers & Associates recently assessed the appropriate setback distance to provide an adequate coastal buffer based on the general guidelines in the draft *State Coastal Planning Policy* (WAPC 2001), and the *Coastal Planning and Development in Western Australia – Towards a Policy Framework* (WAPC 1996). The MP Rogers & Associates report recommended a setback distance of 73m from the present day vegetation line. The current concept plan for the Port Catherine project encroaches within this recommended setback. PCD recognises and agrees that the current concept will need to be modified to ensure the development remains behind the recommended setback line, which will provide additional buffer to the Coogee Beach dunes.

The ER Section 5.4.1 identifies the requirement for management at the interface between the amendment area and the Coogee Beach foredunes. Management will primarily be directed at minimising the edge effects of disturbance at the southern boundary and ensuring that increased public usage of the area does not destabilise the remaining dune system.

The Coogee Beach dunes are currently undergoing rehabilitation by the City of Cockburn and local community groups. In the past, areas of the dunes have been severely degraded by trampling, destruction of vegetation, invasion by exotic weed species and development. This follows years of neglect and unrestricted access that has resulted in loss of habitat and natural amenity.

Dune rehabilitation by the Council will be carried out over several years, with the aim of restoring the dunes to a more natural state, enhancing habitat and the natural amenity to the coastline. Works have begun in the northern section of the Coogee Reserve, on the dunes adjacent to the land proposed for the Port Catherine development.

Current rehabilitation works include weed control, sand stabilisation, fencing and revegetation. The City of Cockburn has recently received a small grant and had previously committed funds to begin the rehabilitation work. New fences have been erected and weed control and sand stabilisation using brushing has commenced. Plants have been ordered for the first year's planting, scheduled for late May 2002. Local

community groups have offered support for the rehabilitation and will be involved in planting.

The Port Catherine project at the boundary to the Coogee Beach dune system will coordinate with the community's efforts to rehabilitate and conserve the dunes. Together with the rehabilitation works, management of people will become a priority requirement and this needs to be integrated with management of the existing recreational node at the Coogee Caravan Park. PCD has committed to minimising disturbance at the interface of the residential development and the Parks and Recreation reserve and ensuring that appropriate access restrictions are maintained. The project will provide for signage and a limited number of controlled access pathways, to assist ongoing dune protection.

There are no dunes within the Port Catherine amendment area directly north of the Coogee Beach dunes. These dunes were removed and the coast filled with rock during previous development.

- g. The Remnant Vegetation Management Plan appears limited in scope and needs to address rehabilitation and management issues beyond just revegetation of former remnant vegetation areas. For example, interface treatments between the PRR reserve and the Regional Park needs to be addressed.**

#### **WAPC Response**

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment. The Landscape Management Plan will be to the requirements of the WAPC with the concurrence of the EPA on advice from DEP and the City of Cockburn.

The Remnant Vegetation Management Plan will detail the proposed design and rehabilitation measures to minimise and compensate disturbance to remnant vegetation in Beeliar Park, Bush Forever Site 247 and Bush Forever Site 341. The Remnant Vegetation Management Plan will be prepared as part of the Construction Management Plan, prior to approval for subdivision or development. It will be prepared to the requirements of the WAPC with the concurrence of the EPA on advice from DEP, CALM and the City of Cockburn.

- h. Cottesloe Central and South Vegetation Complex is low in secure conservation reserves, and should be preserved**

#### **WAPC Response**

As described in ER Section 3.2, there is very little native vegetation remaining within the amendment area to the south of the railway line. Most of the vegetation that does exist in this area is regrowth following previous clearing and has generally re-colonised

disturbed areas. Most is very weedy and with very few, if any, native plants in the understorey. The most common shrub is Coast Teatree (*Leptospermum laevigatum*), an eastern states import, while Castor Oil Plant (*Ricinus communis*) is also common. There are also thickets of self-sown pines, mainly along the railway and north of it, and prickly shrubs of African Boxthorn (*Lycium ferocissimum*), mainly south of the railway and east of the amendment area.

Other alien species that are well established and abundant in the amendment area include *Pelargonium capitatum*, *Euphorbia terracina*, *Trachyandra divaricata*, *Lupinus* sp. and several African grasses.

There are scattered individuals and small populations of native shrubs of several species among weedy growth.

North of the railway, the loss of up to 3.78ha of coastal heath vegetation between the PRR and the railway line will be compensated through rehabilitation of at least the same area within the adjacent parts of Bush Forever Site 247 that is currently devoid of vegetation, due to previous quarrying and other ground disturbing activities. The proposed rehabilitation measures will include seeding and replanting, together with weed reduction and control of indiscriminate access to assist regeneration. The Remnant Vegetation Management Plan will detail the proposed design and rehabilitation measures to minimise and compensate disturbance to remnant vegetation in Bush Forever Site 247 and Beeliar Park. The Remnant Vegetation Management Plan will be prepared as part of the Construction Management Plan, prior to approval for subdivision or development (refer to ER Section 6).

The need to conserve Cottesloe Central and South Vegetation Complex is supported, however the proposed amendments do not compromise this requirement.

- i. **The ER fails to identify the specific coastal species that are present in the northern dune of the amendment area. The ER identifies that there is some remnant vegetation in the dune (P82) but fails to describe it accurately. The City of Cockburn's Integrated Coastal Management Strategy, prepared by Ecoscape et al., quotes from a vegetation survey by Weston (in Bowman Bishaw Gorham, 1998) that reported no significant flora in the Port Catherine area, although it noted that "coastal species such as Spinifex sp., Cakile maritima, Scaevola crassiflora, Callitris preissi and Lepidosperma gladiatum are present. Further inland species such as Dryandra sessilis, Acacia cyclops, Hakea prostrata, Templetonia retusa and Banksia attenuata are also present". Ecoscape et al. said that "it was evident through community consultation that rehabilitation of the area should be a goal of management."**

### **WAPC Response**

Additional vegetation mapping of the northern dune and the coast south of it has been completed and is described in the Addendum to ER Appendix VI (attached). The Addendum includes text, Plates 1-4 and an updated Figure 3-5. With reference to the



amended vegetation map (attached), the vegetation of the coastal dunes in the amendment area is described as follows.

#### Area A' – Northern Dune Vegetation

The northern dune area is, basically, a high foredune roughly between the flyash disposal area and an area some 300m south of it that has a derelict tannery and other disused buildings and rubble. The dune slopes steeply to the beach to the west and to the dual use pathway to the east, and it includes blowouts and slopes both vegetated and eroded. The vegetation of this area is mapped as A', and the larger areas of sand on the dune that are bare of vegetation are part of the area designated as W (Condition 7) on vegetation maps in Weston (2001) and Bowman Bishaw Gorham (2001) (refer to updated ER Figure 3-5 in the Addendum for clarification of vegetation units and condition). These bare areas are apparently now larger than the areas shown on the aerial photo map.

The vegetation of the dune varies from dense stands of one principal species, such as the stand of *Spinifex longifolius* Closed [perennial] Grassland on the lower part of the western slope, to isolated individual plants surrounded by loose sand, and from monospecific stands of established alien plants, and mixed alien grasslands, to mosaics of small areas of Low Heaths, Low Shrublands, Sedgeland and Grasslands of natives, principally *Scaevola crassifolia*, *Lepidosperma gladiatum*, *Spinifex longifolius*, *Acacia cochlearis* and *Hemiandra pungens*. There are also plants of the native species *Acacia rostellifera*, *Olearia axillaris*, *Myoporum insulare*, *Lomandra maritima*, *Acanthocarpus preissii* and *Threlkeldia diffusa*. The weeds *Trachyandra divaricata*, *Euphorbia paralias*, *Cakile maritima* and *Bromus diandrus*, *Lagurus ovatus* and other alien grasses are common to abundant and widespread. There is also at least one shrub of African Boxthorn (*Lycium ferocissimum*), a declared Pest Plant.

The condition of the Area A' vegetation is assessed as under 30% Very Good (3) to Good (4) and over 70% Good (4) to Completely Degraded (6), with areas of severe localised disturbance.

#### Area A (northern)

The proposed amendment coastal area immediately south of the northern dune is lower dunes, a heavily disturbed, weedy version of Area A (southern). The vegetation is a mosaic and mixture of alien weed vegetation, especially of *Tetragonia decumbens*, *Trachyandra divaricata* and grasses, and native plants. The native species are principally *Scaevola crassifolia*, *Lepidosperma gladiatum* and *Spinifex longifolius*. There are also *Euphorbia paralias*, *Cakile maritima*, *Pelargonium capitatum* and other weeds.

The condition of the vegetation of Area A (northern) is assessed as under 50% Good (4) to Degraded (5) and over 50% Degraded (5) to Completely Degraded (6), with areas of severe localised disturbance. The rating is so poor because the vegetation is so weedy and heavily disturbed.

#### Coastal Area W

The proposed amendment coastal area between Area A (northern) and Area A (southern) is a flat raised area separated from the ocean by, mainly, steep rocky slopes and cliffs. It

is continuous with and part of the area shown on the vegetation maps in Weston (2001) and Bowman Bishaw Gorham (2001) as 'W'.

The vegetation of this area comprises alien species and is assessed as Condition 7.

### **3.1 Beeliar Regional Park**

- a. Beeliar Regional Park stands to lose about 2 ha with no compensation to the conservation estate. Beeliar Park should be preserved. This region links remnant wildlife habitats at Manning Park, Coogee Beach and Woodman Point. Relinquishing this land including the Coogee ridgeline is unacceptable. The area should be rehabilitated in recognition of its importance as habitat.**

#### **WAPC Response**

As described in Section 5.5.1 of the ER, the proposed PRR reservation north of the railway includes 1.57ha of Bush Forever Site 247 (and Beeliar Park) and a further 1.64ha that is included within Beeliar Regional Park but was not nominated for protection in Bush Forever Site 247 (ER Figure 3-8). The proposed Industrial rezoning north of the railway includes a further 0.57ha that is similarly within Beeliar Regional Park but excluded from Bush Forever Site 247 (ER Figure 3-8).

Of the total area of 3.78ha (1.57 ha within Bush Forever Site 247 and a further 2.21ha that is included within Beeliar Regional Park but was not nominated for protection in Bush Forever Site 247), about 30% (1.13ha) contains regrowth vegetation with low plant diversity and significant weed infestation probably due to the regrowth becoming established under disturbed conditions. The other 70% is a derelict quarry or has been otherwise substantially disturbed and is devoid of remnant vegetation (ER Figure 3-8).

No reasonable alternative exists for rerouting the PRR through this section of Beeliar Regional Park.

The location of the land proposed for rezoning from PRR reserve to Industrial, between the deviated PRR and the railway, deems it unsuitable for inclusion within Beeliar Regional Park. The absence of any remnant vegetation deems it unsuitable for conservation as remnant bushland.

It is proposed to compensate for any necessary clearing of remnant shrubland within both Bush Forever Site 247 and Beeliar Regional Park through rehabilitation of at least the same area within the adjacent parts of Bush Forever Site 247 that is currently devoid of vegetation, due to previous quarrying and other ground disturbing activities. The proposed rehabilitation measures will include seeding and replanting, together with weed reduction and control of indiscriminate access to assist regeneration. The focus of the proposed rehabilitation will be adjacent to the PRR, to also maximise public benefit.

The Remnant Vegetation Management Plan will detail the proposed design and rehabilitation measures to minimise and compensate disturbance to remnant vegetation

in Bush Forever Site 247 and Beeliar Park. The Remnant Vegetation Management Plan will be prepared as part of the Construction Management Plan, prior to approval for subdivision or development (refer to ER Section 6).

The 2.21ha reduction to the area of Beeliar Regional Park that is not included in Bush Forever Site 247 (comprising 1.64ha proposed from realignment of the PRR reserve and 0.57ha proposed for Industrial rezoning) will also be compensated by rehabilitating the area of presently barren land within the Regional Open Space reserve on the eastern side of the Port Catherine amendment area, proposed to be landscaped and irrigated as shown in ER Figure 1-2. This will significantly enhance the amenity of the eastern flank of the ridge and assist in achieving the north-south linkage concept promoted by the Beeliar Regional Park proposals for this locality. The proposal also conforms to the City of Cockburn's aspirations for a network of recreational trails through the ridge area. A Landscape Management Plan for the Coogee Regional Open Space area will be prepared to the requirements of the WAPC and the EPA on advice from the City of Cockburn and the DEP as part of the Waterways Environmental Management Plan.

- b. Rehabilitation proposals should compensate for the loss of all conservation estate in Beeliar Regional Park not just the “clearing of remnant vegetation within the Bush Forever Site 247 or Beeliar Regional Park” (page 37 of the ER Summary). The ER (page 87) states that the proponent will compensate for the clearing of remnant (regrowth) shrubland by rehabilitation of at least a similar area of Bush Forever Site 247, yet only 1.13 hectares will be rehabilitated.**

#### **WAPC Response**

Refer to response to Submission 3.1(a).

- c. The rehabilitation management measures outlined in the ER (page 85) are inadequate. Rehabilitation should include tube-stock plantings of local species appropriate seed distribution, a maintenance period, pest control, weeding, mulching and watering.**

#### **WAPC Response**

As stated in ER Section 5.1.1 (page 86) and proposed as a condition of the MRS amendment in ER Section 6-2.1, a Remnant Vegetation Management Plan will be prepared as part of the Construction Management Plan prior to application for subdivision approval. The Plan will detail the proposed rehabilitation measures to minimise and compensate disturbance to remnant vegetation. The Plan will be implemented by PCD to the requirements of the WAPC with the concurrence of the EPA on advice from DEP, CALM and the City of Cockburn.

- d. The groundwater interception and diversion scheme should not impact upon Beeliar Regional Park in any way without authorisation from CALM and the City of Cockburn.**

**WAPC Response**

As described in ER Section 4.3.2, the groundwater interception, re-use and diversion scheme will cause very marginal variation to groundwater levels at Beeliar Park. Groundwater modelling (ER Figure 4-30) has shown that end of summer groundwater drawdown at Beeliar Regional Park will be less than 20cm. This drawdown is well within natural variation and would not adversely affect vegetation.

## **4.0 FAUNA**

### **4.1 Terrestrial**

- a. The dune reserve to the west of Cockburn Rd in the northern amendment area supports reptiles and other fauna.**

#### **WAPC Response**

The northern dune area to the west of Cockburn Road comprises a coastal foredune bounded by a flyash disposal area, Cockburn Road, the ocean and an area with a derelict tannery and other disused buildings and rubble. The dune slopes steeply to the beach to the west and to the dual use pathway to the east, and it includes blowouts and slopes both vegetated and eroded.

Refer to the response to Submission 3.0(i) regarding the vegetative condition of this area. The vegetation in the area is mostly degraded, with areas of severe localised disturbance. Based on the degree of disturbance and the vegetative condition, the dune has very low fauna habitat value.

The one area of dense vegetation west of Cockburn Road in the northern amendment area is the small remnant of dense *Acacia rostellifera* located between Robb Road and the railway. The value of this area as fauna habitat was specifically assessed by Bamford Consulting Ecologists (refer ER Appendix VII). The assessment determined that “while it undoubtedly supports some fauna, its small size and isolation compromises its value.”

- b. The vegetation of the amendment area is degraded but still supports a vast amount of fauna and should be preserved.**

#### **WAPC Response**

Refer to Section 5.2 of the ER. South of the railway the amendment area has very low fauna habitat value. North of the railway, the eventual loss of approximately 4ha of coastal heath habitat between the PRR and the railway line is unlikely to affect the abundance, species diversity and geographical distribution of terrestrial fauna. The fauna of the site is widespread in the metropolitan region and populations will persist in the remnant habitat within the contiguous Bush Forever Site 247.

- c. The ER fails to identify the presence of Kites (Black Shouldered Kite) in the amendment area.**

#### **WAPC Response**

Bamford Consulting Ecologists conducted fauna searches and habitat appraisals of the amendment area on two separate occasions, as described in Appendix VII to the ER.

Fauna observed on the site and adjacent vegetated areas, notably north of the railway line, included 21 birds, 7 reptiles and 3 (introduced/exotic) mammal species. These are listed in Table 1 of Appendix VII and included, contrary to the submission, the presence of Black Shouldered Kites.

Other than the Short-billed Black Cockatoo, which was the only species of conservation significance recorded, all species observed are widespread in the metropolitan region. The black cockatoo was observed on the eastern flank of the limestone ridge, outside of the proposed MRS amendment area.

- d. The existence of several species of birds of prey living in this area, or using it as hunting ground, should be guarded with great zeal and cherished, not neglected.**

#### **WAPC Response**

Birds of prey recorded in the amendment area include the Black-shouldered Kite, Collared Sparrowhawk and Nankeen Kestrel. These birds are relatively widespread in the metropolitan region and populations should persist in the contiguous Beeliar Regional Park, protected as Bush Forever Site 247. The loss of less than 4 ha of coastal heath habitat between the PRR and the railway line will be fully compensated by rehabilitation of a like area of currently denuded land in Bush Forever Site 247. The abundance and/or use of the area by birds of prey are most unlikely to be affected by the proposed Amendment.

- e. There are diverse insects, spiders, frogs, reptiles, birds (list provided) that may not be threatened on a regional scale, but may be lost from this area if the development proceeds.**

#### **WAPC Response**

Bamford Consulting Ecologists conducted fauna searches and habitat appraisals of the amendment area on two separate occasions, as described in Appendix VII to the ER. Fauna observed on the site and adjacent vegetated areas, notably north of the railway line, included 21 birds, 7 reptiles and 3 (introduced/exotic) mammal species. These are listed in Table 1 of Appendix VII.

Other than the Short-billed Black Cockatoo, which was the only species of conservation significance recorded, all species observed are widespread in the metropolitan region. The black cockatoo was observed on the eastern flank of the limestone ridge, outside of the proposed MRS amendments.

South of the railway the amendment area has very low fauna habitat value.

North of the railway, the loss of less than 4 ha of coastal heath habitat between the PRR and the railway line will be fully compensated by rehabilitation of a like area of currently denuded land in Bush Forever Site 247. The fauna of the site is widespread in

the metropolitan region and populations should be able to persist in the remnant habitat within the contiguous Beeliar Regional Park, protected as Bush Forever Site 247.

- f. Given that the fauna study for the proposal is five years old and only included brief visits to the site, it may not provide an accurate description of the sites fauna values including seasonal changes and migratory species.**

#### **WAPC Response**

Fauna values would not have significantly changed over the intervening period since the surveys were conducted. Conservation values for fauna remain stable over the relatively long term (unless they decline). Ecological values within the amendment area would not have increased since the surveys were conducted.

The fauna study included both fauna searches and habitat appraisals on two occasions, winter and summer.

#### **4.2 Marine**

- a. The proposed marina has the potential to directly and indirectly negatively impact on almost all of the remaining nearshore seagrass in Owen Anchorage. This may impact on the diversity and geographic distribution of marine fauna within Owen Anchorage East. This could establish a marine desert in the very area where the community enjoys good recreational access to the marine environment.**

#### **WAPC Response**

Loss of seagrass within the marina boundaries will be approximately 0.3ha. This is equivalent to:

- 1/70<sup>th</sup> of one percent of the total seagrass habitat (2,104.8ha) in Owen Anchorage
- 1/20<sup>th</sup> of one percent of the *Posidonia sinuosa* habitat (580.0ha) in Owen Anchorage
- 1/8<sup>th</sup> of one percent of the total seagrass habitat (245.9ha) in eastern Owen Anchorage (not including Success Bank and Parmelia Bank).
- 1/8<sup>th</sup> of one percent of the *Posidonia sinuosa* habitat (244.7ha) in eastern Owen Anchorage (not including Success Bank and Parmelia Bank).

The location and design of the proposed marina have specifically been reconfigured to minimise disturbance to seagrass habitat. In addition, the proposed management of groundwater entering the marina will mean that the project will derive a net benefit to seagrass habitat by achieving a 10% reduction in the dissolved inorganic nitrogen loading that flows annually into Owen Anchorage in the groundwater.

As described in ER Section 5.3.2, the marine fauna in the Port Catherine locality is impoverished. The primary habitat types are shallow sub-tidal sand, pavement reef and, in the northern sector, deeper generally finer sand (ER Figure 3-6).

Sand habitat is the dominant habitat in Owen Anchorage (EPA, 1996) and has a generally impoverished fauna. The regional implications to marine fauna of enclosure and partial filling of approximately 27ha of sand habitat within a marina will be negligible (and may even be beneficial - marinas elsewhere along our coast have become used as nurseries for baitfish such as sandy sprat, anchovy and blue sprat).

The small areas of subtidal pavement reef in the amendment area also have a low diversity and abundance of plants and animals. The dynamic nature of the sediment in this area would ensure that the pavement reef represents a restricted habitat for most fauna. The loss of approximately two hectares of this habitat will be regionally insignificant and will be more than replaced by the proposed breakwaters.

- b. The ER does not consider the extensive presence of, mostly cryptic, marine invertebrate fauna. In addition, the Omeo wreck site is an artificial reef that has a richly varied flora and fauna. The build-up of sand in the shadow of the marina will essentially smother and bury the artificial reef.**

#### **WAPC Response**

Refer to response to Submission 4.2(a).

As described in ER Section 5.3.2, the marine fauna in the Port Catherine locality is impoverished. Each of the benthic habitats within the amendment area is well represented elsewhere in Owen Anchorage. The small habitat losses that will occur within the amendment area will be regionally insignificant. The proposed breakwaters will more than replace hard substrate habitats that are affected.

With respect to the Omeo wreck, PCD is strongly committed to retaining and protecting this wreck. It is proposed to monitor Coogee Beach and the accumulation of sand to the north of the development and complete sand bypassing to continue the feed of sand to Coogee Beach, without interfering with the beach dynamics. Also refer to response to Submissions 1.1(b) and 1.1(d).

- c. The breakwater construction will destroy marine life for at least 150m from the edge.**

#### **WAPC Response**

The most sensitive marine habitat in the vicinity of Port Catherine is seagrass meadow. As discussed in ER Section 5.3.1, the potential impacts to seagrass habitat resulting from construction of marine breakwaters was assessed by reviewing seagrass habitats near established marinas at Hillarys, Mindarie, Two Rocks and Success Harbour. The results showed that seagrass is generally excluded from a zone up to 100 metres wide around



the outside of a breakwater. Possible causes of this impact are short-term shading by sediments generated during or following construction of the breakwater and/or altered seabed conditions generated by wave reflection from the completed breakwater.

Seagrass beyond 100m from the groynes appear to be unaffected by the presence of the breakwater.

The closest seagrass habitat outside the Port Catherine marina is approximately 130m from the breakwater. The nearest area of extensive seagrass meadow is beyond 275m from the breakwater. These areas are beyond the zone of likely impacts from sediment plumes or wave reflection. Therefore, apart from the 0.3ha of seagrass within the marina boundaries, no seagrass elsewhere in Owen Anchorage is considered to be at risk from the construction or operation of the proposed marina.

Other than the seagrass meadows, the marine fauna near Port Catherine is generally impoverished. Any impacts to fauna that may be associated with the marina will be localised and will be more than compensated by the new habitat created by the breakwaters.

## 5.0 CONTAMINATION

- a. **Concern was expressed that soil and groundwater is contaminated and most of the site is unsuitable for housing.**

### WAPC Response

The Port Catherine proposal includes cleaning up all land within the development area, to render it suitable for urban development as proposed in accordance with strict international and national environmental and public health guidelines. ER Volume 3, Site Contamination Assessment and Management Program, Sections 1.3 and 6.3, address site clean up.

## 5.1 Soil

- a. **It is essential that soils are free from contamination, rubble and general waste.**

### WAPC Response

Refer to response to Submission 5.0(a).

The site cleanup will be in accordance with a Remedial Works Management Plan (RWMP), to include a Site Remediation Validation Plan (refer to response to Submission 5.0(b)). The RWMP will ensure that the site cleanup is consistent with the intended land use and protection of marine water quality.

The site cleanup will be supervised at all times by a Health, Safety and Environment Officer (HSE Officer) who will be a person with extensive experience in the assessment, management and cleanup of contaminated land. If at any time, the cleanup uncovers additional soils or waste materials that are a potential source of previously undetected contamination, the HSE Officer will take precautionary action to determine if a hazard exists and what management procedures should be applied.

These rolls and responsibilities will be defined in the Occupational Health and Safety Plan, which will also form part of the RWMP.

- b. **Can a guarantee be given that there will be no contamination left in the proposed development to be a risk to the health of future residents, the public and the environment?**

### WAPC Response

The site cleanup will be validated to the satisfaction of the WAPC with the concurrence of the EPA on advice from the Health Department of Western Australia (HDWA), the

DEP, Water and Rivers Commission (WRC) and the City of Cockburn. Audit results to verify the clean up must be provided to the approval of these authorities on completion.

Prior to the application for approval or subdivision or development, a Site Remediation Validation Plan will be prepared with the objective of demonstrating cleanup in accordance with the Site Contamination Assessment and Management Plan. The plan will be in accordance with the *Contaminated Site Assessment Guidelines for the Development of Sampling and Analysis Program* (DEP Contaminated Sites Assessment Series, 2001).

- c. By what means and where will contaminated soil from the proposed development be disposed?**

**WAPC Response**

The Site Contamination Assessment and Management Program Summary Report in Volume 3, Section 6.2 of the ER provides this detail. The soil is suitable for disposal to Class II or III landfill sites. Portions of the uncontrolled fill in the northern part of the amendment area require disposal to a Class IV landfill site.

- d. Past Fly/Coal Ash disposal to lots 109 & 43701 within the development is of concern. PCBs may also have been disposed in the fly ash pits. What remediation works will be carried out at these sites?**

**WAPC Response**

Management of fly ash is addressed in ER Section 4.2 and Volume 3, Part 1, Section 6.2. The management of past flyash disposal to Lots 109 and 43701 is proposed to be fully consistent with the WAPC management of the contiguous flyash deposition area, which is located in the other portion of the same property. The contiguous flyash deposition area was assessed in the previous WAPC Consultative Environmental Review (CER) (CMPS&F, 1998) and will be managed by WAPC in accordance with the Ministerial Conditions (EPA Bulletin 957, 2000).

The entire area of previous flyash disposal, including the property assessed in the WAPC CER and the contiguous property assessed in the ER, will be set aside as Public Open Space and will not be developed as residential.

- e. Approval by the Radiological Council is needed if dwellings are to be built in areas of previous fly/coal ash contamination. Approval of remedial processes should also be sought if the area is not built on (e.g. parkland is still open to the public).**

## **WAPC Response**

The flyash deposit on the contiguous land managed by the WAPC was assessed in the CER (Consultative Environmental Review, CMPS&F, 1998). As per Condition 6 in EPA Bulletin 957 (2000), subject to leachate tests to confirm that there is no risk to the environment, the flyash is to be contained on-site with a minimum cover of one metre of clean fill material to the requirements of the EPA on advice of the Health Department, WorkSafe WA, the WRC and the DEP.

Consistent with this condition of approval, PCD proposes to conduct leachate tests and to manage its contiguous area of flyash deposition in accordance with the Ministerial Conditions set for the WAPC property.

The entire area of previous flyash disposal, including the property assessed in the WAPC CER and the contiguous property assessed in the ER, will be set aside as Public Open Space and will not be developed as residential. Therefore, approval from the Radiological Council, to develop dwellings on the disposed flyash, is not applicable.

Nonetheless, the necessity to seek approval of remedial processes from the Radiological Council, prior to the area being built upon, is acknowledged.

**f. Site history indicates that asbestos is a potential contaminant of concern. Why has asbestos contamination and remediation not been addressed?**

## **WAPC Response**

A proposed condition of approval of the MRS Amendment will be the preparation of an Asbestos Management Plan as part of Construction Management. The Asbestos Management Plan (AMP) will be prepared prior to the consideration of an application for approval to subdivision or development within the amendment area, which ever occurs first and will be to the requirements of the WAPC with the concurrence of the EPA on advice from the HDWA.

Elements of the AMP will include:

- removal of asbestos buildings and any asbestos pieces;
- any soils containing visible asbestos fibre will be covered by at least 1m of clean soil.
- air monitoring for asbestos during construction activities; and
- handling, transport and disposal of asbestos according to occupational health and safety legislation and guidelines.

A proposed addendum to Part 2 “Construction Management” in ER Section 6, specifying the requirement for the AMP, is appended.

## 5.2 Groundwater

- a. **The Health Department supports preventing groundwater abstraction by placing memorials on titles at lots where Drinking Water Guidelines are exceeded. The WRC would need to be consulted on this matter and on the groundwater management and monitoring program prior to implementation.**

### WAPC Response

This is acknowledged. As specified in ER Section 6.1, the Groundwater Management and Monitoring Program, as part of the Remedial Works Management Program (ER Section 6), will be to the requirements of the WA Planning Commission with the concurrence of the EPA on advice from the DEP, HDWA, WRC and the City of Cockburn.

- b. **There are also concerns about sites where lots will not have memorials placed on them (some private bores that had detectable contaminates below drinking water guidelines). What level of restrictions will be communicated to potential purchasers and how will this be done?**

### WAPC Response

Memorials on titles will preclude groundwater abstraction in all areas within the amendment area where current or predicted groundwater contaminant concentrations exceed the DEP (2001) Drinking Water Guidelines. Predicted concentrations were derived from groundwater flow and contaminant fate and transport modelling, which included appropriately conservative assumptions. This is described in detail in ER Volume 3, Part 3, Appendix XII, Section 3.0 and shown in Figure 9.

- c. **Concerns regarding exposure to the groundwater via aerosols and microbiological parameters should be addressed. The ER refers to the use of groundwater to irrigate parks but there is no separate risk assessment on this.**

### WAPC Response

The local groundwater is currently used extensively for irrigation in the area. There is no reason to suspect public health concern related to microbiological contamination. If there was, it would be a regional concern not directly related to the proposed MRS Amendment.

- d. **Trace metals and hydrocarbons in stormwater from parking lots at the development have not been addressed. How will stormwater be managed?**

### WAPC Response

As stated in ER Section 4.6.3, stormwater will be retained and infiltrated on site with no stormwater discharge to the marina waterway or Owen Anchorage. Stormwater run-off will be managed by a piped system using gullies, pits and soakage structures. The proposed system will allow for maximum soakage and retention on site to accommodate up to the 1 in 10 year average recurrence interval (ARI) storm. Overland flow paths along roads and over public open space will manage peak flows for the 1 in 100 year ARI storm, with eventual discharge to the marina.

## **6.0 ROAD AND RAIL TRAFFIC**

- a. The ER assessment of the impacts from increased noise and vibration addresses only impacts to future residents, not existing residents.**

### **WAPC Response**

The railway is remote from existing residences.

The realigned Cockburn Road Reserve will pass within 120m of residences within the north-western corner of Cockburn Waters, reduced from the 150m currently separating them from Cockburn Road.

In comparison, the minimum distance between the carriageway and nearest future residential lots will be in the order of 15 metres. Accordingly, the future residences are the most noise and vibration sensitive and it is appropriate that the noise and vibration assessment for the ER focussed on these.

Prior to approval of the town planning scheme amendment, PCD will prepare a Noise Management Plan to ensure that the amenity of all nearby residences, including existing residences, is protected from noise emissions from the PRR and railway reserve. The Noise Management Plan will be prepared and implemented to the requirements of the WAPC and EPA on advice from DEP.

- b. There has not been any consideration of potential cumulative impacts of road and rail adjacent to the proposed development.**

### **WAPC Response**

The railway line near the realigned Cockburn Road is in a cutting approximately 4 metres in depth. The residences near the road at this point are at least 90m distance from the railway line, separated by the vegetated flyash disposal area that will be preserved as POS. The impact of railway noise and vibration on residences near the road will be negligible compared to the road traffic.

Similarly, residences near to the railway are relatively remote from the road.

Therefore, the noise and vibration from the trains does not impact on residences near the road and vice versa.

- c. Concern was expressed that the noise reduction mounds (1.5m) and standard fencing (1.8m) will leave almost no view of the ocean from the road for the entire length of development.**

## WAPC Response

The views of the ocean from the realigned Cockburn Road will be partially, but far from fully, obscured by the proposed residences. However there will be broad views to the ocean from more than half of the realigned road, with partial or intermittent views to the ocean from the rest.

Subject to the road design, views to the ocean are very unlikely to be reduced by the noise attenuating mounds or fences.

### 6.1 Existing Rail Line

- a. **There are presently more than two train movements per week. During grain exports through the Fremantle Inner Harbour there were in the order of 12 train movements per day on this freight line. Plans are being finalised for a new freight rail link and rail terminal within the Inner Harbour.**

## WAPC Response

The information that was provided by the rail authorities during preparation of the ER was that the average frequency of train movements past the Port Catherine site is currently about two per week, at a speed of 40 kilometres per hour. Westrail advised during preparation of the ER that they do not currently use the line and will not do so for some years, although it is still being used about twice per week by Australian National Rail.

It was understood that virtually all grain movements are through the CBH terminal in Kwinana rather than through Fremantle.

Current planning to expand the use of rail to service the Port of Fremantle Inner Harbour is acknowledged and will be accommodated during detailed design consideration of the Port Catherine development. To protect the amenity of nearby and existing residents from noise and vibration emissions from the railway, a Noise and Vibration Management Plan will be prepared when detailed planning for development occurs, prior to finalisation of the local town planning scheme amendment. Strategic buffers or other design options can be included in the plan if required, prior to any development occurring.

The number of train movements during the night is the critical issue, not the number of train movements per 24 hours, because the night is the noise sensitive period. The rail traffic during daytime could be substantially increased within acceptable noise limits provided night traffic was limited.

The noise and vibration assessment for the ER included allowance for two train movements per night, which is a significant increase on current traffic and is likely to accommodate future rail movements. At this volume of traffic, the noise and vibration at a distance of 30m from the track, which is the approximate distance of the nearest proposed residence, is acceptable without noise attenuating structures. The  $L_{Aeq, 8 \text{ hour}}$  at



30m would be 45dB(A) so has a Noise Amenity Rating of N1 (EPA rating criteria, as per preliminary draft EPA Guidance for EIA No. 14 (Version 3) – Road and Rail Transportation Noise).

If use of the railway increased to four train movements per night, the  $L_{Aeq, 8 \text{ hour}}$  at 30m would be 48dB(A) so has a Noise Amenity Rating of N2. This noise would be conditionally acceptable for residential land use, subject to appropriate noise barriers being installed to ameliorate potential noise nuisance.

If use of the railway increased to eight train movements per night, the  $L_{Aeq, 8 \text{ hour}}$  at 30m and without noise barriers would be 51dB(A) so has a Noise Amenity Rating of N3, which would be unacceptable for residential land use. However appropriate noise barriers to attenuate the noise, strategic buffers, other design options and/or memorials on titles of affected allotments, both to advise of the potential noise nuisance and to ensure that “quiet house” design principles are used, will ensure satisfactory management of noise even at this level of traffic. As described in the ER Section 5.8.3, noise amelioration measures (including memorials on some titles) are proposed. A leaflet outlining appropriate design and construction methods will also be provided to affected purchasers.

The management of current and likely future railway noise will be defined during the detailed planning for development, prior to finalisation of the local town planning scheme amendment. The proposed Noise Management Plan will be based on on-site noise measurements of freight rail activities to validate the  $L_{max}$  and  $L_{eq}$  levels and will be prepared to ensure that the amenity of nearby residences is protected from noise emissions from the railway. The Noise Management Plan will be prepared and implemented to the requirements of the WAPC and EPA on advice from DEP and the City of Cockburn.

A new freight link from the inner harbour would require the necessary approvals and is not a part of this development.

- b. There is currently a review of rail freight transport in progress which is likely to increase the traffic in heavy trains along the adjacent freight railway line. It is inevitable that this proposed encroachment on a freight corridor will lead to a clash of public interests in the future.**

#### **WAPC Response**

Refer to response to Submission 6.1(a). To protect the amenity of nearby and existing residents from noise and vibration emissions from the railway, a Noise and Vibration Management Plan will be prepared when detailed planning for development occurs, prior to finalisation of the local town planning scheme amendment. Strategic buffers or other design options can be included in the plan if required, prior to any development occurring.

- c. **The possibility of both passenger and freight rail has the potential to impact on the assumptions regarding the length and number of train movements used in the noise modelling.**

#### **WAPC Response**

The noise emissions from a passenger train service is, over the sensitive night period, approximately the same as for freight trains. This is because the high number of passenger trains is compensated by their lower noise emissions.

- d. **The Fremantle Port Authority is concerned about the impact of the proposed Urban zone on the Rail reserve (used solely for freight rail) that intersects the amendment area. The Rail reserve operates 24 hrs per day, and provides the only freight rail link to the Inner Harbour of the Port of Fremantle, which is the State's singular major container port. Since 1996/97 container trade has increased by 41% and is expected to continue increasing. Fremantle Port's aim is to move at least 25% by rail, requiring 4 trains (8 movements) per day (assuming double stacked containers).**

#### **WAPC Response**

The number of train movements during the night is the critical issue, not the number of train movements per 24 hours, because the night is the noise sensitive period. The rail traffic during daytime could be substantially increased within acceptable noise limits provided night traffic was limited.

Even if the number of train movements increased to as many as eight per day, the number of train movements during the night period does not necessarily have to increase to more than two movements per night, which was the number assessed in the ER.

At two train movements per night, the noise at a distance of 30m from the track, which is the approximate distance of the nearest proposed residence, is acceptable without noise attenuating structures (refer to response to Submission 6.1 (a)).

Even if the number of train movements doubled to four per night, the noise at the nearest proposed residences would be conditionally acceptable for residential land use, subject to appropriate noise barriers being installed (refer to response to Submission 6.1 (a)).

If use of the railway increased to as many as eight train movements per night (i.e. all projected traffic at night), it would be necessary to install appropriate noise barriers to attenuate the noise and also to place memorials on titles of affected allotments, both to advise of the potential noise nuisance and to ensure that "quiet house" design principles are used (refer to response to Submission 6.1 (a)). If necessary, strategic buffers and/or other design options could be applied. As described in the ER Section 5.8.3, the requirements for these noise amelioration measures are recognised and proposed.

Noise control measures are also available to the railway to allow even more traffic.

Prior to approval of the town planning scheme amendment, PCD will prepare a Noise Management Plan to ensure that the amenity of all nearby residences, including existing residences, is protected from noise emissions from the railway (refer to ER Section 6).

- e. **Current trade would increase 3 to 4 fold if rail port trade increases from 3% presently to 25-30%. It is possible for the allowable noise levels (8 movements per night) to be exceeded with freight train movements alone; they will certainly be exceeded if a passenger rail service is included.**

**WAPC Response**

Refer to responses to Submissions 6.1 (a-d).

- f. **Will the embankment proposed to protect houses from the noise of the railway (2 freight trains per day) be suitable for the increased frequency of trains that would result from a passenger service between Fremantle and the new Perth/Mandurah railway line?**

**WAPC Response**

Yes. Refer to response to Submissions 6.1 (a-d).

- g. **A 3m high barrier is required to attenuate locomotive noise; the proposed 1m high bund is insufficient.**

**WAPC Response**

At low speed, the noise emissions from a freight train are dominated by the wheel-rail interaction noise, not locomotive noise. Therefore, the installation of a low height barrier is appropriate and a 3 metre high barrier is not required.

Noise emissions from trains reduce significantly with speed. Trains at Port Catherine will be travelling at around 40km/hr.

Refer also to responses to Submissions 6.1 (a-d) and 6.1 (i).

- h. **Any assumptions used for noise modelling purposes need to be conservative (i.e. over-estimate likely noise levels) in order to allow for the possibility that more stringent criteria will be adopted when the EPA guidance is finalized.**

**WAPC Response**

The assumptions used in the acoustical assessment are conservative and will allow for variations in rail or road movements. The proposal has appropriately assessed noise using the criteria recommended by the DEP.

- i. No consideration has been given to wheel squeal due to track curvature. This has been is a significant contributor to noise levels/annoyance through Fremantle.**

#### **WAPC Response**

Wheel squeal is very unlikely to be a concern at Port Catherine because of the low speed of the trains (around 40km/hr), the long radius of the rail curve, and the relatively remote distance of proposed residential allotments in relation to the position of the maximum curve.

The requirement for possible mitigation of train noise, including any wheel squeal, will be assessed and included in the Noise Management Plan. As discussed in response to Submission 6.1 (a), the Noise Management Plan will be based on on-site noise measurements of freight rail activities to validate the  $L_{max}$  and  $L_{eq}$  levels, including any wheel squeal, and will be prepared to ensure that the amenity of nearby residences is protected from noise emissions from the railway. Noise amelioration measures could include higher performance noise barriers, quiet house design and/or larger setbacks from the railway line.

- j. Reliance on two forms of noise amelioration is of concern as it leaves little margin for cost effective amelioration measures should the assumptions used in the modelling subsequently be found to be incorrect or insufficiently conservative.**

#### **WAPC Response**

The proposed noise amelioration measures are practical and effective, and allow for additional modifications if required. The acoustical assessment is conservative and the proposed amelioration will be adequate. The appropriate time to finalise noise amelioration is when the sub-division layout has been finalised.

Prior to finalisation of the town planning scheme amendment, a Noise Management Plan will be prepared to ensure that the amenity of nearby residences is protected from noise emissions from the railway and PRR. The Noise Management Plan will be based on on-site measurements of rail traffic noise, conservatively applied, and will be to the requirements of the WAPC and EPA on advice from the DEP.

- k. Notification (memorials) should be required on certificates of titles (advising of the 24 hr freight use of the rail link for freight and the noise that it generates) for any lots within 65m of the railway line at later stages in the planning process.**

## **WAPC Response**

The requirement for memorials on titles to advise of potential noise and requirements for “quiet house design” is acknowledged, as proposed in ER Section 5.8. The number and location of lots requiring memorials will be determined when the subdivision layout has been finalised. No distance has been set due to the variation in ground levels and other factors that affect noise propagation.

These detailed design aspects will be appropriately addressed in the Noise Management Plan (refer ER Section 6), to be prepared by PCD prior to approval of the town planning scheme amendment, to ensure that the amenity of all nearby residences is protected from noise emissions from the PRR and railway reserve.

## 7.0 LANDSCAPE AMENITY

- a. **No high-rise development should be allowed as it would become an eyesore.**

### WAPC Response

High-rise developments are not proposed.

- b. **The proposed irrigated parkland on the eastern flank can only provide for views to the east and is not an acceptable compromise in visual amenity terms.**

### WAPC Response

The proposed parkland to the east of the amendment area is almost entirely on the western flank of the ridge and will have sweeping views of Cockburn Sound. As discussed in ER Section 5.9, the proposed landscape enhancement to this area will incorporate the main vantage points that will provide panoramic views to the ocean and the coastline north and south of Port Catherine (refer ER Figure 1-2).

## 7.1 Ridgeline

- a. **The ER fails to acknowledge that the previous strategic recommendations (e.g. goals of Coogee Regional Open Space), which identified that these areas should be set aside as regional open space, were taken with the full knowledge that the quality of the flora was somewhat degraded. The landscape value of the ridgeline and the potential of the space to act as a physical linkage between areas of Beeliar Park and the coast are in fact the main reasons for its recommended retention as regional open space. The primary value of the ridgeline stems from the fact it is a largely unspoiled example of the Spearwood dune system in this region. The somewhat denuded and stark nature of the ridgeline in the amendment area does little to lessen the significant landscape and recreation value of this limestone feature.**

### WAPC Response

The Coogee Regional Open Space was originally set aside in 1963 by the (then) Metropolitan Region Planning Authority for the primary purpose of providing an odour buffer between residential areas and the noxious industries on Cockburn Road. In 1983, the Department of Conservation and Environment (DCE) proposed to include the Parks and Recreation “*odour buffer*” within System 6 Area M92 with a recommendation that the area be managed as a Regional Park and the need to link wetlands (e.g. Manning Lake with Market Garden Swamps to the south) by open space (DCE, 1983).

The Beeliar Regional Park proposal, published in 1992 after more than six years of scientific review and extensive public consultation, did not include the Coogee Regional Open Space within the Regional Park: instead it proposed that “*retention of open space linkages between Manning Lake, Coogee open space, the coast and the Market Garden Swamps should be a priority*” (DPUD, 1992).

Whilst the Port Catherine development will reduce the area of the Coogee ridge that is currently zoned for “Parks and Recreation”, the proposed landscaping of parkland across the eastern side of the development will augment the linkage value, which is now low, and thereby compensate for the loss.

The existing ecological linkage between Manning Lake and Market Garden Swamps is very poor. There is no continuous strip of native vegetation between these two wetlands, either through the lowland valley to the east of the Coogee Ridge or across the ridge itself. Rather, there are stepping stones of shrubby plants and other perennial vegetation along both routes. These stepping stones vary in number, size and composition: on the ridge they are small, open and largely of alien shrubs; while along the lowland route in the valley to the east, they are few but larger, largely of native paperbarks and closer to directly in line between the swamp and the lake.

The high limestone ridge with degraded vegetation is of little relevance to faunal linkage between two wetland areas - remnant wetlands in the intervening space would be more appropriate. The ridge currently provides minimal ecological linkage value between the wetlands.

The Port Catherine development will augment the environmental values of the retained area of park across the eastern side of the development. It is proposed to develop this area as parkland, including revegetating east-west and north-south linkages and creating a wetland lake as part of the groundwater reuse scheme.

The proposed landscape enhancement will augment the current minimal faunal linkages from Beeliar Regional Park to Market Garden Swamps and Woodman Point in the southwest. Recreational linkages will also be significantly improved. These outcomes are consistent with the original System Six requirements, and with the City of Cockburn’s aspirations for the area.

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment (refer ER Section 6).

- b. The landscape value of the ridge is relevant when viewed from all directions although the ER makes the assumption that it is only relevant from the east. The ER suggests that the landscape value of the ridgeline is compromised by the railway cutting, power lines and tracks in the area. However, these man made features have only a minimal impact on the overall natural form of the ridgeline and were also present when the area was previously recognised as important open space.**

## WAPC Response

ER Section 3.3.1 describes the landscape character of the amendment area and the views from, and to, the site. The site is described as having moderate to high scenic quality on the basis that it is characteristically massive in size and form. However it has been denuded of its original vegetation and does not present landscape diversity in terms of vegetation patterns and/or water form. Furthermore, it is affected by high voltage transmission lines, roads and a railway cutting.

ER Section 5.9.1 assesses the visual impacts of the proposal, from both the western and eastern directions.

ER Section 5.9.2 applies the Visual Management System recommended by CALM to assess the landscape sensitivity of the site as seen from Beeliar Regional Park, including the view-shed from Cockburn Cement Lookout and adjacent pathways.

The visual impact of the amendment area from Coogee Beach is assessed in ER Section 5.12

- c. **The extent of proposed excavation of the ridgeline is of concern. In excess of 8 m of the limestone ridge will be removed and therefore the natural profile of the ridge will be severely compromised. The excavation will result in a significant negative impact on the landscape value of the whole region. Any infrastructure, vehicles or buildings placed on this plateau will be clearly visible from the east. Not only does the proposal completely compromise the ridgeline when viewed from the west, the claim that it is protected visually from the east cannot be substantiated. The impact on the landscape will reduce the value of Beeliar Regional Park.**

## WAPC Response

This is discussed in ER Section 5.9.1. The proposed Port Catherine development has been specifically designed to maintain views to the ridge from the east, in an apparent undeveloped state. That is, the ridge “skyline” will be modified, but no development will be visible. Figure 5-7 shows the impact of the proposed PRR reserve upon the ridge landscape from the east.

The majority of the proposed PRR reserve relocated along the eastern side of the amendment area remains on the western side of the ridge crest. No earthworks will occur on the eastern side of the road and therefore the present appearance of the ridge from the east will not be affected along these parts.

There are two short sections of road where the ridge occurs on the western side of the road. In these sections, earthworks will lower the ridge crest and upper slopes to approximately road level. The effect of these changes is that there will be two short sections of road where the ‘skyline’ of the ridge from the east will be modified, as indicated on ER Figure 5-7. The two sections are 150m and 80m in length respectively, separated by a high point.



Infrastructure, buildings and vehicles will not be visible from the east. Along the 150m section of road at the top of the ridge, neither the road nor embankment will be visible from the east. For the 80m length of the road, an embankment up to 3m high will be visible from the east. This embankment will be screened by vegetation to be planted during the proposed landscaping of the Coogee Regional Open Space immediately to its east, as shown in ER Figure 1-2.

At no other point will a road embankment be visible from the east, as the road will always be in a cut.

Regardless of screening from planted vegetation, future residences on the western side of the road will not be visible from the east.

In mitigation of the slight impact to the local visual amenity, the benefit of locating the regional road on this alignment is that it will enable panoramic views to be obtained by future users of the road. This will be a primary distributor road with a regional catchment. Currently Cockburn Road passes derelict industrial land in this locality; therefore the future driving experience in this area will be significantly enhanced.

- d. To protect the visual amenity of the ridgeline the current 20 metre contour should be the highest extent of any new urban zone or road reservation.**

#### **WAPC Response**

Refer to response to Submission 7.1(c).

- e. Views from the ridgeline to the western horizon and the dunes should be maintained.**

#### **WAPC Response**

The panoramic views from the ridgeline will not reduce. A significant benefit of locating the regional road near the ridgeline is that it will enable the many future users of the road to enjoy these views. In addition, the proposed parkland on the eastern side of the amendment area will be landscaped to enhance and beautify the ridge and its eastern flank. This landscaped parkland will include dual use paths, passive recreational opportunities and vantage points providing panoramic views to the ocean and offshore islands.

The present landscape in this area is barren and mostly inaccessible.

- f. The proposal to rezone much of the western flank of the ridgeline to Urban will completely interrupt some of the views from Manning Park to the south. Other vistas from Manning Park will be broken in the middle ground by a sea of roof tops. This will destroy the visual connectivity and the dramatic sense of a piece of wilderness will be lost. The EPA should require that all of these important vistas be retained.**

#### **WAPC Response**

ER Section 5.9.2 assesses the landscape sensitivity of the site as seen from Beeliar Regional Park, including the view-shed from Cockburn Cement Lookout and adjacent pathways.

The amendment area is visible from only the western-most and south-western corner of Beeliar Regional Park (refer ER Figure 5-8). The view from this area to the ridge slope and shore of the amendment area currently comprises mostly derelict industrial land that has been denuded of its original vegetation and does not present landscape diversity in terms of vegetation patterns, landforms and/or water form. The proposed change to urban development will be of similar form and scale to the previous industrial development and will not unduly affect the visual amenity.

The marina will be a new element in the landscape which will result in a distinct change in the nearshore coastal viewshed from Beeliar Regional Park. However the more prominent offshore viewshed, being across to the islands and views south along the coastline to Woodman Point, will remain unchanged.

The visual assessment in ER Section 5.9.2 concluded that the important view-shed from Cockburn Cement Lookout and adjacent pathways in Beeliar Regional Park to the realigned Cockburn Road is manageable through road design and screening vegetation.

#### **7.2 Coast**

- a. For the substantial foreshore dunes, the presence of weed species does not significantly diminish the landscape and social values of the dune. Proper management should be established so that vegetation rehabilitation programmes can be instigated to expand the extent of native coastal species.**

#### **WAPC Response**

As discussed in ER Section 5.4.1, the remnant foredunes at Port Catherine occupy a distance of 400m (discontinuous) along the Owen Anchorage coastline. The dunes are in a moderately to heavily degraded condition. Disturbance to the Coogee Beach dunes is specifically avoided and the proposed development will not adversely affect the integrity, function and remaining environmental values of the foredunes of Owen Anchorage. In this respect, refer also to response to Submission 1.2(e).

With respect to the northern area of dune, refer to the response to Submission 3.0(i). The vegetation in the area is mostly degraded, with areas of severe localised disturbance. The area has only low conservation value.

With respect to the Coogee Beach dunes, PCD will continue to liaise with the City of Cockburn to assist the ongoing rehabilitation of these dunes, and to ensure that the dunes are conserved and protected. In this regard, refer to response to Submission 3.0(f).

- b. The dunes in the northern area of the amendment are a landform feature that have been recognised in other coastal areas of Perth and are worth preserving for public enjoyment.**

#### **WAPC Response**

As discussed in ER Section 5.4.1, the remnant foredunes within the amendment area that will be removed by the Port Catherine development occupy a distance of 400m (discontinuous) along the coastline.

The dunes in the northern area comprise a remnant coastal foredune bounded by a flyash disposal area, Cockburn Road and an area with a derelict tannery and other disused buildings and rubble. The dune slopes steeply to the beach to the west and to the dual use pathway to the east, and it includes blowouts and slopes both vegetated and eroded.

Refer to the response to Submission 3.0(i) regarding the condition of this area. The vegetation in the area is mostly degraded, with areas of severe localised disturbance. The area has only low conservation value.

Good condition foredune is protected for about 3,600 metres south of the development in the Woodman Point Reserve and, to the immediate north of the South Fremantle Power Station, the beach, foredune and adjacent inland areas are reserved as Regional Open Space for a distance of 2,700 metres to Success Harbour. The 400m of dune that will be affected by the Port Catherine development is approximately 6% of this lineal extent.

- c. The ER fails to provide adequate recognition of the intrinsic value of the beaches in the amendment area. It also fails to acknowledge the aesthetic and recreational value of the beach to the regional community (as identified by Ecoscape, et al.).**

#### **WAPC Response**

Refer response to Submissions 1.2(a) and (b).

- d. The Tamala limestone outcrops, which are exposed as headlands at the centre of the amendment area, are not found elsewhere in Owen Anchorage.**

### **WAPC Response**

There are three small headlands of exposed Tamala limestone within the amendment area. Historically, these outcrops were behind a beach and became exposed about fifty years ago when the coast at Port Catherine eroded after the construction of groynes further to the north cut off the sand supply from the north (refer ER Section 5.4).

The headlands are not considered to have high geomorphic significance requiring their conservation.

Approximately 1.8km of coastal cliffs with higher geomorphic significance, up to 6m high and comprising exposed Tamala limestone with intermittent sandy beaches at the base, are protected within Bush Forever Site 346, in Cockburn Sound at Henderson. Exposed limestone headlands also occur on the east coast of Carnac Island.

- e. The construction of groynes along the length of Coogee Beach would totally destroy the recognised landscape and social values attributed to the long stretch of white sand beach.**

### **WAPC Response**

The Port Catherine development specifically avoids any disturbance to Coogee Beach and the adjacent dune system. No groynes will be constructed along Coogee Beach. Refer to responses to Submissions 1.2(a), 1.2(b) and 3.0(f). The long white sand beach will not be disturbed. Refer also to response to Submission 7.2(f).

- f. The visual amenity of the coastal foreshore will be affected by the proposal. The proposal to construct a marina will essentially limit views along the coast. In the context of the vast stretches of unspoiled white sand beaches south of the old Power Station, such a proposal will have a significant negative impact on the visual amenity of the foreshore in and around the amendment area. Instead of the current sweep of a sand beach the proposed breakwaters will have a similar presentation to Jervoise Bay: an uninviting, industrial monolith.**

### **WAPC Response**

The visual amenity of Coogee Beach is discussed in ER Section 5.12. The proposed development completely avoids and protects Coogee Beach and the associated dunes. PCD reconfigured the project design to protect the beach following detailed consultations on planning and environmental matters during early project planning.

The visual amenity of the amendment area from Coogee Beach will not be unduly affected. Currently, the view to the north from the location of the existing Coogee jetty comprises an expanse of beach which is abruptly interrupted by the existing rock armour in front of the old abattoir site. The dilapidated remains of some abattoir buildings have only recently been demolished and removed. Whilst the area of Coogee Beach will not

be reduced, the visual expanse of rock armour will be enlarged due to the proposed marina's southern breakwater. However, the components of the landscape will essentially remain the same, that is, it will be a built landscape at the northern end of Coogee Beach.

There is currently no "sweep of a sand beach" in the amendment area. The foreshore within the amendment area currently includes only 450m of discontinuous beach. To the north of Coogee Beach is 600m of decaying seawall, constructed along the foreshore of the old abattoir site. North from this is 200m of beach and exposed limestone, which essentially forms the natural coastline although some was historically filled for use in tallow manufacture and the remainder has been generally degraded by uncontrolled access. From there to the northern boundary of the amendment area is a beach and remnant coastal foredune bounded by a flyash disposal area, an area with a derelict tannery and other disused buildings and rubble.

- g. Any marina proposal will actually compromise the 180 degree panorama of the ocean that presently exists.**

#### **WAPC Response**

ER Section 5.9.1 assesses the visual impacts of the proposal, from both the western and eastern directions. ER Section 5.9.2 assesses the landscape sensitivity of the site as seen from Beeliar Regional Park, including the view-shed from Cockburn Cement Lookout and adjacent pathways. The visual impact of the amendment area from Coogee Beach is assessed in ER Section 5.12.

The panoramic views from the ridgeline will not reduce. A significant benefit of locating the regional road near the ridgeline is that it will enable the many future users of the road to enjoy these views. In addition, the proposed parkland on the eastern side of the amendment area will be landscaped to enhance and beautify the ridge and its eastern flank. This landscaped parkland will include dual use paths, passive recreational opportunities and vantage points providing panoramic views to the ocean and offshore islands.

Refer also to responses to Submissions 7.2(f)

### **7.3 Linkages**

- a. The retention of the ridgeline would provide for visual and physical linkages between other areas of conservation/recreational value (Manning Park, the Market Garden Swamps and various coastal reserves). It is important to establish good connectivity between open space areas by having linkage crossroads on top of the ridgeline, this will provide legibility for uses of these recreational networks.**

**WAPC Response**

This is acknowledged and is consistent with the proposal. The proposed landscaping of parkland across the eastern side of the development will augment the recreational and ecological connectivity between these areas with both north-south and east-west linkages. It will also incorporate the main vantage points that will provide panoramic views to the ocean and the coastline north and south of Port Catherine. These outcomes are consistent with the original System Six requirements for Coogee Open Space. They also conform to the City of Cockburn's aspirations for the area.

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment (refer ER Section 6).

- b. The MRS amendment fails to implement the establishment of a link between the existing dunes and the ridgeline although it has been recommended in several planning documents. The EPA should require that this link be established, at least in part.**

**WAPC Response**

The plan provides a high degree of recreational connectivity between the ridge and the coast, including a dual use path and recreational cycleway next to the railway to the north, a pathway from the ridge to Coogee Beach in the south, and strong connectivity through to the marina throughout the development.

Also refer to response to Submission 7.3(a).

- c. The proposal will place an urban wedge between the M92 and M90 System 6 areas in this area the parks and recreation reserve should be retained.**

**WAPC Response**

Refer to response to Submission 3.0(d). The proposed landscaping of parkland across the eastern side of the development will augment the recreational and ecological connectivity between these areas with both north-south and east-west linkages. It will also incorporate the main vantage points that will provide panoramic views to the ocean and the coastline north and south of Port Catherine. These outcomes are consistent with the original System Six requirements for Coogee Open Space. They also conform to the City of Cockburn's aspirations for the area.

The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment (refer ER Section 6).

- d. The amendment should create a link between the ridge and the coast following the railway cutting alignment and including the beach and dunes in the northern half of the amendment area. This would create an almost uninterrupted transect between the coast and a coastal wetland. This link should be reserved as Parks & Recreation.**

**WAPC Response**

The suggested link is provided (refer to ER Figure 1-2). There is a dual use path and recreational cycleway on the northern side of the railway. Recreational connectivity from the ridge to the ocean on the southern side of the railway is via parkland and treed avenues.

The coast north of the proposed marina will accumulate sand to form a beach around 50m wide. This beach will be protected from the sea breeze and is likely to become a significant recreational resource. It will have a public road and pedestrian interface.

The dunes in the northern half of the marina will not be retained. This area comprises a remnant coastal foredune bounded by a flyash disposal area, Cockburn Road and an area with a derelict tannery and other disused buildings and rubble. It includes blowouts and slopes both vegetated and eroded. Also refer to the response to Submission 3.0(i) regarding the vegetative condition of this area. The vegetation in the area is mostly degraded, with areas of severe localised disturbance. The area has only low conservation value.

Also refer to response to Submission 7.3(a).

- e. The diverted Cockburn Road will sever the greenway connection between the Manning Lake and Woodman Point Reserves.**

**WAPC Response**

The diverted Cockburn Road will simply deviate the existing Cockburn Road and will not affect any greenway connection between the Manning Lake and Woodman Point Reserve.

In addition, the proposed landscaping of the Coogee Regional Open Space to the east of Port Catherine will augment the recreational connectivity between these reserves. The details of the landscaping for the Coogee Regional Open Space area will be included within the Landscape Management Plan that will be prepared as part of the Waterways Environmental Management Plan, prior to finalisation of a town planning scheme amendment (refer ER Section 6).

Refer also to responses to Submissions 7.1(a), 7.3(a) and 7.3(b).

## 8.0 MANAGEMENT

- a. **The impact of the construction of a marina on adjoining beaches is of great concern. Similar structures in the area have resulted in small rock material washing up on adjoining beaches with impact on public enjoyment and public safety concerns. It is simply not possible for such breakwaters to be constructed without some rock spoil escaping both during and after construction. Coogee Beach, as the region's primary beach must be protected.**

### WAPC Response

The marina breakwaters will be constructed with large limestone armour stone. M.P. Rogers & Associates, Coastal Engineers, conducted investigations of the wave climate and seabed stability for the project. The investigations confirmed that a conventional rock-armour breakwater will provide an adequate service life and that limestone is a suitable armour stone. All material for the breakwater will be imported to site from regional limestone quarries. Experience at numerous marinas in Western Australia (eg. Mandurah Ocean Marina, Success Harbour, Hillarys Boat Harbour) has shown that appropriate attention to marina construction avoids any risk of significant loss of material from the breakwater.

Construction is proposed to commence with the northern breakwater followed by the southern breakwater to enclose the marina area. This will facilitate control of sediment movement and water turbidity during construction of internal components, including land reclamation. Reclamation for offshore development areas will follow construction of the breakwaters. A silt curtain is proposed either from the shore to the northern breakwater or breakwater-to-breakwater to contain turbidity from the reclamation works.

As described in ER Section 5.6.1, visual monitoring of the adjacent waters of Owen Anchorage will be undertaken on a daily basis throughout the offshore construction program. A Construction Management Plan will be prepared prior to application for subdivision approval. The Plan will provide detail on management procedures and a monitoring program for the protection of marine water quality, including rock spoil. The Plan will be implemented to the requirements of the WAPC and EPA on advice from DEP, CALM and the City of Cockburn.

- b. **The developer should ensure that rubble, such as that at Port Beach, be prevented from occurring at Woodman Point or South Beach.**

### WAPC Response

Refer to response to Submission 8.0(a).

- c. **With respect to dust impacts the ER only considers potential impacts on future residents but existing residents should also be included.**



## **WAPC Response**

The effect of dust emissions on the welfare and amenity of the surrounding community (existing) will be minimised by pro-active management. This is described in ER Section 5.5.

The Remedial Works Management Plan, to be prepared prior to an application for approval for subdivision or development within the amendment area (refer ER Section 6), will include a Dust Management and Monitoring Plan that will specify the detailed management and monitoring procedures for managing dust emissions during the site contamination cleanup. Management procedures will include:

- In dry conditions, access tracks, roads, stockpiles and operational areas will be kept moist by the use of water trucks.
- Wind fencing will be placed around the periphery of contaminated sites undergoing excavation.
- All machinery used in contaminated excavations will be steam cleaned prior to leaving the location to prevent the spread of contaminated material and any residual material, which is contaminated, will be disposed of appropriately.
- Disturbed areas, stockpiled soils and contaminated material will be promptly stabilised by means such as wetting, wind fencing and hydromulching.
- During removal of contaminated soils, if considered necessary a wash down facility will be provided on the exit route from the site to remove soil adhering to vehicles, thereby preventing distribution of contaminated material.

The Construction Management Plan, to be completed prior to subdivision approval, will specify the detailed management and monitoring procedures for managing dust emissions during project construction. Dust will be controlled by a combination of wind fencing, site watering and surface stabilisation (e.g. hydromulching). Areas where earthworks have been completed will be stabilised promptly by such means as mulching, sealing or revegetation, as appropriate. No vegetation debris or other material generated during construction will be burned on site. Vegetative material will be recycled on site.

### **8.1 Construction Phase**

- a. It is unclear where the many tonnes of fill required for the marina will be trucked from, and what the ecological impact will be on the source area.**

## **WAPC Response**

All material for the construction of the breakwaters will be obtained from existing local limestone quarries, probably those at Wattleup and/or Hope Valley.

The residential development on the western flank of the ridge will be shaped so that ocean views and aspects are maximised. This will involve cutting and filling across the site with benching and retaining of lots to create a variety of level and sloping lots. The areas of cut and fill, which comprise the bulk earthworks program, are shown on ER Figure 4-31. The cut material, which will be surplus to lot requirements, will provide the general fill for the new offshore residential areas. In conjunction with the fill from

the Primary Regional Road reserve, a balance of cut to fill can be achieved, reducing the need to import materials.

- b. There is concern that water quality outside to the marina will be impacted during construction and for many years. Short term sediment plumes during construction and long term dissolving limestone can impact marine flora and fauna and water visibility.**

#### **WAPC Response**

Suspended sediment plumes are discussed in ER Section 5.6.1. Dredging will be carried out following completion of the breakwater and closure of the entrance to the harbour by a temporary rock bund or silt curtain so disturbed sediments will not escape from the harbour. The Construction Management Plan (refer ER Section 6) will specify monitoring and management procedures to prevent adverse impacts on marine water quality, flora and fauna and coastal processes during project construction. The Construction Management Plan is to be completed prior to approval for subdivision or development in the amendment area, to the satisfaction of the WAPC with concurrence from the EPA.

A Waterways Environmental Management Plan (refer ER Section 6), providing for ongoing monitoring and management of marine water and sediment quality and including timely and appropriate response to contingent events, is to be completed prior to finalisation of the town planning scheme amendment.

Experience at existing non-commercial marinas in Western Australia and elsewhere in Australia indicates that appropriately designed, constructed and managed marinas do not suffer from or result in poor water quality. Limestone (calcium carbonate) is natural and very abundant in the marine environment and will not impact flora or fauna.

- c. During the construction phase there should be no direct contact water activities in water affected by turbidity (where a secchi disc is not visible at 1.2m depth)**

#### **WAPC Response**

Possible suspended sediment plumes during marina construction are discussed in ER Section 5.6.1. Dredging will be carried out following completion of the breakwater and closure of the entrance to the harbour by a temporary rock bund or silt curtain so disturbed sediments will not escape from the harbour. The Construction Management Plan (refer ER Section 6) specifying detailed management and monitoring procedures is to be completed prior to subdivision approval, to the satisfaction of the WAPC with concurrence from the EPA. This will include contingency response to possible risks.

The construction area will be closed to public access. In the event that nearby swimming areas were adversely affected by turbidity then appropriate ameliorative

action or response would be implemented to ensure that unsafe direct contact water activity did not occur.

- d. Existing residents will be subject to many months or years of noise, vibration, dust and possibly blasting 6 days per week from 7 am to 7 pm in a quiet residential area.**

#### **WAPC Response**

The potential nuisance and management of construction noise is addressed in ER Section 5.8.1. It is recognised that noise from earthmoving machinery, trucks and compaction equipment has the potential to affect nearby residents (particularly those adjacent to the south-eastern sector of the site and, due to the staging of development, within the amendment area during the second and subsequent stages). Blasting may be required in some excavation areas, although it will be avoided wherever possible.

Construction noise will be carefully managed to ensure that all construction activities comply with the *Environmental Protection (Noise) Regulations 1997*, which are considered to define an acceptable level of noise impact on people in terms of amenity and welfare (EPA, 1997). The management procedures to ensure compliance with these regulations will be described in the Construction Management Plan, to be prepared and implemented by PCD to the requirements of the WAPC and the EPA on advice from DEP and the City of Cockburn.

- e. Homes in the vicinity of the development should be surveyed for structural condition and background noise and vibration levels by an independent authority before any proposal proceeds.**

#### **WAPC Response**

This will be undertaken. As provided in ER Section 5.8.2, PCD will offer the owners of all houses and other buildings in Old Coogee near to the construction area a free structural inspection before the commencement of construction.

The management of construction vibration will be described in the Construction Management Plan, to be prepared and implemented by PCD to the requirements of the WAPC and the EPA on advice from DEP and the City of Cockburn.

## **8.2 Operation Phase**

- a. The formal agreement for the management of the marina must include details of the monitoring regime and maintenance and funding arrangements, and set-out the responsibilities of each party. Funding arrangements should include contingencies sufficient to cover occasional extreme storms.**

### **WAPC Response**

This is acknowledged. The agreement will be defined in detail within the Waterways Environmental Management Plan (refer to ER Section 6.0), to be prepared prior to finalisation of the local town planning scheme amendment, to the satisfaction of the WAPC and EPA on advice from the City of Cockburn and the DEP.

It is proposed that PCD will be responsible for the ongoing management and monitoring responsibilities associated with all aspects of the marina for the first five years following completion of marina construction. Thereafter, it is proposed that ongoing responsibility will devolve to the City of Cockburn.

Funding for the City to accept ongoing management responsibility will be established with seed capital from PCD. Subject to the City's consideration, ongoing revenues could be augmented (if necessary) through differential rating, a levy or other arrangements applied against the marina estate.

This arrangement will be similar to arrangements commonly applied at marinas and canal estates at Mandurah and elsewhere in Western Australia.

- b. The proponent and the City of Cockburn need to have formal agreement on the management of water quality.**

### **WAPC Response**

This is acknowledged. Refer to response to Submission 8.2(a). The Waterways Environmental Management Plan (ER Section 6.0) will provide the basis for a formal agreement on the management of water quality.

- c. How will Cockburn Council fund the ongoing costs associated with the marina, e.g. cost of returning sand to Coogee Beach after it has built up north of the marina, cost of removing silt built up to the harbour entrance (ER Summary p 33)?**

### **WAPC Response**

Funding for the City to accept ongoing management responsibility as Waterways Manager for the marina, including responsibility for sand bypassing operations, will be established with capital contributions by the developer to a sinking fund, special area rates levied over the development and added to the sinking fund, and interest generated from the sinking fund.

The financial modelling shows that the sinking fund will have accumulated approximately \$1.5 million by 2010, when the City of Cockburn is scheduled to become responsible for waterways management. Annual growth in income from special area rates (\$260,000) and interest (\$95,000) will be \$355,000 per year by 2010. Ongoing costs to the City of Cockburn as Waterways Manager (in 2010 dollars) are estimated to

be \$261,000 per year, including \$43,200 per year for coastal monitoring and sand bypassing. On this basis, the proposed funding arrangements provide 35% surplus of income over expected management costs.

Therefore, the financial modelling shows that ongoing responsibilities as Waterways Manager can be readily funded on a “landowner pays” basis without any additional financial burden to the City of Cockburn.

This arrangement will be similar to arrangements commonly applied at marinas and canal estates at Mandurah and elsewhere in Western Australia.

- d. Sand bypassing from the north beach build-up must be designed in detail to avoid local nuisance from excavating and dumping sand on beaches. Wind blown sand management is also essential.**

#### **WAPC Response**

This is acknowledged. The management of sediment transport to achieve a stable coastline, including management of proposed sand bypassing operations, will be defined in the Waterways Environmental Management Plan (refer ER Section 6), to be prepared prior to the finalisation of the local town planning scheme amendment.

It is proposed to install a permanent underground sand bypassing pipe in the breakwater and across the harbour entrance, protected by an easement, to accommodate the periodic sand bypassing. The bypassing will be as a seawater slurry, which will not cause wind blown sand. Sand bypassing will only be required once every three to five years and will occur in winter to reduce interference with public enjoyment of the beach.

The preferred method for the sand bypassing scheme will be defined in consultation with the City of Cockburn on advice from the DPI.

**The following questions and concerns were raised regarding the flushing assessment:**

- e. The northern part of the marina will have the least amount of flushing and the highest potential for elevated nutrient levels. Will there be contingency plans to address this problem?**

#### **WAPC Response**

The northern part of the marina will have good flushing characteristics as shown in the computer modelling of the water quality (ER Section 5.6.4). There will be little inflow of nutrients and pollutants from the development because of the design of the sewerage and drainage systems and the small lot sizes. In addition, the proposed groundwater interception scheme will reduce the flow of nutrient rich groundwater into the waterways.

A Waterways Environmental Management Plan will be prepared prior to finalisation of the local town planning scheme (refer ER Section 6.0). The Plan shall include provision for timely and appropriate response to contingent events, including definition of responses to possible temporary episodes of reduced water quality eg increasing groundwater extraction, seawater pumping to augment flushing.

- f. Poor mixing in the northern canals has been shown in the modeling results and the remediation measures recommended by Rodgers and Associates in their October 2000 report could be needed, however, small pipes through breakwaters provide only small flows under tidal action. A pumped system would need to be installed during initial construction and it is unlikely that local government will agree to the cost of operating such systems.**

#### **WAPC Response**

The northern canals of Port Catherine will have good flushing characteristics as discussed in ER Section 5.6.4. The computer modelling indicates that these areas will have e-folding times of around 4 days. This is quite comparable to the eastern end of Hillary's Boat Harbour.

MP Rogers & Associates assessed the feasibility of installing pipes through the breakwaters for pumped and/or passive water exchange, as part of their studies to optimise the marina design during preparation of the ER. It was concluded that pipes would derive only very marginal benefit to water exchange, were prone to possible silting and were unnecessary to secure good water quality in the marina. Pipes through the breakwaters are not proposed.

Ongoing funding of all elements of the Waterways Environmental Management Plan will be by capital contributions by the developer to a sinking fund, special area rates levied over the development and added to the sinking fund, and interest generated from the sinking fund. The financial modelling shows that ongoing responsibilities as Waterways Manager can be readily funded on a "landowner pays" basis without any additional financial burden to the City of Cockburn.

- g. The proposal may have detrimental effects on the marina's water quality, therefore direct contact water activities should not be allowed within the marina or within 50 metres of dewatering discharges.**

#### **WAPC Response**

As described in ER Section 5.6.5, the proposed marina design and management support confidence that there will not be significant contaminant inputs to the marina waterway. Water quality in the Port Catherine marina is expected to be comparable to both Hillarys and Success Harbours. Experience at these and other marinas in Western Australia and elsewhere in Australia has been that appropriately managed marinas do not suffer from poor water quality.

PCD proposes to monitor water and sediment quality to test these predictions, and to implement appropriate management or remedial action if necessary. The monitoring and

management procedures will be detailed in the Waterways Environmental Management Plan (refer to ER Section 6.0) to be prepared prior to the finalisation of the local town planning scheme amendment. The Plan will include provisions for ongoing monitoring and management of marine water and sediment quality, including timely and appropriate response to contingent events.

There will be no swimming in the marina.

It is not clear what is meant by “dewatering discharges” during marina operations. The reinjection of abstracted groundwater will be back into the groundwater, inland from the coast, and will not affect any beach. As discussed in ER Section 4.3.2, the water captured by the intercept drain will remain of high quality, even over the long term. The reinjection scheme will not reduce water quality in the adjacent marine environment.

If sand bypassing is meant, then safety considerations require closure of the beach from public access within the immediate area (50-100m) of both the sand bypassing excavation and discharge. This will not significantly disrupt beach use: the bypassing operations at Port Catherine will only occur every few years, in winter, and will be of short duration.

- h. There is concern that water quality outside the marina will be impacted for many years. Dissolving limestone can impact marine flora and fauna and water visibility (refer to experience at Jervois Bay).**

#### **WAPC Response**

Refer to responses to Submissions 2.2(i) and 4.2(c). As discussed in ER Section 5.6, the marina is not anticipated to adversely affect water quality in the surrounding waters.

PCD proposes to monitor water and sediment quality to test these predictions, and to implement appropriate management or remedial action if necessary. The monitoring and management procedures will be detailed in the Waterways Environmental Management Plan (refer to ER Section 6.0) to be prepared prior to the finalisation of the local town planning scheme amendment.

- i. The ER does not address the potential impacts of mosquitoes or mosquito borne disease. There are several wetlands nearby which may pose a risk and it is important that the storage lake be designed to minimise the potential for mosquito breeding.**

#### **WAPC Response**

The lake will be designed and landscaped to function as a natural wetland and should not exacerbate any mosquito or midge concerns in the area. Water turnover over the summer will be every two days, which will preclude mosquito breeding.

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**ADDENDUM**  
**(APRIL 2002)**

**TO**

**APPENDIX VI:**

**VEGETATION AND FLORA REPORT (DR. A WESTON)**



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10 April 2002

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Dear Richard,

**Port Catherine Environmental Review (ER)**  
**(August 2001)**

**Comments on Submissions and Extension of Vegetation Mapping**

This letter report addresses points on vegetation and flora raised or implied in submissions by the Conservation Council of WA (No. 472) and the Coogee Coastal Action Coalition (No. 476) on Metropolitan Scheme Amendment No. 1010/33 and in communications by the Department of Environmental Protection, and it extends the vegetation mapping to cover more details of the coastal vegetation and of thickets north of the rotary lookout. Photographs of this vegetation, and of the Area A (southern) coastal vegetation immediately south of the proposed amendment area are reproduced in Plates 1 to 4.

**The Coastal Vegetation**

Each of the two submissions, No. 472 and No. 476, has one paragraph critical of an aspect of the ER's description of vegetation and flora. The two paragraphs are very similar and state, essentially, that

*“The ER fails to identify the specific coastal species that are present in the northern dune in the amendment area. Whilst the ER identifies that there is some remnant vegetation in the dune, it fails to describe it accurately/properly. Ecoscape et al has identified numerous coastal species.”*

Submission No. 476 quotes the relevant paragraph from Ecoscape and CoastWise (1999, p. 32), including the five coastal species and the five inland species listed in that paragraph. There is nothing in the paragraph to indicate that any of these species was recorded in the northern dune area, or even that they were recorded anywhere in the Port Catherine area by

Ecoscope. It appears, instead, that Ecoscope and CoastWise is referring to the Weston report (in Bowman Bishaw Gorham 1998) and listing some of the species from it. One of the coastal species listed, *Cakile maritima*, is an established alien, a weed, and another, *Callitris preissii*, is significant in the metropolitan area but does not occur in the northern dune area.

Although Weston (2001) describes the foredune vegetation immediately south of the proposed urban zone amendment area (see Plate 3B), neither Weston nor Bowman Bishaw Gorham (2001) describes the vegetation of the northern dune or of the coast south of it. This deficiency is corrected below.

### **Area A' – Northern Dune Vegetation**

### **Plates 1, 2**

The northern dune area is, basically, a high foredune roughly between the flyash disposal area and an area some 300m south of it which has a derelict tannery and other disused buildings and rubble. The dune slopes steeply to the beach to the west and to the dual use pathway to the east, and it includes blowouts and slopes both vegetated and eroded. The vegetation of this area is mapped as A', and the larger areas of sand on the dune that are bare of vegetation are part of the area designated as W (Condition 7) on vegetation maps in Weston (2001) and Bowman Bishaw Gorham (2001). These bare areas are apparently now larger than the areas shown on the aerial photo map.

The vegetation of the dune varies from dense stands of one principal species, such as the stand of *Spinifex longifolius* Closed [perennial] Grassland on the lower part of the western slope, to isolated individual plants surrounded by loose sand, and from monospecific stands of established alien plants, principally *Tetragonia decumbens* Closed Herbland, *Trachyandra divaricata* Open Herbland and mixed alien grasslands, to mosaics of small areas of Low Heaths, Low Shrublands, Sedgeland and Grasslands of natives, principally *Scaevola crassifolia*, *Lepidosperma gladiatum*, *Spinifex longifolius*, *Acacia cochlearis* and *Hemiandra pungens*. There are also plants of the native species *Acacia rostellifera*, *Olearia axillaris*, *Myoporum insulare*, *Lomandra maritima*, *Acanthocarpus preissii* and *Threlkeldia diffusa*. The weeds *Trachyandra divaricata*, *Euphorbia paralias*, *Cakile maritima* and *Bromus diandrus*, *Lagurus ovatus* and other alien grasses are common to abundant and widespread. There is also at least one shrub of African Boxthorn (*Lycium ferocissimum*), a declared Pest Plant.

The condition of the Area A' vegetation is assessed as under 30% Very Good (3) to Good (4) and over 70% Good (4) to (6), with areas of severe localised disturbance.

### **Area A (northern)**

### **Plate 1A foreground**

The proposed amendment coastal area immediately south of the northern dune is lower dunes, a heavily disturbed, weedy version of Area A (southern), south of the proposed amendment area, which has benefited from rehabilitation and management. The vegetation of this area is mapped as A, and the larger disturbed areas bare of vegetation are left as part of the area designated as W (Condition 7) on vegetation maps in Weston (2001) and Bowman Bishaw Gorham (2001).

The vegetation of Area A (northern) is a mosaic and mixture of alien weed vegetation, especially of *Tetragonia decumbens*, *Trachyandra divaricata* and grasses, and native plants. The native species are principally *Scaevola crassifolia*, *Lepidosperma gladiatum* and *Spinifex longifolius*. There are also *Euphorbia paralias*, *Cakile maritima*, *Pelargonium capitatum* and other weeds.

The condition of the vegetation of Area A (northern) is assessed as under 50% Good (4) to Degraded (5) and over 50% Degraded (5) to Completely Degraded (6), with areas of severe localised disturbance. The rating is so poor because the vegetation is so weedy and heavily disturbed.

### **Coastal Area W**

### **Plate 3A**

The proposed amendment coastal area between Area A (northern) and Area A (southern) is a flat raised area separated from the ocean by, mainly, steep rocky slopes and cliffs. It is continuous with and part of the area shown on the vegetation maps in Weston (2001) and Bowman Bishaw Gorham (2001) as 'W'.

The vegetation of this area is of two basic types, both comprising alien species. *Tetragonia decumbens* Closed Herbland is near the coast and covers coastal rocks and steep sandy slopes, has climbed fenceposts and remnants of fences and clammers over rubble. A grassland of *Bromus diandrus* and other weedy grasses and herbaceous plants, with shrubs of American Tree Tobacco (*Nicotiana glauca*), is on eastern parts of the flat raised area with soil. Sprawling plants of *Oenothera drummondii* are conspicuous in areas which are otherwise bare of plants. There are also a few large herbaceous plants of the alien species *Chenopodium album* and a few shrubs of the native shrubs *Acacia rostellifera* and *Rhagodia baccata* subsp. *?dioica*.

The condition of this vegetation is assessed as 7; it comprises alien species and has very few native plants. This vegetation is not, in any sense, native bushland.

**Thickets North of Rotary Lookout****Plate 4**

The southeastern corner of the Port Catherine Concept Plan (Bowman Bishaw Gorham 2001, Figure 1-2) shows a pond in a depression or valley north of the Rotary Lookout a short distance east of Catherine Crescent. Creation of this pond would require the clearing of one stand of *Leptospermum laevigatum* (alien) Closed Tall Scrub (S, Condition 7) and partial clearing of another stand (also S, 7), which is east-northeast of the first one. A stand of *Dryandra sessilis* – *Leptospermum laevigatum* Open to Closed Heath (F, Condition 5-6) due south of the site should not be affected by the clearing.

These three stands are mapped as S, S and F.

The remainder of the vegetation of the site is the same weedy grassland mapped as W (Condition 7) north of the site.

***Hibbertia spicata* subsp. *leptotheca* and FCT 26a**

Habitats of the Priority Three taxon *Hibbertia spicata* subsp. *leptotheca* and Floristic Community Type (FCT) 26a are similar - both occur on limestone with shallow soils - though *Hibbertia spicata* subsp. *leptotheca* more commonly occurs in FCT 27 than in FCT 26a.

All identified, and mapped, occurrences of FCT 26a are now outside the proposed amendment area and should not be affected by proposed activities associated with it. Habitats most likely to be suitable for *Hibbertia spicata* subsp. *leptotheca* are in the FCT 26a area.

Although plants could not be identified as *Hibbertia spicata* subsp. *leptotheca* from flowering material during the flora and vegetation surveys, because the surveys were not during the July-October flowering period of *Hibbertia spicata* subsp. *leptotheca*, no plants were found either in the FCT 26a area or elsewhere that were vegetatively similar to *Hibbertia spicata* subsp. *leptotheca*.

**Acknowledgements**

Access to the Western Australian Herbarium collections was essential for carrying out the project and is greatly appreciated. Paul Wilson's help with plant identifications is also greatly appreciated.

## References

Bowman Bishaw Gorham (1998). *Port Catherine Development Project and Realignment of Controlled Access Highway into Beeliar Regional Park / System 6 Area M92*. Unpublished environmental review report and technical appendices. [quoted in Ecoscape and CoastWise 1999]

Bowman Bishaw Gorham (2001). *Port Catherine Environmental Review*. Report prepared for Western Australian Planning Commission.

Ecoscape (Australia) and CoastWise (1999). *Integrated Coastal Management Strategy for the City of Cockburn*. Report prepared for City of Cockburn.

Weston, A.S. (2001). *Searches for Rare and otherwise Significant Flora and Assessment of Vegetation Condition: Port Catherine Project Area, Spearwood and Coogee, City of Cockburn*. Appendix VI of Bowman Bishaw Gorham (2001).

Regards.

Arthur

Modification for map legend:

- A: (southern) Beach and Coastal Dune Vegetation, with few *Callitris preissii*.  
(northern) Beach and Coastal Dune Vegetation, with no *Callitris preissii*.





A. Looking north (over of south end of northern dune, Area A', and, in foreground, Area A (northern). (Photograph ASW 02.IV.1-16)



B. Looking north over western slope of central part of northern dune, the most vegetated part of the dune. (Photograph ASW 02.IV.1-22)

PLATE 1





A. Looking north along lower western slope of central part of northern dune. *Spinifex longifolius* is on the base of the slope. (Photograph ASW 02.IV.1-24)



B. Looking south over the blowout on the crest of northern dune. (Photograph ASW 02.IV.1-19)

PLATE 2



A. Looking north over south end of weedy vegetation (W) that is between Area A (northern) and Area A (southern), from border between this vegetation and Area A (southern). (Ph ASW 02.IV.1-13)



B. Looking south over north end of Area A (southern), from border between this vegetation and the weedy vegetation that is north of it. (Photograph ASW 02.IV.1-14)

PLATE 3



A. Looking southeast over proposed site of pond north of Rotary Lookout and east of Catherine Cr. *Leptospermum laevigatum* Closed Tall Scrub in centre and along left horizon. *Dryandra sessilis* - *Leptospermum laevigatum* Open to Closed Heath near right margin. (Photograph ASW 02.IV.1-12)



B. The stand of *Leptospermum laevigatum* Closed Tall Scrub in centre of Plate 4A, with the only plant of *Acacia rustellifera* (in fruit) in it. (Photograph ASW 02.III.3-18)

PLATE 4