Bunbury Port, Inner Harbour extension

Bunbury Port Authority

Report and recommendations of the
Environmental Protection Authority

Environmental Protection Authority
Bulletin 497
February 1991

Bunbury Port, Inner Harbour extension

Bunbury Port Authority

Report and recommendations of the Environmental Protection Authority

ISSN 1030-0120
ISBN 0 7309 3460 8

Contents

Figures

Contents

Summary and recommendations

Bunbury Port Authority proposes to extend the Inner Harbour at Bunbury by dredging a strip of land to the south-east of the existing basin, to allow for two additional ship berths and associated on shore facilities. The dredged spoil would be used to complete the filling of partially filled areas, to make the land suitable for further development.

Dredging would be undertaken by a cutter suction dredge to a depth of 12.2 m. An estimated volume of 1.8 million m^3 of dredged material would consist mostly of sand and silt, with smaller quantities of limestone and basalt. Controlled blasting could be required.

The dredged spoil would be pumped hydraulically to reclamation areas, to the north-east of the Inner Harbour. The total fill capacity of the reclamation areas exceeds the estimated volume of dredged fill.

It is proposed to direct the dredge water through a series of weirs and channels before discharge into the Leschenault Estuary at Mill Point. For reclamation areas C1 and C2, the dredge water would be directed back into the Inner Harbour.

The reclamation site was reclaimed from Vittoria Bay in the Leschenault Estuary during the previous dredging of Inner Harbour. The area was only partially reclaimed, and a large area of inter-tidal saltmarsh, and a shallow sub-tidal area remain.

Five public submissions were received, all of which stressed the importance of the partially reclaimed areas as waterbird habitat. Seventeen of the migratory shorebirds and their habitat are protected by an international treaty.

The Environmental Protection Authority has concluded that there are potential impacts from discharge of dredge wastewater into Leschenault Estuary, and that the beneficial uses for Leschenault Estuary are both greater in number and of a higher level than those for the Inner Harbour.

Therefore, the Environmental Protection Authority has decided that the waterbird habitat and the estuary should be protected, and that the proposal requires some modification in order to be considered environmentally acceptable. Accordingly, the Environmental Protection Authority recommends:

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to extend the Bunbury Port Inner Harbour as modified during the process of interaction between the proponent, the Environmental Protection Authority, the public and the government agencies that were consulted, is environmentally acceptable with the exception of the filling of reclamation areas A1 and A2 as shown in Figure 3, and the disposal of dredgewater into the Leschenault Estuary.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as the conservation and management of waterbirds and their habitat, and the preservation of the beneficial uses of the Leschenault Estuary by maintaining existing water quality.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the proponent's commitments in the Consultative Environmental Review (CER), as modified in response to the environmental issues raised during the public review period and the Environmental Protection Authority's recommendations.

Recommendation 2

The Environmental Protection Authority recommends that:

1. **those parts of reclamation areas A1 and A2 as shown between the dotted line and the estuary in Figure 3 should not be filled;**
2. **the areas listed in recommendation 2.1 should be removed from Port Authority jurisdiction;**

3. this area and the other areas containing significant waterbird sites within the estuary and the Preston River, be vested in the Leschenault Inlet Management Authority and managed for conservation of waterbird habitat;
4. the Leschenault Inlet Management Authority boundary be changed to the boundary shown as a dotted line in Figure 3;
5. the Leschenault Inlet Management Authority should prepare and publish a management plan for the above areas in consultation with the Bunbury Port Authority and the City of Bunbury;
6. reclamation is carried out in such a way as to allow the waterbirds to habituate to noise.

Recommendation 3

The Environmental Protection Authority recommends that:

1. all wastewater from the dredging and reclamation operation be directed into the Inner Harbour, such that the water quality is good enough for Power Generation (Beneficial Use No 15) and for Navigation and Shipping (Beneficial Use No 16);
2. spoil dumps and all drainage are to be designed and managed so that neither sediments nor wastewater enters the Leschenault Inlet either directly or indirectly as a result of the dredging and reclamation operation;
3. Bunbury Port Authority prepare a monitoring and management plan for dredgewater to the satisfaction of the Environmental Protection Authority.

1. The proposal

Bunbury Port Authority proposes to extend the Inner Harbour at Bunbury by dredging a strip of land to the south-east of the existing basin, to allow for two additional ship berths and associated on shore facilities. The dredged spoil would be used to complete the filling of partially filled areas, to make them suitable in accordance with current zonings for bulk storage and port related activities.

Dredging would be undertaken by a cutter suction dredge to a depth of 12.2 m. Material would be cut below sea bed level by the rotating cutter head, and drawn into a large diameter suction pipe to be pumped ashore. The dredged material would be mostly sand and silt, with smaller quantities of limestone and weathered basalt. If fresh basalt is found, controlled blasting would be required to remove it. The total volume of dredged material is estimated at some 1.8 million m^3.

All the dredged spoil would be pumped hydraulically to reclamation areas. These are land areas to the north-east of the Inner Harbour, bounded by Vittoria Bay on the Leschenault Estuary, Preston River, existing alumina leases and State Electricity Commission land. They were partially filled when the current Inner Harbour was dredged in the early seventies. The estimated fill capacities of each reclamation area is as follows:

Table 1: Reclamation areas - fill capacities (CER page 16)

Reclamation area	Fill volume (m^3)	Surface area (m^2)	Average fill depth (m)
A1	306,000	170,000	1.8
A2	440,000	200,000	2.2
B1	145,000	50,000	2.9
B2	102,000	73,000	1.4
B3	31,000	31,000	1.0
B4	107,000	82,000	1.3
C1	750,000	Surcharge volumes for mineral sands area	
C2	310,000		
TOTAL	2,191,000		

The total fill capacity of the reclamation areas exceeds the estimated volume of dredged spoil, and the proponent states that Area B is unlikely to be filled at this stage. However, the surcharge volumes to be placed in Areas C1 and C2 will not be determined until late in the project as they will be dependent on settlement monitoring results. Surcharge would remain in place for approximately one year, after which some of the fill would be used to complete filling of the reclamation areas, and the balance used off site. If volumes are less than expected, some portion of Area B would be filled. Figure 1 shows the reclamation areas, the layout of the dredge pipeline, and proposed drainage.

The dredged spoil would be pumped through a pipeline approximately 1.0 m in diameter, floating between the dredge and the shoreline. The pipe would be placed overland as required. Where the pipeline is to cross existing rail tracks, either thrust boring under the tracks or a temporary bridge over the tracks would be used.

On discharge into each reclamation area, the washwater would spread and slow down, causing the suspended solids to settle out. The boulders and cobble sized rocks would collect in front of the discharge pipe, followed progressively by the coarse sand, fine sand, silts and clays as the water moves away from the discharge point. The area in front of the discharge outlet would be cleared by a bulldozer. All the dredged spoil would be hydraulically placed as much as possible, but additional dozing and grading would be required to redistribute the material and trim to final levels.

It is proposed to direct the washwater through a series of weirs and channels, and collect it behind the final bunds on the Vittoria Bay foreshore, before being discharged into the bay at Mill Point through a controllable overflow. For two of the nominated reclamation areas (C1 and C2) the washwater would be directed back into the Inner Harbour. The dredging contractor may opt to route washwater from additional areas back in to the Inner Harbour. The washwater discharge and weir operation would be managed to achieve the required water quality limits on release into Vittoria Bay.

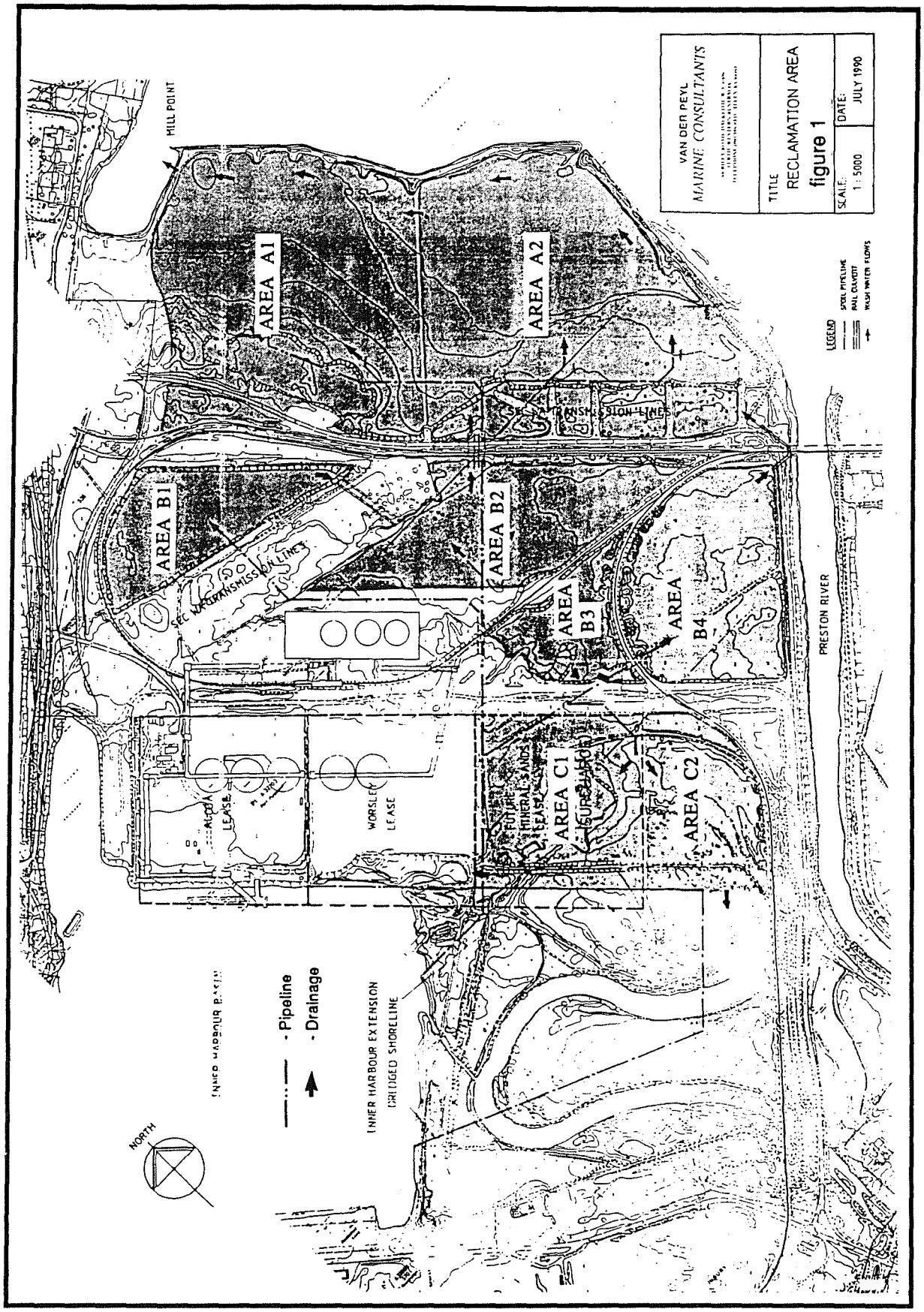

Figure 1: Reclamation area

Preliminary earthworks would involve the removal of vegetation and the stockpiling of topsoil, and the construction of bunds, open channel drainage, culverts and weirs. Final earthworks would involve grading and stabilisation of the reclamation, and rock slope protection works along the berthing lengths of the Harbour extension. The strip of land adjacent to the Vittoria Bay foreshore would incorporate a level 5 m wide strip suitable for later development as a cycleway and restricted vehicle access way, and would extend from the Preston River entrance along the foreshore to Mill Point. A 2.5 m high mound would back this access way, to screen the later developed industrial areas from the foreshore and other parts of the Leschenault Estuary.

2. Background

On 24 May 1990, the Environmental Protection Authority set the level of assessment for the Port extension at a Public Environmental Review. In response to a letter from the Bunbury Port Authority, the Environmental Protection Authority agreed to change the level of assessment to a CER subject to the following conditions:

Firstly, the proposal to be assessed is confined to only the dredging of the extension of the inner harbour as outlined in the referral, and to the suitable disposal of the spoil to complete the reclamation of the specified areas.

Secondly, the proposal does not include, and will not include environmental assessment of any significant change in the existing function or use of the Bunbury Port Authority land, or any port related development on specified areas being reclaimed.

Thirdly, any environmental approvals subsequently given to undertake the dredging and complete the reclamation works will in no way give tacit environmental approval to future developments on the reclaimed areas or the installation of new facilities on Bunbury Port Authority land.

Fourthly, any proposals to introduce new activities into the Bunbury Port Authority land, or to develop new infrastructure and facilities will be first referred to the Authority so that the appropriate level of environmental assessment can be determined.

Fifthly, these conditions will in no way prejudice subsequent Environmental Protection Authority's recommendations to the Minister for Environment as a result of this assessment.

In a letter dated 11 June 1990 the Bunbury Port Authority agreed to these conditions.

3. The receiving environment

3.1 Flora

The area to be dredged has been cleared previously for farming, and is covered in introduced pasture grasses. Flooded gum *(Eucalyptus rudis)* and Sheoak *(Casuarina obesa)* can be found along the relict Preston River channel to the south-east of the dredging site. In low lying areas subject to tidal inundation, saltmarsh and sedges occur.

The reclamation site was reclaimed from Vittoria Bay during the previous dredging of the Inner Harbour by the construction of a bund wall, with a small opening to allow drainage into Vittoria Bay. The site was only partially reclaimed, and a large area of inter-tidal saltmarsh, and a shallow sub-tidal area remain. The inter-tidal saltmarsh is dominated by the samphires, *Halosarcia halocnemoides* and *Suaeda australis.* The sub-tidal area contains about 50% plant cover with the red alga *Gracillaria sp* being the dominant submerged macrophyte. The seagrasses *Halophila ovalis* and *Heterozostera tasmanica* account for about 20% of the plant cover, and the green algae *Enteromorpha spp* for 5%. The latter is also prevalent throughout the inter-tidal zone, forming a ground cover underneath the saltmarsh herbland. Fringing the inter-tidal saltmarsh are sedges dominated by *Juncus krausii* and *Scirpus nodosus.*

The other wetland behind the Alcoa storage tanks is only marginally brackish, and Bullrushes *(Typha sp)* have replaced the sedges. Other low lying areas to be filled are dominated by introduced grasses and weeds.

No rare or endangered plant species were identified in either the area to be dredged or the proposed reclamation area.

3.2 Fauna

The proponent considers that the inter-tidal and sub-tidal portions of the bunded area would be inhabited by fauna similar to that occurring on the adjacent Preston River delta; that the areas would serve as feeding and possible breeding grounds for waterbirds; and that the dryland areas would provide habitat for a number of reptiles, insects and amphibians.

3.3 Human use

The public use the area around the Leschenault Inlet Cut for fishing, boating, and for sightseeing. The bunded area between Mill Point and Point Mornington is used for the viewing of waterbirds. Sightseeing of the Inner Harbour and adjacent area is mostly undertaken from cars using the sealed port roads.

4. Public submissions

Five submissions were received, two from government departments, one from an interested group and two from members of the public.

Topics covered in the submissions include the:

- adequacy of the CER document;
- filling of reclamation sites A1 and A2;
- conservation value of areas A1 and A2 and adjacent areas for waterbirds;
- cumulative loss of wetland areas by reclamation of the estuary;
- Environmental Protection Authority's Wetland Policy;
- transfer of the Preston River delta to the Leschenault Inlet Management Authority;
- transfer of wetland areas and Inlet waters within Port Authority boundaries into System 6 (C66);
- creation of artificial wetlands after the Preston River is diverted;
- design of earthworks and revegetation of the foreshore and the spoil dumps;
- maintenance of water quality including the possible transfer of toxic residues, silt or toxic dinoflagellate cysts from the Inner Harbour to the Inlet; and
- development and implementation of a management plan for the Preston River delta.

The proponent's response to these issues is included in Appendix 1.

5. Environmental issues

The Environmental Protection Authority has identified a number of environmental constraints to the proposal. Based on its assessment of the proposal, additional information provided in the public submissions, and the proponent's response to the public submissions, the Authority recommends as follows:

Recommendation 1

The Environmental Protection Authority has concluded that the proposal to extend the Bunbury Port Inner Harbour as modified during the process of interaction between the proponent, the Environmental Protection Authority, the public and the government agencies that were consulted, is environmentally acceptable with the exception of the filling of reclamation areas A1 and A2 as shown in Figure 3, and the disposal of dredgewater into the Leschenault Estuary.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring detailed consideration as the conservation and management of waterbirds and their habitat, and the preservation of the beneficial uses of the Leschenault Estuary by maintaining existing water quality.

Accordingly, the Environmental Protection Authority recommends that the proposal could proceed subject to the proponent's commitments in the Consultative Environmental Review (CER), as modified in response to the environmental issues raised during the public review period and the Environmental Protection Authority's recommendations.

5.1 Conservation of waterbirds and their habitat

The Preston River mouth and surrounding areas have been highly modified by the re-alignment of the river and extensive bunding along the shoreline of Vittoria Bay. Because of this disturbance and the nature of the wetland the proponent has stated that the area has "limited value" and that further development will not have significant impact.

In response to public submissions the proponent states that areas A1 and A2 are man-made land fill areas, constructed for port use, and that they are not wildlife or conservation areas. Further, the proponent states that Area B is unsuitable for filling at this time because of difficulties generated by the surrounding and intersecting rail lines throughout the area, such as placing hydraulic fill against embankments, crossing rail lines and draining the areas, and that it is intended to move fill to Area B in one year's time.

However, all the public submissions stress the high value of this area for waterbirds. For example, the report by Ninox Wildlife Consulting for the Mosquito Control Review Committee in June 1989, showed that mosquito breeding areas such as the tidal pools and saltmarshes which occur in the proposed development area were extremely important to waterbird populations, and that any modifications to them had to be specifically and carefully adapted to the individual attributes and significance of each site.

Six sampling sites were established and monitored by Ninox for the report. Three lie within the reclamation areas (Waterbird sites 3, 4 and 5). One is situated just to the north between Mill and Turkey Points (Waterbird Site 1) and two are located in the shallows and mud flats opposite the development area (Waterbird sites 2 and 6). See Figure 2.

The surveys carried out for the report showed that:

- 72% of all waterbirds and shorebird species identified at the estuary were found in this location alone;
- 35% of all individuals recorded at the estuary used the Preston River mouth, its rich inter-tidal feeding grounds and the large tidal pool located in reclamation area A2;
- parts of reclamation area A1 are important to waterbirds as a high tide and stormy weather refuge. A limited number of these refuges is available around the estuary, particularly along the highly developed eastern edge;
- 17 species of shorebirds recorded in the area during the survey are listed in international treaties for the protection of migratory birds and their environment (Japan/Australia, and China/Australia Agreements); and
- 27 mosquito breeding areas at the estuary were ranked as either "Very High Significance", "High Significance" "Intermediate Significance" or "Low Significance' for waterbirds based on a series of seven assessment criteria. Waterbird Sites 3, 4 and 5 which are within or immediately adjacent to the area where development is proposed, were all designated as "Very High Significance" to waterbirds. In addition, Sites 4 and 5 ranked as the two most significant Leschenault Estuary sites, while site 3 ranked as fourth.

The report also stated that physical and chemical mosquito control measures in individual sites could not be viewed in isolation, since the effects of treatment or activity would involve adjacent areas through the movements of birds, water currents and suspended matter from site to site.

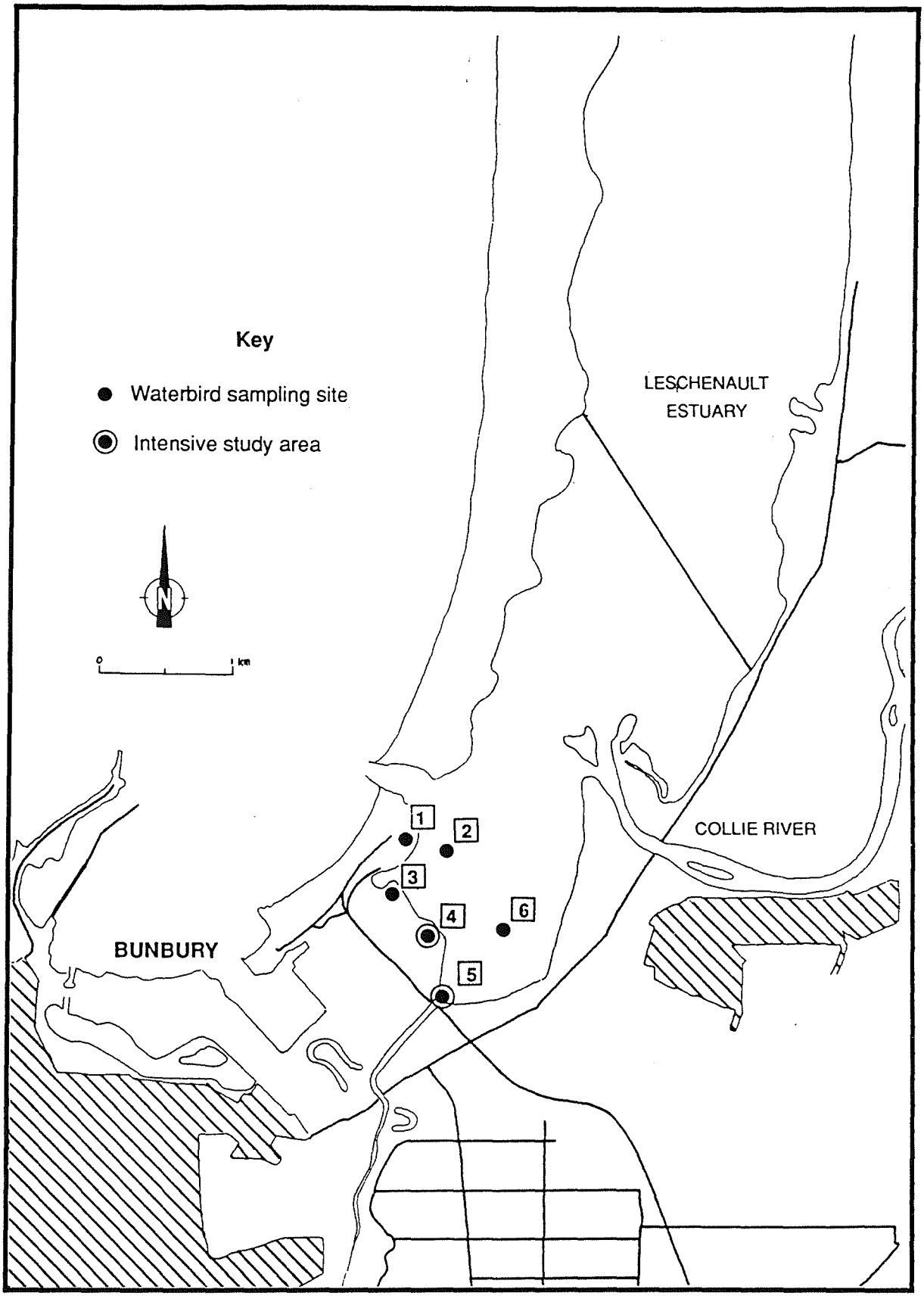

Figure 2: Water sampling site locations at Leschenault Inlet and associated wetlands (Ninox Wildlife Consulting)

In its submission, the Royal Australian Ornithologists Union (RAOU) supports the above statement. The RAOU submission says that:

"Areas A1 and A2 reveal an important connection in the movement of birds along the shore of Vittoria Bay. Area A1 provides important roosting habitat for a variety of waterbirds (particularly migratory shorebirds in spring/summer) and these birds often shelter and feed in area A2. Due to the very limited roosting opportunities available to shorebirds during times of high tide or adverse weather, these two sites play a vital role in maintaining shorebird populations in Leschenault Estuary. There is evidence that a similar pattern of usage exists between area A2 and the Preston River mouth."

This pattern of usage is illustrated in Figure 3.

The RAOU goes on to say that although Bunbury Port Authority has offered to compensate for the loss of areas A1 and A2 by handing over the Preston River mouth to the Leschenault Inlet Management Authority, there is no compensation possible for the loss of habitat in the reclamation areas which forms an integral link between a series of obviously connected sites.

The proponent has responded to these issues by saying that

1. the Environmental Protection Authority summary of this issue is incorrectly based on the premise that all adjacent sites will be adversely affected, as only sites 3 and 4 will be affected by reclamation;
2. the project will be isolated effectively from the other sites because no chemicals or earthworks into the estuary are involved, and because the proponent will meet specified monitoring and water quality commitments;
3. the birds using the feeding sites in the reclamation area will locate to other areas of the estuary.

However, the Environmental Protection Authority considers that the issue of the interconnectedness of the waterbird feeding and roosting sites is significant, and that the artificial nature of the wetland does not negate its importance.

5.1.1 International significance

Australia is obliged by international treaties to protect habitats used by migratory shorebirds. Although the numbers of these birds at Leschenault Estuary are not high, compared to some other south-western estuaries, 17 migratory species listed under the Japan/Australia Migratory Birds Agreement, and the China/Australia Migratory Birds Agreement are recorded as using these sites, and are listed in Appendix 3. These sites are, in the RAOU's opinion, by far the most significant area in the estuary.

The RAOU considers that in terms of numbers this estuary is one of the least surveyed on the west coast, and that further intensive surveys would reveal greater numbers of individuals, species and breeding records.

5.1.2 Access

The proponent states that a strip of land adjacent to the Vittoria Bay foreshore would incorporate a level 5 m strip suitable for later development as a cycleway and restricted vehicle access way. This accessway would extend from the Preston River entrance along the foreshore to Mill Point.

The RAOU's opinion is that the proposed cyclepath would encroach on an important land/water interface, which is the area most productive for waterbirds, and that it would also present opportunities for interference with the birds by people and domestic animals. However, they suggest that a cyclepath along the boundary of reclamation sites A1 and A2 would probably cause limited disturbance, whilst allowing good views across the waterbird habitat as it would be on higher ground.

The Environmental Protection Authority considers that location of the cycleway would be more appropriate along the boundary of the proposed conservation areas, rather than along the foreshore.

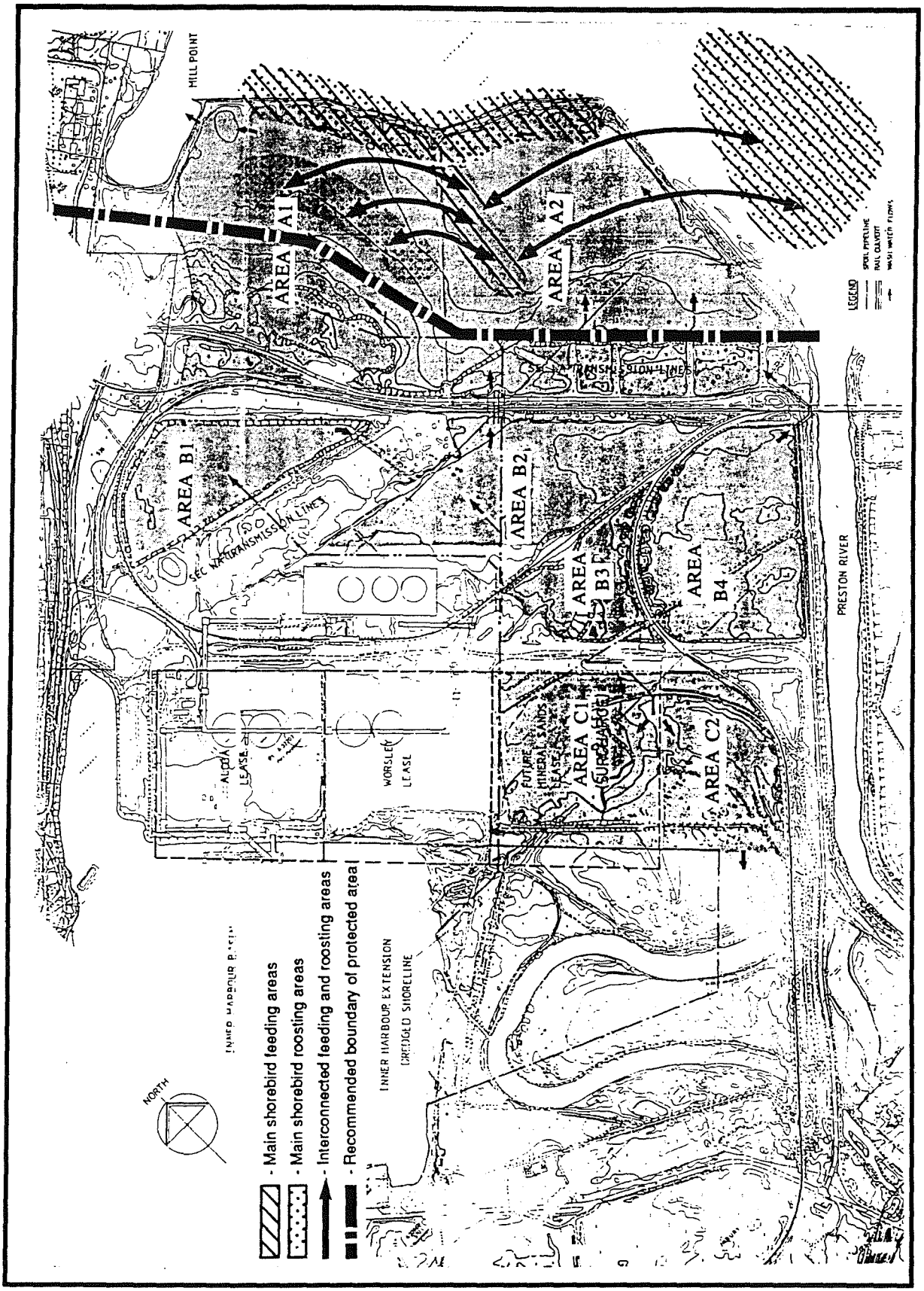

Figure 3: Recommended boundary to reclamation area and pattern of waterbird usage

5.1.3 Noise

The proponent states that blasting (if any) would use modern submarine technology, including electrical time delay detonators, to fracture the basalt bedrock. Small rigs, low explosive volumes and ample use of time delays would be used to minimise noise and vibration disturbances from blasting activities.

However, the proponent has not assessed the impact of noise on the waterbirds from earthmoving equipment used to spread the fill. The RAOU states that the birds would become accustomed to this noise, provided they are given time to become used to it. The Environmental Protection Authority considers that reclamation should be carried out in such a way as to allow the waterbirds to habituate to the additional noise generated.

5.1.4 Impacts of the proposal

Given the information in the public submissions on the importance and interconnectedness of all the Waterbird Sites, the Environmental Protection Authority considers that the proposed reclamation and wastewater discharge, as proposed in the CER will have significant negative impacts from filling on Waterbird sites Numbers 3, 4 and 5, and possible negative impacts on Waterbird Sites Numbers 1, 2 and 6 from wastewater discharge.

By international agreement, Australia is required to protect and manage these habitats. The Port Authority has offered to relocate its boundary near the Preston River delta so that the Leschenault Inlet Management Authority can manage this area, but the Environmental Protection Authority considers that this commitment is not an adequate compensation for the loss of the other waterbird sites. However, by making this commitment the Port Authority has recognised that it is not a conservation body. The Environmental Protection Authority considers that these areas should be conserved and managed by an organisation with the appropriate expertise. As the Leschenault Inlet Management Authority manages other parts of the Leschenault Inlet for conservation, the Environmental Protection Authority makes the following recommendations:

Recommendation 2

The Environmental Protection Authority recommends that:

1. **those parts of reclamation areas A1 and A2 as shown between the dotted line and the estuary in Figure 3 should not be filled;**
2. **the areas listed in recommendation 2.1 should be removed from Port Authority jurisdiction;**
3. **this area and the other areas containing significant waterbird sites within the estuary and the Preston River, be vested in the Leschenault Inlet Management Authority and managed for conservation of waterbird habitat;**
4. **the Leschenault Inlet Management Authority boundary be changed to the boundary shown as a dotted line in Figure 3;**
5. **the Leschenault Inlet Management Authority should prepare and publish a management plan for the above areas in consultation with the Bunbury Port Authority and the City of Bunbury;**
6. **reclamation is carried out in such a way as to allow the waterbirds to habituate to noise.**

5.2 Maintenance of water quality in Leschenault Estuary

The Environmental Protection Authority has identified some possible negative impacts from the disposal of dredge water into the Leschenault Estuary, and in the absence of quantitative data, has utilised Water Quality Criteria for Marine and Estuarine Waters (DCE Bulletin 103, 1981) as the basis for assessment.

5.2.1 Wastewater disposal

In the CER the Port Authority states when the reclaimed areas are utilised for port related industries, septic tank systems would be provided. The proponent considers that disposal of small volumes of wastewater is unlikely to significantly impact the existing water quality in the Inner Harbour or Vittoria Bay, and that nutrient loading from the septic tanks to these marine and estuarine ecosystems is unlikely to be sufficiently high to result in the eutrophication of these areas.

As explained in Section 2, this assessment has proceeded on the understanding that future port development and its impacts will be assessed at a later date, and that the current proposal in no way implies the environmental acceptability of future development on the reclaimed land. That assessment would include any proposals for wastewater disposal, and no conclusion as to its acceptability or otherwise is drawn here.

5.2.2 Drainage from spoil dumps

Concern was expressed in one public submission about the likelihood of turbidity from the spoil dumps contaminating the estuary when it rains. Given the porous nature of the dredge material, and provided that shallow grades are maintained during the reclamation process, the Environmental Protection Authority considers that rainfall would be dissipated by way of infiltration.

5.2.3 Dredge water disposal

The proponent states that quality of water discharged into Leschenault Inlet would be managed by settling ponds in the reclamation areas, particularly at Mill Point, an adjustable weir overflow from the settling ponds, and a geotextile screen across the inlet at Mill Point, if required. Neither specifications nor performance criteria were given in the CER. A programme of turbidity monitoring with samples from Vittoria Bay and Leschenault Inlet would be undertaken, as would monitoring of the outflow, such that turbidity would be below the level required to reduce ambient light penetration through the water column in Vittoria Bay by more than 10%. Thus the runoff would comply with the relevant criteria in Schedule 7(2) of Bulletin 103 set for the maintenance and preservation of aquatic ecosystems.

The proponent argues that water drained to Vittoria Bay at Mill Point from the dredge spoil sites would have a low particulate load and turbidity because 80% of the material to be dredged is coarse sands or larger sized particles, although some clays may remain in suspension, but only at a low concentration. In addition, the turbidity management programme would ensure that there would be sufficient retention time at the reclamation sites. No significant impacts from the runoff water into the Leschenault Inlet are expected by the proponent, as the runoff would be drained to the southern end of the bay, and water velocities should be low enough to allow settling of any material remaining in suspension before the runoff mixes with the waters of Leschenault Inlet proper. No calculations are provided in the CER to substantiate the statement about water velocities.

However, no water quality data for the Inner Harbour or for Leschenault Estuary have been given by the proponent, nor the required quantitative water quality limits on release into the receiving waters. Neither is there data on the flushing of the Inlet, the mixing of the runoff with estuary water, and prediction of the zone of impact for turbidity. For a quantitative assessment, details of the particulate load and likely light reduction due to dredge spoil runoff into Vittoria Bay would also be required. The statement that runoff would have s.s. <80 mg/L (a suspended solids concentration of less than 80 milligrams per litre) and a light loss of <10% (a reduction in light levels in the water of up to 10%) has not been substantiated, as no backup data and calculations have been given.

5.2.4 Beneficial uses of the Leschenault Estuary and the Inner harbour

The Environmental Protection Authority has adopted the following definition of a "beneficial use":

"A beneficial use is any use of the environment or any element or segment of the environment that is conducive to public benefit, welfare, safety or health. A beneficial use will require protection from the detrimental effects of any direct or indirect alteration of the environment." By defining the beneficial use first, then the assimilative capacity required to support that use will be established.

The management objectives for each beneficial use are expressed as water quality standards which in turn are based on scientifically derived water quality criteria. This ensures the protection of a body of water for any stated beneficial use (Water Quality Criteria for Environmental Protection and Management of Marine and Estuarine Waters, DCE Bulletin 103, 1981).

However, during the last decade much more data has been generated on water quality criteria, and Bulletin 103 is being revised currently.

5.2.4.1 General aesthetic criteria

These criteria apply to all water bodies regardless of other beneficial uses and particularly to Leschenault Inlet because it is a tourist attraction.

Waters should be free from:

1. substances which will settle to form putrescent or otherwise objectionable sludge deposits in areas where they would not occur naturally.
2. floating debris, oil, grease, scum, foam and other floating materials, in amounts sufficient to be unsightly or otherwise objectionable.
3. materials which produce colour, odour, turbidity, taints or other conditions to such a degree as to be unsightly or otherwise objectionable. In addition, colour should not exceed 100 Pt-Co units.

5.2.4.2 Beneficial Use No 2 - harvesting of aquatic life (excluding molluscs) for food

Minimal risk concentrations are required to protect consumers from biomagnification of toxicants which may accumulate in tissues of aquatic life. For most toxins in edible fish and molluscs, accumulation causes human health standards to be reached before acute or chronic effects are noted in the animals.

5.2.4.3 Beneficial Use No 7 - maintenance and preservation of aquatic ecosystems

Aquatic ecosystems are valuable food, recreation and educational resources. Properly constituted marine and freshwater communities are essential to the efficient assimilation of organic matter and recycling of nutrients in the aquatic environment. Such processes are important in maintaining water quality. They also provide a reliable indicator of the quality of water and hence of its suitability for other beneficial uses by humans.

Although localised deterioration of an aquatic ecosystem, due to degradation of water quality, may be reversible, in general the recovery of the abused system to its former state is far more costly than prevention of the abuse. The draft bulletin sets out three levels of protection Class 1 - Maximum Level, Class 2 - High Level, and Class 3 - Lower level of protection.

The most appropriate level of protection for Leschenault Inlet is considered to be Class 2 which is a high level of protection such that any waste discharges or anthropogenic changes which do occur may be readily assimilated or withstood by the system without any detectable effects on the biota or the structure of the ecosystem to which they belong. Class 1 may be too high a level given the current level of development around the Inlet.

Given the variety of Waterbird Sites, and the importance of the connections between them, the Environmental Protection Authority considers that it is important to maintain water quality over the whole of the estuary.

5.2.4.4 Beneficial Use No 9 - scientific and educational uses

The quality of water used for scientific and educational studies of non polluted habitats should be compatible with the criteria set out in Beneficial Use No 8 Maintenance and Preservation of Aquatic Ecosystems - Level 1 Protection. The quality of water used for studying degraded and recovering water bodies should be compatible with the criteria set out in Beneficial Use No 8 - Maintenance and Preservation of Aquatic Ecosystems - Level 2 or 3 Protection. The actual level of protection is designated on a site by site basis according to the level of degradation or recovery.

The Leschenault Estuary and Inlet is used for the scientific study of migratory waterbirds. The RAOU carries out research funded by the Department of Conservation and Land Management on an annual basis which includes an annual waterfowl count, and this area is also included in the Department of Conservation and Land Management's study of waterbirds on the Swan Coastal Plain. In addition the area was also surveyed for the Mosquito Control Review Committee's report "The significance of mosquito breeding areas to the waterbirds of Leschenault Estuary" in 1989.

Therefore water quality in this area must also be maintained at all times for Beneficial Use No 9 criteria, which is the same as the criteria set out for Beneficial Use No 7 - Level 2 Protection.

5.2.4.5 Beneficial Use No 15 - power generation

Bunbury Power Station is located at Point Hamilton between Koombana Bay and the Inner Harbour. The inlet pipe to the power station is located directly off the Point, and to protect the water intake the criteria for Beneficial Use No 16 must apply during dredging and reclamation operations.

The suggested criteria have been derived from those established for other beneficial uses which are judged relevant and effects which may occur on equipment and efficiency. The prime requirements for the protection of this beneficial use are avoidance of corrosion, algal and other plant growths, erosion, scale deposition, undesirable floating objects and materials and settleable materials occurring in amounts or concentrations that are greater than those normally expected in marine and estuarine waters.

The criteria for this use are considerably less stringent than those for Beneficial Uses Nos 7 and 9.

5.2.4.6 Beneficial Use No 16 - navigation and shipping

The criteria set out in Schedule 16 are designed to give a reasonable level of protection to shipping, port facilities, installations and equipment and also to personnel. Waters for shipping should satisfy the following three requirements: suitability for unobstructed passage of shipping and boats; satisfactory physical and chemical properties for intake for engine room, motors and other uses; and physical, chemical and biological properties which will afford reasonable protection of port facilities, installations and equipment, and not cause unpleasant or unsafe conditions for crew, passengers and the general public.

The criteria for this use are considerably less stringent than those for Beneficial Uses Nos 7 and 9.

5.3 Proximity to Koombana Bay

Concern has been expressed about the possibility of dredgewater contaminating Koombana Beach, to the west of the Inner Harbour. This beach is used for swimming and is where dolphins come in for feeding by humans. However, the water quality criteria to be set by the Authority for the proposed dredge water discharge into Inner Harbour are those for Beneficial Uses No 15 for Power Generation and No 16 for Navigation. These criteria are appropriate for Inner Harbour operations. Normally, Beneficial Use No 1 Direct Contact Recreation for swimming and Beneficial Use No 5 Passage of Fish and other Aquatic Life, would be required for Koombana Beach. The Authority considers that it would be inappropriate to require these criteria to be met for Inner Harbour uses as there is no evidence to suggest that current water quality within the Harbour is having any detrimental effect on Koombana Beach. Accordingly, the Authority does not consider it necessary to apply the more stringent water quality criteria to the Inner Harbour dredging.

Therefore, on the basis of potential negative impacts from the discharge of the dredge wastewater into Leschenault Estuary,and given that the Beneficial Uses for this estuary are both greater in number and of a higher level than those for the Inner Harbour, and that therefore water quality criteria to be met for the Estuary are far more stringent, the Environmental Protection Authority makes the following recommendation.

Recommendation 3

The Environmental Protection Authority recommends that:

1. **all wastewater from the dredging and reclamation operation be directed into the Inner Harbour, such that the water quality is good enough for Power Generation (Beneficial Use No 15) and for Navigation and Shipping (Beneficial Use No 16).**
2. **spoil dumps and all drainage are to be designed and managed so that neither sediments nor wastewater enters the Leschenault Inlet either directly or indirectly as a result of the dredging and reclamation operation.**
3. **Bunbury Port Authority prepare a monitoring and management plan for dredgewater to the satisfaction of the Environmental Protection Authority.**

5.4 Other matters

The Environmental Protection Authority considers that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Environmental Protection Authority.

The Environmental Protection Authority notes that during the detailed implementation of proposals, it is often necessary or desirable to make minor and non-substantial changes to the design and specifications which have been examined as part of the Environmental Protection Authority's assessment. The Environmental Protection Authority believes subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

6. References

Department of Conservation and Environment Bulletin 103. Water Quality Criteria for Marine and Estuarine Waters of Western Australia. Perth, Western Australia 1981.

Ninox Wildlife Consulting. The significance of Mosquito Breeding Areas to the Waterbirds of Leschenault Inlet, Western Australia. Perth, Western Australia 1989.

Appendix 1

Proponent's commitments

These are commitments contained within the CER but not included in the Summary of Commitments in the report:

1. The strip of reclaimed land adjacent to the Vittoria Bay foreshore would incorporate a level 5 m wide strip suitable for later development as a cycleway and restricted vehicle access way. This would extend from the Preston River entrance along the foreshore to the bay at Mill Point.
2. A 2.5 m high mound would back this accessway, effectively screening the later developed industrial areas from the access way, the foreshore and other areas of Vittoria Bay and the Leschenault Estuary.
3. If necessary, the surface of the completed reclaimed areas would be stabilised with hydromulch or similarly adequate method to stabilise the top layer.
4. Strategic planting of the screening mound would be undertaken.
5. Monitoring of the outflow would be conducted in recognition of the sometimes varying retention requirements and reclamation area operations would vary to suit.
6. Access would be maintained throughout the construction period although it may be inconvenienced on occasions.

The following are the proponent's commitments as summarised in the report:

C1. The BPA commits to managing the potential for increased turbidity generated at the dredging location and at the locations where washwaters leave the reclamation areas. The washwaters to be discharged into Leschenault Inlet will be managed for adequate retention periods through the use of bunds, weirs and staged areas of operation such that the appropriate water quality requirements as detailed in Reference 6 are met.

C2. The BPA commits to monitoring project activities with respect to noise and dust generation on site. In the event of complaints being received, the BPA or its agent will investigate and take appropriate action to rectify the problem if the relevant Environmental Protection Authority limits have been exceeded.

C3. The BPA commits to ensuring that the pipes associated with transport of the dredged spoil to the reclamation areas will be installed to the satisfaction of Westrail and will not disrupt rail traffic or road usage.

C4. The BPA commits to carrying out monitoring of water turbidity of estuarine waters adjacent to any points of washwater discharge from the reclamation areas and to institute a programme of the reporting of the test results to LIMA and the Environmental Protection Authority.

C5. The BPA commits to carrying out monitoring and management programmes designed to detect and address foreseeable problems associated with the proposed project.

C6. The BPA commits to relocate the Port Authority Boundary near the Preston River mouth as indicted in Figure 8, and assist in the development and implementation of a management plan for Waterways Management Reservation.

Appendix 2

Summary of issues and proponent's responses

SUMMARY OF ISSUES AND PROPONENT'S RESPONSES

The following is a summary of the issues and questions raised by submissions to the Environmental Protection Authority on the Consultative Environmental Review for the Bunbury Port Inner Harbour Extension Project, and the proponent's responses.

1. Adequacy of the CER document

The Royal Australian Ornithologist Union considers the CER totally inadequate in its review and presentation of waterbird conservation issues.

Under Section 3.2 (Community benefits p.9) the proponent states that reclamation will be "restricted to areas which are of limited value to the natural environment".
Reclamation areas A1 and A2 have been shown to be the most important areas for waterbirds in the Estuary.

The CER does not consider the option of alternative fill sites.
The omission of an evaluation of this alternative is a major inadequacy.

The Royal Australian Ornithologists Union was not consulted during the course of preparing the document. It is implied that discussions with other organisations identified a concern for wildlife areas. This concern is appreciated, but statements about modifying the design of the project, thereby implying that these concerns were alleviated, is misleading. The general acceptance for the project as outlined in Section 10 (consultations) is therefore considered unbalanced.

RESPONSE :

In the CER we have identified Area A (1&2) as a man-made land fill area, constructed in relatively recent years. The area was bunded and filled with dredged material (sand and limestone) during construction of the Inner Harbour in the early 1970's with the specific aim of providing additional land, backing the new harbour for port related industry.

A portion of this area contains a shallow tidal pond; the dredging project at the time was terminated due to rock encountered, prior to the land fill being completed.
The pond has in time vegetated and become a mosquito breeding and bird feeding site.

Identification of parts of Area A as mosquito breeding sites led to their subsequent inclusion in the Ninox study and report (Reference 8).
We acknowledge that this study rates the two sites in this area highly in terms of bird feeding. Our opinion remains, however,that in terms of conservation it cannot be held in the same regard as the natural areas of the estuary.

Area A was planned, approved and constructed for port use. It is not a wildlife or land conservation area.

The immediately adjacent river mouth and wetlands contain extensive shallow areas and are rated by the Ninox study as equal in all scopes of assessment of quality as to waterbird amenity. The river mouth wetlands and the balance of the estuary will not be physically affected by this project.

Alternative fill sites to Area A were not considered as the intention of the project is to prepare the land for future port use, as previously planned.

2. Filling of reclamation sites A1 and A2

Table 5.2 (p.16) of the CER gives the fill capacities of the reclamation areas. The CER states the reclamation area B is unlikely to be filled at this stage. Using the figures presented in Table 5.2., areas C, B, and A1 could be reclaimed, leaving approximately 60,000 cubic metres of dredge spoil to be disposed of. Therefore the necessity to fill area A2 is negated.

The CER presents no justification on why the saltmarsh lagoon needs to be filled. It is not clear from the CER whether there were other options to filling area A2. There is no justification in the CER as to why Area B cannot be filled as a priority to Area A2.

The attitude that the area was not filled during the original harbour construction and, therefore, should be filled now is inappropriate. The construction of the Inner Harbour in the early 1970's was not subjected to any environmental impact assessment. Areas of mangrove, saltmarsh and an island system have already been reclaimed from Leschenault Estuary.

It is stated in the CER that the total capacity of the reclamation areas exceeds the volume of expected dredge spoil. The RAOU therefore recommends that the Bunbury Port Authority does not fill sites A1 and A2, and that only areas B and C be used for dredge spoil.

RESPONSE :

Area B is unsuitable for filling at the time of dredging in this project because of the complications generated by the surrounding and intersecting rail lines throughout the area - placing hydraulic fill against rail embankments, crossing the rail lines and draining the areas (during hydraulic fill placement) are major complicating factors.
Instead it is intended that Areas A (746,000 cu.m.) and C (240,000 cu.m.) be filled, with an additional surcharge of 820,000 cu.m. being further placed in Area C, for sub-soil pre-treatment. Approximately a year after this dredging project the surcharge material would be moved by scraper to fill Areas B-1 to B-4, a volume of approximately 385,000 cu.m..

The balance (theoretically 435,000) is to be moved as surcharge over other parts of Areas A and B, in the course of their development.
Ultimately any unused excess volume of soils will be disposed of, off-site.

Area A needs to be prepared in the course of this project to allow some years of soil settlement to occur, prior to its final development.

3. Conservation Value of the Reclamation Area

A report to the Mosquito Control Review Committee by Ninox Wildlife Consulting in 1989 titled "The significance of mosquito breeding areas to the waterbirds of Leschenault Estuary" showed that the tidal pools and salt marshes that occur in the proposed development area were extremely important to waterbird populations, and that any modifications to them had to be specifically and carefully adapted to the individual attributes and significance of each site. This does not appear to have been given adequate consideration in the CER.

Six sampling sites were established by Ninox and monitored within and adjacent to the Preston River mouth. Three lie within the reclamation sites, (Waterbird sites 3, 4, and 5). One site is situated just to the north (Waterbird site 1) and two located in the shallows and mudflats opposite the development area (Waterbird Sites 2 and 6.) See attached map. The Ninox report stated that physical and chemical mosquito control measures in individual sites could not be viewed in isolation since the effects of treatment would involve adjacent areas through the movements of birds, water currents and suspended matter from site to site. Similarly the effects of the proposed harbour extensions will impinge on nearby areas in one form or another. For this reason all six sites have been included in the following analysis.

Because the Preston River mouth and the wetlands are a highly modified and disturbed site, it is tempting to assume, as the CER does, that the area has limited value and that further development will not impinge significantly upon it. This is not the case.
The Mosquito Control Committee surveys showed that:

. 72% of all waterbirds and shorebird species identified at the Estuary were found in this location alone;
. 35% of all individuals recorded at the Estuary used the Preston River mouth, its rich inter-tidal feeding grounds and the large tidal pool located in reclamation area A2;
Parts of reclamation area A1 are important to waterbirds as a high tide and stormy weather refuge. A limited number of these refuges are available around the Estuary, particularly along the highly developed eastern edge;
. 17 species of shorebirds recorded in the area during the survey are listed in international treaties for the protection of migratory birds and their environment (Japan/Australia,China/Australia Agreements);

. 27 mosquito breeding areas at the Estuary were ranked as either "Very High Significance", "High Significance", "Intermediate Significance", or "Low Significance" based on a series of seven assessment criteria. Waterbird sites 3, 4, and 5 which are within or immediately adjacent to the area where development is proposed, were all designated as "Very High Significance" to waterbirds. In addition, sites 4 and 5 ranked as the two most significant Leschenault Estuary sites, while site 3 ranked as the fourth.

It should also be noted that in terms of numbers of surveys, it is one of the least surveyed estuaries on the west coast. The RAOU considers that further intensive surveys would reveal greater numbers of individuals, species and breeding records.

RESPONSE :

The comments contained in Responses 1 and 2 apply.
The statistics presented relate to all six sites, rather than the two that will be reclaimed.
We consider that the EPA summary of this issue is incorrectly based on the premise that not only the sites contained in Area A will be removed but all adjacent sites (ie. the entire southern end of the Estuary) will be adversely affected.

Of the Ninox sampling sites, two only (No's 3 & 4) lie within the reclamation area, not three.
Site No. 5, the river delta, will not be physically altered or filled in any way.
Likewise, sampling sites 1, 2 and 6 will not be modified by the project works.

The CER details the extent of reclamation areas (Fig.2) and containment and management measures of the dredge waters:

- water will discharge into the Estuary at Mill Point only.

- the principles of retention times and controls to achieve water quality are outlined, actual details will be the subject of later design and will depend on the capacity of equipment used by the selected contractor.

- monitoring and water quality criteria are proposed for water entering the estuary to satisfy the criteria set down by the EPA Bulletin 103, for the maintenance and preservation of aquatic ecosystems.

We concur with the concern expressed by the Ninox study regarding the need to not view mosquito control measures (physical and chemical) in isolation and to be aware of effects on adjacent areas.
Notwithstanding this, however, the changes proposed by this project will remove two of the mosquito/waterbird sites but this will be isolated from the other areas :

- no chemicals are involved.

- no earthworks into the estuary water body are involved except the minor instance of filling the tidal gap in the existing bund.

- the proponent will meet his monitoring and water quality commitments.

The birds currently using the feeding sites in the reclamation area will re–locate to other areas of the estuary.
The areas involved are not considered significant in terms of breeding potential.

The comment by the RAOU with respect to the likelihood of greater numbers of individuals, species and breeding records (if a more intensive study was conducted) is noted.
However, the Ninox study considered that its 12 month study was reasonably "comprehensive" and a further 9 surveys by the RAOU around the time did not identify any further species or numbers.

4. Cumulative Loss of Wetland Areas in the Estuary

Works establishing the Inner Harbour in the 1960's resulted in considerable loss of wetlands along the tidal delta connecting what is now the Leschenault Inlet and Estuary. No environmental impact study of the project was carried out, and it is impossible to determine how this may have affected the viability of the Estuary particularly with regard to the bird population.

Over the years there has been considerable loss of wetland habitat in the general area and although one area on its own may not appear great, it is the cumulative loss that can become significant. Notwithstanding that the Port Authority has created some additional wetlands in some places in the past, it would have to be acknowledged that inner–harbour developments in the past have led to an overall significant reduction in wetland habitat.

RESPONSE :

The proponent acknowledges that the loss of a man–made wetland site is associated with this project.
This has to be weighed against the human environment benefits the project will generate, along with off–setting benefits relating to the natural environment.

5. EPA's Wetland Policy

The EPA's policy of no nett loss of wetlands on the Swan Coastal Plain needs to be implemented in this case.

It is considered the principle should be where a wetland is lost the proponent should endeavour to provide an equivalent area of wetland either within the development or at an alternative site. Plans to do this need to be nominated together with a timetable for their implementation.

RESPONSE :

The proponent is not against the general policy of preserving wetlands. But the comments of Response 4 apply, with emphasis on the fact that this is not a natural wetland but an area of partially reclaimed land.
Furthermore, it is an area of land that was specifically created by the Port Authority, within port boundaries, for the establishment of port industry in accordance with long-standing (and frequently re-affirmed) port and regional development plans.

Partially filling the estuary to create alternative wetlands was discussed with the Waterways Commission and LIMA.
However, loss of natural seagrass and algae beds in the filled area was considered to rule this out, as acknowledged in Summary Item No.8.
Alternative methods of assisting in the protection and upgrading of the wetland areas were proposed and discussed, with the following two possible contributions by the BPA considered to be of appropriate assistance:

- BPA to transfer (with appropriate ministerial approval) the Preston River Mouth Wetlands, as indicated on Figure 8 of the CER, to the Waterways Commission for management by LIMA, also to undertake survey works to suit.

- to assist in the development of a management plan for the above area.

6. Transfer of the Preston River Delta

The Port Authority transfer of the Preston River delta to the Leschenault Inlet Management Authority for conservation reasons is environmentally responsible. However the saltmarsh lagoon should be included in the land transfer. Its waterbird conservation value alone justifies this.

LIMA endorses the commitment made by the Port Authority to excise the Preston River delta from the Port Authority boundary, and its establishment as a waterways reservation. This is endorsed and will ensure that the remaining number 1 bird feeding and roosting area will be protected in perpetuity and enhanced through an established management plan.

RESPONSE :

As noted above Area A is an area of reclaimed land with a significant role in supporting port related industry in the future development of Bunbury as a port.
Furthermore, if the salt marsh area was not filled an additional 400,000 cu.m. (approx.) of fill would require disposal off the site.The additional costs involved would threaten the viability of the project.

7. Inclusion in System 6 (C66)

These areas should be protected and conserved in perpetuity, not filled. This area has been excluded from System Six, and this situation requires rectifying.

The System 6 Report in particular did not include land or waters of the Estuary that fell within the Port of Bunbury boundary. This has created an anomaly whereby the majority of the waters of the Estuary are included in a System 6 area (C66) while those with the Port Authority boundary are not. These waters arc no less important having important algae and seagrass beds as well as the Preston River Delta area which has established after the diversions of the Preston River in the 1960's.

RESPONSE :

The System 6 boundaries recognize established Port land and waters.
Exclusion of this area by the System 6 study is a separate issue, unrelated to this project.

8. Creation of artificial wetland areas

The Port Authority has indicated that when the Preston River is later diverted to accommodate future harbour developments, artificial wetland areas will be created. It is recommended that the proponent be requested to prepare a concept plan of future harbour developments that would address this question. The problem with examining the impacts of one instance of reclamation is that an overall picture is not available for future options and wetlands tend to be examined on a piecemeal basis only.

LIMA and the proponent have discussed the possible impacts and how artificial wetlands could be developed. Relocation of the Preston River would leave considerable scope for the enhancement of wetland areas and bird habitats. However the Port Authority could not guarantee that this plan would occur or over what time period. It is considered essential that if further works are to be carried out on the port area in the future then artificial wetlands must be established and the relocation of the Preston River will be the ideal opportunity to do this.

Thought was given to the establishment of an island in Vittoria Bay for waterbird usage using spoil from the dredging operation. However due to the seagrass and algae beds in the area plus the need to keep the channel open between the Preston River and the 'Cut' as well as the difficulties in physically transporting the dredge spoil no suitable location could be found.

RESPONSE :

The "Bunbury Port Strategy" (Reference 1, 1984) and the "Bunbury Port Authority – Inner Harbour Development Plan" (Reference 3, 1989) are referred to in the CER.
Both documents fully detail the BPA's current concept plan of future harbour development.
Diversion of the river is a firm factor in long term plans for the next major harbour extension, some time in the future.
The proponent agrees that this will provide a good opportunity to incorporate the creation of additional wetlands/samphire flats.

9. Port Authority Boundary

It is not clear from the CER whether parts of Leschenault Estuary will still remain within the Port Authority boundary. Parts of the estuary falling within Port Authority tenure are now valuable wetlands and should be conserved.

This highlights the need to prepare a concept plan to take into account all future harbour developments so that a clearer picture can be obtained of possible impacts and future options.

Due to the significance of the Preston River mouth and areas A1 and A2 for waterbird usage, the RAOU would recommend that the entire area be transferred to the Leschenault Inlet Management Authority as outlined on the accompanying map.

RESPONSE :

Figure 8 of the CER details clearly the wetland areas proposed for transfer, as agreed with LIMA and the Waterways Commission.

With respect to the request for a concept plan, the comments of Response 8 again apply.
These plans have been in the public arena for some time.
The 1984 Bunbury Port Strategy was fully supported and accepted by the State Government.

As emphasised in the CER, future development of the port industrial land is not included in this submission.
This will require separate submissions in due course.

10. Landscaping

It is recommended a qualified landscape architect be engaged to advise the proponent on matters such as the shape and design of spoil dumps and the re-vegetation and re-shaping of the foreshore area along the southern shore of Vittoria Bay.

RESPONSE :

Surcharge areas are temporary only. The fill areas will be regraded and reshaped after settlement, for use and development by the BPA.
As noted in the CER, the foreshore bund will incorporate an access track and will be shaped to suit.
Landscape planting and stipulations will be in accordance with professional advice.

11. Foreshore Area

The consultant has also advised that the foreshore along the southern shore of Vittoria Bay extending from the bund around to Mill Point would be regraded to allow the establishment of foreshore vegetation including samphire. These works should occur above the existing high water mark and not push spoil into the Estuary. A formal commitment is required on this matter.

RESPONSE :

The proponent agrees that any earthworks will be away from the highwater mark, not encroaching on the Estuary in any way.

12. Turbidity from Spoil Dumps

Bunds and other engineering structures would need to be designed to prevent turbidity in the Inlet as a result of heavy rainfall.

RESPONSE :

The proponent agrees.

13. Water Quality

LIMA is also concerned about the possible transfer of dinoflagellate cysts from dredge waters and soil coming from the Inner Harbour into the Leschenault Estuary. This would only be of concern during the initial stages of dredging when the top sediments from the harbour are being removed. The consultant has advised us this spoil and water would not enter the Estuary, however LIMA considers it necessary that a formal commitment is made regarding this issue.

Prior to the commencement of dredging samples of sediments from the Harbour and embayment adjacent to Mill Point should be analysed for the presence of toxic dinoflagellate cysts. This will enable determination of their presence in the estuarine system prior to dredging commencing.

The monitoring programmes for cysts and turbidity should be developed in consultation with LIMA.

The potential for toxic residues or silt to intrude into waterbird feeding grounds should be assessed, and if this is a possibility, action is taken to ensure that this does not eventuate.

RESPONSE :

The project does not in the main dredge the existing basin but an area which is presently land or high rock. For the relatively small amount of existing harbour face that will be removed the proponent will undertake to ensure that these sediments will be moved to Area C only.

14. Management Plan

The proponent has made a commitment to assist with the development and implementation of a management plan for the Preston River Delta area. Expenditure of approximately $16,000 is suggested as a guide, but final expenditure could only be determined after the preparation of the management plan is completed. These costs would not include any survey work required for boundary determination, which should be included at the proponent's expense. It is recommended that the proponent should be required to pay the majority of the cost.

RESPONSE :

The proponent has agreed to be responsible for and bear the cost of the Figure 8 boundary survey.

The proponent is in agreement with assisting in the development and implementation of a management plan with a budget expenditure of approximately $16,000, and is in agreement to paying the majority of the cost.

Appendix 3

List of migratory shore birds protected by international treaty

Waterbirds recorded on and adjacent to the proposed reclamation and spoil areas between September 1987 and October 1989.

PELECANIDAE	
Pelecanus conspicillatus,	Australian Pelican
ANHINGIDAE	
Anhinga melanogaster,	Darter
PHALACROCORACIDAE	
Phalacrocorax carbo,	Great Cormorant
P. varius,	Pied Cormorant
P. sulcirostris,	Little Black Cormorant
P. melanoleucos,	Little Pied Cormorant
ARDEIDAE	
Egretta alba,	Great Egret *
E. garzetta,	Little Egret
PLATALEIDAE	
Threskiornis aethiopica,	Sacred Ibis
T. spinicollis,	Straw-necked Ibis
Platalea flavipes,	Yellow-billed Spoonbill
ANATIDAE	
Cygnus atratus,	Black Swan
Tadorna tadornoides,	Australian Shelduck
Anas superciliosa,	Pacific Black Duck
A. gibberfrons,	Grey Teal
A. rhynchotis,	Australasian Shoveler
PANDIONIDAE	
Pandion haliaetus,	Osprey
ACCIPITRIDAE	
Circus aeruginosus,	Marsh Harrier
HAEMATOPODIDAE	
Haematopus longirostris,	Pied Oystercatcher
CHARADRIIDAE	
Pluvialis squatarola,	Grey Plover *
P. dominica,	Lesser Golden Plover *
Charadrius ruficapillus,	Red-capped Plover
RECURVIROSTRIDAE	
Himantopus himantopus,	Black-winged Stilt
Cladorhynchus leucocephalus,	Banded Stilt

Recurvirostra novaehollandiae,	Red-necked Avocet
SCOLOPACIDAE	
Arenaria interpres,	Ruddy Turnstone *
Numenius madagascariensis,	Eastern Curlew *
N. phaeopus,	Whimbrel *
Tringa brevipes,	Grey-tailed Tattler *
T. hypoleucos,	Common Sandpiper *
T. nebularia,	Greenshank *
Limosa lapponica,	Bar-tailed Godwit *
Calidris canutus,	Red Knot *
C. tenuirostris,	Great Knot *
C. acuminata,	Sharp-tailed Sandpiper *
C. ruficollis,	Red-necked Stint *
C. ferruginea,	Curlew Sandpiper *
LARIDAE	
Larus novaehollandiae,	Silver Gull
Hydroprogne caspia,	Caspian Tern *
Sterna nereis,	Fairy Tern
S. bergii,	Crested Tern
SYLVIIDAE	
Megalurus gramineus,	Little Grassbird
EPHTHIANURIDAE	
Ephthianura albifrons,	White-fronted Chat

An asterisk indicates those waterbirds recorded on and adjacent to the proposed reclamation areas which are protected by international treaty.