

CORAL COAST MARINA DEVELOPMENT

CLARIFICATION TO MATTERS ARISING FROM THE RESPONSE TO SUBMISSIONS, NOVEMBER 2001

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PREAMBLE

In November 2000, Coral Coast Marina Development Pty Ltd (CCMD) submitted a proposal 'Coral Coast Resort Public Environmental Review Document' for formal review.

The review period ended at the end of January 2001, and a series of submissions on the document were received by the Environmental Protection Authority (EPA). A set of responses was prepared to these submissions and provided to the Environmental Protection Authority Service Unit in November 2001. The EPA Service Unit then independently requested further clarification on some aspects of these responses in a letter dated 25 March 2002. This document provides responses to these additional requests.

1. MANAGEMENT ISSUES

1.1 Management of Issues Outside of the SAMMP

The EPA Service Unit understands that during the course of the assessment process CCMD's proposed framework for the long-term management of its proposal has undergone some changes. Accordingly, so as to gain an understanding of the most recent management proposal, more (most recent) information should be provided as to how the authority/body responsible for the long-term management of the proposal will be formed, funded and operated in the long term.

In relation to responsibility for management in the short-term (from development until the completion of Stage 1) CCMD will have responsibility. As CCMD's role as developer diminishes, (as land ownership is passed onto others either as packages for further development or sale to private landowners) management responsibility will be passed on to an incorporated Coral Coast Resort Community Association to be formed under the *Associations Incorporation Act 1987*

The Coral Coast Resort Community Association and accordingly all its members will be responsible to the Shire of Carnarvon and in turn to the WA Government. Responsibility will fall to the Coral Coast Resort Community Association for management of waterways. The term waterway is interpreted to mean any artificial channel, lake, harbour, or embayment within the scheme area (Shire of Carnarvon TPS 11) which is used or intended for use for navigational, ornamental and recreational purposes, or for any of those purposes. The term includes any access channel or connecting channel or sea wall and any addition to or alteration of a waterway within the meaning of the definition

The Coral Coast Resort Community Association will also contribute to the management of the airstrip.

To fund these programs, shire rates and levies will be imposed on owners of property in the CCR. All owners will by way of title be obliged to become members and contribute to the Coral Coast Resort Community Association. Representation will be proportional to Gross Ratable Value of property owned much as occurs in strata title agreements. A similar system has been established to fund marina management in Mandurah.

The matter of management responsibility and funding in the longer-term is further described in Appendix 1.

In order to assist the EPA in its consideration of the relevant management issues and to provide it with sufficient certainty that the management proposed can be achieved the EPA Service Unit requests that a consolidated list of relevant environmental management issues (including 'contingency measures') which would be funded by the special area rate be forwarded for information.

Funding will vary throughout the life of the project. Reallocation of funding to areas of need can be initiated by CCMD during the development of Stage 1, and the Coral Coast Resort Community Association when established.

Page 327. Please clarify who will take on the role of Waterways Manager in the long term and how the role will be funded.

The Coral Coast Resort Community Association will be Waterways Manager in the long-term. The Coral Coast Resort Community Association will employ a Marina Manager and support staff for the specific purpose of supporting the day to day management functions of the waterways as defined in the proposed rules for the association.

1.2 Contingency Measures

Page 206. It is stated that "In parallel with the implementation of the SAMMP, contingency measures will be developed in consultation with regulators. Contingency measures will include input (eg codes of practice) and output (eg numbers of snorkellers carried) methods, as well as community education management methods. These contingency measures will be developed prior to the opening of the CCR and accordingly prior to any additional pressures from this source."

Please confirm whether CCMD has made a commitment to implement and monitor the effectiveness of proposed contingency measures, which appear to be outside the scope of the SAMMP. In the case that these measures will not be undertaken by CCMD, please outline who will implement and monitor the effectiveness of proposed "contingency measures".

Required contingency measures will be identified and developed during the development of the Environmental Management Program (EMP), as will the identification of responsibilities.

The EMP will identify management requirement for construction and operational issues. CCMD has the responsibility for developing and implementing the EMP for the duration of Stage 1 and for making up any shortfall in required funding over this period.

After completion of Stage 1 responsibility for maintaining the EMP will fall to the facility and waterways managers, to be funded through the Coral Coast Resort Community Association. The scale of funding has been indicated previously.

The EMP will form a component of the Environmental Management System (EMS), a commitment to which being indicated in section 1.1 of the Response to Submissions (ATA Environmental 2001) consistent to the specifications and standards, under the umbrella of ISO 14000.

It is proposed that health, safety and environmental management plans for the CCR, including contingencies, will comply with OHSAS 18001 and ISO 14001. This system will facilitate the management of the occupational health, safety and environmental risks associated with the construction and operation of CCR. Management systems will include the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the proposed Occupational Health, Safety and Environmental Policy.

Relevant EMS plans and procedures will be developed by DNV in consultation with ATA Environmental and major consortium members.

Major consortium members, Brown and Root Services Pty Ltd, Clough Engineering Ltd, (resort construction) and Brown and Root Services Asia Pacific Pty Ltd (utilities and services provider, asset manager and facilities maintenance) each hold certification under ISO 9000 group of documents.

1.3 Management Requiring Planning Controls

Page 234. CCMD argue that the achievement of management objectives for water quality is linked to, among other things, the “management of nutrient inputs to private gardens and public open spaces”. The commitments made by the proponent in this regard are noted.

The EPA Service Unit understands that the proponent’s commitment to manage nutrient inputs to private gardens may be difficult to administer via the Environmental Protection Act process because the application of nutrients to gardens, is not within the control of the proponent. These matters may be better addressed either via planning approvals (caveat/deeds of arrangements) or be the long term responsibility of the ultimate Resort

Manager. The mechanism by which such controls can be put in place and monitored in the long term requires further clarification.

The manner by which these controls can be effected is presented in Appendix 1, Section 2. Building, landscaping and related activities can be tied into local bylaws as has been implemented elsewhere. Council can specify limitations on construction, finishes and manner of implementation. It can also be an obligation on the Coral Coast Resort Community Association members.

CCMD is working with the Carnarvon Council to develop a set of standard building specifications in support of maintaining environmental values at CCR. CCMD have made clear commitments in relation to the provision of specific infrastructure (for example, dog kennels) to provide alternative accommodation for pets travelling with visitors. The powers to enforce use of this facility lie however with Council. CCMD can not act outside its legal powers in this or any other issue, however it will provide every support (through staff and facilities) to Council in this regard. The importance of educating and gaining the support of residents and visitors in these endeavours is also clear. Community pressure will play an important role in this regard. Council would clearly be keen to receive clear direction from the EPA in this regard.

Will “strict building codes” be enshrined in the local TPS? How will building controls be transferred to owners of freehold lots?

Building codes will be enforced through building approval requirements of the Shire of Carnarvon. They will also be reflected in the covenant placed on the title for all lots. Local bylaws can also be developed to address such matters as lighting controls or fertiliser usage.

1.4 Vehicle Access

CCMD acknowledge that it does not have any powers to limit vehicle access from areas other than in the Townsite, and vehicles may be able to deviate around the development area and access beaches to the north through Cardabia station. Please clarify the term liaise in the statement on page 220 that “CCMD will liaise with the Baiyungu Aboriginal Corporation and CALM in relation to means to prohibit access, particularly during the nesting season.” Does CCMD intend to contribute in any way the managing access outside the Mauds Landing townsite?

Access to Bateman Bay beaches will limited through the CCR. However vehicles driven by CCR, Coral Bay settlement residents or visitors and ‘day trippers’ may access the beaches through Cardabia Station Land which abuts the CALM controlled terrestrial portion of the Ningaloo Marine Park. CCMD propose to consult with the Baiyungu Aboriginal Corporation and CALM with a view to identifying how best to manage access

on other than townsite land. The development of education strategies, signage and limitation of beach access points are seen as possible opportunities to limit impacts.

CCMD would support any such measures and contribute to funding for implementation. The provision of permanent CALM presence within the area will present opportunities not previously available to address this problem.

1.5 Management Issues Associated with the SAMMP

Boating

Page 198. Both the PER and the proponent's response to submissions put forward CCMD's view that "Potential impacts of increased visitation and boat use will be offset by:

Public education and monitoring support;

- Relocation of boats from Coral Bay;*
- Reduction in large boats travelling down back reef to Cardabia Passage; and*
- Direct access to deeper water and Cardabia Passage."*

It is the EPA Service Unit's understanding that point two is not within the control of CCMD, and requires commitment from CALM and/or DPI to manage. Please clarify the mechanism by which point two could be implemented to assist CCMD in achieving its proposed offset.

The limitation of boating in southern Bills Bay is consistent with CALM management objectives for the area. This issue has been previously raised in planning documents relevant to the area.

Limitations to the control of boating in the southern portion of Bills Bay is constrained by a lack of an alternative (trailed) small boat launching area, and safe mooring area for larger tourism vessels. The Government through the Department of Planning and Industry (DPI) is itself investigating alternative boat launching areas, including:

- € an area north of Moncks Head;
- € Northern Bills Bay; and
- € Mauds Landing,
- € or any combination of the above three.

With the implementation of the CCR (or any of the other Government option for example), CALM or other agencies will be less constrained to use its powers to implement more acceptable controls over boating in southern Bills Bay.

The marina facilities at CCR have been designed to accommodate boats currently moored or launched over the beach at Coral Bay.

The permanent presence of CALM and Fisheries WA (FWA) officers in the area supported by development of the CCR will introduce a level of regulatory control at present unavailable.

The reduction in large, presumably mainly commercial vessels, which currently travel along the back reef to Cardabia Passage also needs to be considered further in the context of the impact of potentially greater numbers of small privately owned vessels which, as historical evidence suggests, stay within the lagoon and particularly within sheltered areas south of Coral Bay.

Agreed and acknowledged.

A possible outcome of the implementation of the CCR will be to shift the focus of boating from southern Bills Bay to Bateman Bay. This has clear advantages for the management of impacts of large boats, especially as it would allow direct access to Cardabia Passage.

However small boats 'car toppers' may continue to be transported 'over the beach' to access the protected waters of southern Bills Bay and southward to Monck's Head. General response E in Volume II of the response to submissions presents a summary of boat count data undertaken in southern Bills Bay and predicts likely increases arising from the implementation of the CCR. About 26% of boats observed during the Easter 2000 survey were considered to be able to be launched across the beach. Based on a predicted approximate doubling of boats in use as a consequence of the implementation of the CCR, and all 'car toppers' being used in southern Bills Bay or the Monck's Head area, boat numbers in use will be in the order of half the total usage (all size classes* at present).

Establishment of a limited launching facility at Monck's Head could reduce small boat numbers in southern Bills Bay. Alternatively CALM may choose to prescribe no-go areas as are implemented in MPA's elsewhere in Australia.

Please confirm the EPA Service Unit's understanding that the SAMMP, once finalised, will be implemented by CALM and to a lesser extent Department of Fisheries staff with funding support from CCMD during construction of stage 1 and for a minimum 5 year period thereafter.

Clarification of this matter must address issues including:

Who will design and implement the fish stock assessment proposed under the SAMMP?

The elements of the proposal which constitute Stage 1 (i.e. is this still consistent with CCMD's November 1999 Structure Plan?)

Page 189. Please clarify the anticipated respective roles of CCMD and FWA as they relate to "Together with FWA, a program will be developed that will enable the collection of recreational catch, fishing effort and the biology of key fish species with the Ningaloo Reef Tract."

During the period to practical completion of the CCR (years 1 to 7) the majority of works relating to the implementation and ongoing operation of the SAMMP will be undertaken by consultants working on behalf of CCMD. CALM may be approached to extend certain aspects of their existing monitoring programs or specialist studies with a view to improving the outcome of the component. CALM will review the plan prior to its implementation, and will receive annual reports on the outcomes and performance indicators. A symposium/workshop is proposed to be held prior to year 7 that will review the results of component elements of the SAMMP, identify the need to continuation and in what form, and look to funding opportunities.

In relation to the assessment of fisheries, CCMD will seek the assistance of FWA in designing the program based on agreed objectives. CCMD will undertake to implement the plan for a period of 7 years followed by review as described above.

The Key Characteristics of the proposal are presented in Appendix 2.

The anticipated respective roles of CCMD and FWA in relation to the CCR are described above.

2. ELEMENTS OF THE PROPOSAL REQUIRING FURTHER DESCRIPTION

2.1 Stormwater

Further description of the urban stormwater management system and its impacts are required.

While it is clear that CCMD intend to design its stormwater management systems to direct stormwater away from the marine environment, more information is required as to where stormwater will be discharged to and what volumes would be accommodated without impacting any areas around the discharge points. Little consideration appears to have been given to the potential ecological consequences (e.g. impacts sources of food for birds) of discharging stormwater to inland areas from a built up areas.

No information has been provided about the predicted quality of stormwater, other than some consideration of nutrients. Consideration should be given to hydrocarbon and metal contamination of stormwater, which would be collected from roads etc. Will detention areas be monitored for contamination?

Section 5.2.5 of the September 2000 report by M P Rogers and Associates provided details of the expected groundwater and surface water responses which would occur immediately following periods of heavy rain such as cyclones. The modelling conducted as a result of those investigations was reported on pages 62-66 of that document.

It is proposed that a stormwater drainage system will capture runoff and redirect it away from the marina waterway to low lying areas inland of the marina. In so doing, the stormwater system collects and concentrates pollutants, in some cases effectively converting non-point (diffuse) sources into point sources. The Swan River Trust (1999) notes that small, often diffuse, nutrient and other contaminant sources in urban drainage are difficult to manage. These smaller sources can be better managed by encouraging changes to urban landscaping and more efficient water and fertiliser use, and by designing and maintaining urban areas, commercial and public properties and houses on Water Sensitive Urban Design principles (Swan River Trust 1999). This is consistent with the approach taken by CCMD and its consultants in the design of the CCR.

Table 1, adapted from WRC 1998, presents a summary of pollutants derived from various land uses relevant to the CCR, and how they will be managed.

TABLE 1
POLLUTANTS FROM VARIOUS LAND USES RESULTING FROM THE
IMPLEMENTATION OF THE CCR

Land Use	How Contaminants Enter Inland Areas	Potential Pollutants	Mitigation/Management
Urban	<ul style="list-style-type: none"> € Stormwater drainage (pipes, drains & watercourses) € Runoff from roads, parks, gardens 	<ul style="list-style-type: none"> € Nutrients (fertilisers) € Pathogens (bacteria and viruses) € Fuel and oil from vehicles € Tyre rubber € Heavy metals (e.g. lead from petrol, chromium, cadmium) € Pesticides/herbicides € Litter (e.g. paper, plastic, bottles, cardboard, aluminium cans) € Sediments € Colour (tanins) 	<ul style="list-style-type: none"> € Limited use of fertilisers, € Promotion of hardstand in public areas, € Public education € Promotion of limited car use (all facilities within walking distance), € Provision of litter bins and signage € Incorporation of water sensitive urban design in building specification of all public buildings.
	<ul style="list-style-type: none"> € Groundwater from sewage 	<ul style="list-style-type: none"> € Nutrients € Chemicals (e.g. fats, soaps, detergents, solvents, disinfectants, grease) € Pathogens (bacteria and viruses) 	Reticulated sewerage directed to an inland treatment plant, with treated effluent evaporated to dryness.
	Groundwater (leachates) and surface runoff from sanitary landfill and liquid waste disposal sites	<ul style="list-style-type: none"> € Nutrients € Bacteria, especially <i>Salmonella</i> (spread by scavenging birds, rodents & insects) € Toxic substances depending on nature of wastes € Acids and alkalis 	Solid waste directed to a fenced inland, managed landfill. Landfill managed to meet DEP requirements, including management of litter and vermin control.

Suspended solids, nutrients, BOD and microorganisms are usually considered the most significant threats in terms of ecological welfare (WRC 1998), with gross pollutants (litter) is the most noticeable indication of water pollution to the community.

WRC (1998) note that nutrients, heavy metals and organic chemicals utilize sediments as vehicles for transport in urban runoff. The deposition of sediment can often result in a corresponding reduction of these pollutants in the waterbody.

It is not intended to concentrate overflow stormwater but rather to allow it to disperse over as wide an area as possible to minimise any local impacts. Gross pollution traps and stilling basins will be installed or created on major outlets, and first flush water samples collected from the stilling basins.

CCMD suggest that the volume of stormwater which may discharge to the salt flats would be less than what occurs under existing conditions by virtue of rainfall directly entering the marina. However, given the proposed increase in paved and roofed areas is expected that stormwater discharge to the samphire will increase as a result of a localised reduction in the area of the catchment where infiltration to the superficial

aquifer would normally occur? Has advice been sought from the Waters and Rivers Commission on any hydrological implications associated with stormwater discharge?

Where stormwater runoff occurs overland away from the marina edges, initial flows and low intensity flows will be absorbed into the sands, with high volumes flowing overland away from the marine waterbody.

In periods of heavy rainfall such as those accompanying cyclonic conditions, the time of concentration of stormwater runoff will be very short. Little direct infiltration occurs during initial high intensity rainfall on the existing natural soils by nature of their composition. That is, the co-efficient of run-off is high under these circumstances, this being the case for both soils in the natural state and for buildings with hard stand. Soil descriptions and bore logs are presented in Appendix 1 or Volume II of the Response to Submissions. Previous work (see Appendix 3) notes that development of the CCR will affect only about 10% of the total low lying area which is subject to inundation during the previous major storm event, Cyclone Elsie.

Advice has not been sought from WRC in relation on hydrological implications associated with stormwater drainage. However much work has been done on this aspect and is incorporated in the PER documents.

Who will undertake maintenance of the stormwater system in the short and long term?

Responsibility for the management of the stormwater system will remain with CCMD until the structural completion or the CCR after which time it will be passed on to the Coral Coast Resort Community Association and Carnarvon Shire.

2.2 Services Area

Further detail should be provided on the indicative layout of the Services Area, including:

- *Areas of native vegetation to be cleared;*
- *Roads; and*
- *Location and scale of individual service infrastructure.*

Figure 4 in Appendix 4 presents a proposed layout for the services area. The services area will be located in an interdunal depression proposed to be located approximately 2.8km south of the CCR (Figure 1 in Appendix 4). The perimeter is approximately 1.5km from the Coral Bay settlement and approximately 2km south east of the runway at the Coral Bay airstrip.

About 10 Ha of the services area will be used for screening and edge buffers. The balance of about 50 Ha will be progressively utilised for landfill or the provision of additional evaporation ponds as the capacity of the WWTS increases.

The area comprises a portion of the Cardabia Station pastoral lease, and has been extensively grazed. A report entitled *Review of Vegetation, Coral Coast Resort Services Area Vegetation* (ATA Environmental 2000b) was presented as Appendix 14 of the PER document. The area is representative of Sand Plain vegetation widely represented on the Exmouth Peninsula and elsewhere in the North West. Subsequent to the vegetation review being carried out, the area was severely impacted by a wildfire (May 2001) with little regeneration.

With regard to the proposed wastewater treatment plant the responses state that "EPA (1997) provides guidelines for separation distances to odour sensitive land uses for biological WWTP. For a plant providing services for a population of up to 5000 persons, a separation distance of 200m is recommended."

It should be noted that it is not just the size of the plant that has a bearing on suitable buffer distances, but also the technology employed. If a pond system is to be employed (as proposed here), 200 metres may be a little tight for a plant this size. The DEP would recommend around 500m as a reasonable buffer. However other technologies, such as IDEA plants, would require a much-reduced buffer.

This issue should be given due consideration as it may be considered further during the assessment of an application for a works approval and license under Part V of the Environmental Protection Act 1986.

Comments made by the DEP are noted and agreed. A discussion of alternative WWT options considered for the proposed site is given in section 3.3 of Appendix 4. Ponds are proposed. As the distance to any odour sensitive land use is well in excess of 1000m, it is not considered the operations of the WWTP will result in odour.

The utilities provider, the Water Corporation of WA and Halliburton KBR will undertake detailed design of the WWTP following approvals. These will be forwarded to the DEP for consideration under the Works Approval and License under Part V of the *Environmental Protection Act 1986*.

Page 454. As the proposed power station will produce less than 10 mega watts in aggregate, it will not be subject to consideration under Part V of the Environmental Protection Act, unless fuel consumption exceeds 500 kg hour⁻¹ or greater than 1000 m³ of diesel is proposed to be stored on site. If the plant does not satisfy these criteria, and therefore will not require consideration under part V of the Act, it is important that the EPA fully understands the potential impacts of the power generation facility. Accordingly, further information is required on matters including:

- *anticipated fuel consumption;*
- *stack height;*
- *demonstrated ability to ensure acceptable dispersion of emissions including NO_x and CO; and*
- *any commitment to meet NEPM emission levels.*

The EPA's expectations with regard to emissions from gas-fired turbines is outlined in EPA Guidance Statement No. 15: Guidance Statement for Emissions of Oxides of Nitrogen from Gas Turbines.

A description of the power transmission and gas supply requirements anticipated for the CCR is presented in section 3.4 of Appendix 4. Fuel consumption at anticipated maximum development of the power station will not exceed the fuel consumption criteria requiring consideration under Part V of the *Environmental Protection Act 1986*. Stack height will be 8m, and not be visible above the dune crests between which the power station will be located. CCMD will undertake to complete a QRA of the facility to ensure the final design does not allow the 50 in a million contour to extend beyond the fenced plant boundary. Air modelling will be undertaken to ensure that emissions do not exceed the EPA's criteria and that NO_x emissions do not exceed 60% of the NEPM criteria for this emission.

It is considered that the relatively small quantity of emissions generated, the absence of any other significant emissions in the area, low background concentrations of combustion by products and the prevailing wind climate all mitigate strongly against the potential for significant air quality impacts.

2.3 Desalination

A more detailed description of the proposed desalination process is required. It is noted that at fully capacity of 2500 visitors wastes produced from the reverse osmosis process are predicted to be in the order of 312 000 Lday⁻¹. Information should be provided on matters including:

- € *consideration for power requirements;*
- € *addition of chemical conditioners, biocides and corrosion inhibitors which may be added to intake water during the desalination process;*
- € *options considered for the disposal of waste brine (e.g. how large are the proposed evaporation ponds);*
- € *anticipated quality of wastewater and its suitability for the preferred method of disposal. Consideration should be given to contaminants from conditioners/anti-scalants/coagulants, membrane cleaning and storage wastes, metals, dissolved oxygen, salinity, temperature and pH; and*

- € *whether the waste brine from desalination could be mixed with domestic waste water without causing shock to the biological processes required for treatment in the wastewater treatment plant.*

Power requirements will vary according to the final choice of RO plant, osmotic pressure and specified recovery rate but will typically be around 15-20 kW.

The addition of chemical conditioners such as anti-scalants (usually detergent types such as sulphates and phosphates, chosen for their biodegradability characteristics) will be determined once the RO plant is defined. The use of biocides will be limited due to pre-filtration measures. Iron will be removed (usually by air flocculation or an ion exchange system up front, with or without dosing with chlorine). Small quantities of citric acid or other acids can be used to adjust pH and sodium hydroxide may be used to aid cleaning the membranes of silt.

The characteristics of the wastewater will be defined once the RO plant design is finalised. The TDS content is likely to be around 2 x the raw water TDS i.e. around 12 000ppm. The wastewater pH can be adjusted, usually leaving the RO plant at around 6 to avoid calcium and magnesium precipitation. Sludge will be sent to landfill or depending on quality, used as bio-solids.

2.4 Cumulative Impacts

Page 185-86. The response to 3.1.1.16 does not clearly answer the submitters concerns. Consideration should be given to the broader issues of the effect of the proposal on the resilience of the Ningaloo Reef in the context of existing pressures, which include rising sea surface temperatures. Similar clarification is required in relation to responses to 3.1.1.21 and 3.1.1.22.

Concerns in relation to the cumulative effects of global scale impacts on coral both locally and worldwide, compounded on anthropogenic effects are acknowledged. CCMD concurs that in the absence of an appropriate management strategy, increasing visitation to the Ningaloo Reef has the potential to increase these cumulative pressures. However each or the submitters fail to acknowledge that visitation pressure continues to increase in the Coral Bay area with only the most rudimentary controls. Predictions by CCMD indicated a further 50 % increase by 2009 regardless of the implementation of the CCR.

The knowledgeable comments by the correspondent in response 3.1.1.22 identified the lack of recovery and continuing poor state of corals in Bills Bay following on from the atypical coral spawning event of 1989. It can be argued that the relocation of the majority of boating away from Bills Bay will reduce pressures on this area and increase resilience in meeting global scale impacts.

Similarly it can be argued that implementation of the CCR presents opportunities to redress a number of the human induced impacts in Bills Bay and elsewhere on the reef by

presenting the opportunity of an acceptable level of management and therefore reducing these pressures both present and into the future. By providing an alternative to current visitation at the Coral Bay settlement providing appropriated liquid and solid waste treatment and reducing obligatory boat operation within the impacted areas, a view is offered that pressures on corals will be reduced and better able to deal with global scale stressors such as water temperature increases.

2.5 Fuel Storage

- € *How much fuel will be stored at the marina for boat refueling?*
- € *What type of fuels will be provided?*
- € *Who will operate/manage the fuelling facility?*

The boat-refuelling operator (private operator) will, based on anticipated demands and re-supply frequency, determine the quantity of fuel that will need to be stored at the marina. Fuel storage will occur about 200m from the fuel dispenser. Safety features will include submersible pumps within the fuel storage tanks rather than at the dispenser, automatic close-off manual operation nozzles.

Boating fuels normally comprise diesel, unleaded petrol and two-stroke premix.

The boat refuelling facility will be designed and operated in accordance with the Department of Mineral and Petroleum Resources *Guidance Note S317 Design, Operating and Maintenance Guidelines for Marine Refuelling Facilities*. This document refers the user to the following for the definitive requirements for the design, operation and maintenance of marine refuelling facilities:

Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992;

- Australian Standard AS 1940 - 1993 The Storage and Handling of Flammable and Combustible Liquids;
- Australian Institute of Petroleum Code of Practice CP4 – 1991 The Design, Installation and Operation of Underground Storage Systems; and
- Department of Mineral and Petroleum Resources Guidance Note S308 Tank Installations for the Storage of Flammable and Combustible Liquids.

3. GENERAL ISSUES

Page 119 RTS Vo. I . The statement “The proposed development occurs outside the identified area of the NMP...” is not correct. The proposed breakwaters will extend into the Ningaloo Marine Park.

Noted and agreed.

3.1 Biophysical Issues

3.1.1 Artificial Reef

Page 175 - Advice on the achievability of the artificial reef should be sought from the Australian Institute of Marine Science at an early stage. Any real off-set/benefit of the artificial reef, needs to be considered in the context of the successful establishment and maintenance of the artificial reef as well as the expected use of the artificial reef by visitors.

Noted and agreed. The Australian Institute of Marine Science will be approached once the CCR receives all required environmental approvals.

The philosophy in establishing a reef within the marina was with a view to providing recreational alternatives to Bills Bay during periods of inclement weather. CCMD also believe it will provide an important training venue for visitors, having sufficient depth for snorkel/SCUBA diver training. It is not considered, nor was it ever proposed as habitat replacement.

Algae, soft and hard corals and other invertebrate assemblages, will colonize the reef. Propagules will be brought in by tidal action. The reef structure and colonizing plants and animals will act to attract fish. As identified by a number of the submitters, coral quality and diversity will never match that of areas elsewhere within the area.

3.1.2 Marine Fauna

Page 203-4. The EPA Service Unit notes that education is an important tool to raise awareness of environmental issues in the community, however the effectiveness of proposed education programs in minimizing risk to the environment can not be presumed at this stage. Accordingly, the statement “...users will abide with controls where they are clearly aware of what they are and why they have been implemented” should be referenced to show that similar strategies have effective elsewhere. Alternatively, a clear statement should be provided stating that this is the view of CCMD.

It is the view of CCMD that effective education strategies are fundamental in maintaining environmental quality within the Ningaloo Marine Park. This view is supported by

research in MPA's elsewhere in Australia. For example and in relation to diver skills, 70% of damage to coral reefs were observed as having been done by 4% of divers during a recent field observation in Eastern Australia (Harriott, Davis & Banks 1997). Prior et al. (1995) noted that these shortcomings could be addressed by better diver education (including videos and brochures) and skills improvement, or by channelling inexperienced divers to less susceptible dive sites.

3.1.3 Manta Rays and Boating

Page 234. The information in the response to 3.1.3.36 appears to be speculative and is not supported by relevant references.

General observations and counts by Ayeling and Ayeling (1985) and Hutchins (1994) were quoted in the response to submission 3.1.3.36, as were the findings of extensive diver tows conducted during the baseline studies of May 2000. The observations of the submitter are not questioned nor discounted, however in relative terms, the species diversity of backreef areas is noted to exceed those of sand substrates. Many of the species identified by the submitter are pelagic and will travel freely in oceanic and nearshore waters.

Page 234. Please clarify the statement "No large plankton feeders are known to feed in the waters of Bateman Bay." Does this imply that it is CCMD's view that Bateman Bay is not a feeding site for plankton-feeding marine wildlife, particularly manta rays?

Noted. The term 'other' as in "No **other** large plankton feeders are known to feed in the waters of Bateman Bay" was omitted.

CCMD, in the discussion of the observations made by the submitter clearly described the activity to the effect that*manta rays may have adapted the circular feeding behaviour to concentrate phytoplankton within the water column.* There was no implication that manta rays did not utilise Bateman Bay for feeding.

3.1.4 Turtles

Page 212. The presumption that the area to be impacted is used by "likely one nesting female" is unsubstantiated and is based on limited data (two seasons of observation). This statement requires further justification.

In the response to submission 3.1.3.11, attention of the submitter is drawn to General Response D in Volume II of the Response to Submissions. This General Response is entitled Marine Turtles and presents a general overview of the published literature. The statement "In Western Australia loggerhead turtles generally nest 3 times per year" is referenced to Environmental Australia 1998. Peter Mack (*personal communication*,

2000) notes that 95% of turtles nesting in Bateman Bay are Loggerheads. Peter Mack also noted that the grouping and the period between hatching indicated that he believed it to be a single female.

To date only CCMD have undertaken to locate, using GPS, individual turtle nests.

CALM has denied CCMD access to the document *“Turtle nesting at Coral Bay: a compilation of reports prepared by Mr Peter Mack for the Department of Conservation and Land Management, 1994/95, 1997/98, 1998/99, 1999/00 and 2000/01.”* This document appears on CALM’s publicly available library catalogue and has been requested through official library channels and through the CALM officer responsible for the document.

Page 214. The statement “One or two female turtles (less than 5%) of turtles breeding on Bateman Bay beaches are hawksbill turtles” is unsubstantiated. A reference or a clear statement should be provided to state how these values were derived.

The statement should have been attributed to Peter Mack in to General Response D in Volume II of the Response to Submissions.

Section 8.2 of Appendix 8 of the PER indicates that it is anticipated that most truck movements delivering materials to the site during construction of the breakwaters would occur at night. However the response to submissions suggests that placement of breakwater materials will occur during the day. Nighttime placement of breakwater materials is likely to increase the risk of impacts on turtles from artificial lighting, particularly during the turtle-breeding season. Clarification of this issue is required.

Transport is proposed by road train at night to avoid the period when most traffic is on the road. Breakwater stone will be stockpiled with construction only taking place during daylight hours.

No construction activities will occur at night, however de-watering pumps will continue to operate.

In relation to vehicle access, the response to submission 3.1.3.20 states that “No vehicle beach access will be allowed from the Townsite, and vehicle access will be controlled by the use of appropriate structures and signage.”

On page 17 of Response to Submissions Volume II, it is stated that “4WD vehicles would be permitted to access the beaches during between 1 November and 31 December only during daylight hours between 6am and 7pm. All vehicle access to the beaches would be prohibited during the main hatching period from 1 January to 31 March...”

Clarification of this issue is required.

The statement on page 17 of the response to submissions actually referred to service vehicles operated by CCMD or designated persons for maintenance (for example, litter removal). No private vehicle beach access will be allowed from the Townsite.

The statement should read:

“4WD service vehicles would be permitted to access the beaches during between 1 November and 31 December only during daylight hours between 6am and 7pm. All vehicle access to the beaches would be prohibited during the main hatching period from 1 January to 31 March. No private vehicle beach access will be allowed from the Townsite”.

“Pedestrian access to the nesting beaches north of the Cardabia access track would also be prohibited during the breeding season between 1 November and 31 March unless as part of a coordinated tour or ecotourism activity”. This management is likely to be difficult to implement in practice. Who would be responsible for long term implementation?

The difficulty in policing this activity is acknowledged. However, the principle nesting areas occur on beaches 4 to 6 km north of the Mauds Townsite (see Figure 2 Volume II of the Response to Submissions) and tourism operators can only reliably determine the timing of hatching. It is therefore anticipated that the significant walk in unlikely event that hatching or egg laying will occur may discourage members of the public in this endeavor.

CALM can regulate entry to the beach to 40m above the HWM should this be desired.

Also on page 17 of Response to Submissions Volume II it is stated that “Methods to prohibit access will be investigated during detailed design phases of the development”. Will CCMD’s Turtle Management Officer be responsible for implementing access controls in both the short and long term?

One of the duties of the Turtle Management Officer will be to implement access controls from the townsite. All CCMD staff will support the officer. It is anticipated that this function will be continued as the Coral Coast Resort Community Association takes over the ongoing management of the CCR.

Matters in relation to how access to Bateman Bay beaches can be managed beyond the townsite boundary will need to be resolved with CALM and Cardabia management.

Section 9 of Appendix 8 of the PER suggests that there would be significant transport of sediment along beaches in the southern portion of Bateman Bay under cyclone conditions. Moreover, on page 421 it is stated that “Should beach conditions be unsatisfactory, marine turtles are known to return to the water and find a more appropriate location.” Accordingly, the impact of breakwaters on sediment accretion and erosion should be addressed in the context of the potential impacts on turtle breeding. Given that the cyclone season and turtle nesting coincide and that there appears to be limited quantitative information on the effect of the breakwaters on beach alignment (both during cyclone and typical conditions), the potential impacts of the breakwaters on beach characteristic and turtle nesting is requires clarification.

A direct hit cyclone will undoubtedly rework the beach sediments and disturb the entire length of Bateman Bay beaches notwithstanding the development. Cross-shore erosion is believed to be more significant in disrupting turtle breeding sites than long-shore movement of sand as is the concern of the correspondent. CCMD has quantified the extent of accretion or erosion in the event of significant cyclonic event and the total quantity of sand moved is not significant in the context of the event. This is largely as a result of the existing reef barrier and its impacts on the attenuation of swell waves approaching the beach.

These swell waves combined with cyclonic winds have the potential to cut the strand line as an element of the natural cycle and irrespective of the construction of the proposed breakwaters.

3.1.5 Marine Mammals

In places, CCMD’s assessment of the impacts of its proposal on marine mammals is not clear and requires some clarification.

On one hand CCMD state “Potential impacts on whale populations will increase as a consequence of both the increase in boat numbers and greater proximity to Cardabia Passage”, while in a later paragraph a range of management and education opportunities resulting from the proposal will ensure that disruption to marine mammals does not occur. In view of CCMD’s statement that there may be increased risks to marine mammals presented by its proposal, a categorical assurance that education programs will assist in ensuring impacts will not occur will be difficult to defend, particularly in light of the limited knowledge about the impact of human interactions on marine mammal behaviour and population ecology in the Ningaloo Marine Park.

Noted and agreed. The **potential** for increased impacts arising purely from the increase in boat numbers is identified, as is possible mitigation arising from opportunity arising from improved management capability and education. The response is poorly worded.

Page 187. CCMD assume that Bateman Bay is unlikely to be an important feeding ground for migrating whales, however the significance of the area for resting is not adequately addressed.

Humpback whales migrate to Ningaloo (and further north) to use Ningaloo and Exmouth Gulf to breed, calve and rest. Recorded humpback whale numbers have been increasing significantly along the West Coast.

The Group IV population occurring on the west coast of Australia, comprising some 8000 individuals, is historically the largest population of humpback whales in the southern hemisphere (Heyward, Reville & Sherwood, 2000).

John Ashton (pers com 2001) has observed whales entering Bateman Bay up to 15 times annually. Relative to the size of the population and acknowledged increase in numbers of the population, CCMD are of the view that Bateman Bay is not significant as a resting area for humpback whales.

Page 236. The degree to which the statement “Most interactions occur beyond the reasonable range of all but larger private (greater than 5.5m) and commercial boats” is consistent with information provided in Figure 3 of the responses is difficult to assess with the available information. Figure 3 does show that humpback whales and calves have been recorded in an area of Bateman Bay adjacent to the proposal. It is therefore likely that whales which return to this area will be within the range of most boats (albeit weather dependent) that would be launched at the CCR.

The numbers of humpback whales that enter Bateman Bay are very limited. See the last paragraph of the response to the question.

Page 239. Information provided about commercial hunting of dolphins is not relevant to this proposal.

Noted and agreed.

A reference, to either a relevant survey or published scientific material, is required to support the statement on page 241 that states “Dugongs are not resident within Bateman Bay...”.

CCMD are not aware of any published source that states specifically that dugong are or are not resident within Bateman Bay. The conclusion is based on the comments of ecotourism operators (Doug Hunt and John Ashton) and observations made both by CALM and annotated on their habitat map and ATA Environmental regarding the sparse populations of seagrass present in Bateman Bay.

Dugongs are dispersed along the entire length of the Ningaloo Reef tract. Based on aerial surveys undertaken in 1989 and 1994, the total population of dugong in the Ningaloo Marine Park is estimated to be in the order of 1000 individuals (Preen *et al.* 1997). Preen noted large concentrations on dense seagrass meadows both to the north and south of Bateman Bay, but made no specific mention of their presence in this local.

Page 312. The Responses to Submissions state “By their nature, it is not considered that these areas (of seagrass) are significant locally or regionally.” What is the basis for this statement, given that Posidonia coriacea is at or near the northern limit of its distribution and that dugong are encountered in the area.

The matter being discussed related to turbidity impacts within the Development Impact Area (DIA) comprising an area of approximately 9 km² that CCMD believe, for the period of construction and a further five years after this time, may be subject to an increase in turbidity. The occurrence of sparse patches of seagrass and macroalgae was noted from northern sections DIA. Better although still sparse populations of both *Posidonia coriacea* and *Halophilla ovalis* are known from elsewhere in Bateman Bay.

Notwithstanding the occurrence of *Posidonia coriacea* and in the knowledge that it is near the edge of its known range, CCMD are of the view that the plants possibly impacted within the DIA are not considered significant either locally or regionally.

Page 187. Statements such as “that single point embarkation/disembarkation within this portion of NMP, regulatory (licensing) controls in place by CALM, and the improved monitoring and education opportunities afforded by the CCR, together with greater regulatory presence will ensure disruption marine mammals does not occur” are unsubstantiated. Improved management will undoubtedly be beneficial, however there is currently no means to forecast the effectiveness of the proposed management and therefore little basis on which to suggest that impacts on marine mammals will not occur. The proposed management will most likely act as a risk reduction only.

Noted and agreed. The statement is poorly worded.

3.1.6 Sharks and Whale Sharks

Page 224 and 245. Taylor (1996) suggests that the population of Whale Sharks that visit Ningaloo may be in excess of 200 individuals which are mainly juvenile males. However, it should be noted that Taylor (1996) goes on to suggest that the population structure may vary inter-annually, with considerable increases in the numbers of females between 1992 and 1994. The sex of the individuals that migrate along the Ningaloo tract may be important in assessing the significance of potential impacts of visitation-type impacts on whale shark populations.

Noted and agreed.

Page 246. Please clarify the term “provide support” in the statement “CCMD would provide support to CALM in identifying increasing pressures on the species and implementing these or additional strategies to reduce impacts”.

CCMD has committed to the development and implementation of a SAMMP within the MSMA and areas otherwise impacted by increased pressures arising from the implementation of the CCR proposal. This will include the collection of data relating to tourism operations originating from the CCR. Observations made and data collected during this program may be relevant to in relation to the management of whale shark interactions.

CCMD are committed to assisting CALM and other regulatory agencies to sustainably manage ecotourism target species.

It is noted that CCMD are of the view that, among other things, the opportunity to reduce boating in Bills Bay will have the effect of reducing the people pressures on aggregations of Black Tip reef sharks. Shark aggregations occur in very shallow water (<0.3m) close to the shore in Bills Bay (Norman unpublished). Accordingly, the most likely source of disturbance to these shark aggregations is from the shore. CALM (2000) notes that beach walking in this area is a popular activity at the current level of visitation. Some consideration should be given as to whether increased numbers of people on beaches in the area may increase the risk of disturbance to the shark aggregations, which are currently of unknown ecological significance.

It should be noted that the area to which Norman refers is about 2 km from the Coral Bay settlement reducing the numbers of visitors potentially access this area. Similarly the area is located about 2 km from the Marina breakwater. Notwithstanding, it is without doubt that an increasing number of visitors to the area will take the opportunity to walk between the two centres along the beach.

CCMD have committed to constructing a dual use path between the Mauds Townsite and the Coral Bay Settlement that may provide an alternative route between the two centres.

It should also be noted that in the event of the CCR proposal not proceeding, an alternative boat launching and mooring site proposed by DPI is adjacent to the shark aggregating site.

3.1.7 Birds

Pages 248-252. The response to submissions reiterates information provided in the PER regarding the distribution of birds species which may or may not occur or use the site. However, there is little discussion of the impact of the proposal on individual species, some of which are listed under international agreements. Consideration of these types of impacts is particularly important. It is noted that in its advice to CCMD, CALM indicates that Point Maud is an important roosting and loafing site and the area is significant in that it provides for large flocks of seabirds and/or shorebirds.

While it may be feasible to manage off-road vehicle use on the beaches towards Point Mauds, it will be very difficult to manage walkers. Consideration should be given to this aspect, particularly in light of CALM's advice to CCMD that there is already potential for disturbance by walkers.

It is noted that CCMD will not encourage the use of specific water craft within the marina or in Bateman Bay, however, it is the EPA Service Unit's understanding that CCMD will not have authority to prohibit the use of jet skis and speed boats, particularly in Bateman Bay. This type of regulation is the role of Government (e.g. CALM and/or DPI).

Noted and agreed. CALM has already established recreational watercraft areas adjacent to Moncks Head and can designate 'no go' areas as has been done at MPA's elsewhere in Australia. The Marina Manager will have the power to limit the use of specific craft from the marina.

Please provide a reference for the survey/monitoring undertaken by CALM.

The information presented consisted of data presented by Adam Meyer of CALM's Exmouth Regional Office. A copy of the data is included as Appendix 5.

3.2 Coastal Processes

Further clarification and discussion is required to fully address submissions in regard to CCMD's assessment of the impact of its proposal on coastal processes.

It is noted that no quantitative measurements of waves were made in Bateman Bay. The action of waves is the dominant forcing process for the transport of coastal marine sediments. Data on wave height, period and direction used in CCMD's assessment of coastal processes are coarse, taken at a significant distance from the proposed development site (400 NM west) and have limitations in regard to the range of conditions represented in the data set (underestimate worst case conditions). Notwithstanding, the suggested swell heights (1-4m in the PER) outside the reef are consistent with those measured by Hearn and Parker (1988) near Tantibiddi Creek.

Appendix 8 refers to work undertaken by Steedman Science and Engineering (1989) and Port and Harbour Consultants (1989) which examined waves and sediment movement as an effect of Tropical Cyclone Hazel. These reports were used to draw conclusions about the effect of the outer reef in attenuating wave height and the effect of extreme events on longshore sediment movement.

The EPA Service Unit concurs that the outer reef would have the effect of reducing wave height and that the reef line is likely to cause this attenuation via the mechanisms listed on pages 7 and 8 of Appendix 8. However, due to the lack of measurements in Bateman Bay (and the absence of comparable information for the area) it is difficult to accurately predict the fate of waves entering Bateman Bay from outside the reef during both typical and extreme events. Accordingly, caution must be exercised when predicting the effects of wave-driven sediment movement on beach dynamics, particularly in the longer term. It is noted that Appendix 8 does make assertions (though unsubstantiated) about the fate of waves based on some knowledge about bathymetry (Page 8) and their eventual effect on longshore and cross shore movement of sediment.

Some regional wave data has been used in modelling however local data was generated using computer models of wave forming processes and using a proven sophisticated model. The model used presents the sum of the knowledge contributed by oceanographers, climatologists and engineers to the development and understanding of coastal processes to this time.

Wave data for Bateman Bay was derived using models consistent with accepted engineering practice with the result being a reliable estimate of wave and sediment conditions in Bateman Bay both seasonally and with regard to exceptional weather conditions as would, for example, accompany a cyclone.

Modelling undertaken in assessing the impacts of construction of the breakwaters is based on a study of wave magnitude derived from long-term records combined with an examination of the movement of Bateman Bay beaches over the period of the photographic record. The current shoreline and movement of the shoreline in response to both typical and extreme events has been reflected in the conclusion that the coastline is stable. The results of the modelling and the photographic record support this conclusion.

The modelling does predict the fate of waves entering Bateman Bay whereas limited measurements of wave amplitude does not.

In regard to the effect of extreme events on coastline shape and processes, the EPA Service Unit notes that the statement "The extreme cyclone storms would create conditions that would transport sand in a southerly direction along the sandy shore of Bateman Bay towards Point Maud" may not hold for all extreme storm events. The impact of cyclones on coastal processes may depend on several factors, including the

track, speed and intensity of individual cyclones. The volume of sediment moved along the shore may also vary between each event.

Appendix 8 makes the assertion that in the months and years that follow cyclone events, persistent low amplitude background swell will rotate the beach back to its original alignment. In coming to this conclusion little consideration appears to have been given to the risk of cumulative effects of a series (>1) storm events. This should be given some consideration.

Modelling of the quantity of sediment transported under a worse case (direct hit cyclone) condition indicates reasonably limited sand transport. By way of example it is considered that a number of one-year return storm events would not have the same impact as the case modelled. The possibility of two or more storm events in a given period is acknowledged. All are attenuated by the offshore reef structures resulting in similar or lesser sand movement. The combined net movement of sand will be redistributed by normal wave patterns. The net effect on the built environment may be to increase the incidence of maintenance dredging predicted on normal climatic events to less than the anticipated about once every ten years.

The Coastal Engineering report suggests that under typical conditions, long-shore sediment transport near the proposed site is negligible and plays a limited role in shaping beach profiles. If this is the case, the conclusion that post-cyclone beach profiles would be re-aligned is called in to question.

The term 'negligible' used in this context relates to the existing beach alignment however post-cyclone there will be some localised changes to beach alignment that will result in localised changes to coastal processes (changed rate of sand movement along the beach and across the beach). These will tend to return the beach alignment and profile to the pre-cyclone condition.

The coastal processes have been described for existing conditions on the basis of off-shore wave data, expected path of waves into Bateman Bay and modeled sediment movement under cyclone conditions. However, little consideration appears to have been given to the extent of impacts associated with the presence of the proposed breakwaters. The EPA Service Unit understands there has been no direct quantitative assessment of the effect of the breakwaters on coastal processes, under either prevailing conditions or extreme events.

The quantitative assessment of the prevailing conditions has been undertaken and is presented in Appendix 8 of the PER document. The assessment indicated that the breakwaters had little effect on coastal processes (sand transported by longshore drift following extreme storm events would otherwise be deposited on the north facing shoreline of Point Maud), with a predicted 10000m³ being deposited against the northern breakwater during an extreme cyclone event.

Moreover, the response to submission 3.1.4.2 assumes that “Because of the proposed breakwater configuration, most the 10 000m³ of sand transported along Bateman Bay during a cyclone would be trapped in the lee of the outer breakwater, with a small portion deposited in deeper water along the eastern breakwater. As CCMD do not appear to have quantitatively predicted the impact of its breakwaters on long shore and cross shore transport, it is not possible to accurately assess how these processes will act to re-align beaches near the proposal. The statement “...the background swell to move it out of the trap area in the months following the cyclone” does not consider any effects of the breakwaters themselves on the effectiveness of long- and cross-shore transport to move sediments from the trap area. Some further information is required to describe how beach accretion and erosion would be brought back into equilibrium following significant beach reshaping by a storm event.

In assessing the movement of sand out of the trap by swells, the impacts of the breakwaters were considered. At this location the waves approach the shore almost parallel to the original shore alignment and the configuration of the breakwaters enables the swell to act on the sand that has accumulated in the previous storm event. Design of the breakwater does not allow for significant shadowed areas that would disallow wave energy to rework sands deposited in extreme storm events.

The PER acknowledges “...new beach alignments for a distance of 300 to 500 m either side of the breakwaters”. The ecological impacts of beach realignment, particularly on bird roosting and turtle nesting also requires some consideration. If beach profiles were to be altered to the extent suggested in the PER by either the breakwaters themselves and/or in concert with a storm event, the time taken to realign the beaches may be important for fauna which used the beach as habitat. CCMD’s consideration of impacts acknowledge that cyclone season coincides with breeding and migration of some significant species in Bateman Bay.

Birds and turtles that use beach areas and regional islands subject to cyclonic regimes are adapted to rapid changes in the beach profile. The beach berm is reworked on a daily basis as a consequence of long-period waves arriving from distant storms. This is demonstrated on the beaches of Bateman Bay by the frequent development of the beach cusps from re-worked beach sediment. The unconsolidated (soft) nature of the beach supports this interpretation of sand continuously in movement.

See also the response to the question below.

Some clear statement as to why the proponent considers these types of impacts would be considered acceptable in the Ningaloo Marine Park should be provided.

CCMD in the development of the Coral Coast Concept considers the north facing shore of Point Maud to be a stable promontory not subject to exceptional sand movements as a

consequence of the existence of Ningaloo Reef offshore and the direction of the prevailing swells. Accordingly, and supported by the results of wave and sand transport modelling, CCMD do not believe that there will significant impacts following the construction of the breakwaters to allow for the operation of the inland marina. Following construction of the breakwaters there will be a period during which a local realignment of the beach will occur on a scale and in a timeframe that will allow fauna to adapt to the changed environment. This will establish a new beach orientation that will not differ significantly from that currently in place. The processes, which maintain the beach profile and alignment will act similarly to stabilise and maintain the new alignment to once again, provide habitat for birds and turtles.

3.3 Coastal Environment

Some clarification should be provided as to how CCMD's commitment to prohibit the operation of quad bikes or similar off road vehicles from the CCR could be implemented, particularly when land is sold. Moreover, if commitments are also required from third parties (e.g. Shire of Carnarvon) to implement the proposed measures, please provide some advice as to whether these parties would be willing to take on the necessary responsibilities.

Please see the comments in relation to Planning Controls. The Coral Coast Resort Community Association and accordingly all its members will be responsible to the Shire of Carnarvon and in turn to the Government. The Coral Coast Resort Community Association in concert with the Local Authority can introduce by laws that prohibit the use of specific equipment (just as it can, for example, prohibit dog ownership within the designated Townsite. Once again though, these bylaws can only be in effect within the Townsite boundary.

Page 264 of the Response to Submissions states "The Foreshore Management Plan will define conservation areas and priorities, identify opportunities to educate members of the community and operators to limit damage, and specify features and construction details for foreshore structures." These points need to be reconciled against the list of actions in the table of proponent commitments.

Noted and agreed.

Will the Foreshore Management Plan go further than to "identify opportunities" to educate the public by providing for the implementation of educational programs?

Noted. Educational opportunities relating to foreshore management will also be implemented and subject to constant review against key objectives and indicators and reviewed.

Who (agency or entity) will take on the responsibility for the implementation of the Foreshore Management Plan in the long term?

The Coral Coast Resort Community Association will have responsibility for long-term implementation of the Foreshore Management Plan.

3.4 Construction Issues

How will liquid and solid construction waste from the on-site construction be dealt with in the period prior to the commissioning of the proposed waste water treatment plant and landfill?

Construction of the WWTP within the services area will commence as soon as all statutory approvals are in place. The WWTP will be operational and will receive liquid waste from the CCR construction workforce. In the event that the initial cell of the proposed landfill site is not available at the time of commencement of construction, the existing landfill will be used.

Is it expected that the dewatering of the marina basin will have off-site impacts on vegetation by affecting shallow groundwater hydrology?

Dewatering will cause a local depletion of the shallow groundwater in the surrounding area (cone of depression). The cone of depression will not extend beyond the area that has been identified to receive fill for construction of marina buildings and private residences.

Where are the proposed "stilling basins" proposed to be located and will their construction impact dune vegetation and landform?

Stilling and adjacent infiltration basins will be located in depressions constructed in the proposed entrance channel. No additional land will be disturbed to provide for these functions.

The statement on Page 452 that "The Wardens Court recommended that the mining lease being the subject of the proposed quarry and infrastructure area should be granted." Should be amended to reflect that the wardens recommendation was conditional on the proposal gaining relevant environmental approvals. The proposal is subject to formal assessment by the EPA at the level of Environmental Review and Management Plan.

Noted and agreed. In relation to this matter, CCMD are assured there is sufficient stone available from existing approved quarries without reliance on those currently being considered by the EPA.

3.5 Pollution Management

3.5.1 Liquid Waste

Page 287 of Response to Submissions and page 32 of the PER. Will the wastewater treatment provider be responsible for assessing water re-use potential?

Yes. It will be a requirement of the detailed design of the WWTP.

Please note that it is possible that site-specific flora and fauna surveys of the services area will be required as a condition on any Works Approval for the proposed wastewater treatment plant. Similar conditions may apply to Works Approvals for other prescribed premises proposed for the service area.

Noted. A report entitled "Review of Vegetation, Coral Coast Resort Services Area" (ATA Environmental 2000b) was provided in Appendix 2 of the PER document. The subject land has previously been grazed and was severely burnt during a wildfire in April 2001.

3.5.2 Solid Waste

Page 217. The response to submission states that "The increase in visitation needs to be offset against the replacement of the existing poorly managed landfill that is located on coastal flats near the Coral Bay settlement." Does CCMD have any confirmation that the existing landfill site will be decommissioned and rehabilitated to appropriate standards?

CCMD do not have the authority to act in this matter. The Shire of Carnarvon has indicated that it is supportive of the decommissioning and rehabilitation of the existing landfill site. There are powers under Part V of the *Environmental Protection Act (1986)* to direct closure and remediation.

It is noted that the Structure Plan indicates that the Asset Manager would be responsible for day to day management of the resort in the long term. Please confirm who will be specifically responsible for the solid waste management (including waste collection, waste sorting, recycling, composting, groundwater quality monitoring, landfill site operation and maintenance) in the long term.

With the possible exception of ongoing groundwater monitoring requirements, the utilities provider, the Water Corporation of WA and Halliburton KBR will undertake the actions specified.

Groundwater monitoring may be a component of a more extensive monitoring program directed by the Coral Coast Resort Community Association. Monitoring responsibility will be defined in the EMS to be developed prior to the commencement of construction.

The DEP have noted responses in relation to the proposed landfill site and make the following comments.

For the Kalbarri landfill, which is also unlined, drinking water was potentially at risk from leachate. Capping of landfill cells with mounded clay was determined to be an acceptable leachate control. This is recommended for the unlined CCMD facility as it prevents accelerated leachate movement following rainfall events.

Drinking water is drawn from the Birdrong Formation from a depth of 800m. Leachate generating capacity and movement rates will be modelled prior to the application for Works Approval being submitted. In the event that there is a significant risk of leachate intersecting the groundwater table and ultimately the ocean, provision will be made to cover the landfill cells.

3.5.3 Marina Water Quality

It is recommended that CCMD commit to managing the waterway to protect ecological health with the marina to an E3 level of protection. The E3 level of protection allows for moderate changes in ecological processes including structure and function (EPA 2000). This is consistent with the management framework outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000). While it is anticipated that CCMD must obtain MPRA views and support on the proposed level of environmental protection outside the marina, it is anticipated that an E1 level of protection would be achieved within waters of the marine park. Advice on setting up the management framework for environmental quality within the marina and outside the marina should be sought from the DEP, in consultation with CALM at an early stage.

Noted and agreed. The ANZECC and ARMCANZ (2000) guidelines were made publicly available after publication of the PER document. Notwithstanding, the manner in which the criteria were determined and statistical basis for determining change was similar in each case.

CCMD will commit to managing the waterway to protect ecological health with the marina to an E3 level of protection, and that an E1 level of protection to be achieved within waters of the marine park beyond an agreed mixing zone (Development Impact Area) at all times, to revert to all areas within five years of the completion of the marine water body, revetments and breakwaters.

The management framework outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality will be used as a guide for development of the program. *The responses to submissions have not considered that, like many boat harbours (e.g. Exmouth Boat Harbour) and other semi-enclosed water bodies, fine sediments accumulate over time. Nutrients and other contaminants bound to these fine sediments which can be released to the water column depending on the oxygen, temperature, pH and salinity status of the interstitial and overlying water. Without considering the ecological processes which can occur in marine sediments and lead to release of contaminants, there is little ground on which to base the assertion that “the marina system will be nutrient poor and this will preclude nuisance plant growth/algal blooms.”*

An assessment of the characteristics of the sediments in Bateman Bay has been undertaken by Parker (1999) this confirms measurements and observations made by ATA Environmental (2000). The proportion of fine sediments is reduced in relation to the example given located on Exmouth Gulf. The fine fraction will settle out during slack tide.

Accordingly, further consideration should be given to the physical parameters that affect ecological processes that occur near the sediment/water interface. These biogeochemical processes and factors influence the release/adsorption of contaminants in marine sediments and include stratification, water temperature, sediment and water column oxygen status (including respiratory demand), sediment redox potential and pH. A conceptual model, similar to that developed by the Centre for Water Research as describe on pages 295 – 296, would assist in predicting the likely consequences that the changed ecological process will have on water quality. Insight into the validity of these predictions can be gained from evaluating changes that have occurred in similarly enclosed water bodies in similar settings. In this regard, it should be noted that dissolved oxygen levels in Exmouth Boat Harbour are consistently lower than in adjoining waters.

Still waiting on a response from the Centre for Water Research on this question.

Page 294. There does not appear to be a quantitative assessment of the effects of temperature on water quality, both in terms of the role that temperature gradients play in driving hydrodynamic processes and possibly more important, the role that vertical temperature stratification may play in sediment and water quality.

Net heat gained or lost in the marina water body is a function of a number of sinks and sources. Temperature gradient will tend to increase water exchange and the variable temperature structure will generally be suppressed by strong prevailing winds and the alignment of the water body.

In reviewing temperature modelling as it would be applied to the marina water body, the issue of the input of significant heat energy by the Leeuwin Current was identified.

When inputting this elevated temperature for the source water, daily heat gain was balanced by the radiant properties of the large and relatively shallow marina waters due to the evaporative cooling effect of the prevailing winds. In effect, the model indicated diurnal net loss (cooling) of marina waters.

Under calm wind conditions for extended periods, localised diurnal heating and cooling is likely to occur in some areas of the marina. The vertical and horizontal temperature gradients will collapse with the onset of even modest winds. This is not dissimilar to local heating and cooling in natural coastal embayments during periods of extreme calm.

Stratification could also be persistent in the upper reaches of the marina (north eastern embayments). This could result from the effect of prevailing winds from the southerly quadrant which force water in to northern, less-well flushed areas of the water body. The ecological effects of such an event do not appear to have been considered. For example while it is noted on page 295 that the differences in oxygen solubility decreases only slightly (6.96 to 6.39 mg L⁻¹) when the temperature rises from 20°C to 25°C, no consideration is given to the ecological consequences of respiration rate doubling with every 10°C increase in temperature.

See the comments on the above dot point. Based on the temperature modelling considered, water temperatures fluctuated about a daily mean sustained by the inflow of warm water from the Leeuwin current. In effect, radiant cooling and evaporation resulted in a reduction in marina water temperatures. Concerns regarding increased respiration rates are unwarranted on this basis.

Page 462. Further to the above, a combination of wind forcing of surface waters and temperature/density stratification could reduce DO conditions in bottom waters and superficial sediments, particularly in the upper reaches of the marina which are poorly flushed. Excess algal growth is not likely to be the issue of most concern in the first instance, rather a combination of limited flushing (limited water movement causing increase deposition of organic material) and bacterial respiration may act to reduce DO in both sediments and in overlying waters. Reduced DO in bottom waters can cause release of NH₄⁺ from sediments, which can be readily utilized by marine algae at low concentrations, and can be toxic to marine life at high concentrations.

See the response presented in the above two questions.

Temperature density stratification is unlikely to occur given the strong ambient winds. Water quality changes during periods of stable atmospheric conditions will soon be dissipated following the presumption of prevailing wind patterns. In combination with the pumping action of swell over the barrier reef and high quality of source waters in Bateman Bay, any variation in dissolved oxygen is unlikely to result in an ecological impact.

Little consideration appears to have been given to the fate and ecological consequences of contaminants (other than nutrients) entering the marina. First-flush rainfall events are likely to be important mechanisms leading to the discharge of non-nutrient contaminants, such as hydrocarbons, heavy metals and pesticides/herbicides into the marina. Further consideration should be given to this issue.

First flush minor flows will not enter the marina body. In the event of significant rainfall events coinciding with the first flush, stormwater may enter the marina body. However the dilution also resulting from the intensity of the event will have the effect on limiting potential environmental impacts. Wave pumping and wind circulation accompanying weather likely to contributing significant rainfall will mix and disperse dissolved substances.

Page 467. The marina should be managed to protect the social environmental values: Maintenance of aquatic life for human consumption and primary contact recreation.

Noted and agreed.

4. MARINE WATER QUALITY

The water quality management strategy proposed in Appendix 10 of the PER is not consistent with the National Water Quality Management Framework outlined in ANZECC & ARMCANZ (2000). The National water quality guidelines are available from the Environment Australia web site. The framework adopted by the EPA for the management of marine waters of Cockburn Sound is outlined in Perth's Coastal Waters: Values and Objectives (EPA 2000). Although the numerical figures for water and sediment quality criteria are not likely to be appropriate for the Ningaloo Marine Park, further guidance on developing a water quality management framework consistent with the National approach can be found in Draft Environmental Quality Criteria Reference Document (Cockburn Sound) (EPA December 2001). Please do not hesitate to contact the assessment officer to arrange time to discuss water quality management in more detail.

Noted and agreed. Please see the comments under Marina Water Quality.

Page 460. The response to Submission 6.2.2.3 provides only an acknowledgement of the need to consult with the Marine Parks and Reserves Authority (MPRA) in regard to defining an acceptable zone of influence around the marina entrance. There will be a need to reach agreement with the MPRA on this matter.

Noted and agreed.

Page 300. Please identify the "number of simple and inexpensive tests" for the presence of tributyltin (TBT).

Dioctyltin and tributyltin detection at trace levels in water and beverages by capillary gas chromatography with flame photometric detection. Jiang, G. B., Xu, F. Z., Zhang, F. J. Res. Center Eco-Environ. Sci., Chinese Acad. Sci., 100085 Beijing, China . *Fresenius' J. Anal. Chem.*, 1999, **363**(3), 256.

Abstract: A simple chromatographic procedure has been developed for the sensitive determination of dioctyltin and tributyltin compounds in water and beverages.

Who would undertake these tests? Under what legal framework would regulations be established to exclude vessels treated with TBT from the marina?

A protocol will be developed and be incorporated in the EMS. The test is a presumptive test only and will be undertaken by the Marina Manager or his delegate with view to determining if a boat has been recently treated with TBT antifouling paint. Boats with TBT coatings will be allowed access to the marina to fuel and provision, for a limited

time. An outside mooring will be provided. All boats will be afforded refuge within the marina in the event of an emergency.

While it is acknowledged that the provision of a sewage pump out facility is an important part of the proposal and management of water quality, what consideration has been given to the difficulties in implementing pump out technology as outlined in The Discharge of Sewage from Vessels into the Marine Environment.

DPI has proposed the Regulations with a view to reduce impacts arising from on board storage and ultimate disposal of sewage. The initiative is largely ineffective due to the lack of pump out facilities, and consistent standards of installation. CCMD will make available the pump out facility and make marina users aware of its availability. The Marina Manager will work with marina users to achieve a high level of serviceability amongst installations.

Page 309. Fundamental to the management of water quality is the ability to control fertilizer use and indeed the water quality modeling was underpinned by CCMD's ability to limit nutrients from fertilisers.

Is there agreement with the Shire of Carnarvon that there is a workable framework under which controls will be implemented to limit fertilizer use? What is this framework? Would controls be transferable from title to title?

See the last question above *Vehicle Access*.

Notwithstanding the EPA Service Unit is of the view that such controls are likely to be difficult to administer in practice.

Noted.

Page 310. What consideration has been given to managing the risks associated with introduced marine species from cruising yachts which are likely to visit the marina?

The Australian Quarantine Inspection Service (AQIS) is responsible for the implementation of safeguards to minimise the risk of introduced marine species from cruising yachts. Accordingly, AQIS has developed a Ballast Water Decision Support System (DSS) to assist in minimising the risk of incursions of exotic species.

The Ballast Water DSS is used to determine the risk rating for each vessel entry into Australian ports. The risk rating will then determine the management strategy for that vessel. The risk rating is based on a number of factors including the likelihood of target species being translocated in the vessels hold, the previous ports at which ballast water

has been taken up and the likelihood of non-target species being translocated, and vessel specifications which may influence translocation via ballast water.

As part of the DSS process, all ships entering Australian waters are required to submit an AQIS Quarantine Pre-Arrival report for Vessels (Pratique) Form 12-48 hours before arrival. The data from these forms will be used as input to the DSS for determination of risk rating for the vessel. AQIS will then be in contact with the Ship's Master with regard to treatment options if treatment is deemed necessary.

The Ballast Water DSS enables vessels intending to visit Australia to lodge information about their ballast water while still at the last port of call or some time prior to arrival in Australia. The time of lodgement should be as early as possible to allow sufficient time to carry out treatment if required.

AQIS officers inspect the vessel and its records on arrival at the first Australian port.

Sediment, water and marine organisms associated with vessels, and marine fouling on the hull of vessels are likely to be of as much significance as ballast water as a potential risk factor for introduction of exotic species.

The Ballast Water DSS at present does not generally apply to vessels moving between Australian ports, but is intended to do so in the future. Similarly, at present, there are no mandatory requirements on hull fouling by AQIS. However this is an area of concern and these are likely to be requirements in the future. Best practice would involve some form of ballast water management if travelling between Australian ports and the recent implementation of procedures to minimise hull fouling.

4.1 Maintenance Dredging

Page 178 - Although it is noted that CCMD expect the need for maintenance dredging will be minimal, some maintenance dredging may be required following cyclone events. Clarification is required as to how this issue will be addressed, particularly in the time following the 5 year period during which CCMD must have control over various elements of its proposal. An outline of long term responsibilities for maintenance dredging is required. CCMD should either consider providing a clear description of any maintenance dredging or a commitment to the preparation of a maintenance dredging management plan.

CCMD is preparing a Waterways Management Maintenance Plan that provides cost projections for maintenance dredging. Following CCMD's period of responsibility the Waterways Manager will assume responsibility for ongoing implementation of the plan. Funding for these works will be derived from rates levied on owners of land as described in Appendix 1.

4.2 Groundwater

Page 316. In regard to the potential impacts of construction activities on groundwater, the responses state “The affects will however, be short lived and only occur during marina construction”. Please provide more information on the anticipated spatial and temporal extents of the biological effects of groundwater draw down during construction.

Please refer to the second question under “*Construction Issues*”

5. SOCIAL ISSUES

5.1 General

Page 323. While it is important to be advised that issues associated with safety at the existing airstrip are being considered by CCMD, the commitment to relocate the airstrip may constitute a new proposal possibly requiring consideration by the EPA.

If a new airstrip is to be an element of the current proposal it will be necessary to give attention to issues related to its location, environmental impacts and management. Please clarify this matter.

In relation to the proposed upgrading of the Cardabia airstrip, the following points are relevant:

In relation to the recognised Cardabia airstrip:

- The site is the recognised Cardabia airstrip to the east of proposed CCR and is indicated (in part) in Figure 1 of Appendix 4;
- Works will include upgrading, realignment and extension of the existing earthen strip to meet CASA standards.

In relation to the 'existing' airstrip:

- The 'existing' airstrip which was built on Cardabia land without permission;
- It is not an accepted airstrip, and is not for public use;
- accordingly the 'existing' airstrip does not have a reporting officer;
- there is some question as to the culpability of Cardabia Station and the Bauyngu people should damage, injury or death result from operations of the airstrip;
- RFDS will not use this strip in case of emergency;
- Fuel is stored in small containers, unbanded and uncovered;
- There is no security;
- The existing Coral Bay airport is directly in line with the end of the runway.
- Notwithstanding the implementation of the CCR, Cardabia Station will not allow this airstrip to continue operating.

The upgrading will occur on Cardabia land and will be the subject of a separate referral by the Biungu Aboriginal Corporation. Matters relating to noise, storage of fuel and additional clearing to allow for the reconstruction will be addressed.

DPI are looking at the construction of a sealed strip 11km from CCR. In the event that this proceeds, this will be the subject of a separate referral to the EPA.

5.2 Visual Amenity

On Page 327 of the Responses it is stated that "...all residential and commercial elements of the development will be largely shielded from the beach by the existing primary and secondary dunes retained. Accordingly some loss of amenity is acknowledged." Have indicative cross-section landscape/layout plans been prepared or any visual impact assessment undertaken with which to determine the general visibility of the proposal from the Marine Park?

Matters relating to visual amenity of both the CCR and Services Area are discussed in response 3.3.3.3. For the resort, detailed landscaping guidelines can be found in the Structure Plan Report (Koltasz Smith 2000).

No indicative cross section landscape/layout plans have been prepared. The marina breakwaters and upper story/roof of three story buildings will be visible from the Ningaloo Marine Park. Being located behind the retained primary and secondary dune system, CCR will not be as visible from the Ningaloo Marine Park as the Coral Bay settlement, which offers no such screening.

Please clarify "A visual barrier will be constructed across swale at the northern extent of the services area..."

Figure 4 in Appendix 4 presents an indicative services area layout plan. The figure also indicated contours. To in part manage visual amenity and light over-spill issues, services are proposed to be located in the interdunal swale. Visitors and residents travelling in a general southerly direction down the Coral Bay Road will view the services area. The statement refers to CCMD's intention to bridge the relevant area between the two adjacent crests with a view to screening this area and limiting any hazards night time lighting may have on traffic. The bund will be rehabilitated using local genotypes, and access road will be curved so passing traffic does not have direct line of sight.

5.3 Risk Assessment

The risk assessment does not address risks associated with key environmental issues such as:

- *Risk of fuel spills and associated impacts in the Ningaloo Marine Park;*
- *Risk to marine fauna from increased visitation; and*
- *Risk to fauna utilizing foreshore areas.*

The response to submission 2.1.2 in volume I of the Response to Submissions refer.

Det Norske Veritas (DNV) were engaged by CCMD to undertake a Qualitative Risk Assessment of the proposed CCR to determine the level of risk to human life and the

environment. The full assessment is presented in Appendix 2 of Volume II of the Response to Submissions.

Public risk and safety was assessed using the Australian/New Zealand Standard AS/NZS 4360: 1999 “Risk Management”.

The hazardous events associated with the proposed CCR facilities were identified and then ranked according to the risk to human life, and environment separately. The significant environmental hazards identified by the risk assessment are:

- € Cyclone damage to maritime;
- € Ground & water pollution due to landfill;
- € Environmental impact due to sewage; and
- € Storm surge (ocean flooding).

And relate to the potential for broader and significant risk to the Ningaloo Reef or its supporting ecological processes.

Impacts on individual animals or groups of animals was considered during the identification of environmental hazards however a threshold level of concern was not reached as:

- € Risk of hydrocarbon spills will be reduced relative to existing practices at the Coral Bay settlement, specifically fuelling over the beach using small containers;
- € The lack of any reports relating to boat strikes on turtle, whale shark or humpback whales in the area; and
- € No recorded reports of harm to animals using the foreshore areas.

APPENDICES

APPENDIX 1

**RULES OF THE ASSOCIATION
CORAL COAST RESORT COMMUNITY
ASSOCIATION (INC)**

APPENDIX 1

RULES OF ASSOCIATION

CORAL COAST RESORT COMMUNITY ASSOCIATION (INC)

1. NAME

The name of the association shall be the “CORAL COAST RESORT COMMUNITY ASSOCIATION INC” (“the Association”).

2. OBJECTS

The objects of the Association shall be as follows:

- (a) to implement any above normal maintenance of the facilities of the Coral Coast Resort set out in the Scheme Area of the Shire of Carnarvon Town Planning Scheme No. 11 – with the construction standards referred to in TPS.11;
- (b) to provide above normal maintenance of the town site in accordance with the construction standards;
- (c) to maintain the breakwaters and revetment walls in accordance with the construction standards;
- (d) to maintain the water depth in the marina and in the entrance channel against the effects of siltation and in accordance with the construction standards;
- (e) to monitor and maintain marina water quality and to clean the marina waterways, in accordance with the construction standards;
- (f) to maintain and administer an emergency fund for repairs due to extraordinary cyclone damage, in accordance with the construction standards;
- (g) to manage and maintain the airport in accordance with the construction standards;

- (h) to provide the agreed annual contribution for environmental improvements for Ningaloo Marine Park and Cape Range National Park;
- (i) to apply the Design Guidelines prescribing standards and requirements for development within the Scheme Area of TPS.11 in addition to the requirements of the construction standards and the monitoring and management plans referred to in TPS.11;
- (j) to administer the maintenance fund established under the Rules of the Association;
- (k) to collect contributions to the maintenance fund from owners of residential, tourist and commercial land and buildings within the Scheme Area of TPS.11; and
- (l) to control mooring rights in the marina.

3. POWERS

The Association shall have power to do all such things as it or its members may deem to be necessary, incidental or conducive to the attainment of the above objects, including without limiting the generality of the foregoing and the provisions of section 13 of the Act;

- (a) the power to act as Trustee of any money or property vested in it for any purpose consistent with the objects set out in these Rules;
- (b) the power to grant any interest or estate in land of which it is the registered proprietor, stands possessed or otherwise acts as Trustee, for purposes consistent with the objects set out in these Rules;
- (c) the power to take appropriate legal action against any member or other person who may be contravening the obligation to pay any moneys as and by way of contributions, membership levy, costs, interest or otherwise towards the implementation and maintenance of

the objectives of the Association and other obligations under the provisions of TPS.11.

4. OFFICERS AND DUTIES OF OFFICERS

4.1 There shall be the following officers of the Association:

PRESIDENT

Who shall be entitled to preside at all meetings of the Association and be an ex officio member of all committees and subcommittees of the Association;

VICE PRESIDENT

Who shall act at all meetings in the absence of the President;

SECRETARY

Whose duties shall include:

- (a) the keeping of a true record of all proceedings of all General Meetings and such other meetings of the Association as may be directed from time to time by the Executive Committee of the Association; and
- (b) the keeping of and maintaining of a register of the members in accordance with section 27 of the Act at the Shire of Carnarvon by the Secretary;
- (c) causing the name of a person who dies or ceases to be a member of the Association to be deleted from the register of members referred to in the proceedings sub-paragraph;
- (d) the co-ordination of the correspondence of the Association;
- (e) ensuring that the Association complies at all times with the provisions of the Act;

- (f) performing such other duties as may be imposed by the Association on the Secretary.

TREASURER

Whose duties shall include:

- (a) the responsibility for receiving all moneys paid to or received by him or her on behalf of the Association together with the obligation to issue receipts for those moneys in the name of the Association;
- (b) the payment of all moneys referred to in paragraph (a) into such account or accounts of the Association as the Executive Committee may from time to time direct;
- (c) making payments from the Funds of the Association with the authority of a General Meeting or of the Executive Committee and in so doing to ensure that all cheques are signed by two Executive Committee members;
- (d) complying on behalf of the Association with sections 25 and 26 of the Act in respect of the accounting records of the Association;
- (e) to submit to the Executive Committee a report, balance sheet or financial statement in accordance with any direction of the President;
- (f) having custody of all securities, books and documents of a financial nature and accounting records of the Association, including those referred to in paragraphs (d) and (e); and
- (g) performing such other duties as are imposed on the Treasurer by these Rules or as are otherwise specified by the Executive Committee from time to time.

COMMITTEE MEMBERS

Who shall be three members of the Association elected in accordance with sub-rule 4.2 of these Rules and such other members as may be co-opted from time to time by the Executive Committee.

- 4.2 The officers shall be elected at each Annual General Meeting by the members present at the meeting or by proxy.

5. EXECUTIVE COMMITTEE

- 5.1 The officers of the Association together with persons nominated by each of the Council of the Shire of Carnarvon and Coral Coast Marina Development Pty. Ltd. from time to time, shall constitute the Executive Committee.
- 5.2 Subject to these Rules the Executive Committee shall be responsible for carrying out the objects of the Association and the Executive Committee shall have full power to carry out its decisions without reference to General Meetings of the Association.
- 5.3 The Executive Committee shall appoint a General Manager who shall be responsible for the day to day management of the business of the Association.
- 5.4 The powers of the Executive Committee shall include the following:
- (a) To make any by-laws as may be necessary for the management of the Association and the carrying out of the objects in these Rules provided that no by-law shall be made which is inconsistent with these Rules;

- (b) Fill any vacancy in the office bearers howsoever occurring or elect any person to the Executive Committee until the next Annual General Meeting of the Association;
- (c) Appoint or create such subcommittees or other organisations which may be comprised of members of the Executive Committee, the Association or any other persons and delegate such of its powers as it deems necessary and expedient to such subcommittees and organisations to carry out all or any part of the objects of the Association or for any purpose or purposes incidental thereto; and
- (d) To give directions to the General Manager;
- (e) To prepare budgets for the operation of the Association and the implementation of the Objectives for each ensuing year.
- (f) Construe these Rules for all purposes, such construction being final unless rescinded at a General Meeting of the Association in which event the resolution of the General Meeting shall apply.

5.5 The representatives of the Executive Committee nominated by the Council of the Shire of Carnarvon and Coral Coast Marina Development Pty. Ltd. shall have the power to require the delay or suspension of the implementation of any resolution of the Executive Committee or of the Association for the expenditure of any funds received, collected or held for the purpose of the implementation of the Objectives of the Association pending the referral of the item to the Shire of Carnarvon for consideration. Where such representatives make such a requirement the Association shall not act upon the resolution nor expend funds as proposed in the

resolution until the matter has been considered by the Council of the Shire of Carnarvon, and that Council has approved the expenditure.

- 5.6 If a resolution of the Executive Committee or any other proposal to expend funds of the Association is referred to the Shire of Carnarvon pursuant to the provisions of sub-rule 5.5 and if the Council of the Shire of Carnarvon resolves that the expenditure should not be made then the Association shall not expend the funds as resolved or as proposed and shall only expend funds in connection with that proposal to the extent and in the manner directed by the Council of the Shire of Carnarvon.
- 5.7 A casual vacancy occurs in the office of an Executive Committee member and that office becomes vacant if the Executive Committee member:
- (a) dies;
 - (b) resigns by notice in writing delivered to the President or if the Executive Committee member is the President, to the Vice President;
 - (c) is convicted of an offence under the Act;
 - (d) is permanently incapacitated by mental or physical ill health;
 - (e) is absent for more than -
 - (i) three (3) consecutive Executive Committee meetings;or
 - (ii) three (3) Executive Committee meetings in the same financial year, of which he or she has received notice without tendering an apology to the person presiding at each of those Executive Committee meetings; or
 - (iii) if he or she ceases to be a member of the Association.

- 5.8 The Executive Committee shall meet together for the dispatch of business not less than twice in each calendar month and the President may at any time convene a meeting of the Executive Committee.
- 5.8.1 Each Executive Committee member has a deliberative vote (other than the vote of the nominee of the Council of the Shire of Carnarvon as provided for in this clause).
- 5.8.2 Any question arising at an Executive Committee meeting shall be decided by a majority of votes, but if there is an equality of votes, the person presiding at the Executive Committee meeting shall have a casting vote in addition to his or her deliberative vote.
- 5.8.3 At an Executive Committee meeting three (3) or not less than half the total number of members of the Executive Committee, whichever ever is the greater constitute a quorum other than where the Executive Committee is to consider resolutions of the kind contemplated in sub-clause 5.5 above, in which case the presence of the nominee of the Council of the Shire of Carnarvon is necessary for there to be a quorum.
- 5.8.4 Subject to these Rules, the procedure and order of business to be followed at an Executive Committee meeting shall be determined by the Executive Committee members present at such meeting.
- 5.8.5 An executive Committee member having any direct or indirect pecuniary interest referred to in section 21 or 22 of the Act shall comply with those sections.

6. MEETINGS

- 6.1 General Meetings of the Association shall be meetings at which all members of the Association are entitled to attend and vote either in person or by proxy.
- 6.2 General Meetings shall be either Annual General Meetings or Special General Meetings.
- 6.3 An agenda for the business to be conducted at General Meetings with a written notice specifying the time, date and place of the meeting shall be sent by post or hand delivered to each and every member of the Association not later than fourteen (14) days prior to the date of the meeting. A General Meeting may by a majority resolution resolve to allow other business to be added to the agenda for that meeting.
- 6.4 The Annual General Meeting shall be held as soon as practicable after the thirtieth day of June in each year and in any event it shall be held prior to the first day of September in the same year at such time and such place as the Executive Committee appoints.
- 6.5 Special General Meetings may be called at any time by the Executive Committee and shall be called by the Executive Committee upon the written requisition handed to the Secretary of not less than 25 members of the Association. All requests for Special General Meetings must specify the business for which the meeting is to be held.

- 6.6 Every motion put to a meeting shall unless unanimously decided be decided in the first instance by a show of hands.
- 6.7 A poll on any question may be demanded by the mover and seconder of the motion and shall be taken in such manner as the President or presiding officer may direct and its result shall be deemed to be the resolution of the meeting on that question.
- 6.8 Upon any question being put at a General Meeting of the Association members shall be entitled to vote as follows:
- 6.8.1 Where a member is a member for part of the year, then that person's membership fees shall be that proportion of the fees which would have been payable by the member for the whole of the year which equals the proportion of the year in which that person is a member.
- 6.8.2 Subject to the next succeeding two paragraphs all votes shall be given by such members as are nominated by the owners of a lot to attend and cast the votes in respect of that lot.
- 6.8.3 A person nominated to cast votes by the owners of a lot may vote by proxy.
- 6.8.4 A person nominated as a proxy shall if required by the presiding officer of the meeting produce written evidence signed or sealed by the relevant principal which specifies the name of the proxy, the purpose of the proxy, and the date or dates of the meetings at which the proxy is authorised to vote on behalf of the principal.
- 6.8.5 Subject to sub-rule 6.8.4 motions shall be carried by a simple majority of votes cast in the affirmative.

6.9.1 No item of business shall be transacted at any General or Executive Committee Meeting unless a quorum of members is present during the time when the meeting is considering that item.

6.9.2 A quorum shall be:

- (a) For General Meetings called under Rule 12 seventy-five per centum (75%) of the total number of members or the nearest integer equal to seventy-five percent;
- (b) For all other General Meetings, fifty percent (50%) of the total number of members or the nearest integer to fifty percent; and
- (c) For Executive Committee Meetings, three (3) or not less than half the total number of members of the Executive Committee, whichever is the greater and consisting of at least one representative for the Shire of Carnarvon and one for Coral Coast Marina Development Pty. Ltd.

6.10 If within one hour after the appointed time for the commencement of a General Meeting a quorum is not present, the meeting shall be dissolved and stand adjourned to a date, time and place in the week following the week in which the adjourned meeting was held and if at the reconvened meeting a quorum is not present within one hour after the time appointed for the commencement of that meeting, the Meeting shall be dissolved.

6.11 At any meeting of the Association a declaration by the President that a resolution has been carried, or carried unanimously, or carried by a particular majority, or lost, and an entry to that effect in the minute

book of the Association, is evidence of the fact, without proof of the number or proportion of the votes recorded in favour of or against that resolution.

7. MEMBERSHIP

7.1.1 Subject to the qualifications set out in sub-rule 7.2 membership of the association shall be open to every person who is the registered proprietor of an estate in fee simple in possession in any lot or of a strata lot within the Scheme Area or any person who is beneficially entitled to become the registered proprietor of such land.

7.1.2 Where the person entitled to membership is a corporation, the member shall be an office bearer or share holder nominated by that Corporation and where a lot is owned by more than one natural person and/or a corporation together, such owners shall nominate a single person to be the member of the association to vote on behalf of all owners of a particular lot.

7.2 Any of the persons described in sub-rule 7.1 shall apply in writing to the Executive Committee for membership of the Association and upon receipt of that application by the Executive Committee and subject to the payment of such membership fees or levies payable by the applicant as are determined by the Executive Committee pursuant to these Rules the applicant shall be a member of the Association.

7.3 A member who has been refused membership may appeal to a general meeting of the Association and upon service of a written notice from the aggrieved party requiring the same the Secretary shall call a Special General Meeting of the Association to hear the

appeal.

7.4 A member shall cease to be a member and to enjoy all rights of membership including any right to enter upon or use the waterways or moorings or any facilities of the Coral Coast Resort to permit, allow or authorise any other person to do likewise if either of the following occurs:

- (a) The membership fees or levies and charges payable by that member as determined by the Executive Committee have been due and payable but unpaid for a period of one month following the date specified by the Executive Committee as the date on which such fees or levies are due and payable and one months written notice of cessation of membership is given to the member by the secretary; or
- (b) The member ceases to qualify to be a member in accordance with the provisions of these Rules.

7.5 A member who is disqualified by virtue of paragraph 7.4(a) may immediately reapply for membership and upon receipt of his application and the outstanding fees shall be re-admitted to membership.

8. MEMBERSHIP FEES

8.1 The membership fees payable by each member in a particular year shall be determined by dividing such amount as the Executive Committee considers necessary to ensure that the Association may function effectively to carry out its objects in accordance with these Rules (other than provisions for 11 maintenance of the Waterways as described in rule 9) by the total number of people as determined by

the Executive Committee who will be members of the association in that year.

8.2 Additionally, members shall be required to pay an annual charge or levy in an amount determined having regard to the provisions of rule 9.

8.3 Membership fees shall be due and payable at such places on such date or dates as are specified by the Executive Committee.

9. MAINTENANCE OF CORAL COAST RESORT

9.1 Responsibility of the Cost of Maintenance

Without affecting the generality of any of the preceding rules, a member has the responsibility to contribute towards the cost (including administration costs) of implementing the Objects of the Association and hereby undertakes so to do.

9.2 Time for Payment of Contributions

Any contribution to the cost of implementing the objects of the Association or any membership fee or levy on members imposed for the purpose of paying the costs of the said implementation shall be paid within 7 days of the Secretary of the Association making demand for the same by posting a demand to the address of the member's Lot in the scheme area or to the member's last known place of address. Interest at the rate applied from time to time by the Commonwealth Trading Bank on overdrafts of a comparable amount shall be payable by any member whose contribution is not paid within the 7 days notice period and such interest may be

claimed and recovered by the Association from the date the 7 days notice expires.

9.3 **Recovery of Contributions**

The Association may take action in a Civil Court of competent jurisdiction to recover from any owner within the scheme area;

- (a) Any membership fee or levy on members imposed for the purpose of implementing the cost (including administration costs) of the objects of the Association;
- (b) Any contribution to the cost (including administration costs) of the implementation of the objects of the Association which the Association has demanded of an owner who is not a member for the time being of the Association;
- (c) Any interest payable on any overdue contribution;
- (d) The costs of recovering the funds referred to in this sub-rule;

9.4 **Trust Account**

The Association shall maintain the trust account established in its name at a branch of theBank within the municipal district of the Shire of Carnarvon (“the Trust Account”) holding the Maintenance Fund in such account as trustee for the Shire of Carnarvon, for the purpose of maintaining Coral Coast Resort and shall use such funds in the manner provided for herein.

9.5 **Imposition of Levies**

The Association shall impose a levy or charge on all owners within the Scheme Area to ensure that funds for adequate maintenance of the Coral Coast Resort and for administrative expenses are obtained from members and non-member owners of lots within the Scheme

Area on an annual basis. The Association may determine levies or charges at different rates depending on whether or not the relevant owner is a member or a non-member, provided the total of the monies levied will meet all likely expenditure associated with the lawful commitments of the Association regarding maintenance of the Coral Coast Resort.

- 9.6 The Association shall pay all charges and levies it obtains pursuant to rule 9.2 into the Trust Account and such monies shall be regarded as forming part of the moneys held in trust for the Shire of Carnarvon.

10. MOORINGS

10.1 Subject to the approval of the Department where required by law and subject to any By-Laws of its owners to the manner of establishment, the Association may establish moorings adjacent to or within the mooring envelope of any Waterway fronting a lot within the Scheme Area.

10.2 The Association shall have the power to grant rights to use the moorings on such terms and at such cost as the Executive Committee shall determine PROVIDED THAT members shall have priority to obtain such rights over non-member owners, notwithstanding that a mooring may be established in a mooring envelope adjacent to the lot of a non-member owner.

11. COMMON SEAL

The Executive Committee shall provide a Common Seal for the purposes of the Association which shall at all times be kept in the custody of the

Secretary and shall only be used by authority of a resolution of the Executive Committee or a General Meeting of the Association and when so used shall be affixed in the presence of any two of the President, Secretary, Vice President or Treasurer who shall sign and countersign respectively the affixation of the Seal.

12. ALTERATION OF CONSTITUTION

12.1 The Constitution shall not be rescinded, altered, added to or amended except by:

- (a) special resolution passed at a General Meeting in accordance with Sections 17 and 24 of the Associations Incorporation Act 1987; and
- (b) with the consent of the Shire of Carnarvon by way of a resolution of its Council.

12.2 Any member so wishing to move for a rescission, alteration or addition to any provision of the Constitution shall give at least twenty-eight (28) days' notice thereof in writing to the Secretary prior to the holding of a General Meeting at which the motion for rescission, alteration or addition is to be considered. Such notice shall be included in the agenda of the relevant meeting, and members shall also be advised that such a resolution is a special resolution.

12.3 The Secretary upon receipt of such notice shall forward a copy thereof to the Shire of Carnarvon not less than twenty-one (21) days prior to the holding of the General Meeting at which the motion is to be considered.

12.4 No rescission, alteration or addition to these Rules shall be deemed carried unless seventy-five per centum (75%) of the members present and voting either in person or by proxy at the meeting considering the motion shall vote in its favour.

12.5 Upon the passing of any such motion the Secretary shall give notice thereof to the Shire of Carnarvon.

13. PROFITS

13.1 The Association is to be maintained for the Objects referred to and it is not to be for the purposes of making a profit divisible amongst its members or any of them or in support of any object other than the objects above mentioned or such other objects as may be agreed upon by the members in the manner herein provided for changing the Constitution.

13.2 Nothing herein shall prevent the payment in good faith of remuneration to any officer or employee of the Association or to any member or any other person in return for any services actually rendered or value given to the Association, nor prevent the payment of interest at a lawful rate and determined by the Executive Committee on money borrowed from any member of the Association or other person or bodies.

14. DISSOLUTION OF THE ASSOCIATION

14.1.1 On application made in writing to the Executive Committee by not less than seventy-five per centum (75%) of the membership of the Association signifying their desire that the Association should be dissolved a Special General Meeting shall be called to consider the

question.

14.1.2 The notice of dissolution shall specify the reason why the motion is to be moved and shall be posted or delivered to the Chief Executive Officer of the Shire of Carnarvon not less than forty-two (42) days before the day fixed for the meeting.

14.1.3 The Association shall not be dissolved unless the Council of the Shire of Carnarvon has given its consent thereto.

14.2 In the event of dissolution of the Association, the Shire of Carnarvon shall undertake the responsibility for the care, control and management of the Coral Coast Resort under TPS.11.

15. DISTRIBUTION OF SURPLUS PROPERTY ON WINDING UP OF ASSOCIATION

If on the winding up of the Association, any property of the Association remains after satisfaction of the debts and liabilities of the Association and the costs, charges and expenses of that winding up, that property shall be distributed:

- (a) to another Incorporated association having objects similar to those of the Association; or
- (b) for charitable purposes,

which incorporated association or purposes, as the case requires shall be determined by resolution of the members when authorising and directing the Committee under section 33(3) of the Act to prepare a distribution plan for the distribution of the surplus property of the Association.

16. INSPECT OF RECORDS, ETC. OF THE ASSOCIATION

A member may at any reasonable time inspect without charge the books, documents, records and securities of the Association.

17. AUDITOR

17.1 The Association at its Annual General Meeting or otherwise at a General Meeting shall appoint an Auditor to audit its accounts.

17.2 The Auditor shall submit a written report to the Annual General Meeting of the Association.

17.3 The Auditor shall be a qualified accountant being a member of an Association of Australian Accountants or of a secretarial institute.

18. ARBITRATION

Should any dispute or difference arise between the Members of the Association which cannot be resolved by the Executive Committee whether as to the interpretation of these Rules or otherwise, then the dispute or difference shall be settled by Arbitration and the President for the time being of the Law Society of Western Australia or his nominee shall act as arbitrator. Subject to the foregoing the provisions of the Arbitration Act, 1985 shall govern the procedure of the Arbitration.

19. INTERPRETATION

In these Rules the term “member” shall include in the case of corporate bodies a person who is appointed by that corporate body to be its representative for the purpose of these Rules and cognate expressions shall have corresponding meanings PROVIDED that at any time no corporate body may be represented by more than one such person. Additionally, where rights are conferred on members pursuant to the terms of these Rules, a member shall be deemed to include the members of the family of

the member, and any servant, agent, invitee or licensee of the member.

Terms not otherwise defined in these Rules shall have the meaning or effect ascribed to them in the Associations incorporation Act 1987.

“Department” means the Department for Planning and Infrastructure or such other department instrumentality or authority of the State of Western Australia from time to time having responsibility for the approval of the design of artificial Waterways, placement and maintenance of navigational aids and policy of Waterways;

“mooring” means any jetty, pontoon, anchor or other method of tying up or restraining a vessel within the water or against or near any wall or bank of the Waterway;

“Scheme Area” means that part of the municipal district of the Shire of Carnarvon defined as being subject to the provisions of TPS.11 in the Town Planning Scheme Text and Maps;

“Trust Account” means the account established pursuant to sub-rule 9.1 for holding the Maintenance Fund for the Coral Coast Resort on behalf of the Shire of Carnarvon;

“Waterway” means any artificial channel, lake, harbour, or embayment within the Scheme Area which is used or intended for use for navigational, ornamental and recreational purposes, or for any of those purposes. The term includes any access channel or connecting channel or sea wall and any addition to or alteration of a Waterway within the meaning of this definition and any system of Waterways within the meaning of this definition in any development of the Scheme Area. The term also includes any other waterway designed for other purposes such as drainage, but which is capable of use as a canal as herein defined. The term more specifically includes the areas depicted in the Scheme Map forming part of TPS.11 as the Coral Coast Resort Marina.

APPENDIX 2

ELEMENTS OF THE PROPOSAL

APPENDIX 2

ELEMENTS OF THE PROPOSAL

Draft summary of key proposal characteristics

Element	Description
Phase 1	The ultimate Phase 1 Coral Coast Resort proposal as depicted by CCMD in its PER (ATA 2000) consists of Stage 1 and additional stage of development.
Stage 1 of Phase 1	Elements of the proposal to be completed by CCMD.
Breakwaters	Two (2) armoured limestone breakwaters designed to withstand Category 5 cyclones. Breakwaters extending approximately 200m from the shoreline with a footprint of approximately 2.5 ha currently in the Ningaloo Marine Park (Recreation Zone) in Bateman Bay.
Inland marina and beaches See Figure 3 in ATA (2000).	Approximately 50 ha with depth ranging between 1.5 and 4.5 m. 250 m entrance channel dredged to approximately 5 m depth. Public swimming beaches within the marina protected by shark nets. Boating facilities including a double lane boat launching facility, dedicated boat fuelling and sullage pump out facilities and a total of about 100 boat pens for public and commercial use Limestone base for the establishment of a diving/snorkelling reef. Spill response equipment. Service wharf and refuelling jetty.
Preparation of the land elements of the site for development. Note that all elements of the ultimate Phase 1 proposal may not be developed by CCMD in the long term.	A total of approximately 86 ha. Raised ground level to approximately 6 m AHD on the ocean side of the marina and approximately 3.6 m AHD on the landward side of the marina. Provision of adequate power, reticulated natural gas, water, sewerage, stormwater management and roads for the ultimate Phase 1 development as described in Section 2 of the PER or the Structure Plan agreed by the Minister for Planning and Infrastructure.
Caravan and Chalet Park	Approximately 4 ha 100 bays with supporting camping and coach camping facilities. 20 chalets/park cabins.
Backpackers Hostel	Approximately 1 ha 60 beds
Permanent residential	Approximately 12.6 ha 200 serviced freehold lots, each ranging between 420m ² and 700m ² in size for private sale. Up to 100 private boat pens for residents.
Marina Village and Resort	Approximately 4 ha Marina Village commercial buildings. Environment and interpretive centre, including contribution toward fit out. Initially 60, two bedroom strata title serviced resort apartments (Stage 1). Up to an additional 60 units constructed as demand requires to complete the first apartment complex as part of the additional stages.

Element	Description
Access and internal arterial roads, public parking	Approximately 20.7 ha Road access from existing Coral Bay road. Internal arterial roads and road reserves. 120 boat trailer parking bays, with secure boat-parking area
Water storage, cooling and use	Approximately 0.5 ha Reverse osmosis desalination plant. Water storage. Approximately 0.52 million kilolitres per annum.
Services Area	Approximately 62 ha of rural zoned land located 1.5 km east of Coral Bay to be developed for service utilities including: a wastewater treatment plant of 575 ML day ⁻¹ prescribed under Part V of the <i>Environmental Protection Act</i> ; a managed landfill site prescribed under Part V of the Environmental Protection Act; <10 MW gas-fired power station (not prescribed under Part V); and a light industrial area.
Emergency Services	CCMD will provide for volunteer-operated services including: Fire and emergency services; Medical centre; and Sea search and rescue. Initial basic equipment will be provided as part of the development costs.
Parks, minor open space and northern access reserves	Approximately 14.5 ha principally paved for low water use. Roads and dry river bed drainage swale.
Additional stages of Phase 1	The following elements may be developed as part of the ultimate Phase 1 Coral Coast Resort proposal. These elements may be developed by CCMD, or the previously prepared land (Stage 1) may be developed by third parties as demand requires.
Serviced apartments	Approximately 3.5 ha 130 two and three storey serviced resort apartments to form the second apartment complex.
Timeshare	Approximately 3.6 ha 100 timeshare units
Tourist villas and townhouses	Approximately 6.7 ha A combined total of 180 resort villas and townhouses
Staff Residential	Approximately 1.7 ha 40 managed freehold lots, each 420m ² in size.
Staff – group housing	Approximately 3.8 ha A combined total of 130 managed villa and duplex units.
Community centre	Approximately 1.6 ha
Auto, marine and coach services	Approximately 0.9 ha Service station and auto services site.

APPENDIX 3

COMMENTS ON STORMWATER DISCHARGE – EWING CONSULTING ENGINEERS



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FACSIMILE TRANSMISSION

COMPANY : ATA Environmental
ATTENTION : Helen Sivertsen **FAX NUMBER** : 9328 3588

C.C.

FROM : Greg Locke **OUR REF** : 989.1 **DATE** : 14 June 2002
Transmission of 4 Page(s) including this Sheet

Helen,

RE: COMMENTS ON RESPONSES TO CORAL COAST SUBMISSIONS

In regard to your queries of today we forward the following information and trust that it is sufficient to assist with formulating your responses.

Stormwater Discharge

- Section 5.2.5 of the September 2000 report by MP Rogers and Associates provided details of the expected groundwater and surface water responses which would occur immediately after periods of heavy rainfall such as cyclones. The modelling conducted as a result of those investigations was reported on Pages 51 - 56 of that document.
- Where stormwater runoff occurs overland away from the marina edges initial flows and low intensity flows will be absorbed in the sands, with high volumes flowing overland away from the Marina in the directions as shown on the attached figure.
- In periods of heavy rainfall such as cyclonic conditions the time of concentration of stormwater runoff will be very short. Little direct infiltration occurs with initial high intensity rainfall in the existing natural state. That is, the co-efficient of runoff is high under these circumstances; this is the case both in the natural state of the land and with buildings and paved areas. Rainfall on the marina will not contribute to the overland flow. Previous work (see attached) notes that development of the Coral Coast Resort will affect only about 10% of the total low lying area which was subject of inundation during the previous major storm event, Cyclone Elsie.

It is not intended to concentrate overflow stormwater but rather to allow it to disperse over as wide an area as possible to minimise the impact on the existing land.

G.H. LOCKE ES., MICE (AUST)
C.E. COOPERING AM (WA) NCE (AUST)

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- To my knowledge, advice has not been sought from the Water and Rivers Commission on hydrological implications associated with stormwater drainage. However, much work has been done on this aspect and is incorporated within the P.E.R. documents.
- The maintenance of the stormwater system in the short and long term will be undertaken by the Town Management Authority.
- The re-fuelling station to be incorporated within the development will be constructed such that storage and delivery of fuel is in accordance with Department of Minerals and Energy Regulations. These include automatic close-off, manual operation only nozzles. It is noted that this practice is much safer than the current practices available which involve loading fuel into and out of dinghys within the marine environment.

Construction of the re-fuelling facility will enable careful control of re-fuelling such that in the event of spillages contingency arrangements including containment booms, absorbing skimmers and the like can be deployed within the marina thus preventing any spillage external to the marina.

Yours faithfully

A handwritten signature in black ink, appearing to read "Greg Locke", is written over a light blue horizontal line.

GREG LOCKE
EWING CONSULTING ENGINEERS PTY LTD

Minimal quantities of runoff will be into the harbour waters where they will be inter-mixed and diluted with harbour waters before mixing and further dilution into the adjacent sea.

In major storm events (cyclones) some overflows may occur into the harbour but in these circumstances substantial dilution would have taken place prior to any of the waters entering the harbour. The majority of runoff will still be directed in-land away from the coast.

4.3 STORMWATER RUN-OFF STORAGE

Previous storm events have resulted in inundation of the lakes and low lying area east of the development for some time (see Fig.2). This area extends into the Mauds Townsite. Development of Coral Coast Resort will affect approximately 10% of this total low lying area, and no substantial alteration is proposed to the mainly dry lake within the Townsite. The 1:25000 scale Australian Survey Corps mapping of 1982 indicates that some 740 hectares of land is now available for flood water storage below R.L. 1.8m AHD. Although detailed level information is not available over all this low lying land if it is assumed that this full area is available for storage from R.L. 0.2m then a 10% reduction in area available for the storage would result in a rise of 0.18m under same storm event.

This is in practice a very conservative prediction as the land to be filled by Coral Coast Resort is in the high part of the lower area at the western extremity and the actual increase in flood level would be less than 180mm. The allowance of 500mm above cyclone Elsie level to R.L. 2.3m AHD is thus considered conservative and to include an adequate factor of safety against flooding in future storm events. The small increase in flood levels will have no significant impact on existing improvements at Cardabia Station.

Main access road levels will need to be raised to permit stormwater levels to equalise across the road. Some areas east of the Resort fall below sea level and following major storm events water is expected to lie for some time, particularly in the lake areas now mainly dry.

4.4 HYDROGEOLOGY

4.4.1 Surface Drainage

Approximately 45% of the Mauds Townsite is comprised of sand dunes. Rainfall onto this land form then infiltrates directly into the dunal soils with excess water collecting in localised low areas for eventual infiltration, evaporation or take-up by native vegetation.

APPENDIX 4

**CORAL COAST RESORT
SERVICES AREA
PRELIMINARY ENVIRONMENTAL ASSESSMENT
AND MANAGEMENT PLAN**

CORAL COAST MARINA DEVELOPMENT

**CORAL COAST RESORT
SERVICES AREA
PRELIMINARY ENVIRONMENTAL
ASSESSMENT AND MANAGEMENT
PLAN**

VERSION 2

OCTOBER 2002

REPORT NO: 2002/54

DISCLAIMER

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An internal quality review process has been applied to each project task undertaken by us. Each document is carefully reviewed by core members of the consultancy team and signed off at Director level prior to issue to the client. Draft documents are submitted to the client for comment and acceptance prior to final production.

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Report No: 2002/54

Checked by: Signed:

Name: Helen Sivertsen

Date: October 2002

Approved by: Signed:

Name: Noel Davies

Date: October 2002

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1. INTRODUCTION

1.1 Objectives

This report describes the utility facilities supporting the Coral Coast Resort, their potential environmental impacts and the proposed management of these impacts.

The Services Area Environmental Assessment and Management Plan is a preliminary document. It provides a general conceptual assessment of potential environmental impacts and proposes indicative management strategies. This document will be updated and finalised once the Coral Coast Resort Project has been approved in principal.

Following approval, the details of the landfill facility within the Services Area will be developed in order for the facility to be approved and licensed under Part V of the *Environmental Protection Act*. Likewise, for the wastewater treatment facilities, as when wastewater treatment plants exceed set criteria, they are also required to be licensed under the *Environmental Protection Act*. The power station, depending on fuel consumption, may require Works Approval and licensing.

The Environmental Management Program (EMP) for the whole project will include the details of the facilities in the Services Area.

1.2 The Proponent

Coral Coast Resort is proposed by Coral Coast Marina Developments Pty Ltd (CCMD), a private company formed in October 1987 with the specific purpose of developing a resort at Mauds Landing.

The registered office of and initial point of contact for CCMD is:

Coral Coast Marina Development Pty Ltd
Suite 1, Poynton House
Cnr. Poynton Ave and Burgess Street
MIDLAND WA 6056

Point of Contact: Mr Alan Smith
Phone: (08) 9274 0711
Fax: (08) 9274 1665

1.3 Overview

The provision of utilities to Coral Coast Resort requires the establishment of a main Services Area. The site proposed is located approximately 2.1km south of the Resort boundary (Fig 1). The perimeter is approximately 1.0km from the Coral Bay settlement boundary and approximately 1.8km south east of the existing runway at the Coral Bay airstrip.

The main Services Area will comprise major utilities sites for:

- € Power Generation and Gas Supplies (gas fired diesel power generators, 3,900kVA, LPG and diesel storage).
- € Wastewater Treatment (720kL/d).
- € 'Industrial land' cell including maintenance workshops, kennels, cold and dry storage facilities for the Resort food, other goods and equipment.
- € Landfill with 25 years plus capacity.
- € Telecommunications infrastructure.

The Service Area has been sized to accommodate waste services and waste disposal requirements for the Resort and potentially for the existing Coral Bay settlement.

A water storage and reverse osmosis plant will be developed separately to the main Service Area and sited approximately 750m to the west of the Caravan and Chalet Park on the southern border of the resort boundary. The treatment plant will cater for 2025 people (250kL/d potable water).

1.4 Site Size

The Services Area comprises approximately 62 ha (inclusive of buffer screening) and is situated in an inter-dunal swale that is well screened from Coral Bay Rd. Access will be from the existing Coral Bay Road.

The entry road to the Services Area will also provide access to the waste disposal site which is proposed to be re-located from its present site (Fig 1) so as to reduce the risk of nutrient/leachate movement into Coral Bay.

The Water Storage and Reverse Osmosis Plant comprises approximately 100m x 45m. Access will be via a 400m service corridor leading off the track to the Old Jetty Carpark (Fig 1).

The location of the Service Area (including the Waste Disposal Site and Reverse Osmosis Plant) is the subject of discussion with the owners of Cardabia Station.

1.5 Ownership

It is proposed that the power, water, wastewater treatment and gas utilities be built, owned and operated by Brown and Root (Halliburton) - a single consortium well experienced in the provision and maintenance of the required service infrastructure.

CCMD acknowledges its responsibility in obtaining the Pastoral Lessee's agreement to the excision of land from the Cardabia Pastoral Lease, required for the Services Area. Discussions have commenced with the Manager of the Station and will be completed once approval is provided for the project to proceed.

1.6 Statutory Framework

In addition to meeting the requirements of the Environmental Protection Act 1986, CCMD in developing the Coral Coast Resort and Services Area is required to comply with, amongst others, any or all of a number of Acts of Parliament and Regulations at the State or Commonwealth level as listed below.

- € Aboriginal Heritage Act 1972;
- € Australian Heritage Commission Act;
- € Conservation and Land Management Act 1994;
- € Dangerous Goods (Transport Act) 1998;
- € Environment Protection and Biodiversity Conservation Act, 1999 (Commonwealth)
- € Environmental Protection Act 1986
- € Environmental Protection (Noise) Regulations 1997;
- € Explosive and Dangerous Goods Act 1994;
- € Fish Resources Management Act 1994;
- € Hazardous and Toxic Substances Regulations;
- € Health Act 1911 and Regulations;
- € Heritage of Western Australia Act 1990;
- € Local Government Act;
- € Mining Act 1978-1987 and Regulations;
- € Occupational Health, Safety and Welfare Act 1984-1987;
- € Soil and Land Conservation Act 1945-1982;
- € Waterways Conservation Act 1976;
- € Water and Rivers Commission Act 1995;
- € Western Australian Marine Act 1982; and
- € Wildlife Conservation Act 1950-1980.

2. EXISTING ENVIRONMENT

2.1 Climate

The climate of the coastal Gascoyne Region is semi-arid to arid, being characterised as having long hot summers and short temperate winters. The average annual maximum temperature is 27.1°C (Bureau of Meteorology website) with summer daytime temperatures ranging from low 20s to low 30s (May *et al.*, 1989). A description of average monthly weather data is presented in Table 1 below.

**TABLE 1
SUMMARY OF CLIMATIC INFORMATION**

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Max. temp. (°C) ⁽¹⁾	37.9	37.3	36.2	33.0	28.2	24.7	24.0	26.0	29.1	32.3	34.3	36.8	31.5
Min. temp. (°C) ⁽¹⁾	22.9	24.2	22.9	20.5	16.1	13.2	11.3	12.3	13.8	16.2	18.4	20.7	17.7
R'fall (mm) ⁽²⁾	16.7	31.4	28.8	11.5	43.1	45.9	26.4	13.5	1.6	2.7	1.2	1.8	221.6
Evap. (mm) ⁽¹⁾	387.5	310.8	310.0	234.0	165.0	117.0	133.3	150.0	234.0	306.0	342.0	375.0	3102.5

⁽¹⁾ Long term averaged data for Carnarvon Post Office. (Bureau of Meteorology, 2000, downloaded 06/10/00)

⁽²⁾ Rainfall figures from Cardabia Station averaged over a 70-year period, (Bureau of Meteorology, 2000, downloaded 11/09/00).

Since records have been kept at Cardabia Station which abuts the site, (1913 until present), the average recorded annual rainfall is 221mm. Rain is predominantly associated with cyclonic disturbances occurring during February and March. Consequently rain-events are irregular but sometimes intense, with a 40% variation on average from year to year (May *et al.* 1989). During the winter period, more regular but less intense rainfall occurs. The mean annual evaporation rate is high (1700-3000mm), generally exceeding precipitation throughout the year. Consequently there is no water surplus and no permanent streams originate in the area (DCE 1984).

Regionally, the synoptic wind patterns are dictated by the intensity and position of high-pressure systems that undergo seasonal latitudinal migration. During winter they are located in the more northerly latitudes (25°-30°S) generating a south-easterly or easterly airflow. During summer, the winds become more westerly or south-westerly as the high pressure cells move southward and a sub-monsoonal depression forms over the north of the continent.

In the region, storm winds of high intensity are associated with the passage of cyclones, thunderstorms and pressure gradient intensifications. The latter are more prevalent in winter when they can produce easterly gales of two to three days duration. Strong winds from cyclones and thunderstorms may occur in summer and their direction and strength is highly variable and unpredictable. In a local context the

prevailing winds result primarily from the diurnal sea/land breezes. Consequently the prevailing winds in the area are from the south (Department of Planning and Urban Development 1992) with brisk southerly sea breezes dominating on approximately 70% of afternoons (May *et al.* 1989).

2.2 Geology and Landforms

Figure 2 illustrates the topography and landforms surrounding the Services Area and Water Storage and Reverse Osmosis Plant Area.

2.2.1 Topography

Water Storage and Reverse Osmosis Plant Area

The Mauds Landing townsite consists primarily of high parabolic dunes behind the Point Maud coastline and low shoreline parallel beach ridges behind the Batemans Bay coast, terminating beyond the eastern site boundary at the seaward end of Pleistocene dunes. A large relict tidal flat exists behind the dunes extending eastward. The parabolic dune system within the western part of the site (behind Point Maud) reaches heights of up to 30m (Maud Hill) where the water storage and reverse osmosis plant will be located. The beach ridges lying parallel to the coastline occur at a maximum elevation of approximately 9m at their southern extent, but are more typically 4-6m AHD.

Services Area

The Services area site consists of longitudinal dunes lying in an approximately north-north-east to south-south-west direction. The dunes tend to be low and undulating with heights between approximately 10m and 20m AHD. Longitudinal, vegetated dunes ridges occur at about 300m intervals, with crests elevated about 7m above the swale. Soils in the swales are thin with calcarenite pavements being clearly evident.

2.2.2 Landforms

Water Storage and Reverse Osmosis Plant Area

The geomorphology at the Resort area, ie. Mauds Landing, is considered by Hesp (1986) to be on the boundary of a geomorphic subregion described as being dominated by Holocene parabolic dunes overlying Holocene relict tidal flats and Pleistocene coastal dunes, alluvial sediments, aeolian plains, dunes and coral terraces.

The predominant landform at Mauds Landing is a relict foredune plain to the seaward side of an extensive relict tidal flat or salt pan. When the sea level was higher than present the topographic low point between the Pleistocene and Holocene terrains formed the large tidal flat and associated mangrove system, with an entrance opening near Mauds Landing. Once the sea level fell this became supratidal and was probably

rapidly closed off by foredune formation along Mauds Landing beach. The original tidal entrance may be seen where arcuate, east-west trending dune ridges are present. Point Maud itself lies on a prominent foreland, dominated by vegetated parabolic dunes and one active parabolic dune. Maud Hill, where the water storage and reverse osmosis plant will be located, lies about 500m inland over the parabolic dunes. The dunes overlie relict tidal flats and the southern margin of the Mauds Landing relict foredune plain (Hesp 1986). The south-facing margin of Point Maud has a narrow fringe of foredunes that extend to the Point.

Services Area

The landform to which the proposed site belongs is described by Beard (1975) as *Sandplains* that are dominated by sedimentary deposits that have developed in a marine shelf environment. Sedimentary dunes overlay these basement rocks and comprise longitudinal dunes, trending north northeast, over limestone or calcarenite. The services area is dominated by longitudinal desert dunes and associated interdunal swales. The floors of the swales often have calcretised Pleistocene dunes cropping out. The logs from the installation of the groundwater monitoring bores show the presence of fine to medium grained sand, well sorted rounded to subrounded grains, quartz with calcareous cement (calcrete) with varying degrees of induration at depth (ATA Environmental 2001).

2.2.3 Geology

Water Storage and Reverse Osmosis Plant Area

At the Marina area which includes the Water Treatment area, the geology is mapped by Hocking *et al.* (1985) as comprising the Holocene units 'Ql' - Coastal Lacustrine Deposits and 'Qs'. Hocking *et al.* (1985) describes Unit 'Ql' as comprising calcareous and gypsiferous clays, silt and sand and evaporitic deposits (mainly gypsum and halite). Unit 'Ql' crops out in the southern and eastern sections of the Marina area that overlap onto the salt pan. Unit 'Qs' is described by Hocking *et al.* (1985) as comprising mostly calcareous sand that is variably quartzose in the form of coastal dunes, beaches and beach ridges. Unit 'Qs' in the Marina area is mapped as being present in the northern and western portions of the area.

Services Area

The geology cropping out at the Services area is mapped by Hocking *et al.* (1985) as comprising the aeolian sandstone Member 'Qbe' of the Bunderra Calcarenite. Hocking *et al.* (1985) describes 'Qbe' Member as a variably calcreted calcarenite of Pleistocene age and aeolian origin with calcrete soils and dune shapes locally preserved. It is also interpreted to be a highly permeable aquifer.

2.3 Surface Hydrology

Rainfall on western portion of the Marina/Water Storage and Reverse Osmosis area and Services Area infiltrates directly into the dune soil profile with accumulation in localised low areas where water is dispersed by infiltration, evaporation, or taken up and transpired by vegetation.

The balance of the Marina site east of the dunes is generally flat and low-lying and storm runoff drains to the southeast, generally towards the salt lake areas that form a large shallow basin. The capacity of this shallow basin and salt lake system is sufficiently large so that stormwater and runoff from major storm events is collected and stored before eventual dissipation by evaporation with some infiltration into the shallow unconfined groundwater aquifer. This area collects all surface runoff from Mauds Landing and its hinterland and has no oceanic outlet.

2.4 Groundwater

The hydrogeology of the area is determined by the nature of the shallow strata, coastal features, and the deep strata of the Carnarvon Basin (Allen 1987). There are two relevant aquifer levels, a shallow unconfined aquifer and a deep confined aquifer known as the Birdrong Sandstone Formation. Although a detailed hydrological study has never been undertaken in the site area, the Birdrong sandstone artesian aquifer is known to be located at a depth of approximately 800m (Rockwater, 1994; Woodward-Clyde, 1993).

Most of the shallow groundwater in the Mauds Landing-Coral Bay area is saline. Bores drilled to depths of 13-60m at distances up to 10km inland from Point Maud encountered water in the salinity range 10 000 to 14 000 mg/L total soluble salts (TSS). Salinities increase from east to west, and reach 35 000 mg/L at depth near the coast where a wedge of sea-salinity water underlies less saline water. There is also believed to be a shallow thin lens of fresher groundwater in the area, and an old well near Point Maud is reported to have been capable of supply 900L/day (Woodward-Clyde 1993).

The shallow aquifers receive recharge waters at infrequent intervals by direct infiltration of rainfall and run-off from hills and ranges, such as the Giralia Range located 27km inland from Point Maud. Apart from a small area west of Giralia Range and the shallowest water at Point Maud, all the unconfined groundwater in the area is saltier than 6000 mg/L TSS, indicating that saline groundwater is being diluted very slowly, if at all (Rockwater, 2000).

Beneath the Coral Bay/Mauds Landing area, shallow groundwater flows from east to west towards the sea. The flat topography, near sea level elevations, and shallow groundwater depths observed beneath the salt lake flats, indicate the water table is very flat and flow rates are likely to be extremely low.

The deeper, confined Birdrong aquifer extends throughout most of the Carnarvon Sedimentary Basin (Shark Bay to Onslow) and extends over approximately

77,000km² on-shore. This aquifer is the source for the town of Denham's water supply as well as for the salt mining operations at Lake MacLeod and Useless Loop (Department of Planning and Urban Development 1992; Woodward-Clyde 1993). The two caravan parks at the Coral Bay settlement each have a bore extracting from this aquifer. These bores provide brackish water (around 5000 mg/L TSS) at approximately 60°C with outflow rates varying from 1670 kL/day ('Bayview') and 2160 kL/day ('Peoples') (Department of Planning and Urban Development 1992; Woodward-Clyde 1993). The aquifer is considered to be a reliable water source (Woodward Clyde, 1993) and is widely utilised for stock bores throughout the region (Department of Planning and Urban Development 1992).

The depth to groundwater within the Services Area as determined when installing groundwater monitoring bores, is discussed in Section 5.2, Liquid and Solid Waste Disposal.

2.5 Vegetation and Fauna

2.5.1 Vegetation

The main vegetation types for the subject areas are shown in Figure 2. The Vegetation and Flora for the entire Resort site is described in detail in the Coral Coast Public Environmental Review Document (PER), (ATA Environmental 2000).

The Mauds Landing area is located within the Carnarvon Biogeographic Region that extends from Shark Bay northwards to Onslow (Thackway & Cresswell 1995).

Beard (1975) described the relevant section of the coastal dune subdistrict as shrub steppe on sandhills vegetated by various spinifex species including: *Triodia pungens*, *T. basedowii*, and *T. sp. aff. Augusta*, with occasional large shrubs of *Acacia coriacea*, *A. tetragonophylla*, and *Gyrostemon ramulosus* above a mixture of low spreading shrubs of about 1m with a spinifex understorey.

The vegetation of the dunal areas is relatively low in diversity as is typical of coastal areas having young sediments, with variations occurring mainly in terms of the proportion of the same predominant species.

The vegetation of the parabolic dunes around the Water Storage and Reverse Osmosis plant varies with the location on the dune (crests, slopes, swales), although the proportion of the dominant species is generally similar with variations occurring in the associated understorey species. This area is summarised as parabolic dunes with *Acacia coriacea ssp coriacea* dominated shrubland over *Eulalia aurea* dominated grassland and *Carpobrotus "septentrionalis"* dominated open herbland.

The vegetation of saline-flats often has numerous units, although they have relatively few species. Within the entire resort study area, there are several smaller areas that have been isolated from the main saline flats due to the encroachment of the parabolic dunes and the relict foredune plain. The saline flats are summarised as dominated by

Frankenia pauciflora ssp *pauciflora* / *Angianthus cunninghamii* / *Lawrencina viridigrisea*/*Halosarcia halocnemoides* ssp *tenuis* low shrubland over *Sporobolus virginicus*/*Carpobrotus "septentrionalis"* grassland/herbland.

From a local perspective, variations of vegetation types within the site are not considered significant. That is, there is no unique vegetation type within any one area of the dunes. The area of dunes in the study area is a relatively small portion of the system and consequently could be assessed as having moderate to low value.

The relict saline flats within the site are part of a series found along the coastline between Carnarvon and Onslow. The saline flats at Mauds Landing is one of three such features behind coastal dunes in the region and shows similar vegetation types adjoining Lake MacLeod approximately 60km south of the site.

Flora

The Flora and Vegetation Assessment (ecologia 1994) for the whole project area is given in Appendix 6 and Section 4.2 of the Public Environmental Review (ATA Environmental, 2000) This assessment considers only the vegetation of the Services Area. The full report on vegetation in the main Services Area is given in Appendix 14 of the PER (ATA Environmental, 2000) and based on a site survey undertaken on 20/8/00.

A search was made of the CALM Threatened (Declared Rare) Flora and Priority Species List and the Western Australian Herbarium Specimen databases within the area bounded by the coordinates 22° 30' - 23° 30' S and 113° 35' - 113° 55' E. No Declared Rare or Priority flora were recorded. The following Priority species have been previously recorded in the Region (Table 2).

TABLE 2
PRIORITY FLORA PREVIOUSLY RECORDED IN THE REGION

<i>Species/Taxon</i>	Cons. Status	Location	Flower. Period
<i>Abutilon</i> sp. Cape Range (AS George 1312)	2	Cape Range, Yardie Creek, Learmonth	Jul-Oct
<i>Abutilon</i> sp. Quobba (H. Demarz 3858)	2	Quobba, Cape Range, Minilya	Jul-Oct
<i>Acacia alexandri</i>	3	Cape Range Exmouth	Jun-Sep
<i>Acacia ryaniana</i>	2	Cape Cuvier, Quobba, Coral Bay	May-Oct
<i>Acacia startii</i>	3	Cape Range, Rough Range, Minilya	Jul-Aug
<i>Acanthocarpus rupestris</i>	2	Cape Range	May-Jun
<i>Brachychiton obtusilobus</i>	4	Cape Range	Aug-Sep
<i>Corcorus interstans</i> ms	3	Exmouth, Ningaloo Station, Barrow Is.	Apr-Oct
<i>Daviesia pleurophylla</i>	2	Cape Range	Sep-Oct
<i>Eremophila glabra</i> ssp. <i>psammophora</i>	2	Dirk Hartog Is., Coral Bay, Dorre Is.	Sep, Nov-Dec
<i>Eremophila occidentis</i> ms	2	Cape Range	-

<i>Species/Taxon</i>	Cons. Status	Location	Flower. Period
<i>Eremophila youngii</i> ssp. <i>lepidota</i> ms	4	S Cape Range, Roy Hill, N Mt. Vernon, Paraburdoo	Mar, Jun
<i>Grevillea calcicola</i>	3	Cape Range, Learmonth, Yardie Creek Stn	Aug, Sep
<i>Harneria kempeana</i> ssp. <i>rhadinophylla</i>	2	Cape Range	May-Sep
<i>Livistona alfredii</i>	4	Millstream, Cave Creek, Cape Range	Nov-Dec
<i>Stackhousia umbellata</i>	3	Cape Range	May-Aug
<i>Tinospora esiangkara</i>	2	Cape Range	Aug-Sep
<i>Verticordia sertina</i>	2	Cape Range NP	Sep

Priority flora known from the Coral Bay area are shaded.

Eremophila glabra ssp. *psammophora* was found to be liberally scattered, particularly in between recent dunes in the Mauds Landing area on shallow soils. *Acacia ryaniana* was less common in this area, with only two of populations being recorded, both on the slopes of parabolic dunes at Mauds Landing.

Abutilon sp. Cape Range, *Corcorus interstans* ms and *Acacia startii* are known to occur within 50km of the subject land (ecologia 2000) but none are known from sandplain country.

Hopkins *et al.* (1996) presents an updated table of threatened ecological communities in Western Australia by IBRA Region. Sandplains are widespread (about six percent of the landform) and are not included in the seven Threatened Communities identified for the Carnarvon Biogeographic Region.

The subject land is located entirely within the shrub steppe unit, with variations in understorey attributable to the relative proportion of various *Triodia* species relative to the proportion of *Cenchrus ciliaris* (buffel grass) present. The resolution available on aerial photography is insufficient to determine dominance between these two species.

The vegetation of the dune apices and swales varies slightly, but each exhibit relatively low diversity as is typical of coastal areas having young sediments. Variations occur mainly in terms of the proportion of the same predominant species, with densities being greater in the swales. Dune apices exhibit greater evidence of recent fire damage.

Most of the vegetation of the area surveyed was in fair condition having been heavily infested with buffel grass that was historically promoted as feed.

Dune swales can be described as sparse to open *A. tetragonophylla* / *A. coriacea* over moderately dense *C. ciliaris* and *T. pungens*. The proportion of *T. pungens* is slightly higher on the apices, however the total vegetative cover is lower.

Species observed during the field survey is included in Table 3.

**TABLE 3
SPECIES OBSERVED IN THE MAIN SERVICES AREA.**

Family	Species
Amaranthaceae	<i>Ptilotus exaltatus</i>
Asteraceae	<i>sp. 1</i>
	<i>sp. 2</i>
Goodeniaceae	<i>Dampieri incana</i>
Mimosaceae	<i>Acacia coriacea subsp. coriacea</i>
	<i>A. tetragonophylla</i>
Poaceae	<i>Centrus ciliaris</i>
	<i>Triodia basedowii</i>
Santalaceae	<i>Santalum spicatum</i>
	<i>T. pungens</i>
Tilliaceae	<i>Corchorus crozophorifolius</i>

The key findings of the initial flora investigation are:

the variation in vegetation types from the subject area are not considered significant from a local perspective;

in a regional context, the sandplain habitat, including the subject land, is well represented making up approximately six percent of the Gascoyne Region and accordingly, removal does not threaten representation;

no Threatened (Declared Rare) Flora and Priority Species were found at the site or are considered likely to be found in the landform.

About 62ha of land will be disturbed by the implementation of this proposal.

It is concluded that given these observations, a more intensive floral survey is not considered necessary.

2.3.2 Fauna and Habitats

The habitat types and potential vertebrate fauna of the site have been evaluated by a specialist fauna consultant, based on an assessment of current aerial orthophotography, ground photography and extensive literature search (ecologia 1994). The full report is given in Section 4.2.2 and Appendix 7 and 9 of the PER (ATA Environmental, 2000).

Habitat Types

The Mauds Landing project area encompasses four faunal habitat types (Figure 3), comprising:

1. sparsely vegetated beachfront;
2. coastal scrub;
3. samphire flats; and
4. salt lakes.

The subject areas are largely dominated by the coastal scrub-heath habitat, which consists of *Acacia* shrublands on coastal dunes and swales (Water Storage and Reverse Osmosis Plant location), and samphire flats (Services Area) surrounding salt lakes.

The coastal scrub-heath habitat is the most structurally diverse habitat within the project area and as a consequence exhibits the greatest species richness. The coastal dunes are the preferred habitat of the surface-burrowing reptiles such as the legless lizards, while the accumulated leaf litter constitutes an important microhabitat for other ground-dwelling species of reptiles. The relatively dense shrub and grass layer affords suitable shelter and a regular food supply for reptiles and for small mammals, while taller shrubs are utilised by arboreal lizard species and small insectivorous birds.

The samphire flats habitat is structurally less complex than the surrounding coastal scrub-heath habitat and as such supports fewer species. Typically plant species of samphire flats are less than about 0.2m tall, although some may grow slightly higher, providing a low, open habitat. Unlike the loose sand layers of the coastal scrub-heath habitat, the soils of samphire flats are heavy textured and typically unsuitable for surface-burrowing fauna species.

Regional mapping of land systems of the Carnarvon Basin (Department of Agriculture 1996) indicates the broad habitat types present within the project area are not unique to the area and are widely distributed both within nearby locations and within a regional context. Similar beach and coastal scrub-heath habitats contained within the project area are identified as occurring immediately north and south of the site and are distributed along coastal areas within the region, extending north to Ningaloo and south of Quobba. The sparsely vegetated beachfront and coastal scrub-heath habitats are both encompassed by the Cape Range National Park. Samphire flats and saline lake habitats that occur at the site extend onto adjoining land to the east and south of the site, and are more extensive along the margins of Lake MacLeod which is located approximately 55km to the south of the Mauds Landing site.

The Services Area consists of scattered *A. coriacea* and *A. tetragonophylla* over *Centris ciliaris* (buffel grass) and *Triodia pungens*. The broad habitat type of the Services Area is similar to the coastal scrub-heath within the development site. The Services Area has been severely impacted by fire and pastoral activities, with the native Spinifex being largely replaced by buffel grass locally. This correlates to Beard's unit "shrub steppe on sandhills" is very widely represented both locally and regionally. Furthermore, the service area lies within a land system that occurs along much of the coastal area in the region Basin (Department of Agriculture 1996)

Vertebrate Fauna

The Coral Coast Resort project area is expected to contain fauna species that are generally widespread and abundant in similar habitats throughout the region. Previous capture records, known distributions and habitat preferences, suggest as many as 189 vertebrate species potentially occur in the entire Resort and Services area (ecologia 1994). This total includes 18 mammal (including 4 introduced species), 116 bird, 51 reptile and 4 amphibian species. It is unlikely however, that all of the potential species listed co-occur within the project area at any one time due to spatial constraints and various temporal variations in the physical environment. Numerous nomadic or migratory species may only occur in the area after substantial rain, or at certain times of the year.

The majority of the fourteen native mammal species listed as potentially occurring in the project area have a major proportion of their distributions in arid central Australia or have Australia-wide distributions. Four species of introduced mammal potentially occur within the project area. These include the cat (*Felis catus*), fox (*Vulpes vulpes*), house mouse (*Mus musculus*) and rabbit (*Oryctolagus cuniculus*). The feral goat (*Capra hircus*) may also inhabit this area. These introduced species have the potential to significantly alter the fauna at the site through predation, modification of the habitat and competition.

The list of potential birds is extensive and includes species that might be vagrant or may only visit under rare conditions, such as water birds that may use wetlands when it is completely inundated. The majority of birds identified as potentially occurring have distributions that extend into all the zoogeographic sub-regions of Australia, including most of the migratory and highly nomadic species. For other species, the project area lies near the northernmost extension or the southern limit of their range and these species therefore may not occur at the site.

Most of the terrestrial reptile species known to occur in the region typically have wide distributions in the arid regions of Western Australia with several species having a range extension into the South West of the state.

Four species of amphibians are listed as potentially occurring within the project area and would largely be confined to the samphire flats habitat and the presence of seasonal freshwater. Most of these species have wide distributions within the arid zone, with the shoemaker frog (*Neobatrachus sutor*) also extending into the South West.

The relative species distribution within each habitat type represented within the project area is presented in bold in Table 4. The information clearly indicates the value of coastal scrub-heath for fauna compared with the other habitat types within the site.

TABLE 4
SPECIES DISTRIBUTION WITHIN EACH HABITAT TYPE

Habitat	Mammals	Birds	Reptiles	Amphibians	Total
Beachfront	1	31	4	-	36
Coastal scrub-heath	18	68	46	-	132
Samphire Flats	15	21	14	4	54
Salt Lake ¹	-	26	-	-	26

Note:

¹ water present

The species list compiled for the site consists of species known from the general region for which suitable habitats may or may not be present within the site. Limited fieldwork has been undertaken in the region and detailed information on habitat associations and specific requirements are not known for many species. Some of the species listed therefore, may not occur due to a lack of suitable habitat while others are only marginally possible at the site and their occurrence would be an extension to currently known distributions. Several other unlisted species are known from the general region for which the habitats may be suitable and could also reasonably be expected to visit habitats within the site on an occasional or opportunistic basis, such as when the saline wetland and samphire flats are inundated. It is unlikely that the site represents a significant habitat for the majority of these species.

Previous land uses such as grazing, weed infestation and fragmentation of habitat by vehicular access and associated disturbance of the vegetation, is likely to limit the species present and suggests the habitats at the site are likely to support smaller populations. In particular, areas of the samphire flats within the site have been substantially modified as a result of indiscriminate vehicle access, while grazing has degraded the northern portion of the coastal scrub/heath.

The associated services area located to the south of the proposed development is highly modified and degraded. The services area is expected to support a less diverse assemblage of fauna that are likely to occur within the coastal scrub-heath of the development site and surrounding areas.

Significant Fauna

Fauna species that have been formally recognised as rare, threatened with extinction, or as having high conservation value are protected under the *Wildlife Conservation Act 1950*. The Department of Conservation and Land Management (CALM) also maintains a list of Priority fauna species that are not presently endangered but are in need of monitoring.

A search of CALM's database was undertaken in August 2000. According to database records, Specially Protected or Priority fauna known to occur in the region comprise marine species not influenced by the Services Area.

Australia has international commitments in relation to trans migratory birds that are listed under the EPBC Act. Environment Australia (2000) presents a list of seabirds reported as occurring in the Ningaloo Marine Park and adjacent areas, including those identified under the JAMBA and CAMBA bilateral agreements. In total eight birds protected under bilateral agreements are known from the NMT, of which five are

known to breed. No breeding seabirds protected under JAMBA and CAMBA agreements are known from the Mauds Landing area (CALM records).

Based on the list of potential species generated for the project area, two other vertebrate taxa protected under the *Wildlife Conservation Act 1950* may occur within the site. These are the red-tailed tropic bird, (*Phaethon rubicauda*), (Schedule 1) and peregrine falcon, (*Falco peregrinus*), (Schedule 4). The Priority 4 grey falcon, (*Falco hypoleucos*), may also occur at the site. All of these are mobile species that do not rely on the habitat of the site for survival and are likely to be transient visitors to habitats in the project area.

The skink, *Lerista haroldi*, is a Priority 1 species that is restricted to an area south of the site between Gnaraloo South and Cape Cuvier. The occurrence of this species at the site would be an extension of its reported distribution (Storr *et al.* 1999).

Historically a further three gazetted rare and currently extant species may have occurred in the area. The western barred bandicoot, (*Perameles bougainville*), bilby, (*Macrotis lagotis*), and the burrowing bettong, (*Bettongia lesueur*), are now considered to be extinct in the region.

The China and Australia Migratory Bird Agreement (CAMBA) between the Federal Government of Australia and the Government of the Peoples' Republic of China binds the signatory governments to the protection of migratory birds and their environment. Fifteen species of trans-equatorial migratory birds that potentially occur in the project area are listed under the annex of CAMBA. With the exception of only one species, all of the birds considered to possibly occur at the site would be present only within the beachfront or saline wetland habitats.

In addition, fauna are covered under the April 1991 Australian & New Zealand Environment & Conservation Council Convention (ANZECC). The ANZECC convention lists fauna as "Endangered – Species in danger of extinction and whose survival is unlikely if the causal factors continue to operate" and "Vulnerable – species believed likely to move into the "Endangered" category in the near future if the causal factors continue to operate."

Conservation Significance

The most significant habitat within the site in terms of species diversity is the coastal scrub/heath. This habitat provides suitable conditions for a much broader range of species, while the other habitat types generally support a restricted range of species, many of which are likely to utilise the areas only on a seasonal or opportunistic basis when conditions are suitable.

The primary conservation significance of the subject land habitats, together with other sections of coastline in the area, is as provision of temporary feeding grounds and resting sites for migratory birds protected under the CAMBA and JAMBA Agreements.

The samphire flats of *Arthrocnemum* sp. and associated salt lakes are widely distributed on a regional scale from Carnarvon in the south to Onslow in the north. The largest such area is to the south in the vicinity of Lake MacLeod. This lake is expected to support all of the species likely to occur within comparable habitat in the project area, and in far greater numbers. Lake MacLeod is currently included in a mining lease with the option that once the lease becomes available, the ponds and adjacent areas of Lake MacLeod are to be vested with the National Parks and Nature Conservation Authority as a Class 'A' park.

Fauna known to occur in the region and those listed as possibly occurring within the site include species that are declared "in need of special protection" or identified as being of conservation under other agreements or mechanisms. The list also contains several species that have restricted distributions within the North West Cape area, and several species that are at or near the limits of their known distributions. The fauna that may potentially use resources within the site however, are not restricted to the project area and are known from, or expected to occur in, adjoining areas of similar habitat and within Cape Range National Park.

Potential Impacts

The development consists of a small area of impact in a landscape where local habitats are extensive. The development will affect less than a hectare of coastal scrub-heath and 62ha of samphire flats both well represented in the region. Furthermore, the habitats have already been degraded to some extent due to pastoralism in the region.

Within the site for the proposed Services Area, loss of habitat will not alter or significantly affect the conservation status of any of the species of significant fauna or other species listed or considered to potentially inhabit or use the site.

The development could in parts potentially create a barrier for the movement of terrestrial fauna through the scrub-heath and samphire flats habitat for species that require dense cover for protection while migrating or dispersing through the area. Migration and movement paths within the area will, however, continue to be available with vegetation to the north and south of the site enabling connection to habitats to the east and movement around the more exposed areas of samphire flats and saline wetlands.

Management measures implemented will ensure that any increase in predation pressure on the local wildlife from foxes and feral cats is minimised.

3. DESCRIPTION OF FACILITIES

3.1 General

The layout of the main Services Area is shown in Figure 4. The scope of the facilities proposed for the Service area and RO plant is described below, while the significant environmental impacts and the proposed management are discussed in Section 5.

3.2 Water Treatment and Reverse Osmosis Plant

3.2.1 Water Supplies

The quality of treated water supplied to the Resort will need to meet World Health Organisation and relevant Public Health standards.

The climatic characteristics of the area are described in Section 2.1. The median annual rainfall for Coral Bay is about 221mm. The rainfall events are highly irregular and characterised by falls of up to 100mm over the May/June period with the balance being made up of irregular falls usually associated with cyclonic activity. Average annual pan evaporation is expected to exceed 3000mm, ie. exceed the average rainfall for all the months of the year. Provision of potable water supply based on storage of rainfall runoff is therefore not considered viable.

Groundwater for treatment to suitable standards is available from the deep artesian Birdrong Formation. The water will need to be desalinated for drinking and domestic water purposes.

The artesian water from the Birdrong Formation is located approximately 800m below ground and flows at a temperature of around 60°C. Experience with use of this water in the existing Coral Bay settlement has shown that the artesian water, cooled as necessary, is quite acceptable with minimal treatment for non-potable uses.

For the purpose of preliminary planning, total artesian water demand for the resort is estimated at 0.52 million kilolitres per annum for Phase I based on the following daily average demands per person:

potable water: 125 litres
reverse osmosis waste: 125 litres
domestic non-potable: 125 litres
irrigation: 250 litres
contingency losses: 75 litres

Total: 700 litres/person/day or 517 ML pa based on an 80% occupancy of 2025 people.

Recent discussions with the Water and Rivers Commission (WRC) and investigations by Rockwater Pty Ltd confirm that 0.52 million kilolitres can be sustainably drawn from the Lyndon-Minilya Basin of the Birdrong Formation which has a capacity of

10.6 million kilolitres per annum. This will not compromise the Coral Bay supplies, with an estimated drop in piezometric head at Coral Bay estimated at 1m on a 42m head.

The WRC has advised that it will issue a licence for groundwater abstraction, pending the issuing of a statement by the Minister for the Environment that the proposal may be implemented, and preparation of an operating strategy.

3.2.2 Description

A review of options for treatment of the water to potable standards concluded that Reverse Osmosis (RO) is the most practical treatment method for the raw water from the Birdrong Formation. 50% recovery is assumed for the initial design.

The needs of this development can be met with a single bore with a second to meet the needs of the existing Coral Bay settlement. Bore placement will be with a view to minimising aquifer drawdown.

3.2.3 Storage and Reticulation of Potable Water

It is proposed to provide a dual water supply to the resort comprising treated potable water and cooled artesian water for non-potable domestic and garden requirements. Both potable and cooled artesian water will be reticulated by gravity to all lots within the resort. A gravity reticulation system would require a storage facility at an elevation of about RL32m at the Resort or at Maud Hill to ensure that water was supplied to meet Water Corporation standards.

A suitable site exists for the construction of the desalination plant and ground level storage vessels for potable and cooled artesian water just off the peak of Maud Hill to the immediate west (Figure 1) of the Resort. Storage will be of size sufficient to meet peak demands with the major ground storage being constructed at the service area or split between the two and water pumped to the higher level storage. The ultimate storage requirements for potable water will be influenced by the demands of the Coral Bay settlement, should connection occur. Non-potable supplies to Coral Bay can be provided from the second bore, if required.

It is proposed that the bore (fibreglass, 800m deep) to service the resort be positioned near the entry roundabout feeding artesian water via borehead pipework to cooling and aeration/settlement ponds which will form a water feature to the resort entry. To store a minimum of three days supply, the lined ponds (1.5m deep) will require a volume of 4,700m³. Cooled artesian water from the cooling and aeration plant (2400m³/d) will be pumped (1400m³/d) to the storage area behind Maud Hill for desalination, storage and gravity reticulation both of potable and non-potable water to the resort. The storage pond will have a sludge removal system. The sludge, depending on quality will be mulched or deposited to landfill. The delivery main for artesian water to the storage tank (3000m³) at high level at the resort will supply 1400m³/d. The delivery main will supply potable water (700m³/d) to high level storage (1000m³) at the Resort.

The desalination/RO plant will be housed in a low level building of approximately 25m² area. A total of 10,000m³ of bladder storage will be provided for cooled artesian water and additional bladder storage of 3,000m³, to provide for five days peak supply of potable water.

Waste from the desalination process will be pumped to dedicated RO evaporation ponds, the wastewater treatment evaporation ponds or mixed with treated wastewater and possible reticulated onto adjacent paddocks to the east of the services area to provide pasture improvement for the owners of Cardabia Station (see Section 3.3).

Power requirements will vary according to the final choice of RO plant, osmotic pressure and specified recovery rate but will typically be around 15-20 kW. The addition of chemical conditioners such as anti-scalants (usually detergent types such as sulphates and phosphates, chosen for their biodegradability characteristics) will be determined once the RO plant is defined. The use of biocides will be limited due to pre-filtration measures. Iron will be removed (usually by air flocculation or an ion exchange system up front, with or without dosing with chlorine). Small quantities of citric acid or other acids can be used to adjust pH and sodium hydroxide may be used to aid cleaning the membranes of silt.

The characteristics of the wastewater will be defined once the RO plant design is finalised. The TDS content of the wastewater is likely to be around twice the raw water TDS ie around 12,000ppm. The wastewater pH can be adjusted, usually leaving the RO plant at around 6 to avoid calcium and magnesium precipitation. Sludge will be sent to landfill or depending on quality, used as bio-solids.

A potable water supply will also be supplied to Cardabia Homestead via a 50mm water service.

3.2.4 Landscaping and Garden Water Supplies

Suitable grasses and vegetation have been shown to flourish and thrive at the existing Coral Bay settlement when irrigated with the Birdrong artesian water. Irrigation management techniques specific to this area are required to ensure satisfactory irrigation, however local application has confirmed that it is practical to irrigate appropriate grasses such as saltene couch, zoysia or similar direct from the artesian water.

Minimising lot and road reserves areas, maximising use of appropriate paved surfaces and minimising areas to be grassed will minimise water required for landscaping.

Properly managed artesian water used in conjunction with existing soils will provide an excellent medium for growing grasses. The water effectively supplies a slow release fertiliser, with nutrients being taken up by the grasses in such a way that only minor supplementation of nutrients may be required to achieve optimal growth. The likelihood of transport of nutrients into the unconfined groundwater either directly or indirectly, is very low.

It is desirable to reduce the level of soluble iron within the water and to reduce its temperature before irrigation to prevent staining and to minimise irrigation system maintenance requirements.

Examination of the soils at the Coral Bay settlement indicates a low conductivity, so there is no apparent build up in the soils matrix. Some surface build up occurs over the irrigated areas but this is removed during mowing. Clippings will be removed and mulched or disposed to landfill.

3.3 Wastewater Treatment and Disposal Plant

Disposal of wastewater and treated effluent away from the sea is seen as of paramount importance in this development. Collection of sewage from each lot (including the Services Area) will be by reticulated sewerage constructed to meet Water Corporation standards. Wastewater collected at the Resort will be pumped via a pressure main to the treatment facility. The wastewater treatment plant will be designed with the potential to accept wastewater from the town of Coral Bay.

The proposed wastewater treatment plant will receive water for treatment from sources of differing salinity. Brackish water will be derived from activities such as washing and other domestic purposes as well as possibly process water from activities in the Services Area. Similarly, water of salinity suitable for human consumption, will also be directed to the wastewater treatment plant.

Brine from the reverse osmosis plant will not pass the wastewater treatment plant. Instead it will be directed to the evaporation ponds at the treatment plant, or to a specific set of evaporation ponds constructed at the Reverse Osmosis Plant. The mix of waste potable water (TDS 500 to 700mg/L) and waste raw water (TDS 6000mg/L) entering the wastewater treatment plant as feed water, is expected to have a TDS level of approximately 3000mg/L.

Treatment of wastewater is proposed by means of Waste Stabilisation Ponds with the capacity to treat 720kL/day in the initial phase. A doubling of the facility has been provided for, should this become necessary in the future. The utilities provider, the Water Corporation of WA and Halliburton KBR, consider this treatment suitable and reliable for use for Mauds Landing and Coral Bay.

Halliburton KBR have been involved in the design and operation of the Christies Beach sewerage pond wastewater treatment plant in Adelaide which has TDS levels of 7000mg/L, and confirm that, in operation, the plant is able to achieve the required effluent standards.

The plant capacity has been sized to cope with residents and visitors, including day visitors on tour. The plant will also have the capacity to treat sewage received from a pump-out facility for boats with on-board storage. Disposal of treated effluent will be via evaporation, and sludges either used as bio-solids for soil amendment in

accordance with relevant guidelines or deposited in the landfill, dependant on quality.

Allowing for annual rainfall, and taking into account the effect of net evaporation at 2300mm per annum, a total pond area of 7.2ha is required for evaporation. Although unlikely to be feasible due to the high salinity levels, opportunities for re-use of treated effluent will be investigated, including irrigation of pastures within Cardabia Station, or establishment of a turf farm. It is recognised that high dissolved solids concentration in the treated wastewater will severely limit reuse opportunities.

The target effluent quality is stated in Table 5.

TABLE 5
TREATED EFFLUENT TARGET QUALITY

Parameter	Quality Target
BOD	< 30 mg/L
Suspended solids	< 20 mg/L
Total phosphorus	< 12 mg/L
Total nitrogen	< 50 mg/L
Thermotolerant coliforms	< 10 ³ cfu/100mL

3.4 Power Generation and Transmission and Gas Supplies

3.4.1 Description

Energy requirements of the resort will be met from reticulated electricity supply, together with reticulated gas from bulk storage at the Power station site (approximately 2ha) within the Services Area (Figure 4).

The fuel type and generating configuration will be defined in detail following Cabinet project approval of the overall project. At this stage it is envisaged that the primary fuel will be LPG gas, with diesel used as a back-up (considering the remoteness of the location and climatic conditions) or as dual fuel. A number of options for electricity supply have been considered, with gas powered diesel generators being the preferred option due to clean burning characteristics, reliability of diesel backup, lower greenhouse gas emissions compared to solely diesel generators, minimised distribution losses and load control permitting energy conservation.

Total generating capacity requirements are estimated at 3,900kVA with an average or around 2.5 MW load. The generation plant is likely to comprise gas powered diesel generators (6 x Genset 600kW and 1 x Genset 300kW with automated load control housed in a power house), with units coming on line as demand increases, supplying power via a high voltage distribution system. A load control system will ensure efficient and economical operation. Additional generating plant could be added to meet load increases by the connection of Coral Bay, as and when required. For supply reliability and maintenance one spare generator is proposed with automated load control.

Metered power supply will also be extended to Cardabia Homestead.

The generators may be housed either in separate acoustic enclosures or in a single building. Each is expected to have a single exhaust of typically 150 or 200mm diameter and height of typically around 6-8m. The small quantity of emissions generated, the absence of any other significant emissions in the area, low background concentrations of combustion by products and the prevailing wind climate all mitigate strongly against the potential for significant air quality impacts.

Recognising the long term of the project, the proposal to establish the plant incrementally and the high cost of sole diesel based generation, the potential use of renewable energy resources remain under review as possible additions or replacements at a later stage.

Other facilities/equipment includes the switchboard, 2 transformers, distribution cabling, utilities workshop, transformer compound and HV switchboard. The power station design is based on equipment redundancy in critical areas to provide a high degree of reliability such as generators, transformers or pumps.

LPG storage (nominally 2 x 150kL) may be above ground or below ground. Diesel storage (nominally 2 x 300kL) will also be located within the power station site. These will be designed, located and operated to the Department of Mineral and Petroleum Resources' requirements and specific to the fuel type.

LPG, primarily for Resort cooking purposes, will be reticulated to the Resort sites from the bulk storage. The design and installation of the LPG facilities and handling will be according to AS 1596-2002 and the transport according to *Dangerous Goods (Transport) (Road and Rail) Regulations 1999*, No 6.

The site will be fenced and designed for fully unattended operation using advanced and proven software systems to carry out the control functions. The local operator and other Service Area operators will remotely operate the power station. A paging system will be used to alert local operators of any alarms or faults.

3.4.2 Fuel Storage and Transportation

LPG and diesel will be transported from Carnarvon or Karratha to the site by road tankers. The proposed route is along the North West Coastal Highway.

All fuel transport and road tanker specifications will comply with the relevant Australian Standards.

3.4.3 Power Distribution

Reticulation within the resort is proposed to be by underground distribution for both low voltage and high voltage lines to ensure that aesthetic demands are met and to maintain safety and reliability of supply during severe weather.

The undergrounding in part of transmission lines to the Resort from the Services Area will be considered.

3.4.4 Amenity

Structures will be painted so as to blend in with the surroundings landscape. In addition, a strategic planting of assorted native trees and shrubs may be undertaken to soften outlines of the buildings and maintain a link to the surrounding terrain, particularly around the perimeter of the power station but without creating a fire hazard or safety concern. This screening will also assist minimising lighting overspill.

Adequate lighting is required for safe operation and for security. In compliance with AS 4289 lighting poles with directional lighting at appropriate angles will be incorporated.

3.5 Refuse Disposal

3.5.1 Description

A suitable refuse disposal site has been identified in the southern portion of the Services Area. Its progressive development will service the combined locations of Coral Bay and the resort for a minimum of 25 years.

As the ground surface of the Services Area is between 8.0m – 18m AHD and groundwater at around 0.0 AHD (11m below ground level at the monitoring bore within the landfill site), a minimum separation of 5.0m between the base of the landfill cell and water table can be maintained.

Visitor numbers vary greatly at Coral Bay, ranging from several hundred during quiet periods to several thousand staying at the settlement with up to 500 visitors daily during school holidays. Eighty percent occupancy at the Coral Coast Resort is anticipated to be 2025 persons. In planning for 5000 residents, visitors and support staff, an assumption has been made that 1.2 tonnes uncompacted refuse/person/annum will be produced at a compacted density of 300kg/m³. Up to 20,000m³ compacted disposal volume per annum will be required, representing at an average depth of 3m, an area of approximately 0.7ha. Compaction will be achieved by heavy equipment.

The landfill will be manned during normal operating hours by maintenance personnel operating other service infrastructure within the Services Area.

Given the inland location of the site, relatively low rainfall, high degree of cementation of the strata, the very low groundwater flow gradient, high evaporation and minimum separation of 5m to the shallow groundwater, lining is not considered necessary. In addition, cells will be developed sequentially to reduce the area of open face. This is discussed in further detail in Section 5.2.

Allowing use of this refuse disposal site by existing Coral Bay operators and residents will enable the existing site to be closed, thus reducing the risk of nutrient/contaminant movement from the existing tip (Fig 1) into Bills Bay. Consolidation of sites will enable improved management techniques to ensure regular compaction of waste.

3.5.2 Landfill - General

The design and operation of a modern landfill should ensure that the non-recyclable portion of the waste stream can be safely managed without creating environmental or health impacts. This is particularly important in an area such as Coral Bay.

Waste will be sorted to ensure dry recyclables (such as aluminium, paper and glass), where feasible, are separated. Where possible, organics will be composted for mulch, aiding vegetation programs. These actions will minimise landfill.

Monitoring bores have been installed upstream, downstream and within the Services Area (Figure 5) to detect any leachate movement and will be regularly sampled to provide early warning of any impacts on the groundwater quality.

Management of the landfill is discussed in Section 5.2.

3.5.3 Solid Waste Treatment – Composting

A composting area will be established to treat organic wastes such as lawn clippings, tree prunings and bio-solids. The composting process will be monitored regularly to achieve acceptable compost quality and to ensure that appropriate temperatures and odour levels are maintained. Compost will be used as it is produced to ensure that the inventory of the treated compost is maintained within agreed levels.

3.5.4 Waste Treatment – Recycling

Opportunities for maximising collection and reuse of recyclables will be sought. Incentives and other promotional activities that encourage sorting and recycling of waste from business, accommodation and the boating public areas will greatly assist minimising the quantity of waste to be landfilled.

3.6 Industrial Site

Workshops, dry storage, cold stores, kennels and general storage facilities are to be located on the site situated at the north end of the Services area. The site is approximately 9.8 ha.

The units will be stand alone with their own compressors, generators, electricity and water supplies. Sewage and grey water will be directed to the adjacent wastewater treatment plant and solid wastes where appropriate to the nearby landfill site. Waste oil will be collected by a licensed recycler. Any fuel storage will be appropriately

bunded and comply with AS 1940, AS 3961 and Department of Mineral and Petroleum Resources' requirements where appropriate. These general management practices are described in Sections 5.2 (Liquid and Solid Waste Disposal), 5.3 (Groundwater Quality and Quantity) and Hazardous Materials (Table 7).

3.7 Telecommunications Infrastructure

Communications infrastructure for the development will be provided by a major communications carrier. Services will include standard telecommunications telephone services linking to a small telephone exchange facility. Telecommunication services utilising cable technology will be installed using underground pipes as for conventional metropolitan Perth subdivision systems.

Methods of delivery of television services in the development will be further examined during design development. The use of MATV infrastructure, managed by the provider, will be investigated to carry free to air broadcast television services, pay TV and Internet services. The system can also provide intra-site video and information services to all locations within the resort.

3.8 Utility Connections to Coral Bay

The primary objective of CCMD in the investigation and identification of utility requirements has been the development of the most effective and efficient service headworks for the broader locality. Consideration of servicing issues has therefore included not only Coral Coast Resort but also cost effective expansion to include the existing Coral Bay settlement. The two developments have a separation of about two kilometres and the services area is to be located to best service both, commensurate with meeting appropriate environmental and economic objectives and to best integrate with the pastoral activities of Cardabia Station. Service demands, other than landfill requirements estimated in here, do not include requirements for Coral Bay, however design provision is made for ready accommodation.

As noted previously, services investigations have assumed the potential for connection of the existing Coral Bay settlement to power, water and wastewater treatment utilities to be constructed for Coral Coast Resort. Accordingly, should the existing settlement at Coral Bay be linked into the utilities provided for Coral Coast, notably water, sewerage and power, CCMD and utilities providers would provide the necessary expansion of headworks at the Services Area to allow for such connections. Costs for the provision of this service, including proportional headworks and amortisation costs, will be payable to the utility provider.

CCMD is committed to working with all parties to facilitate co-provision of services and to minimise the overall environmental impact in the Coral Bay area.

3.9 Emergency Services

It is proposed that base level, volunteer operated emergency services be provided to the resort by CCMD comprising:

*Fire and Emergency Services;
Nursing Station and First Aid; and
Sea Search and Rescue.*

The emergency service provision for the entire Resort complex will also adequately cover the Services Area. The utilities provider will facilitate the emergency services through the provision of staff training for employees on site in the Services Area and provision of basic safety and first aid equipment. It is proposed as part of staff recruiting and training, to attract and develop suitably trained volunteers capable of responding to an emergency situation.

Higher-level and back-up emergency services will be sourced from Carnarvon or Exmouth as need requires.

4. SEPARATION DISTANCES AND REGULATORY APPROVALS

A number of the activities to be sited in the Services Area require specific legislative approvals. In addition, general adherence is required to the buffer distances recommended in the manual titled '*Policies, Guidelines and Criteria for Environmental Impact Assessment: Industrial - Residential Buffer Areas: Separation Distances No. 3 Draft Policy July, 1997*'. These are also recommended in *Statement of Planning Policy No. 4 – State Industrial Buffer Policy*. Table 6 summarises the recommended buffer distances for each activity to be conducted in the Services Area and also comments on the regulatory requirements. Figure 4 shows these distances on the Services Area layout.

**TABLE 6
BUFFER DISTANCES**

SERVICE	BUFFER (m)	COMMENT
Dog Kennels	500	In a rural zone, not usually referred to the EPA, referred to the LGA. Potential for noise and odour impacts
Fuel Storage of petroleum products and crude oil in tanks exceeding 2000tonnes capacity	Case by case 50 in million risk contour must be within fenced compound	Referred to EPA, requires licence and/or Works Approval, referred to DMPR and must comply with Codes of Practice Potential for odour and risk impacts
Gas fired diesel Power station (3900kVA)	50 in million risk contour within fenced compound	Works Approval. License will depend on type and amount of fuel consumed.
Recycling Waste Facility	200	Not usually referred to the EPA
Solid Waste Treatment and Disposal	500m	Rural area tip site for normal household and commercial waste. Usually referred to the EPA and DEP WM Division for approval. Potential for noise, dust and odour impacts. Works Approval and Licensing required under <i>the Environmental Protection Act 1986</i> .
Waste waster Treatment plant	500m	Aerobic pondage systems with a capacity to treat effluent from a population of < 5 000. Works Approval and Licensing for >100m ³ /d (or >100tonnes pa waste incl septage or sewage treatment plant sludge, is discharged onto land)

5. IDENTIFICATION AND MANAGEMENT OF ENVIRONMENTAL IMPACTS

5.1 Introduction

The construction and operation of the utilities areas will result in changes to the biophysical and social environment. Consideration of these possible impacts has led to the following factors being identified that may be considered relevant to this proposal:

BIOPHYSICAL - Land Based Ecosystems

terrestrial flora;
fauna (specially protected threatened fauna);
terrestrial flora;
subterranean fauna;
marine water quality
flood/storm risk;

POLLUTION MANAGEMENT

liquid and solid waste disposal;
groundwater quality and quantity;
air quality;
construction impacts;
noise;

SOCIAL SURROUNDINGS

Public Health and Safety
Air Safety;
Hazardous Materials;
Aboriginal culture and heritage;
European heritage;
Visual amenity and light overspill; and
Public consultation.

These factors are summarised in Table 7. Those considered significant are further discussed in relation to the EPA objectives that will describe relevance of the factor, the area of likely impact, criteria that will be applied, management strategies by CCMD to manage or otherwise minimise impacts.

TABLE 7
CORAL COAST RESORT – MAUDS LANDING
PROPOSED MANAGEMENT OF SIGNIFICANT ENVIRONMENTAL IMPACTS

Factor (Site Specific Factor)	Relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
Vegetation and Flora	Proposal site of 62 ha (Services Area) and 0.5ha (RO Plant)	<p>To maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities.</p> <p><i>Applicable Standards, Guidelines or Procedures:</i></p> <ul style="list-style-type: none"> € Ningaloo Marine Park Management Plan 1989 – 1999, Management Plan No 12, CALM. (CALM 1989); € EPA System 9 Recommendation 9.3 (EPA 1975); and € CALM Threatened (Declared Rare) Flora and Priority Species List. 	<p>The service area is located within the Carnarvon Biogeographic Region (Thackway & Cresswell 1995). Approximately 63ha will be disturbed.</p> <p>The vegetation of the parabolic dunes around the Water Storage and Reverse Osmosis plant varies with the location on the dune (crests, slopes, swales), although the proportion of the dominant species is generally similar with variations occurring in the associated understorey species. This area is summarised as parabolic dunes with <i>Acacia coriacea</i> ssp <i>coriacea</i> dominated shrubland over <i>Eulalia aurea</i> dominated grassland and <i>Carpobrotus "septentrionalis"</i> dominated open herbland. Less than 1ha will be disturbed.</p> <p>The saline flats/sandplains/samphire flats are summarised as dominated by <i>Frankenia pauciflora</i> ssp <i>pauciflora</i> / <i>Angianthus cunninghamii</i> / <i>Lawrenzia viridi-grisea</i>/<i>Halosarcia halocnemoides</i> ssp <i>tenuis</i> low shrubland over <i>Sporobolus virginicus</i>/<i>Carpobrotus "septentrionalis"</i> grassland/herbland. Around 62ha will be disturbed.</p> <p>From a local perspective, variations of vegetation types within the site are not considered significant. That is, there is no unique vegetation type within any one area of the dunes. The area of dunes in the study area is a relatively small portion of the system and consequently could be assessed as having moderate to low value.</p> <p>The relict saline flats within the site are part of a series found along the coastline between Carnarvon and Onslow. The saline flats at Mauds Landing is one of three such features behind coastal dunes in the region and shows similar vegetation types adjoining Lake MacLeod approximately 60km south of the site.</p> <p>A desktop review of CALM Rare and Priority Flora data has been undertaken. No DRF have been identified, however two Priority Flora (<i>Acacia ryaniana</i> and <i>Eremophila glabra</i>) have been identified as being common in the study area. The priority species were found to be well represented. It is likely that they will also be present within the conservation estate, including tombolo/sandy spits adjoining the Cape Range National Park.</p>	<p>Limit clearing to areas absolutely necessary for implementation of the proposal;</p> <p>Develop and maintain vegetation buffers. Predominantly arid zone shrubs and bushes will be encouraged. Trees will be generally large rooted and indigenous to the area.</p>	<p><i>Given:</i></p> <p><i>the variation in vegetation types from the subject area are not considered significant from a local perspective;</i></p> <p><i>in a regional context, the sandplain habitat, including the subject land, is well represented making up approximately six percent of the Gascoyne Region and accordingly, removal does not threaten representation;</i></p> <p><i>no Threatened (Declared Rare) Flora and Priority Species were found at the site or are considered likely to be found in the landform;</i></p> <p>€ and commitments for the preparation and implementation of Environmental Management and Revegetation and Landscaping Plans,</p> <p>it is considered that the proposal can be implemented to meet the EPA's requirements.</p>
Fauna (Specially protected /threatened fauna)	Proposal site of 62 ha (Services Area) and 0.5ha (RO Plant)	<p>Protect Specially Protected (Threatened) Fauna species and their habitats consistent with the provisions of the <i>Wildlife Conservation Act 1950</i> and The <i>Environment Protection and Biodiversity Act</i></p>	<p>Clearing of approximately 63ha for the services area development site will result in habitat loss. Habitats are well represented both locally and elsewhere including areas encompassed by the Cape Range National Park.</p> <p>The development area comprises two faunal habitat types:</p> <ul style="list-style-type: none"> € Coastal scrub-heath (0.5ha disturbed) € Samphire flats/Sand Plains (62ha disturbed), and <p>Numerous nomadic or migratory species may use the area opportunistically. Desktop surveys of the potential utilisation have been undertaken with minimal ground surveys providing support.</p> <p>The desktop review of CALM Specially Protected (Threatened) Fauna database</p>	<p>In conjunction with the proposed management of the Marina/Resort and Services Area, an environmental manager will be appointed and take direct responsibility for meeting environmental objectives during construction and management.</p> <p>Management strategies to limit impacts to fauna include:</p> <ul style="list-style-type: none"> € Restrict clearing to development areas. € Enhancement of those areas retained. 	<p>Given that the site of the proposed development is largely modified and degraded (grazing, weed invasion, off road vehicle access etc) sand plains well represented regionally, the results of desk top surveys and habitat assessments, and commitments to manage priority fauna through the development of appropriate management strategies, it is considered that the proposal can</p>

Factor (Site Specific Factor)	Relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
			indicated that 1 Schedule 1 vertebrate taxa are potentially within the project area - the grey falcon (<i>Falco hypoleucos</i>). It is a mobile species that do not rely on the habitat provided by the subject area for survival. Other species protected under international treaties (JAMBA and CAMBA) may potentially occur in the area.	<ul style="list-style-type: none"> € Rehabilitate and maintain a vegetation buffer along the boundaries of the Service Area. € Plan the access road to minimise clearing of native vegetation. € Should sensitive or specially protected fauna be identified in the area proposed for disturbance, undertake and report on a terrestrial faunal survey of the subject land specifically for that species. € If specially protected fauna are identified in vegetation identified for removal, advise CALM and develop a management plan for the population's protection including trapping and relocation to other areas, prior to or on an 'as needs' basis during construction. 	be implemented to meet the EPA's objectives in relation to fauna.
Subterranean Fauna	Proposal site of 63ha and down hydraulic gradient for a distance of 200m from the subject land.	To ensure that impact on subterranean fauna is avoided.	<p>Preliminary hydro geological assessments carried out at the site indicate deep sands of recent origin with no limestone or subterranean voids present. A saltwater wedge extends well inland in the Mauds Landing area.</p> <p>Stygofauna are known to be widespread within the unconfined aquifer of the coastal plain of the Exmouth Peninsula. No abstraction of shallow groundwater will occur within the service area, with irrigation waters (brackish) supplied from the Birdrong Formation and reticulated throughout.</p> <p>5 monitoring bores have been installed in the Service area. Full results of the sampling and the bore logs are given in Stygofauna Assessment Coral Coast Resort Report No. 2001/22 ATA Environmental (Sept 2001).</p> <p>No stygofaunal populations were identified from the Services Area. Given the silt in the samples was very fine and of recent origin, animals occurring in the host formations would have difficulty finding adequate living space and would likely be unable to keep body surfaces sufficiently clean for gas exchange.</p>	<ul style="list-style-type: none"> € The lack of limestone and voids, limited freshwater and lack of natural barriers to movement, makes the development of unique species unlikely. € It is highly unlikely that important stygofaunal populations within the superficial aquifer will be impacted by the CCR. 	Given the negative results of sampling for stygofauna during monitoring bore installations and the sub-surface geology and hydrology in the subject area, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to subterranean fauna.
Flood/Storm Risk	The subject area, and surrounding pastoral properties	Ensure buildings, and developed landforms, and members of the public are not subject to unacceptable risk due to flooding and storm surge.	<p>Flooding of the Services Area is possible due to cyclonic rains and the physical characteristics of the flat surrounds. However, unlike the Marina area, the Services Area at 2km inland is unlikely to be affected by sea surge and the ground surface varies from 8-18m AHD. Design final finished floor levels specifications will be above flood levels.</p> <p>Main access road levels will be raised and it will be necessary to permit stormwater levels to equalise across the road through culverts. Some areas east of the main resort fall below sea level and following major storm events, water is expected to lie for some time, particularly in the lake areas now mainly dry.</p> <p>Piped stormwater systems within the service area and resort road works will only be used where necessary. Stormwater will generally be disposed of by overland flow directed away from the marina and towards the low-lying salt pans with local compensation areas where necessary away from the marina and services area edges.</p> <p>Stormwater may carry oils and grease from road surfaces and work areas and suspended particulate matter.</p>	<p>Design of services area structures and buildings to meet 1 in 100 year return period storm events, with contingencies.</p> <p>Implementation of strict planning controls to ensure finished floor levels above any anticipated maximum flooding level, and construction to appropriate cyclone building codes to a rating of Category 5 and windspeeds equivalent to Region D, Terrain Category 2 AS 1170.2.</p> <p>Emergency evacuation procedures developed and put in place.</p> <p>Oils and greases will be trapped in conventional roadside pits, however the remaining contaminants transferred to the drainage dissipation areas will be readily degraded under the prevailing climatic</p>	Given commitments made and regulatory requirements to meet certain design and construction standards, the utilisation of natural drainage to low lying areas away from the marina, services area and sea, for evaporation and infiltration, and commitments to develop and implement an Emergency Response Plan, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Flood/Storm Risk.

Factor (Site Specific Factor)	relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
				conditions. The stormwater system will be designed to cater for normal rainfall events.	
Marine Water Quality	<p>Development Impact Area (DIA) of marine waters within 2600m of the High Water Mark (HWM) at the channel entry and extending from a point 200m W of Point Maud and extending to Pardy Point.</p> <p>Maud Specific Management Area (MSMA) comprising an area of 111.3km² including the DIA and coincident with the Maud Sanctuary Zone, otherwise extending seaward to the 18m contour N to a point due W of Bruboodjoo Pt and westward to the HWM.</p>	<p>Maintain the quality of marine waters and sediments to ensure that existing and potential users, including ecosystem maintenance, are protected, consistent with the <i>Draft Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i>, ANZECC July 1999.</p>	<p>The waters of Ningaloo Marine Park are largely pristine with some deterioration noted with respect to nutrient enrichment (inorganic nitrogen), elevated microbiological levels and TBT levels in Bills Bay adjacent to the Coral Bay settlement. Some elevation of arsenic and metals levels off Mauds Landing occur possibly as a result of residual contamination from historical and current activities.</p> <p>The waters within the Ningaloo Marine Park are, by world standards, nutrient-poor as a result of both low riverine inputs and the absence of significant upwelling of nutrient rich waters from the deeper oceans. A low standing crop of phytoplankton and high water clarity results.</p> <p>Nutrient enrichment of waters by human activities in the Services Area such as:</p> <ul style="list-style-type: none"> € sewage discharge; € contaminated groundwater inputs; and € surface runoff; <p>can stimulate phytoplankton blooms as well as promoting excessive growth of nuisance algae.</p> <p>Short-term impacts including smothering of corals and benthic organisms, are unlikely occur as a consequence of any activities in the Services Area.</p> <p>Accidental and deliberate spills from:</p> <ul style="list-style-type: none"> € industrial discharges; and € contaminated surface drainage and groundwater flows; <p>are possible sources of toxic contaminants, pathogenic organisms and litter originating in the Services Area.</p> <p>Sewage discharge from vessels has the potential to increase nutrient levels and to cause health problems for direct contact recreational activities.</p> <p>Boating activity is likely to increase significantly in Bateman Bay and the proposed marina as a consequence of the implementation of this proposal. Boating is likely to be reduced in Bills Bay, as will contaminated groundwater discharges from the existing settlement, should connections to deep sewerage occur. All stormwater from the Coral Coast Resort will be directed away from the marina and ocean, and the entire development deep seweraged. Liquid effluents will be treated at a wastewater treatment plant located in the Services Area.</p> <p>Modelling of nutrient concentrations has indicated that under worst case conditions, an increase of up to 30% above average conditions will occur in the entrance channel, ultimately to discharge to Bateman Bay on a falling tide. This is within the range of background conditions, and will rapidly drop to ambient background levels upon initial mixing.</p>	<p>Maintenance of water quality nearshore marine waters will rely on intensive management of nutrient inputs within the Service Area generally.</p> <p>The near shore marine water quality management strategy is linked to the provision of services (WWTP and landfill) inland, management of nutrients inputs to private gardens and public open spaces and to the direction of potentially contaminated storm water inland away from the marina/ocean. Further management strategies for the management of the Resort as a whole will include specific components dealing with the Services Area. These strategies will include:</p> <ul style="list-style-type: none"> € provision of information and public education is being proposed as a mechanism to limit visitor impacts on water quality; € sewerage pump-out facility for visiting boats and treatment of the sewage in the Services Area; € secure hydrocarbon storage and fuel pumping facilities within the Services Area; € development and implementation of a Water Quality and Sediment Monitoring Program, prior to construction, with contingency measures. Baseline monitoring will consist of select nutrient, hydrocarbon, metal, pesticide and chlorophyll and TBT analysis of a representative number of samples within the DIA and MSMA. € Continuation of monitoring programs to be undertaken for a period of at least 5 years following completion of the development, followed by a review. 	<p>Given the commitments made to control the quantity of deleterious substances into the marina and nearshore marine areas, and further commitments to identify and respond to any identified changes, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to marine water quality.</p>
Construction Impacts	Local and Regional public roads between the proposed	Manage impacts such that emissions will not adversely impact their welfare and amenity or cause health problems:	<p>This issue is taken in the context of the development of the Services Area at the same time and as part of the construction of the Resort as a whole.</p> <p>Dust will be created during construction due to vehicular movement on unsealed</p>	<p>A Construction Management plan will be developed that will describe management responses to pollution.</p> <p>Dust As a management response, water carts</p>	Given the distances between the proposal sites and sensitive premises, the termination of

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	Learmonth quarry, and Maud Landing, transport routes from major regional centres, the Coral Bay settlement and surrounding land users.	<p>☒ dust emissions meet the requirements in EPA Policies, Guidelines and Criteria for EIA No 18, <i>Air Quality Impacts from Development Sites</i>.</p> <p>☒ Construction noise levels meet the <i>Environmental Protection (Noise) Regulations 1997</i>.</p> <p>☒ road traffic associated with the project does not result in unacceptable levels of safety on the existing or proposed road network.</p>	<p>roads and ground disturbing construction activities.</p> <p>As all roads and trafficable areas within the Services area will be sealed and open areas otherwise landscaped, very little dust will be generated during operation.</p> <p><i>Construction and Transport noise</i> has been considered relative to potential impacts on the existing Coral Bay settlement and at Cardabia Station. In each case, the EPA's criteria will be met at all times. Traffic counts undertaken by Main Roads WA indicate (1999 combined E and W) an average of 412 vehicle movements daily, comprising principally light vehicles and 4WDs (77.1 %). Anticipated heavy traffic increases due to construction will result from the transport of raw materials. Heavy traffic on the Coral Bay Road will increase to approximately 20 vehicle movements by road train from the Learmonth quarry per day. The bulk of these additional heavy vehicle movements terminate at the Services Area or Resort townsite.</p> <p>The nearest residential premises are located approximately 1.8 km W of the services area. Cardabia Homestead is located afar to the north, approximately 2.5 km from the Resort boundary</p>	<p>will be used for dust suppression when deemed appropriate by the Construction Manager. Dust generated during construction will be minimised by the application of DEP guidelines and best practice in dust suppression (including watering of surfaces and rehabilitation of disturbed areas).</p> <p>Noise Heavy vehicle traffic is anticipated to increase by 40 movements during peak construction, and 20 movements during the operational phase. All vehicles will be road licensed, and meet ADR. Heavy vehicles will not enter the existing Coral Bay settlement, but will terminate either at the Services Area or at the Resort site. A noise screening assessment was carried out. It was concluded that noise generated during construction will not be significant when received at the closest residence and complies with the requirements of the <i>Environmental Protection (Noise) Regulations 1997</i> at all times.</p> <p>Transport Hazard CCMD will construct all roads, slip lanes and undertake traffic calming measures to the requirements of MRWA and the Shire of Carnarvon.</p>	<p>traffic before it reaches Coral Bay, and commitments made to develop and implement a construction management plan, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to construction impacts.</p>
Liquid and Solid Waste Disposal	Proposal site of 62 ha (Services Area) and 0.5ha (RO Plant).	<p>Liquid and solid wastes should be contained and isolated from groundwater and surface surrounds.</p> <p>Landfills must be approved and licensed under Part V of the <i>Environmental Protection Act 1986</i> and comply with the Code of Practice for Rural Landfill Management (DEP 1995b) and the Waste Acceptance Criteria for Landfills (DEP 1995c).</p>	<p>Comments in the Groundwater Quality and Quantity section below are also relevant.</p> <p>All living units at the resort and operator facilities in the Services Area will be fully serviced, including reticulated sewerage collection. Wastewaters will be treated in a Wastewater Treatment Plant, (720kL/day capacity) to be located in the Services Area, and constructed to the requirements of the Shire of Carnarvon and Water Corporation.</p> <p>Lined ponds are proposed, and will be sized to allow for total evaporation of all treated effluents.</p> <p>The landfill site (33ha) within the Services Area sufficient to provide a minimum 25 years capacity will be established to the requirements of the Shire of Carnarvon and Waste Management WA, and a weekly collection service to the Mauds Landing townsite will be provided. All municipal and building waste will be directed to this landfill.</p> <p>The Services Area has been sized so that it can also accommodate liquid and solid waste disposal requirements of the existing Coral Bay settlement.</p>	<p>Elements of the solid and liquid waste disposal strategy include:</p> <ul style="list-style-type: none"> ☒ Provision of reticulated sewerage for the resort, with treatment at a wastewater treatment plant located in the Service Area and established for the purpose. ☒ Provision will be made for the connection of services at the existing Coral Bay settlement if requested. ☒ Construction of the first cell of a managed landfill site in the Services Area to the requirements of Waste Management WA and the Shire of Carnarvon, with sufficient development area to meet 25 years anticipated requirements. The operation of landfill site, including weekly collection service. 	<p>Given the commitments to provide efficient services to the Resort and Services Area, to provide improved utilities to service the Coral Bay settlement, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to liquid and solid waste management.</p>
Groundwater Quality and Quantity	Groundwater below the site and down hydraulic gradient for a distance of 200m from the subject land.	<p>Maintain the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the <i>Draft Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i>, ANZECC July 1999 and NHMRC/ARMCANZ <i>Australian Drinking Water</i></p>	<p>Comments in the Liquid and Solid Waste Disposal, Marine Water Quality and Hazardous Materials sections are relevant to this factor.</p> <p>Unconfined groundwater in the area has >6000 mg/L total soluble salts. Water is currently drawn from the Birdrong Artesian Formation for the Coral Bay settlement. Existing uncontrolled disposal of solid and liquid wastes from the Coral Bay settlement and use of septic tank liquid waste treatment units, has been implicated in contributing to degradation of superficial groundwater resources.</p> <p>Five groundwater monitoring bores have been installed upstream, downstream</p>	<p>The strategy for groundwater protection is based on the reduction of both point and diffuse nutrient sources with the potential to impact, together with monitoring capability and contingency planning:</p> <ul style="list-style-type: none"> ☒ 5 groundwater monitoring bores have been established upstream, downstream and in the Services Area to characterise the superficial groundwater quality. 	<p>Given the commitments to provide efficient utilities to the Resort and Services Area, to provide improved utilities to service the Coral Bay settlement, with provision for expansion to also manage solid and liquid domestic waste from Coral Bay if requested; and the commitments</p>

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		<i>Guidelines - National Water Quality Management Strategy.</i>	<p>and within the Services Area for water quality sampling.</p> <p>For this proposal, a bore will be constructed and water drawn from the Birdrong Artesian Formation at a depth of about 800m and treated prior to reticulated supply. Anticipated water requirements are approximately 0.52 million kL/annum. Investigations indicate a sustainable draw from the Birdrong Formation in the range of 10 million kL/annum. A second bore may be required to supply Coral Bay.</p> <p><i>WRC confirm availability and sustainability of anticipated requirements without compromising Coral Bay's current supply.</i></p> <p>Groundwater will be treated to potable standard by reverse osmosis, and supplied to the resort and Services Area.</p> <p><i>Nutrient enrichment of waters by human activities within the Services Area such as:</i></p> <ul style="list-style-type: none"> € Sewage discharge; € Contaminated groundwater inputs; and € Surface runoff; <p>can stimulate phytoplankton blooms as well as promoting excessive growth of nuisance algae.</p> <p>Provision of a reliable reticulated supply from a sustainable source and effluent treatment to a high standard at an inland treatment plant will greatly reduce the potential impacts on the superficial aquifer.</p>	<ul style="list-style-type: none"> € a shallow groundwater-monitoring program will be developed prior to construction, and baseline data established. € shallow groundwater monitoring program will continue for 5 years post operation, followed by a review. € development of contingencies for failures in containment within the services and townsite areas. <p>Provision will be made to allow for the connection of the existing Coral Bay settlement to the WWTP and the use of the landfill if requested by the Bills Bay settlement. This will certainly reduce nutrient inputs to Bills Bay.</p> <p>The hydraulic head and water quality from the Resort artesian bore and surrounding bores will be monitored to confirm that head losses are acceptable within the modelled projections.</p>	to undertake monitoring of the shallow groundwater and deep artesian water, with contingencies, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to ground water quality and quantity.
European and Aboriginal Culture and Heritage	Proposal site of 62 ha (Services Area) and 0.5ha (RO Plant).	<p>(i) Ensure that the proposal complies with the requirements of the <i>Aboriginal Heritage Act, 1972.</i></p> <p>(ii) Ensure that changes to the biological and physical environment resulting from the project do not significantly adversely affect cultural associations with the area.</p>	<p>The subject land at present consists predominantly of saline flats (62ha) and minimal parabolic dunes (<1ha). Implementation of the proposal will require cut and fill and accordingly, disturbance of the site can be anticipated.</p> <p>Previous archaeological and ethnographic investigations indicate the presence of a well-developed and diversified aboriginal community in the Cape Range Region for a period of up to 25000 years. A full archaeological and ethnographic survey undertaken at the request of the WA Museum has identified 5 archaeological sites of significance in the main marine area, predominantly comprising broken shells, stones or glass artefacts. A further search of the Aboriginal Affairs Department (AAD) records has been undertaken, with no additional sites having been recorded in the intervening period. No sites have been identified in the RO Plant area or Services Area.</p> <p>Discussions have been held with elders of the Baiyungu people in relation to the cultural significance of the entire proposal site. CCMD will liaise with the Baiyungu people to establish a protocol for site development prior to construction, consistent with the procedures identified by the (AAD).</p> <p>Policies will be developed and agreed that will provide training and work opportunities for the Baiyungu people, and opportunities for self-controlled business.</p> <p>CCMD has also agreed to provide funding for Cultural and Tourist Facilities for the Baiyungu community.</p> <p>CCMD has received agreement in principle for implementation of the proposal from the Yamatji Land and Sea Council on behalf of the Baiyungu people and Gnulli group. The Native Title claim has now progressed to advertising under section 29 of the <i>Native Title Act.</i></p> <p>There are no known sites of European historical or cultural significance within</p>	<p>Management of this factor deals with the Service Area and Main Resort development as a whole. CCMD recognises the vital link between the aboriginal people and their natural environment and that their culture reflects a subtle and often complex relationship with the land. Management measures to enhance the opportunities for the Baiyungu people and Gnulli group include:</p> <ul style="list-style-type: none"> € liaison with Baiyungu people in relation to training, employment and self managed business opportunities, with agreement being reached prior to the commencement of any site works; € resolution of all Native Title issues in accordance with the Native Title Act. € development of a Site Heritage Protocol that will specify actions to be taken should any place or object, including skeletal remains be uncovered during implementation of this proposal. In the event of any sites of archaeological significance being uncovered during excavation, work will cease in the immediate area, the site cordoned off, and advice sought from an appropriately qualified and experienced archaeologist, the Baiyungu people and the Aboriginal 	Given agreements already in place, the number and significance of known sites, the absence of known sites in the Services Areas and reduced likelihood of additional site of significance being uncovered, and commitments to meet the requirements of the <i>Aboriginal Affairs Act (WA)</i> and <i>Native Title Act (Com)</i> , it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Aboriginal Culture and Heritage

Factor (Site Specific Factor)	Relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
			the Service Areas.	<p>Affairs Department in relation to significance and/or required conservation measures;</p> <ul style="list-style-type: none"> € applications will be made to the Aboriginal Affairs Department prior to disturbance of any sites. € development of an induction program for all employees and site contractors that will identify the importance of the conservation of aboriginal heritage and emphasise procedures to protect any sites unearthed. <p>Measures relating to European heritage will be incorporated in the Site Heritage Protocol.</p>	
Hazardous Materials	Proposal site of 62 ha (Services Area) and 0.5ha (RO Plant).	The handling of hazardous materials and dangerous goods is covered by: <i>Explosives and Dangerous Goods Act, 1995</i> ; the <i>Occupational Health and Safety Act, 1984</i> and the <i>Environmental Protection Act, 1986</i> .	<p>Specific quantities of hazardous materials and their handling and storage will be defined once project approval is obtained. General requirements for the project are to:</p> <p><i>minimise spillages from the storage and handling of hazardous materials and dangerous goods; and ensure storage of hazardous materials and dangerous goods is confined to specially designated areas away from drains, above flood levels etc.</i></p> <p>Fuel; oils; lubricants; chemicals; paints; solvents; concrete curing compounds; sealants; and cleaning products are examples of hazardous substances commonly used on construction sites. Potential spillage risks include: oil spillage from vehicle servicing, accidental spillage due to equipment or tankage failure, malfunction or refuelling operations, accidental spillage during handling of hazardous materials; or accidental spillage during transport of containers.</p> <p>Hazardous substances shall be stored separately in a weatherproof and fire resistant building on an impervious base and bunded.</p> <p>Hazardous material stores shall be located well away from sensitive areas such as natural drains, flood plains etc and other surface water bodies. External areas on site where significant quantities of hazardous substances are handled, loaded or unloaded will have an impervious base and bunded if necessary.</p> <p>All staff on site shall be trained in the hazards associated with the stored hazardous substances and procedures to follow in the event of an emergency. MSDS sheets will be kept on site for all hazardous substances stored on site. Trucks used to transport hazardous substances to site will be appropriately signed, identifying the substance in accordance with the Explosives and Dangerous Goods Act.</p>	<p>The following general management practices shall be adopted to minimise spillages and environmental impacts from hazardous materials.</p> <p>i) Refuelling Refuelling associated equipment shall to be maintained in good working order, without leaks and with appropriate level alarms, shutdown and dry break systems. All equipment shall be refuelled and lubricated within a bunded area and away from natural surface drainage features.</p> <p>Spill containment facilities such as earthen bunds, compacted pads or drip trays shall be provided at refuelling stations, oil and chemical storage sites and vehicle maintenance areas as per Australian Standard AS1940. Stormwater from refuelling and maintenance areas shall drain to oil separation traps.</p> <p>ii) Equipment Maintenance Fuel and lubricating systems on mobile machinery shall be provided and maintained in good working order, without leaks. Drums containing oils shall be maintained in a sealed condition and stored on an impervious base such as sealed concrete.</p> <p>iii) Fuel and/or Oil Spills In the event of a fuel or oil spillage, the spill shall be recovered immediately using absorbent materials, which shall then be placed in disposable drums or containers for later removal to an approved waste disposal facility.</p> <p>Any contaminated soil resulting from a fuel or oil spillage shall be excavated and removed to an authorised waste disposal site or a site approved by the Local Government Authority.</p>	Given the lack of large quantities of hazardous materials proposed and the proposed management thereof, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Hazardous Materials.

Factor (Site Specific Factor)	Relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
				All significant spills shall be reported to the relevant government authority as soon as practicable and the contaminated soil removed.	
Air Safety	All areas in proximity of Coral Bay Airport	Ensure air safety requirements are not breached by the development. CASA is the federal body that sets guidelines for and administers air safety in Australia.	<p>The Services Area is 1.8km south east of the Coral Bay Airport runway. Wind roses show a dominance of winds from the south.</p> <p>The two aspects are of concern when a power station is located near an airport:</p> <p><i>Height of exhaust stacks (chimneys); and</i></p> <p>ε Vertical velocity of the exhaust gases.</p> <p>The CASA guidelines are that plume vertical velocities should be less than 4.3m/s at or below the Obstacle Limitation Surface (OLS) height at the power station location and that the OLS will not be breached.</p>	Once the power station equipment details and emission characteristics are defined, the stack heights, exit velocities and temperatures will be checked to ensure compliance with the CASA criteria.	Given the typical expected height of the exhaust stacks and typical efflux velocities expected for similar capacity and type power stations, and the management proposed, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Air Safety.
Public safety	Proposal site of approximately 62ha.	Ensure that risk is as low as reasonably achievable and complies with the requirements in EPA Policies, Guidelines and Criteria for EIA No 2, <i>Guidance for Risk Assessment and Management: Offsite Hazardous Individual Risk from Industrial Plant</i> (EPA 2000)	<p>Hazards at the Services Area relate mainly to the storage of resort LPG and the power station site with its associated storage and use of significant quantities of LPG and distillate. Minimal hazardous and flammable materials will otherwise be held within the Services Area. Approvals will be sought from DMPR in relation to gas and diesel storage and use. The final site storage capacities and location may require compliance with the Control of Major Hazard facilities as detailed in the Code of Practice NOHSC:2016(1996).</p> <p>Public access to the site will be limited by perimeter fencing and hazards indicated by signage using accepted practice.</p> <p>Once the power station details are defined, a detailed quantitative risk assessment will indicate the risk to the general public and neighbouring industrial area. These risks must not be in excess of those limits specified under Governmental Regulatory requirements. The criteria for the power station is based on 'industrial' zoning requires the risk at the site boundary to not exceed ten in a million per year (50×10^{-6}/year) as defined in the EPA Guidance.</p> <p>The route for the transport of LPG is from Carnarvon or Karratha to the Services area via the North West Coastal Highway and major arterial roads. Location of the power station in the Services Area will eliminate the need for hazardous goods vehicles related to this proposal to travel through the Coral Bay settlement or the Resort.</p> <p>Once the power station capacity and fuel requirements are defined and the Resort LPG requirements are known, a risk assessment will demonstrate the level of risk associated with the transportation of LPG and distillate fuel.</p> <p>A series of general recommendations have been made to ensure that both risk posed by the plant and transport will be as low as reasonably practicable (ALARP).</p>	<p>Risk from the bulk storage of LPG and distillate, and the operation of LPG generators can be managed by proper land use planning, plant design, commissioning and operation. Risk associated with the transport of significant quantities of LPG and distillate is managed to acceptable levels by adherence of DMPR requirements. In both cases, ALARP principles will be included in detailed design, and operation.</p> <p>Based on the results of the risk assessment a Transport Management Plan (TMP) consistent with ALARP principles will be prepared. The overall aim of the TMP will be to detail the procedures to be adopted and actions required during all phases of emergency response management associated with the transport of LPG from Carnarvon or Karratha to the Services Area.</p>	Given the commitment to fully assess the level of risk associated with the Services Area and individual sites as appropriate and the transport of LPG, to implement ALARP principles and management measures proposed, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Public Safety.
Visual Amenity including Light Overspill	Proposal area and surrounding properties including the view from public roads and nearby residences.	Visual amenity of the area adjacent to the project should not be unduly affected by the proposal.	<p>The Services Area is located in an inter-dunal swale to the south east of the existing Coral Bay Road. The land will be built up between the two dunes and vegetated to a 'natural' landform, thus hiding the view of the Services area from the Coral Bay road and public vantage points.</p> <p>Entry is off an access road (leading off Coral Bay Rd) and is designed so that there is no direct view of the Services Area from the Coral Bay Rd</p> <p>The Water Treatment Plant is situated on the slopes of Maud Hill. The RO plant will be housed in a low level building.</p>	<p>Enforcement of Building and Landscaping Guidelines will be through the Shire of Carnarvon Town Planning Scheme and development approval process to ensure consistency and aesthetic acceptability. The Services Area will not be visible from public roads.</p> <p>The location of the Water Treatment Plant behind Maud Hill, the low building height,</p>	Given the proposed layout and location of the services area, and commitment to meet certain design and construction standards, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to Visual Amenity.

Factor (Site Specific Factor)	Relevant Area	EPA Objective	Proposal Characteristics and Potential Impact	Proposed Management	Predicted Outcome
				<p>combined with the use of bladders rather than tanks, will ensure that the facility will be adequately screened from ground view.</p> <p>The design of the access road off from Coral Bay Rd will ensure there is no view of the southern end of the Services Area. The built up and vegetated 'bund' along the northern boundary of the Services Area will ensure there is no view of the Services Area northern end from the Coral Bay Rd</p> <p>Lighting for safety and security will comply with AS4282 and include the use of bollard lights, directional lighting, shrouding etc to minimise overspill.</p>	
Public Consultation	<p>Residents within the existing Coral Bay settlement, neighbours, conservation groups and relevant decision makers.</p> <p>Public consultation program will include decision makers, community interest groups (both local and Perth based), Govt. Depts., LGA's, State Govt. Ministers and backbenchers, as well as members of the opposition, adjacent landowners and resident members of the community as well as a cross-section of visitors.</p>	<p>To provide the public with opportunities to be informed on the proposal and accordingly provide comments on particularly the environmental aspects.</p>	<p>A proposal to establish a major tourist facility and associated Services Area at Mauds Landing to reduce impacts from the existing Coral Bay development has previously been assessed. A summary of the main characteristics of the Services Areas was included. Accordingly the public is generally well informed of the issues and have had the opportunity to develop views. The findings of the 1995 Select Committee endorsed the Mauds Landing townsite (and Services Areas) as the only major tourist development site allowed for development on the Western margin of the Cape Range area.</p> <p>A series of public displays were held in the towns of Exmouth, Coral Bay and Carnarvon. Meetings have been held with decision makers, involved agencies and community groups seeking their comments. A number of newspaper articles have resulted from aspects of the development. A web page has been established both to inform and to seek comment.</p> <p>Principal issues of concern identified by members of the community centre on the potential impacts resulting from introducing additional short term and permanent residents to the Coral Bay area, and the adjoining Ningaloo Marine Park – effectively the potential to exceed the 'carrying capacity' of the local environment.</p> <p>As far as possible, comments received during this preliminary consultation have been incorporated into the development strategy for the implementation of the Coral Coast Resort and Services Areas</p>	<p>Several strategies have been proposed, or have been modified/extended in response to these concerns. Issues in relation development of emergency response plans have all been reinforced or implemented following the consultation.</p> <p>A draft Natural Resources Management Agreement has been developed with Government to provide additional resources to regulatory agencies in the area. While outside the Services Area, but with potential to be affected by activities within the Services Areas - a Specified Area Marine Management Plan is proposed to determine the impacts of greater visitation/utilisation of Ningaloo Marine Park, and identify a series of management options should unsustainable activities be identified. Development of such measures is recognised as critical to the successful implementation of this proposal.</p>	<p>Given the extended history of the project, preliminary consultation with community members and targeted consultation with decision makers and key players, as well as the 8-week consultation required as a component of the EPA assessment process, it is considered that community consultation can be carried out to meet the EPA's objectives.</p>

5.2 Liquid and Solid Waste Disposal

A summary of the proposal characteristics is presented in Table 7.

Relevant Area

Services areas.

EPA Objective

Liquid and solid wastes should be contained and isolated from groundwater and surface surrounds.

Applicable Standards, Guidelines or Procedures

Landfills must be licensed under Part V of the *Environmental Protection Act* 1986 and must comply with the Code of Practice for Rural Landfill Management (DEP 1995b) and the Landfill Classification and Waste Acceptance Criteria for Landfills (DEP 1995c).

Assessment and Discussion of Management

Comments within Section 5.3 (Groundwater Quality and Quantity) are also relevant. Elements of the solid and liquid waste disposal strategy for the Coral Coast Resort located within the Services Area include:

provision of reticulated sewerage for the resort, with treatment at a WWTP located in the Services Area and established for the purpose (Section 3.3); and

provision of a managed landfill site (Section 3.5).

Wastewater from domestic, commercial and industrial sources may contain a range of substances considered hazardous to the environment, including total nitrogen, total phosphorus, some heavy metals, inorganic and organic compounds. Environmental issues of concern at most landfills are:

dust, litter, noise, odours and pests;

migration of contaminated stormwater and leachate off site or into the shallow groundwater;

generation of landfill gas (methane); and

untidy appearance.

Existing Conditions

DEP (1995a) found elevated levels of inorganic nitrogen and faecal Coliforms in groundwater along the shoreline of Coral Bay and adjacent marine waters indicating that groundwater, contaminated by sewage, was entering Bills Bay. The existing landfill site is inadequately managed and lies directly in the path of (1.6km south) of the existing airstrip.

Wastewater Treatment Plant

All living units at the resort (and operator facilities within the Services Area) will be fully serviced, including reticulated sewerage collection. The wastewater treatment plant (WWTP) will also treat sewage received from a pump-out facility for boats with on-board storage. The WWTP will require a Works Approval and Licence under Part V of *The Environmental Protection Act 1986*.

The proposed method of treatment of wastewater is described in Section 3.3. Waste Stabilisation Ponds with the capacity to treat 720kL/day in the initial phase will be used. WWTP design has been determined in recognition of the likely brackish water (minimum 3000mg/L total dissolved solids) followed by disposal of treated effluent to a lined evaporation pond.

The site is located centrally in the Services Area and will occupy approximately 6.8ha. The plant capacity has been sized to cope with residents and visitors, including day visitors on tour. Construction is to be to the requirements of the Shire of Carnarvon and Water Corporation. Additionally, the opportunity exists for expansion of the wastewater treatment plant to accommodate Coral Bay settlement's liquid effluents.

Landfill

Resort refuse management is described in Section 3.5. The landfill site is located at the southern end of the Services Area and at its full extent after 25 years of operation, will occupy approximately 33ha.

A suitable refuse disposal site has been identified in the southern portion of the Services Area, at an elevation of around 12m above sea level. Its progressive development will service the combined locations of Coral Bay and the Resort for 25+ years. Construction of the first cell of the landfill site in the services area to the requirements of the DEP and the Shire of Carnarvon will occur prior to the operational phase of the project.

Provision of a managed refuse collection and more controlled landfill operation, will result in a reduction of wind blown litter and odour from the existing landfill. This will act to improve the amenity of the entire Coral Bay precinct.

The proposed landfill will be effectively manned during normal working hours, as infrastructure maintenance personnel operating within the Services Area will have responsibility for its operation.

As discussed in Section 3.5, it is proposed that the landfill be unlined. This could theoretically permit leachate to escape from the base of the landfill. Evidence from groundwater monitoring of municipal landfills in Western Australia indicates that the main component of landfill leachate of environmental concern is nitrogen in the form of ammonia. Given the following:

- € Limited potential for leachate formation due to the high net evaporation rate. Rainfall at the site is low (average 221mm annually) with a very substantial excess of evaporation over rainfall. This, coupled with the large capacity for domestic waste to absorb and retain incident rainfall, means that there is little potential to produce landfill leachate that may contaminate the underlying superficial aquifer;
- € Depth to groundwater table is between approximately 10.5m and 15.5m (the monitoring bore, SMW2, within the proposed site, detected water at 11m below ground level);
- € Low hydraulic head which results in very low flow velocities in the superficial aquifer towards the coast;
- € Tendency for ammonia to attenuate through a variety of natural processes; and
- € The geology intersected in the Services Area comprises strata comparable to that described by Hocking *et al.* (1985) as the Bunderra Calcarenite. Hocking *et al.* describe the Bunderra Calcarenite as a variety of calcreted calcarenite of Pleistocene age and aeolian in origin. At the Services Area, the Bunderra Calcarenite comprises sands that are poorly to strongly indurated as a result of calcretisation. The nature of the geology is such that the soils under the site will have relatively low permeability and act to retard the movement of leachate in the groundwater system.

it is considered most unlikely for that landfill will generate detectable impacts on the coastline.

Landfills must be licensed under Part V of the *Environmental Protection Act* 1986. The proposed landfill site will be designed and managed in accordance with the *Code of Practice Rural Landfill Management (Draft)*, Landfill Category C, which receives greater than 1500 tonnes per annum (DEP 2000) and will comply with the requirements of the report titled "Landfill Classification and Waste Acceptance Criteria" (1995c).

Resort refuse management will include:

public waste minimisation education programs;

implementation of a kerbside collection scheme incorporating residences, commercial properties, public facilities and boat mooring areas;

spot checks and regular inspections of rubbish collection areas to maintain efficiency of collections and maintenance of safe and clean pick-up points;

provision of a timely bulk waste collection service from any construction and/or demolition sites;

optimum and effective use of the landfill site to be developed for the purpose, and consistent with DEWCP requirements; and

maximisation of recycling benefits including separate green waste collection and treatment.

Relevant specifications within the *Draft Code of Practice for Rural Landfills* that, when implemented will limit environmental impacts, include:

1. wire fencing around the site and putrescible face comprising a 1.8 m fence topped with three barbed wire strands, and lockable gates to restrict access to the public, fauna and livestock;

minimising the size of the working face, covering the face regularly with clean fill and aligning the tip face according to the prevailing wind. This together with the use of windbreaks (such as earth bunds), mobile litter screens and supplementary litter control (such as litter collection) will reduce windblown litter;

2. maintenance of a minimum 5m between the base of the landfill and the water table;
3. diversion of stormwater away from the disposal cells;
4. no deliberate burning of putrescible waste;
5. recycling of green waste, maintenance of fire breaks and fire response contingencies;

active feral animal control and rodent control program;

erecting and maintaining litter screens if required;

regular collection of wind blown litter; and

disposing of odorous waste by immediate deep burial.

Visual amenity is discussed in Table 7. Landscape plantings adjacent to the main Coral Bay Road will visually conceal much of the Services Area and associated solids and effluent disposal areas behind the existing sand ridges.

Groundwater monitoring will be used to determine whether significant levels of leachate production is occurring and will provide an early warning for the need for any corrective measures to prevent significant groundwater contamination. Five monitoring bores have been installed in, downstream and upstream of the Services Area to detect for any nutrient movement (Figure 5). Table 8 provides the co-ordinates and groundwater table for each bore.

TABLE 8
MONITORING BORE CO-ORDINATES AND GROUNDWATER DEPTH

BORE NO.	COORDINATES		DEPTH TO GROUNDWATER (mbgl)		
	EASTING	NORTHING	INITIAL LEVEL	WATER	STANDING WATER LEVEL
SMW1	7437576	0786035		15.6	15.56
SMW2	7436841	0785747		10.9	10.58
SMW3	7436969	0786176		10.7	10.69
SMW4	7436834	0785441		8.2	8.26
SMW5	7437821	0785582		2.7	2.65

Liquid and Solid Waste Disposal Management Strategies

1. Develop and enter into a build, own and operate agreement with a utilities contractor for the development of utilities and services.
2. Develop and construct, in accordance with the requirements of DEWCP and the Shire of Carnarvon, the first cell of a managed landfill site in the services area. The identified site will have an anticipated capacity for 25 years disposal for both the Coral Coast Resort and existing Coral Bay settlement.
3. Design and install, in consultation with the Water Corporation and Shire of Carnarvon, deep sewerage within the Resort site and construct a waste water treatment plant to service the Mauds Landing townsite, with provision for upgrading to accommodate the connection of Coral Bay.

Implementation of this proposal will also enable both the existing landfill and waste water treatment sites to be closed, thus reducing the risk of nutrient movement into Bills Bay. The existing sites are nearer the coast and the landfill site is in a low lying area which can exacerbate the risk of contamination risk to the under-lying groundwater. Consolidation of sites will enable improved management techniques to be used to ensure regular compaction of waste, and control of vermin.

Comments on Relevance of Factor

Given the undertaking to provide efficient utilities complying with Regulations to service the Coral Coast Resort, with consideration for the waste disposal needs of Coral Bay, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to liquid and solid waste management. The opportunity exists to reduce existing discharges to groundwater and consequently to sensitive nearshore marine areas through the construction of more environmentally acceptable infrastructure and the implementation of improved controls.

5.3 Groundwater Quality and Quantity

A summary of the proposal characteristics is presented in Table 7. Comments in the sections Liquid and Solid Waste Disposal (Section 5.2), Marine Water Quality (Table 7) and Hazardous Materials (Table 7) are also relevant to this factor.

Relevant Area

Groundwater below the Services Area site and down hydraulic gradient for a distance of 200m from the Services Areas.

EPA Objectives

Maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected.

Applicable Standards, Guidelines or Procedures

Consistent with:

- (i) the Draft Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC July 1999; and
- (ii) NHMRC/ARMCANZ Australian Drinking Water Guidelines - National Water Quality Management Strategy.

Assessment and Discussion of Management

The guiding principles for the management of surface and groundwater quality in Australia are set out in *National Water Quality Management Policies and Principles – A Reference Document* (ANZECC & ARMCANZ 1994).

The National Strategy emphasises the importance of:

ecologically sustainable development;

integrated (or total) catchment management;

best management practices, including the use of acceptable modern technology, and waste minimisation and utilisation; and

the role of economic measures, including user pays and polluter pays.

Management of catchments in accordance with the National Policy involves the development of a plan for the affected catchment and aquifer which takes account of all existing and proposed activities and developments, and which contains the agreed environmental values and feasible management options.

A major concern indicated during the preliminary consultation associated with the implementation of this project has been the potential for nutrient enrichment of near shore marine waters by activities within the Service Area such as:

sewage discharge;

contaminated groundwater inputs; and

surface runoff.

Should such contaminants reach the coast, they can impact the sensitive coral communities, stimulate phytoplankton blooms, and promote excessive growth of nuisance algae in near shore waters. Existing uncontrolled disposal of solid and liquid wastes from the Coral Bay settlement and the use of septic tank liquid waste treatment units and leach drains have been implicated in contributing to degradation of superficial groundwater resources.

An evaluation of the groundwater resources and conditions near Mauds Landing is presented in Rockwater (2000) in the PER. Water is currently drawn from the Birdrong Artesian Formation for the Coral Bay settlement.

The development of the new Resort at Mauds Landing will require the construction of a new bore to allow water extraction from the Birdrong Artesian Formation. The extracted water will be treated prior to being used as a reticulated supply. It is estimated that the new development will require an extraction of approximately 0.52 million kL/annum. Investigations indicate a sustainable draw from the Birdrong Formation in the range of 10 million kL/annum (Rockwater 2000).

WRC confirm availability of anticipated requirements and have identified the need for the development of an Artesian Water Operating Strategy prior to a licence being issued.

The activities within the Services Area that may affect groundwater quality, are considered here. The Power Generation Plant, Landfill Site and Wastewater Treatment Plant have the greatest potential to impact the groundwater.

The following management practices are critical in determining the level of risk that a premises poses as a source of pollutants to surface and groundwater sources:

- € Emergency management practices in response to such events as accidental spills.
- € Illegal discharges of solid or liquid wastes or poor housekeeping resulting in discharge of wastes to surface or groundwater.
- € Poor storage practices eg where there is no bunding of chemical storage areas.
- € Poor waste management contributing to the formation of contaminated runoff.
- € Poor stormwater management practices such as the lack of flow calming or pollutant traps.

Due to the episodic nature of the rainfall with occasional intense deluges, drainage cannot always be contained on-site. While the details of the stormwater system for the Services Area will be developed in the next phase of the project, the following management procedures will be adopted:

Operations Wastewater and Stormwater

Where appropriate, the individual units within the Services Area will have two stormwater systems that may be networked with the other units. One system will handle stormwater from all areas that may carry residues from works areas, petroleum product handling areas (associated with engine maintenance and operation) and areas of pipe work. This water will be treated in an oil/water separator, with underflow directed to a soakage pit. This will allow for the ability to respond to accidental spillage events. In addition, the oil/water separator will contain an automatic monitoring system to regularly confirm the quality of water leaving the separator.

The second system will collect stormwater that is free from possible contamination (eg. from rooftops and uncontaminated hard stand areas) and directed it to a stilling basin. This water is then released to a natural or constructed soakage basin in low lying areas of salt pans away from the Resort, Services Area and Marina. The stormwater system will be designed to cope with a one in ten year, 72 hour flood event.

Under normal operations, the water discharged from the oil/water separator will be suitable for release and meet the Australian & New Zealand Environment & Conservation Council (ANZECC) Australian Water Quality Guidelines for Fresh and Marine Waters (1992) Levels for Protection of Aquatic Ecosystems.

In the event of an exceptional storm event causing the water management system to overtop, the dilution brought about by the volume of water will ensure minimal environmental impacts.

A Water Management Plan that includes Spill Management will be developed for the Services Area to deal with accidental spillage and the containment of contaminated water.

Whilst drainage management will be based on the principles outlined above, the detailed design will be the subject of a Water Management Plan to be prepared by the proponent to the satisfaction of the Water and Rivers Commission. Issues relating to surface water management, including the final design of the evaporation ponds and the spill contingency plan, will be addressed in the Water Management Plan.

Waste Oils

Waste oils are to be collected for storage and disposal by a licensed contractor. A waste oil tank is to be constructed and bunded in accordance with Department of Mineral and Petroleum Resources standards.

Pipe work, valving and pumping will be installed to collect wastewater from wash bays, engine bays, bunds and work areas, for separation in oil separators.

Management of Bulk Fuels

All bulk fuel storage tanks will be designed and constructed (including bunding) in accordance with Australian Standard AS 1940-1993 and requirements of the Department of Mineral and Petroleum Resources' Dangerous Goods Division and the *Explosives and Dangerous Goods Act*, 1995. LPG will be handled and stored according to AS 1596-2002.

Management of Solid Wastes

All non-recyclable solid waste will be removed as required by licensed contractors and taken to the adjacent, registered landfill. Recyclable materials will be segregated where feasible.

Sewage and Grey Water

Grey water and sewage will be directed to the adjacent WWTP for treatment.

Landfill

In relation to the landfill site, shallow groundwater occurs at about Australian Height Datum (0.0 AHD). Installation of a monitoring bore (SMW2) within the landfill area determined the water level to be around 11m below the ground level (Section 5.2). The proposed site for the Services Area has an elevation of around +8m to +18m AHD. Accordingly fill will be deposited no closer than 5m from the shallow groundwater interface.

Other factors that limit the potential for groundwater impacts from landfill are detailed in Section 5.2. The strategy for groundwater protection in the Services Area is based on the reduction of both point and diffuse nutrient sources with the potential to impact, together with monitoring capability and contingency planning:

- € provision of information and public education is being proposed as a mechanism to limit employee, contractor and resident impacts on groundwater quality;
- € 5 groundwater monitoring bores have been established to characterise the superficial groundwater quality. Two years data will be available before the operation of the WWTP, and opening of the Coral Coast Resort.
- € development and implementation of a shallow bore monitoring program prior to construction, with contingency measures. Baseline monitoring will consist of select nutrient, hydrocarbon, metal, and physical measurements within the shallow groundwater. The shallow groundwater monitoring program will continue for at least five years following commissioning, followed by a review.
- € development of contingencies for failures in containment within the services and townsite areas;
- € the provision of adequate solid and liquid disposal systems;

- € construction of secure hydrocarbon storage and fuel pumping facilities; and
- € segregation of clean and potentially contaminated storm and wastewater.

The monitoring bores will provide early warning of any nutrient movement towards the coast such that corrective procedures to the disposal methodology could be introduced before any significant risk of contamination migration could develop. Based on landforms, topography and rainfall characteristics of the area, the rate of groundwater movement to the coast is expected to be extremely slow which will permit close monitoring and remedial action if necessary.

The regular groundwater-monitoring program results will be compared with regional baseline levels and to 'trigger levels' in documents such as the *Draft Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Indicated water quality will be considered both temporally and spatially.

Provision of a reliable reticulated supply from a sustainable source and effluent treatment to a high standard at an inland treatment plant will greatly reduce the potential impacts on the superficial aquifer. Provision will be made to allow for the connection of the existing Coral Bay settlement to the WWTP. Should connection occur, this will certainly contribute to the reduction of nutrient inputs to Bills Bay as the current technology, management practises and disposal sites at Coral Bay pose an unacceptable risk of contamination to Bills Bay and the groundwater.

Services Area Groundwater Protection Management Strategies

1. To develop and implement a surface water management component of the EMP, to the approval of the WRC, for the Services Area including but not limited to:

- € A water management plan which will provide details of potential impacts on surface water and groundwater quality, and how they will be addressed.
- € Release of treated waters from operational areas will only occur if water quality meets ANZECC Guidelines for Protection of Aquatic Ecosystems.
- € Management of bulk fuels in accordance with AS 1940 and DMPR requirements.
- € Waste oils to be stored in a bunded area and collected periodically for recycling.
- € All solid waste will be disposed of to the landfill on the adjacent site.

Groundwater Quality and Quantity Management Strategies

1. Develop and implement, in consultation with Geological Survey of WA, DMPR and WRC, a shallow groundwater monitoring program that will include, but not be limited to:
 - € program design;
 - € confirmation of the location and number of sample bores;
 - € parameters and sample frequency.
2. Develop and implement the Services Area component of an Emergency Response Plan, including but not limited to the following elements:
 - € failure of containment at the WWTP;
 - € loss of containment at bulk hydrocarbon storage facilities (including boat bunkering)
3. Develop and implement the Services Area component of an Artesian Water Operating Strategy, including but not limited to the following elements:
 - € monitoring of head and flows from bores;
 - € water use efficiencies;
 - € administration and operation; and
 - € contingency plans.

Comments on Relevance of Factor

Given the undertaking to supply efficient utilities to service Mauds Landing with provision for expansion to also manage solid and liquid domestic waste from Coral Bay, and the undertaking to monitor the shallow groundwater and prepare a Water Management Plan, Emergency Response Plan and Artesian Water Operating Strategy, with contingencies, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to ground water quality and quantity.

5.4 Construction Impacts

A summary of the proposal characteristics is presented in Table 7. This summary considers the impacts from the construction of the Services Area and main Resort jointly.

Relevant Area

Local and regional public roads between the proposed Learmonth quarry and Mauds Landing, transport routes from major regional centres, the Coral Bay settlement and surrounding land users.

EPA Objectives

- i) Manage impacts such that emissions will not adversely impact upon their welfare and amenity or cause health problems.

- ii) To ensure that road traffic associated with the project does not result in unacceptable levels of safety on the existing or proposed road network.

Applicable Standards, Guidelines or Procedures

- i) dust emissions will meet the requirements in EPA Policies, Guidelines and Criteria for EIA No 18, *Air Quality Impacts from Development Sites*;
- ii) construction noise levels will meet the *Environmental Protection (Noise) Regulations 1997*;
- iii) transport noise to comply with Section 4.3 of the EPA’s Draft Policy *Criteria for proposed increase in road or rail traffic (July 1999)*; and
- iv) comply with relevant AusRoads publications that identify best practice in road safety design construction and management practice, including:

- AP-1/89* *Rural Road Design.*
- AP11* *Guide to Traffic Engineering Practice.*
- AP-12/91* *Road Maintenance Practice.*

Assessment and Discussion of Management

Dust

The EPA Policies, Guidelines and Criteria for EIA No 18, *Air Quality Impacts from Development Sites*, is applicable to the control of dust from construction activities.

The nearest residential premises is located approximately 2km west of the services area. Cardabia Homestead lies well to the north of the Services Area and is closer to the main Resort (2.5km east of the townsite boundary).

Climatic characteristics are briefly described in Section 2.1. Morning and evening wind rose data is presented in M.P. Rogers and Associates (2000). Winter roses show a dominance of easterly winds in the morning that shift southerly in the afternoon, and are typically in the range of 10 to 28km/hr. Summer winds tend to be stronger (20 to 37km/hr), tending southerly in the morning and south westerly in the afternoons. Wind direction percentage data in the direction or residential areas is presented in Table 9.

**TABLE 9
WIND DIRECTION, PERCENTAGE OCCURANCE AND SEASONAL
DATA TO DUST SENSITIVE LOCATIONS**

Construction Site	Dust Sensitive Location			
	Coral Bay Settlement		Cardabia Homestead	
	Wind Direction to Impact	% occurrence (season, time)	Wind Direction to Impact	% occurrence (season, time)

Mauds Townsite	NNE	4 (winter am)	SW	24 (summer pm)
Services Area	E	11 (winter am)	SSW	16 (summer pm)

Dust may be created during construction due to vehicular movement on unsealed roads and ground disturbing construction activities. As the majority of the disturbed areas of the site will be landscaped and paved following construction, significant dust generation during operation is unlikely.

The EPA guidelines (EPA 1996) contain an assessment chart to assist in the potential for adverse impacts as a result of dust and windborne material, and identifying the appropriate level of management for a site. The assessment chart determines the site classification based on the nature of the development site and the proximity to other land uses. The site classification indicates the level and type of management required to prevent dust problems and protect nearby land uses.

Common factors considered to influence the potential for airborne dust lift off and associated adverse impacts from development sites include wind speed and direction, wind direction oscillation, area of land disturbed and exposed, soil dryness and compaction, the preventative measures implemented and the proximity of nearby residents and land uses sensitive to dust impacts.

The subject land experiences low rainfall and seasonally strong winds with prominent diurnal cycles. Based on the viewed site conditions there is a relatively high potential for the generation of dust during both winter and summer. However, no land uses sensitive to impacts by dust are located within 1km of the site boundaries. Pastoral activities occur adjacent to the services area however this land use is not considered sensitive to dust.

The assessment chart contained in the DEP guidelines has been used to determine the potential in the Service Area and Resort for dust and determined it to be Class 2. Such sites are considered to present a low risk of causing dust pollution events.

The DEP guidelines indicate that for Class 2, sites areas of exposed disturbed land should be kept to a practical minimum and methods of dust suppression such as water carts, wind fencing and surface stabilisation should be available

Dust generated during construction will be minimised by the application of DEP guidelines and best practice in dust suppression (including watering of surfaces, minimisation of working surfaces at any one time, and progressive rehabilitation of disturbed areas). Contingency plans will be developed within the Construction Management Plan in the event that nuisance dust occurs.

Noise

Noise emissions from the construction activities at the services area are required to comply with the assigned noise levels as determined in the *Environmental Protection (Noise) Regulations, 1997* at any noise sensitive premises. Under these regulations the assigned outdoor noise levels for the noise received at any noise sensitive premises during various times of day is determined by the calculation of an influencing factor,

which is then added to base levels. The influencing factor is calculated for the usage of the land within two circles, having radii of 100m and 450m from the premises of concern.

The influencing factor for residences located around the services area development sites is 0. Therefore, the maximum allowable L_{A10} noise levels are as listed in Table 10.

TABLE 10
ASSIGNED L_{A10} NOISE LEVELS AT RESIDENCES
LOCATED IN THE CORAL BAY SETTLEMENT

Time of Day	Assigned L_{A10} Noise Level
0700 - 1900 hours - Monday to Saturday	45
0900 - 1900 hours - Sunday & Public Holidays	40
1900 - 2200 hours - All Days	40
2200 - 0700 hours - Monday to Saturday	35
2200 - 0900 hours - Sunday & Public Holidays	35

With construction proceeding during daylight hours only during the week with some possibility of extension into the weekend, the most stringent regulatory criteria is the all day period assigned L_{A10} (sound level for 10% of the time) noise level of 40dB(A).

A noise screening assessment as outlined in the EPA's *Draft Guidance for Assessment of Environmental factors No 8 – Environmental Noise* has been carried out. It was concluded that noise generated during construction will not be significant when received at the closest residence and complies with the requirements of the *Environmental Protection (Noise) Regulations 1997* at all times.

Single point calculations based on free field reduction were also carried out. The nearest noise sensitive premise determined from the main Resort and services Area construction sites is located approximately 2.1km to the north-west. Based on a measured sound power of 105dB(A) at 7m for generic earth moving plant, free field reduction in sound power will see the level reduced to an L_{A10} below 40 within the distance to the nearest residence.

Transport noise is specifically excluded from the Environmental Protection (Noise) Regulation 1997. The Environmental Protection Authority has produced a draft policy for Road and Rail Transportation Noise issued on the 9 July 1999. Section 4.3 of the draft policy *Criteria for proposed increase in road or rail traffic* would apply in this case. Construction traffic will include up to 60 additional truck movements per working day, reducing to an additional 20 truck movements per working day during the operation phase. However transport will terminate at either the services area or Mauds Landing and not continue on into either Coral Bay or Cardabia Homestead.

Accordingly it is concluded that noise emissions during both the construction and operation phases of the project will comply with the regulations at all residences and at all times.

Transport Risk

This factor relates to the operation of heavy transport for the construction and servicing of the proposed resort, and the preservation and improvement requirements for local and main roads that will carry the bulk of this material or produce.

Heavy vehicle traffic is anticipated to increase by 60 movements during peak construction and 20 movements during the operational phase. All vehicles will be road licensed, and meet Australian Design Regulations (ADR). Heavy vehicles will not enter the existing Coral Bay settlement but will terminate either at the services area or at the proposed resort site.

In summary, the average number of heavy vehicle movements each day on Coral Bay Road during the early stages of construction (coinciding with armour stone transport and placement) will increase from the predicted level of 46 to 111. An increase in traffic between the proposed quarry at Learmonth down the Manilya-Exmouth Road, from a predicted 22 heavy vehicle movements to 73, will occur. A further increase of 12 heavy vehicles travelling north from Minilya Highway is anticipated, with the predicted number increasing from 43 to 55 during the peak construction period.

Following haulage of armour stone, heavy vehicle movements related to construction activities on the Coral Bay Road and the Manilya-Exmouth Road north, are anticipated to reduce to approximately 73 and 41 journeys each day.

The increase in truck movements associated with the construction and the operational phases of the Coral Coast Resort also coincides with the general increase in road traffic along the road network. Noise levels associated with the additional truck movements are unlikely to impact on community members as the trucks will not pass through any residential areas.

Armour stone and construction material haulage routes both on Coral Bay Road and north of the Coral Bay Road turnoff on the Manilya-Exmouth Road coincide with those travelled by school buses. Tourist traffic on the Manilya-Exmouth Road both north and south, and Coral Bay Road may also be affected.

Scheduling of material deliveries may be able to be adjusted to minimise conflicts with other road users. Improvement works such as widening, overlay, reconstruction, realignment, sealing and the construction of specific traffic calming devices in critical areas will be agreed upon with Main Roads WA and the Shires of Carnarvon and Exmouth.

Ausroads is the association of Australian and New Zealand road transport and traffic authorities. Ausroads produce a series of publications that identify best practice in road safety design construction and management practice, including:

AP-1/89 *Rural Road Design.*
AP11 *Guide to Traffic Engineering Practice.*
AP-12/91 *Road Maintenance Practice.*

CCMD will construct all roads, slip lanes and undertake traffic calming measures to the requirements of MRWA and the Shire of Carnarvon and be consistent with Ausroads standards and best practice guidelines.

Construction Management Strategies

Develop and implement a Construction Management Plan, in consultation with the DEP and the Shire of Carnarvon including but not limited to the following elements:

dust management procedures;

noise management procedures;

€ development and maintenance of safe roads within the project area.

Comments on Relevance of Factor

Given the distances between the proposal site and sensitive premises, the termination of traffic before it reaches Coral Bay, and undertaking to develop and implement a construction management plan, it is considered that the proposal can be implemented to meet the EPA's objectives in relation to construction impacts.

5.5 Air Quality

EPA Objective

During Operations: *Ensure that gaseous emissions do not adversely affect the environment or health, welfare and amenity of nearby land users by meeting the requirements of the National Environmental Protection Measure (NEPM) for Ambient Air Quality (NEPC 1998) and acceptable standards.*

During Construction: *To protect the surrounding land users such that dust emissions will not adversely impact upon their welfare and amenity or cause health problems and meet the requirements in EPA Policies, Guidelines and Criteria for EIA No 18, Air Quality Impacts from Development Sites.*

Dust during construction has been discussed above in Section 5.5 (Construction Impacts).

Applicable Standards, Guidelines or Procedures

Standards and goals for ambient air quality are given in the National Environmental Protection Measure (NEPM) for Ambient Air Quality (NEPC 1998). These values are presented in Table 11 below.

**TABLE 11
NEPM STANDARDS AND GOALS**

Pollutant	Averaging Period	Maximum Concⁿ Ppm ($\mu\text{g}/\text{m}^3$) unless otherwise stated	Goal within 10 years Max. allowable exceedance
Carbon monoxide	8 hours	9.0 ppm (11.25mg/m ³)	1 day a year
Nitrogen dioxide	1 hour	0.12 ppm (246)	1 day a year
	1 year	0.03 ppm (61)	None
Photochemical	1 hour	0.10 ppm (214)	1 day a year
Oxidants (as ozone)	4 hour	0.08 ppm (171)	1 day a year
Sulfur dioxide	1 hour	0.20 ppm (572)	1 day a year
	1 day	0.08 ppm (228)	1 day a year
	1 year	0.02 ppm (57)	None
Lead	1 year	0.50 $\mu\text{g}/\text{m}^3$	None
Particles as PM 10	1 day	50 $\mu\text{g}/\text{m}^3$	5 days a year

Notes: modified from Schedule 2, NEPC 1998
Refer to the full document for definitions

Existing Environment

The nearest residence is located approximately 1.8km west of the nearest boundary of the power station. Wind rose data for Cardabia Station show a dominance from the south in the afternoon, with a higher frequency of winds recorded from the east. Periodic heavy rain and thunderstorms dominates wet season conditions.

Assessment and Discussion of Management

The power station emissions are considered to be the most significant influence on the air quality of the Service Area. The power station operations are described in Section 3.4. When the final generator configuration and fuel type has been chosen, detailed air modelling will be undertaken to predict emissions, especially NO_x, SO_x, CO, CO₂ and particulates.

A general discussion of typical emissions follows, based on similar operations, assuming the Services Area power station will be primarily gas fired with diesel as dual fuel or back up.

The combustion of natural gas (mostly propane and butane) will produce hot waste gases consisting mostly of nitrogen, oxygen, carbon dioxide and water vapour. Whilst the emissions are effectively free of the sulphur compounds and particulates that are traditionally associated with coal and oil fired power station emissions, they do contain oxides of nitrogen (NO_x).

Gas fired engines also emit minor quantities of carbon monoxide and unburnt hydrocarbons at levels (typically 10-20ppm by volume of exhaust gas) which have negligible environmental significance at low concentrations.

During operation, based on the relative emissions calculated from the model and the NEPM standards (Table 11), the only pollutant of potential concern is likely to be NO_x and dust.

NO_x

For the power station, the pollutant of concern is likely to be NO₂, the reactive component of NO_x. For diesel engines, the NO_x released primarily exists as NO with less than 10% NO₂. Upon release, the NO is converted to NO₂ by chemical reactions as the plume is transported down wind. Assessment of the NO₂ percentage in NO_x at Kwinana using monitoring (Dames & Moore 1993) and from modelling of the Pinjar gas turbine plumes (Bowman Bishaw & Gorham 1990), indicates that approximately 50% will be an upper limit for concentrations of NO₂ at ground level.

For emission sources from the proposed power station, which consist of buoyant plumes from low stacks, the following dispersion processes are considered important:

convective conditions, especially with a low inversion, where the plume may be mixed to the ground within 1km from the stacks; and

enhanced plume dispersal and reduced plume rise due to the disturbed airflow around nearby structures partially “trapping” the plume. This may potentially generate relatively high concentrations, very close to the stack if there are large buildings close by in the Service Area.

To estimate concentrations under these scenarios an dispersion model such as Ausplume v5.1 is recommended. This version is an update of the Ausplume v4.0, which incorporates the algorithms for estimating the impacts of adjacent structures on plume dispersion from ISC-PRIME.

Due to the cleaner burning characteristics of LPG gas, the prevalent wind speeds, the low generating capacity and the indicative stack heights, emissions complying with the NEPM are expected. Once generating requirements are finalised, fuel feed rates defined and modelling complete, the results of the modelling will be used to ensure compliant equipment selection, the need (if any) for additional pollution abatement measures, the design of any noise reduction bunding to avoid inversions, recommended power station layout etc.

Air Quality Management Strategies

1. Modern primarily gas fired diesel engines will be installed that meet the EPA’s emission criteria.
2. Once the equipment has been short-listed, model the proposed power station configuration to confirm compliance with the NEPM.
3. To develop and implement an EMP for the CCMR, including but not limited to:
 - € Control of gaseous emissions.

- € Develop monitoring programs for gaseous emissions from the power station during commissioning and if necessary, on occasion during operation.

Comments on Relevance of Factor

Given the cleaner burning characteristics of modern gas fired diesel engines compared to solely diesel generators, the relatively low generating capacity, the distance to the nearest residents, the average wind speed, the undertaking to model the final engine selection and to ensure compliance with the NEPM and EPA (dust) criteria, it is considered that the EPA's objective for this factor will be met.

5.6 Public Health and Safety

EPA Objective

Ensure that risk is as low as reasonably achievable and complies with the requirements in EPA Policies, Guidelines and Criteria for EIA No. 2, *Guideline for Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant*.

Ensure that transportation and storage of fuels complies with the Australian Dangerous Goods Code so as to ensure that risk is as low as reasonably achievable.

Applicable Standards, Guidelines or Procedures

EPA Policies, Guidelines and Criteria for EIA No. 2, *Guideline for Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant* (EPA 2000). Relevant criteria are:

- € A risk level in residential zones of one in a million per year or less, is so small as to be acceptable to the EPA.
- € A risk level in 'sensitive developments', such as hospitals, schools, childcare, aged care housing developments of between one half in a million per year is so small as to be acceptable to the EPA.
- € Risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry, and the cumulative risk level posed on an industry should not exceed a target of one hundred in a million per year.
- € A risk level for any non-industrial activity located in buffer zones between individual industrial facilities and residential zones of ten in a million per year or lower, is so small as to be acceptable to the EPA.

Assessment and Discussion of Management

Major hazards in the Services Area relate to the power station activities – the storage and use of significant quantities of LPG and distillate, and the transport (including road train unloading) of these fuels.

Power Station Site

The fuel storage capacities for the power station and the Resort will be defined in detail once the Project has been approved in principal. Nominally this is assumed to be 2 x 150kL LPG bullets and 2 x 300kL diesel storage tanks. Risk from the bulk storage of LPG and distillate as well as the operation of the generating plant can be managed by proper land use planning, plant design, commissioning and operation and if necessary, by extending the site boundaries.

Once the components of the power station have been defined in detail, a site specific risk assessment will be undertaken.

To determine the hazards associated with the proposed operation, a Quantitative Risk Assessment (QRA) will be undertaken. The QRA will address a number of generic hazards (loss of containment, impact, severe weather, fire, major equipment failure, working environment etc). For each of these hazards, consideration will be given to whether the hazard can occur. If the hazard can occur, the following will then be identified: potential causes, consequences, prevention, detection, control and mitigation measures. As necessary, recommendations will be made to address areas of concern.

It is recommended that a model such as BP Cirrus version 6.1 risk package be used to determine the risk contours and check compliance with the EPA criteria. The contours will be shaped depending on the location of the LPG storage tank and the LPG unloading facilities, the generators, quantities and types of other chemicals/fuels on site etc.

Based on similar size power stations in industrial areas, it is likely that the area of the site considered (2ha) in the CCR Services Area is sufficient to contain all unacceptable risk as it is located in an industrial area (the 50 in a million contour should fall within the boundary fence). This will however be affected by the amount of fuel storage, the type of fuel stored, whether under or above ground and the location of the storage facilities within the site. If necessary, the boundary fence may be increased into the general services site and fuel storage design re-addressed. The contour related to risk to the public (the 10 in a million contour as defined in the EPA Guidance) must likewise be checked.

Further recommendations based on the QRA will relate to:

- € The location of the LPG road train loading operation within the site.
- € Egress in the event of a major fire.

- € Consultation with fire and emergency services early in the development of the project.
- € Need for regular fire fighting, emergency (including evacuation) procedures for workers and local Fire and Emergency Services personnel.
- € Design and location of the LPG vessels relative to the boundary of the property.
- € Storage of other flammable liquids on site.
- € Need to continually evaluate risk reduction measures to ensure operational risks are as low as reasonably practical.

The following generic safety measures will be implemented at the power station:

- € Gas detectors will be installed to detect gas leaks in the facility. Infrared flash/flash sensors will also be installed. Together, these systems will shut down and protect the plant in the event of a gas leak and or a fire.
- € Where applicable, all storage areas will be constructed to comply with the Dangerous Wastes Regulations and Australian Standards. The facility may be required to comply with Control of Major Hazard Facilities NOHSC: 2016 (1996) depending on equipment selection, fuel type and storage quantities.
- € The LPG, lube oil and distillate storage shall comply with the required separation distances from the site boundary and other equipment.
- € All diesel tanks with a combined storage capacity larger than 5000L are to be banded to contain at least 100% of the capacity of the largest container in accordance with AS 1940 "The Storage and Handling of Flammable and Combustible Liquids". Transformers and liquid fuel tanks will also be banded according to Australian Standards.

Aside from stored hydrocarbons, there is minimal stored energy in the form of compressed air or hydraulic systems. Appropriate storage for the following typical quantities of chemicals will be provided: lubricating oils (10kL), waste oil (5kL), nitrogen (4m³), acetylene (1.5m³), oxygen (2 m³), inhibitor cooling water (100L), detergent (5L), degreaser (10L), paint (4L) and thinners (5L). Public access to the site will be limited by perimeter fencing and hazards indicated by signage using accepted practice.

The site will be designed to meet Fire and Emergency Services Authority of Western Australian and fire extinguishers will be strategically sited throughout the facility. A fire control plan will be developed before the facility is commissioned.

The protection of the Power Station from fire and gas leakage shall be achieved primarily by sound facility design and operational practices, which will ensure that the possibility of the outbreak of fire and leakage of LPG is minimised. The Power

Station shall have a fire fighting and gas leakage protection facility with the following items:

1. Gas detectors selected and installed in accordance with appropriate standards in all areas where gas leakage could occur.
2. Fire detectors (UV and thermal) installed in generation enclosures and control rooms, and fuel handling facilities in accordance with appropriate standards requirements. Fire detection system will be based on opposing risks for response to alarms to reduce spurious trips and multiple circuits to ensure a high level of protection.
3. Fire Alarm and warning system (audible sirens and flashing lights) to appropriate standards with remote alarm signal to pagers and a central control centre.
4. Portable fire extinguishers selected and located in accordance with appropriate standards.
5. The fire and gas detection system alarms shall be interlocked with emergency shutdown valves to automatically isolate fuel supply to alarmed areas.
6. Training in fire fighting, emergencies and evacuation shall be provided regularly to workers on site. This shall include the local fire brigade when ever possible.

With respect to Occupational Health and Safety, the proponent has undertaken to develop management strategies along such philosophies as described in AS 4801, AS 4804 and the ISO 14000 series of documents.

Transport

An assessment of transport risk related to the LPG and distillate deliveries will be undertaken when the transport route and frequency of deliveries (ie power station requirements and storage facilities) are defined. The impact on the total traffic on the transport route will be assessed.

The road tanker transport, handling, storage and emergency procedures for LPG and any bulk fuel will comply with the appropriate standards.

Transport Risk Assessment

Subject to the results of screening study, a HAZID may be required to determine the risks associated with the transport of large quantities LPG. The HAZID will address a number of generic hazards (loss of containment, impact, severe weather, fire, major equipment failure, working environment, other). For each of these hazards, consideration will be given to whether the hazard can occur. If the hazard can occur, the following will be identified: potential causes, consequences, prevention, detection, control and mitigation measures. As necessary, recommendations will address areas of concern.

The results of the risk assessment will determine the level of risk for transportation of LPG. It is likely the risk assessment for transportation will indicate that the worst case situation will be a collision involving a fully laden road tanker in a densely populated area. Prevention of this would rely on the training and competence of the tanker driver, road/weather conditions, condition of the vehicle and the amount of time spent driving through populated areas. To reduce this risk to 'as low as reasonably practical' (ALARP), it is recommended that the route selection ensures minimum travel through built up areas. To ensure the drivers have appropriate training and competence, routine auditing and 'testing' of driver skills will be considered.

Based on the results of the risk assessment a Transport Safety Management System (SMS) shall be developed. The overall aim of the SMS is to detail the procedures to be adopted and actions required during all phases of emergency response management. The SMS will provide the following:

- € Implement an underlying system of risk management and accident prevention.
- € Provide sufficient instruction to effectively deal with the transportation emergency.
- € A plan of action that is acceptable to the proponents, Department of Mineral and Petroleum Resources, Department of Transport and Government Emergency Response Agencies.
- € Minimisation of risk to the public, contractors, employees, members of Emergency Response Services, property or the environment.
- € Regular emergency exercises.
- € Use of satellite phones to ensure continuous communication with the emergency centre.

All transportation of LPG will be undertaken in accordance with the following legislation and codes:

- € Explosives and Dangerous Goods Act 1961 (WA).
- € Dangerous Goods (Transport) (Road and Rail) Regulations 1999, (WA). These regulations call up the requirements of the ADG Code 6th edition.
- € Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) 6th Edition (1998) Federal Office of Road Safety (Transport and Communications).
- € Mine Safety and Inspection Act 1994 (WA).
- € Mine Safety and Inspection Regulations 1995 (WA).

- € Occupational Safety and Health Regulations 1996 (WA).
- € Environmental Protection Act 1986 (WA).

Public Health and Safety Strategies

1. Once generating capacities are known and equipment layout is being designed, ensure that the 50 in a million contour (EPA criteria for an industrial area) falls entirely within the fenced boundary of the power station.
2. Design and manage all elements of the project such that individual risk is as low as reasonably practicable.
3. Develop and implement health and safety components of the site EMP, for the Power Station site including but not limited to:
 - € Develop and implement a Transport SMS for the transport of LPG from Carnarvon or Karratha to the Services Area.
 - € Develop Occupational Health and Safety management strategies along such philosophies as described in AS 4801, AS 4804 and the ISO 14000 series of documents
 - € Site Environmental Management System consistent with the ISO 14000 series objectives & practices.
 - € Site Safety Management System consistent with Work Safe WA objectives and practices.
 - € Site Quality Management System consistent with the ISO 9001 objectives and practices.
 - € A Fire Control Plan will be prepared for the power station in accordance with the requirements of the Fire and Emergency Services.

Comments on Relevance of Factor

Given a full risk assessment will be undertaken to ensure the appropriate risk contours fall within a fenced boundary, the risk assessment of the fuel transport will be undertaken, the development of the SMS and implementation of ALARP principles, it is considered that the EPA's objective for this factor will be met.

6. OVERALL ENVIRONMENTAL MANAGEMENT SYSTEM

6.1 Overview

An environmental management system (EMS) is a structured approach to ensuring sound environmental management in industrial or other activities, including the adoption of pollution prevention techniques and the mitigation of negative environmental impacts. Poor management is often the basic cause of poor environmental performance. Accordingly the adoption of measures that improve management can be viewed as positive in reducing environmental impacts.

The practical application of EMS has, until now, been mainly within large enterprises with a specific focus on industrial activities. A set of specifications and standards, under the umbrella of ISO 14001, has been developed as the proposed common international EMS framework.

6.2 Implementation of Environmental Management Systems for CCR

It is proposed that health, safety and environmental management plans for the CCR including the Services Area, will comply with OHSAS 18001 and ISO 14001. This system will facilitate the management of the Occupational Health, Safety and environmental risks associated with the construction and operation of the CCR. Management systems will include the organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the proposed Occupational Health, Safety and Environmental policy.

Relevant EMS plans and procedures will be developed by CCMD in consultation with ATA Environmental and major consortium members.

Major consortium members, Brown and Root Services Pty Ltd and Clough Engineering Ltd, (resort construction) and Brown and Root Services Asia Pacific Pty Ltd (utilities and services provider, asset manager and facilities maintenance) each hold certification under ISO 9000 group of documents.

7. CONCLUSIONS

Many of the design specifications and individual items of equipment will only be finalised once the Project has been approved in principal. Hence the management strategies are general in nature.

The Services Area Environmental Assessment and Management Plan is a preliminary document. It provides a general conceptual assessment of potential environmental impacts and proposes indicative management strategies. This document will be updated and finalised once the Coral Coast Resort Project has been approved in principal.

Following approval, the details of the landfill facility within the Services Area will be developed in order for the facility to be approved and licensed under Part V of the *Environmental Protection Act*. Likewise, for the wastewater treatment facilities, as when wastewater treatment plants exceed set criteria, they are also required to be licensed under the *Environmental Protection Act*. The power station, depending on fuel consumption, may require Works Approval and licensing.

The Environmental Management Program (EMP) for the whole project will include the details of the facilities in the Services Area.

Many of the indicative management strategies will be developed jointly with the management commitments for the Resort and Marina such as the vegetation management plans and cultural heritage protocols. Others are specific to the Services Area such as for the power station site - the strategies for undertaking air quality modelling, ensuring equipment complies with EPA criteria and public safety risk assessments. These issues will be re-visited once approval for the Project as a whole has been obtained and the design specifications developed.

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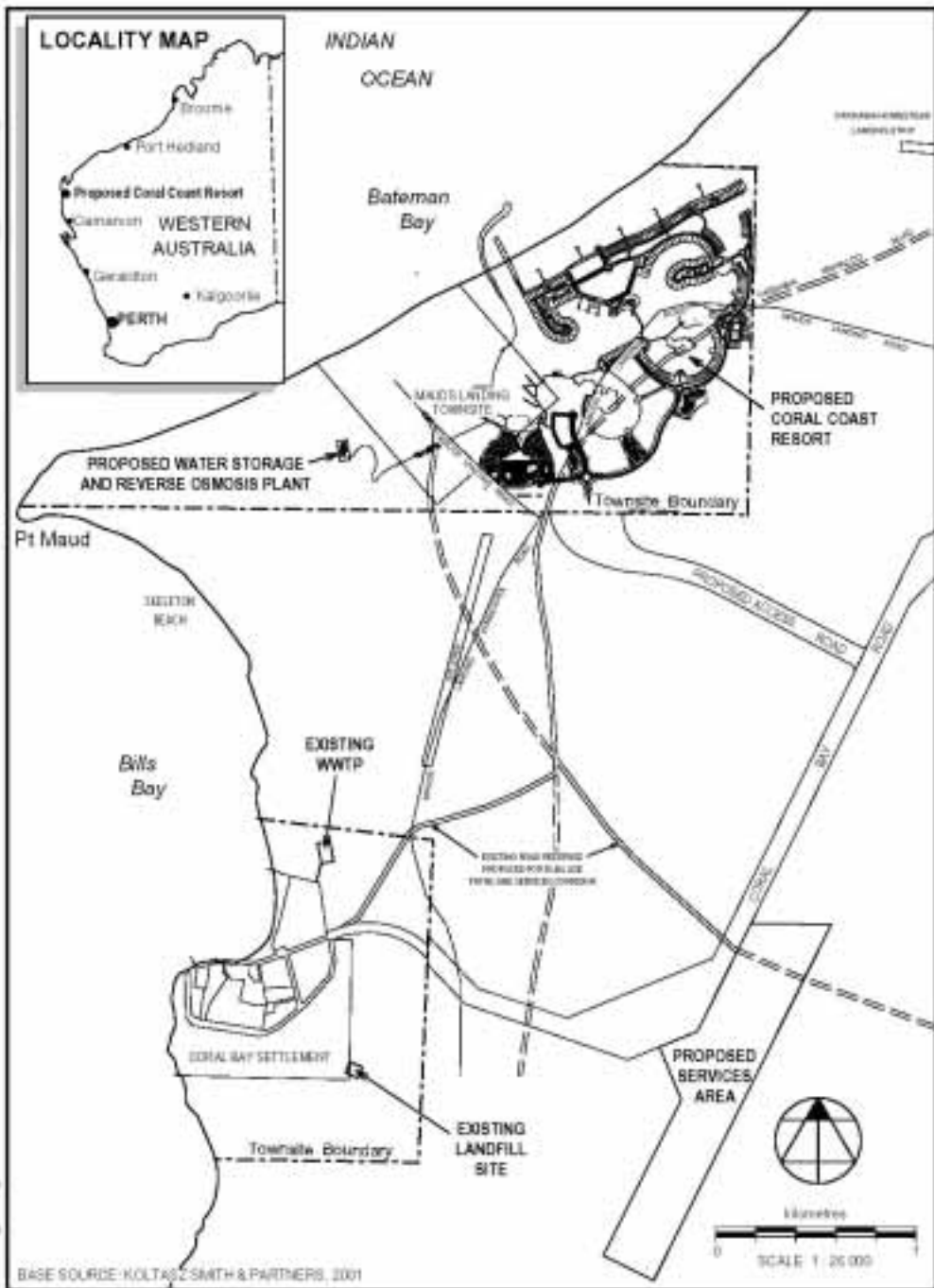
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FIGURES

PRINTED: Wed 18/04/02



2001/02_MH1.dwg DATUM: AMS DRAWN: GJM 10/6/02 CHECKED: HS 14/6/02

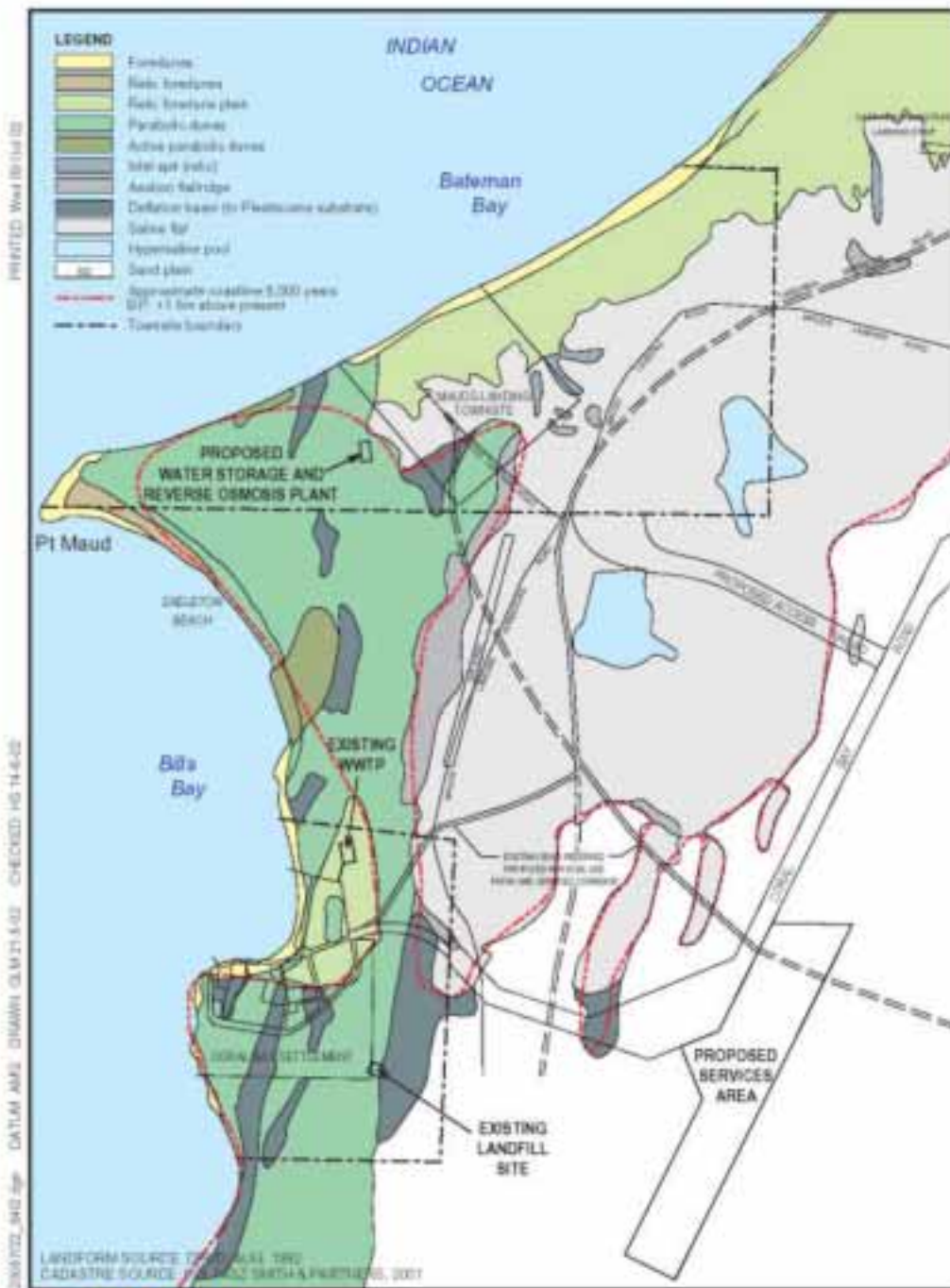
BASE SOURCE: KOLTASZ SMITH & PARTNERS, 2001



CORAL COAST RESORT - SERVICES AREA

LOCATION

FIGURE 1



PRINTED: Wed 09 Oct 02

2005/02_010_00 DAYUM AMJ DRAWN: GJM:22-02 CHECKED: HS 14-02

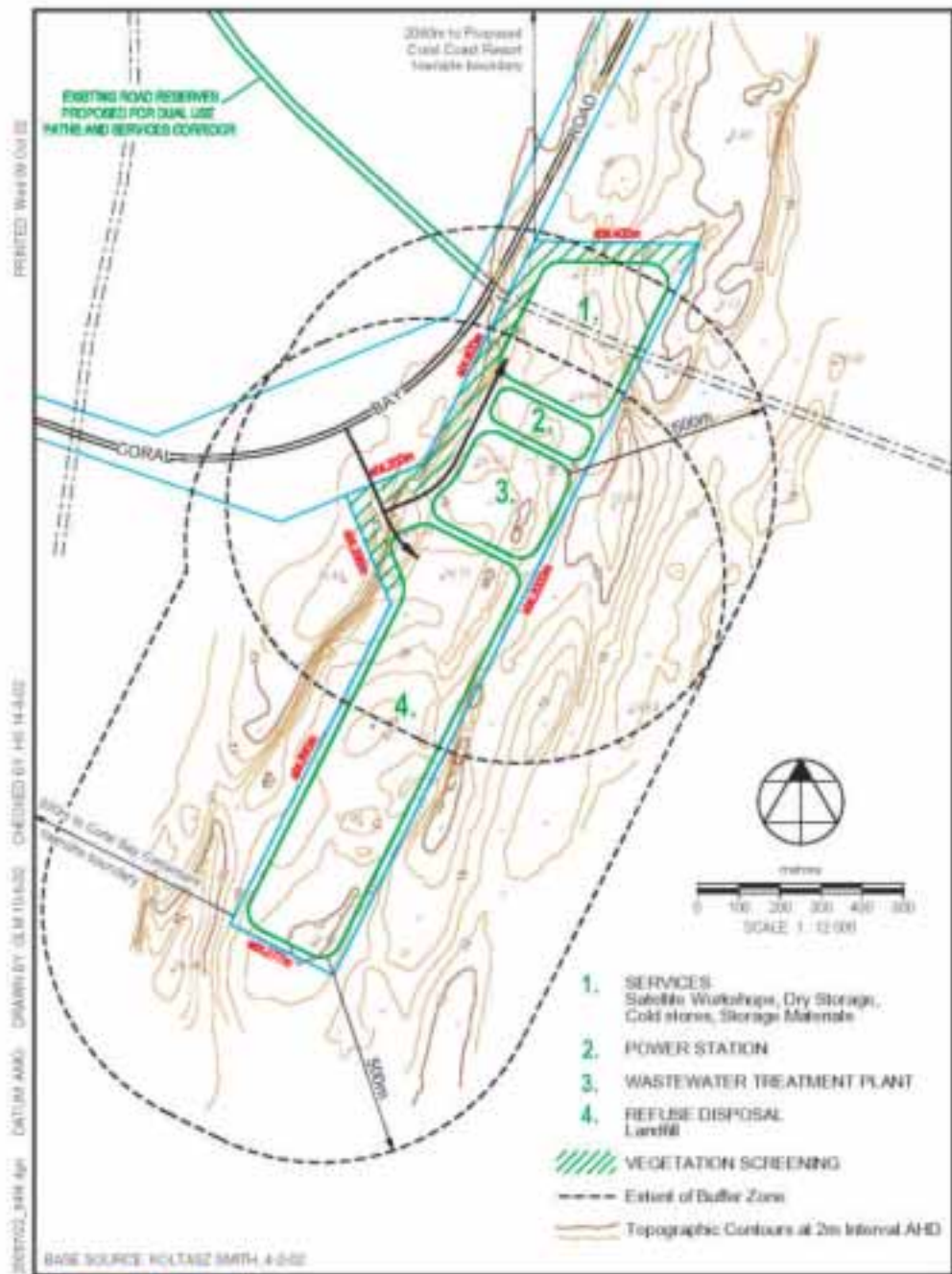


SOURCE: Services RELEASE SMITH & PARTNERS
Mauds Landing Townsite BOWMAN BISHAW (BORMAN) AFTER ECOLOGIA, 1994



CORAL COAST RESORT - SERVICES AREA
VEGETATION AND FAUNAL HABITATS

FIGURE 3



CORAL COAST RESORT - SERVICES AREA
SERVICES AREA LAYOUT

FIGURE 4

APPENDIX 5

BIRD MONITORING DATA – SUPPLIED BY CALM EXMOUTH REGIONAL OFFICE

Monthly seabird monitoring – Pt Maud 2001 (allow 45 mins. walk from northern sanctuary sign)

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Date/Time		18th/1200	8th/1100									
Tide (1,2,3or4)		4	1									
Wind/weather		15/18 SW	calm									
<i>Any disturbance?</i>												
Giant Petrel												
Wedge-tailed Shearwater												
Pelican												
Sanderling			30									
Ruddy Turnstone												
Total No. of Terns												
Silver Tern												
Caspian Tern			15									
Bridled Tern												
White winged black tern												
Common Tern		4000	3000									
Sooty Tern												
Crested Tern		12	50									
Lesser Crested Tern												
Fairy Tern												
Sandpiper												
Other waders												
Unidentified birds												
Cormorant		18	2									
Silver Gulls			8									

Tide 1=High, 2=Ebbing, 3= Low, 4=rising
 Counted by?

Counted by?	CW	AM	AM	CW		CW/FS	CW	AM	CW	CW
Historical Seabird monitoring - Pt Maud										

	1990	1991	1999
Date/Time	22-Aug	3-Feb	5-Oct
Wind/weather		1815hrs	1310 hrs
<i>Any disturbance?</i>			Dog tracks
Giant Petrel			
Wedge-tailed Shearwater			
Pelican			
Pied Oystercatcher			
Sanderling			15
Ruddy Turnstone			
Total No. of Terns			
Silver Tern		6	
Caspian Tern	600		
Bridled Tern			
White winged black tern		120	
Common Tern		800	150
Sooty Tern			
Crested Tern	1500	3	30
Lesser Crested Tern	400		
Fairy Tern	1000		
Sandpiper			
Other waders			
Unidentified birds			1(Plover)
Counted by?	Mary Bremner	Sue Osborne	C Williams