Cape Peron Ocean Outlet Metropolitan Water Supply, Sewerage and Drainage Board.

Report and Recommendations by the Environmental Protection Authority.

Department of Conservation and Environment, Western Australia
Bulletin 114
May 1982

ENVIRONMENTAL PROTECTION AUTHORITY
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HON MINISTER FOR CONSERVATION
AND THE ENVIRONMENT

Your Ref.
Our Ref. 97/77

My Dear Minister

The Environmental Review and Management Program prepared by the Metropolitan Water Supply, Sewerage and Drainage Board for its Cape Peron Ocean Outlet Project has been considered by the Environmental Protection Authority following submissions by the public and Government departments.

Please find attached the Authority's report and recommendations. Your concurrence is sought for the EPA to publish the report and recommendations.

Yours sincerely

A R MAIN
CHAIRMAN

20 May 1982

Att

CAPE PERON OCEAN OUTLET

METROPOLITAN WATER SUPPLY, SEWERAGE AND DRAINAGE BOARD.

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C O N T E N T S

SUMMARY

A regional wastewater disposal system has been developed for Perth's southern suburbs which leads to a wastewater treatment plant at Woodman Point. Effluent is discharged into Cockburn Sound. This discharge has had a serious deleterious effect on the water quality of the Sound. This resulted in the Cockburn Sound Environmental Study recommending either advanced secondary treatment or ocean discharge.

A new larger wastewater treatment plant is now being built at Woodman Point. This plant has a planned capacity to treat 125 mld which is the estimated flow in the year 2001.

The MWB has produced an ERMP which examined the effluent disposal options for the new wastewater plant. The preferred option is to pump the effluent through a 23 km pipeline to a transition tower at Cape Peron then for it to gravitate down a 4 km submarine pipeline to a diffuser on the sea bed 20 m below the surface of the Sepia Depression.

This proposal has been prepared on the basis of the discharge meeting Water Quality Criteria for a number of beneficial use areas allocated to the region. This approach ensures that all existing water users are protected from adverse environmental changes caused by the discharge.

The proposal is supported by a comprehensive environmental study which used computer based predictive models. It will be necessary to monitor the scheme in operation to ensure that it achieves the predicted performance levels.

This ongoing monitoring programme is also necessary because the volume of effluent will increase as the population of the catchment grows.

A number of alternative disposal systems were examined in the ERMP, these covered both land disposal and marine outlets. None of these alternatives could be shown to have any environmental and/or cost advantage over the preferred option.

The EPA considers that the MWB has gathered sufficient data to support its claims for the performance of the proposed outlet. On the basis of the evidence presented in the ERMP and supporting documents and after careful consideration of the submissions made to it by the public and Government Departments, the EPA has found that the proposal is environmentally acceptable providing a number of conditions, including a detailed monitoring programme are agreed to by the MWB.

1. Background

As the Perth Metropolitan population grows, the requirement for wastewater disposal also increases. The original septic tank disposal systems are not capable of adequately disposing of the waste and have caused environmental, social and health problems in many areas.

Government Policy is now such that nearly all new subdivisions must be deep sewered, in addition, there is a programme to deep sewer areas formerly served by septic tanks.

The wastewater collected by these sewers is treated at various plants around the metropolitan area to varying degrees before disposal on land or at sea.

Wastewater from the majority of Southern suburbs is fed to the Woodman point plant which discharges into Cockburn Sound. The existing plant is approaching its capacity and so the Board has, after considerable study, decided to build a new, larger plant adjacent to the existing one. This new plant's waste would have discharged into Cockburn Sound through a new outlet. However, the Cockburn Sound Environmental Study (1976-79) showed that one of the significant causes of the deterioration of the Sound's water quality was the nutrient and bacterial input from the Woodman Point plant effluent. The Study recommended that the discharge be either upgraded by further treatment or disposed of by an ocean outfall. These options were studied by the Board and it decided that the ocean outfall option was both cheaper and more acceptable environmentally than advanced secondary treatment with disposal to either Cockburn Sound or Owen anchorage.

The EPA received a Notice of Intent from the MWB for the ocean outlet proposal and subsequently advised that an ERMP be prepared. The ERMP guidelines were prepared and required consideration of alternative disposal options. These were to include various land disposal systems as well as the various seawater disposal options.

2. The Proposal

The Cape Peron Ocean Outlet Project consists of five major components which are : A pump and control station at Woodman Point, a 23 km buried land pipeline, a transition tower at Cape Peron, a 4 km submarine pipeline terminating in a 316 m diffuser.

2.1. The Pump Station at Woodman Point. This facility will collect, pump and control the effluent from the Woodman Point Wastewater treatment plant through the entire discharge system. It will consist of a large steel framed and clad building housing ultimately four pumps (2 of 150 Mld and 2 of 250 Mld capacity), and two covered storage and balancing sumps with a combined capacity of 1,900 m^3.

The proposed site is on land owned by the MWB within the existing Woodman Point Wastewater Treatment Plant site. The existing Cockburn Sound outlet will be retained for emergency use and maintenance purposes only.

2.2. The Onshore Pipeline. The pipe will be approximately 23 km. long, will link the pump station to a transition tower at Cape Peron. The pipe will be approximately 1,400 mm internal diameter and made of mild steel with an internal cement mortar lining. All pipe, except for a 50 m section near the Rockingham Road and Conway Road intersection will be buried. The route has been gazetted and will involve mainly easements passing through a wide range of land tenure. However, there are 5 areas of environmental importance where the route passes through areas with important landscape and/or vegetation elements. These are identified in the ERMP and special construction and restoration measures will be applied.

There will also be a number of auxilliary features on the pipeline which will remain visible after construction. Up to 25 gas release points will be required from which a tanker will remove gas and some liquid from the pipe on a regular maintenance cycle. Gas release points will have 900 x 500 mm concrete covers close to ground level, but will require access roads. They will be remote from residential areas.

Drain points will also be required. The number and location is yet to be decided. The drain valves will be housed in concrete covered manholes flush with the ground. They are required so that sections of the pipeline can be drained to carry out maintenance or repairs, their use would be extremely rare.

Oxygen injection installations will be required 1.5 km and 2.3 km upstream of the transition tower to ensure that effluent is "fresh" (not odorous) when it reaches the tower. They will consist of 4.8 m x 2.1 m liquid oxygen tanks and a small dissolving system in a fenced enclosure with road access.

2.3. The Transition Tower : This forms the junction between the onshore and offshore pipelines and is required for the control of the two pipe systems. It would consist of a large concrete structure 14 m high and 7 m x 5 m in plan. It would be on land already vested in the MWB.

2.4. The Offshore Pipeline : This will consist of a submarine pipe partly buried and partly exposed, 4 km. long with an internal diameter of 1,400 mm. It is most likely to be a steel pipe with cement mortar lining and an external concrete weight coating. It would be laid by the bottom pull technique. Special attention will be given to corrosion control and pipe stability on the sea bed in the final design.

After leaving the base of the transition tower, the pipe will be laid in a trench cut through the coastal dunes. After the pipe pulling operation the coast and dunes will be fully restored.

The first 1,250 m of pipe from the shore will be buried in a trench cut through the sea bed and covered with rockfill to protect it from storm wave activity.

The next 1,150 m of pipe will be laid in an open trench excavated in the sea bed and the final 1,600 m will be partially buried in the seabed which is sandy.

2.5. The Diffuser : 316 m at the end of the pipeline will have 69 ports through which the effluent will be injected into the sea water. To maintain maximum mixing the ports will be progressively opened, some each year, to match increasing effluent flows. The Diffuser will be in 20 m of water and have an initial dilution factor in excess of 100.

Rock armour will be laid around and on the diffuser to prevent scouring of the sea bed.

3 The Water Quality Concept :

3.1 Introductory Remarks

Water quality criteria have a key role in the management of marine and estuarine waters. Such criteria when established permit the formulation of environmental protection policies through which may be made the decisions relating to the management of the water quality in a given area. The need for water quality criteria has emerged as a result of the present, proposed and possible future developments along the coastline of Western Australia.

Following a decision of the Environmental Protection Authority to develop marine and estuarine water quality criteria for Western Australia, a committee was established as the Marine and Estuarine Water Quality Criteria Working Group with the following terms of reference :

"To examine relevant marine and estuarine water quality criteria from Australian authorities and overseas sources and to recommend to the Environmental Protection Authority appropriate criteria for Western Australia, taking into account the various beneficial uses of the waters."

The Committee's report has been published in April, as Bulletin No. 103 by the Department of Conservation and Environment.

Since publication, the Water Quality Criteria have found a ready acceptance throughout not only Western Australia, but also in other States and overseas. Indeed there is an indication that at least one other State is preparing to write the criteria into regulations. They have been particularly welcomed by consultant engineers working in the field of wastewater treatment plant design.

3.2 The Beneficial Uses Concept

The successful management of water quality, or in fact, any other resource, involves the consideration of social, economic, technological, scientific and political factors. In all of these areas the value judgements made at one point in time may well differ from those made at a later point in time. This will be as a result of new scientific knowledge, technological advances and changes in social and political values. The formulation, administration and amendment of policies need to be undertaken so that not only are all of the above considerations taken into account, but changes in the same may also be allowed for.

The most effective means of achieving some sort of control of water quality is through the setting of ambient water standards. These standards need to be set in accordance with the management objectives set out in the policy. Management objectives (expressed as water quality standards) are based on the scientifically derived water quality criteria which ensure the protection of a body of water for any stated beneficial uses. The term "beneficial use" is not defined in the Environmental Protection Act, but is clearly intended to imply uses which require positive management to prevent alteration or degradation to the point where the water is no longer wuitable for such a use. As a result, the EPA's Working Group has adopted the following definition of "beneficial use." :

"A beneficial use is any use of the environment or any element or segment of the environment that is conducive to public benefit, welfare, safety or health. A beneficial use will require protection from the detrimental effects of any direct or indirect alteration of the environment."

When dealing with environmental management through environmental protection policy reference is often made to "Criteria", "Objectives", and "Standards".

To avoid any ambiguity here they have been defined as follows :

"Criteria" means the scientific yardsticks upon which a decision or judgement may be made concerning the ability of water of a given quality to support a designated beneficial use.

"Objectives" represent the desirable, possibly long-term aims or goals of a water quality management programme. Such objectives are often derived after consideration of water quality criteria in the light of economic, social or political factors.

"Standards" are current legally enforceable levels established by an authority. Standards are not necessarily based upon sound scientific knowledge or ideal environmental requirements, but may in fact be established quite arbitrarily in the absence of technical data, and often with a marginal factor of safety.

The criteria are not absolute and unchanging yardsticks of water quality in relation to the various beneficial uses. They should be used with considered judgement and due awareness of other factors which may need to be taken into account, including the natural quality of the water concerned, the kinds of organisms it contains and the local hydrological conditions.

The water quality criteria selected for any beneficial use or level or class of protection within a beneficial use can only be refined in the light of new scientific knowledge. Social, economic, and political considerations can play no part in the selection of such criteria. These factors must be taken into account in the selection of the beneficial uses for which any particular water body is to be protected and the level of protection to be applied.

The decisions and judgements which may be called for on the basis of criteria in this document are often particularly complex when issues of public health are involved. Additional factors requiring consideration may include the origin of bacterial pollution of recreational waters or the methods of food preparation and patterns of consumption of various seafoods. The information may not be readily ascertainable without appropriate investigation.

For these reasons the most valuable function of certain health criteria is to indicate the need for further investigation before a final judgement as to appropriate action is made. Such criteria are designated as "health investigation levels" and set out, in respect of certain parameters that may affect human health directly or indirectly, levels above which the appropriate authority should be notified so that it may investigate the circumstances and advise on any action necessary to prevent the occurrence of a situation potentially dangerous to health. Health investigation levels are thus set below those levels at which a health risk would actually occur.

The Committee has established, for given beneficial uses, criteria which may be used to derive water quality objectives. These criteria should not be used as objectives or standards without further critical examination.

Beneficial uses identified and considered by the Working Group are as follows :

a. Direct Contact Recreation (e.g. bathing, swimming, surfing, water-skiing, skin and scuba diving.)

b. Harvesting of Aquatic Life (excluding Molluscs) for Food.

c. Harvesting of Molluscs for Food.

d. Harvesting of Aquatic Life for Non-edible Uses (e.g. pearls).

e. Passage of Fish and Other Aquatic Life (e.g. migration).

f. Aquaculture of All Forms (fish, molluscs, crustacea, algae, etc.).

   Class 1 - Edible Uses,
   Class 2 - Non-edible Uses.

g. Maintenance and Preservation of Aquatic Ecosystems.

   Class 1 - Maximum level of protection (i.e. natural state)
   Class 2 - High level of protection.
   Class 3 - Minimal level of protection.

h. Maintenance and Preservation of Foreshores and Banks (e.g. protection against erosion of banks).

i. Scientific and Educational Uses.

j. Flushing Water and Water Replenishment (e.g. harbour waters moving further upstream with incoming tide.)

k. Agricultural Water Supply (e.g. after desalination or for irrigation).

l. Potable Water Production (desalination).

m. Recovery of Minerals (e.g. salt).

n. Industrial Water Supply

   Class 1 - Food Processing - Washing and cooking procedures
   Class 2 - Food Processing - In-plant holding procedures.
   Class 3 - Steam Generation, Cooling and Other Processes.

o. Power Generation (e.g. by tides or waves).

p. Navigation and Shipping (e.g. commercial and naval).

Beneficial uses will, of course, vary from area to area. Ideally, the identification of beneficial uses to be protected should take into account the following :

. nature and extent of existing uses,
. anticipated uses and demand pressures,
. factors affecting environmental quality and the degree of use, e.g. land use, point source and diffuse discharges, etc.,
. social and economic consequences of policy objectives, and
. feasibility of attainment.

It should be noted that the sole purpose of identifying beneficial uses for protection is to provide the basis for the derivation of water quality management objectives and not to specify permissible uses, as in land use planning.

Bulletin 103 has proposed a list of water quality criteria for each of the above beneficial uses as well as discussing the requirements and characteristics of the various criteria.

3.3 Beneficial Use, Areas at Cape Peron, & Surrounding Waters.

The Water Quality Criteria have no statutory basis and the EPA is yet to formalise the way in which beneficial use areas are established. The MWB has proposed a series of beneficial use areas for its design work.

These beneficial use areas are shown in the ERMP and are reproduced here in Figure 2. The process by which they were selected is given in the ERMP as follows :

"Beneficial Use Zones

Not all the possible beneficial uses listed in Table 3.2 (as per list on page 7) are considered applicable to the waters off Cape Peron. From the results of the ecological mapping and biota surveys, the following were selected as relevant.

Use No. 1 Direct Contact Recreation (e.g. bathing, swimming, surfing, water skiing and scuba diving).

No. 2 Harvesting of Aquatic Life (excluding Molluscs) for food.

No. 3 Harvesting Molluscs for food.

No. 5 Passage of Fish and other Aquatic Life (e.g. migration).

No. 7 Maintenance and Preservation of Aquatic Ecosystems - Class 2 high level of protection.

No. 8 Maintenance and Preservation of Foreshore and Banks.

No. 9 Scientific and Educational Use.

Further investigation indicated that the four beneficial use classifications shown on Fig. 6.1 (Figure 2 in this report) would adequately define the most stringent criteria likely to apply in any area. i.e. Beneficial Use Numbers 1, 2, 3 and 7 were considered to be critical for this area.

To provide 'targets' for the engineering design and location of the diffuser, boundaries were then selected for each of these beneficial use areas.

- The boundary for Direct Contact Recreation was drawn 1 km offshore from the Western edge of Cape Peron. Bathers or windsurfers would not normally venture beyond this limit. This distance is extremely conservative by world standards but was considered warranted because of the proposed Aquatic Reserve which extends to about this distance and the islands which would fall within the zone. Further zones were provided around the wrecks of the RMS Orizaba, a favourite diving spot on the Five Fathom Bank and the Carlisle Castle on Coventry Reef.

- A zone for Harvesting of Aquatic Life (including Crustacea and Fish) was drawn to correspond with all of the onshore reefs and the Five Fathom Bank. Rock lobster are only found in the Sepia Depression during their brief offshore migration from the nearshore reefs.

- Abalone and mussels are harvested in water less than 2 m deep in the area and a boundary for Mollusc Harvesting for food was set conservatively to correspond to the 5 m contour.

- The whole of the area, including the Sepia Depression was designated for Maintenance and Preservation of Aquatic Ecosystems, Class 2 - High Level of Protection."

The EPA accepts this as a reasonable approach in lieu of a more formalised system which is yet to be developed. However, it is necessary to point out that the beneficial use areas may be subject to changes at some future date.

4. Environmental Issues.

4.1 The Pump and Control Station.

This facility will be built on land owned by the MWB remote from residential areas. The landscaping, tree planting and noise and odour control proposed in the ERMP should ensure that no adverse environmental effects extend beyond the MWB land.

4.2 The Onshore Pipeline

In operation, the onshore pipeline will have virtually no effect on the environment once it has been constructed. There will need to be constant gas removal from the pipe, a feature of all major effluent lines of this type, however, the gas release points will be manually operated and not automatic. The proposed tanker removal system should ensure no odour problem for residents near the line.

In the most unlikely event of a pipe failure or breakage from an external event, the sophisticated control system will ensure a rapid shut down of the pumps and therefore minimal damage to the surroundings. The necessity to drain sections of the pipe for emergency repairs or unforeseen maintenance could cause minor environmental problems if the effluent drained into a wetland or other sensitive area. The EPA will require the MWB to submit for its approval the final location of all drainpoints and the disposal options proposed for them if they were ever to be used. (Recommendation 1.1).

The oxygen injection installationspose a minor hazard because of the possible escape of liquid oxygen especially during refilling operations. The MWB has assured the EPA that they will meet the Australian Standard for the safe handling of cryogenic fluids. The installations should be remote from residential areas both now and in the future.

The major effect of the onshore pipeline will be the disruption caused during the construction work. This will result in some public inconvenience and some environmental effects. Special care will be needed in dealing with groundwater, both the effects of dewatering operations on other users and the disposal of groundwater need careful planning. The five areas of environmental importance described in the ERMP will require special construction and restoration procedures, these should involve further input from both DCE and the Agriculture Department (Recommendations 1.2).

In its submission, the Shire of Rockingham has identified a number of areas under its control which will be affected by the pipeline construction. The EPA sees the need for further consultation between the MWB and Shire to clarify and where possible minimise these effects. (Recommendation 1.3).

4 .3 The Transition Tower

The tower will have a visual impact on the Cape Peron Area. This will be modified by landscaping, tree planting and the existing sand dunes and therefore will not be a significant impact for most residents or visitors.

It could cause an odour problem if not correctly managed. (Recommendation 1.4).

4.4 The Offshore Pipeline

After leaving the transition tower, the pipe will be laid in a trench cut through the coastal dunes, beach and near shore area. The effect of this trench will be considerable and the restoration of this area will require careful planning and future management to ensure its stability. (Recommendation 1.2).

The pipe will then be laid in a trench cut into the sea bed for 1,250 m from the shore. It will then be covered by rock fill. This work will disrupt the local ecosystem and activities such as blasting will cause the death of many marine organisms. Sediment deposition from the activities will also adversely affect many reef communities. However, the EPA considers that there will be no long term effects from this work and that the area will be rapidly recolonised and returned to its original condition.

The final 2,750 m of pipe will be laid in an open trench or in a shallow trench on the sandy sea floor. Minor disruption will occur as the pipe is laid but there will be no long term effects. The pipe route will be inspected by divers every year in spring for any adverse effects or malfunction and results of this inspection will be included in the MWB's report to the EPA. (Recommendation 2.1).

4.5 The Diffuser

The local effect of the diffuser will be considerable with a change in the species distribution reflecting the changed environment and physical conditions. None of these changes are considered significant. The possible effect of bacterial contamination of rock lobsters living in the immediate diffuser zone has been raised by the Department of Fisheries and Wildlife. This possibility would only effect lobsters eaten raw and may not even occur. However as some lobsters are exported live from the region, the Fisheries and Wildlife Department is undertaking research to establish if it is possible for lobsters to be contaminated and if so, how long it will take to decontaminate them in clean water holding tanks. The results of this work will be published. It must be stressed that it is a minor concern as it would only effect lobsters continuously living very close to the diffuser and therefore caught there, and then it would require secondary transfer of the bacteria to the flesh of the lobster which would have to be eaten raw to present any health risk. (Recommendation 2.1).

4.6 The Effect on Water Quality

The disposal of large quantities of primary treated effluent into the sea is obviously an environmentally sensitive issue, and it is also a controversial one. This has been shown by the very large public response to the ERMP.

This concern is in part a result of past unsatisfactory practices for sewage disposal. Throughout Australia and in many overseas countries, rivers, lakes and coastal waters have been polluted and water quality lowered by waste water discharges. Whilst small discharges may cause insignificant problems, as the volume is increased, the effects become more and more significant until major environmental problems are generated. Often major capital works are required to correct the situation.

The Cockburn Sound Environmental Study has clearly shown that the existing effluent discharge has contributed to the environmental degradation of the Sound. The waters of the Sound are poorly flushed and are simply not capable of assimilating the pollution load being placed upon them. By moving the discharge to the Sepia depression it has been established that better mixing and dispersion will be achieved and only minor long term environmental changes will occur.

However, to the people who live in the area the proposal is obviously a source of considerable concern. Many of the submissions were from long term residents of the Rockingham area who have seen Cockburn Sound deteriorate over the years as a result of increasing pollution from many sources. They have seen areas such as Palm Beach change from a very pleasant recreation beach with clear water and clean sand to its present unsatisfactory condition. They have also witnessed the effects on the marine life of the Sound. Because of this there is the obvious fear that this proposal will be the start of the same sort of degradation process in Warnbro Sound and Shoalwater bay.

This attitude is clearly illustrated by the public response to the ERMP with some 40% of responses raising the issue of beach and near shore pollution, and 31% referring to the existing Cockburn Sound problems.

The EPA can understand the reasons for the local concern about the proposal, and recognises its responsibility to carefully examine the proposal in an objective and scientific manner.

The EPA considers that the Board has presented sufficient evidence to show that the overall concept of disposing of this large volume of waste in the waters of Sepia Depression is environmentally sound. The Board has shown that the discharge should not cause the water quality in any of the beneficial use zones to fall below the proposed Water Quality Criteria for those use zones. The EPA is also completely satisfied that there will be no adverse effects on the condition of any of the area's beaches or near shore waters due to this proposal.

The studies undertaken by the Board in preparing the ERMP have been based on its own extensive data collection and historical data from other sources. The predictions on the resulting water quality in the various beneficial use zones has been carried out using a computer based model which can examine the many variables involved. The EPA accepts these results as a reasonable and conservative estimate of the effects which would occur if a real discharge was to take place. However, it is essential that these predictions be validated should the proposal proceed. This will involve considerable monitoring of the waters around the discharge at various times of the year and input to the computer model of more real data.

Parameters such as bacterial die-off rates are estimated (based on data from other discharge sites), and therefore there is some doubt as to their precision. The EPA however, believes that the estimates made are reasonable and that the model studies have shown sufficient margins exist to accommodate the changes likely to occur should the discharge commence.

There has been public concern expressed about possible bacterial and viral contamination of the coastal waters leading to health problems for swimmers. The EPA considers that the Water Quality Criteria for Beneficial Use 1, Direct Contact Recreation, are adequate to protect swimmers from health risks. The model studies undertaken by the Board have shown that under all known weather conditions the proposed discharge would not result in bacterial levels rising above the criteria level anywhere within the Direct Contact Recreation Use area.

The Public Health Department, The Shire of Rockingham and the MWB will continue their monitoring programmes at local beaches to ensure that the criteria are met and that bacterial levels are safe for swimmers. There has been some public criticism of the bacterial die-off rate used by the Board in the ERMP. The EPA accepts the Board's estimates are reasonable under the proposed conditions, however, it also believes that the Board must carry out detailed monitoring as soon as the discharge commences to establish real die-off rates under various conditions and that a full reassessment of bacterial levels be undertaken and submitted to the EPA for consideration after the first year's operation. (Recommendation 2.1).

The EPA also acknowledges the Board's undertaking to upgrade treatment or if necessary install secondary treatment if the Water Quality Criteria are not met.

The EPA will recommend to Government if and when secondary treatment or other corrective measures are required so that the Water Quality Criteria continue to be met. (Recommendation 8.6). The annual report to the EPA on the monitoring programme will enable any potential problems to be isolated well before the WQC limits are reached. This will mean that there will be sufficient early warning that corrective measures are required and the necessary works can be carried out before adverse effects occur.

There were a number of submissions which raised the question of possible industrial waste being added to the discharge at a future date. The majority of these were opposed to such a possibility while two were critical of the proposal because it did not include industrial waste.

The EPA believes that it should not totally exclude the possibility of certain pretreated industrial waste being disposed of at the same site. However, it is definitely opposed to any industrial or other waste being added to the effluent which would change its composition or characteristics, without its prior approval. A full environmental investigation, including provision for public review would be necessary if such a scheme was proposed. In addition, under any such proposal, the discharge as a whole would still have to meet the Water Quality Criteria. (Recommendation 4.).

As an area of inshore reef around Cape Peron has been recommended under the System 6 proposal as a Marine National Park, the EPA would like to see the existing short effluent pipe shutdown and the effluent from the Cape Peron Plant disposed of in the new outlet. (Recommendation 1.5).

The proposal when operational will have a significant beneficial effect on the water quality of Cockburn Sound. However, as an emergency measure the existing outlet to the Sound will be retained so that effluent can be diverted into the Sound if the Cape Peron pipeline is non-operational. Because of the environmental sensitivity of the Sound, the EPA believes that any future usage of the existing Woodman Point outlet must be strictly limited to emergency situations only. It has therefore recommended that the MWB report any usage to the EPA in its Annual Cape Peron Outfall Report.

4.7 Effects on Wildlife Marine Life and Fishing

Of the public submissions received, 18% mentioned the possibility of the discharge having an adverse effect on the wildlife of the areas. Most referred particularly to the seals, penguins and birds of the offshore islands. The EPA is convinced that there will be no adverse effects on the wildlife because the nature of the effluent discharged will prevent any direct feeding by the wildlife and the mixing in the diffuser zone will mean that the water quality at the surface will meet the criteria for beneficial use 7, maintenance and preservation of aquatic ecosystems, Class 2 high level of protection.

Sixteen percent of submissions either questioned the effect on marine life or claimed it would have an adverse effect. The various beneficial use zones and their associated water quality criteria have been designed to ensure that there are no adverse effects on marine life and in particular professional and amateur fishing. There may be some minor increase in species numbers in the diffuser area as a result of the increased nutrient input. The Water Quality Criteria have special provisions to prevent tainting or accumulation of toxic substances. The MWB have shown that none of these substances will be present at anywhere near the critical concentrations.

The very remote possibility of bacterial contamination of rock lobsters was discussed under 4.5 above.

Shellfish can concentrate bacteria under certain conditions which can then result in a health risk if they are eaten without being cooked. A beneficial use Zone 3 has been allocated to all areas likely to be used for collecting edible molluscs. This areas criteria are designed to prevent any bacterial or chemical contamination. The proposed monitoring programme will also include a "sentinal organism" programme in which species of molluscs will be placed in various locations away from the diffuser and later sampled to measure any bacteria they may have collected. (Recommendation 2.1).

4.8 Effluent Reuse and Land Disposal

A large area of public concern was the issue of wasting rather than reusing the effluent in some form with some 41% of submissions expressing this view. While superficially it appears to be a huge waste of a resource it is in fact a complex of economic, social, technical and health problems. There are certainly techniques available to treat waste water so that it can be recycled as drinking water, or more commonly as irrigation or industrial water, however, these processes involve both high initial capital costs for the plant and also high operating costs in terms of labour and energy. They also involve health risks and social barriers. Because of this they are only used in areas where either water is very expensive or not available from other sources or where lower quality effluent cannot be discharged because of constraints such as other downstream users or a sensitive receiving environment.

It is recognised that some forms of reuse of wastewater in the Perth area could result in significant conservation of water resources and may have other indirect environmental advantages, such as fewer dam sites being required, or less lowering of water tables by groundwater extraction. However, the EPA accepts the Board's analysis that it is not economically, technically or socially feasible at this time to upgrade the treatment plant at Woodman Point to the stage where the water could be reused in some form. It also recognises that the Board will continue its research into the treatment and reuse of urban wastewater wherever possible. (Recommendation 8.4). This is necessary so that the effects of reuse including environmental effects can be properly evaluated.

5. The Alternatives

The ERMP has examined various alternative disposal options for the Woodman Point Plant. These have been examined to varying degrees based on their engineering feasibility, cost and environmental effects. Discharge to rivers or lakes and evaporation have been shown to be unsuitable for the Perth area and so were not considered further. Other land disposal and reuse options have been considered in more detail and where possible costed so that they can be compared with the proposed outlet. Various ocean and coastal water options were also considered and costed.

While land disposal or reuse was supported by a large number of public submissions it must be realised that it too would have considerable environmental impact. This has not been seriously considered in the ERMP as these options are shown to cost far more than ocean disposal, or they are simply not capable of using the volumes of effluent from the plant.

It has been a Board concept for many years to concentrate on a number of large regional wastewater treatment plants. This has resulted in a network of mains, pump stations and other capital works all leading to the Woodman Point plant. This effectively prevents further consideration of an alternative disposal policy based on a number of smaller, more localised plants, using a wider range of treatment technology each suited to local environmental conditions with much smaller total effluent volumes which could be suitable for reuse or land disposal.

The EPA strongly supports any investigation of reuse or recycling of wastewater. It acknowledges that the Board does operate a number of alternative plants within the Woodman Point catchment area and that the Board is continuing to examine alternative disposal systems. Of particular interest is the current groundwater recharge trials at the Canning Vale Plant.

In considering the various marine water disposal options the Sepia Depression site has definite environmental advantages over either Owen Anchorage or Cockburn Sound sites (with secondary treatment) or a West of Five Fathom Bank site.

The EPA believes that the Sepia Depression outlet can meet the Water Quality Criteria and therefore there is no reason to support more costly outlet options which are either not as environmentally acceptable or have no environmental advantages. The same argument can be applied to the provision of secondary treatment, if the Water Quality Criteria are met by current proposals it would be a waste of public funds to install secondary treatment at this stage.

6. The ERMP

The ERMP Document was based on an extensive research programme undertaken in the preceding 12 months. This research was overseen by the Technical Liaison Committee made up of local experts in environmental matters.

The EPA believes that it adequately describes the proposal and the environmental impacts. The technical appendix was also comprehensive and adequately covered the more technical aspects of the environmental research. The Board also made the full feasibility study documents available to anyone who was interested. This open approach and the fact that the main ERMP was free of charge are endorsed by the EPA.

The treatment of the alternatives particularly the land based options was superficial but under the particular circumstances it is understandable as none of the options were economically acceptable, and the Woodman Point Plant and regional collection system were already in existence.

There were some public criticisms of the ERMP. A large number of people were critical of the figures S.1 and 3.1 because the offshore pipe was not shown to scale, even though the figure was clearly labelled schematic and the length of the pipe is written next to it. The scale bar on figure 6.7 was incorrect although the drawing is correct and fully to scale.

These editorial errors are regarded as minor and there are numerous other figures where the pipeline and scales are shown correctly.

Figure S.1 is reproduced in this report (figure 1) with the pipeline shown at the correct relative length.

A number of people were critical of the offshore oceanographic study period claiming it was only 7 months and not a full 12 months. This appears to have arisen by confusing the Board's Progress Report in September and the ERMP. It is not correct and the study covered a full 12 month period and in addition made considerable use of historical data.

There were a number of criticisms of the bacterial die-off rate based on a paper published in the USA by W. D. Won and H. J. Ross. Study of the paper shows that it is based on laboratory conditions and is not relevant to the proposed discharge. The Board's die-off rate is supported by other published material (see R. S. Fujioka et al, Applied and Env. Micro 1981 41 690) and has been accepted by the EPA but the monitoring programme will precisely determine these values.

There was also criticism of the bacterial levels set by the Water Quality Criteria for direct contact recreation. The criticism is based on a paper published by V. J. Cabelli et al. The EPA believes that the levels set by the criteria are adequate to protect water users from infection by bacteria. This opinion is also supported by the Public Health Department.

There was some criticism of the Board's flow predictions, however, the Board has satisfied the EPA that these are realistic estimates based on sound data. Climatic effects can have a strong influence on the winter peak flows and also the average flow so that there will always be some uncertainty in any forward predictions.

The Board's estimates of the cost and feasibility of building a pipeline over or through the Five Fathom Bank were criticised by several writers. Although the option was not examined in the same detail as the proposed outlet the EPA accepts the Board's estimates as a reasonable indication of the cost and sees no advantage in extending the pipeline as the proposed site will meet the Water Quality Criteria. Extending the pipe over the Five Fathom Bank has several environmental disadvantages.

7. Conclusions

The EPA has examined the proposal by the MWB to dispose of primary treated wastewater through a pipeline and diffuser some 4 km off Cape Peron in the Sepia Depression. It has also considered the 544 submissions received from the public and 13 submissions from Government departments.

The Cockburn Sound Environmental Study clearly showed that it was not environmentally acceptable to continue to dispose of primary treated wastewater in Cockburn Sound and that an alternative must be found.

This proposal has been based on a sound environmental approach by first identifying the existing beneficial uses of the marine water and then designing the outlet so that none of these existing uses will be adversely affected. To achieve this goal the MWB have carried out a comprehensive environmental and engineering study which has shown that the concept is feasible and that the resulting water quality will meet the necessary criteria under the full range of weather and operating conditions.

The EPA has proposed that an adequate monitoring programme be set up and implemented so that it can be shown the predicted results are being achieved and no adverse environmental effects are occurring.

The EPA proposes to review the outlet's performance twice in its first year of operation and then annually. The results of these reviews will be published by the EPA. The Authority will also undertake to recommend remedial action should it be shown to be necessary for the maintenance of water quality in any of the beneficial use areas.

While the major concern has been focussed on the possible effects on marine water quality there are a number of more minor concerns associated with the proposal, most involve possible adverse impacts related to the construction activities and onshore operations. These have been discussed and where necessary recommendations have been made.

Having considered the ERMP, the associated technical data, and the public submissions, the EPA finds that the proposal to construct and operate a wastewater discharge pipeline from Woodman Point to Sepia Depression, discharging 4 km off Cape Peron in a water depth of 20 m is environmentally acceptable with the following recommendations.

8. Recommendations

1. Design and construction

1.1 When the final detailed design work is undertaken approval for the location of each drain point and any operational limitations should be obtained from the EPA.

1.2 The MWB should obtain prior advice from DCE and the Department of Agriculture on construction and re-vegetation procedures to be used in the environmentally sensitive areas of the land pipeline.

1.3 The MWB should have further talks with the Shire of Rockingham on construction procedures and land reinstatement in areas under the Shire's control, especially those matters listed in the Shire's submission.

1.4 The MWB should design the transition tower to prevent any odours escaping under the full range of operating and maintenance conditions.

1.5 The detailed design of the transition tower be such that the existing Cape Peron outlet be closed and the effluent from the treatment plant at Cape Peron be added to the new outlet.

2. Monitoring

2.1 The EPA stresses the importance of monitoring to ensure that other users of these waters continue to be protected as predicted in the ERMP. Accordingly, EPA proposes that a detailed monitoring programme be submitted by MWB to the EPA within three months for its approval. The monitoring programme psoposed is outlined :

2.1.1 Water quality monitoring of the shape and extent of the detectable plume, to determine whether the plume conforms with the predictions of the ERMP.

2.1.2 Filter feeding sentinel organisms (mussels) to be held in the upper part of the water column at selected sites within Beneficial Use Areas 2 and 3 of Figure 6.1 (attached) to determine whether reef shellfish are being exposed to faecal bacteria.

2.1.3 If monitoring under items 1 or 2 above indicate that the discharge is extending further and at higher concentrations than predicted in the ERMP, MWB will immediately;

(a) advise EPA,

(b) intensify sampling of receiving waters and biota to determine the extent of the impact,

(c) report to EPA on the further steps MWB proposes to take in order to safeguard other users of the area.

2.1.4 Surveys of the seabed carried out for the ERMP showed that in the vicinity of the proposed outfall there was little fauna upon which rock lobsters could feed. This might change after construction and operation of an outfall. Therefore the monitoring programme will include checks of the fauna within both the sediment and the rock fill close to the outlet, for increases in species of food value to rock lobsters. Such species will be checked for accumulation of faecal bacteria. The results of these investigations will be passed to the Department of Fisheries and Wildlife for consideration and advice to EPA.

2.1.5 Underwater check of pipeline each spring; advise EPA of any damage or alteration which could affect any other users of the area.

2.1.6 Establish bacterial die-off in the discharge area under various conditions as soon as possible after the discharge commences. These new values to be used to re-calculate the distribution of bacterial concentrations. The results to be reported to the EPA and to Public Health Department.

2.2 The EPA proposes to notify both the MWB and Government whenever corrective measures, including secondary treatment, are required so that water quality and other uses of the area are maintained throughout the life of discharge.

3. Future Sewage Disposal

The Board continue and where possible expand its current research and trials on wastewater treatment, reuse, and groundwater recharge.

4. Other Waste Material

Should the Board or any other body or person propose to use the Cape Peron outlet to dispose of industrial or other wastes which will alter the composition or character of the effluent, then a separate ERMP will be required. The EPA will then consider the proposal in terms of the receiving water quality and environmental effects, and recommend whether or not such a discharge should be permitted.

5. Reporting

The MWB report to the EPA six monthly in the first year, then annually on the performance of the outlet; these reports will include sufficient technical information to enable the Authority to satisfy itself that the discharge is meeting the Water Quality Criteria and that no adverse environmental effects are occurring.

This report should include the time, quantity and quality of any emergency effluent discharged through the Woodman Point outfall to Cockburn Sound. The EPA proposes to publish annually a report on the Cape Peron outlet performance.

APPENDIX 1

SUMMARY OF PUBLIC SUBMISSIONS RECEIVED

Introduction

A total of 544 submissions were received from the public, the vast majority coming from residents of the Rockingham Shire area. 36 form letters were received and were included as 1 single submission in the total. The EPA would prefer people to write individually or as a group when making a submission on an ERMP.

The submissions ranged from letters of one sentence expressing opposition, to lengthy detailed submissions covering a wide range of topics. Three submissions called for special consideration, these were from the Rockingham Districts Residents Association, the Shire of Rockingham, who engaged WAIT AID to carry out an analysis of the ERMP and the Conservation Council of W.A.

Considerable thought and effort has gone into these submissions which the EPA wishes to acknowledge. Copies of these submissions have been forwarded to the MWB for formal consideration of the issues raised. The submission from the Conservation Council has raised border issues of waste water disposal in the area as a whole and the need to include industrial effluents, under controlled conditions, as part of the present proposal.

The issues raised are of a serious nature, but somewhat broader than the ERMP considerations. This submission will be considered further by the EPA and a formal reply will be prepared.

While many of the submissions were based on an analysis of the information presented in the ERMP there were unfortunately far too many in which no references to the ERMP were made and the comments were such that the writers have obviously not read the document before sending their submissions.

The following table shows the issues and topics of concern raised by the submissions received. The percentage figure given is based on the number of submissions raising a particular issue relative to the total number of submissions, as many letters raised more than one issue the total percentages will exceed 100%.

Summary of Public Submissions

Total number of submissions	544
Submissions from people or organisations opposed to the proposal	99%
Reason for opposition were given as :	
That land disposal or reuse including irrigation, groundwater recharge, industrial use or complete recycling would be more suitable	41%
That the same thing will happen to the Shoalwater Bay and Warnbro Sound as happened to Cockburn Sound. The proposal is only transferring the Cockburn Sound problems south. Government assurances on Cockburn Sound have proved wrong.	31%

It will or might cause beach pollution and/or near shore water pollution. 40%

It will or might damage wildlife in the area particularly on the offshore islands. 18%

It will or might damage marine life including fish and/or fishing both professional and amateur. 16%

It will cause bacterial contamination of recreational waters. 5%

It will or might cause viral contamination of recreational waters. 2%

It will or might cause unspecified health problems. 5%

It will or might cause problems in coastal waters due to excessive nutrient loading. 4%

Because of problems in other marine outlets elsewhere in Australia and overseas either seen or reported. 6%

Because not enough study has been carried out. 9%

Because of knowledge or reports of superior treatment schemes elsewhere in Australia and overseas. 3%

Because it clashes with System 6 recommendations. 1%

Because of the compounding effects of other developments (mainly a reference to Mangels Bay Dock and Canal developments). 2%

Because it will adversely affect business, land values and tourist activity in the area. 5%

Miscellaneous opposition. 2%

No specific reason given. 23%

Submissions from those supporting the proposal. These were based on the improvement to Cockburn Sound and thoroughness of the studies. 1%

Particular ERMP related issues

Criticism of the ERMP detail. This included map scales drift and current data and 7 or 12 month Study Period. 9%

A direct challenge to data in the ERMP. This covered groundwater recharge rates, flow predictions, five fathom bank feasibility and cost and bacterial die-off rates. 2%

The question of possible future industrial waste being included in the discharge, who will authorise it, who will control it. Usually given as a negative aspect of the proposal. 5%

However there were two submissions which were critical of the proposal because it did not include industrial waste.

The question of future secondary treatment, who will decide if it is necessary, why not do it now? how is the cost to be met.	5%
The proposal would be acceptable if the discharge was taken beyond the Five Fathom Bank.	5%
Other options or combinations of options were not examined in enough detail.	1%
Questions of access and risks within the mixing zone.	1%
The existence of the Woodman Point plant making other options not feasible, and criticism of the Board's planning to build Woodman Point prior to a suitable outlet being available.	1%
Other pollution problems in the Rockingham area under the Board's control which are not satisfactory. (Mainly the CIK problem and contractors illegally dumping.)	1%
The need to monitor the future performance of the proposal both physical and biological parameters.	1%
Septic tanks and/or compost toilets would be a better solution to waste disposal.	1%
Possible adverse effects of strikes and/or plant stoppage on effluent quality.	1%
Not enough time to study ERMP.	1%
Concerns about : H_2S at diffusion site. Use of the scheme beyond design capacity. Need to remove sheet piles from coastal zone.	Less than 1%

Other Issues

Reference to Local Authority Referendum and results.	4%
Criticism of Government and/or Minister responsible for past statements and events.	6%

APPENDIX II

SUMMARY OF SUBMISSIONS RECEIVED FROM GOVERNMENT DEPARTMENTS

A total of 13 Government Departments and Instrumentalities made submissions to the EPA after considering the ERMP. These submissions are summarised below.

1. Department of Agriculture, Western Australian Herbarium

   This section of the Department drew attention to an important macro-algae occurrence just off shore and north of the pipeline route at Cape Peron. They have highlighted the need for care in the construction phase to prevent damage to this community either by direct disruption or from excessive sediment deposition.

2. Department of Marine and Harbours

   Have no objections to the completed proposal but have pointed out the need for adequate notices and warnings during the construction phase to protect other users of the offshore waters from navigation hazards.

3. State Energy Commission

   Has no matters of concern.

4. Metropolitan Region Planning Authority

   Has no objection in principle to the proposed onshore pipeline but required some undertakings from the Board on liaison with land holders and instrumentalities affected by the proposal, detailed earthwork plans for final approval and further consultations on the future of the temporary construction area.

5. National Parks Authority

   This Authority pointed out its interests in Penguin Island the possible Cape Peron Marine Park recommended by the System 6 Study. It accepts the proposal but has expressed doubt about possible abnormal events causing unwanted environmental effects on or around the offshore islands.

6. Department of Lands and Surveys

   This Department commented on the various matters yet to be finalized in relation to land requirements for the pipe route. They also pointed out the clash with System 6 recommendations M92 and M102. Special attention is drawn to the status of the temporary construction area required at Cape Peron.

7. Westrail

   Has no objections to the proposal and will liaise with MWB on detailed engineering works.

8. Main Roads Department

   This Department raised a number of possible problem areas associated with road crossings, reserves and construction activity. These matters will be dealt with directly by the MWB and MRD.

9. W.A. Museum

This body concluded that no detrimental effects would occur in the coastal recreation areas and that the fishery may be enhanced by nutrient input and habitat diversity. They commented on the possible adverse effects of industrial waste being included in the future.

The need for adequate ongoing monitoring to confirm the predictions was stressed and they questioned the effects of upgrading the treatment process.

10. Public Health Department

This Department found that the ERMP was a generally satisfactory document. They pointed out that the third paragraph of Section 9.2 on page 137 was not entirely correct in that they as well as the Shire of Rockingham and MWB will sample the water at swimming beaches on a regular basis throughout the year. They will also be giving additional study to the question of viruses being dispersed by the discharge.

11. Department for Youth, Sport and Recreation

This Department considers that the Water Quality Criteria adopted should ensure that no adverse effects are suffered by recreationists.

They also commented on the desirability of the proposed landscaping around the transition tower and restoration of the construction area for recreation purposes. They also acknowledged that there will be considerable disruption to recreation activities during the construction phase. The need to assure the public that adequate remedial measures will be taken should problems occur was stressed.

12. Department of Resources Development

This Department noted the ERMP's comments on possible future inclusion of industrial waste but offered no further comment. They saw the document as most comprehensive and acknowledged the beneficial effect of the proposal on Cockburn Sound.

13. Department of Fisheries and Wildlife

This Department made a detailed submission of some 5 pages. It was in two parts, the first was additional information that the department had collected for the Technical Liaison Committee, on which they were represented, which was not available at the time the ERMP was published. This covered

(i) The importance of the inshore reefs of the Cape Peron area as both a nursery ground and productive fishery for rock lobsters.

(ii) Figures on the economic importance of the area were produced and the November to December time period was identified as the main rock lobster catching time in the pipeline area.

(iii) Field trials established that rock lobsters move through the Sepia Depression in the November-December period and that some small number settle there. Further trials are planned to establish the number of these animals living permanently in the Depression.

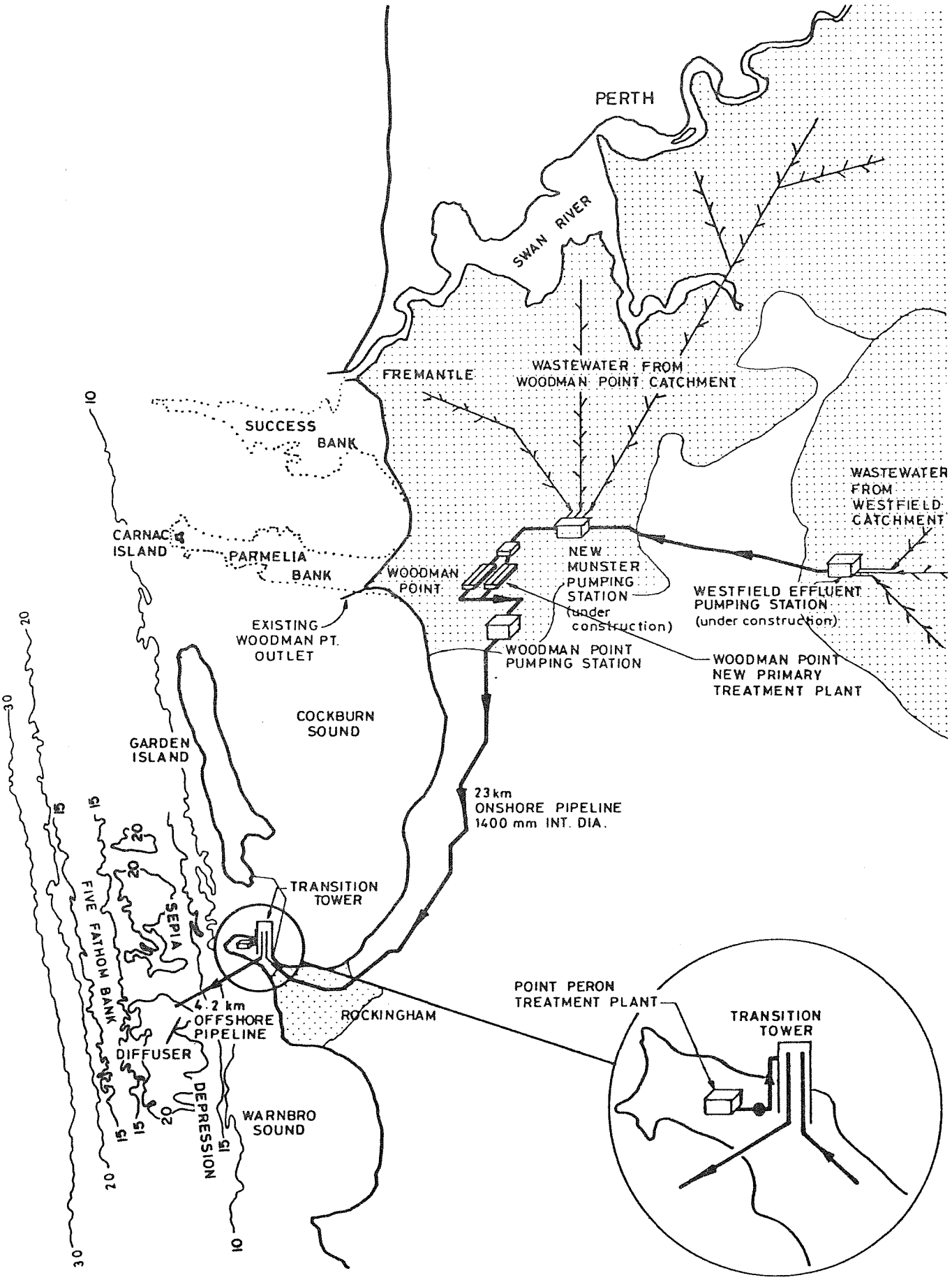
(iv) Tagging experiments have shown that lobsters migrate from the Cape Peron area to offshore reefs which are important commercial fishing areas.

The second part of the submission was made up of comments on the ERMP. These were: The problem of using predictive and extrapolative evidence rather than experimental data on which to base environmental effects. They acknowledge that nutrients, particulates, hydrocarbons and heavy metals are most unlikely to be present in sufficient amounts to have any effect on fishing. The distance from the outlet to abalone stocks is seen as adequate to prevent any bacterial or viral accumulation by the shellfish.

The possible contamination of rock lobsters by bacteria in the diffuser mixing zone was discussed and the further research required to establish whether or not a problem exists is acknowledged.

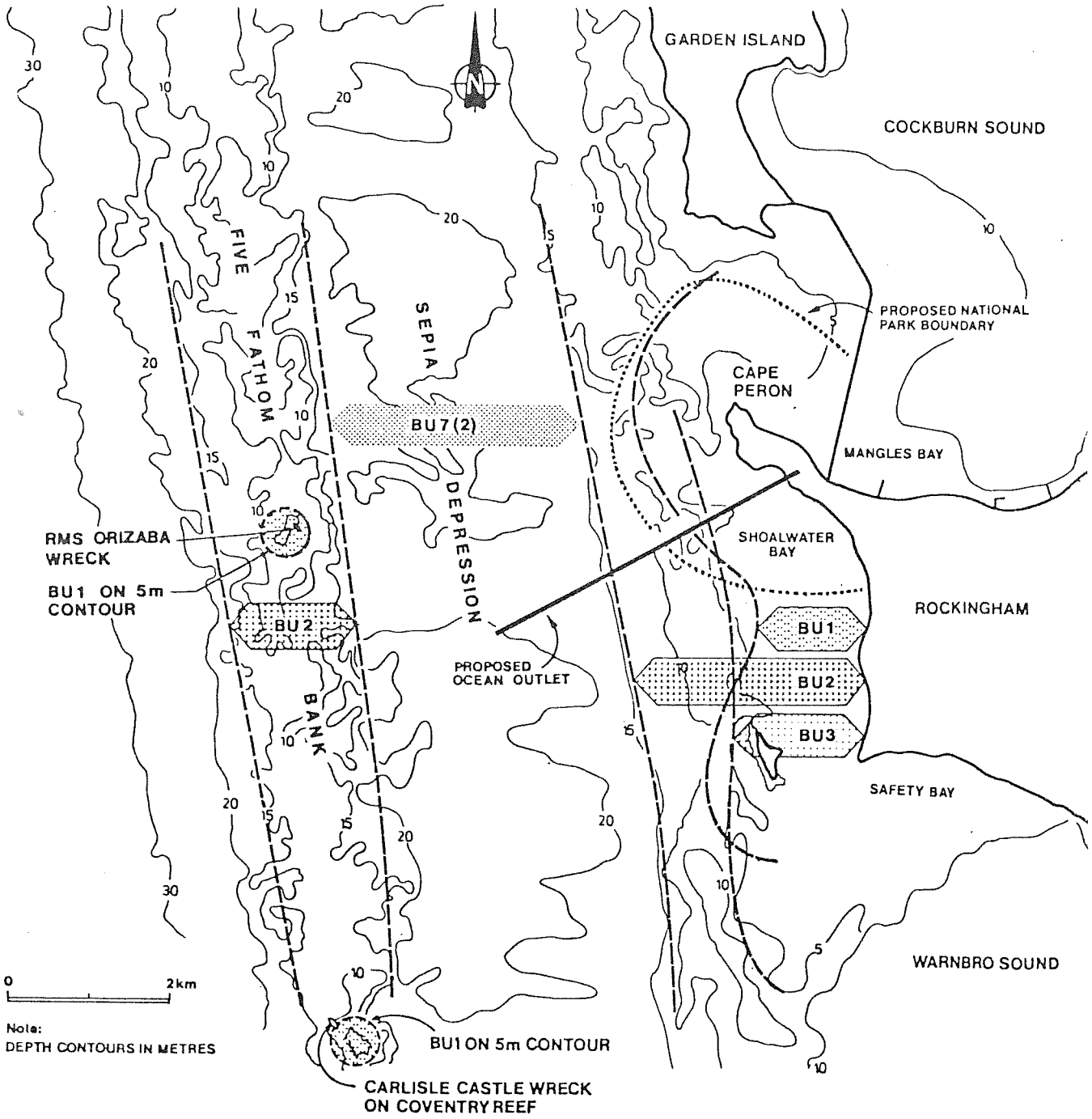
The unavoidable destruction of nearshore reefs by construction activity was discussed and the desirability of not allowing blasting in the November-December period was mentioned.

Finally the Department emphasised the need for a separate ERMP before any industrial waste discharged is considered.



SCHEMATIC PRESENTATION OF PROPOSED WASTEWATER DISPOSAL SYSTEM

Figure 1



LEGEND

	BU1	Direct contact recreation
	BU2	Harvesting of aquatic life for food
	BU3	Harvesting of molluscs for food
	BU7(2)	Aquatic ecosystems-High level protection

BENEFICIAL USE AREAS

Figure 2