# FURTHER NAVAL FACILITY DEVELOPMENT

# AT HMAS STIRLING

# GARDEN ISLAND, WESTERN AUSTRALIA

# DEPARTMENT OF DEFENCE

Advice prepared by the
Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
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## i. SUMMARY AND RECOMMENDATIONS

The Department of Defence proposes to develop additional naval facilities on Garden Island, comprising Stages 2 and 3 of the long term development programme for HMAS Stirling. Stage 1 includes all existing facilities. The further developments are expected to be completed by the year 2000 to enable the Commonwealth Government's objective of homeporting about half the Australian Fleet by this time.

A Public Environmental Report (PER) prepared by the Department of Defence was released for a six week public review period ending on 7 June 1989. As the proposal is a Commonwealth project, appropriate Commonwealth legislation is directly applicable to its assessment. However a joint review of the proposal has been arranged to be undertaken by the Department of the Arts, Sport, the Environment, Tourism and Territories and the Authority.

This report of the Environmental Protection Authority has been prepared under the joint assessment procedures in accordance with the State Commonwealth Memorandum of Understanding. As such, it is not a report under Part IV of the Environmental Protection Act 1986.

The Authority's major concerns arising from the proposal relate to the potential for impacts on the water quality and marine ecosystems of Cockburn Sound. The Environmental Protection Authority has considered these and other issues associated with the proposal and has presented its advice in this report. The Authority considers that the following points should be taken into account should the proposal receive approval.

RECOMMENDATION 1

**The Environmental Protection Authority recommends that the Department of Defence should ensure that the accumulation of tributyl tin (TBT) in Careening Bay and Cockburn Sound resulting from Department of Defence activities is not deleterious to the beneficial uses of Cockburn Sound.**

RECOMMENDATION 2

**The Environmental Protection Authority recommends that a detailed programme for the monitoring of tributyl tin (TBT) should be prepared by the proponent as soon as possible. In addition to the commitments made in the Public Environmental Report, the programme should provide for:**

- **monitoring of TBT concentrations in the water, sediments and marine biota at several selected sites outside of Careening Bay;**

- **monitoring to be carried out for a three year period initially and then reviewed, with annual reports on monitoring and management;**

- **reporting after three years, containing reference to all monitoring results obtained over the three year period, interpretation of these results, and any amendment to management in accordance with the monitoring results; and**

- **results and reports to be made available to the public and the Environmental Protection Authority.**

RECOMMENDATION 3

The Environmental Protection Authority recommends that the Department of Defence should examine alternative antifouling paints to those containing tributyl tin (TBT) for use on all naval vessels likely to enter Western Australian waters as a matter of priority, and that the possibility of a re-painting programme be considered immediately following adoption of an alternative.

RECOMMENDATION 4

The Environmental Protection Authority recommends that the Department of Defence should install cross-drains or other suitable drainage systems into slipways at HMAS Stirling to prevent contaminated run off from entering Cockburn Sound. Contaminated water should be collected and treated prior to disposal.

RECOMMENDATION 5

Where tributyl tin (TBT) compounds are used or removed the Environmental Protection Authority recommends that the Department of Defence should prevent water pollution resulting from airborne particles and dust caused by hull preservation and maintenance activities.

RECOMMENDATION 6

The Environmental Protection Authority considers that the Department of Defence should prepare a monitoring programme which defines pre-construction conditions and examines post construction impacts for a period of three years to evaluate:

i) the condition of the seagrass meadows near Colpoy's Point to determine any detrimental impacts of landfill operations; and

ii) beachline erosion and sediment transport in the waters and nearshore environment of the eastern coast of Garden Island.

The results and reports should be made available to the public and the Environmental Protection Authority annually.

RECOMMENDATION 7

The Environmental Protection Authority recommends that any future proposal for construction of a breakwater at Sulphur Bay be subject to environmental impact assessment.

RECOMMENDATION 8

The Environmental Protection Authority considers that the Department of Defence should not develop the proposed demolition range if its use has unreasonable noise and vibration impacts on the mainland. The Department of Defence should conduct further investigations into alternate sites.

RECOMMENDATION 9

The Environmental Protection Authority recommends that the Department of Defence carry out an investigation into alternatives for the proposed helicopter support facility with a view to ensuring that flora and fauna impacts are minimised.

RECOMMENDATION 10

The Environmental Protection Authority considers that the proponent should address measures to minimise the following construction-related impacts in consultation with the Garden Island Environmental Advisory Committee:

- spread of exotic plant species;

- introduction of disease; and

- clearing.

RECOMMENDATION 11

The Environmental Protection Authority recommends that the Department of Defence prepares a nutrient monitoring programme for the sewage effluent and groundwater near the sewage infiltration site in consultation with the Environmental Protection Authority. The results should be made available annually to the Garden Island Environmental Advisory Committee and the Environmental Protection Authority. The Environmental Protection Authority considers that the disposal of sludge from the sewage treatment plan should be addressed in the Environmental Management Plan.

RECOMMENDATION 12

The Environmental Protection Authority recommends that the Department of Defence should integrate its emergency and contingency plans with the State Government's Kwinana Integrated Emergency Management Scheme.

RECOMMENDATION 13

The Environmental Protection Authority considers that the Department of Defence should make monitoring results available on an annual basis to the public and the Environmental Protection Authority for commitments which refer to Environmental Protection Authority standards or pollution concerns. With regard to other commitments in the PER and responses to submissions, regular reports on the status of those commitments could be referred to Garden Island Environmental Advisory Committee for comment.

## 1. INTRODUCTION

The development of Garden Island as the site for a Naval Base began in 1971, when the Commonwealth Parliament approved the construction of a causeway linking Garden Island to the mainland. Parliamentary approval was given for the construction of facilities on Garden Island in 1972. The majority of these facilities are concentrated at the base at Colpoy's Point in Careening Bay, and the Royal Australian Armament Weapons and Engineering Depot (RANAWED) at Sulphur Bay on the north-eastern shore of the island. With the commissioning of HMAS Stirling on 28 July 1978, the majority of existing facilities were completed to form Stage 1 of the development programme and facility developments have continued on Garden Island since the base was commissioned.

The proponent, the Department of Defence, presently proposes to develop additional naval facilities on Garden Island. These facilities, and associated defence housing on the mainland in the Rockingham/Kwinana area, are required to increase the level of support available to Royal Australian Navy ships to enable homeporting of about half of the Australian Fleet.

In accordance with the legislative requirements of the Commonwealth Environmental Protection (Impact of Proposals) Act, 1974, a Notice of Intention for the proposal was prepared in February 1988. The Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT) set the level of assessment as a Public Environmental Report (PER). The PER was released for public review on the 26 April 1989, for a six week period ending on 7 June 1989.

As the proposal is a Commonwealth project on Commonwealth land, and is therefore assessed under the appropriate Commonwealth legislation outlined above, the Western Australian Environmental Protection Authority has not undertaken an assessment of the proposal in accordance with the Environmental Protection Act. However under the Commonwealth/State Memorandum of Understanding, a joint review has been arranged between the Department of the Arts, Sport, the Environment, Tourism and Territories and the Environmental Protection Authority.

The Authority has therefore prepared this advice following consideration of the PER, as well as the response provided by the Department of Defence to public submissions.

## 2. DESCRIPTION OF PROPOSAL

The proposal by the Department of Defence for development of HMAS Stirling comprises three stages, the first of which includes all existing facilities. The development programme is proposed in two further stages, where Stage 2 covers the development from 1989 to 1996 and Stage 3 the development from 1996 to 2000. All proposed developments will be sited in designated defence facility areas on the Zone Plan for Garden Island (figure 1).

The proposal consists of the following components:

- wharf and shoreline works;
- new buildings and facilities;
- upgrading and extensions to facilities;
- engineering services; and
- calibration, test, trials and exercise facilities.

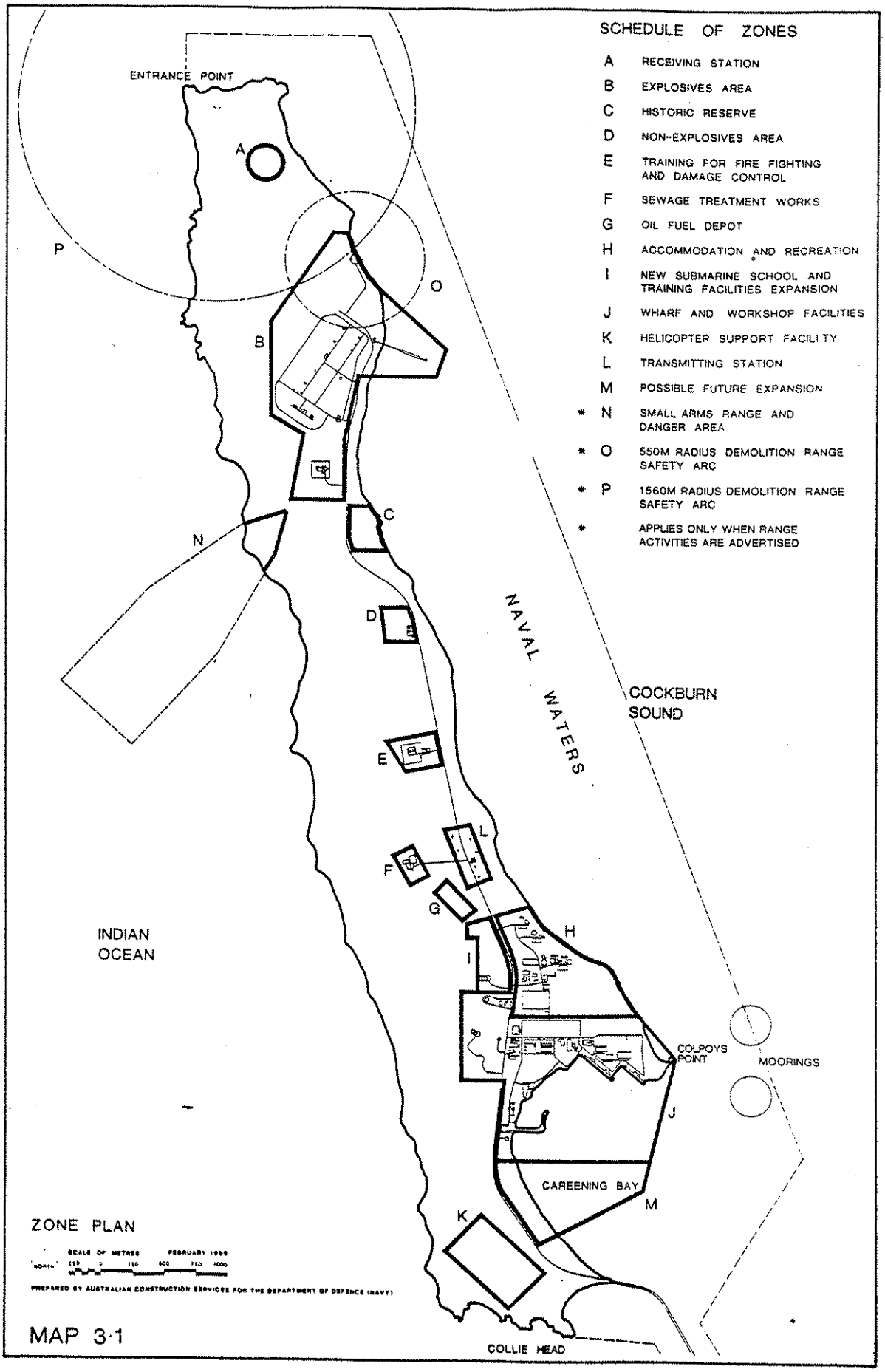



Figure 1. Zone Plan for Garden Island.

Although the design details for many of the individual facilities have not yet been finalised, sufficient information has been provided for the Authority to consider the environmental implications of the project.

This section describes the major developments proposed without direct reference to the various impacts involved.

## 2.1 WHARF AND SHORELINE WORKS

The developments proposed for Careening Bay include the reconstruction of the small ships harbour and the provision of a new major fleet units wharf.

Works in the small ships harbour would provide wharf area and an addition to the existing breakwater. A small boats marina would be created adjacent to the shoreline in the harbour area, involving dredging to a depth of RL -3.0m. Dredging and dry removal would affect an area of 8000 $m^2$.

The new major fleet units wharf would be a jetty structure of 320 metres in length, constructed parallel to the destroyer wharf. Dredging requirements would affect an area of 52000 $m^2$, part of which was dredged during the initial development. A depth of RL - 11.0m would be achieved.

The total dredging programme, including the small ships harbour, would take about 4 to 5 months and involve the removal of approximately 50 000 m3 of shoreline sand and fine calcareous sediments. All dredge spoil would be used for landfill and sediment would be allowed to settle or be decanted to sea via 'turkeys nest' ponds.

Proposed landfill sites include a roll-on-roll-off marshalling area near the fleet pier, boat repair hardstanding and eroding beach areas to the north of Colpoy's Point.

## 2.2 BUILDINGS AND FACILITIES

Most of the sites proposed for the development of buildings and facilities have already been cleared or surveyed for development. Development of these facilities would continue to be concentrated at the base area in Zones H, I and J.

A total of 45 hectares of land would need to be cleared of vegetation within the naval facility zones, 17.5 hectares of which is required for the helicopter support facility proposed for Zone K. This site would be levelled in preparation for a 100 m2 concrete landing pad, a landing strip, hardstanding area and buildings.

A new demolition range is proposed to be located on the north-west corner of Garden Island (Zone P), and would allow for the destruction of unexploded ordinance which is above the capacity of the existing range (Zone O).

A zone designated as a small arms firing range, located on the western side of the island is for contingency purposes. There is no intention to establish a range facility at this site except to meet a wartime requirement.

The radio receiver antennae would be relocated from the base area at Careening Bay to Zone A at the northern end of the island.

## 2.3 ENGINEERING SERVICES

The proposal includes the expansion and upgrading of both the sewage and sullage treatment systems, as well as extension to the stormwater drainage system.

### 2.3.1 SEWAGE TREATMENT

The existing sewerage plant would be upgraded with the separation of fresh and saline sewage. The saline sewage from the ships would be treated by the existing lagoon system, and the expandable package sewerage plant (Rotating Biological Contractor - RBC), proposed for construction in Zone J, would treat freshwater sewage from island facilities. The treated effluent would be disposed of via seepage to the groundwater on an area west of the existing lagoons.

These changes are proposed to alleviate the present problems with maintaining salinity levels at the design concentration of the current treatment system, and associated problems with odour and effluent quality.

### 2.3.2 SULLAGE TREATMENT

Sullage is bilge and ballast water from ships and submarines, and consists of water, oil and chemicals.

It is proposed to replace the existing sullage treatment facility with a new plant, designed to meet NSW guidelines. This plant would be capable of limiting oil discharges to 1 part per million (ppm), as well as meeting all other NSW environmental standards.

It is proposed to pump the treated saline water into Careening Bay.

### 2.3.3 STORMWATER DRAINAGE SYSTEM

Stormwater runoff from the accommodation and base areas would be directed to drainage sumps for infiltration.

Stormwater runoff from the helicopter support facility would be drained through appropriate sediment traps before discharge to a sump for disposal by groundwater seepage. It is proposed to contain the oily waste water and cart it away for treatment.

The practice for stormwater runoff from the wharf and nearby hardstanding areas would be to collect the runoff and pipe it into Careening Bay.

## 2.4 POSSIBLE FUTURE DEVELOPMENTS

The Department of Defence will give consideration to the construction of a breakwater in Sulphur Bay to the north of the Armament Wharf if currently planned measures to minimise the effects of climatic conditions, presently restricting the use of the wharf, prove unsuccessful.

## 2.5 ENVIRONMENTAL MANAGEMENT PLAN

A supporting objective of the proposal is to upgrade the existing Land Management Plan (LMP) for Garden Island to an Environmental Management Plan (EMP). This would involve a review of the current management practices on the island, leading to the development of more comprehensive strategies for management of the environment and programmes for monitoring the effects of the proposed

development. The EMP would also consider the nearshore and marine environment in addition to the terrestrial environment, which is the extent of the environment currently addressed in the LMP. The EMP is expected to be completed by the end of 1990.

## 3. ENVIRONMENTAL ASSESSMENT

The Authority has considerable knowledge of the regional setting of HMAS Stirling and has been intimately involved in various aspects of environmental management within it. The Authority is continuing with initiatives in this area. In its review of this proposal and preparation of this advice, the Environmental Protection Authority on has been guided by this knowledge.

Cockburn Sound has been subjected to a wide range of impacts which have proven detrimental to the ecology of the embayment over the years. The Sound has many beneficial uses, such as those defined in Bulletin No 103 (Department of Conservation and Environment, 1981), however for these multiple uses to co-exist a balance between them all must be achieved and maintained.

The main sources of pollutant discharge into Cockburn Sound have historically been from the Kwinana Industrial Complex. Nutrient input has had the most significant impact on the Cockburn Sound environment, resulting in eutrophic (nutrient enriched) conditions and subsequent loss of seagrass meadows which are the basis of biological productivity in the Sound. Heavy metals have also had an effect on the marine ecosystem, being accumulated in bottom sediments and marine organisms.

The naval developments on Garden Island and the use of Cockburn Sound by Royal Australian Navy vessels constitute only one potential source of impacts detrimental to the marine environment, therefore they must be seen in the regional context of which they are a part.

The proposal to expand naval facilities on Garden Island creates the potential for additional environmental impacts. The Authority has identified the following impacts as being of particular significance:

- impact on sea water quality, both within Careening Bay and in Cockburn Sound;
- impact on seagrass meadows, especially those along the eastern flank of Garden Island;
- risks and hazards associated with the position of Garden Island in its regional setting;
- noise emissions as a result of operational activities;
- siting of the helicopter support facility; and
- impact of underwater sonar emissions on marine life.

Other issues promoting sufficient concern for the Authority to consider in this review of the proposal include:

- construction stage impacts;
- proposed monitoring programmes;

- liquid waste disposal;

- fuel and oil spill contingency plans; and

- management of grassed areas.

Reference is also made to the proposed Environmental Management Plan for Garden Island, as this is seen as an important aspect of the proposal.

A number of environmental impacts associated with the proposal are considered to be minor or are adequately addressed by the proponent in the PER (refer to Appendix 1). These impacts include:

- vehicle emissions;

- runoff from construction sites;

- construction traffic;

- wharf, dolphin, and breakwater construction impacts;

- impediment to water flow by the major fleet units wharf;

- short term turbidity due to dredging;

- solid waste disposal;

- aesthetic impairment of buildings;

- radar emissions;

- small arms firing range for contingency use;

- movement of vessels; and

- access control of construction workers and naval personnel.

The Authority does not further discuss these issues.

## 3.1 WATER QUALITY

Activities at HMAS Stirling which have the potential to reduce water quality in Careening Bay and Cockburn Sound have been identified by the Authority as follows:

- elevated levels of tributyl tin pollution from the increasing numbers of Navy vessels using Careening Bay and Cockburn Sound, and from runoff from the slipway in the small boats harbour into Careening Bay;

- stormwater runoff from wharfs and nearby hardstanding areas in to Careening Bay and Sulphur Bay;

- discharge of treated sullage effluent into Careening Bay;

- nutrient pollution through groundwater seepage from liquid waste disposal areas; and

- accidental fuel spills.

As the majority of naval facilities are concentrated in and around Careening Bay this area is the primary receiving water for pollutants. Decline in water quality within Careening Bay and dispersion of these pollutants to the wider environment of Cockburn Sound is of major concern.

The waters of Cockburn Sound tend to retain pollutants for a long period of time as a result of the enclosed nature of this marine environment. This situation can result in impacts to the seagrasses and benthic fauna, as well as other marine life, to create conditions detrimental to the beneficial uses of the Sound.

Water quality criteria for marine waters were adopted by the Environmental Protection Authority in 1981 and published as Bulletin 103. These criteria are currently under review. New criteria developed will be consistent with the objective of maintaining "beneficial use". The concept of beneficial use is clearly defined in Bulletin 103.

The Authority has used the concept of zoning areas for beneficial uses to determine marine water quality criteria apply for new developments. In the case of Garden Island the water circulation in Cockburn Sound, which flow northwards along the Island's eastern coast, needs to be taken into consideration. On the eastern coast of Garden Island beneficial use No.1 (direct contact recreation), beneficial use No.3 (harvesting of mulluscs for food) and beneficial use No.7 (2) (maintenance and preservation of aquatic ecosystems, class 2) would apply.

### 3.1.1 TRIBUTYL TIN (TBT) CONTAMINATION

Tributyl tin is an organotin compound commonly used in antifouling paints to inhibit the growth of marine plants and animals that occurs when boats are moored. There are three primary ways that TBT enters the marine environment; as runoff from slipways used for hull preservation and maintenance, as paint which flakes from vessel hulls and by leaching from the paint into the water. Extremely low concentrations of TBT's (parts per trillion) have toxic effects on marine life.

The increased number of naval vessels to be moored and slipped in Cockburn Sound is cause for concern if TBT's continue to be used. Currently all Department of Defence vessels use TBT paints.

The Environmental Protection Authority has decided that in this State, vessels greater than 25 metres could continue to use TBT paints. The reasoning behind this decision was that most vessels of this size spend the majority of their time in open waters, away from the sensitive shallow marine habitats. Also there is the added complication that most vessels greater than 25 metres are from overseas and therefore exempt from any WA restrictions.

By the year 1999, HMAS Stirling will be homeport for 17 vessels greater than 25 metres. Not only will these vessels contaminate the waters around Careening Bay but they will also be slipped and refitted at the new Marine Support Facility (MSF) in Jervoise Bay, leading to further

contamination. It is expected that more than 50% of slipped vessels at the MSF will be Department of Defence vessels. The Authority is now concerned that if TBT continues to be used on these larger Department of Defence vessels these could be extensive TBT contamination in Cockburn Sound.

To calculate the likely levels of TBT in Careening Bay a simple model based on the following parameters was used (Maltz 1988).

1. Number and size of vessels based at HMAS Stirling:

   3 ships @ 113m * 12.5m
   1 ship @ 96m * 13.4m
   1 ship @ 135m * 14.3m
   1 ship @ 136m * 13.7m
   1 ship @ 170m * 25.9m
   5 ships @ 42m * 7.1m
   1 ship @ 113m * 13.0m
   4 subs @ 90m * 8.1m

2. Leaching Rates - A leaching rate of 4ug TBT/$cm^2$/day has been used. This is the maximum leaching rate intended to be permitted in WA.

3. Exchange Volumes - Using the classical tidal prism approach which assumes complete mixing and a continuous loading of the pollutant.

4. Leaching Loads - TBT input has been evaluated on the basis of leaching rate, hull area and number of boats.

5. Degradation Rate - As half lives of 6-7 days have been documented (Seligman et al. 1986), a 10% decay rate per day has been used.

Using the above information and theoretical formulae, ambient TBT concentrations in Careening Bay have been calculated. The approach is based on the Steady State Tidal Prism Approach (steady state concentration being approached after an infinite number of tidal cycles). It assumes TBT to be uniformly distributed with no temporal or spacial differences in the concentration. It further assumes that the continuous daily TBT load into the water is transported out of the bay in the tidal prism volumes and that water brought in on the tidal flood is completely mixed with the polluted water. The model does not allow for wind mixing. Predicted levels for the whole home posted fleet and half the fleet have been calculated.

TBT level in port (ie the waters between the wharfs) with 17 vessels is 1160 ng/l

TBT level in port (ie the waters between the wharf's) with 8.5 vessels is 580 ng/l

TBT level in Careening Bay with 17 vessels is 128.3 ng/l

TBT level in Careening Bay with 8.5 vessels is 64 ng/l

These calculated TBT levels are much greater than the United States Environmental Protection Agency limit of 10 ng/l, and are therefore of concern as the Authority intends to adopt this TBT water quality criterion.

Similar calculations undertaken for TBT levels in the Marine Support Facility (MSF) also show TBT levels much greater than the United States Environmental Protection Agency limit. One ship moored in the semi enclosed water body of the MSF results in a TBT concentration of 30 ng/l and if the capacity number of vessels (7) were moored, the TBT level would be raised to 210 ng/l. These values do not include contamination from the vessels during slipway maintenance or hull cleaning operation.

The waters of Cockburn Sound are ideal for mariculture and currently there are 3 mussel farm leases in operation. The spat for these farms is also collected in Cockburn Sound. Mussel spat is extremely sensitive to low levels of TBT in the water and 50% will die at TBT levels of 40 ng/l. Sub lethal effects occur at levels below this. At 80 ng/l a reduction in length growth rate occurs in the adult mussel *M.edulis*.

The Authority is concerned that beneficial uses of Cockburn Sound such as described above, are not adversely effected by TBT pollution.

RECOMMENDATION 1

The Environmental Protection Authority recommends that the Department of Defence should ensure that the accumulation of tributyl tin (TBT) in Careening Bay and Cockburn Sound resulting from Department of Defence activities is not deleterious to the beneficial uses of Cockburn Sound.

RECOMMENDATION 2

The Environmental Protection Authority recommends that a detailed programme for the monitoring of tributyl tin (TBT) should be prepared by the proponent as soon as possible. In addition to the commitments made in the Public Environmental Report, the programme should provide for:

- monitoring of TBT concentrations in the water, sediments and marine biota at several selected sites outside of Careening Bay;

- monitoring to be carried out for a three year period initially and then reviewed, with annual reports on monitoring and management;

- reporting after three years, containing reference to all monitoring results obtained over the three year period, interpretation of these results, and any amendment to management in accordance with the monitoring results; and

- results and reports to be made available to the public and the Environmental Protection Authority.

RECOMMENDATION 3

The Environmental Protection Authority recommends that the Department of Defence should examine alternative antifouling paints to those containing tributyl tin (TBT) for use on all naval vessels likely to enter Western Australian waters as a matter of priority, and that the possibility of a re-painting programme be considered immediately following adoption of an alternative.

At present there is no cross-drain system to collect TBT paint scrapings or paint residues at the HMAS Stirling slipway. Testing of sediment from around commercial slipways in Jervoise Bay has indicated extremely high organotin levels, ranging from 132 to 5000 ug/kg. It is intended that slipways still using TBT in 1990 will have to be licensed as "prescribed premises" under Part V of the Western Australian Environmental Protection Act (1986). The types of controls to be enforced will be cross drains or some other form of collection drain which will prevent the transport of TBT and other wastes into the marine environment.

The Authority is also preparing an environmental code of practice for abrasive blasting and it is expected that under this code it will no longer be acceptable for wastewater and mud from blasting operations to flow into the marine environment.

RECOMMENDATION 4

**The Environmental Protection Authority recommends that the Department of Defence should install cross-drains or other suitable drainage systems into slipways at HMAS Stirling to prevent contaminated run off from entering Cockburn Sound. Contaminated water should be collected and treated prior to disposal.**

While TBT compounds continue to be used, use of slipways for hull de-fouling, painting, abrasive blasting and hydroblasting activities should be restricted to periods when conditions do not encourage the inadvertent entry of airborne particles and dust into the marine environment. If this is not practicable, the area should be contained in such a way as to avoid this pollution occurring.

RECOMMENDATION 5

**Where tributyl tin (TBT) compounds are used or removed the Environmental Protection Authority recommends that the Department of Defence should prevent water pollution resulting from airborne particles and dust caused by hull preservationand maintenance activities.**

### 3.1.2 STORMWATER RUNOFF FROM WHARF AREAS AND HARDSTANDING

The proponent proposes to collect and pipe runoff from the wharf and adjoining carparks directly into Careening Bay. The proponent is committed to monitoring the levels of hydrocarbon contaminants in stormwaters discharging into the Bay and in the sediments of the Bay. The Authority considers this proposal is acceptable provided that management procedures are re-evaluated should the monitoring results indicate any problems resulting from the practise of runoff discharge. The Department of Defence should make a commitment in this regard in the EMP.

The PER does not deal with the disposal of stormwater runoff from the Armament Wharf and nearby hardstanding areas. In view of the fact that the seagrass meadows along the eastern flank of Garden Island are of the highest biological importance to the Cockburn Sound ecosystem, pollution entering the Sound from developments at Sulphur Bay should be minimised.

The proponent should develop and implement operational practises such that there is no contaminated runoff from the RANAWED and Armament Wharf into Sulphur Bay or Cockburn Sound.

### 3.1.3 STORMWATER RUNOFF FROM BUILDINGS AND HARDSTANDING

The PER states that runoff from buildings and hardstanding is directed to drainage sumps for infiltration to the groundwater. The Authority considers this to be an acceptable method of drainage provided that the sumps are efficient in the removal of contaminants, and that this level of efficiency is maintained.

### 3.1.4 DISCHARGE OF TREATED SULLAGE EFFLUENT

The PER states the method of disposal of treated sullage effluent is to be discharge to Careening Bay. Although the Environmental Protection Authority requires oil content to be less that 8 parts per million (ppm), the proposed sullage treatment plant is capable of limiting oil discharge to 1 ppm. Therefore the Authority's standard should be viewed as a maximum limit, as it was proposed, while it is obviously desirable to maintain effluent discharge at the lowest value obtainable by practical means. The proponent is commited to monitoring effluent releases to ensure compliance with Western Australian Environmental Protection Authority standards (PER paragraph 6.61).

### 3.1.5 ACCIDENTAL FUEL SPILLS

The environmental consequences of a major oil spill in Cockburn Sound or Careening Bay could be disastrous. The management of accidental oil spills at HMAS STIRLING is by standard navy operating procedures. The Port of Fremantle has an oil spill contingency plan which covers Cockburn Sound. However, the Navy's procedures are not part of that plan. As the HMAS Stirling expands the number of home ported vessels, potential for an oil spill increases.

The Authority considers that the navy operating procedures should be integrated with those of the Port of Fremantle and other local area emergency plans.

## 3.2 IMPACTS ON SEAGRASS MEADOWS

The extent of seagrass in and around Careening Bay is negligible, and since the area was previously disturbed during initial developments the Authority considers that dredging within the harbour poses no unmanageable threat to seagrass habitats. The proponent has made a commitment to survey areas affected by dredging as part of the monitoring programme (PER paragraph 6.13).

In contrast, the seagrass meadows flanking the eastern shore of Garden Island are some of the best remaining seagrass habitats in Cockburn Sound, and must therefore be protected. The proposals which have a direct potential to adversely impact upon these meadows are:

- the use of dredge spoil for landfill to stabilize eroding beach areas to the north of Colpoy's Point; and

- the potential for future development of a breakwater in Sulphur Bay to the north of the existing Armament Wharf.

### 3.2.1 DREDGE SPOIL IMPACTS NORTH OF COLPOY'S POINT

The PER states that all dredge spoil will be treated (PER paragraph 3.23) so no problems are anticipated with leachates from the dredge spoil in its use for landfill operations. No commitment to monitor areas of possible impact from landfill has been made in the PER. The Authority believes the proximity of the proposed landfill site to seagrass meadows justifies monitoring to ensure there are no adverse impacts on the seagrass.

HMAS STIRLING Working Paper No. 7 provides an appropriate objective and methodology for monitoring of seagrass meadows.

**RECOMMENDATION 6**

**The Environmental Protection Authority considers that the Department of Defence should prepare a monitoring programme which defines pre-construction conditions and examines post construction impacts for a period of three years to evaluate:**

i) **the condition of the seagrass meadows near Colpoy's Point to determine any detrimental impacts of landfill operations; and**

ii) **beachline erosion and sediment transport in the waters and nearshore environment of the eastern coast of Garden Island.**

**The results and reports should be made available to the public and the Environmental Protection Authority annually.**

### 3.2.2 BREAKWATER AT SULPHUR BAY

Research carried out by the proponent concluded that the area of seagrass meadows at Sulphur Bay had declined prior to development in the Bay. However the Cockburn Sound Environmental Study (Department of Conservation and Environment, 1979) concluded that localized deterioration of seagrasses could be attributed in part to the construction of groynes and shore structures which altered wave patterns and sediment stability.

Construction of a breakwater at Sulphur Bay has the potential to adversely affect the seagrass meadows, both through construction activities and the completed structure itself.

The importance of these seagrass beds leads the Authority to believe that any future proposal to construct a breakwater in Sulphur Bay should be subject to environmental assessment.

**RECOMMENDATION 7**

**The Environmental Protection Authority recommends that any future proposal for construction of a breakwater at Sulphur Bay be subject to environmental impact assessment.**

## 3.3 NOISE EMISSIONS

### 3.3.1 CONSTRUCTION ACTIVITIES

Potential nuisance may be caused by noise associated with pile driving during the construction phase. No direct reference is made in the PER to the

intensity of noise from this activity or to other potential sources of noise during the construction phase. The proponent, in it's response to public submissions, undertook to limit the time span during which pile driving will be allowed (Paragraph 15.2d). The Authority considers that the proponent should liaise with local authorities during the construction phase concerning the hours of operation and the timing of any particularly noisy procedures, especially in view of the potential for cumulative noise impacts.

### 3.3.2 HELICOPTER ACTIVITY

Additional information provided by the proponent (Peploe and Cook, 1988b) gives noise levels from a helicopter rescue flight recorded and calculated at HMAS Creswell, reproduced here as Table 1.

Table 1: Helicopter noise recorded and calculated at HMAS Creswell, July 1988. (1) and (2) are actual measurements, at 0.8 and 1.3 km respectively and the other values are calculated. Discrepancies are attributed to meteorological conditions at the time of measurement.

| DISTANCE(KM) | 0.8 | 1.3 | 2 | 4 | 6 |
|---|---|---|---|---|---|
| LEVEL(dBA)(1) | 65.6 | - | 54 | 42 | 32.5 |
| (2) | - | 54.4 | 48.6 | 36.5 | 27 |

These data indicate that background levels in the Kwinana/Rockingham area will not be exceeded if helicopter flights are outside a distance of approximately four kilometres from residential areas. The proposed helicopter facility on Garden Island is approximately 4.5 km from residential areas.

The PER states that most operational flights would be seaward of Garden Island and mainland trips would be routed away from residential and recreational areas to reduce noise impacts (PER paragraph 6.73). If more than one helicopter were to be airborne at the same time there is potential for the noise impacts to exceed acceptable levels. The Department of Defence should be aware of this potential and endeavour to take noise emissions into consideration when planning the intensity of helicopter activity so that environmentally acceptable noise levels in the residential areas may be maintained. The proponent should work closely with local authorities to ensure that noise emissions do not create a public nuisance.

### 3.3.3 DEMOLITION RANGE

The PER states that the proposed demolition range would only be used on the rare occasion that the material to be destroyed is above the quantity to be handled at the existing range.

Work by Sills (1982) shows that for a given charge weight and source to receiver distance changing meteorological conditions can alter the observed sound intensities by over 30 dB at distances greater than 1km. Sound rays can be refracted and focused by wind and temperature gradients in the lower atmosphere to such a degree that damage to property has occurred over 10km from the source and it is probable that the sound intensity at the focus exceeded 140dB (peak linear). Figure 3 shows a noise assessment undertaken at Larkhill in the United Kingdom using a 5 kg charge.

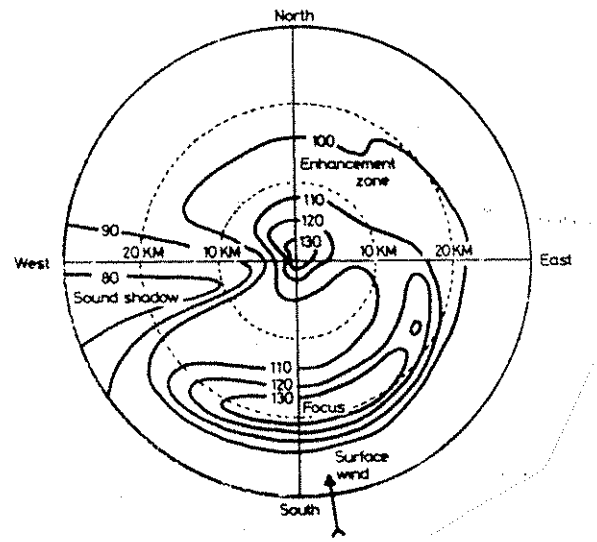



Figure 3. Noise assessment for Larkhill on 20 January 1981 at 21.00 h GMT Sound pressure levels in peak linear dB. Source 5 kg H.E. (Sills, 1982)

Members of the public have expressed concern over the impacts of noise and vibration experienced from demolitions on the existing range in the past. In view of this the Authority would advise the Department of Defence to research the effect of local meteorological conditions on blast noise experienced in residential areas from demolitions carried out on Garden Island and to re-assess the proposal to conduct demolition activities on Garden Island. The Authority considers that no noise in excess of 115 dB (peak linear) should occur in residential areas as a result of demolition activities.

The EPA believes that further consideration should be given to alternative siting of the proposed demolition range, and that a location such as the Lancelin Range may be more acceptable.

**RECOMMENDATION 8**

**The Environmental Protection Authority considers that the Department of Defence should not develop the proposed demolition range if its use has unreasonable noise and vibration impacts on the mainland. The Department of Defence should conduct further investigations into alternate sites.**

### 3.3.4 LOUDSPEAKERS (PIPES)

The PER describes loudspeaker noise as sporadic and localized, and usually confined to working hours. From the data given in Table 2, showing noise levels from tannoy (pipes) and 'growler' (rust removal) equipment, noise from these sources appears to be manageable as long as the Department of Defence is receptive to complaints and able to adjust procedures accordingly. Meteorological conditions should be taken into account when considering management of noise from operations.

Table 2: Recorded and Calculated Noise Levels at HMAS Stirling March 1988 (Persloe and Cook 1988b)

| TANNOY | | | | | | |
|---|---|---|---|---|---|---|
| DISTANCE (KM) | 0.05 | 1 | 2 | 3 | 4 | |
| LEVELS (dBA) | 82.5(1) | 53.5 | 44.5 | 32.5 | 23 | |
| **GROWLER** | | | | | | |
| DISTANCE (KM) | 0.2 | 0.5 | 1 | 2 | 3 | 4 |
| LEVELS (dBA) | 68(2) | - | 51 | 42 | 30 | 20 |
| | - | 53.5(3) | 46 | 37 | 25 | 15 |

3.4 SITING OF HELICOPTER FACILITY

The Environmental Protection Authority has the following concerns about the proposed helicopter facility;

- The Department of Defence has not provided details on the area required to be cleared. The Authority is concerned that the facility appears to require a relatively substantial area of land to be cleared.

- The site is close to the only remaining *Myoporum insulare* plant community on the island.

- The site is elevated and will detract from the natural aesthetic qualities of the island.

- There is potential for unacceptable noise emission from helicopter activity as discussed in Section 3.3.2.

The Department of Defence in its response to submissions considered that Zone K is the only suitable site remaining on the island because the other relatively flat areas are being occupied by the armaments depot and the main base (Paragraph 5.23a). The Department of Defence also determined that it would seek the assistance of CALM in 'fine tuning' the siting of the helicopter support facility and associated construction works to ensure that the effects of development on the *Myoporum insulare* community would be minimal (Paragraphs 10.2 and 10.3).

The Authority does not consider that it could support the present siting of the helicopter facility at this time. The Authority considers that an important aspect of environmental assessment is the examination of alternative sites to find the most environmentally acceptable location for the proposed development. As no detailed plans have been formulated for the helicopter facility on the proposed site and the facility is not expected to be required until 1996 the opportunity exists for a continued search and evaluation of sites, and further consideration of the clearing requirements for such a facility, without unduly imposing on time or other constraints.

**RECOMMENDATION 9**

**The Environmental Protection Authority recommends that the Department of Defence carry out an investigation into alternatives for the proposed helicopter support facility with a view to ensuring that flora and fauna impacts are minimised.**

## 3.5 CONSTRUCTION STAGE IMPACTS

The range of potential impacts from the construction of facilities include:

- spread of exotic plant species;
- introduction of disease (Phytopthora cinnamomi) by unwashed construction vehicles or infected soil; and
- clearing and wood refuse disposal.

### 3.5.1 SPREAD OF EXOTIC PLANTS

The spread of exotic plant species may result from movement of vehicles carrying seeds into areas previously undisturbed. Also the disturbance of areas will create an environment with greater potential for invasion by exotic plant species. The management of this issue should be covered by the proponent in a monitoring and management programme to address construction impacts (Refer to recommendation 2 below).

### 3.5.2 INTRODUCTION OF DISEASE

Unwashed trucks and construction machinery moving onto Garden Island have the potential to carry diseases not present on Garden Island. A commitment should be made by the proponent to minimise the likelihood of the spread of disease by taking measures to wash all vehicles which enter the island for construction purposes (Refer to recommendation 2 below).

The proponent has advised that Paragraph 7.29 of the PER is a commitment to test landfill brought in from the mainland for disease pathogens and weed seeds. The Authority considers this testing important for an area with the environmental significance of Garden Island.

### 3.5.3 CLEARING AND WOOD REFUSE DISPOSAL

Concern has been expressed that the clearing of vegetation for extensions to facilities on Garden Island has the potential to impact on restricted plant species, specifically in Zones K, B and A. The Department of Defence should endeavour to minimise the effects of clearing in all zones on the island and adhere to its commitment in the PER that no plant communities will be disturbed that are not well represented on the island (PER paragraph 6.8).

The proponent has made commitments to replanting of trees native to the island to compensate for that vegetation removed in clearing for development, and proposes to minimise dust with the use of suitable surfactants (PER paragraph 6.9). The Authority supports these proposals.

The disposal of timber and scrub cleared has not been addressed in the PER. The generally accepted procedure for wood disposal is on-site burning, however this wood could be used more productively if, for example, it was made available for firewood.

RECOMMENDATION 10

**The Environmental Protection Authority considers that the proponent should address measures to minimise the following construction-related impacts in consultation with the Garden Island Environmental Advisory Committee:**

- **spread of exotic plant species;**

- **introduction of plant disease; and**

- **clearing.**

These issues should be addressed before construction commences, and associated commitments made by the proponent in the PER should be adopted throughout the construction phase.

## 3.6 UNDERWATER SONAR EMISSIONS

Marine mamals, especially dolphins, can be affected by the use of sonar equipment in shallow or contained waters. Dolphins have a peak frequency of about 60kHz, and external sonar emissions of frequencies close to that of the dolphin's peak frequency will have some degree of impact. The EPA has been advised that sonar equipment operating at frequencies below about 200kHz would have the potential to affect dolphins in the vicinity. Active sonar can disorientate fish and marine mammals.

The Department of Defence acknowledges that investigations have shown the effects of active sonar are known to be harmful at certain levels to marine mammals and fish and has indicated that the use of active sonar will be controlled through WA General Orders and Base and Ships Standing Orders (Responses to submissions, paragraph 9.2 h).

The Environmental Protection Authority encourages further investigation of this issue with an emphasis on local conditions and fauna with a view to incorporating any findings in standing orders. The Authorities concern about sonar emissions is to ensure that aquatic fauna is not affected.

Any Department of Defence activities which use underwater explosives are likely to be harmful and should not be carried out in Cockburn Sound or near Garden Island.

## 3.7 SEWAGE TREATMENT PLANT WASTE DISPOSAL

The proponent currently monitors sewage effluent on a monthly basis for total dissolved solids, suspended solids (typically 100 mg/litre, pH 6.9) and residual chlorine (4 mg/litre). Although not tested the biochemical oxygen demand (BOD) is thought to range from 50 to 100. The results are sent to the Public Health Department (PER paragraph 7.34).

A new treatment plant is proposed for freshwater sewage and the existing plant will handle saline sewage. When the new sewage treatment plant is commissioned there would initially be weekly testing of BOD and suspended solids concentrations but this would be reduced to monthly intervals (PER paragraph 7.23 g). No waste water from the existing or proposed treatment plants would be discharged to Cockburn Sound (PER paragraph 6.59). Breakdown contingency plans which cover the failure of electric motors and associated drive assemblies and pump failures have been prepared (paragraph 7.23 h).

The existing lagoons at Zone F are sited some 600m from each coast. By moving the seepage beds 200m to the west the general direction of the effluent plume as it moves through the aquifer should be away from Cockburn Sound. The proponent has made a commitment that final siting would be confirmed following consultations with the Authority. Groundwater would be monitored by bores located downslope from the seepage beds (PER Annex E; paragraph 70).

The Environmental Protection Authority is concerned that effluent may flow to the east with high levels of nutrient and that this may affect the seagrass meadows. The disposal of sewage sludge is also of concern.

RECOMMENDATION 11

**The Environmental Protection Authority recommends that the Department of Defence prepares a nutrient monitoring programme for the sewage effluent and groundwater near the sewage infiltration site in consultation with the Environmental Protection Authority. The results should be made available annually to the Garden Island Environmental Advisory Committee and the Environmental Protection Authority. The Environmental Protection Authority considers that the disposal of sludge from the sewage treatment plan should be addressed in the Environmental Management Plan.**

## 3.8 NUCLEAR WARSHIP VISITS

The Department of Defence has stated that provision of additional facilities will have no impact on whether or not allied nuclear-powered, nuclear-capable or nuclear-armed warships visit HMAS Stirling or the Port of Fremantle. The facilities are being constructed to homeport Australian Vessels. The issue of nuclear ship visits to HMAS Stirling has not been addressed by the Authority in this report.

Monitoring for radioactivity is undertaken under an existing agreement between the State and Commonwealth Government.

## 3.9 RISKS AND HAZARDS

The Authority believes that the developments and operational activities of HMAS Stirling should be incorporated into the cumulative risk analysis of the Kwinana industrial area in view of the proximity of Garden Island to Kwinana.

The contingency and emergency plans for HMAS Stirling should be integrated with the Kwinana Integrated Emergency Management Scheme (KIEMS). KIEMS is administered by the State Emergency Service and will soon commence the process of integrating local area emergency plans.

RECOMMENDATION 12

**The Environmental Protection Authority recommends that the Department of Defence should integrate its emergency and contingency plans with the State Government's Kwinana Integrated Emergency Management Scheme.**

## 3.10 MANAGEMENT OF GRASSED AREAS

The Department of Defence has provided details of its fertiliser usage for the ovals on Garden Island. Whilst the levels of usage will probably not cause environmental problems because of the soil types of Garden Island, the Authority believes that the Department of Defence could implement a Nutrient and Irrigation Management Plan (NIMP). Such a plan can achieve fertiliser savings through soil/tissue testing and split applications, water savings through better irrigation scheduling and savings in mowing costs. Many local authorities in Perth are currently adopting NIMPs and significantly reducing fertilizer application rates and hence the potential for nutrient loss.

## 3.11 ENVIRONMENTAL MANAGEMENT PLAN

The Department of Defence proposes to upgrade the existing Land Management Plan (LMP) to an Environmental Management Plan (EMP), incorporating programmes for monitoring those components of the physical and biological environments of Garden Island and Cockburn Sound viewed as being susceptible to natural and human induced changes.

A review of the current LMP for Garden Island has been completed by the Department of Defence (HMAS STIRLING Environmental Working Paper No 5, 1988). This report outlines information on the following aspects of the proposed EMP:

- the adequacy of information for land management (erosion control, fauna - including pests, flora - including weeds, and public recreation);
- identifies key information deficiencies;
- the need for a review of management aims and objectives and for the introduction of strategies as a means to measure the level of achievement of these;
- the adequacy of the approach taken for the LMP;
- pertinent questions are raised relating to the comprehensiveness of the LMP and the proposed EMP;
- identifies matters not addressed by the LMP; and
- outlines management implications of the proposed developments.

The review briefly covers all components of environmental management of Garden Island. The Department of Defence indicated in its response to public submissions that the approach in preparing the EMP is in accordance with "HMAS STIRLING Environmental Working Paper No 5" and is summarised in Annex K of the PER.

The Authority believes that upgrading the LMP to an EMP is an important aspect of the proposal for expansion of naval facilities on Garden Island. The commitments made in the PER and response to public submissions should be implemented as soon as possible.

### 3.11.1 ENVIRONMENTAL MONITORING

The Department of Defence has indicated that the revised monitoring program will be finalised after the review of this Public Environmental Report, the hearing on the proposal by the Parliamentary Standing Committee on Public Works and evaluation by the Garden Island Environmental Advisory Committee.

The Authority is keen to integrate relevant portions of the proposed monitoring programs with its monitoring programs and considers that there would be benefits for both the Department of Defence and the Authority in coordinating monitoring programs and sharing the results.

Many Department of Defence commitments in the PER allude to Environmental Protection Authority standards or pollution concerns. The Environmental Protection Authority is naturally keen to be aware of the monitoring results in relation to those commitments.

The Environmental Protection Authority also considers that all monitoring results should go to the Garden Island Environmental Advisory Committee as a matter of course.

**RECOMMENDATION 13**

**The Environmental Protection Authority considers that the Department of Defence should make monitoring results available on an annual basis to the Environmental Protection Authority for commitments which refer to Environmental Protection Authority standards or pollution concerns. With regard to other commitments in the PER and responses to submissions, regular reports on the status of those commitments could be referred to Garden Island Environmental Advisory Committee for comment.**

## 4. CONCLUSIONS

The Environmental Protection Authority has reviewed the Department of Defence's proposal to expand naval facilities on Garden Island. The scope of the proposal provides the potential for many environmental impacts. Although many of these are manageable, the Authority has identified a variety of issues not adequately addressed by the proponent, and has made recommendations in relation to these. Issues of major concern to the EPA were the potential for the proposal to impact on sea water quality and seagrass meadows in Cockburn Sound, the impact of noise emissions from operation and the siting of the helicopter support facility.

## 5. REFERENCES

Department of Conservation and Environment (1979), Cockburn Sound environmental study, Report No 2. Department of Conservation and Environment, Perth, Western Australia.

Maltz A (1988) Assessment of organotin compounds, especially tributyl tin compounds used as antifoulants. Assessment report, State Pollution Control Commission, New South Wales.

Peploe P and Cook R (1988a) Environmental noise levels due to ship activities at HMAS Creswell, Jervis Bay, NSW July 1988. National Acoustic Laboratories Commissioned Report No 23, Chatswood, New South Wales.

Peploe P and Cook R (1988b) Environmental noise levels due to ship activities at HMAS Stirling, WA March 1988. National Acoustic Laboratories Commissioned Report No 22, Chatswood, New South Wales.

Sills A G (1982) The prediction of sound intensity from an explosive source. Applied Acoustics 15 231-240.

## THE PROPONENTS ENVIRONMENTAL COMMITMENTS

### A. COMMITMENTS REFERENCED IN THE TEXT

Tributyl Tin

PER 7.37 In addition sampling and measurements will be carried out as an ongoing part of monitoring the environmental effects of operations to determine:

a) the levels of tributyl tin (TBT) in the sediments underlying the berths of ships and the slipway as well as along the shoreline and deeper waters of Careening Bay.

Sullage Effluent

PER ANNEX E; Paragraph 77. The plant envisaged is designed to comply with NSW guidelines (specifically for Sydney Harbour) and is capable of limiting oil discharges to 1 part per million as well as meeting all other NSW environmental standards. The Western Australian Environmental Protection Authority standards is 8 parts per million.

PER 6.61 Sullage from the bilges or fuel displacement tanks of submarines will be treated in an upgraded plant with increased capacity and quality of filtration (paragraphs 3.30c, 76 to 78, Part 2, Annex E). This plant is located in the wharf area and the filtered saline water is to be pumped into Careening Bay. The effluent to be released will be monitored and maintained at the Western Australian Environmental Protection Authority standards (paragraph 6.29).

PER 7.37 In addition sampling and measurements will be carried out as an ongoing part of monitoring the environmental effects of operations to determine:

d) the efficiency of sewage and sullage treatment for the ship and shore facilities.

PER 7.23 The key mechanisms which are used to safeguard the environment are as follows:

b) Ships standing orders which cover such matters as fuelling, electro-magnetic emissions and the management of sewage, sullage and solid waste.

Impacts on seagrass meadows

PER 6.13 None of the shoreline of offshore works in Careening Bay will destroy or damage major areas of marine or nearshore habitat, as these were previously dredged or affected by construction during initial developments (paragraphs 3.16 and 5.36). Areas affected by development will be surveyed as part of the monitoring programme. This will confirm recolonization and maintenance of stable physical conditions or any other changes should they occur.

THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

PER 3.23 The total dredging programme including small ships harbour will involve the removal of some 50,000$m^3$ of shoreline sand and fine calccareous sediments. All dredge spoil will be treated and used for land fill.

PER APPENDIX H-4 There will be no adverse effects from leachates from the drege spoil, as flocculants will be settled and allowed to infiltrate or be decanted to the sea via 'turkey nest' ponds.

PER 7.37 In addition sampling and measurements will be carried out as an ongoing part of monitoring the environmental effects of operations to determine:

c) the stability of seagrass meadows flanking the eastern shoreline of Garden Island; and

Noise Emissions: Construction Activities

RES 15.2 All of these issues have been addressed in the PER and control measures will be developed to:

d) limit the time span during which pile driving will be allowed.

Noise Emissions: Helicopter Activity

PER 6.73 Most operational flights will be to seaward of Garden Island to fleet units on exercise. Where mainland trips are required air traffic will be routed clear of residential and recreational areas to minimize noise effects. These movements would conform to normal civil air traffic control procedures for metropolitan Perth. All helicopter movements over Garden Island will be routed away from facility buildings and in particular fuel and gas storages.

PER 7.36 Operational environmental monitoring will be carried out by the Department of Defence on:

b) noise levels associated with ships and helicopters using the base.

Noise Emissions: Demolition Range

PER 7.36 Operational environmental monitoring will be carried out by the Department of Defence on:

a) the operations of the demolition range to record date, time, size of charges used and materials demolished.

Siting of Helicopter Facility

RES 10.2 The Club (Naturalists Club) drew attention to the situation that the siting of the proposed helicopter support facility "will either engulf or be very close to the only remaining "Myoporum insulare community".

THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

RES 10.3 Department of Defence will seek the assistance of CALM in 'fine tuning' the siting of the helicopter support facility and other construction works. This should ensure that the effects of development on the Myoporum insulare and other plant communities are minimal.

Construction Stage Impacts

PER 7.29 Construction. The items to be monitored in the course of the construction program are site works, land fill brought in from the mainland, shorelines and dredge spoil used for land fill (paragraph 7.16).

PER 6.8 There will be no clearing outside the designated development zones (Map 3.1) and no plant communities will be disturbed that are not well represented on the island.

PER 6.9 Nuisance caused by dust will be suppressed through the use of suitable surfactants. Undesirable noise will be reduced by standard suppression measures.

PER APPENDIX H-1 Trees removed to make way for buildings will be compensated for in the landscaping plans for the surrounds of new facilities. All vegetation removed will be replaced with native species common to the Island.

Underwater Sonar Emissions

RES 9.2 h) The effects of sonar on the marine environment have been investigated by the Department of Defence and are known to be harmful at certain levels to marine mammals and fish. The use of active sonar in Cockburn Sound will be controlled through the WA General Orders and Base and Ships Standing Orders.

Sewage Treatment Plant Waste Disposal

PER 7.34 Operation of the sewerage treatment plant is strictly monitored. The quality of the effluent is tested monthly and the results sent to the Public Health Department. The effluent is tested for total dissolved solids, suspended solids (typically 100 mg/litre, pH 6.9) and residual chlorine (4 mg/litre). Although not tested the biochemical oxygen demand (BOD) is expected to range from 50 to 100 (Table 5.2).

PER 7.23 The key mechanisms which are used to safeguard the environment are as follows:

g) Routine operational surveillance, by the plant operator, of the effluent from the sewage works... Initially there will be weekly testing of BOD and suspended solids concentrations after commissioning of the plant. This will be reduced to monthly intervals.

THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

h) Breakdown contingency plans for both the new and existing treatment plants which cover the failure of electric motors and associated drive assemblies and pump failures.

PER ANNEX E; Paragraph 73. The existing lagoons at Zone F are sited some 600m from each coast. By moving the seepage beds 200m to the west the general direction of the effluent plume as it moves through the aquifer should be away from Cockburn Sound. The final siting will be confirmed following consultations with the Western Australian Environmental Protection Authority. Groundwater will be monitored by bores located downslope from the seepage beds.

the aquifer should be away from Cockburn Sound. The final siting will be confirmed following consultations with the Western Australian Environmental Protection Authority. Groundwater will be monitored by bores located downslope from the seepage beds.

PER 6.59 Sewage is treated separately to sullage (paragraphs 60 to 78, Part 2, Annex E). The existing sewage plant is to be upgraded to met the increased volume of waste by separating the fresh water sewage from saline sewage for treatment, with the freshwater sewage in a package treatment plant and the saline sewage in the existing lagoons (paragraphs 3.30c and 67 to 69, Annex E). These methods are standard approaches and will meet the Western Australian Environmental Protection Authority requirements. No waste water from the existing or proposed plant will be discharged to Cockburn Sound (paragraph 73, Annex E).

Environmental Monitoring

PER 7.38 Monitoring programs to meet the requirements of 7.37 a-c will be developed in collaboration with the Western Australian Environmental Protection Authority. Monitoring of sewage and sullage will follow the current practices and use Australian Construction Services resources.

RES 6.5 e) Monitoring programs will be implemented through the EMP. These will have the purpose of improving management programs and providing an ongoing assessment of the effects of operations and the correct levels of public access on island and near-shore areas.

RES Paragraph 25. Currently (the) EMP is being prepared by Department of Defence's consultants. Following governmental review and endorsement the plan should be ready for implementation by the end of 1990.

PER S.44 The monitoring program will be finalised after the review of this Public Environmental Report, the hearing on the proposal by the Parliamentary Standing Committee on Public Works and evaluation by the Garden Island Environmental Advisory Committee.

THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

RES 9.2 b) The EMP will also deal with wastewater management and the control of pollution relating to:

i) the discharge of stormwater runoff form hardstanding and other areas, treated bilge and ballast water, treated sewerage and drainage from the slipway;

ii) the containment of solid materials from the maintenance of hulls;

iii) the containment and treatment of oily wastes; and

v) the collection and incineration of quarantine wastes.

B. OTHER COMMITMENTS

Construction impacts

PER 7.5 Department of Defence policies and practices guide the mitigation measures which will be taken during construction of facilities to reduce the localized effects of site clearing, dust, noise, vibration, dredging and the disposal of spoil, the increased movement of traffic and parking.

PER 7.16 Construction activities will be kept under review to ensure that:

a) mitigation measures for dust, noise, vibration and traffic movement are effective;

b) the level of disturbance to terrestrial habitats is kept within reasonable limits and any site rehabilitation that may be needed is done;

c) shoreline construction does not destroy or damage unrecorded marine archeological relics; and

d) dredge spoil does not result in flocculants from drainage areas reducing water quality in Careening Bay.

Fuel Spills

PER 7.9 ... all bulk storage facilities (B25 for aviation and B52 for the fuel oil installation) are constructed and operated according to the Australian Standards Association, AS 1940-1882, "The Storage and Handling of Flamable and Combustible Liquids Codes" which provide both safety and environmental standards.

Landscaping

PER 7.14 Landscaping will compliment the built environment. Design and plant materials will continue the existing landscape theme. A plant nursery will be established on the island for the propagation of plant material native to the island.

## THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

Pollution Control

PER 7.6 Amelioration procedures which relate to control of fuel spill, electro-magnetic emissions, and the management of solid and liquid wastes have been identified. The same procedures are used at all naval establishments and will be implemented throughout the operation of the facilities to ensure that deletrious environmental disturbances are minimal.

PER 7.23 .... The key mechanisms which are used to safeguard the environment are as follows:

b) Ships standing orders which cover such matters as fuelling, electromagnetic emissions and the management of sewage, sullage and solid waste.

General

PER 7.27 .... The proposed monitoring program and the factors to be addressed by the Department of Defence are to ensure that the current high standard of environmental management of defence lands, facilities and operational activities is enhanced.

PER 7.35 The intention of the Department of Defence is to monitor key components of the environment which would indicate natural and human induced environmental changes. Measurements would include sea level height and possible erosion of the shoreline as a result of high water levels arising from the "Greenhouse effect" of global temperature rises and other climatic changes.

Public Awareness

PER 7.24 Public awareness is another safeguard. A brochure has been prepared for distribution outlining the constraints to public access and giving reasons for preserving the natural environment in public areas.

Environmental Management Plan

The Department of Defence has made commitments to involve the following organisations in the preparation of the EMP.

RES 9.3 Cockburn Sound Conservation Committee

RES 10.4 The Naturalists Club

RES 9.2 Having reviewed the observations and recommendations made by the Cockburn Sound Conservation Committee the Department of Defence respond as follows:

a) The EMP will be extended to include the marine environment of the waters nearshore to Garden Island. This is outlined in HMAS STIRLING Environmental Working Papers 5 and 7 and stated in Annex K of the PER. Monitoring of the marine environments is covered in Section 7 of the PER (7.28, 7.35, 7.37);

THE PROPONENTS ENVIRONMENTAL COMMITMENTS (Cont'd)

b) The EMP will also deal with wastewater management and the control of pollution relating to:

i) the discharge of stormwater runoff form hardstanding and other areas, treated bilge and ballast water, treated sewerage and drainage from the slipway;

ii) the containment of solid materials from the maintenance of hulls;

iii) the containment and treatment of oily wastes;

iv) the collection and removal of solid wastes; and

v) the collection and incineration of quarantine wastes.

RES 6.5 c) The EMP will make provision for protection of wildlife and conservation values through:

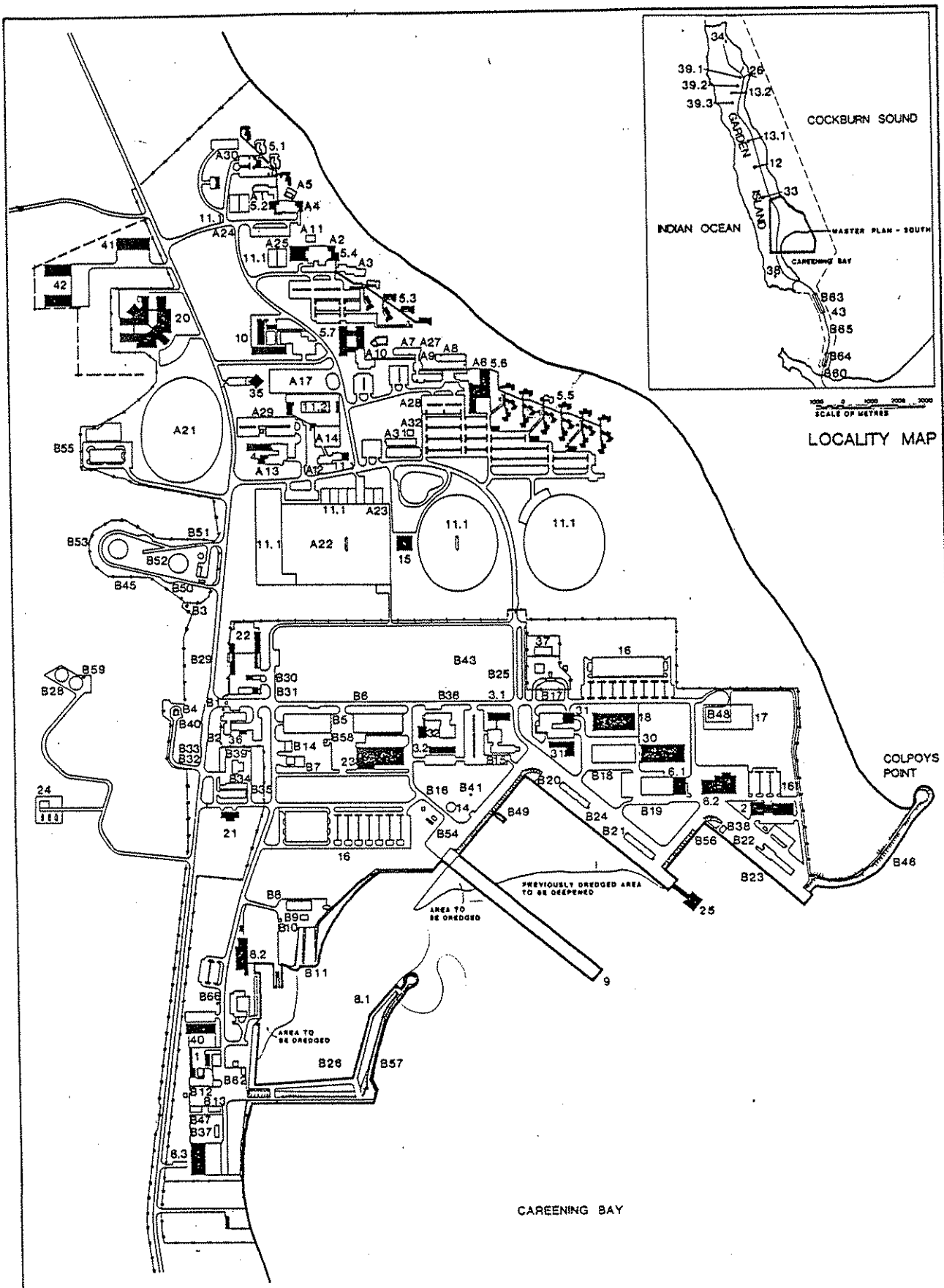
i) existing statutes;

ii) minimisation of reticulated lawn and garden areas; and

iii) educational programs which focus on fire risks and the biological risks of noxious pests and feral animals.

d) Monitoring programs will be implemented through the EMP. These will have the purpose of improving management programs and providing and ongoing assessment of the effects of operations and the correct levels of public access on island and nearshore areas.

PER 7.32 Records are maintained of outbreaks of fire on the island. The effects of controlled burning are also monitored. These tasks reflect management strategies outlined in the Land Management Plan.


COCKBURN SOUND
INDIAN OCEAN
GARDEN ISLAND
CAREENING BAY
MASTER PLAN - SOUTH
LOCALITY MAP
COLPOYS POINT
CAREENING BAY
PREVIOUSLY DREDGED AREA TO BE DEEPENED
AREA TO BE DREDGED
AREA TO BE DREDGED
EXISTING FACILITIES
PROPOSED FACILITIES
MASTER PLAN - SOUTH
SCALE OF METRES
FEBRUARY 1989
PREPARED BY AUSTRALIAN CONSTRUCTION SERVICES FOR THE DEPARTMENT OF DEFENCE (NAVY)
MAP 3·2

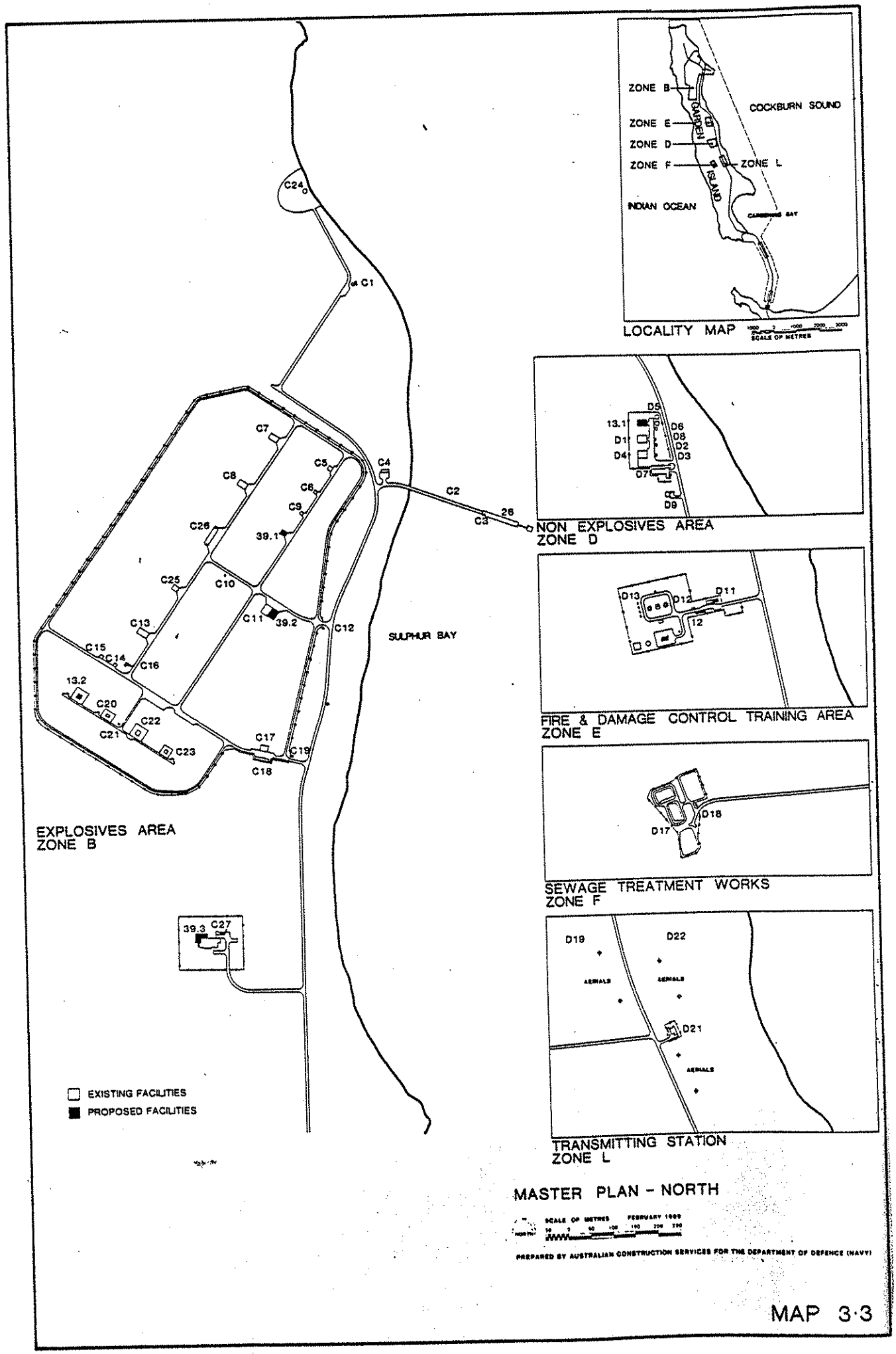
# HMAS STIRLING - MASTER PLAN - (SOUTH) - SCHEDULE OF FACILITIES

## EXISTING FACILITIES

| ITEM | DESCRIPTION |
|---|---|
| A1 | OFFICERS ACCOMMODATION |
| A2 | SENIOR SAILORS MESS |
| A3 | SENIOR SAILORS ACCOMMODATION |
| A4 | OFFICERS WARDROOM |
| A5 | OFFICERS SWIMMING POOL |
| A6 | JUNIOR SAILORS GALLEY AND CAFETERIA |
| A7 | JUNIOR SAILORS ACCOMMODATION |
| A8 | JUNIOR SAILORS ACCOMMODATION |
| A9 | JUNIOR SAILORS ACCOMMODATION |
| A10 | JUNIOR SAILORS RECREATION CENTRE & SHIPS CANTEEN |
| A11 | SENIOR SAILORS SWIMMING POOL |
| A12 | SQUASH COURTS |
| A13 | MEDICAL CENTRE |
| A14 | GYMNASIUM |
| A17 | PARADE GROUND |
| A21 | SPORTS OVAL |
| A22 | SPORTS FIELDS |
| A23 | JUNIOR SAILORS TENNIS COURTS |
| A24 | OFFICERS TENNIS COURT |
| A25 | SENIOR SAILORS TENNIS COURT |
| A26 | JUNIOR SAILORS SWIMMING POOL |
| A27 | JUNIOR SAILORS LAUNDRY |
| A28 | VEHICLE MAINTENANCE RAMP |
| A29 | SUB-STATION |
| A30 | SUB-STATION |
| A31 | ARMY ACCOMMODATION |
| A32 | ARMY LAUNDRY |
| B1 | GUARDHOUSE |
| B2 | FIRE STATION |
| B3 | Z FORCE MEMORIAL |
| B4 | FIRE BOOSTER PUMP HOUSE |
| B5 | SUPPLY CENTRE |
| B6 | BULK STORE |
| B7 | FLAMMABLE LIQUID STORE |
| B8 | SHIPWRIGHTS WORKSHOP |
| B9 | WINCH HOUSE |
| B10 | SLIPWAY PAINT STORE |
| B11 | SLIPWAY |
| B12 | CLEARANCE DIVING RECOMPRESSION |
| B13 | SUPPORT CRAFT OFFICE AND AMENITIES |
| B14 | GAS BOTTLE STORE |
| B15 | ADMINISTRATION HEADQUARTERS |
| B16 | COLLIMATION TOWER |
| B17 | POWER HOUSE/UTILITIES |
| C18 | ENGINEERING WORKSHOP |
| B19 | ELECTRONICS WORKSHOP |
| B20 | ANCILLARY BUILDING - DESTROYER WHARF |
| B21 | ANCILLARY BUILDING - DESTROYER WHARF |
| B22 | ANCILLARY BUILD-SUBMARINE WHARF |
| B23 | SUBMARINE WHARF |
| B24 | DESTROYER WHARF |
| B25 | AVCAT FUEL FACILITY |
| B26 | SMALL SHIPS HARBOUR |
| B28 | WATER STORAGE TANKS |
| B29 | TRANSPORT COMPOUND |
| B30 | TRANSPORT OFFICE |
| B31 | TRANSPORT WORKSHOP |
| B32 | DAS.ACS - DEPOT |
| B33 | DAS.ACS - WORKSHOPS |
| B34 | DAS.ACS - PLANT BUILDING |
| B35 | DAS.ACS - OFFICE |
| B36 | N.O.C.W.A. OPERATIONAL HEADQUARTERS |
| B37 | RECREATIONAL BOAT SHED |
| B38 | SALTWATER PUMPHOUSE |
| B39 | DAS ACS - P.O.L. STORE |
| B40 | POLICE POST |
| B41 | MAIN FLAG POLE |
| B43 | AERIAL FARM |
| B45 | OIL FUEL INSTALLATION |
| B46 | GROYNE - COLPOYS POINT |
| B47 | SUPPORT CRAFT WORKSHOP |
| B48 | HELICOPTER LANDING PAD |
| B49 | OFFICERS BOAT LANDING |
| B50 | FUEL PUMPHOUSE |
| B51 | FIRE WATER STORAGE TANK |
| B52 | FUEL TANK |
| B53 | FUEL TANK |
| B54 | FUEL FILTER HOUSE |
| B55 | SUBMARINE ESCAPE TRAINING FACILITY |
| B56 | LANDING SHIP HARD |
| B57 | GROYNE - SMALL SHIPS HARBOUR |
| B58 | INCINERATOR |
| B59 | V.H.F. BUILDING |
| B60 | CAUSEWAY POLICE CONTROL POST (LOCALITY MAP) |
| B62 | SUB-STATION |
| B63 | HIGH LEVEL BRIDGE (LOCALITY MAP) |
| B64 | LOW LEVEL BRIDGE (LOCALITY MAP) |
| B65 | CAUSEWAY (LOCALITY MAP) |
| B66 | ARMY WATER TRAINING FACILITY |

## PROPOSED FACILITIES

| ITEM | DESCRIPTION |
|---|---|
| 1 | EXTENSION TO DIVING (CDT4) FACILITIES |
| 2 | PORT SERVICES BUILDING |
| 3.1 | TECHNICAL SERVICES BUILDING |
| 3.2 | SUBMARINE SQUADRON BUILDING |
| 4 | EXTENSION TO MEDICAL CENTRE |
| 5.1 | ADDN'L OFFICERS ACCOMMODATION |
| 5.2 | EXTENSION TO OFFICERS WARDROOM |
| 5.3 | ADDN'L SENIOR SAILORS ACCOMMODATION |
| 5.4 | EXTENSION TO SENIOR SAILORS MESS |
| 5.5 | ADDN'L JUNIOR SAILORS ACCOMMODATION |
| 5.6 | EXTENSION TO JUNIOR SAILORS GALLEY |
| 5.7 | EXTENSION TO RECREATION CENTRE |
| 6.1 | EXTENSION TO ELECTRONICS WORKSHOP NO. 1 |
| 6.2 | ELECTRONICS WORKSHOP NO. 2 |
| 7 | EXTENSION TO SUBMARINE WHARF SERVICES |
| 8.1 | MINE WARFARE/SUPPORT CRAFT BERTHS |
| 8.2 | SLIPWAY ANCILLARY AND SUPPORT CRAFT BUILDING |
| 8.3 | MINE WARFARE SUPPORT BUILDING |
| 9 | FLEET PIER |
| 10 | FLEET BASE GENERAL AMENITIES |
| 11.1 | SPORTS FACILITIES |
| 11.2 | SWIMMING POOL |
| 14 | SULLAGE AND OVERSIDE SERVICES |
| 15 | SPORTS PAVILLION AND AMENITIES |
| 16 | CARPARK |
| 17 | HELICOPTER LANDING PAD (INTERIM) |
| 18 | HULL MAINTENANCE WORKSHOP |
| 20 | NEW SUBMARINE SCHOOL |
| 21 | PROJECT SITE OFFICE |
| 22 | EXTENSION TO MOTOR TRANSPORT FACILITY |
| 23 | NAVAL STORE |
| 24 | SEWERAGE PLANT |
| 25 | DESTROYER WHARF DOLPHIN |
| 30 | ENGINEERING WORKSHOP |
| 31 | EXTENSION TO POWERHOUSE |
| 32 | EXTENSION TO NOCWA HEADQUARTERS |
| 33 | FUEL INSTALLATION EXTEN (LOCALITY MAP) |
| 34 | RECEIVING STATION (LOCALITY MAP) |
| 35 | CHAPEL |
| 36 | EXTENSION TO FIRE STATION & GUARD HOUSE |
| 37 | EXTENSION TO AVCAT FUEL STORAGE FACILITY |
| 38 | HELICOPTER SUPPORT FACILITY (LOCALITY MAP) |
| 40 | DIVING SCHOOL |
| 41 | TACTICAL TRAINER |
| 42 | TRAINING SCHOOLS |
| 43 | CAUSEWAY CYCLEWAY (LOCALITY MAP) |
| 44 | SPORT'S FACILITIES - EXTENSION |
| 45 | NAVAL STORES - ADDITIONAL BLDG |
| 46 | MEDICAL CENTRE - EXTENSION |
| 47 | BARRACKS ACCOMMODATION - EXTENSION |


ZONE B
ZONE E
ZONE D
ZONE F
ZONE L
COCKBURN SOUND
GARDEN ISLAND
INDIAN OCEAN
LOCALITY MAP
SCALE OF METRES
C24
C1
C7
C8
C5
C6
C9
C4
C2
C3
26
C26
39.1
C25
C10
C11
39.2
C12
C13
C15
C14
C16
13.2
C20
C22
C21
C23
C17
C19
C18
SULPHUR BAY
EXPLOSIVES AREA
ZONE B
39.3
C27
D5
13.1
D6
D1
D8
D2
D4
D3
D7
D9
NON EXPLOSIVES AREA
ZONE D
D13
D12
D11
12
FIRE & DAMAGE CONTROL TRAINING AREA
ZONE E
D18
D17
SEWAGE TREATMENT WORKS
ZONE F
D19
D22
AERIALS
D21
TRANSMITTING STATION
ZONE L
EXISTING FACILITIES
PROPOSED FACILITIES
MASTER PLAN - NORTH
SCALE OF METRES
FEBRUARY 1989
PREPARED BY AUSTRALIAN CONSTRUCTION SERVICES FOR THE DEPARTMENT OF DEFENCE (NAVY)
MAP 3·3

# HMAS STIRLING - MASTER PLAN - (NORTH) - SCHEDULE OF FACILITIES

## EXISTING FACILITIES

| ITEM | DESCRIPTION |
|---|---|
| **ZONE B. EXPLOSIVES AREA** | |
| C1 | FIRING SHELTER |
| C2 | ARMAMENT WHARF |
| C3 | ARMAMENT WHARF CRANE |
| C4 | AMENITIES BUILDING |
| C5 | EXPLOSIVES STORE |
| C6 | EXPLOSIVES STORE |
| C7 | EXPLOSIVES STORE |
| C8 | EXPLOSIVES STORE |
| C9 | EXPLOSIVES STORE |
| C10 | TOILET |
| C11 | EXPLOSIVES STORE |
| C12 | POLICE POST |
| C13 | EXPLOSIVES STORE |
| C14 | EXPLOSIVES STORE |
| C15 | EXPLOSIVES STORE |
| C16 | SUB-STATION |
| C17 | EXPLOSIVES WORKSHOP OFFICE |
| C18 | GARAGE/WORKSHOP |
| C19 | POLICE POST |
| C20 | EXPLOSIVES WORKSHOP |
| C21 | TOILET |
| C22 | EXPLOSIVES WORKSHOP |
| C23 | EXPLOSIVES WORKSHOP |
| C24 | DEMOLITION RANGE PIT |
| C25 | EXPLOSIVES STORE |
| C26 | EXPLOSIVES STORE |
| C27 | TORPEDO SUPPORT FACILITY |
| **ZONE D. NON-EXPLOSIVES AREA** | |
| D1 | NON-EXPLOSIVES STORE |
| D2 | NON-EXPLOSIVES DANGEROUS GOODS STORE |
| D3 | FLAMMABLE STORE |
| D4 | WORKSHOP |
| D5 | WATER STORAGE TANKS |
| D6 | PUMPHOUSE |
| D7 | ADMINISTRATION BUILDING |
| D8 | FUELING POINT AND CANOPY |
| D9 | RANGERS OFFICE AND WORKSHOP |
| **ZONE E. FIRE & DAMAGE CONTROL TRAINING AREA** | |
| D11 | CHANGEROOM AND STORE |
| D12 | P.O.L. STORE |
| D13 | FIRE AND DAMAGE CONTROL GROUND |
| **ZONE F. SEWERAGE TREATMENT WORKS** | |
| D17 | SEWERAGE FARM |
| D18 | CHLORINATOR BUILDING |
| **ZONE L. TRANSMITTING STATION** | |
| D19 | AERIAL FARM - WEST |
| D21 | TRANSMITTER BUILDING |
| D22 | AERIAL FARM - EAST |

## PROPOSED FACILITIES

| ITEM | DESCRIPTION |
|---|---|
| 12 | EXTENSION TO FIRE AND DAMAGE CONTROL TRAINING AREA |
| 13.1 | NON-EXPLOSIVES STOREHOUSE |
| 13.2 | EXPLOSIVES WORKSHOP |
| 26 | ARMAMENT WHARF FENDERING |
| 39.1 | EXPLOSIVES STORE |
| 39.2 | TRANSIT STORE |
| 39.3 | TORPEDO SUPPORT FACILITY EXTN |

## 5. WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION AUTHORITY (EPA)

5.1 The EPA seeks answers to a range of questions. Responses to each question asked by the Authority are given in paragraph 5.3 to 5.31.

5.2 DoD note that the two of the proposals which give rise to the questions have neither been fully planned nor designed, e.g. the helicopter support facility and the emergency demolition range.

5.3 Two questions have been raised in regard to the use of fertilizers on grassed areas. What are the current and expected fertilizer loadings? What impact is this nutrient input predicted to have on the water quality of Cockburn Sound? The answers are as follows.

a) Approximately 2.5 tonnes of fertilizer is presently applied to the playing fields once a year. This equates to some 500kg/ha as the Australian Rules oval is 2.5ha and the Cricket/Rugby field is 3.0ha. In the future another 1.25 tonnes would be required for the additional Australian Rules oval (Item 1.1, PER Map 3.2)

b) The composition of the fertilizer used is:
   i. nitrogen, 12 percent as sulphate of ammonia;
   ii. potassium, 9.9 percent as murlate of potash;
   iii. phosphate, 1.7 percent as superphosphate;
   iv. magnesium, 0.25 percent as magnesium sulphate; and
   v. iron, 0.15 percent as iron sulphate.

c) This loading is believed to be similar to that used on other playing fields on the Swan Coastal Plain. The effects of this fertilizer load on the water quality of Cockburn Sound are predicted to be extremely small because:
   i. the playing fields are 400m from the nearest shoreline and there is no surface runoff reaching the beachline; and
   ii. any runoff is into the sand and phosphates in the soil tend to break down through hydrolysis.

5.4 The issue of noise exposure outside the boundary of the base has been raised. EPA ask:'What are the actual noise emission levels, and the disturbances from the following sources:

a) helicopters; and
b) loudspeakers (pipes) and berthed vessels on base?

5.5 Environmental noise levels due to ship activities have been studied by the National Acoustic Laboratories (NAL) at HMAS STIRLING in March 1988 and at HMAS CRESWELL at Jervis Bay, NSW in July 1988. The results of these studies is documented in NAL Commissioned Reports 22 and 23 respectively (Peploe and Cook, 1988 a and b). From the field measurements NAL concluded that the most significant noise levels from ship activity were a result of rust removal using 'growler', external tannoy

system (pipes) and helicopter operations. Data in NAL reports show that in all cases (if operations are transposed onto the Garden Island environment) noise levels at the nearest residential location are below those considered as acceptable by the NSW State Pollution Control Commission (SPCC).

5.6 DoD understand the Western Australian Environmental Protection Authority Act has adopted similar noise regulations to that of the NSW SPCC. On the basis of data provided by the NAL naval operations are well within acceptable noise limits.

5.7 Peploe and Cook (1988a) provide $L_{10}$ values for varying distances for both tannoy use and growler operations. These are given in Table 5.1 below. The average $L_{10}$ values (1) for the tannoy were measured 50m from HMAS MORESBY and for the growler were measured at 200m(2) and 500m (3) from paint and rust removing operations on HMAS SWAN. These were then extrapolated to predict levels at greater distances. NAL note that discrepancies between the predicted levels for $L_{10}$ values at 200m from that at 500m may be partially due to the meteorological conditions at the time of measurement. The nearest residential areas are at least 5 km from the harbour area. Noise from these sources at residential areas is therefore predicted to be below 25 dBA, the NSW SPCC Standard for night activities.

TABLE 5.1
RECORDED AND CALCULATED NOISE LEVELS AT HMAS STIRLING MARCH 1988

| | | | | | | |
|---|---|---|---|---|---|---|
| **TANNOY** | | | | | | |
| **DISTANCE (KM)** | 0.05 | 1 | 2 | 3 | 4 | |
| **LEVELS (dBA)** | 82.5(1) | 53.5 | 44.5 | 32.5 | 23 | |
| **GROWLER** | | | | | | |
| **DISTANCE (KM)** | 0.2 | 0.5 | 1 | 2 | 4 | 6 |
| **LEVELS (dBA)** | 68(2) | - | 51 | 42 | 30 | 20 |
| | - | 53.5(3) | 46 | 37 | 25 | 15 |

5.8 Measurements were made at HMAS CRESWELL of the noise associated with a helicopter rescue over water. This is viewed as the noisiest helicopter operation. A helicopter rescue training flight lasts more than 25 minutes in contrast to a helicopter fly over which lasts about 20 seconds.

5.9 Average $L_{10}$ levels recorded at HMAS CRESWELL at 800m(1) and 1300m(2) from the helicopter rescue flight (Peploe and Cook, 1988b) are given in Table 5.2. The nearest residential areas are approximately 4.5

km from the helicopter support facility. Noise levels of up to 35-40 dBA may therefore be experienced. Aircraft movements are expected to average two per day, with up to 10 per day during each annual 14 day fleet exercise period. The average background A-weighted sound pressure levels predicted under AS1055.2 for a Category R3 area such as Rockingham is 40-50 dBA. The maximum noise level of 40 dBA is therefore approximately the same as the expected existing background noise level at night and is well below the peak level of 82 dBA allowed under the NSW SPCC Noise Control Manual guidelines for helicopter operations near residential areas.

TABLE 5.2

HELICOPTER NOISE RECORDED AND CALCULATED AT HMAS CRESWELL JULY 1988

| DISTANCE (KM) | 0.8 | 1.3 | 2 | 4 | 6 |
|---|---|---|---|---|---|
| LEVEL (dBA) | 65.6(1) | - | 54 | 42 | 32.5 |
| | - | 54.4(2) | 48.6 | 36.5 | 27 |

5.10 In regard to operation of the existing demolition range the EPA asked:'What is the expected range within which the noise emissions of the charges from the demolition range will fall?'

5.11 NAL figures provided to DoD show that a 20kg charge reaches 115dBA peak emission at a maximum radius of 8km. This is the NSW SPCC criteria for peak impulse noise. Residential areas in Rockingham and Kwinana lie well outside this radius. Also it is noted that the most common charge is 5kg and this has a much smaller peak impulse radius.

5.12 Two questions have been asked in relation to the piping of runoff from wharf sites and adjoining carparks into the sea at Careening Bay: 'What are the options for treating or containing this runoff?'. What are the levels of contaminants in the water?'.

5.13 Some 6.6ha of the Base (roads, carparks and hardstanding), to the south of Vancouver Road are drained into Careening Bay. Water is discharged into the Bay through five discharge pipes: two along Baudin Road; one on the eastern end of the escort wharf; and two at the western end of the submarine wharf.

5.14 There are no viable options for containing this water as the stormwater drainage system is in place and the volume would be too great to store and pump away. Other storm water on the base is run into sumps and allowed to percolate into the ground.

5.15 DoD plan to have the runoff monitored as part of the monitoring program for the EMP (PER paragraph 7.37b).

5.16 DoD expect hydrocarbon levels in the runoff to be low. Also the levels of sediment, Biological Oxygen Demand, nitrogen, and phosphorus from runoff into Careening Bay are expected to be lower than for urban or suburban streets in Rockingham. This is because: the traffic volumes on the roads within HMAS STIRLING are comparatively low; the numbers of vehicles parked is constant; and there is no runoff containing garden fertilizers or pesticides from uncontrolled domestic use.

5.17 Monitoring of the heavy metal load in the seabed immediately under the outfalls in Careening Bay was commenced in March 1989. Samples were collected by RANR divers as part of the EPA monitoring program to review the differences in heavy metals in the sediments of the Cockburn Sound since they were last recorded in 1978.

5.18 Three questions have been asked by the EPA.

a) 'What alternative anti-fouling paints have been considered?'

b) 'Has consideration been given to limiting the use of TBT anti-fouling paints?'

c) 'Have the United States Department of Defense anti-fouling practices been examined?'

5.19 The use of anti-fouling paint containing tributlytin (TBT) is receiving careful consideration. DoD note that the Western Australian government is moving towards a position in regard to the use of these materials. DoD responses to the questions are as follows.

a) Navy currently uses TBT based anti-fouling paints after previously using copper based paints. Tin free paints are currently being tested and a change over to alternate paints will take two to five years to implement. At this stage the environmental impact of alternate paints is not known.

b) Subject to operational requirements, current policy includes the discontinuance of the use of TBT paints on vessels less than 25 metres in length (except aluminium craft, for which no suitable alternative exists), the use of minimum-release paints for all ships, and dock side procedures that ensure that harmful products are not released in sufficient quantity to damage the environment. TBT paints are to be replaced when testing has identified a suitable replacement which does not have other unacceptable environmental problems.

c) Navy is aware of the United States Department of Defense anti-fouling practices and the cost penalties associated with them.

5.20 Discharge from the slipway directly into Careening Bay is also a matter of concern to the EPA. Two questions have been asked:

a) 'What are the reasons for not treating this runoff before discharge into the Bay?'

b) 'How can the runoff from slipway areas be contained?'

5.21 At the time of construction, no special provisions were made to contain and treat runoff from the STIRLING slipway before it drains into the Bay. An extensive drainage system and collection sump would be needed if runoff had to be collected. However, in view of the anticipated change over to alternate anti-fouling paints, only short-term benefit would be gained by extensive and costly modifications of the slipway at this time. At present, dry contaminated grit is picked up from the slipway area and removed to a chemical dump site for disposal. Pending the introduction of new paints, DoD has restricted the use of TBT paints as detailed in sub-paragraph 5.19b, and has restricted the abrasive blasting of hulls coated with TBT paint to the minimum necessary for essential modifications or repairs. To assess the effectiveness of these measures, monitoring has been commenced as detailed in sub-paragraph 5.17. If monitoring indicates that the measures implemented are not effective, the requirement for further action will be reviewed.

5.22 Proposals for a new helicopter support facility raise four questions.

a) 'Why has the site (Zone K) been chosen?'

b) 'What other sites have been investigated?

c) 'Why will 17.5ha need to be cleared when the proposed facility will not cover the whole site?'

d) 'Will the same design criteria apply to tis site?'

5.23 It is emphasized that a large permanent helicopter support facility is not expected to be required until 1996. The same design criteria as used elsewhere on the Island will be used for the site. The DoD response to questions a) to c) from paragraph 5.26 is as follows:

a) Zone K has always been reserved as the site for a possible helicopter support facility. This is the only suitable site remaining on the Island because the only other relatively flat areas are being occupied by the armament depot and the main base. To develop other sites would require significant earthworks , with consequent environmental impact. It is also the optimum site from an aircraft operations point of view because of wind considerations, base workshops, base operations and services.

b) There are no other suitable sites on the Island. Alternative locations on the mainland including RAAF PEARCE will continue to be examined before a final decision to locate the facility on the Island is made.

c) The actual area to be cleared is as yet to be determined. It will lie within the 17.5ha zone. Clearing will be minimized, consistent with

air safety requirements. Helicopters will be parked, fuelled and serviced in the hardstanding area of some 100m x 100m.

5.24 The requirement for an additional demolition range on the northern end of the Island raised the following questions.

a) 'How much land will need to be cleared?'
b) 'What form of development is proposed?'
c) 'What will be the impact of clearing on vegetation, faunal habitats, soil stability and runoff characteristics of the land?'
d) 'What forms of pollution are likely to be a consequence of activities on the demolition range?'
e) 'What impact will siting and usage of the demolition range have on the amenity, recreation, aesthetic and conservation values of the northern end of the Island?'
f) 'What provision has been made for monitoring the impacts of demolition activities on the range on all the above factors?'
g) 'Does the 1560m radius demolition range safety zone result in the area being off-limits?'
h) 'If so, how will this be managed?.

5.25 The proposed additional demolition range at the northern end of the Island is required for the destruction of large ordnance if required. It will only be used if the size of the explosive charge cannot be reduced to below the 20kg limit imposed on the current demolition range. The range is therefore expected to be used on a very infrequent basis. DoD's responses to questions a) to h) (paragraph 5.26) as as follows.

a) The land requirements for the demolition range are very small. A natural depression in the northern part of the Island is to be used . This will be cleared of trees and vegetation out to a radius of 100m, to minimize fire hazard.

b) The actual demolition pad will be 50m radius and screened with limestone. A 200m access track (sited to minimize loss of vegetation and impact on the environment) will be constructed. No structures are proposed for the site.

c) There will be no clearing of vegetation other than for the essential 100m radius and the access track. By carefully siting the access track, the loss of vegetation and hence faunal habitat will be minimized. The soils of the site are the sand common to the Island and there is effectively no surface runoff.

d) On the infrequent occasions the range is expected to be used, demolition will lead to blast noise, brief emissions of particulate matter, and a variety of minor gaseous discharges. Oxides of nitrogen and chlorine compounds are expected to be among the substances emitted to the air during demolition, however these releases are no different to releases from quarrying or similar uses of explosives. Some minor pollution may occur from metallic

fragmentation of the ordnance. Explosion of a charge in excess of 20kg would only occur as a last resort, when all other disposal techniques have been proven not viable.

e) Apart from the infrequent use of the facility, there will be no impact on the amenity and recreational use of the area. As a facility without any structures and with only a short access road, there will be little loss in either aesthetic or conservation values of the northern end of the Island. Blast effects may cause damage to surrounding vegetation, however as the range is sited in a natural depression, visual impact will be minimal.

f) The additional demolition range will be monitored in the same way as proposed for the existing facility. There is no need to provide monitoring above that which will apply to other publicly accessible and natural areas of the Island. This is because there will be minimal biophysical impacts for the development of the site and that there will be little reduction in recreational, aesthetic or conservation values.

g) The safety zone will only be off-limits when demolition operations are in progress.

h) Where demolitions are preplanned, restrictions will be advertised in the local press. At all times, visual inspection of the safety area will be carried out before demolitions to ensure that there is no danger to the public.

5.26 Provision will be made for replanting elsewhere as compensation for any loss of amenity, recreation, aesthetic and conservation values of development sites on the Island. A nursery is to be provided and all plantings are to be with vegetation native to the Island. Seed will be collected locally. The operation of the replanting and the selection of areas will be contained in the EMP.

5.27 The EPA state that: 'It is considered that the development of the proposed Environmental Management Plan should be timed to complement the expansion of naval facilities. This would be advantageous in co-ordinating the management of Garden Island as a whole.' Two questions arise from this position.

a) 'When will the EMP be fully developed into a working document?'.
b) 'How will the EMP be prepared and who will be involved in the preparation?'.

5.28 DoD advise that the EMP is currently being prepared and that it should be implemented as a working document by the end of 1990. Environmental Management Services Pty. Ltd. of Canberra are the consultants undertaking the preparation of the EMP. The approach which is being taken is outlined in HMAS STIRLING Environmental Working Paper №5 and is summarized in Annex K of the PER. The mechanisms for confirming the monitoring program, which will be an integral part of the EMP, is given in paragraph 7.40 of the PER.

5.29 DoD propose that the development of the EMP will be an iterative process. Feedback on the review of draft material will be sought from State government departments and agencies, Local Government, conservation organizations, academic research bodies and interested members of the general public. The final document will be in both electronic and hard copy formats. Material used to develop the EMP will be held on the geographic information system PORTENVIRO which is currently being developed for use with HMAS STIRLING and Jervis Bay in NSW.

APPENDIX 4

## LIST OF ENVIRONMENTAL CONCERNS AND ISSUES RAISED IN SUBMISSIONS TO DASETT

CONSERVATION

* Protection of island vegetation

  - increased area of clearing since 1980 LMP

  - increased fire risks with more personnel and activity on island.

  - zones K & B will affect most to the remaining Melaleuca heugelii community.

  - zone K will either engulf or be close to the only remaining Myoporum insulare community.

  - receiving station (zone A) should be designed ore relocated so that no clearing of tall trees (Callitris preisii/Melaleuca lanceolata) occurs. A preference for locating facilities in the the poor Acacia rostilifera vegetation in zone A was noted.

  - need to protect vegetation between zones.

  - protection of vegetation should be more important than aesthetic considerations.

* Lack of attention to creation of "edges" in zone location (for ease of management)

  - increased lawn areas likely to increase Tammer population to high levels.

  - increased likelihood of noxious pests with more personnel.

  - causeway needs to be a more effective barrier to feral animals.

* Protection of seagrass meadows

  - is frequency of monitoring adequate to allow preventitive action?

  - will monitoring results be public knowledge?

* Protection of historic sites

  - National Estate listed shipwrecks.

  - Cliff Head Historic Site.

PUBLIC SAFETY

* Cummulative risk and hazards analysis

  - request revision giving consideration to terrorist/urban guerilla attacks and proposed petrochemical plant.

LIST OF ENVIRONMENTAL CONCERNS AND ISSUES RAISED IN SUBMISSIONS TO DASETT (Cont'd)

- no reference to Natural Disasters Organisation Department of Defence "Report of proceedings of a major urban disaster civil defence study" in PER.

* Helicopter flight paths should avoid industrial areas to prevent accidents

* Transfer of munitions through built up areas

* Safety of small arms firing range

* Potential conflicts between naval and recreational vessels

WATER QUALITY RELATED ISSUES

* Tributyl-tin contamination

  - from slipway runoff.

  - from aerosol particles with hull de-fouling.

* Stormwater runoff

  - from helicopter hardstanding area (100 m x 100 m) should not be disposed of by seepage but treated with sullage.

  - should not be disposed of in Cockburn Sound, which is currently being rehabilitated.

* Sewage

  - nutrients from effluent may reach Cockburn Sound via groundwater so should be pumped to mainland. This is unacceptable because Cockburn Sound is currently being rehabilitated.

* Sullage

  - effluent from treatment plant should not be disposed of in Cockburn Sound, which is currently being rehabilitated.

  - effluent standards do not take into account existing pollution levels.

* Accidental fuel or oil spills contingency plans not public

* Possible heavy metal pollution from surface runoff and fuel spills

MISCELLANEOUS POLLUTION ISSUES

* Noise

  - helicopter flight paths should be kept away from residential areas.

  - pile driving noise; restrict hours.