REPORT

Strategic Environmental Assessment of Defence Activities in the Great Barrier Reef World Heritage Area

Prepared for

Directorate of Environmental Stewardship, Department of Defence

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INTRODUCTION

In order to support and sustain Australia’s strategic and defence interests, the Australian Defence Force (ADF) is required to develop and maintain the forces and capabilities required for naval and amphibious warfare in a range of settings. Key to this is the ability to operate in a variety of geographical areas, for activities ranging across the spectrum from general ship transit or aircraft overflight to intense, large-scale, combined arms exercises involving military forces from many countries. Due to its physically large size and location, and the range of training opportunities provided, the Great Barrier Reef (GBR) region is an important area regularly used by all three arms of the ADF for training, and includes the Shoalwater Bay Training Area (SWBTA), arguably Australia’s single most important area for the conduct of amphibious and combined arms exercises. Other Defence agencies use the GBR region for research, development, trials and evaluation of new technologies and operational procedures. Defence also undertakes operational activities in the GBR region, such as hydrographic survey, the rendering safe of explosive ordnance, search-and-rescue, fisheries patrols and border protection surveillance and response. Within the GBR region are sited Navy, Army and Air Force bases and a number of Defence Practice Areas (DPA), and a Defence Science and Technology Organisation (DSTO) research station. In an operational sense, the ADF needs to be familiar with operating within the GBR region should this be required in times of armed conflict or heightened international tensions.

Given the importance of the GBR region to the ADF, its ecological and socio-economic sensitivities and the protection mechanisms in place, the Department of Defence (Defence) seeks to characterise and assess its activities within the GBR World Heritage Area (GBRWHA) and contiguous areas. The purpose of this review is to identify what, if any, activities may compromise World Heritage values and other significant socio-economic attributes and the management mechanisms employed by Defence to limit or remove any such risk.

The overriding goal of this environmental assessment is to facilitate sustainable military activities in the GBRWHA and contiguous areas. This is to be achieved through a comprehensive cataloguing and analysis of Defence activities undertaken in or near the GBRWHA, and notification of these activities and Defence environmental management procedures to the Great Barrier Reef Marine Park Authority (GBRMPA: also referred to hereafter as “the Authority”) in accordance with the legislative requirement for Defence to give the Authority prior notification of intended activities.

This is achieved through the identification of potentially incompatible activities and receptors, so that sensible risk recognition and avoidance strategies can be identified and agreed with GBRMPA.

This assessment focused upon exercises and routine peacetime activities; it does not address and does not seek to place controls upon Defence operations within or near the GBRWHA undertaken in time of national emergency or in situations such as disaster relief or search-and-rescue.

The assessment of Defence activities and the attendant implications for World Heritage values recognises the range of existing EMPs and those being developed to cover RAN ships and Defence maritime activities, ADF ships and aircraft, and individual EMPs addressing major training areas.
EXECUTIVE SUMMARY

LEGISLATIVE AND POLICY FRAMEWORK

Defence activities are controlled by Commonwealth legislation, Commonwealth and Defence policies and some State and Territory legislation. A plethora of Commonwealth and Queensland law has some application to Defence activities within the GBRWHA and contiguous areas. The principal piece of legislation that holds primacy over all other Commonwealth and State legislation for the GBRWHA is the Great Barrier Reef Marine Park Act 1975 (GBRMP Act). The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is also of great importance, particularly with regard to the protection of World Heritage and National Heritage values, threatened and migratory species and wetlands of international importance.

RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

Defence activities in the GBRWHA and contiguous areas have been identified and analysed, with a particular focus upon vectors with potential to degrade the GBR’s World Heritage values arising from these activities, and concludes with analysis of the actual risk of adverse environmental outcomes arising from these actions.

It should be noted that despite the potential for destruction and environmental disturbance posed by the weapon and sensor fits of ADF ships and aircraft, many of the activities and equipments described in this assessment are rarely, if ever, undertaken or employed within or near the GBRWHA. For the great majority of the time that ADF ships and aircraft are within the GBR region they are engaged in activities no different to that which are characteristic of their merchant marine or civil aviation equivalents. Weapons and decoys are rarely discharged, and most sensors are inactive for the majority of the time. The only exception to this state is the more frequent use of navigation radars and, to a lesser extent, long range air search radars.

Approximately 38 islands are located within GBR DPA. These islands can be broadly classified into three categories: those directly affected by Defence activities and those indirectly affected, and those not affected by Defence activities. Islands directly affected by Defence activities may be used for weapon impact areas or may be landed upon by Defence personnel during training activities. Indirect effects include aircraft flying over or near the islands that could potentially disturb birds and other organisms sensitive to anthropogenic noise. Only a limited number of islands within GBR DPA are actually used by Defence in any way, with most rarely, if ever, visited by Defence personnel. Islands which are used by Defence are Townshend, Raynham and Triangular Islands in the SWBTA and Rattlesnake Island in Halifax Bay, although other islands may be visited on rare occasions.

Objective evaluation of all Defence activities known, likely or perceived to have potential for adverse environmental outcomes indicates that the biggest ‘environmental’ risk presented by Defence use of the GBRWHA is largely restricted to adverse consequences arising from public perception, often inaccurate and therefore not of actual environmental significance. Of the credible environmental risks, quarantine issues, particularly the potential for introduction of exotic marine pests, presents the highest risk to the environment stemming from Defence activities in the GBRWHA. This conclusion takes into account standard Defence management practices and environmental risk reduction measures.

In addition to these relatively high risk issues, there are two cohorts of impacts that are either:

- small scale and inconsequential but unavoidable; or
• potentially large scale and severe, but only arising as a result of abnormal circumstances, such as an accident.

Examples of the former include:

• the debris and residues arising from the use of expendable stores and ordnance;
• lethal effects, such as fish kills, and sub-lethal effects, such as minor acoustic disturbance, arising from the use of explosive ordnance such as demolition charges;
• incidental and instantaneous acoustic disturbance which may occur if a loud, low-flying aircraft or hovering helicopter coincided in the same space and time as a noise sensitive animal; and
• lawful discharges of sewage from ships, particularly large amphibious units.

Impacts of these origins cannot be avoided, although they may not result in any tangible disturbance. These impacts occur as an unavoidable consequence of, for example, the use of the expendable store, the operation of the aircraft at low-level or the detonation of an HE charge. Management is effected by ensuring that these activities only occur at a time, place and/or intensity such that the environmental implications do not attain any significance.

Examples of unlikely but potentially severe events include:

• large oil spills, particularly following a grounding or collision involving a tanker, and especially if this occurred in a particularly sensitive marine area of the GBR; and
• public risk, particularly to civil aviation and other mariners, arising from exercise activities involving explosives and aerial vehicles (e.g. ADF aircraft, missiles, aerial targets, SLFs).

These impacts are managed by reducing the risk of occurrence to one that is as low as is reasonably practicable. This approach is consistent with that adhered to in other fields of potentially hazardous activities such as civil aviation and the petroleum industry. Risk is reduced through application of appropriate design and construction standards, effective maintenance, low risk standard operating procedures (in this case including proper notification of civil authorities and adherence to range clearance requirements), personnel training and awareness, and the preparation, exercise and provisioning of effective contingency response measures. Consideration of the low likelihood but severe consequence scenarios in the risk assessment recognises that significantly adverse environmental outcomes are possible from Defence activities in the GBRWHA, albeit improbable.

Very little Defence activity in the GBRWHA involves permanent coastal infrastructure or permanent human settlement, except in already established areas.

Most Defence activities are virtually benign, and if not so, of such low temporal and spatial intensity that significant adverse outcomes are unlikely. This conclusion is supported by:

• the small size of the ADF and the limited number of ships and aircraft actually exercising within or transiting in or over the GBRWHA at any one time or on an annual basis;
• the large size of the GBRWHA; and
• the findings of detailed environmental impact analyses conducted both in Australia and overseas concerning the maritime, aviation and amphibious activities conducted by Defence and Defence support agencies in oceanic, littoral and coastal areas.

The public perception of environmental risk from Defence activities characteristically exceeds the reality, either by dint of the small actual impact, or the infrequent activation of weapons or
sensor systems which may be the cause for concern. For example, actual use of missiles and torpedoes is essentially non-existent in the GBRWHA and minimal in the Coral Sea, and except for the very occasional use against a hulk target (only once every few years) ordnance involved in weapon practice at sea is invariably inert. Similarly, most gun ordnance used is practice ammunition with very low explosive potential.

Consistently, the findings of environmental impact studies of Defence maritime operations is that most activities occasion inconsequential impacts with minimal likelihood of significantly adverse outcomes. Where such outcomes are possible, these are easily avoided or mitigated by the implementation of suitable impact avoidance or risk reduction measures.

The history of use of the GBRWHA has proven that Defence activities can co-exist with civil activities including merchant shipping, civil aviation, commercial fishing and marine tourism and recreation. Most Defence activity within the GBRWHA is analogous to equivalent civil activities involving the operation of surface vessels and aircraft. Adverse consequences from Defence activities which may be incompatible with other users of the GBR and any mutual interference are largely avoided by spatial and temporal separation in planning stages, including timely public notices. Any displacement of civil users from exercise areas during the conduct of Defence activities is usually of short duration, and where flexibility allows, exercise planning aims to avert user conflict through avoiding areas and times of peak use. Similarly, there is no evidence of damage to aspects or artefacts of heritage significance, including historic shipwrecks.

Tourism and recreation, the principal sources of economic activity in the GBR region, are also unlikely to be affected by Defence activities. Analysis of tourism activity indicates that most is clustered in nodes centred upon areas within reach of coastal centres at Port Douglas, Cairns, Townsville, Proserpine, the Whitsundays and Gladstone. There is only minimal overlap with existing DPA, and Defence activities in other areas of the GBRWHA are unlikely to detract from tourism operators or the amenity of tourists.

Defence activities in the GBR region are unlikely to detract from Native Title claims or from traditional uses, except to the extent that coastal DPA are periodically closed.

**RISKS TO CETACEANS AND OTHER SENSITIVE MARINE FAUNA**

Much has been made of beaked whale strandings purportedly caused by MF naval sonars. While there may indeed be some causal link, indicating the need for pragmatic risk avoidance measures, it is important to keep the strandings allegedly caused by sonar in context. From the mid-1960s to mid-2003, 190 ships have been fitted with SQS-26 or SQS-53 sonar systems or derivatives (none of which have been or are used by the ADF). These are the high-power, lower MF band convergence zone sonars whose initial deployment in the mid-1960s has been linked by some commentators to observed mass strandings of beaked whales since that date. Only eight multiple strandings involving a total of 82 beaked whales may be linked with sonar activities over a period of nearly forty years. Over the same period there have been many thousands of strandings of whales as individuals and in groups of up to several hundred, including other mass strandings of beaked whales. The unavoidable conclusion is that even if the operation of sonar may cause mass strandings its influence on the overall pattern of whale strandings and subsequent mortalities is insignificant, accounting for less than 1% of all recorded whale strandings; when compared with other losses of anthropogenic origin, such as fishing by-catch, the discrete risks from naval sonar are probably inconsequential. This risk is further reduced when it is considered that the GBR region is not recognised as a preferred habitat for beaked whales, these animals favouring deep, open ocean habitats. This
observation is supported by the stranding record, which indicates only a handful of recorded beaked whale strandings along the Queensland coast compared to hundreds in other States.

Another risk to cetaceans and other large marine animals is ship or boat strike. This risk is ameliorated to a great extent, however, by the improved manoeuvrability, shallower draught and increased number of watchkeeping personnel in warships compared with most merchant ships.

The threatened whale species of principal concern to the GBRWHA is the humpback whale. Both major Australian humpback migration routes straddle Australia’s two busiest Maritime Exercise Areas, and the area in the upper reaches of Shoalwater Bay (north of Akens Island) is recognised as an aggregation area. Observations suggest that Australian Defence activities have neither the inherent impact potential nor intensity to have caused adverse effects upon humpbacks or other species of whales or dolphins.

Objective analysis of the potential mechanisms by which Defence activities may impact cetaceans indicates that most activities are essentially benign, and of those which may not be, the actual likelihood of adverse outcome and level of consequence, especially at the population level, makes for negligible to very low environmental risk.

The principal risks to dugongs and sea turtles are vessel strikes and disturbance or physical injury from the detonation of explosives. Although these risks can never be totally negated, they are minimised by adherence to standard Defence practices. The identification of Shoalwater Bay as a secure dugong habitat and its declaration as a Dugong Protection Area suggests that well managed Defence activities are not incompatible with dugong protection, and may in fact enhance it by reducing other threats. Arguably, Shoalwater Bay remains largely pristine because hotel and marina developers and recreational boaters have been excluded from the bay and its littoral and agricultural practices removed from its hinterland. Similarly, Shoalwater Bay is an important area for turtles and remains so after nearly forty years of use as a Defence training area.

Acoustic disturbance from high explosive (HE) detonations, explosive signals, underwater sound (SUS) and active anti-submarine warfare (ASW) search sonars will have the most widespread spatial influence of any of the Defence vectors of potential environmental concern. Even during all but the most extended and intense periods of Defence activity, these acoustic influences are possibly not dissimilar to sensitive receptors from the acoustic perturbations caused by a severe thunderstorm encompassing rainfall upon and agitation of the sea surface and lightning strikes, especially in the case of impulsive sources (URS, 2004). These events generate high intensity, broadband noise which has properties of frequency and strength promoting long distance propagation.

**CUMULATIVE AND PERSISTENT IMPACTS**

Three categories of cumulative impacts are possible from Defence activities in the GBRWHA, namely:

- long-term accumulation of persistent contaminants and debris;
- chronic impacts resulting from continual or cyclical low-scale inputs in a specific area; or
- short periods of intense activity involving a large number of units, such as a major exercise which may result in additive or synergistic effects from individual potential impact vectors (e.g. several ships, landing craft, fixed-wing aircraft and helicopters involved in a large amphibious exercise).
The most likely cause of the first of these possible cumulative effects would be long-term use of sonobuoys, expendable bathythermographs (XBTs) and other expendable stores in a small area. Inputs of expendable stores into GBR waters are at such a low relative rate of input that accumulation of material to any environmentally significant degree is unlikely to occur.

Chronic cumulative impacts from Defence activities are unlikely to be of any significance within the GBR region. The nature of most Defence activities in the GBRWHA is that they are of extremely low to moderate temporal intensity, coupled with low spatial intensity as activities are typically spread over hundreds, if not thousands, of square kilometres of sea. Exceptions to this are the nodes where some activities are concentrated by virtue of specific geographical features, training ranges or infrastructure such as:

- Naval Gunfire Support (NGS) activities at Townshend Island;
- amphibious exercises in portions of the SWBTA and Cowley Beach; and
- explosives training at Triangular Island.

Most of these nodes of concentrated activity are long-established, hence the Defence activities represent ongoing use. Where the concentrated use is only recently established or proposed, appropriate, focused environmental assessment has been undertaken.

It is conceivable that the annual exercise cycle, such as amphibious exercises at CBTA, could contain elements which coincide in an incompatible manner with some sensitive phase in an annual ecological or socio-economic cycle. Potential examples include bird migration or nesting periods, turtle nesting or hatching periods, whale migration and aggregation activity, or season peaks in commercial fishing or tourism activity. None of these possible conflicts are evident as a result of Defence activities in the GBRWHA. Thus, no chronic or cyclical deleterious impacts from Defence activities are apparent. In the case of major exercises in the Coral Sea, the mobile and dispersed nature of naval activities indicates minimal likelihood of cumulative environmental outcomes in all but exceptional circumstances.

Appropriate planning of the scale, intensity, location and timing of exercises of type must be sufficient to avoid any negative outcomes as a result of cumulative or cyclical impacts.

**PUBLIC PERCEPTION**

Notwithstanding quantifiable risks to the receiving environments, public perception of adverse environmental outcomes often overstates the reality or context of Defence impacts. Incorrect public perception may lead to unnecessary regulation aimed at managing a risk that simply does not warrant such control. Defence has established sound credentials as a capable and enduring environmental steward. This is evidenced by the many Defence areas which are listed in the Register of the National Estate or Ramsar wetlands and others which are refuge habitat for threatened species and ecological communities. The condition of the natural attributes of Shoalwater Bay is a prime example of this.

The biggest environmental management risk for Defence activities in the GBRWHA so far as cetaceans are concerned, is public and regulatory perception of the ‘harmfulness’ of Defence activities. This largely stems from misunderstanding and an incomplete appreciation of how Defence activities are managed and conducted.
EPBC ACT IMPLICATIONS

Matters of National Environmental Significance encompass the risk of significant adverse environmental outcomes to:

- World Heritage sites;
- Ramsar sites;
- nationally endangered or threatened species and ecological communities;
- migratory species;
- national heritage items and places;
- Commonwealth marine areas; and
- nuclear actions.

A full listing of matters of NES and the possible impacts upon these ecological values by Defence activities in the GBRWHA is presented in Appendix D. The category of nuclear actions has no nexus with Defence activities in the GBRWHA, and with the exception of one aspect of the Commonwealth marine environment, it is considered improbable that Defence activities in the GBRWHA of the type and scale currently undertaken or envisaged would have any adverse impact upon any matter of NES according to the criteria promulgated by DEH.

The exception to this conclusion is the potential for a known or potential pest species to become established in a Commonwealth marine area. Compared with other Commonwealth marine areas, which are typically open water areas some distance from the coast, waters within the GBR include shallow waters, reefs, mud and tidal flats which are more vulnerable to the establishment of many potential marine pests. The risk from Defence activities, however, would essentially reflect the character of that presented by other commercial and recreational craft operating within the GBR region.

There is also a risk that the integrity of the Ramsar wetlands within the SWBTA may be compromised by Defence activities. Although recognised as a risk, the possibility of this actually occurring should be assessed as minimal, considering the positive history of use of Shoalwater Bay and the practices employed by Defence to protect the conservation status of the SWBTA.

Other EPBC Act requirements have linkages with Defence activities in the GBRWHA. These include:

- general protection provisions for cetaceans, threatened species, migratory species and listed marine species, including reporting provisions in the case of injury or mortality of any of these species and specific EPBC cetacean protection regulations; and
- controls on access to and activities within Commonwealth marine protected areas.

These requirements are in addition to the general stipulation for any activity by a Commonwealth agency that may result in a significant effect upon the environment, or any activity which may have an environmental impact upon a Commonwealth area (e.g. the Australian EEZ), to undergo environmental assessment. Thus even though Defence activities in the GBRWHA are considered unlikely to occasion any significantly adverse outcomes upon matters of NES, any potential for significant adverse outcomes requires assessment and possibly referral and approval under the aegis of the EPBC Act.

Although the risks cannot be fully discounted, the range, scope and intensity of Defence activities currently conducted in the GBRWHA or those envisaged are considered unlikely to occasion any significant adverse environmental outcomes in general, let alone impact upon
any matter of NES. This conclusion assumes adherence to current Defence environmental management policies and procedures.

IMPLICATIONS OF DEFENCE ACTIVITIES FOR WORLD HERITAGE VALUES

Given the diversity and broad range of World Heritage values, and their spatial extent, it is unlikely that Defence activities in the GBRWHA or contiguous areas would detract from or degrade these in any tangible sense. Defence activities in the GBRWHA are well managed and responsibly conducted, and of relatively low spatial and temporal extent, with periodic concentrations in space and time. These usually occur with established DPA during larger exercises. Consequently, any impacts of a long-term or irreversible nature arising from Defence activities will be concentrated and contained within a small area. An example of this is the obvious alteration of mudflats around Triangular Island resulting from its long-term use for explosives training.

It may be considered that the effects of most Defence activities within the GBRWHA are subsumed into the overall effects of other human activities within the region. For example, in most instances aircraft overflight and ship transit are subsets of the larger complex of other aircraft and shipping activity within the region. Similarly, permanent Defence infrastructure within the coastal hinterland of the GBRWHA is invariably established within larger coastal settlements.

By way of contrast, Defence activities have been demonstrated to actually enhance the conservation of World Heritage values. This is achieved by indirect means such as improving hydrographic charts and understanding of tidal and other oceanographic processes within the Reef area, and direct means such as the rendering safe of UXO and by limiting public access and coastal developments in Defence areas, the outstanding example of which is Shoalwater Bay. This latter conclusion is supported by the findings of the Commonwealth Commission of Inquiry examining Defence use of Shoalwater Bay.

CONCLUSIONS

Defence Activities undertaken in the GBRWHA are unlikely to have significant negative effects on the World Heritage values of the area, nor upon other socio-economic values of the GBR region for the following key reasons.

- Most of the GBRWHA ecological values are widespread, and no rare or threatened species and or threatened ecological communities are known to occur solely in DPA.
- Intensive Defence training activities are restricted primarily to DPA, which represents a small portion (< 0.01%) of the GBRWHA. Further, even in these spatially small areas, most Defence activities are unlikely to permanently alter the natural resources in these areas.
- Similarly, in terms of time, Defence activities in the GBRWHA occur over a small proportion of any one-year. Thus, an individual DPA might be used as little as a few weeks of each year.
- Defence activities in GBR areas external to DPA are largely benign and effectively amount to transit by ships or overflight by aircraft.
- Many non-Defence related activities permitted in the GBRWHA, such as trawling and tourism, are chronic and widespread agents of disturbance. In contrast, Defence related activities are spatially and temporally restricted. Impacts associated with Defence activities are typically short-lived.
• High conservation values potentially at risk from Defence activities include marine turtles and seabird nesting sites, and marine mammals. However, turtle and seabird nesting sites are not well represented in DPA and Defence planning permits flexibility to ensure Defence activities either do not occur during the main nesting periods or permit suitable allowances to minimise risks of disturbance.

• In general, Defence activities pose no more risk to cetaceans than current shipping/boat activities already undertake in the GBRWHA by bulk, fishing and recreational vessels.

• DPA can provide strong conservation outcomes by restricting general public access to areas of high conservation value e.g. Shoalwater Bay. Also, potentially destructive commercial activities, such as trawling and net fishing are often prohibited from DPA.

• Defence recognises its obligation to protect the values of the GBRWHA through the development of high level dialogue with GBRMPA and DEH, a well-structured regime of environmental management policies and procedures, and the employment of environmental officers based in Brisbane, Rockhampton and Townsville able to give advice and assistance to ADF units operating in the GBR region.

Most activities performed by the ADO and Defence support contractors within the GBRWHA are environmentally benign or pose an extremely low risk of significantly adverse environmental outcomes. Similarly, there is minimal risk of cumulative outcomes attaining any degree of serious environmental significance. The potential for adverse outcomes is further reduced by the fact that most of the time that ADF ships and aircraft spend in GBRWHA is effectively ‘innocent passage’, which is essentially environmentally benign.

Defence activities within the GBRWHA and contiguous areas are characteristically well planned, well controlled and cognisant of inherent environmental risks and responsibilities. Defence policies and procedures related to environmental protection within the GBR meet or exceed existing statutory requirements, a prominent example being the far more stringent controls applied by Defence to sewage discharges from ships compared with requirements in the GBRMP Regulations.

Risks do exist of adverse environmental outcomes, the most significant of which are the possibility of introducing potential marine pests into the marine environment or a large oil spill, particularly if this occurs in a sensitive area of the GBRWHA or nearby. Of greater likelihood is the risk of degradation of water following the discharge of sewage from a large ship or group of ships with many personnel onboard in circumstances where there may be limited water exchange. Areas where this scenario is most likely to arise are CBTA and SWBTA during major amphibious exercises. These do not occur often and Defence management measures are in place to reduce both the spatial and temporal occurrences. Accordingly, this vector is unlikely to lead to any long-term degradation of any portion of the GBR. Over time the environmental significance of this activity will diminish as new generation ships and waste management systems improve the quality of discharge effluent.

Defence activities occurring in the Torres Strait, Coral Sea or southern Queensland sea areas are unlikely to impact upon values of the GBRWHA. Potential vectors of impact upon the GBR region include overflight of aircraft and transit of ships to/from the GBR region to these external areas, or wider-scale impacts originating in these external areas and extending as far as the GBR region. Principal examples of the latter include a large oil spill or drifting of expendable material and debris. The possibility of pollution or debris from an external origin reaching the GBR and having some deleterious impact is an artefact of current and winds, distance of the source from the GBR, the nature of the material and any dispersion, dilution and degradation processes in operation. The only credible scenarios so far as major impacts are concerned are either an oil slick or a drifting ship hulk, which failed to sink during a HULKEX in the Coral Sea, reaching the GBR region. It should be recognised that the risk of
these outcomes is low, given the planning and preparation inherent to these sorts of activities and the opportunity for intervention if the GBR was deemed to be at risk. Smaller scale impacts within the contiguous areas are unlikely to have sufficient spatial or temporal persistence to impact upon the GBRWHA.

Some Defence activities have the potential to cause severe environmental outcomes if environmental management strategies are not in place, albeit with a very low probability of occurrence. Conversely, other Defence activities have unavoidable adverse environmental outcomes which are almost universally of low to negligible environmental significance, small-scale, transitory and localised. These impacts do not represent any tangible ecological or socio-economic threat to the sustainable use by Defence or other users of the Australian marine environment.

Compared to other human activities in the GBRWHA, Defence activities are generally conducted at low spatial and temporal scales. Accordingly, many observed or speculated impacts which may be connected by some observers with Defence actions are usually operating on a much smaller scale than those arising from some analogous civilian activity. Similarly, the scale and intensity of many of the conceivable negative outcomes from Defence activities are insignificant compared to those occurring as a result of natural events such as storms, sediment and nutrient deposition from river systems, or the unexplained natural phenomena of whale strandings.

Although a causal link has yet to be proven, it is possible that high-power active sonar may cause harm to cetaceans in exceptional circumstances. The precautionary principle dictates that a pragmatic approach be adopted in order to reduce such risk, but this should be done in a reasonable and practicable manner to ensure serious irreversible impacts are avoided. It is important to keep the observed record of possible deleterious impacts upon cetaceans, particularly beaked whales, in context, noting the many thousands of whales which strand annually without any apparent cause. Furthermore, only high-powered active LF and MF ASW sonars have been implicated in any way, indicating that the risk, if any, is lower for other sonars. Accordingly, risk reduction procedures for active sonars other than LF and MF ASW systems need not be as stringent.

Defence activities in the GBRWHA represent minimal risk of causing significant and adverse environmental outcomes. The risks that do exist can be readily managed by prudent planning and the adherence to reasonable risk recognition, avoidance and mitigation procedures.

Other human activities within the GBR region are not generally coincident with the nodes of Defence activities, and consequently, are not affected in any persistent or tangible manner.

Conversely, Defence activities in the GBRWHA have been demonstrated to improve the protection and conservation of components of the World Heritage values by both direct and indirect means.

On balance, it may be concluded that Defence activities and presence within the GBRWHA have an effectively neutral to positive effect upon World Heritage values.
1. INTRODUCTION

1.1 BACKGROUND

The Australian Defence Force (ADF) is compelled to operate and train in the Great Barrier Reef World Heritage Area (GBRWHA) and Great Barrier Reef Marine Park (GBRMP) and has done so since before the inception of the GBRMP. To continue to operate in the Great Barrier Reef (GBR) region the ADF must be able to demonstrate compliance with legislated responsibilities and satisfy community expectations regarding responsible use of the region and its resources. This Strategic Environmental Assessment (SEA) is intended to facilitate responsible, ongoing use of the GBR region by the ADF and supporting elements of the Australian Defence Organisation (ADO).

The ADO is a major land manager and resource user, with a clear recognition of the environmental management responsibilities incumbent upon it.

Defence’s vision is to be a leader in sustainable environment and heritage management in support of the ADF developing and maintaining capability to defend Australia and its national interests. To achieve this, the Defence Environment Policy states that Defence will:

- establish an innovative Environmental Management System (EMS) which supports ADF capability, promotes environmental sustainability and achieves the Government’s broader environmental objectives;
- create a culture where sustainable environmental management is considered an integral element of capability development, equipment acquisition and through life support, including operational application;
- establish clear lines of accountability for environmental outcomes;
- develop effective processes for education and training in support of the creation of an environmentally aware culture;
- measure and report environmental performance as part of a process of continuous improvement; and
- create a climate of transparency and strategic partnerships with key environmental stakeholders.

(Department of Defence 2002a)

The Australian Defence Mission is to promote the security of Australia, and to protect its people and its interests. Subordinate to this objective are the missions of the three Service arms of the ADF. It is instructive to consider their individual missions:

- **Navy**: To fight and win in the maritime environment as an element of a joint or combined force, to assist in maintaining Australia’s sovereignty and to contribute to the security of our region.
- **Army**: To win the land battle which, with current Australian Defence doctrine, involves manoeuvre over the littoral and amphibious insertion and sustainment.
- **Air Force**: To be a combat-focused force, structured for war and trained to win. Accordingly, the Service’s Vision is to prepare for, conduct and sustain effective air operations to promote Australia’s security and interests.
Continued access to and utility of use of the GBR is essential to sustain Australia’s combat effectiveness and the realisation of Service Missions.

In order to support and sustain Australia’s strategic and defence interests, the ADF is required to develop and maintain the forces and capabilities required for naval and amphibious warfare in a range of settings. Key to this is the ability to operate in a variety of geographical areas, for activities ranging across the spectrum from general ship transit or aircraft overflight to intense, large-scale, combined arms exercises involving military forces from many countries. Due to its physically large size and location, and the range of training opportunities provided, the GBR region is an important area regularly used by all three arms of the ADF for training, and by other Defence agencies for research, development, trials and evaluation of new technologies and operational procedures. Defence also undertakes operational activities in the GBR region, such as hydrographic survey, the rendering safe of explosive ordnance, search-and rescue, fisheries patrols and border protection surveillance and response. Within the GBR region are sited Navy, Army and Air Force bases and a number of Defence training areas, and a Defence Science and Technology Organisation (DSTO) research station (Figure 1.1). In an operational sense, the ADF needs to be familiar with operating within the GBR region should this be required in times of armed conflict or heightened international tensions.

Given its character, biophysical diversity, indigenous heritage values and World Heritage listing, specific protections have been legislated in both the Commonwealth and Queensland Parliaments for the conservation and protection of the natural and cultural heritage values of the GBR, and the uniqueness and sensitivity of the area is also recognised internationally by bodies such as the International Maritime Organization (IMO). These statutory provisions mirror the iconic status with which the GBR is held by the Australian public and the wider global community.

The GBR is a source of immense wealth for Australia, drawn from a number of economic sectors including tourism and recreation and commercial fishing. The GBR is the centre of a great deal of scientific research and education, and holds promise for bio-prospecting endeavours. Ports and shipping routes within the GBR region provide for the export of commodities vital to Australia’s economic well-being and international competitiveness.

The GBR region has been used by Defence for many decades and many activities may be considered to be ‘ongoing’. However, increasing environmental knowledge, legislative obligations and community expectations require the holistic assessment of the environmental implications of Defence use, how these may impact upon World Heritage values, and the development and implementation of any strategies necessary to manage this risk.

Given the importance of the GBR region to the ADF, its ecological and socio-economic sensitivities and the protection mechanisms in place, the Department of Defence (Defence) seeks to characterise and assess its activities within the GBR World Heritage Area (WHA) and contiguous areas. The purpose of this SEA is to identify, evaluate and catalogue what, if any, Defence activities may compromise World Heritage values and the adequacy of management mechanisms employed by Defence to limit or remove any such risk.

The Department of Defence aims to ensure that activities and exercises conducted within the GBRWHA and contiguous areas are effectively planned and managed with regards to the environment and conservation of World Heritage values. This is the purpose of this report.
1.2 STRATEGIC ENVIRONMENTAL ASSESSMENT

This report presents a Strategic Environmental Assessment of Defence activities within the GBRWHA. SEA can be defined as the formalised, systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or programme (Partidario 1999).

According to Thomas (2001) major criticisms of orthodox Environmental Impact Assessments (EIAs) has been that they have been site-specific and have not considered the cumulative effects of development. SEA, on the other hand, allows for consideration of environmental impacts across a larger geographical area, and over a period of development. Thomas (2001) provides the following summary of the difference between EIA and SEA:

<table>
<thead>
<tr>
<th>EIA</th>
<th>SEA</th>
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<tbody>
<tr>
<td>Begins when considerable thought and planning has been given to a proposal</td>
<td>Begins at the earliest stage of public accountable decision-making</td>
</tr>
<tr>
<td>Focuses on the better execution of specific actions</td>
<td>Focuses on the previous conditions in which specific action are inserted</td>
</tr>
<tr>
<td>Reactive approach</td>
<td>Proactive approach</td>
</tr>
<tr>
<td>Scope is site specific with an emphasis on a short time span</td>
<td>Scope is “global” to broaden the spatial and temporal range of the assessment</td>
</tr>
<tr>
<td>Use is for the assessment of specific projects</td>
<td>Use is for the assessment of programs, plans and policies</td>
</tr>
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Importantly, SEA is not done as an alterative to EIA or Cumulative Impact Assessment (CIA). Rather, SEA, CIA and EIA would form a tiered process of assessment. The conduct of this SEA will permit comprehensive, holistic and long-term consideration of Defence activities in the GBRWHA at the policy, planning and implementation levels.

1.3 OBJECTIVES OF THE STRATEGIC ENVIRONMENTAL ASSESSMENT

The overriding goal of this environmental assessment is to facilitate sustainable military activities in the GBRWHA and contiguous areas. This is to be achieved through a comprehensive cataloguing and analysis of Defence activities undertaken in or near the GBRWHA, and notification of these activities and Defence environmental management procedures to the Great Barrier Reef Marine Park Authority (GBRMPA: also referred to hereafter as “the Authority”) in accordance with the legislative requirement for Defence to give the Authority prior notification of intended activities (see Section 2.4.12).

The ultimate objectives of this assessment, therefore, are to:

- Identify, quantify and assess the risk of adverse environmental outcomes (including biophysical and social aspects) of all Defence activities currently undertaken, or intended, in the GBRWHA, with emphasis upon World Heritage values.
- Identify, quantify and assess the risk of adverse environmental outcomes (including biophysical and social aspects) of all Defence activities currently undertaken, or intended, in areas contiguous to the GBRWHA, to the extent that they may adversely affect World Heritage values.
- Identify means of avoiding adverse environmental outcomes, or otherwise reducing or mitigating those adverse outcomes which cannot be avoided. Emphasis will be upon
avoiding significant impact upon sensitive receptors and World Heritage values through spatial and temporal separation, consistent with maintenance of Defence objectives.

- In consultation with GBRMPA ensure that activities undertaken within the GBRWHA and contiguous areas can gain approval on the basis of the application of standard Defence planning and environmental management procedures, or where this may not be appropriate, in the case of for example large-scale exercises, by referral to GBRMPA and the Commonwealth Department of the Environment and Heritage (DEH). The principal benchmarks for determining the significance of any potential adverse environmental outcome and the level of approval required are the Commonwealth Great Barrier Reef Marine Park Act 1975 and the Environment Protection and Biodiversity Conservation Act 1999 and attendant Regulations and Guidelines.

These are achieved through the identification of potentially incompatible activities and receptors, so that sensible risk recognition and avoidance strategies can be identified and agreed with GBRMPA.

This assessment focuses upon exercises and routine peacetime activities; it does not address and does not seek to place controls upon Defence operations within or near the GBRWHA undertaken in time of national emergency or in situations such as disaster relief or search-and-rescue.

### 1.4 METHODOLOGY

There are three fundamental components of this assessment. These are:

- description and quantification of the full range of Defence activities undertaken in the GBRWHA by the ADO and Defence contractors;
- consideration of the environmental implications of these activities, particularly with respect to World Heritage values, and the regulatory framework within which they are controlled; and
- review of the management framework within which these activities are planned, assessed and controlled to reduce environmental risks.

The assessment report identifies the range and timing of Defence activities undertaken in or near the GBRWHA, the nature of the receiving environments and the potential sensitivities of environmental receptors. The assessment then considers these interplaying factors within the context of determining which of those activities may have an actual or potential effect upon World Heritage values, and the management measures applied by Defence.

The assessment of Defence activities and the attendant implications for World Heritage values recognises the range of existing EMPs and those being developed to cover RAN ships and Defence maritime activities, ADF ships and aircraft, and individual EMPs addressing major training areas.

### 1.5 SCOPE AND LIMITATIONS OF THE STRATEGIC ENVIRONMENTAL ASSESSMENT

The geographical scope of this report is confined to the GBRWHA and contiguous areas to the extent that activities in the contiguous areas may impinge upon World Heritage values. The focus is upon the marine areas of the GBRWHA up to the high water mark, and the
Defence activities which occur within them. Consideration of terrestrial areas is essentially confined to the islands which exist within or near declared Defence Practice Areas (DPAs) within the GBRWHA, and specifically to those islands which are used by Defence or may be affected by Defence activities. DPAs are those areas declared in the 2004 Annual Notices to Mariners (NOTMARs).

The environmental assessment concentrates upon those activities undertaken by the ADO, primarily the three arms of the ADF, plus DSTO and the Defence materiel Organisation (DMO). The armed forces of other states also make frequent use of these areas. Other nations which commonly use the GBRWHA areas are New Zealand and the United States, and to lesser extents France, the United Kingdom, Canada and Singapore. While not directly assessing the use and potential environmental impact of these international users, the assessment nevertheless establishes a framework of appropriate environmental control within which combined bilateral or multilateral exercises involving these users will be conducted.

To the greatest extent practicable, this assessment addresses all activities currently undertaken by the ADO or those that may be forecast in the short to mid-term, based upon new capability and equipment acquisition programs and emerging ADF doctrine. This broad coverage extends to Defence activities which are only rarely undertaken in the GBR region, or residual ADF capabilities which may soon be retired but for which relevant equipment still exists in the inventory.

This assessment addresses all anticipated activities up to the level of major exercises involving multiple ship and/or aircraft units engaged in high-tempo, multi-facet combat training activities. This recognises the potential for environmental effects to intensify in a cumulative or synergistic manner when otherwise small, discrete impacts are concentrated in spatial and/or temporal dimensions. It is not anticipated that this assessment would provide a vehicle for approval without further notification of activities such as major exercises or first-of-class shock trials. Activities of these types will require more focused consultation and assessment, although this assessment and other Defence procedures will provide a framework permitting streamlined evaluation and setting of management prescripts.

Whenever new platforms, weapons or sensors or new employment techniques for existing ones are introduced, a determination will need to be made as to whether this new element poses a risk of significant adverse environmental outcomes. In the event that significant adverse outcomes are possible, then issuance of an Environmental Clearance Certificate (ECC) or formal referral will be required.

1.6 STRUCTURE OF THIS REPORT

This report commences with an overview of the objectives and methodologies specific to this strategic environmental assessment.

Section 2 introduces the environmental legislative and policy framework within which Defence operates within the GBRWHA and contiguous areas.

An overview of Defence activities in the GBRWHA is provided in Section 3, detailing where exercise areas and bases are located, the current management and control arrangements, history of use and details of assets employed and activities conducted by Defence. This section also details the strategic management framework applied by Defence for activities in the GBRWHA.
An overview of the receiving environment is presented in Section 4, with an emphasis upon World Heritage values. This describes the physical and biophysical environments and socio-economic attributes of relevance to Defence activities and their sound management.

The report continues in Section 5 with a review of management of the GBRWHA.

Section 6 and Appendices A, B and C provide a detailed examination of Defence’s activities within the GBRWHA and contiguous areas, with Appendix B focusing upon Triangular Island in Shoalwater Bay. The report identifies their potential for occasioning adverse environmental outcomes and detriment to World Heritage values. These outcomes are evaluated in Section 6 and conclusions are presented in Section 7.

Section 8 presents the acknowledgements of people contributing to this report and the project team, and the Bibliography and Glossary are presented in Section 9.

This report builds upon the ADF Maritime Activities Environmental Management Plan (ADFMA EMP), particularly the Phase 1: Initial Environmental Review (URS 2004). Although this report is written as a stand-alone document, further detail and analysis is available in the ADFMA EMP, and the reader is directed to that EMP if further information is required.

1.7 METHODOLOGY

1.7.1 Review of Existing Information

Currently available management and policy material has been reviewed. The review concentrated on primary documents from a range of previous studies undertaken in the GBRWHA and contiguous areas, and also includes other material such as Defence policies, legislation, Australian standards, and other reports as appropriate. Where relevant, other documents which have been integrated into management of activities (e.g. standard exercise instructions) have also been reviewed.

Further relevant information is drawn from reports and observations, evaluations or research programs conducted in Australian exercise areas or overseas studies. Examples of overseas studies include various environmental impact assessment studies relating to a number of US Navy proposed activities, and the study of the environmental effects of torpedo and sonobuoy use on the Canadian Forces Maritime Experimental and Test Ranges.

1.7.2 Description of the Environment

The biophysical and socio-economic characteristics of the environment are described to establish features pertinent to effective environmental management of Defence activities. It should be noted that the quantity and quality of data available is often limited and not of uniform detail across the individual areas.

1.7.3 Analysis of Authority and Responsibility, and Planning Procedures

Command and control responsibilities for Defence activities and individual DPA have been identified, and whether the Defence use of the individual areas is on the basis of comprehensive scheduling or planning, or undertaken on a less frequent or sporadic basis.
1.7.4 Defence Activities and Associated Environmental Aspects

The approach adopted for this assessment was to categorise similar activities primarily based upon their potential for adverse environmental outcome, for example:

- the use of hull-mounted, active sonars, operating in the lower and medium frequency bands;
- the use of inert non-recoverable stores, such as expendable bathythermographs (XBTs) and submarine expendable bathythermographs (SSXBTs);
- low-level flying; and
- range clearances for high-seas live-firings.

All activities and associated environmental issues were assessed for their potential to cause adverse environmental outcomes, particularly with respect to degradation of the World Heritage values of the GBR region. Defence environmental and planning policies, procedures and management practices were considered when evaluating the environmental impacts of these activities.

1.7.5 Liaison and Consultation

Information for this assessment has been drawn from a number of Commonwealth and Queensland agencies. These include:

- Great Barrier Reef Marine Park Authority (GBRMPA)
- Department of the Environment and Heritage (DEH; formerly Environment Australia [EA] and incorporating the former Australian Heritage Commission [AHC])
- Australian Maritime Safety Authority (AMSA)
- Airservices Australia
- Australian Quarantine and Inspection Service (AQIS)
- Australian Fisheries Management Authority (AFMA)
- Department of Industry, Tourism and Resources (DITR)
- Geosciences Australia
- Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- Commonwealth Native Title Tribunal
- Queensland Department of Primary Industries
- Queensland Environment Protection Agency
- Queensland Department of Cultural Heritage
- Queensland Department Natural Resources and Mines
- Queensland Parks and Wildlife Service
2. LEGISLATIVE AND POLICY FRAMEWORK

2.1 INTRODUCTION

Defence activities in Australian territory are controlled by Commonwealth legislation, Commonwealth and Defence policies and some State and Territory legislation. A significant amount of Commonwealth legislation and Defence policies are derived from international agreements to which Australia is a Party. State/Territory legislation also has some applicability, but this is limited to specific aspects and only applies in waters within State/Territory jurisdiction. It is Defence policy to comply with State/Territory legislation where it is not inconsistent with Commonwealth laws; this is termed the ‘good neighbour’ policy, albeit of limited application to marine areas.

The Australian Constitution provides for a Federal structure of government in Australia, with clear lines of responsibility between Commonwealth and State/Territory Governments. The Constitution grants to the Commonwealth sole responsibility for the naval and military defence of Australia. The Constitution also confers primacy to Commonwealth legislation (under s109 of the Constitution), such that any Commonwealth legislation overrides State legislation to the extent of any inconsistency. The application of a State law to activities of the Commonwealth has become a complicated area of the law in recent years. State law will not apply to the Commonwealth:

- where it is inapplicable as a matter of statutory construction (that is, the law does not purport to bind the Crown or apply to the Commonwealth in the particular circumstance); or
- where the Commonwealth is immune because a State law cannot restrict or modify the executive capacities of the Commonwealth (i.e. its rights, powers, privileges and immunities). However, a State law of general application can operate to regulate activities which the Commonwealth chooses to undertake.

A plethora of Commonwealth and Queensland law has some application to Defence activities within the GBRWHA and contiguous areas. It is not intended or considered necessary to undertake a definitive cataloguing or review of all potentially relevant legislation. Rather, this section concentrates on the principal aspects of the most relevant Commonwealth legislation noting that:

- where an inconsistency arises between State and Commonwealth legislation, s109 of the Constitution provides that Commonwealth legislation will prevail to the extent of the inconsistency;
- ADF ships and aircraft are subject to Commonwealth law wherever they may be physically located;
- Defence activities are Commonwealth activities; and
- the vast bulk of the Defence activities conducted in the GBRWHA are external to Queensland State waters.

Brief synopses of the most relevant items of Queensland legislation are also presented.

Defence activities in the GBRWHA are subject to many Commonwealth statutes, however, the principal piece of legislation that holds primacy over all other Commonwealth and State legislation for the GBRWHA is the Great Barrier Reef Marine Park Act 1975 (GBRMP Act). The GBRMP Act includes provisions for the establishment of the Great Barrier Reef Marine Park Authority (GBRMPA), the regulation of all activities in the GBRMP and the enforcement of regulations and collection of environmental management charges. The
relationship of the GBRMP Act with other Commonwealth legislation is expanded upon later in this section, including the situation where potential gaps and overlaps may occur with regard to jurisdiction and the relevance to Defence activities conducted within GBRWHA boundaries.

Not all facets of effective environmental management are currently addressed by Commonwealth legislation, and other aspects covered by existing legislation are yet to be adequately defined either by common application or case law. In such absences of Commonwealth legislation or policy, it is Defence policy to default to best practice environmental management, consistent with management and development of capability. This accords with the Defence vision of being a leader in environmental stewardship.

Therefore this section presents:

- definition of State versus Commonwealth Waters;
- review of international conventions and obligations;
- summary of pertinent Commonwealth legislation, policies and programs, particularly the *Great Barrier Reef Marine Park Act 1975*;
- description of Defence policies and instructions; and
- summary of principal Queensland legislation.

### 2.2 COMMONWEALTH VERSUS STATE/TERRITORY WATERS

In accordance with the Third United Nations Law of the Sea Convention (UNCLOS III) Australia may exercise jurisdiction and claim certain sovereign rights in the waters measured seawards from the coastline (‘baselines’). Normal baselines are measured from the low water mark (LWM) along the coast, and straight baselines may be used to close off river mouths, bays or to enclose low-tide elevations that are situated within the breadth of territorial sea.

The maritime zone that extends from the baselines out to 12 nautical miles (nm) is the territorial sea. The zone that extends out to 200 nm from the baselines constitutes Australia’s Exclusive Economic Zone (EEZ). Territorial islands such as Christmas, Cocos, Norfolk, Lord Howe, Macquarie, Heard and McDonald Islands and the Australian Antarctic Territory also generate their own territorial sea and EEZ.

Waters within Australia’s maritime zones are sub-divided into State/Territory and Commonwealth controlled areas. The States and Territories have jurisdiction over waters to 3 nm (5.6 km) from the baseline (Figure 2.1) as a result of the 1980 Offshore Constitutional Settlement (OCS) between the States and the Commonwealth. The baseline follows the LWM on the mainland except where it extends offshore to encompass nearshore islands and close off large embayments such as is the case, for example, of Port Phillip Bay and the Rowley Shelf between Exmouth and Port Hedland. Other State waters have their genesis in the drafting of the Australian Constitution, such that the South Australian Gulfs (Spencer Gulf and Gulf St Vincent) remained as South Australian state waters. The Commonwealth is responsible for all waters of its external territories unless special arrangements have been made with the States or Territories. Australian seabed and airspace external to State/Territory waters is subject to Commonwealth jurisdiction.
2. LEGISLATIVE AND POLICY FRAMEWORK

Figure 2.1  Delineation of Commonwealth and State/Territory Waters

This arbitrary division of Australia’s waters into State/Territory and Commonwealth control can make management of marine resources and activities difficult; for example, most major fisheries operate in both State/Territory and Commonwealth waters. The OCS developed a workable framework for the Commonwealth and States/Territories to allocate and share jurisdictional responsibilities. For example, the Commonwealth and States/Territories have entered into arrangements that better reflect fishing practices and the location and extent of fishing grounds (Bureau of Rural Sciences, 1999). The Commonwealth also maintains jurisdiction for certain regulatory responsibilities within State/Territory coastal waters (but not necessarily within internal State/Territory waters such as bays, estuaries, etc) such as sea dumping and aspects of ship navigation. The States and Territories exercise jurisdiction over the seabed beneath and airspace above their coastal waters, although the Commonwealth retains certain rights relating to activities and structures within this zone concerned with defence.

2.3 INTERNATIONAL CONVENTIONS AND OBLIGATIONS

Australia is signatory to a range of international agreements which have applicability to the environmental management of activities in the GBRWHA. These are ultimately expressed in Australian law in order to have effect within the Australian jurisdiction. Nevertheless, it is germane to recognise the international agreements which form the foundations for the attendant Australian legislation. These are summarised below.

2.3.1 UN Convention on the Law of the Sea 1982

The ability of any nation to exercise regulatory controls over its claimed territorial seas is founded upon customary international law and treaties. The United Nations Convention on the Law of the Sea 1982 (UNCLOS) is the principal instrument for the delineation and
codification of the maritime rights and responsibilities of sovereign nations, and the basis for declarations of maritime zones including EEZs. UNCLOS is primarily concerned with maritime jurisdiction, rights of navigation, economic activities in littoral waters and similar issues. It also stipulates a general duty for signatories to protect and preserve the marine environment (ANZECC, 1995), and an obligation to prevent, reduce and control marine pollution from the various major pollution sources including from the land, from the atmosphere, from vessels and from dumping.

UNCLOS obliges parties to cooperate in international fora and to adopt laws to prevent, reduce or otherwise control pollution of the marine environment from all sources, including vessels.

2.3.2 World Heritage Convention

The *World Heritage Convention 1972* (WHC) enables the definition and selection of natural or cultural sites which can be considered for inscription on the World Heritage List. It also sets out the duties of States Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each participating country pledges to conserve not only the World Heritage sites situated within its territory, but also to protect its national heritage.

Each country must generate its own applications for sites to be inscribed on the World Heritage List. Each application has to include a plan detailing how the site is managed and protected in national legislation. After a site is selected, its name and location are placed (or inscribed) on the World Heritage List. Australia is a signatory to the WHC and currently has 15 sites listed. The GBR was inscribed on the World Heritage List in 1981.

2.3.3 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Convention) and the 1996 Protocol

The *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972* (London Convention) is concerned with ‘sea dumping’, which is the act of deliberate disposal at sea of waste or other matter, or any deliberate disposal (scuttling) at sea of vessels, aircraft, platforms or other man-made structures. The convention addresses such activities as the dumping of dredge spoil, sewage sludge and municipal garbage, and the scuttling of ships and aircraft. It does not address wastes generated during the normal conduct of ship activities (these are covered by MARPOL 73/78). The convention does not consider ‘dumping’ to include the placement or abandonment into the sea of items other than for the mere disposal thereof.

The 1996 Protocol to the London Convention essentially revises and refines the original convention. The 1996 Protocol introduced a change of emphasis compared to the original convention. Whereas the 1972 convention sought to regulate what was dumped in the sea, the 1996 protocol essentially seeks to cease sea dumping unless it can be demonstrated that the intended dumping is environmentally benign or insignificant and for all intents and purposes the only practicable option. The Protocol will supersede the London Convention for those states that are party to the Protocol. Australia is a Party to both the London Convention and the 1996 Protocol.
The Convention contains an exemption from compliance by ‘vessels and aircraft entitled to sovereign immunity under international law’ (i.e. warships, naval auxiliaries and military aircraft).

2.3.4 International Convention for the Prevention of Pollution from Ships 1973 as modified by its Protocol of 1978 (MARPOL 73/78)

MARPOL 73/78, administered by the International Maritime Organization (IMO), is concerned with the management of ‘operational wastes’ from shipping. Operational waste is considered to be that which is generated during the course of the normal activities of a vessel, as opposed to waste material which may be carried by a ship for the express purpose of disposing that material at sea, otherwise referred to as ‘sea dumping’. Operational waste can be further subdivided into three components:

- Domestic waste – all food wastes and other material produced by crew and passengers (e.g. embarked troops) in a vessel’s living (and office) spaces;
- Maintenance waste – waste generated in the routine operation and maintenance of a vessel’s engineering equipment and hull; and
- Cargo-associated wastes – all waste materials produced as a result of cargo stowage and handling, including liquid cargoes.

The Convention has six Annexes, addressing oil (I), bulk noxious liquid substances (II), harmful packaged substances (III), sewage (IV), garbage (V) and air emissions (VI). Annexes I, II, III, IV and V are currently in force. Annex VI has not been ratified by the requisite number of nations and is not yet in force.

MARPOL 73/78 essentially revolves around prohibiting the discharge of polluting materials to sea, except for selected materials and only when a ship is in an area where such disposal is permitted and the discharge is conducted in accordance with other regulations stipulated by the Convention. The Convention also provides a framework for:

- the documentation of waste discharges from ships via Oil Record Books (Annex I) and Garbage Record Books (Annex V);
- ship construction and equipment standards, set in order to reduce the risk of marine pollution, particularly of oil or chemicals in the event of accident;
- a ship survey and inspection regime, and cooperation between governments for enforcement and the detection of violations;
- the provision of adequate port waste reception facilities;
- the reporting of ship accidents involving oil or harmful substances; and
- promotion of the international exchange of information and technical cooperation.

The Convention has declared a number of ‘Special Areas’ denoted for their particular sensitivities to marine pollution. More stringent discharge restrictions apply in Special Areas. Nine Special Areas have been designated to date, none of which occur within the Australian region. The IMO is also able to declare ‘Particularly Sensitive Sea Areas’ (PSSA) under the MARPOL 73/78 regime. A PSSA is an area considered to warrant special protection because of its significance for recognised ecological or socio-economic or scientific reasons and which may be vulnerable to damage by international maritime activities. The GBR region of Australia was the first PSSA to be declared, and Torres Strait was similarly designated in 2005.
‘Nearest land’, taken as the baseline of the territorial sea, is used as the datum within the Convention delimiting the boundaries of sea areas where discharges of specified categories of waste are prohibited or subject to other controls. Annexes I, II, IV and V define the GBR region to be within the baseline of Australia. Annex IV permits nations to impose less stringent discharge requirements upon ships within their territorial waters (e.g. the GBR region).

A synopsis of the discharge restrictions imposed by Annexes I, IV and V is presented in Table 2.1. The provisions of Annexes II and III are of minimal relevance to the ADF.

Annex VI presents a framework for the reduction of ship-sourced emissions of SO\(_x\), NO\(_x\), volatile organic compounds (VOCs) and ozone depleting substances (ODSs). It also seeks to control the design, approval and operation of shipboard incinerators. Although not imposing controls, Annex VI encourages the development of CO\(_2\) emission reduction strategies and the prohibition of the use of perfluorocarbons as substitutes for ODSs in ship fire suppression systems.

Emissions of oxides of sulphur are to be reduced by imposing caps on the maximum permissible sulphur content of fuel. These are set at 4.5% (m/m) sulphur except for designated SO\(_x\) emission control areas (the Baltic Sea is the only one to have been declared to date) where the limit is 1.5% (m/m) or the ship is to be fitted with equipment to limit emissions to 6.0 g SO\(_x\)/kW h\(^{-1}\) or less. A complex code has been developed to reduce NO\(_x\) emissions from ships, largely revolving around the size and mode of operation of diesel machinery with a power output > 130 kW, with permissible levels set from around 10-20 g NO\(_x\)/kW h\(^{-1}\). No deliberate emissions of ODSs are permitted.

Warships and naval auxiliaries are exempted from compliance with MARPOL 73/78, although this exemption carries the caveat that governments will require such ships to comply to the greatest practicable extent.
### Table 2.1 Synopsis of MARPOL 73/78 Pollutant Discharge Regulations (Annexes I, IV, and V)

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Disposal Outside Special Areas</th>
<th>Disposal Within Special Areas</th>
<th>Disposal Within Great Barrier Reef Region</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oily Wastes (Annex I)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil or oily mixture originating from all oil tankers.</td>
<td>Prohibited, except when: a. the ship <em>en route</em>; b. the ship is &gt; 50 nautical miles from nearest land; c. instantaneous rate of discharge of oil does not exceed 30 L per nautical mile; d. total quantity of oil discharged does not exceed 1/30,000 of the quantity of cargo being carried; e. ship has appropriate oil pollution control equipment (e.g. filters, alarm, automatic shut-off, slop tank).</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Oil or oily mixture from ships of 400 GRT and above other than an oil tanker and from machinery space bilges excluding cargo pump room bilges of an oil tanker unless mixed with oil cargo residue</td>
<td>Disposal prohibited, except when: a. the ship is <em>en route</em>; b. oil content of the effluent before dilution does not exceed 15 ppm; c. ship has appropriate oil pollution control equipment (e.g. filters, alarm, automatic shut-off).</td>
<td>Disposal prohibited, except for processed bilge water when: a. (in the case of oil tankers) bilge water does not originate from cargo areas or is mixed with oil cargo residues; b. the ship is underway; c. oil content of the effluent before dilution does not exceed 15 ppm; d. ship has appropriate oil pollution control equipment (e.g. filters, alarm, automatic shut-off).</td>
<td>Disposal prohibited, except when: a. the ship is underway; b. oil content of the effluent before dilution does not exceed 15 ppm; c. ship has appropriate oil pollution control equipment (e.g. filters, alarm, automatic shut-off).</td>
</tr>
<tr>
<td>Oil sludge (from holding tanks)</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Oily rags, used oil filters and similar</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
</tbody>
</table>
## 2. LEGISLATIVE AND POLICY FRAMEWORK

### Sewage (Annex IV)

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Disposal Outside Special Areas</th>
<th>Disposal Within Special Areas</th>
<th>Disposal Within Great Barrier Reef Region</th>
</tr>
</thead>
</table>
| Comminuted and disinfected sewage from ships of 400 GRT, or less if certified to carry more than 15 persons | Disposal prohibited except when ship is:  
  a. > 3 nautical miles from nearest land;  
  b. underway at a speed not less than 4 knots. | NB: Special Areas have no application under Annex IV | Disposal prohibited except when ship is:  
  a. > 4 nautical miles from boundary of GBR;  
  b. underway at a speed not less than 4 knots |
| Sewage which is not comminuted or disinfected from ships of 400 GRT, or less if certified to carry more than 15 persons | Disposal prohibited except when ship is:  
  a. 12 nautical miles from nearest land;  
  b. underway at a speed not less than 4 knots. | n/a | Disposal prohibited except when ship is:  
  a. 12 nautical miles from boundary of GBR;  
  b. underway at a speed not less than 4 knots |
| Treated sewage (in an IMO approved sewage treatment plant) | Nil restrictions | n/a | Nil restrictions |

### Garbage (Annex V)

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Disposal Outside Special Areas</th>
<th>Disposal Within Special Areas</th>
<th>Disposal Within Great Barrier Reef Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastics</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Floating dunnage, lining and packing materials</td>
<td>&gt; 25 nautical miles from nearest land</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Paper, rags, glass, metal, bottles, crockery and similar refuse</td>
<td>&gt; 12 nautical miles from nearest land</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>All other garbage including paper, rags, glass, etc. comminuted or ground</td>
<td>&gt; 3 nautical miles from nearest land</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Food waste not comminuted or ground</td>
<td>&gt; 12 nautical miles from nearest land</td>
<td>&gt; 12 nautical miles from nearest land</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Food waste comminuted or ground</td>
<td>&gt; 3 nautical miles from nearest land</td>
<td>&gt; 12 nautical miles from nearest land</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Mixed refuse</td>
<td>Determined by the most stringent conditions applying to any single component of the mixture</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
<tr>
<td>Toxic or noxious materials</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
<td>Disposal prohibited</td>
</tr>
</tbody>
</table>
2.3.5 Other Relevant International Agreements

**Convention on Biological Diversity 1992**

This agreement sets out commitments for maintaining the world's ecological underpinnings and balancing them with economic development. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

The Convention is firmly established within the tenets of ‘sustainable use’. It recognises that effective conservation extends beyond protection of selected species and habitats, and that ecosystems, species and genes must be used for the benefit of humans but that this should be done in a way and at a rate that does not lead to the long-term decline of biological diversity. The Convention also offers guidance based on the precautionary principle that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat.

**Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979**

The aim of the Bonn Convention is to conserve terrestrial, marine and avian species over the whole of their migratory range. The Convention commits ‘range states’ to take action to conserve migratory species and their habitats, especially those under threat.

**Convention on Wetlands of International Importance (Ramsar Convention) 1971**

This is commonly referred to as the Ramsar Convention, after the Iranian town where the convention was drafted. The aims of the Ramsar Convention include halting the worldwide loss of wetlands and conservation of, through wise use and management, those that remain. Australia is one of over 80 countries to become a Party to the Convention. As part of its responsibilities, Australia is expected to:

- nominate specific sites to the List of Wetlands of International Importance;
- promote wise use of all wetlands within their territories; and
- create and manage wetland reserves.


The JAMBA agreement recognises that many species of birds migrate between Australia and Japan and live seasonally in respective countries and that there are certain species of birds which are in danger of extinction. It recognises also that co-operation between the two countries is essential for the conservation of these birds.

Similar to JAMBA, the CAMBA agreement is concerned with the protection of bird species that migrate between Australia and China.

As a signatory to JAMBA and CAMBA, Australia is obliged to:

- preserve and enhance the important habitats used by migratory birds listed in the agreements;
- encourage joint research programs and share the information gained;
In June 2002 the Governments of Australia and the Republic of Korea announced joint intentions to establish a similar bilateral agreement for the protection of bird species that migrate between Australia and Korea, although this proposed agreement is yet to be formalised.

2.4 PRINCIPAL COMMONWEALTH LEGISLATION

The six main pieces of Commonwealth legislation relevant to the environmental aspects of Defence activities in the GBRWHA are the:

- *Great Barrier Reef Marine Park Act 1975* (GBRMP Act);
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*;
- *Environment Protection (Sea Dumping) Act 1981*;
- *Quarantine Act 1908*; and
- *Historic Shipwrecks Act 1976*.

Further detail is provided below with particular emphasis on the GBRMP Act and the EPBC Act are the key Commonwealth environmental statutes relevant to the GBRWHA.

2.4.1 Great Barrier Reef Marine Park Act 1975

The GBRMP Act established the Great Barrier Reef Marine Park (GBRMP) and the Great Barrier Reef Marine Park Authority (GBRMPA), a statutory authority within DEH’s environment portfolio. The Act provides for the protection and managed exploitation of the GBRMP by placing controls on activities within the Reef region. This is principally effected through the promulgation of zoning plans and management plans, with authority for their implementation and enforcement derived in-turn from the Act.

The GBRMP Act is the principal Act that regulates the management and operation of the GBRMP. The primary provisions of the GBRMP Act are designed to:

- establish the GBRMP;
- establish the GBRMPA, a Commonwealth authority responsible for the management of the Marine Park;
- establish the Great Barrier Reef Consultative Committee to advise the Minister and the GBRMPA;
- provide a framework for planning and management of the Marine Park, including through zoning plans, plans of management and permits;
- prohibit operations for the recovery of minerals (which includes prospecting for or exploitation of minerals and petroleum resources) in the Marine Park (unless approved by GBRMPA for research);
- require compulsory pilotage for certain ships in prescribed areas of the GBR region; and
- provide for regulations, collection of environmental management charges, enforcement, etc. (GBRMPA 2004).
Operation of the GBRMP Act binds the Crown in the right of the Commonwealth.

The GBRMP is designated as a Commonwealth area under the provisions of the 1980 OCS, separate from Queensland State waters which extend to 3 nm from established baselines. The EPBC Act prohibits that any separate portions of the GBRMP can be segregated and declared as a Commonwealth reserve under the provisions of the EPBC Act itself, thereby wresting regulatory control away from the GBRMPA. This function of the EPBC Act is designed to ensure that regulatory control of the GBRMP remains with the GBRMPA to provide ongoing centralised management of the Marine Park. In all matters relating to the GBRWHA that involve World Heritage, then the EPBC Act applies and DEH is the lead Commonwealth agency. In all other matters relating to marine park operation and management, the EPBC and DEH are subservient to the GBRMP Act and the GBRMPA respectively.

### 2.4.1.1 GBRWHA Zoning Scheme

The *Great Barrier Reef Marine Park Act 1975* provides for the establishment, control, care and development of the Great Barrier Reef Marine Park. The Great Barrier Reef Marine Park Authority is responsible for the management of the Marine Park. The *Great Barrier Reef Marine Park Zoning Plan 2003* (Zoning Plan) is the primary planning instrument for the conservation and management of the Marine Park. In having regard to the objects set out in subsection 32 (7) of the Act, this Zoning Plan takes account of the world heritage values of the Marine Park and the principles of ecologically sustainable development. For the purposes of the Act, the Amalgamated Great Barrier Reef Section is divided into the zones described in Schedule 1 and named as follows:

(a) the General Use Zone;
(b) the Habitat Protection Zone;
(c) the Conservation Park Zone;
(d) the Buffer Zone;
(e) the Scientific Research Zone;
(f) the Marine National Park Zone;
(g) the Preservation Zone;
(h) the Commonwealth Islands Zone.

In addition to these zones, there are ‘Designated Areas’ for specific activities. These designated areas are: Shipping Areas; Special Management Areas and Fisheries Experimental Areas.

The Zoning Plan aims, in conjunction with other management mechanisms, to protect and conserve the biodiversity of the Great Barrier Reef ecosystem within a network of highly protected zones, while providing opportunities for the ecologically sustainable use of, and access to, the Great Barrier Reef Region by current and future generations. In addition to the protection of representative areas of biodiversity, this Zoning Plan also provides for the protection of other areas of high conservation value by assigning protective zoning to a range of habitats such as coral reefs, sponge beds, seagrass beds and deep water areas, as well as important dugong habitats and other special or unique sites. The Marine Park is managed as a multiple use area. This means that, while enhancing the conservation of the Marine Park, this Zoning Plan also provides for a range of recreational, commercial and research opportunities, and for the continuation of traditional activities.
2.4.1.2 Defence activities in relation to the Zoning Plan

Part 5 (Additional purposes for use or entry) of the Zoning Plan provides for use or entry to zones for purposes in addition to those for which provision is made in Part 2 (Zones), Part 3 (Remote Natural Area) and Part 4 (Designated Areas). Such purposes include access for the purposes of Defence operations as well as safety, emergencies, environmental monitoring, navigational aids, government survey, and Aboriginal or Torres Strait Islander custom or tradition.

Section 5.2 of the Zoning Plan makes provision for Use or entry Without Permission After Notification. It states that a zone (including a zone or part of a zone in the Remote Natural Area or a Designated Area) may be used or entered without permission, after notification to the Authority and subject to any directions given by the Authority, for any of the following purposes:

(a) otherwise than in an emergency, to remove or salvage a vessel or an aircraft, or a section of a vessel or an aircraft, or other wreck, that is wrecked, stranded, sunk or abandoned;
(b) to construct, operate or service navigational aids, and their ancillary buildings and works, that are authorised under a law of the Commonwealth or of Queensland, including the operation of vessels and aircraft for those purposes;
(c) to remove, in accordance with an order under the Regulations (being an order to which section 38H of the Act applies) or a deed of agreement, property described in the order or deed;
(d) to undertake defence activities that would otherwise require permission under this Zoning Plan;
(e) to undertake government geodetic surveys, government bathymetric surveys or similar government surveys;
(f) to undertake urgent maintenance or works on essential public services (including power, water, sewerage and communication systems), that are authorised under a law of the Commonwealth, Queensland or a local government authority;
(g) to deal with an emergency involving a serious threat to the environment, other than a threat mentioned in subparagraph 5.1 (a) (v) or (vi).

In the Zoning Plan, ‘defence activities’ is defined as activities for defence purposes:

(a) conducted by the Defence Force; or
(b) conducted by an arm of the defence forces of another country that is in Australia with the approval of the Government of Australia; or
(c) conducted or authorised by the Department of Defence.

2.4.1.3 Relationship of the GBRWHA with the GBRMP

The GBRWHA overlaps the GBRMP as depicted in Figure 2.2. The GBRMP and the GBRWHA are two separate entities that are subject to different legislation and regulated by separate bodies. The GBRMP was established in 1975 with the passing of the GBRMP Act and the formation of the GBRMPA to manage the marine park. The GBRWHA came into existence in 1981 via inscription on the World Heritage List under the auspices of the World Heritage Convention. Regulatory control and management of the GBRWHA is vested within the Commonwealth Department of the Environment and Heritage (DEH).
Areas within the GBRMP boundaries are covered by the provisions of the GBRMP Act except various bays, inlets and islands that are either State waters or islands, some of the latter privately owned. The GBRMP extends to the Low Water Mark tidal datum of the Queensland coast. Where the GBRWHA boundaries extend beyond the GBRMP boundaries, only the provisions of the EPBC Act apply as the World Heritage Area is also a Commonwealth marine area. Over 99% of the GBRWHA is comprised of the GBRMP, the remainder being comprised of islands (Queensland, Commonwealth and privately owned), internal waters of Queensland and several exclusion zones around ports. The provisions triggered within the EPBC Act that are relevant to the GBRWHA relate to Matters of National Environmental Significance (NES) for World Heritage properties. The entire GBR region is classified as a World Heritage Area (WHA) (defined by coordinates provided by DEH), which includes all land, seabed (to a depth of 1,000 m) and airspace (to an altitude of 915 m) above the terrestrial boundaries. In essence, GBRMPA is responsible for management of the GBRMP, while DEH is responsible for management of the World Heritage aspects of the GBR region plus other matters of NES. Further detail on how these management arrangements are implemented is provided in the proceeding Sections.

2.4.1.4 Environmental impact assessment and approvals

If a proponent seeks to undertake a development or prescribed activity or intensify an existing operation or activity in the GBRMP, then the GBRMPA is the consent authority. Alternatively, the EPBC Act stipulates that if an action has, will have or is likely to have a significant impact upon a matter of NES, then the matter should be referred to the Commonwealth Environment and Heritage Minister to determine whether or not an environmental impact assessment is necessary before the proposal can proceed. If the proposed action involves World Heritage properties, Ramsar wetlands of international
significance or Commonwealth marine areas, then a Referral must be made to DEH under the EPBC Act if the proponent considers that it is likely that a matter of NES could be significantly affected. Since the GBRMPA is a Commonwealth agency, then any referral submitted to it must be subsequently referred to DEH for the Commonwealth Minister for the Environment and Heritage to determine whether or not environmental assessment is required under the EPBC Act. However, an approval under Part 9 of the EPBC Act is not required for an action (where the action would otherwise need an approval under the EPBC Act) if the action is occurring in the GBRMP and the person is authorised to take that action under a permit, zoning plan or plan of management. GBRMPA is, however, required to seek and consider any advice of the Commonwealth Minister for the Environment and Heritage in respect of such an action prior to making any permit decision.

**Land Tenure**

The *Coastal Waters (State Title) Act 1980* vests title to the seabed inside the outer limits of the three-mile territorial sea in Queensland, subject to a number of reservations including, in particular, the continuing operation of the *Great Barrier Reef Marine Park Act 1975*. Exclusive rights to explore and exploit the seabed of the continental shelf beyond the territorial sea are vested in the Commonwealth subject to certain limited rights conferred on third parties. Within the limits of the State of Queensland, public title is vested in the State of Queensland, apart from public lands owned by the Commonwealth. Some land is held by private persons (Kelleher et al. 1989).

### 2.4.1.5 Regulation of activities in the GBRMP

Within the boundaries of the GBRMP, a person may take an action prescribed in the EPBC Act without an approval provided that the action is taken in accordance with the following instruments made or issued under the GBRMP Act:

i. a zoning plan;
ii. a plan of management;
iii. a permission;
iv. an authority;
v. an approval; or
vi. a permit.

Zoning plans delineate the GBRMP into areas on the basis of their conservation significance, management requirements, resource or other human exploitation potential, and approved use or uses. Once completed, zoning plans are Gazetted and thus have the force of law. There are 30 separate zoning subdivisions that are categorised by geographic location into four large regions. These four regions cover the entire marine park area and are shown in Figure 2.3.

Management plans may be developed to provide for the protection and conservation of specific ecological, heritage and scientific values, to balance competing uses and to manage for ecologically sustainable use.

The GBRMP Act also prescribes activities that are not permitted within the Park, or the conditions under which these specified activities may be permitted. Certain offences are also contained within the Act and Regulations; those of greatest relevance to ADF activities being regulations controlling waste discharges. The Act and Regulations prohibit the discharge of waste within the GBRMP except in defined circumstances. Garbage, noxious substances and oil may not be discharged within the GBRMP; oily water may be discharged but only when the oil-in-water content is less than 15 ppm; and sewage may only be discharged more
than 500 m to seawards of the seaward edge of the nearest reef (this is in the case that the vessel is fitted with some sort of sewage holding tank. For vessels not so fitted the Act does not impose any discharge controls). The release of waste from a vessel or aircraft is not considered an offence if the discharge was for the purpose of securing the safety of the vessel or aircraft, or for the purpose of saving life at sea.

Permits, issued by GBRMPA, are required before any activity may be conducted if that activity is not in accordance with the relevant zoning plan, or if the activity is nominated by the zoning plan as one which specifically requires a permit. The objectives of permits are to:

- reduce impacts on high-use and sensitive areas;
- separate potentially conflicting activities;
- encourage responsible behaviour by all Marine Park users;
- collect data; and
- monitor activities which may become damaging to the marine park.

As a general guide, the following activities require a permit.

- most commercial activities, including tourist operations;
- installation and operation of structures, such as jetties, marinas, pontoons and mariculture facilities;
- any works, such as repairs to structures, dredging and dumping, placement and operation of moorings;
- anchoring or mooring for an extended period;
- waste discharge from a fixed structure;
- research;
- educational programs; and
- traditional hunting.

Should damage be caused to the GBRMP as a result of any act or omission in contravention of the GBRMP Act or Regulations, the Act gives power for an order to be made to repair or remedy any condition arising from that act or omission, to mitigate any damage arising from that act or omission, and/or to prevent any damage likely to arise.

Through the mechanisms of zoning and management plans, the Act provides a framework for the management of activities proposed to be conducted within the Park. There is no authority contained within the Act for the GBRMPA to parallel or duplicate the environmental assessment processes established under other legislation. The Act may be considered to confer power on GBRMPA to vet proposed activities, essentially to the extent that the proposed activity may be inconsistent with the Act itself or attendant Regulations, or a relevant management or Zoning Plan.

GBRMP Zoning Plans denote a number of Defence Restricted Areas, which equate to the DPA within the area. GBRMPA Zoning Plans require that Defence notify the Authority of intended Defence use.
2.4.2 Environment Protection and Biodiversity Conservation Act 1999 and Regulations

2.4.2.1 Background

The EPBC Act applies to all Australian territory (including Australian waters) and Australian ships, aircraft and ADF personnel wherever they may be. Under the EPBC Act, actions that are likely to have a significant impact upon the environment are subject to an assessment and approval process. An action includes a project, development, undertaking, activity, or series of activities. Amongst other powers, the EPBC Act provides for the protection of significant species and their habitat. Species and their habitats are deemed significant by virtue of their conservation status (i.e. endangered or vulnerable), if they are migratory or otherwise protected under international convention. Cetaceans have special significance under the EPBC Act, and are afforded a high level of protection within the Australian Whale Sanctuary (i.e. Commonwealth waters).

The EPBC Act was introduced to reform the level of environmental regulation and the manner in which the Commonwealth becomes involved in the assessment of proposals. Commonwealth involvement is triggered when matters of National Environmental Significance (NES) arise and therefore, its involvement in matters that have only State/Territory or local significance is limited. For Commonwealth agencies, however, any actions likely to have significant impact on the environment, including social and economic, require assessment and approval. Additionally, the intent of the Act is to more effectively implement the Intergovernmental Agreement on the Environment (IGAE), and the subsequent 1997 Council of Australian Governments (COAG) Heads of Agreement on Commonwealth/State Roles and Responsibilities for the Environment.

The EPBC Act replaced the following legislation:

- Australian Heritage Commission Act 1975;
- Environment Protection (Impact of Proposals) Act 1974;
- Endangered Species Protection Act 1992;
- National Parks and Wildlife Conservation Act 1975;
- World Heritage Properties Conservation Act 1983; and

Amendments to the Act in late 2003 expanded its scope to also incorporate recognition and protection of items of cultural and natural heritage, previously regulated by the Australian Heritage Commission Act 1975.

Referral to DEH of a proposed activity is required where a significant impact on a matter of NES is anticipated or expected, or for Commonwealth agencies where a significant impact on the environment is likely. The Act also dictates that a proponent must obtain a special permit for specified activities when, for example:

- interference (as defined in the Act) with cetaceans, listed species or ecological communities is anticipated or expected; or
- activities are proposed to be undertaken in Marine Parks and/or Reserves.

The EPBC Act makes provision for assessment and control of actions that are likely to have a significant impact (‘triggers’). While the EPBC Act does not explicitly indicate what
constitutes a significant impact, DEH have produced guidelines to assist proponents in determining whether or not their proposed activities will ‘trigger’ the Act. Triggers under the Act are further discussed below.

Under the EPBC Act, species and ecological communities of environmental significance listed by state, territory and local governments that are present in marine areas and recognised as part of the ‘environment’, are protected from any significant impacts related to Defence activities.

2.4.2.2 Objectives

The EPBC Act has a number of objectives, as follow:

- to provide for the protection of the environment, especially those aspects of the environment that are matters of NES;
- to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources;
- to promote the conservation of biodiversity;
- to promote a co-operative approach to the protection and management of the environment involving governments, the community, land-holders and indigenous peoples;
- to assist in the co-operative implementation of Australia's internal environmental responsibilities;
- to recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity; and
- to promote the use of indigenous peoples' knowledge of biodiversity with the involvement of and in co-operation with, the owners of the knowledge.

In its function to provide protection for matter of NES, the EPBC Act appears to have primacy over the management of heritage principles within the GBRWHA as such, overriding the responsibilities of the GBRMPA even though the GBRWHA covers largely the same boundaries as the GBRMP. Effectively there are two management authorities for the same area, the differentiating feature being the aspect under consideration, whether it be related to the GBRMP or issues relating to matter of NES.

Under the Act the “environment” is defined as:

(a) ecosystems and their constituent parts, including people and communities;
(b) natural and physical resources;
(c) the qualities and characteristics of locations, places and areas; and
(d) the social, economic and cultural aspects of a thing mentioned in sub-paragraph (a), (b) or (c).

Decisions made under the auspices of the Act must be based on the principles of ecologically sustainable development. The Act defines the following as the principles of ecologically sustainable development:

- decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;
- if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
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- the principle of inter-generational equity: that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;
- the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and
- improved valuation, pricing and incentive mechanisms should be promoted.

2.4.2.3 Environmental Assessment and Approval under the EPBC Act

2.4.2.3.1 Triggers under the EPBC Act

The EPBC Act is triggered by actions that are likely to have a significant impact on:

- a matter of NES;
- the environment on Commonwealth land; or
- the whole of the environment if:
  - the action is taken in a Commonwealth area; or
  - the action is taken outside of a Commonwealth area but has an effect on a Commonwealth area; or
  - the action is taken by a Commonwealth agency (e.g. Defence) in any area (i.e. including State/Territory areas, international waters or the sea area and territories of any sovereign state).

The term ‘Commonwealth area’ refers to land, airspace and marine areas that are regulated and administered by the Commonwealth. Commonwealth land includes land defined as Commonwealth Gazetted areas that are administered by the Commonwealth through a Commonwealth agency. Airspace that may periodically be regulated by the Commonwealth includes Military Sensitive Areas. Activation of airspace for military activities is regulated by Airservices Australia in conjunction with Defence exercise planners. Commonwealth marine areas are the waters and the seabed below and airspace above within the 200 nm EEZ of the Australian mainland (territorial baseline) or Australian Territories and excluding State/Territory waters, however, in the context of this review, Commonwealth areas in the marine environment are those within the GBRWHA boundaries and Defence Maritime Exercise Areas.

If an action is determined to trigger the EPBC Act, it is referred to as a “controlled action”.

The Act makes provision for the conduct of strategic assessments. These may be undertaken when it is considered that the implementation of a policy, plan or program would involve activities that may otherwise be considered as controlled actions under the terms of the Act.

2.4.2.3.2 Matters of National Environmental Significance

The EPBC Act identifies seven matters of NES as follow:

- World Heritage sites;
- National Heritage places;
- Ramsar sites;
- nationally endangered or threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas; and
- nuclear actions.
These are expanded upon below.

**World Heritage Sites**

Activities that have, or are likely to have, a significant impact on the values that give a World Heritage site its World Heritage status will trigger the EPBC Act.

There are 16 World Heritage sites within Australia.

**National Heritage Places**

Australia's national heritage comprises natural and cultural places of exceptional heritage value that are considered to help give Australia its national identity. Such places are a living and accessible record of the nation's evolving landscapes and experiences.

Proposed activities that may impact upon the heritage values of a listed National Heritage place require approval from DEH before any action takes place.

**Ramsar Sites**

The Ramsar Convention pertains to wetlands of international importance.

The EPBC Act seeks to regulate activities that will or are likely to have a significant impact on the ecological character of a nominated wetland. These characters are those values that make the wetland one of international environmental significance.

**Nationally Threatened Species and Ecological Communities**

DEH maintains lists of endangered or threatened species and communities. Any action that has or is likely to have a significant impact on any of the listed species or communities will trigger the EPBC Act.

**Migratory Species**

Australia is signatory to a number of treaties, such as JAMBA, CAMBA and the Bonn Convention, which deal with migratory species, such as marine turtles, birds, whales and dolphins. Listed migratory species are established under Part 13, Division 2, subdivision A of the EPBC Act, and lists are maintained by DEH.

If an activity has the potential to impact on a migratory species or compromises Australia’s ability to meet its obligations under international agreements on migratory species, the EPBC Act will be triggered.

**Commonwealth Marine Areas**

A person must not take an action (where an action includes a project, development, an undertaking, activity or series of activities) in a Commonwealth marine area that has, will have or is likely to have, a significant impact on the environment. Additionally, a person must not take an action outside a Commonwealth marine area that has, will have or is likely to have, a significant impact on the environment in those Commonwealth waters.
**Nuclear Actions**

Nuclear activities, including uranium mining, will trigger the EPBC Act. However, the definition of ‘nuclear action’ in the EPBC Regulations does not encompass the activities of nuclear powered ships or submarines.

**2.4.2.3.3 Additional Matters of National Environmental Significance**

Additional matters of NES can be specified in the EPBC Act. Regulations may be made only after seeking comment and consultation with all States and Territories.

**2.4.2.3.4 Definition of Significant Impact**

Whether an impact is considered to be significant is determined by reference to the EPBC Act, the EPBC Regulations 2000 and related Administrative Guidelines and to a certain extent, will also be determined by the courts. It is likely that an activity that compromises the objectives of the EPBC Act as listed above will be considered as having or causing a significant environmental impact.

**2.4.2.3.5 Referral and Assessment**

If a person proposes to take an action and they consider that it may be or is a controlled action because it may impact on a matter of NES, or the environment (for a Commonwealth action or area), it must be referred to the Commonwealth Minister for the Environment and Heritage for the Minister to decide if the action is to go through a formal assessment process. Figure 2.4 outlines the process used to decide whether an action requires approval under the Act.

Once the referral has been made and it is determined that there will be a controlled action, the Commonwealth Minister for the Environment and Heritage makes a decision on the type of assessment that will be undertaken in determining whether or not the action may proceed. The Minister requests Preliminary Information from the proponent before a decision is made on the type of assessment process to be applied.

The following assessment procedures are provided for in the EPBC Act and may be selected and applied by the Commonwealth Minister for the Environment and Heritage:

- assessment on a case-by-case basis under which an assessment process will be stipulated as being one of the following:
  - Preliminary Documentation (PD) (Division 4 of the Act);
  - Public Environment Report (PER) (Division 5 of the Act);
  - Environmental Impact Statement (EIS) (Division 6 of the Act);
  - Inquiry (Division 7 of the Act); or

- assessment by an accredited assessment process as identified in:
  - a Bilateral Agreement; or
  - a Ministerial Declaration.
Is the action likely to have a significant impact on the environment?

NO

Approval is not required from the Commonwealth Minister for the Environment and Heritage under the EPBC Act.

YES

Is the action:
- approved by DEH, another Commonwealth agency (e.g. GBRMPA), or conducted in accordance with an accredited Management Plan?
- Subject to Ministerial declaration under section 158 of the EPBC Act?

NO

Approval may not be required from the Commonwealth Minister for the Environment and Heritage under the EPBC Act.

YES

Approval is required by the Commonwealth Minister for the Environment and Heritage under the EPBC Act.

Figure 2.4 Determining Whether a Defence Action Requires Referral under the EPBC Act

To date, no Assessment Bilateral Agreement has been established between the Commonwealth and Queensland, although a draft has been prepared. Note that the Minister for the Environment and Heritage still has to give approval to assessments under an Assessment Bilateral Agreement or a Ministerial Declaration.

2.4.2.3.6 Approvals

When a proposal is referred to the Commonwealth Minister for the Environment and Heritage for consideration, he/she decides whether or not to attach environmental conditions to the approval. Additionally, he/she may, at a later date, decide to revoke an approval.

2.4.2.3.7 When Referral and Approval is not required

Referral and approval is not required if the action:

(1) is approved by a State or Territory in accordance with an accredited Management Plan;
(2) is approved by another Commonwealth agency in accordance with a Management Plan accredited by the Commonwealth Minister for the Environment and Heritage; or
(3) when the proponent has obtained a written declaration by the Minister to be exempt if the Minister is satisfied that the action is necessary in the national interests of Australia’s defence or security or in relation to a national emergency.

Activities which were undertaken before the EPBC Act came into effect, or which were approved under other legislative processes (e.g. the Environment Protection / Impact of
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Proposals Act 1974) do not require referral under the EPBC Act. However, should ‘ongoing’ activities change in a manner that may result in significant environmental impact, then referral may be warranted. ‘Change’ to ongoing activities which may occasion referral can encompass intensification or expansion of activities above the historical norm.

2.4.2.4 Biological conservation

Under the EPBC Act, provisions are also made for the protection of:

- nationally threatened native species and ecological communities;
- protected migratory species;
- key threatening processes to conservation;
- critical habitats;
- recovery plans for threatened species;
- marine species;
- wildlife conservation plans;
- abatement plans for the threatening processes;
- protection for whales and cetaceans;
- control of access to biological resources in Commonwealth areas;
- establishment of protected areas; and
- World Heritage management plans.

No person can take an action that results in death or injury of a Commonwealth listed species or of a member of a listed ecological community in a Commonwealth area, or trade, take, keep or move a member of a listed species or listed ecological community in a Commonwealth area. There are however, exceptions where, for example, the action is:

- authorised by a permit;
- covered by an approval of the Commonwealth Minister for the Environment and Heritage;
- taken in a humane manner and is reasonably necessary to relieve or prevent suffering by a member of a listed threatened species or listed threatened ecological community;
- reasonably necessary to prevent a risk to human health;
- an action by a Commonwealth agency, or an agency of a State or of a self-governing Territory, that is reasonably necessary for the purposes of law enforcement;
- taken in an emergency situation such as the result of an unavoidable accident; or
- reasonably necessary to deal with an emergency involving a serious threat to human life or property.

Any person who takes an action which results in death or injury to a listed protected species or ecological community or listed migratory or marine species in a Commonwealth area is required to report such instance and the matters surrounding it to DEH within seven days of becoming aware of it.

In addition, a person must not knowingly damage critical habitat in a Commonwealth area or contravene a Management Plan for a site on the World Heritage List within Commonwealth land.

The Minister for the Environment and Heritage may grant exemptions from the requirement to seek permits to, among other things, kill, injure, take, trade, keep or moving listed threatened species or ecological communities, listed migratory species, cetaceans, or listed marine species in or on a Commonwealth area. The Minister may specify that any or all prohibitions in Part 13 of the EPBC Act do not apply in relation to an action to which an
exemption relates. Such exemption/s may only be granted if the Minister is satisfied that it is in the national interest to do so.

2.4.2.5 Whale protection

Cetaceans (i.e. whales and dolphins) are afforded special significance and protection within the EPBC Act. This specific protection for cetaceans is in addition to any other protection that individual species may have as migratory or threatened species. Whale protection provisions of the EPBC Act apply to all Australian corporations, citizens, vessels, aircraft and Commonwealth agencies whether or not within Australian waters.

It is an offence if a person takes an action that results in an injury or death of a cetacean. It is also an offence if a person takes, trades, keeps, moves or interferes with a cetacean. This is a strict liability offence (i.e. a state of mind to knowingly commit the offence is not needed).

Certain actions are not offences if:

- a permit has been issued for the action;
- the action is provided for in a recovery or wildlife conservation plan;
- the action is necessary to prevent a risk to human health;
- the action is undertaken by a State/Territory agency or Commonwealth agency for law enforcement; or
- the action is reasonably necessary to deal with an emergency involving a serious threat to human life or property.

A person can apply to the Minister for a permit to be issued under section 238. The Minister must not:

- issue a permit unless satisfied that the action will contribute significantly to the conservation of cetaceans or if the action will interfere with cetaceans, the interference is incidental to and not the purpose of taking the action;
- the action will not adversely affect the conservation status of a species or population and the taking of the action is not inconsistent with a recovery plan or wildlife conservation plan in force for a species of cetacean; and
- the holder of the permit will take all reasonable steps to minimise the interference with cetaceans.

Any person who takes an action which results in death or injury to a cetacean is required to report such instance and the matters surrounding it to DEH within seven days of becoming aware of it.

2.4.2.5.1 The Australian Whale Sanctuary

The Australian Whale Sanctuary is defined by the EPBC Act as the waters of the EEZ other than the coastal waters of a State or the Northern Territory. However, the Minister for the Environment and Heritage may include waters of the States and the Northern Territory within the Australian Whale Sanctuary as “prescribed waters” if deemed necessary to ensure adequate protection for cetaceans.
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2.4.2.5.2 Synopsis of Cetacean Regulations

Regulations have been promulgated in the EPBC Act to control the use of vessels and aircraft in close proximity to cetaceans within the Australian Whale Sanctuary. These are summarised below.

**Restricted craft**
Restricted craft (e.g. a hovercraft) is not permitted within 300 m of a cetacean.

**Other vessels**
Within the caution zone of a cetacean (i.e. 300 m for a whale, 150 m for a dolphin), a vessel must:
- operate at a constant slow speed so that its wake is negligible;
- not drift or approach closer than 100 m to a large whale or 50 m of a dolphin or porpoise;
- if the cetacean shows signs of being disturbed, immediately withdraw from the caution zone at a constant slow speed so that vessel wake is negligible;
- if there is more than one person on the vessel, post a lookout;
- only approach a cetacean:
  - from the rear, no closer than 30º to its observed direction of travel; or
  - by positioning the vessel ahead of the cetacean at more than 30º from its observed direction of travel; and
  - for a motorised vessel approaching a whale under power, keep the vessel downwind of the whale;
- avoid sudden or repeated changes in direction or speed;
- avoid abrupt reductions in the noise level of the vessel;
- avoid excessive engine use, gear changes, manoeuvring or making way astern;
- avoid using bow or stern lateral thrusters to maintain position;
- not restrict the path of the cetacean; and
- not pursue the cetacean or move into or through a group of cetaceans.

If a cetacean approaches a vessel or comes within 100 m in the case of a large whale or 50 m in the case of a dolphin or porpoise, the vessel must:
- place the engines in neutral, let the cetacean approach and avoid engaging propellers; or
- slow down and continue on a course that will avoid a potential collision; or
- steer a straight course away from the cetacean at a speed not more than 4 kts.

If a dolphin approaches the vessel or comes within 50 m, the vessel must not change course or speed suddenly.

A vessel must not enter the caution zone (300 m) of a calf or a pod containing a calf. If a vessel accidentally enters the caution zone of a calf or a pod containing a calf, the vessel must immediately stop the vessel and turn off engines or place them in neutral; or withdraw from the caution zone at a constant slow speed so that wake is negligible.

A vessel must not enter the caution zone of a cetacean if there are already two vessels in the caution zone.

When leaving the caution zone of a cetacean, a vessel must withdraw at a constant slow speed so that its wake is negligible; and proceed to the outer limit of the closest cetacean’s caution zone before gradually increasing speed.
If a large whale surfaces near a vessel when it is being operated for a purpose other than for watching cetaceans, the vessel must take all care necessary to avoid a collision.

**Aircraft**
A fixed-wing aircraft:
- must not operate at a height lower than 1,000 ft within a horizontal radius of 300 m of a cetacean,
- must not approach a cetacean from head on; and
- if a cetacean shows signs of being disturbed (e.g. immediate or repeated dives, increased swimming speed) must immediately withdraw.

A helicopter:
- must stay at least 1000 metres away from a cetacean; and
- must not hover over a cetacean (Comment: height of hover is not specified).

**Feeding**
A person must not intentionally feed or attempt to feed a cetacean that is in a natural environment. Feeding is taken to include the throwing of food or rubbish in the water near a cetacean.

**Noise**
A person who is within 300 m of a cetacean must avoid making loud or sudden noises, and a person must not play recorded or amplified sound underwater within 300 m of a cetacean.

The EPBC Regulations concerning interactions with cetaceans have their genesis in the intention of minimising the risk of interference to cetaceans from whale watching activities, as can be expected when the specific objective of aircraft and vessels engaged in whale watching is to locate cetaceans and then observe them at close range. These regulations make no real distinction, however, regarding incidental encounters between cetaceans and vessels or aircraft that happen to occur concurrently in the same space and time.

**2.4.2.6 Commonwealth Reserve Areas**
Commonwealth reserves can be declared under the EPBC Act over areas of land or sea that the Commonwealth owns or leases, or are in a Commonwealth marine area (beyond the State limit of three nautical miles). When a new Commonwealth reserve is created, it must be assigned to a category such as: strict nature reserve, wilderness area, national park, or managed resource protected area.

The activities that can occur in a reserve depend upon the type of reserve and whether a management plan is in place for the reserve. The activities that may be controlled include killing or taking a member of a native species, mining, development of the reserve or the use or possession of firearms and explosives. Although, the presence of these articles on a vessel on ‘passage’ through an area is permitted.

Regulations also control the use of vessels in Commonwealth reserves and the discharge of polluting liquids and gases, prohibit the depositing of litter (e.g. solid waste disposal from ships). The release of an ‘object’ from aircraft is also prohibited.
2.4.2.7 National Heritage Management

The framework for managing Commonwealth and national heritage matters underwent significant restructuring in early 2004, resulting in changes to the way in which Australia’s natural, indigenous and historic heritage is managed. The new national heritage system introduced the following elements:

- the National Heritage List – this list records the places with outstanding heritage values to Australia, including places overseas. These places have values or characteristics that have special meaning for Australia as a whole;
- the Commonwealth Heritage List – the list comprises natural, indigenous and historic heritage places on Commonwealth land and waters or under Australian Government control. Australian Government-owned places include installations (e.g. Defence establishments), national institutions (e.g. the High Court buildings) and other sites which reflect Australia’s development as a nation;
- the Australian Heritage Council – an independent body of heritage advisers established through the Australian Heritage Council Act 2003. It replaces the Australian Heritage Commission. The Council’s role is to assess the values of places nominated for the National Heritage List and the Commonwealth Heritage List, advise the Minister for the Environment and Heritage on conserving and protecting listed values and the nomination of places with heritage values to these lists. The Council also maintains the Register of the National Estate; and
- continued management of the Register of the National Estate (RNE) – the RNE continues to exist, with some 13,000 natural and cultural heritage places throughout Australia.

Commonwealth agencies are required to develop a heritage strategy to describe an approach for effectively managing places that it owns or controls for the long-term protection and conservation of their Commonwealth heritage values. Agencies must not contravene any management plan that applies to National Heritage List places and Commonwealth Heritage List places and any action taken in the absence of a management plan must not be inconsistent with National Heritage Management Principles.

Items in the RNE and the Interim List are protected from disturbance to the extent that a proposed activity may destroy or degrade the heritage value. Any proposed Commonwealth activity that may degrade or destroy the heritage value of a listed item or place is to be avoided, unless there is no feasible and prudent alternative and that all reasonable measures have been or would be, taken to minimise any adverse impacts.

2.4.2.8 Annual reporting

The Act requires Commonwealth agencies to furnish annual reports addressing several areas of environmental performance and compliance with the EPBC Act. Specifically, the annual report is to:

- address how the actions of, and the administration (if any) of legislation by, the agency during the reporting period accorded with the principles of ecologically sustainable development;
- identify how the outcomes (if any) specified for the agency in an Appropriations Act relating to the period contribute to ecologically sustainable development; and
- document the effect of the agency’s actions on the environment over the reporting period;
• identify any measures the agency is taking to minimise the impact of its actions on the environment; and
• identify any mechanisms which may be in place for reviewing and increasing the effectiveness of those measures.

2.4.3 Protection of the Sea (Prevention of Pollution From Ships) Act 1983

This Act translates into Australian legislation the active provisions of MARPOL 73/78. As per the Annexes of the parent convention, the Act addresses oil, noxious liquid substances, packaged harmful substances, sewage and garbage.

As per MARPOL 73/78, this Act extends the exemption in law from compliance with waste discharge controls by warships and naval auxiliaries. Nevertheless, it reinforces the intent of the convention that such ships shall comply with waste discharge regulations as practicable.

2.4.4 Environment Protection (Sea Dumping) Act 1981

This Act is the vehicle for the promulgation of the London Convention in Australian law. An important departure from the parent convention and its 1996 Protocol is that the Act does not extend the broad exemption for military ships and aircraft to the ADF. However, the Act does provide an exemption for ADF vessels and aircraft being used in a situation of armed conflict or emergency situations. The Act also does not apply to foreign naval, military or air forces.

Any proposal to dump material at sea, which may include using a ship hulk as an exercise target or as a recreational dive site, requires application to DEH for a Sea Dumping Permit.

2.4.5 Quarantine Act 1908

This Act provides for the protection of Australia’s public health, biodiversity and agricultural resources by placing controls on the movement of potentially harmful organisms and materials into Australia. Ships and aircraft of the ADF and material carried within them are subject to the Act. Vehicles, equipment and stores arriving from overseas and landed in Australia by ship or aircraft during amphibious activities are also subject to quarantine requirements.

This Act forms the legislative basis for the Australian Quarantine and Inspection Service (AQIS) Ballast Water Regulations. In time, the Quarantine Act 1908 may be used as an instrument to control the risk of introductions of exotic marine organisms via hull fouling.

2.4.6 Historic Shipwrecks Act 1976

This Act provides for the protection of certain shipwrecks and relics of historic significance. Under this Act, the Minister may declare a protected or no-entry zone around specific wrecks. These zones may be declared where circumstances place it at particular risk of interference. This declaration prohibits all entry into this zone in the absence of a permit. Permits are also required to undertake any activities otherwise prohibited or restricted by the Act. The protected area also includes the airspace above the zone.
In addition to specifically identified ‘historic’ shipwrecks, blanket protection is also afforded to all shipwrecks and associated relics in Australian waters which have been sunk for 75 or more years.

The regulations under the Act may make provision to restrict the use within a protected zone of any equipment, explosives, instruments or tools, or ships carrying any such equipment to remain within a protected zone.


### 2.5 GREAT BARRIER REEF MARINE PARK AUTHORITY POLICIES AND GUIDELINES

GBRMPA has developed several policies to regulate activities conducted in the Marine Park. They include:

- Policy on Bareboat Operations in the Great Barrier Reef Marine Park;
- Cruise Ship Policy;
- Policy on Managing Tourism Permissions to Operate in the Great Barrier Reef Marine Park (including Allocation, Latency and Tenure);
- Policy on Moorings in the Great Barrier Reef Marine Park; and

Several draft policies are under consideration, including:

- Dredging and Spoil Disposal;
- Environmental Impact Management; and
- Structures.

#### 2.5.1 Whale and Dolphin Conservation Policy for the Great Barrier Reef Marine Park

The policy most relevant to Defence activities is the *Whale and Dolphin Conservation Policy for the Great Barrier Reef Marine Park*. It was released in 2000 by GBRMPA and involved extensive consultation with Commonwealth agencies. The intent of the policy is to provide guidance for actions within the Marine Park and complements a number of existing cetacean management instruments. The policy plays a central role in providing a precautionary approach to cetacean conservation in the marine park. The key objective of the policy is:

“...to provide for a basis for managing human activities that will, or are likely to, affect the whale and dolphin populations in the Great Barrier Reef Marine Park so as to ensure their conservation and, where necessary, their recovery” (GBRMPA 2004).

The policy provides direction for the implementation of the following key aspects for cetacean conservation in the GBRMP:

- improving information about whales and dolphins in the Marine Park;
- development of educational programs and policies;
- codes of practice;
- management of aircraft and vessels in the marine park;
• management of whale watching and swimming-with-whales activities;
• management of other human activities;
• protection of key whale and dolphin habitats; and
• priority species, populations and individual animals.

Also identified in the policy are the primary activities that may result in impacts upon whales and dolphins, including Defence activities conducted in the designated exercise areas within the GBRMP. The policy observes that ship movements, explosions, low-altitude flight, supersonic flight and sonar propagation are potential threats of disturbance to cetaceans in the GBRMP. In relation to Marine Park zoning plans, the policy notes that:

“Defence operations may be undertaken in the marine park after notification to the Authority or its delegate and subject to any directions the Authority or its delegate may impose as are reasonably necessary for the conservation, protection and preservation of the Marine Park.” (GBRMPA, 2004).

2.5.2 Zoning and Plans of Management

The whole of the GBRMP offers different degrees of protection for different habitats within its boundaries. This spectrum of protection ranges from general use areas, which allow commercial and recreational activities that include fishing, collecting and trawling, to no-take areas that allow access but prohibit all extractive activities, to preservation areas that prohibit all forms of access. Furthermore, several management tools (e.g. zoning, education, permits, management plans) are being used to help achieve ecological and other management objectives.

The Plans of Management are designed to ensure that:

• appropriate proposals are developed to reduce or eliminate threats to conservation, cultural, heritage or scientific values;
• species and ecological communities are managed to enable their recovery and continued protection and conservation;
• activities conducted in the GBRMP are conducted in an environmentally sustainable manner;
• management objectives of particular areas within the Marine Park do not conflict;
• community groups are involved in the management of the Marine Park; and
• people may use the Marine Park for recreational purposes.

The primary objective of GBRMP Zoning Plans is to designate what type of activities can be undertaken in a given area over specified timeframes. The zoning separates incompatible activities such as commercial fishing and tourism activities and allows certain zones to be permanently protected from threatening processes for various periods of time. The Marine Park Zoning also dictates whether a type of activity can be undertaken in a zone, subject to conditions that determine a ‘right of use’, such that activities can be undertaken as-of-right, with permission or prohibited.

2.6 DEPARTMENT OF DEFENCE POLICIES AND INSTRUCTIONS

The Australia Defence Organisation and individual groups within the Defence Organisation have promulgated a range of policies which provide a framework for the environmental management of Defence activities. Policies and instructions may be promulgated in a variety
of forms, with each carrying differing levels of authority and applicability. Promulgation vehicles include:

- Defence Instructions (DI), which may be ‘General’ (DI[G]), ‘Navy’ (DI[N]), ‘Army’ (DI[A]) or ‘Air Force’ (DI[AF]).
- Defence Environmental Instructions (DEI)
- Australian Defence Doctrine Publications (ADDP)
- Australian Books of Reference (ABR)

Some of these policies and instructions have an overt focus on environmental management, while others the environmental management aspects are of a more incidental nature. The synopses which follow are not intended to exhaustively or definitively review all Defence publications of relevance to environmental management and/or the GBR region, but to provide an overview of those considered most pertinent.

DI(G)s are lawful general orders for ADF members under the *Defence Force Discipline Act 1982*, and lawful and reasonable directions on members of the Australian Public Service (APS) under the *Public Service Act 1999* and APS Code of Conduct.

### 2.6.1 Defence Environment Policy

The Department of Defence has promulgated policy setting out its vision of being a leader in environmental stewardship and the mechanism by which the Defence Organisation intends to achieve and maintain that objective. This policy is presented in Section 1 of this report.

### 2.6.2 Departmental Environment Instructions

Defence has promulgated a series of Departmental Environment Instructions (DEI) aimed at ensuring compliance with the EPBC Act. Specific DEIs of relevance to the EMP are:

- DEI No. 1/2002: *Defence Environmental Policy and Management System*
- DEI No. 2/2002: *Killing, Injuring or Taking Listed Threatened Species and Ecological Communities in a Commonwealth Area*
- DEI No. 3/2002: *Killing, Injuring or Taking Listed Migratory Species in a Commonwealth Area*
- DEI No. 4/2002: *Killing, Injuring or Taking Listed Marine Species in a Commonwealth Area*
- DEI No. 5/2002: *Management of Defence Infrastructure that is in a Listed World Heritage Property*
- DEI No. 6/2002: *Management of Defence Infrastructure that Contains a Wetland of International Importance*
- DEI No. 8/2002: *Reporting of Environmental Incidents Within Defence*
- DEI No. 9/2002: *Interfering With Whales or Other Cetaceans*
- DEI No. 10/2002: *Management of Threatening Processes Affecting Endangered and Vulnerable Species and Ecological Communities on Defence Land*
- DEI No. 11/2002: *Assessment of a Defence Action that Requires the Approval of the Environment Minister*
- DEI No. 12/2002: *Defence Use of Commonwealth Reserves*
- DEI No. 13/2002: *Annual Reporting of Environmental Matters*
- DEI No. 14/2002: *Approval of a Defence Action by the Environment Minister*
2. **Legislative and Policy Framework**

- **DEI No. 15/2002**: Recovery of a Listed Threatened Species or a Listed Threatened Ecological Community on Defence Land
- **DEI No. 16/2002**: Referral of a Defence Action that Has, Will Have or is Likely to Have a Significant Impact on the Environment (superseded by DI[G] ADMIN 40-3)
- **DEI No. 17/2002**: Annual Reporting on the Implementation of National Environmental Protection Measures

DEI 16/2002 provides guidance on criteria which may trigger the need for EPBC Act referral for a proposed activity.

With the exception of DEI No. 1/2002, all of the other DEIs listed translate EPBC Act requirements into policy and instructions for the Australian Defence Organisation.

### 2.6.3 Environmental Assessment within the Defence Organisation

To ensure that the ADO meets its statutory environmental assessment obligations as set by the EPBC Act, Defence makes an internal assessment to determine if a proposed activity needs to be formally referred to DEH and/or GBRMPA. The purpose of the internal assessment is to determine if the proposed activities may have a ‘significant’ environmental impact, and if so, that the matter be subject to a formal referral. Guidance on these procedures is contained in DEI No. 16/2002.

Those that are not referred are still subject to appropriate controls as specified in an internal Environmental Clearance Certificate (ECC). Guidance on these procedures is contained in DI(G) ADMIN 40-3.

The internal screening of proposed Defence activities follows well-established procedures arising from the Commonwealth **Environment Protection (Impact of Proposals) Act 1974** (EPIP Act) (since replaced by the EPBC Act) and the **Australian Heritage Commission Act 1975**. In response to the EPIP Act, a Memorandum of Understanding (MoU) was developed between the Minister for Defence and the Minister for the Environment that obviated the need to refer all Defence proposals to the Commonwealth Department of the Environment. This MoU enabled the decision as to whether a Defence proposal or activity was likely to affect the environment to a significant extent to be taken by the Minister for Defence or his/her delegate. No parallel internal assessment regime can be established under the auspices of the EPBC Act, however the internal initial assessment stages of any proposed activity emulate key elements of the new regime, and thus continue a well established procedure for Defence to consider the impact of its activities on the environment.

### 2.6.4 Defence Instructions

A number of Defence Instructions (DIs) promulgate policy and instructions applicable to environmental management in the GBRWHA. Those considered most germane are listed below, followed by a summary of key points of the most relevant DIs.

- **DI(Navy [N]) ADMIN 19-1**: Quarantine Instructions
- **DI(General [G]) ADMIN 40-3**: Assessment and Approval of Defence Actions Under the Environment Protection and Biodiversity Conservation Act 1999
- **DI(G) ADMIN 46-1**: Quarantine
- **DI(G) ADMIN 59-1**: Management of Defence Training Areas
\begin{itemize}
  \item DI(G) LOG 07-8: Management of Hazardous Substances Except Dangerous Goods in Class 1 (Explosives) and Class 7 (Radioactive Materials)
  \item DI(G) LOG 10-1: Dumping of Surplus and Obsolete Stores and Material at Sea
  \item DI(G) LOG 10-2: Management of Land Affected by Unexploded Ordnance
  \item DI(N) LOG 21-4: Policy for the Reporting and Management of Oil Spills
  \item DI(N) LOG 72-6: Royal Australian Navy Laser Safety
  \item DI(N) OPS 19-1: Policy for the Disposal of Shipborne Waste
  \item DI(AF) OPS 3-2: Low Flying
  \item DI(AF) OPS 3-7: Aircraft Noise Nuisance
  \item DI(N) PERS 19-3: Occupational Health and Safety Radio-Frequency Hazards (RADHAZ)
\end{itemize}

DI(G) ADMIN 40-3 describes the processes for consideration of the potential environmental and heritage impacts of Defence activities, and policy for the assessment and approval of such actions. The DI(G) categorises Defence actions into one of four broad categories, based upon their potential for environmental impact and any consequent required action.

DI(G) ADMIN 59-1 describes responsibilities for planning and management procedures required for Defence Training Areas (TA) and ranges. This includes guidelines for the conduct of environmental impact assessment and post-activity clearance of training activities. The DI also delineates management responsibilities for individual training areas.

DI(G) LOG 10-1 outlines Defence policy in relation to the Environment Protection (Sea Dumping) Act 1981 and policy measures for ADF compliance. The instruction also covers procedures required for the application of a permit for sea dumping and lists prohibited materials and materials requiring special handling procedures.

DI(G) LOG 10-2 specifies responsibilities within the Services and the Department for the management of land and offshore areas affected by unexploded ordnance (UXO), in the context of the Commonwealth’s national policy. The Instruction requires the recording of the location and details of any UXO resulting from Defence weapons practices, and the responsibility of Defence to render safe any UXO of military origin which poses a public risk.

DI(N) LOG 21-4 outlines policies and procedures for the prevention of oil spills, and the response and reporting procedures to be followed in the event of a spill. It directs all Fleet units to have an oil spill emergency plan, and requires RAN tankers to have an oil pollution emergency plan consistent with the requirements of MARPOL 73/78 Annex I.

DI(N) LOG 72-6 Expands upon ADF laser safety requirements promulgated in ADFP 410 Defence Laser Safety. This DI focuses upon personnel and equipment safety in and around the laser mounting, and in the path of the beam.

DI(N) OPS 19-1 conveys the requirements of MARPOL 73/78 and the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 into policy and instructions for Australian warships and Naval auxiliaries. In some instances the policy directives contained within DI(N) OPS 19-1 exceed the requirements of MARPOL 73/78 and the Protection of the Sea (Prevention of Pollution From Ships) Act 1983.

DI(AF) OPS 3-2 Places a general prohibition on flying below 250 ft by daytime over water, although aircraft fitted with a functioning ground proximity device (e.g. radar altimeter) may be authorised to fly at a minimum height of 100 ft. The DI directs aircrew to avoid low flying over ‘known sensitive areas’.
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DI(AF) OPS 3-7 directs aircraft captains and controllers to undertake aircraft operations in such manner that unnecessary aircraft noise nuisance to the public is avoided, to the extent that the efficiency and effectiveness of operations are not prejudiced. Where some noise disturbance is unavoidable, then suitable vertical and horizontal separations should be maintained, or activities timed to reduce the extent of the nuisance.

To varying extents, a number of these DIs are obsolescent, as they have not been updated to reflect the requirements of new or amended legislation, new management techniques or Defence compliance philosophies.

A number of other DIs have some relevance to environmental management in a peripheral sense, such as those related to management of the electro-magnetic spectrum, ozone depleting substances and hazardous materials, and the conduct of activities such as air combat training.

2.6.5 Other Instructions, Guidelines and Directives

**ABR 6111 RAN Environmental Policy Manual**

This is a two volume reference which identifies environmental aspects of RAN activities at sea and ashore, and sets a policy framework of objectives and commitments to reduce potential adverse impacts. These are contained in Volume 1, the Navy Environment Plan. Volume 2 summarises Commonwealth, State and Territory environmental legislation.

Sections of ABR 6111 Vol. 1, of particular relevance to this EP, address the potential environmental effects, and related RAN management commitments, of and upon:

- activities in marine areas, with specific reference to habitat modification and effects upon marine mammals, seabirds and benthic communities;
- commercial and recreational fisheries;
- electromagnetic radiation and sonar; and
- spills of oil and Otto Fuel II.

This reference has not been updated since original promulgation in 1994, so does not reflect EPBC Act requirements nor advances in environmental management knowledge and techniques which have occurred in the intervening period.

**MARORDS (Maritime Command Orders)**

MARORDS is the short title for AFTP1: *Maritime Command Orders*. MARORDS are the standing orders of the Maritime Component Commander to all Fleet units and subsidiary commands under his authority. Chapter 30 of MARORDS deals specifically with protection of the marine environment.

Chapter 30 details the over-riding policies and instructions dealing with environmental compliance by Fleet units (e.g. ABR 6111 and DI[N] OPS 19-1) and provides expanded guidance where warranted. This guidance includes, for example, specific directions for ships to take when anchored in company to minimise the risk of discharges such as sewage presenting an environmental hazard.

MARORDS delegates responsibility for the management and coordination of ship’s environmental compliance requirements to the Executive Officer as the ship’s Environmental Coordinating Officer. The responsibilities of this position include:
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- ensuring implementation of the ship’s Environmental Plan.
- liaising with government, local authorities and the community in relation to the ship’s environmental affairs;
- establishing effective training programs for ship’s staff in relation to environmental matters;
- dissemination of information to maintain environmental awareness;
- maintaining the environmental information and records system for the ship;
- initiating regular audits to ensure the ship’s waste management procedures are effective; and
- contingency planning for, and management of, environmental incidents.

The instructions establish a framework for annual audit of ships’ environmental management processes and performance. Ships are directed to contact the Fleet Environmental and Occupational Health and Safety Co-ordinating Officer, Directorate of Environmental Stewardship (DES) or local Defence environmental officers for advice as required to ensure compliance with extant environmental regulations.

**Australian Defence Force Maritime Activities Environmental Management Plan**

The EMP promulgates exercise planning measures and unit-level guidelines and mitigation procedures to be adopted by ADF ships and aircraft, plus contracted service providers, when conducting activities at sea. The EMP addresses the full range of Defence activities at sea and in coastal areas, including the use of ASW sonar, high explosives, gunnery and missile shoots, aircraft operations and cetacean collision avoidance measures. The procedures promulgated in the EMP have application in all sea areas.

**Generic Environmental Management Plan for Royal Australian Navy Ships**

The RAN Ship EMP (Defence Publishing Service, 1999) is intended as a framework within which individual ships or classes will develop platform specific environmental management and compliance procedures. The Generic EMP establishes a management and accountability framework to facilitate achievement of these outcomes.

Ship discharges and emissions and management of potentially polluting material are the focus of the Generic EMP; in its current state ship operations are not addressed. The Generic EMP pre-dates the EPBC Act and so does not recognise the requirements of this item of legislation.

The Generic Ship EMP is being updated, broadened and ‘typed’ to apply it to individual ship classes. In its new form the EMP for ships will be integrated with the ADF Maritime Activities EMP.

**Royal Australian Air Force Aircraft Operations Environmental Management Plan**

The EMP will complement the aviation management measures contained in the ADF Maritime Activities EMP by extending the environmental risk recognition and mitigation procedures to cover all RAAF aviation activities, whether over the sea or land. The RAAF Aircraft Operations EMP is expected to be promulgated by 2006.

**The Air Force Environmental Management Handbook**

The Air Force Environmental Management Handbook identifies potential environmental effects arising from the operation of RAAF bases and aircraft. The Handbook states RAAF
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policy and the environmental management responsibilities of base commanders and other command and management personnel.

The Handbook was released in 1996, and so pre-dates the EPBC Act. Consequently, implicit and explicit EPBC Act requirements are not addressed.

Miscellaneous Exercise and Doctrinal Instructions

A number of exercise planning guides and tactical documents place controls on actions such as the ditching of garbage and bilge water during activities such as Anti Submarine Warfare exercise, submarine search and rescue, helicopter operations, launch and recovery of boats, torpedo firings, diving and swimming operations. These restrictions are intended as safety measures or as tactical doctrine in order to improve combat effectiveness, rather than for environment protection.

2.7 PRINCIPAL QUEENSLAND LEGISLATION

Items of Queensland State legislation are reviewed. This review is limited to those statutes focused upon or otherwise relevant to environmental protection of the Queensland coast, the prevention of marine pollution and the protection and conservation of marine biodiversity and heritage.

It should be noted that Queensland jurisdiction only applies to the extent of its territorial waters, generally only 3 nm from the national baseline (although Commonwealth waters may exist by exception within the 3 nm limit). Australian States provide for the application of State laws within their territorial waters via individual Coastal and Other Waters (Application of State Laws) Acts, arising from the OCS. Reference to Queensland State waters also includes the seabed and subsoil beneath, and the airspace above those waters. Most of the GBRWHA, and the bulk of Defence activities conducted within it, lies in waters beyond State jurisdiction, but even within this zone, ADF ships, aircraft and activities are primarily controlled by Commonwealth legislation.

A listing of State legislation considered germane to marine environment protection is presented in Table 2.2.

As a general rule (though not exclusively true in every circumstance) the environmental obligations of the GBRMP Act and the EPBC Act will override obligations that may arise under State/Territory law, although every activity needs to be considered on a case-by-case basis. It should further be noted that some of the State legislation specifically exempts the Commonwealth, or more particularly, Defence vessels and aircraft (both Australian and foreign). Inclusion of this legislation in this review is primarily intended to indicate the level of marine environment protection legislated by Queensland as a benchmark against which to gauge Defence environmental performance.
### Table 2.2 Queensland Legislation Relevant to Protection of the Marine Environment

<table>
<thead>
<tr>
<th>Environment and Coastal Protection</th>
<th>Marine Protection / Marine Pollution</th>
<th>Living Marine Resources Conservation</th>
<th>Nature Conservation</th>
<th>Historic Shipwrecks</th>
</tr>
</thead>
</table>

**Environmental Protection Act 1994**

The object of this Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (i.e. ecologically sustainable development).

Protection of the environment is to be achieved by an integrated management program that is consistent with ecologically sustainable development. The Act is supported through a number of regulations and policies specifically addressing air, water, noise and waste management.

**Queensland Heritage Act 1992**

The Queensland Heritage Act provides for the conservation of Queensland's cultural heritage, including the protection and conservation of submerged relics and other objects of significance to Queensland's cultural heritage.

If the Governor in Council is of the opinion that remains of a ship, or some other object, situated in, or recovered from, territorial waters of the State is of cultural heritage significance, the Governor in Council may declare the remains or other object to be a protected relic. In doing so, the Governor may declare an area of Queensland's territorial waters in which a protected relic is situated to be a restricted zone. The declaration may:

- restrict access to a restricted zone; or
- restrict or prohibit specified activities within a restricted zone.

A person must not, without reasonable excuse, contravene a restriction or prohibition imposed under a restricted zone. The following actions are offences under the Act, unless done with the Minister’s consent or with reasonable excuse:

- knowingly damaging or destroying a protected relic;
- knowingly interfering with a protected relic;
- disposing of a protected relic; or
- removing a protected relic from waters in which, or land on which, it is situated.

The Act requires the reporting of any discovery of relics in Queensland’s territorial waters that may be of cultural heritage significance.
**Transport Operations (Marine Pollution) Act 1995**

This Act was established to protect Queensland's marine and coastal environment by minimising deliberate and negligent discharges of ship-sourced pollutants into coastal waters. This purpose is to be achieved primarily by giving effect to relevant provisions of Annexes I, II, III, IV and V of MARPOL 73/78.

The purpose is also to be achieved by:

- providing an approach to protecting Queensland's marine and coastal environment from ship-sourced pollutants complementary to the approach of the Commonwealth and the other States;
- making provision about the discharge of sewage from ships;
- giving power to deal with shipping casualties that are polluting, or threatening to pollute, coastal waters;
- enhancing, through education processes, industry and community awareness of the effects of ship-sourced pollutants on Queensland's marine and coastal environment; and
- providing for the imposition of severe penalties on persons who pollute Queensland's marine and coastal environment in contravention of this Act.

Under this Act, if:

- oil;
- a noxious liquid substance;
- a harmful substance carried as cargo in packaged form;
- garbage; or
- a pollutant discharged during a transfer operation;

is discharged from a ship into coastal waters, then the ship's owner, ship's master and any other member of the ship's crew whose act caused or contributed to the discharge (unless the member was complying with an instruction from the master or of someone authorised by the master to give the instruction), each commit an offence.

If any oil residues (that cannot be discharged from a ship without contravening section 26(1)) are not retained on board the ship while the ship is in coastal waters, the ship's master and owner each commit an offence.

If a ship with a gross tonnage of at least 400 tons or designed to sleep at least 15 persons does not have onboard a shipboard waste management plan, the ship's owner and master each commit an offence. Further, if the ship is not fitted with any equipment that may be required to implement the plan, the ship's owner and master each commit an offence.

**Nature Conservation Act 1992**

This Act is based on principles to conserve biological diversity, ecologically sustainable use of wildlife, ecologically sustainable development and international criteria for establishing and managing protected areas.

The Act's object is the conservation of nature. This is to be achieved by an integrated and comprehensive conservation strategy for the whole of Queensland involving matters including:
• gathering, researching and disseminating information on nature, identifying critical habitats and areas of major interest, and encouraging the conservation of nature by education and co-operative involvement of the community;

• dedication and declaration of areas representative of the biological diversity, natural features and wilderness of Queensland as protected areas;

• managing protected areas;

• protecting native wildlife and its habitat;

• ecologically sustainable use of protected wildlife and areas;

• recognition of the interest of Aborigines and Torres Strait Islanders in nature and their co-operative involvement in its conservation; and

• co-operative involvement of landholders.

The Act provides for:

• 11 classes of protected areas ranging from national parks (scientific), World Heritage management and international agreement areas to national parks (Aboriginal land) and nature refuges and co-ordinated conservation areas involving private property;

• six classes of wildlife — presumed extinct, endangered, vulnerable (collectively known as threatened wildlife), rare, common (these classes are collectively prescribed as protected wildlife), international and prohibited wildlife (these classes relating to non-native species);

• the rights of Aborigines and Torres Strait Island people to hunt and gather protected wildlife for traditional purposes;

• conservation plans that can allow for the ecologically sustainable taking and use of protected wildlife from the wild for commercial or non-commercial purposes;

• development of codes of practice describing standards and procedures that a person must comply with if taking, keeping and using specific species of protected wildlife;

• controls on the commercial and non-commercial taking, keeping and use of protected wildlife by regulation, prescribing some species of protected animals and plants as commonly kept, recreational, commercial or restricted wildlife;

• under the Act, a person, other than an authorised person, must not take, use or keep a protected animal. This is unless the take was under a conservation plan applicable to the animal, or a licence, permit or other authority issued or given under a regulation, or an exemption under a regulation.

The Nature Conservation (Whales and Dolphins) Conservation Plan 1997 provides further legal protection for whales and dolphins in Queensland waters and is administered with the Management program for the conservation and management of whales and dolphins in Queensland 1997–2001. It states the management intent for whales and dolphins, protects them from interference by people or equipment, provides for measures to protect an animal that is sick, injured or at risk of harassment, and sets conditions for whale watching. Other parts of the Plan set procedures in the event of accidental taking or stranding and extra protection for those declared special interest whales or dolphins.

Marine Parks Act 1982

The Marine Parks Act 1982 provides for the setting apart of tidal lands and tidal waters as marine parks. The object of a marine park is to protect and conserve special areas while allowing for the planned use of marine resources.

Marine parks protect a range of habitats including mangrove wetlands, seagrass beds, mudflats, sandbanks, beaches, rocky outcrops and fringing reefs. Marine park boundaries can be established in waters up to the highest astronomical tide. They include the tidal water and...
land, subsoil and airspace above the boundaries. The plants and animals within the boundary
are also part of the marine park.

Australia's first marine park was established in 1937 at Green Island off the Queensland coast.
In 1974, the second was declared over Heron and Wistari Reefs. The largest and best-known
marine park is the Great Barrier Reef Marine Park - a Commonwealth marine park jointly
managed by the Great Barrier Reef Marine Park Authority and the Queensland Parks and
Wildlife Service. Queensland state marine parks include:

- Cairns Marine Park
- Trinity Inlet/Marlin Coast Marine Park
- Townsville Whitsunday Marine Park
- Mackay/Capricorn Marine Park
- Woongarra Marine Park (near Bundaberg)
- Hervey Bay Marine Park
- Moreton Bay Marine Park

A number of new marine parks are proposed by the Queensland government, including the
Great Sandy Marine Park which would incorporate tidal lands and waters south of the
GBRMP to the Noosa River.

Each marine park in Queensland is divided into zones. The zoning plan for each marine park
defines the zones and describes how each zone can be used. A marine park zoning plan will
usually include the objectives for each zone and specify which activities are allowed and
which are prohibited or require a marine park permit. Designated areas allow for special
management of some locations.

Any contravention of or failure to comply with a provision of a zoning plan shall constitute an
offence against this Act.

Coastal Protection and Management Act 1995

The object of this Act is to:

- provide for the protection, conservation, rehabilitation and management of the coast,
  including its resources and biological diversity; and
- have regard to the goal, core objectives and guiding principles of the National Strategy
  for Ecologically Sustainable Development in the use of the coastal zone; and
- provide, in conjunction with other legislation, a coordinated and integrated management
  and administrative framework for the ecologically sustainable development of the coastal
  zone; and
- encourage the enhancement of knowledge of coastal resources and the effect of human
  activities on the coastal zone.

Coastal management is to be achieved by coordinated and integrated planning and decision
making, involving preparation of coastal management plans, declaration of control districts in
the coastal zone as areas requiring special development controls and management practices,
and the use of other relevant legislation wherever practicable to achieve the object of this Act.

Fisheries Act 1994

The main purpose of this Act is to provide for the use, conservation and enhancement of the
community's fisheries resources and fish habitats. Under the Act an area may be declared to
be a fish habitat area. A person must not unlawfully perform, or cause to be performed, works

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or related activity in a declared fish habitat area without a permit. It is an offence for a person to unlawfully remove, destroy or damage a marine plant, or cause a marine plant to be removed, destroyed or damaged without a permit.
3. **DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION**

3.1 **OVERVIEW**

Defence undertakes both training and operational activities within or near the GBRWHA. Operational activities include hydrographic survey and fisheries patrols. So far as maritime training and exercise activities are concerned, the marine components of the GBRWHA are mainly used by the RAN and the maritime aviation components of the RAAF, principally involving the Surveillance and Response and Air Combat Groups (SRG and ACG). The Australian Army also makes use of some of these areas, mainly for amphibious and Special Forces (SF) activities and the training of helicopter crews. The naval and maritime aviation forces of allied nations are also users of the GBRWHA.

Australia has a number of permanently Gazetted maritime exercise and range (including live-firing) areas, established at locations around the Australian continental landmass. A number of these are located within or near to the GBRWHA (see Figure 2.3), including the Shoalwater Bay Training Area (SWBTA), arguably Australia’s single most important area for the conduct of amphibious and combined arms exercises.

The ability of the naval, maritime air and amphibious components of the ADF, and allied nations, to conduct activities in the GBRWHA is critical to the maintenance of Australia’s defence posture. Use of the exercise areas is also crucial for individual ship and aircraft certifications and the conduct of trials and evaluations of doctrine, tactics, weapon and sensor systems, often under the auspices of DSTO and the DMO. Contractor support activities, such as target and recovery services, are performed by Defence Maritime Services (DMS) and aviation contractors.

DPA are Gazetted and their designation for military activities communicated to mariners, aviators and the public at large via a variety of means. These include appropriate markings on marine and air navigation charts, Notices to Airmen (NOTAMs) and Notices to Mariners (NOTMARs), augmented by specific broadcasts, Internet notices, media releases and classified advertisements in newspapers when designated activities are scheduled to occur.

Management of the DPA and ranges is vested in specific Defence agencies as the Training Area Management Authority (TAMA, as detailed in DI(G) ADMIN 59-1: *Management of Defence Training Areas*). This responsibility may be delegated as appropriate. The conduct of activities within the DPA is regulated by Service publications such as AFTP 4F. Details of where the DPAs are, what activities they are cleared for, and management delegations are provided in:

- AFTP 4F: Australian Fleet Exercise Instructions;
- DI(G) ADMIN 59-1;
- *Annual Notices to Mariners* (NOTMARs) (available through the Australian Hydrographic Service, and listed on that agency’s Website); and
- The *Designated Airspace Handbook* (issued by Airservices Australia).

3.2 **DEFENCE PRACTICE AREAS AND BASING**

Permanent Defence presence within and near the GBRWHA is in the form of bases and DPAs.
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

3.2.1 Bases

A number of Navy, Army and Air Force bases are arrayed along the eastern coast of Queensland, some within the littoral of the GBRWHA. Those within the immediate vicinity of the GBRWHA are: HMAS Cairns, in Cairns; Lavarack Barracks and the Ross Island barracks, in Townsville; and RAAF Townsville, also in Townsville.

HMAS Cairns is an RAN Fleet Base providing direct support to patrol boats, landing craft and survey ships. A total of 5 x Fremantle Class Patrol Boats (FCPBs), 6 x Landing Craft, Heavy (LCHs), 2 x Hydrographic Survey ships (HSS) and 4 x Survey Motor Launches (SMLs) are based in Cairns. These ships operate extensively within the GBR region and wider afield, undertaking a substantial proportion of their ship work-up and evaluation activities in close proximity to the base. Cairns also provides logistic support and refuelling services to visiting naval units.

The RAN also maintains a Navy Fuel Installation and a diving Tender at Thursday Island.

Lavarack Barracks is the base for the Army’s 3 Brigade. This is an infantry-centred light Rapid Reaction Force, comprising three infantry battalions with supporting artillery, armour (in the form of armoured personnel carriers), combat engineer, signals and logistic support units. This Brigade is frequently involved in amphibious exercises, and the Port of Townsville is used for the embarkation and disembarkation of the Brigade for the purposes of exercises and operational deployments, such as the July 2003 intervention in the Solomon Islands.

Ross Island barracks, Townsville is the base of the Army’s 10 Force Support Battalion (10 FSB). This is the Army’s principal water transport unit, operating LCM8s, LARCs (Lighter Amphibious Resupply Cargo) and a range of smaller support craft.

RAAF Townsville is co-located with Townsville Airport. The RAAF base is jointly used by the RAAF and Army aviation units, namely 5 Aviation Regiment. A number of DHC-4 Caribou transports are permanently based at RAAF Townsville, and the airbase is periodically used by most RAAF aircraft types when engaged in exercises or operational activities. Aircraft types typically operating from RAAF Townsville on a temporary basis include F/A-18s, P-3s and C-130s. 5 Aviation Regiment is the Army’s principal aviation unit, operating a range of rotary-wing aircraft types. Army helicopter types based at RAAF Townsville include Blackhawks, Chinooks, Kiowas and Iroquois. It may be expected that the Tiger helicopter will also operate periodically from the airbase after its introduction into service.

The RAAF Combat Survival Training School is also located in Townsville. The School trains ADF aircrew in the techniques of survival, evasion and escape, in both marine and terrestrial settings. The School operates a number of motor launches.

DSTO operates a tropical research station at the Cowley Beach, near Innisfail. This is located within the Cowley Beach Training Area (CBTA) and is the site of both marine and land test, trial and evaluation activities.

In the wider field, there are a number of Army bases clustered around Brisbane and Army Reserve depots in major regional centres along the Queensland coast. Also of relevance for Defence activities in the GBRWHA is RAAF Amberley, near Ipswich. RAAF Amberley is the base for the RAAF’s strike and reconnaissance forces, namely the F-111s, and will also be the base for the A330TT tanker aircraft to be acquired via Project AIR 5402.
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

3.2.2 Defence Practice Areas

Currently declared DPA within or adjacent to the GBRWHA are listed in Table 3.1.

Table 3.1 Declared DPA Within or Adjacent to the GBRWHA

<table>
<thead>
<tr>
<th>Sector</th>
<th>Name</th>
<th>Total Area (km²)</th>
<th>Nature of Activity</th>
<th>Vertical Limits (ft)</th>
<th>Administrative Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>R767</td>
<td>Cairns</td>
<td>864.9</td>
<td>Firing</td>
<td>SFC-NOTAM</td>
<td>Navy</td>
</tr>
<tr>
<td>R778</td>
<td>Cairns (Outer Reef)</td>
<td>739.0</td>
<td>Surface and AA firing</td>
<td>SFC-NOTAM</td>
<td>Navy</td>
</tr>
<tr>
<td>R783</td>
<td>Lizard Island</td>
<td>261.5</td>
<td>Surface and AA firing</td>
<td>SFC-NOTAM</td>
<td>Navy</td>
</tr>
<tr>
<td>R747</td>
<td>Rattlesnake Island</td>
<td>345.3</td>
<td>Weapons Range</td>
<td>SFC-6,000</td>
<td>RAAF</td>
</tr>
<tr>
<td>R748</td>
<td>Halifax Bay</td>
<td>1574.8</td>
<td>Weapons range</td>
<td>SFC-60,000</td>
<td>RAAF</td>
</tr>
<tr>
<td>R784A*</td>
<td>Cowley Beach</td>
<td>325.7</td>
<td>Surface and AA firing</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R784B*</td>
<td>Cowley Beach</td>
<td>837.7</td>
<td>Firing</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R680</td>
<td>Akens Island</td>
<td>529.2</td>
<td>Firing</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R682</td>
<td>Townshend Island</td>
<td>1128.0</td>
<td>Gunnery practice</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R683</td>
<td>Cape Clinton</td>
<td>1344.5</td>
<td>Gunnery and weapons</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R684A</td>
<td>Mount Hummock</td>
<td>1277.3</td>
<td>Firing (terrestrial)</td>
<td>SFC-2,000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R684B</td>
<td>Mount Hummock</td>
<td>1277.3</td>
<td>Firing (terrestrial)</td>
<td>2,000-NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R686</td>
<td>Triangular Island</td>
<td>137.9</td>
<td>Demolition</td>
<td>SFC-10,000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R687A</td>
<td>Raspberry Creek</td>
<td>1674.7</td>
<td>Firing (terrestrial)</td>
<td>SFC-2000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R687B</td>
<td>Raspberry Creek</td>
<td>1674.7</td>
<td>Firing</td>
<td>NOTAM</td>
<td>Navy</td>
</tr>
<tr>
<td>R689</td>
<td>Shoalwater Bay</td>
<td>5968.7</td>
<td>Weapons range</td>
<td>NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R693</td>
<td>Elliot</td>
<td>2,797</td>
<td>Firing (terrestrial)</td>
<td>SFC-2,000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R695A</td>
<td>Herbert Creek</td>
<td>323.7</td>
<td>Firing (terrestrial)</td>
<td>SFC-2,000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R695B</td>
<td>Herbert Creek</td>
<td>323.7</td>
<td>Firing (terrestrial)</td>
<td>2,000-6,000</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R695C</td>
<td>Herbert Creek</td>
<td>323.7</td>
<td>Firing (terrestrial)</td>
<td>6,000-NOTAM</td>
<td>Army/CSIG</td>
</tr>
<tr>
<td>R725</td>
<td>Saumarez Reef</td>
<td>381.7</td>
<td>Bombing</td>
<td>NOTAM</td>
<td>RAAF</td>
</tr>
<tr>
<td>R677(A&amp;B)</td>
<td>Brisbane</td>
<td>67,400</td>
<td>Military flying and laser training</td>
<td>SFC-60,000</td>
<td>RAAF</td>
</tr>
<tr>
<td>R676</td>
<td>Cape Moreton</td>
<td>432.0</td>
<td>Firing</td>
<td>NOTAM</td>
<td>Navy</td>
</tr>
</tbody>
</table>


Maritime ranges and exercise areas may be considered to fall into one of three broad categories, namely:
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

- Broad areas which can be used for a diverse array of military activities. These are predominantly sea areas but may include a terrestrial component. Examples are Brisbane and Halifax Bay.
- Terrestrial ranges with a sea component, such as CBTA and SWBTA.
- Small Defence Practice Areas, predominantly over sea areas, used for limited, possibly specialist training. Examples include Lizard Island, Cairns, Elliott and Saumarez Reef.

It is noteworthy that the declared purpose of use of DPA (as promulgated in the Annual Notices to Mariners) does not reflect the full range of activities undertaken within a given declared area. For example, there are no areas declared specifically for anti-submarine warfare training or helicopter operations. Most Defence activities in the DPA do not have any associated declaration of use in the notices. This is because the declaration and notification process reflects the underlying rationale of the protection of public safety, particularly for aviation. Accordingly, the process of promulgation and public information is centred upon notification and control of those activities with the greatest potential to present a hazard to other users of the concerned maritime area and the airspace above it. Thus, many activities are conducted within DPA without any public notification where it is deemed these pose a minimal risk to public safety.

3.3 HISTORY OF USE

Naval forces have been conducting military training activities in the Australian maritime areas since the arrival of the First Fleet in 1788, and air forces have been operating over marine areas since at least the establishment of the RAAF in 1921.

Before the inception of the RAN in 1911, naval defence of the Australian colonies was mainly provided by ships of the Royal Navy (RN) deployed to the Australia Station. In 1859, the RN established the Australia Squadron, a flotilla of men-o-war permanently based in Sydney. During the mid to late 19th Century, small colonial navies were formed by the colonies of New South Wales, Victoria, Queensland and South Australia to enhance naval defences, especially for those colonies some distance from the Sydney base. In 1891 seven ships of the newly-formed Australian Auxiliary Squadron, intended to augment the RN presence, arrived in Sydney.

Following Federation, the individual colonial forces combined to form the Commonwealth Naval Forces. The first RAN Fleet arrived in Sydney on 1913. From that time onward, naval defence of Australia became a national responsibility, with the RN ships on the Australia Station transferring to New Zealand. RN warships and auxiliaries continued as frequent visitors to Australia, and many operated from Australian ports during the Second World War. Substantial Australian and US forces operated from bases and in training areas within the GBR region during the Second World War, particularly Townsville, and Brisbane was the site of a wartime US Navy base.

The intensity and diversity of exercise, training and trials activities has changed as a result of global strategic circumstances, evolution of the size, composition and basing of the RAN, Army and RAAF, changes in tactical and strategic doctrine, and advances in technology. Nevertheless, there has been a thread of Defence activities in the GBR region for many decades. The SWBTA is a particular focus of these activities, playing host to most of Australia’s major amphibious exercises and other major naval exercises since the early 1980s, and the importance of both SWBTA and CBTA have been reinforced with Australia’s new emphasis upon amphibious warfare.
Before the official promulgation and Gazettal of maritime exercise areas it may be assumed that management and control arrangements for naval exercises were less formal, although activities were most likely concentrated in areas within easy reach of major bases. The first Australian exercise areas were declared in the first ever Australian *Notices to Mariners*, published on 1 January 1933. Areas notified as firing areas were Port Phillip, Port Jackson, Port Hobart, Jervis Bay and Hervey Bay. The 1936 NOTMARs gave further warning advice to seafarers of naval practice areas.

A NOTMAR dated 13 October 1944 may be considered as the first promulgation of MXA in Australia and New Guinea in a form resembling those which currently exist. Areas within the GBR region, or nearby, notified to mariners variously as gunnery, artillery, air bombing, air gunnery and ‘other’ practice areas were Moreton Bay, Burnett River, Cleveland Bay and Cairns.

Although some areas promulgated in the 1944 notice are no longer MXA, and new areas have been added and existing ones modified in the intervening period, a clear linkage exists with declared maritime Defence Practice Areas from 1944 to the present day, and in some cases as far back as 1933. The declaration of these areas formalised the use of maritime areas for Defence exercise activities, a practice which had been ongoing for many decades previously. Thus, it can be seen that current Defence activities within GBR DPA represents continuation of ongoing, well established use of these areas.

3.4 MANAGEMENT AND CONTROL

3.4.1 Defence Management and Control of Activities in the GBR DPA

DI(G) ADMIN 59-1 assigns Defence training areas (TA) to one of six categories. All of the DPA within or near the GBRWHA are either Category 1 or Category 4. These categories are as follow:

**Category 1.** Predominantly land based TA, and essentially natural terrain, dedicated to the conduct of live fire and manoeuvre (land, air and sea) training. The TA may also encompass littoral approaches to the land element. Training activities may be joint (i.e. involving more than one arm of the ADF), combined (i.e. involving Australian and foreign forces) or restricted to single Service only. The TA is Commonwealth owned or leased (in perpetuity) property and is declared a DPA. The full range of live fire training activities, including the use of UXO producing ammunition, is normally permitted. Airspace restrictions are applied as required.

**Category 4.** Offshore TA dedicated to the conduct of live fire and manoeuvre (air and sea) training, including Army watercraft. The TA is declared a DPA. Notification to the public of live fire and manoeuvre training activity is made through NOTAMs and NOTMARs. UXO producing ammunition is normally permitted.

DI(G) ADMIN 59-1 delegates responsibility for the management of training areas to Training Area Management Authorities (TAMA). Responsibilities for the DPA as promulgated in the DI(G) are detailed in Table 3.3. It should be noted that some inconsistencies and omissions apply to training areas, their names and responsible administrative authorities when *Annual Notices to Mariners* and the *Designated Airspace Handbook* are compared with DI(G) ADMIN 59-1.
Table 3.3  Maritime Exercise and Range Areas Within the GBRWHA or Contiguous Areas as per DI(G) ADMIN 59-1

<table>
<thead>
<tr>
<th>Exercise Area*</th>
<th>Range Category</th>
<th>TAMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lizard Island</td>
<td>4</td>
<td>MHQ</td>
</tr>
<tr>
<td>Cairns (Inner Reef)</td>
<td>4</td>
<td>MHQ</td>
</tr>
<tr>
<td>Cairns (Outer Reef)</td>
<td>4</td>
<td>MHQ</td>
</tr>
<tr>
<td>Cowley Beach</td>
<td>1</td>
<td>CSIG</td>
</tr>
<tr>
<td>Halifax Bay/Rattlesnake Island</td>
<td>4</td>
<td>HQAC</td>
</tr>
<tr>
<td>SWBTA (incl. Townshend Island NGSR)</td>
<td>1</td>
<td>CSIG</td>
</tr>
<tr>
<td>Saumarez Reef</td>
<td>4</td>
<td>HQAC</td>
</tr>
<tr>
<td>Elliot</td>
<td>4</td>
<td>MHQ</td>
</tr>
<tr>
<td>Brisbane</td>
<td>(not listed)</td>
<td>HQAC</td>
</tr>
<tr>
<td>Cape Moreton</td>
<td>4</td>
<td>MHQ</td>
</tr>
<tr>
<td>Hervey Bay</td>
<td>4</td>
<td>MHQ</td>
</tr>
</tbody>
</table>

* As per Annual Australian Notices to Mariners 2004 and DI(G) ADMIN 59-1

3.4.2 Declaration and Gazettal Process

Defence Practice Areas are declared for the purpose of conducting Defence operations or practices. A DPA is declared under Defence Force Regulations, Part IX, and notified in the Commonwealth of Australia Gazette.

All DPA are further listed in Annual Australian Notices to Mariners, issued and maintained by the Australian Hydrographic Service, and also notified in the Designated Airspace Handbook. The Annual Notice contains details of:

- declared areas and their boundaries, by name and alphanumeric designator;
- category of the declaration, denoted by a prefix which may be: R, Restricted Area, an area where restrictions on air activities apply, and which may be extended to maritime traffic via NOTMARs; P, Prohibited Area, an area within which ships are not permitted under any circumstances; or SR, Surface Restricted Area, an area where restrictions apply to maritime traffic only (NB: only ‘R’ designated DPAs occur in the GBR region);
- methods for notification of warnings, variously via NOTAMs and NOTMARs, and the display of flags, flares and other visual markers by ships and aircraft engaged in firing activities;
- upper and lower vertical limits applying to the notice and whether the restriction is permanent (e.g. surface to 8,500 ft, surface to 60,000 ft, 8,000 ft to 16,000 ft), or promulgated for a defined height block and period via NOTAMs;
- hours and days of operation;
- types of firing practices anticipated (e.g. aircraft bombing, air-to-air gunnery, air-to-surface gunnery or rocketry, shore-to-sea firing, sea-to shore firing, guided weapons firing); and
- administrative authority (Navy, Army/CSIG or Air Force) appointed to manage Defence activities in the designated area.

The Annual Australian Notices to Mariners notes that weapon firing practices are not restricted to the declared DPA, but may take place in any area with approval from Navy Headquarters and appropriate range clearances.
3.4.3 Programming of Activities in the GBR DPA

With the exception of activities conducted on fixed infrastructure or specific ranges, such as the Townshend Island NGS range, virtually all of the Defence activities conducted within the DPA could be undertaken in any suitable sea areas and subject to appropriate range clearance. Programming activities within declared, well-documented DPA presents a number of advantages to Defence managers, planners and users and non-Defence users alike. These advantages are:

- use of permanent, well promulgated areas promotes awareness of the possibility of Defence activities within those areas to non-Defence users, and facilitates non-ambiguous notification of potentially hazardous activities;
- ease of coordination with non-Defence users and regulators, such as those engaged in civil aviation traffic management and commercial fishermen;
- the presence of DPA near ADF bases reduces transit times and fuel consumption, permitting more efficient use of resources and time;
- exercise planning and coordination is enhanced through the use of well-defined areas; and
- safety is enhanced through positive spatial control of activities and verifiable physical separation.

Thus, use of the DPA can be seen to promote safety of Defence and non-Defence maritime and aviation users, and economy of use and efficiency of effort for Defence users and planners. These outcomes are achieved while simultaneously enhancing the effectiveness of maritime training and system evaluation activities.

Maritime exercises are designed to take individual ships and aircraft in a sequential process from practice of a basic, single-element capability through to test and evaluation of ships, aircraft and crews in a complex, multiple scenario combat situation involving concurrent air, surface and sub-surface threats. Complexity and composition of end-point of the training and evaluation process varies between ship categories, such smaller units such as patrol boats need to demonstrate a narrower range of capabilities and sometimes to a less advanced degree when compared with major surface combatants.

For major exercises, exercise programmes are promulgated and coordinated via a set plan, which is in effect a script for participating units. The exercise plan contains details of the timing and scheduling of designated activities, the unit/s involved, the location of activities, air space management and other safety issues.

Routine control and scheduling of activities for less intensive activities is effected by the nominated or delegated administrative authority, with the level of effort and extent of programming a reflection of the intensity of planned use. Activities in, for example, R677A and R677B, major offshore flying training areas, are coordinated and controlled by the RAAF via a more detailed and comprehensive range management programme than are activities in less frequently used DPA such as R693 (Elliott) or R783 (Lizard Island).

No matter the intensity of use, the assigned administrative authority is responsible for ensuring appropriate notification of planned activities, observation of safety requirements and suitable scheduling to achieve deconfliction of potentially incompatible activities as and when smaller or less frequently used DPA are activated.
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

3.4.4 Range Clearance and Safety Procedures

Standard safety procedures ensure that DPA are clear before activities occur that may impinge upon the safety of other civil and military vessels and aircraft in the area. Examples of activities requiring some degree of range safety clearance are aircraft and aerial target activity, the use of lasers, missile launches and gunnery shoots. Appropriate range clearance is achieved by:

- permanent marking on charts of weapons range areas and notices regarding submarine activity;
- promulgation of permanent NOTAMs and NOTMARs;
- issuing of NOTMARs in a timely manner before specific individual programmed activities with a risk of interference are conducted. NOTAMs are also issued if aerial activity is involved;
- publication of Notices to the Public, in newspapers, as appropriate;
- range clearance procedures immediately before and during the programmed activity. Range clearances are effected by visual and radar search, augmented by aerial search if aircraft are available. If required, the planned activity is postponed until such time as the range is clear;
- ships involved in live firing activities display flags and other visual markers; at night time ships and aircraft may use bright white flares for illumination; and
- Annual Notices to Mariners contains instructions for seafarers on procedures to be followed if they inadvertently enter into a range area during a live fire activity.

Range safety traces (i.e. the footprint that requires to be cleared for that particular activity) are based upon the maximum theoretical range and altitude capabilities of guns, missiles, torpedoes, lasers and so on, plus a safety margin. For bombs and gun projectiles, the safety traces consider the possibility of ‘skip’ or ricochet over the water surface. For guided weapons, the possibility of uncontrolled, and therefore unguided, operation is also taken into account.

Although originally intended to ensure safety of air and sea navigation and the protection of human life, standard ADF range clearance procedures have been expanded to ensure that the range area is also clear of marine mammals and turtles which could be affected by the planned activities. As well as visual means, standard cetacean range clearance procedures also include maintaining a watch on sonar to detect any cetacean vocalisations.

Further details of potential hazards from military maritime activities are promulgated via the Annual Australian Notices to Mariner.

3.4.5 Current Environmental Management of DPA

The ADFMA EMP has been developed to cover Defence activities in maritime DPA, simultaneously coordinating and augmenting guidance and management effected through a number of other means. These include the policies and instructions outlined in Section 2, existing EMPs for some (largely terrestrial) training areas, and some exercise specific environmental instructions for the larger exercises which have been subject to some form of environmental assessment.

EMP have been prepared for the following DPA which include a maritime element:
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

- Cowley Beach;
- Halifax Bay; and
- Shoalwater Bay.

These EMPs address management of the maritime areas within their boundaries to varying levels of comprehensiveness. In some cases, there is virtually no assessment of the marine components or the environmental impacts and management of Defence activities within them. Others pre-date the EPBC Act, so it is likely that all relevant issues may not have been addressed or addressed sufficiently within the context of existing legislative requirements.

Furthermore, what environmental mitigation measures for maritime activities that may exist are unlikely to provide a standardised and consistent set of instructions for ADF units, notwithstanding any area specific requirements.

Environmental assessments have also been prepared for major exercises with a maritime component, such as:

- Kangaroo 1995;
- Tandem Thrust 1997;
- Crocodile 1999;
- Tandem Thrust 2001;
- Crocodile 2003; and
- Talisman Saber 2005.

These assessments have been developed into environmental instructions contained within the exercise plans.

Certain proposals for new infrastructure in the exercise areas, new weapon and sensor capabilities, and significant maritime activities have also been prepared. These include assessments under the Environment Protection (Impact of Proposals) Act 1974, the EPBC Act and the Environment Protection (Sea Dumping) Act 1981. Some of these assessments are:

- Replacement Heavyweight Torpedo;
- Replacement Lightweight Torpedo;
- various DSTO sonar trials;
- introduction into service of the Kalkara pilotless target aircraft;
- selection of training areas for mine warfare forces, including the use of mine disposal charges; and
- ex-USS Reeves HULKEX.

In addition to these examples of environmental assessments and EMPs, a number of Defence policies, instructions and Memos have varying degrees of applicability and specificity to management of the maritime areas. These have been detailed in Section 2.6.

Effective environmental management of Defence activities in the maritime areas is reinforced through ADO involvement in cooperative and integrated management efforts and dialogue with other management agencies. Examples of this include Defence involvement in the formulation of Australia’s Oceans Policy, regular dialogue with DEH, AQIS, GBRMPA, Airservices Australia, AMSA and State/Territory wildlife conservation agencies, and involvement with the development of the first Regional Marine Plan. Dialogue is also maintained with representatives of commercial fishing groups.
Responsibility for the provision of environmental planning and advice is vested with the Corporate Services and Infrastructure Group (CSIG). In terms of maritime training areas this service is delivered by Senior Environment Advisers (SEAs) and Regional Environment Officers (REOs) assigned to CSIG management regions. The RAN has responsibility for the environmental management of Fleet units, management of (most) GBR DPA and for exercise planning and coordination in (most) DPA, although the SWBTA and Cowley Beach are managed by CSIG. Similarly, the RAAF has responsibility for the environmental management and conduct of RAAF aircraft and for exercise planning and coordination in DPA for which it has administrative authority. Army retains responsibility for the environmental management and conduct of Army units and Army exercise planning, although responsibility for the management of Army training areas has been delegated to CSIG.

In normal circumstances, exercise planning and the execution of scheduled activities will take account of environmental management responsibilities via adherence to standing instructions and relevant EMPs. In certain circumstances an ECC will be required for a proposed activity which is not specifically addressed by the ADFMA EMP and/or RAN Ship EMP and that may be considered to present a limited risk of minor adverse environmental outcomes (either actual or perceived), or a more detailed assessment undertaken and possible EPBC Act referral in the case of a proposed action more likely to result in significant impact on the environment.

### 3.4.6 Training and Awareness

The ADF has initiated a program to improve general environmental awareness of personnel at all levels and with all functions within the organisation. More specific training is given to personnel as required by their specialist functions, for example, marine engineering personnel are educated in MARPOL 73/78 oil discharge regulations, Officer of the Watch (OOW) trainees on cetacean avoidance procedures.

Training in the environmental aspects of ship operations and responsibilities to mitigate potential impact is given to all Officers selected to command and administer RAN ships. This training forms a module of the CO/XO Desig. (Commanding Officer/Executive Officer Designate) course attended by all designated COs and XOs before joining their new ships.

Environmental awareness in-service is maintained via briefings and written instructions from environmental staff in the DES, Navy Headquarters and Maritime Headquarters. Analogous structures exist for RAAF and Army users of the GBRWHA.

### 3.4.7 Public Engagement

Range safety requirements dictate the promulgation of public notices to warn the public (including aviators and mariners) as required of Defence activities which may compromise public safety. The Defence public relations organisation also uses the popular media to advise the public of impending activities which may cause some disturbance, mainly via aircraft noise. This advice is usually provided via a press release, informing media of the planned activity and containing the caveat that noise (normally from high-performance aircraft operations or naval gunnery), or some other disturbance or temporary exclusion, may occur. Larger exercises may have a more comprehensive media effort, involving Press briefings and media demonstrations. As appropriate, media releases and briefings address the environmental assessment and management processes engaged in by Defence in the planning and conduct of the subject exercise.
Large or otherwise potentially environmentally significant exercises or activities will contain a community engagement component as part of the environmental assessment process. Community engagement variously takes the form of consultation with interested stakeholders, public information sessions, and invitation for public comment on environmental assessments. This often contains a targeted media element, with the location and likely extent of public interest in the activity determining the range of media outlets to be engaged. Recent examples include Exercises Tandem Thrust 2001, Crocodile 2003 and Talisman Saber 2005, each of which attracted national media interest.

At another level, Parliamentarians, members of the public and interest groups use the Commonwealth Parliamentary process to enquire about Defence environmental management of maritime activities. These queries may take the form of Ministerial correspondence, Parliamentary questions or briefings to Parliamentary committees.

Information on Defence environmental management is also available on the Defence website.

### 3.4.8 Defence Sponsored Environmental Research

In order to improve environmental knowledge and reduce the likelihood of adverse outcomes from Defence activities, Defence is actively undertaking or providing assistance to research tasks aimed at improving environmental knowledge of Australia’s maritime areas.

Some avenues by which this is being achieved are:

- Targeted research projects undertaken by DSTO.
- Hydrographic survey and oceanographic research undertaken by the Marine Science Ships and aircraft of the RAN Hydrographic Group.
- Compilation of environmental data (e.g. bathythermographic profiles, whale sightings, whale vocalisations, weather observations, etc) gathered by ADF ships and aircraft incidental to other activities.
- Tailored research and monitoring tasks, such as:
  - the ecology and distribution of Blue whales in the WAXA;
  - the effects upon Dugongs and turtles from Defence explosive training activities in Shoalwater Bay;
  - the ecology of Dugongs in Shoalwater Bay;
  - noise exposure from aircraft;
  - underwater acoustic propagation characteristics and deterministic factors;
  - the risks of RAN ships acting as vectors for exotic marine pests; and
  - the effect of biocide-based anti-fouling paints on the marine environment.
- Research attached to environmental assessment of and environmental planning for major exercises, new procedures and the employment of new weapon systems and sensors.

Some of this research is being conducted by DSTO, DMO and other Defence agencies or by contractors to Defence. Other financial and material support is provided by Defence to independent researchers and academic institutions.
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

3.4.9 Management and Control Responsibilities Exercised by Queensland and Queensland Government Agencies

Other Commonwealth and Queensland Government agencies have some role in the management of activities conducted within the GBRWHA. Relevant agencies, and their areas of responsibility, are shown in Table 3.4.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Management Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of the Environment and Heritage</td>
<td>Environmental impact assessment; World Heritage areas; Listed migratory species; Listed endangered and vulnerable species; Cetaceans; Commonwealth Waters; Historic shipwrecks; Sea dumping; Places on the National Estate and Commonwealth heritage registers; Maintenance of the Register of the National Estate Commonwealth heritage register; and Assessment of proposals for actions which may compromise the heritage value of places or items on the RNE or Commonwealth list.</td>
</tr>
<tr>
<td>National Oceans Office</td>
<td>Regional marine planning; and National oceans policy coordination.</td>
</tr>
<tr>
<td>Great Barrier Reef Marine Park Authority</td>
<td>Management of the GBRMPA, including the development and implementation of zoning and management plans.</td>
</tr>
<tr>
<td>Airservices Australia</td>
<td>Aviation traffic management services.</td>
</tr>
<tr>
<td>Department of Industry, Tourism and Resources</td>
<td>Release of petroleum exploration and production leases; and Supervision of petroleum exploration and production. NB: DITR responsibilities include environmental assessment and regulation of proponent activities.</td>
</tr>
<tr>
<td>Australian Maritime Safety Authority</td>
<td>Navigation safety; Maritime search and rescue; and Prevention of pollution from ships.</td>
</tr>
<tr>
<td>Australian Fisheries Management Authority</td>
<td>Fisheries management.</td>
</tr>
<tr>
<td>Australian Customs (incl. Coastwatch)</td>
<td>Maritime patrol and surveillance.</td>
</tr>
<tr>
<td>CSIRO</td>
<td>Scientific research.</td>
</tr>
<tr>
<td>AGSO</td>
<td>Subsea geographic and geological research and survey.</td>
</tr>
<tr>
<td>AQIS</td>
<td>Quarantine barrier control, including regulation of discharges of ballast water from overseas sources.</td>
</tr>
<tr>
<td>Queensland EPA</td>
<td>Environmental management and assessment</td>
</tr>
<tr>
<td>Queensland Parks and Wildlife</td>
<td>Management of State Marine Protected Areas and conservation management of native biota</td>
</tr>
</tbody>
</table>

Defence has established lines of communication with other Commonwealth agencies as necessary to ensure the safe and environmentally effective management of Defence maritime activities. Defence is also an active contributor to environmental management programs and other initiatives of other Commonwealth and Queensland agencies. Examples include regional marine planning, marine species protection and conservation programs, navigation safety, ship waste management, marine resource conservation and quarantine enforcement.
These contributions may be either on a bilateral or multilateral basis. Defence has established a high-level consultative forum with GBRMPA, the purpose of which is to maintain dialogue between the two agencies to ensure compatibility between Defence activities and management of the GBRMP.

3. **Defence Presence in the Great Barrier Reef Region**

3.5 **ADF Use of the GBR Region**

3.5.1 **Assets Employed Within or Near the GBRWHA**

3.5.1.1 **Royal Australian Navy**

The RAN is a balanced, medium-sized navy possessing skills and arms in essentially all maritime warfare disciplines except for fixed-wing, carrier-borne aviation. As such, the RAN requires to exercise virtually the full spectrum of maritime warfare activities including defence by surface ships against air, surface and sub-surface attack, offensive counter-surface operations, submarine warfare, amphibious warfare, surveillance and intelligence collection, patrol and interdiction, mine warfare and special operations. Development and maintenance of these capabilities involve activities in both open ocean, or ‘blue water’ areas and in coastal, littoral environments.

3.5.1.1.1 **Platforms**

Currently, the RAN has around 55 commissioned warships and auxiliaries, plus other support craft, with further ships on order. Operational control of the RAN is vested in Maritime Component Command, with the responsibility to provide properly trained and equipped maritime forces to CJOPS (Chief, Joint Operations) for operational tasking. Ships and aircraft are grouped for administrative and logistics purposes into Force Element Groups (FEGs). RAN FEGs, and the ship classes and aircraft around which they are formed are as follow:

**Surface Combatant FEG**

*Adelaide* Class Guided Missile Frigates (FFG): HMA Ships *Adelaide*, *Sydney*, *Darwin*, *Melbourne* and *Newcastle*.

*Anzac* Class Frigates (FFH): HMA Ships *Anzac*, *Arunta*, *Warramunga*, *Stuart*, *Parramatta*, *Ballarat* and *Toowoomba* (with *Perth* scheduled for delivery in 2006).

**Submarine FEG**

*Collins* class Submarine, Guided Weapons (SSG): HMA Ships *Collins*, *Farncomb*, *Waller*, *Dechanieux*, *Sheean* and *Rankin*.

**Mine Warfare and Clearance Diving FEG**

*Mine Countermeasures Vessels*

*Huon* class Mine Hunter, Coastal (MHC): HMA Ships *Huon*, *Norman*, *Diamantina*, *Gascoyne*, *Hawksebury* and *Yarra*.

Minesweeper, Auxiliary (MS[A]): MS(A)s *Wallaroo* and *Bandicoot*, although the concept of this class of auxiliary means that any suitable trawler or tug-type vessel could be fitted with minesweeping gear or towed sidescan sonar for minehunting.
This FEG also incorporates the RAN’s Clearance Diving Teams (CDTs) 1 and 4.

**Patrol Boat FEG**

*Fremantle* Class Patrol Boats (FCPB): HMA Ships *Fremantle, Bunbury, Geraldton, Gawler, Launceston, Bendigo, Geelong, Dubbo, Wollongong, Ipswich, Townsville* and *Gladstone*.

The FCPBs are being replaced by 14 *Armidale* class patrol boats under Project SEA 1444. The first 12 of these boats will be named HMA Ships *Armidale, Bathurst, Bundaberg, Albany, Pirie, Maitland, Ararat, Launceston, Larrakia, Wollongong, Childers* and *Broome*.

**Amphibious and Afloat Support FEG**

**Amphibious Ships**

Landing Platforms, Auxiliary (LPA): HMA Ships *Manoora* and *Kanimbla*.

Landing Ship, Heavy (LSH): HMAS *Tobruk*.

Landing Craft, Heavy (LCH): HMA Ships *Betano, Balikpapan, Brunei, Labuan, Tarakan* and *Wewak*.

**Afloat Support Ships**

Auxiliary Oiler, Replenishment (AOR): HMAS *Success*

Auxiliary Oiler (AO): HMAS *Westralia*.

**Hydrographic FEG**

Hydrographic Ships (HS): HMA Ships *Leeuwin* and *Melville*.

Survey Motor Launches (SML): HMA Ships *Benalla, Mermaid, Paluma* and *Shepparton*.

FFGs and FFHs are collectively referred to as Major Fleet Units (MFUs). MHCs, FCPBs, MS(A)s and similar are collectively referred to as Minor War Vessels (MWVs).

In addition to these principal warships and auxiliaries, the RAN also operates a number of support craft. These include: three 22 t, 65 ft diving tenders with a top speed of 28 kts; nine 35 ft Survey Motor Boats; four 6.5 t Landing Craft, Vehicle/Personnel (LCVPs); and the 239 t Sail Training Ship (STS) *Young Endeavour*. Small boats include Fast Insertion Craft (FICs), Rigid Hull Inflatable Boats (RHIBs) and miscellaneous work and utility boats and lighters.

RAN ships and their pertinent features are summarised in Table 3.5.

*Westralia* will be replaced in 2006 by HMAS *Sirius* a double-hulled tanker compliant with new IMO Regulations, as a component of Project SEA 1654. Additionally, HMAS *Adelaide* will decommission in 2006.
3. **Defence Presence in the Great Barrier Reef Region**

**Table 3.5 Summary of Principal Features of RAN Ship Platforms**

<table>
<thead>
<tr>
<th>Class</th>
<th>Displacement (t)</th>
<th>Max. Speed (kts)</th>
<th>Radar System/s</th>
<th>Principal Sonar System</th>
<th>Missiles</th>
<th>Guns</th>
<th>Torpedoes</th>
<th>Aircraft</th>
<th>Decoys</th>
<th>Complement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adelaide</strong> FFG</td>
<td>4,100</td>
<td>29</td>
<td>AN/SPS-49, AN/SPS-55, Mk 92 CAS and STIR</td>
<td>AN/SQS-56 (first four ships) or Mulloka (to be replaced by Spherion MFS in four ships)</td>
<td>RIM-66 Standard, RGM-84 Harpoon</td>
<td>1 x 76 mm, 20 mm CIWS, 12.7 mm MGs</td>
<td>Mk 46 SLT</td>
<td>Up to 2 x Seahawk or Squirrel</td>
<td>SRBOC with chaff and IR flares, Nulka, AN/SLQ-25 Nixie, LeScut active expendable torpedo decoys</td>
<td>200</td>
</tr>
<tr>
<td><strong>Anzac</strong> FFH*</td>
<td>3,600</td>
<td>27</td>
<td>AN/SPS-49, 9LV 453, I-band navigation</td>
<td>Spherion B, Narama Towed Array</td>
<td>RIM-7 Sea Sparrow</td>
<td>1 x 57/54, 12.7 mm MGs</td>
<td>Mk 46 SLT</td>
<td>1 x Seasprite or Seahawk</td>
<td>SRBOC with chaff and IR flares, Nulka, AN/SLQ-25 Nixie</td>
<td>165</td>
</tr>
<tr>
<td><strong>Collins</strong> SM</td>
<td>3,051 surface; 3,353 dived</td>
<td>10 surfaced, 20 dived</td>
<td>1007 (I-band)</td>
<td>Scylla, Narama or Kariwara Towed Array</td>
<td>UGM-84 Sub-Harpoon</td>
<td>nil</td>
<td>Mk 48 Mod 4</td>
<td>nil</td>
<td>Submarine decoys, SubScut active expendable torpedo decoys</td>
<td>45</td>
</tr>
<tr>
<td><strong>Huon</strong> MHC</td>
<td>720</td>
<td>14</td>
<td>1007 (I-band)</td>
<td>Type 2093</td>
<td>nil</td>
<td>30 mm</td>
<td>nil</td>
<td>nil</td>
<td>Super Barricade with chaff and IR flares</td>
<td>38</td>
</tr>
<tr>
<td><strong>MS(A)</strong></td>
<td>412</td>
<td>11</td>
<td>I-band navigation</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>10</td>
</tr>
<tr>
<td><strong>ACPB</strong></td>
<td>291</td>
<td>25</td>
<td>I-band navigation</td>
<td>nil</td>
<td>nil</td>
<td>25 mm rapid fire cannon; 12.7 mm MGs</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>29</td>
</tr>
<tr>
<td><strong>FCPB</strong></td>
<td>245</td>
<td>30</td>
<td>1006</td>
<td>nil</td>
<td>nil</td>
<td>40/60</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>24</td>
</tr>
</tbody>
</table>
### 3. Defence Presence in the Great Barrier Reef Region

<table>
<thead>
<tr>
<th>Class</th>
<th>Displacement (t)</th>
<th>Max. Speed (kts)</th>
<th>Radar System/s</th>
<th>Principal Sonar System</th>
<th>Missiles</th>
<th>Guns</th>
<th>Torpedoes</th>
<th>Aircraft</th>
<th>Decoys</th>
<th>Complement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>(I-band)</td>
<td></td>
<td>Bofors, 12.7 mm MGs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPA</td>
<td>8,450</td>
<td>20</td>
<td>2 x 1007 (I-band &amp; F/G-band)</td>
<td>nil</td>
<td>Nil, but can carry RBS-70 Army detachment</td>
<td>12.7 mm MGs, 20 mm CIWS</td>
<td>nil</td>
<td>4 x Blackhawk, 3 x Sea King or 1 x Chinook</td>
<td>SRBOC with chaff and IR flares</td>
<td>198, plus up to 450 troops</td>
</tr>
<tr>
<td>LSH</td>
<td>5,700</td>
<td>18</td>
<td>1006 (I-band)</td>
<td>nil</td>
<td>nil</td>
<td>12.7 mm MGs</td>
<td>nil</td>
<td>Up to 4 x Sea King</td>
<td>nil</td>
<td>144, plus up to 500 troops</td>
</tr>
<tr>
<td>LCH</td>
<td>503</td>
<td>10</td>
<td>I-band navigation</td>
<td>nil</td>
<td>nil</td>
<td>7.62 mm MGs</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>13</td>
</tr>
<tr>
<td>LCVP</td>
<td>6.5</td>
<td>22</td>
<td>Nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>3, and can carry up to 36 troops</td>
</tr>
<tr>
<td>AOR</td>
<td>17,900</td>
<td>20</td>
<td>1006 (I-band)</td>
<td>nil</td>
<td>Nil, but can carry RBS-70 Army detachment</td>
<td>12.7 mm MGs, 20 mm CIWS</td>
<td>nil</td>
<td>1 x Sea King or Squirrel</td>
<td>nil</td>
<td>205</td>
</tr>
<tr>
<td>AO</td>
<td>40,870</td>
<td>16</td>
<td>2 x 1007 (I-band &amp; F/G-band)</td>
<td>nil</td>
<td>Nil, but can carry RBS-70 Army detachment</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>80</td>
</tr>
<tr>
<td>HS</td>
<td>2,170</td>
<td>14</td>
<td>I-band navigation</td>
<td>CMAS 36/39, Klein 2000 Towed Sidescan</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>1 x Squirrel</td>
<td>nil</td>
<td>50</td>
</tr>
<tr>
<td>SML</td>
<td>320</td>
<td>12</td>
<td>I-band navigation</td>
<td>S113, ELAC LAZ 72</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>nil</td>
<td>15</td>
</tr>
</tbody>
</table>

* Under Project SEA 1448 the *Anzacs* are to be fitted with new fire control radars and a very short-range air defence system, based upon either missiles or guns.

(Defence 2004; Jane’s 2001a)
Naval Aviation FEG

**Combat Helicopters**
S-70-B2 Seahawk (x 16) 816 Squadron
SH-2G Seasprite (x 11) 805 Squadron

**Utility Helicopters**
SK50 Sea King (x 6) 817 Squadron
AS 350 Squirrel (x 12) 723 Squadron

Salient features of RAN helicopters are presented in Table 3.6.

<table>
<thead>
<tr>
<th>Type</th>
<th>Role</th>
<th>Speed (kts/km/h)</th>
<th>Range (nm/km)</th>
<th>Ceiling (ft/m)</th>
<th>Sensors</th>
<th>Weapons</th>
<th>C/measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seahawk</td>
<td>ASW, ASST(^1), utility</td>
<td>135/250</td>
<td>600/1,110</td>
<td>12,000/3,810</td>
<td>Surface surveillance radar, sonobuoys, FLIR(^2), MAD(^3)</td>
<td>ASW torpedoes, 2 x 7.62 mm MGs</td>
<td>Chaff &amp; IR flares</td>
</tr>
<tr>
<td>Seasprite</td>
<td>ASuW, ASW weapon carrier, utility</td>
<td>130/240</td>
<td>540/1,000</td>
<td>22,500/6,860</td>
<td>Surface surveillance radar, sonobuoys, FLIR</td>
<td>Penguin ASM, ASW torpedoes, 7.62 mm MG</td>
<td>Chaff &amp; IR flares</td>
</tr>
<tr>
<td>Sea King</td>
<td>Utility</td>
<td>125/230</td>
<td>630/1,165</td>
<td>10,500/3,200</td>
<td>Surface surveillance radar</td>
<td>ASW torpedoes, depth charges, 7.62 mm MG</td>
<td>nil</td>
</tr>
<tr>
<td>Squirrel</td>
<td>Utility, training</td>
<td>125/230</td>
<td>390/720</td>
<td>10,000/3,050</td>
<td>nil</td>
<td>2 x 7.62 mm MGs</td>
<td>nil</td>
</tr>
</tbody>
</table>

Notes:
1. ASST = Anti-Ship Surveillance and Targeting
2. FLIR = Forward Looking Infra-Red
3. MAD = Magnetic Anomaly Detector

Seahawks form the embarked flights in FFGs and are also used in Anzac class frigates as an interim measure until the Seasprite is fully introduced into service. Sea Kings are used as utility and medium-lift helicopters embarked in the LPAs and Success. Squirrels may be periodically embarked in FFGs, Success and the HS. All RAN helicopters may also operate over the sea from airfields ashore.

### 3.5.1.1.2 Basing

The RAN currently operates five Fleet Bases and one Naval Air Station (NAS). These and the units Homeported in them are summarised in Table 3.7.
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

Table 3.7  RAN Fleet Bases and NAS

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Assigned Units</th>
<th>Nearest Exercise Area/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet Base East (FBE)</td>
<td>Garden Island, Sydney, NSW</td>
<td>3 x FFG, 2 x Anzac, 2 x LPA, LSH, AOR</td>
<td>EAXA</td>
</tr>
<tr>
<td>HMAS Waterhen</td>
<td>Waverton, Sydney, NSW</td>
<td>6 x MHC, 2 x MS(A), CDT1</td>
<td>EAXA</td>
</tr>
<tr>
<td>HMAS Cairns</td>
<td>Cairns, Qld</td>
<td>2 x HS, 4 x SML, 5 x FCPB, 4 x ACPB, 4 x LCH</td>
<td>R778, R767</td>
</tr>
<tr>
<td>Darwin Naval Base (DNB)</td>
<td>Darwin, NT</td>
<td>10 x FCPB, 8 x ACPB, 2 x LCH</td>
<td>NAXA</td>
</tr>
<tr>
<td>Fleet Base West (FBW) (HMAS Stirling)</td>
<td>Garden Island, Perth, WA</td>
<td>3 x FFG, 3 x Anzac, 6 x Collins, AO, CDT4. Also site of Helicopter Support Facility for Seahawks and Seaspites.</td>
<td>WAXA</td>
</tr>
<tr>
<td>HMAS Albatross, NAS Nowra</td>
<td>Nowra, NSW</td>
<td>805, 816, 817, 723</td>
<td>EAXA</td>
</tr>
</tbody>
</table>

3.5.1.2 Royal Australian Air Force

The RAAF is a relatively small yet well-equipped air force and the most capable in the Pacific region. Capabilities maintained by the RAAF include strategic strike, reconnaissance, interdiction, interception and air superiority, maritime patrol, maritime strike, strategic and tactical airlift, aerial refuelling and maritime search and rescue. The RAAF is in the process of acquiring an Airborne Early Warning and Control (AEW&C) capability which will include a maritime surveillance element.

The combat arm of the RAAF is also formed into FEGs, which are centred upon Wings. Current force structure of the combat and combat support elements of the RAAF likely to operate in the GBRWHA are as follow:

**Air Combat Group**
81 Wing (tactical fighter), 82 Wing (precision strike and reconnaissance) and 78 Wing (operational training).

**Air Lift Group**
84 Wing (airlift, aerial refuelling, VIP transport and navigation training), 85 Wing (operational training) and 86 Wing (airlift).

**Surveillance and Response Group**
41 Wing (ground-based surveillance, control and reporting), 42 Wing (airborne surveillance and control) and 92 Wing (maritime patrol).

Aircraft types currently operated by the RAAF and which exercise over maritime areas are as follow:

**F-111**
31 x F-111 strike and 4 x RF-111 reconnaissance aircraft, in 1 and 6 Squadrons.

The F-111 is a supersonic, swing-wing aircraft optimised for long-range, low-level precision strike. It also fulfils a maritime strike role. The aircraft can carry a range of Mk 82 500 lb and Mk 84 2000 lb freefall bombs, including electro-optical and laser-guided versions (i.e. GBU-
3. **Defence Presence in the Great Barrier Reef Region**

12s and GBU-24s), BLU-109s, plus AGM-84 ASMs. For self-defence the F-111 can be fitted with 2 x AIM-9 Sidewinder AAMs. The RAAF has acquired the AGM-142 Raptor stand-off attack munition, with a range in the order of 75 km, although this has not yet been introduced into service.

**F/A-18**

71 x F/A-18 Hornet fighter-attack aircraft in 3, 75 and 77 Squadrons and 2 Operational Conversion Unit (OCU).

The F/A-18 is a supersonic air defence and strike fighter, with the capability to be employed in maritime strike and Fleet air defence. For the maritime strike role, the Hornet can be fitted with up to 4 x AGM-84 ASMs, 70 mm rockets and a number of bomb types including Mk 82, Mk 84, GBU-12 and practice systems. The Hornet may also carry AGM-88 HARM missiles to attack air defence systems, although this missile is yet to be accepted into Australian service. Air defence weapons include a 20 mm Vulcan cannon and combinations of AIM-7 Sparrow and AIM-9 Sidewinder missiles or AMRAAMs (Advanced Medium Range Air-to-Air Missile) and ASRAAMs (Advanced Short Range Air-to-Air Missile).

**P-3 Orion**

19 x P3 Orion (currently being upgraded to AP-3C versions) in 10 and 11 Squadrons (operational).

The P-3 is a long-range maritime patrol aircraft (MPA) with primary roles in ASW, Anti-Surface Warfare (ASuW) and ocean surveillance. Secondary roles include search and rescue (SAR) and minelaying. Orions use sonobuoys as the principle means to detect, localise and classify submarines, with up to 80 sonobuoys able to be carried. They are also equipped with MAD, ESM, FLIR and surface surveillance radar. Primary weapons are Mk 46 lightweight torpedoes (LWTs) (to be replaced by MU90/Impact LWTs), although the P-3 can also carry AGM-84 ASMs, Mk 82 bombs and a variety of depth bombs and mines.

**Hawk**

33 x Hawk Lead-in Fighters, in 76 and 79 Squadrons.

The Hawk is used as a lead-in fighter trainer for pilots converting to F/A-18 and F-111 fast jets. Hawks are also used in the Fleet support role, acting either as adversary aircraft to test ship air defence capabilities, or as fighters providing combat air patrol under the control of shipborne fighter controllers. RAAF Hawks are cleared to carry AIM-9 Sidewinder and ASRAAM missiles, and a range of bombs.

**C-130**

12 x C-130H and 12 x C-130J Hercules transport aircraft in 36 and 37 Squadrons, respectively.

The C-130 fulfils the roles of tactical (H model) and strategic (J model) airlift, and both are employed in the air drop of paratroop and SF personnel and equipment. Hercules also have a role in maritime SAR, which is periodically tested. For this role C-130s are equipped with Air-Sea Rescue Kits (ASRKs) and may also deliver Storpedoes.

**B707**

4 x 707 strategic transports (3 aircraft equipped as aerial tankers) in 33 Squadron.

**Caribou**

14 x DHC-4 Caribou tactical transports in 38 Squadron.
Caribou may be employed in the SAR role, and are thus capable of delivering ASRKs and Storpedoes.

**PC-9**

64 x PC-9/A trainers, assigned to Central Flying School (CFS), 2 Flying Training School (2FTS) and the Forward Air Control Development Unit (FACDU).

The PC-9 is a high-performance two-seat turboprop aircraft, with the principal role of pilot training for all RAAF and Navy pilots. Additional ADF roles include forward air control (FAC) and aerobatic display with the RAAF Roulettes.

In addition to aircraft in the current inventory, the RAAF is acquiring six Boeing 737 ‘Wedgetail’ AEW&C aircraft, through Project AIR 5077. These will be operated by 2 Squadron within the SRG and based at RAAF Williamtown with a permanent detachment at RAAF Tindal. Introduction into service is planned for early 2007.

Project AIR 5402 will acquire an enhanced aerial refuelling capacity for the RAAF. This is to be filled by five tanker aircraft based upon Airbus A330-200 airframes. Each tanker will be fitted with a centreline refuelling boom and two wing mounted hose and drogue pods. These will be based at RAAF Amberley.

RAAF basing in relative proximity to the GBRWHA is presented in Table 3.8.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Assigned Units</th>
<th>Nearby GBRWHA DPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAAF Townsville</td>
<td>Townsville, Qld</td>
<td>38 Squadron (Detachment)</td>
<td>Halifax Bay, Rattlesnake Island</td>
</tr>
<tr>
<td>RAAF Amberley</td>
<td>Ipswich, Qld</td>
<td>1, 6 and 38 Squadrons</td>
<td>R677A, R677B</td>
</tr>
<tr>
<td>RAAF Scherger</td>
<td>Weipa, Qld</td>
<td>Nil (bare base)</td>
<td>nil</td>
</tr>
<tr>
<td>RAAF Williamtown</td>
<td>Williamtown, NSW</td>
<td>3, 76 and 77 Squadrons, 2OCU, FACDU</td>
<td>n/a</td>
</tr>
</tbody>
</table>

RAAF aircraft routinely deploy away from their bases in order to undertake training and participate in exercises. For example, RAAF Townsville regularly hosts F/A-18, C-130 and P-3 aircraft during exercises in the GBR region.

In addition to aviation activities, the Air Force maintains the RAAF Combat Survival Training School at RAAF Townsville. The school operates a number of small boats to support survival training in marine and coastal scenarios.

### 3.5.1.3 Australian Army

Aviation and maritime transport elements are the main Army users of the GBRWHA in manoeuvre operations. Army watercraft most liable to operate in the GBR region are 116 t LCM8 landing craft. The Army has 15 x LCM8s on strength, most of which are assigned to 10 FSB based in Townsville. The LPAs and HMAS *Tobruk* are each capable of carrying and...
deploying 2 x LCM 8s. These landing craft operate with a crew of five and are armed with 2 x 0.50” cal. machine guns.

Army Special Forces (SF, comprising Special Air Service Regiment [SASR] and 4 [Commando] Battalion Royal Australian Regiment [4RAR(Cdo)]) periodically exercise within the GBR region. Activities undertaken include parachute drops, swimmer and diver assaults and use of small watercraft such as RHIBs, Zodiacs, COWs (Commando Operational Watercraft), assault boats and collapsible canoes known as Klepper boats. Red Viper an Army motor launch based in Sydney, periodically deploys to the GBR region in support of Army activities.

The Army also has Ship’s Army Detachments (SADs) in RAN amphibious ships, namely Kanimbla, Manoora and Tobruk. Additionally, elements of 16 Air Defence (AD) Regiment, operating RBS-70 short-range surface-to-air missiles, are routinely attached to RAN amphibious and afloat support ships to provide a point defence capability.

The Army’s 5 Aviation Regiment operates 35 S-70-A9 Blackhawk and six CH-47D Chinook helicopters from RAAF Townsville. All of these helicopters may be operated from RAN LPAs, and can also land on Tobruk. An additional squadron of up to 12 trooplift helicopters, optimised for operations from the LPAs, are to be acquired as a component of project AIR 9000.

Under Project AIR 87 the Army is acquiring 22 Eurocopter Tiger Armed Reconnaissance Helicopters (ARH), with the first aircraft due for delivery in late 2004. These will be based in Darwin, and it is expected that they will operate periodically from the LPAs. Principal Army aircraft are described below:

**S-70-A9 Blackhawk**
The Blackhawk is a multi-role battlefield transport helicopter capable of carrying 10 troops. Its airframe and powerplant are common to that of the Seahawk in RAN service. The Blackhawk may be armed with two door-mounted 7.62mm machine guns. Blackhaws are used to move troops and equipment between amphibious ships and shore, and can be embarked in the LPAs.

**CH-47D Chinook**
The Chinook is a twin-rotor medium-lift helicopter used to provide troop lift and battlefield support in moving fuel, artillery, ammunition and stores and troops. Aeromedical evacuation is another capability. The Chinook may be armed with two door-mounted 7.62mm machine guns. Chinooks are periodically used to move troops, equipment and materiel between amphibious ships and shore and can be embarked in the LPAs.

**Tiger**
The Tiger ARH is a twin engine, tandem seat helicopter. It will provide the Army with new capabilities in tactical reconnaissance and flexible, high-precision, highly mobile firepower. The helicopter will be armed with Hellfire 2 air-to-ground missiles, 70 mm free flight rockets, and a 30 mm chin mounted cannon. Tigers are intended to be capable of operation from the LPAs.

**UH-1H Iroquois**
The Iroquois (or ‘Huey’) is employed by the Army in utility and battlefield support roles. The UH-1H may be fitted with a variety of weapons to fulfil the latter role, including machine guns and rockets. All Army Iroquois are based at Townsville. Any use over maritime areas is expected to be limited.
Kiowa
Army aviation also operates a number of Bell 206B Kiowa light battlefield reconnaissance helicopters, some of which are based in Townsville. Use over maritime areas is minimal, although they do periodically land on RAN ships.

Army use of the marine areas of the GBR is less frequent than that of the Navy or RAAF, and often occurs in conjunction with either or both of the other two Services. Army aviation units periodically use islands within GBR region DPA for cabin-gunning and the wider GBR region for training requiring overwater flying.

3.5.1.4 DSTO and DMO

DSTO is responsible for scientific and technological research, development and evaluation tasks in support of the ADF. As such, DSTO is a recognised world research leader in many forms of submarine and anti-submarine warfare and works closely with the Navy and RAAF in order to test, develop, evaluate and validate new and emerging technologies.

DMO activity is centred upon evaluation of new technologies and systems that may be acquired for the ADF, and the provision and maintenance of range support infrastructure such as instrumented ranges.

Considerable research is undertaken by DSTO and DMO in marine areas, including some within the GBR region. This can involve, for instance, testing of active and passive sonar systems or biofouling control systems. Other research tasks focus upon the varying acoustic propagation characteristics of waters surrounding Australia.

3.5.1.5 Defence Support Contractors

Range and training support tasks are fulfilled for the ADO by contractors. The current major contractor for the provision of maritime support is Defence Maritime Services (DMS). Services provided by DMS include:

- target towing;
- provision of remote control surface targets;
- practice torpedo recovery and recovery of other retrievable objects (e.g. Kalkara target drones, inert mine shapes, inert missile shapes;
- range clearance and safety surveillance;
- vessels for trials support platforms; and
- vessels for submarine rescue platforms (including exercises).

DMS operates a fleet of support vessels co-located with RAN vessels at Fleet bases around Australia, including HMAS Cairns. The DMS fleet includes:

- 2 x 2,090 t Trials and Safety Vessels (ASR) with a crew of 20, and able to accommodate up to 44 additional personnel;
- a 670 t ASR with a crew of 20, and able to accommodate up to 44 additional personnel;
- 3 x 92 t Torpedo Recovery Vessels (TRV), with a crew of nine; and
- a 165 t navigation Training Ship (AXL), which operates with a crew of nine and up to 18 trainees.
Aviation support services are provided by contractors operating from RAAF bases. Aircraft used are usually small, twin-engine executive jets. Tasks usually involve providing an airborne platform for radar tracking or electronic warfare (EW) training, fighter controller training, acting as a target for air combat and intercept training, maritime strike simulation or towing a drogue target for air-to-air or surface-to-air weapons practices.

The RAAF also contracts helicopter SAR tasks to civilian operators, although no helicopter SAR contractor flight is located at RAAF Townsville. These contractors operate medium helicopters such as Super Pumas.

### 3.5.1.6 Allied Forces

Foreign naval, and to a lesser extent air, units visiting Australia regularly conduct exercise activities within the GBR region, either on an independent national basis or in company with RAN and/or RAAF units. These activities may be in the form of simple activities such as Passage Exercises (PASSEXs), NGS serials undertaken on an opportunistic basis, narrow-focus joint exercises such as those in the *Dugong*, *Lungfish* or *Pitch Black* series, or larger-scale, multi-facet joint exercises such as those in the *Crocodile*, *Tandem Thrust* and *Talisman Saber* series.

Foreign military aircraft visiting Australia generally only do so for the specific purpose of participating in combined exercises, or in the case of Singapore, to use Australia’s relatively uncluttered airspace for pilot training at the individual and unit levels.

The most frequent visitors to Australia, and parallel users of the GBR, are units of the Royal New Zealand Navy (RNZN), United States Navy (USN), and to a lesser extent, the Royal New Zealand Air Force (RNZAF). Singaporean land and air forces regularly train in the SWBTA, but this is mostly concerned with manoeuvre over land and activities in the airspace above, and so is largely outside the scope of this SEA.

Although there is a great degree of commonality between ADF equipment and tactics, in environmental management terms there are some differences, mostly subtle, between Australian and foreign forces. This strategic assessment considers use of the GBRWHA and contiguous areas by foreign forces mainly in an incidental sense, primarily because most foreign military activities are conducted as a component of and in concert with Australian military units and Australian exercises. Where there are activities or equipment unique to the visiting foreign forces, such as nuclear powered warships and hovercraft, these are specifically addressed by this SEA. There may, however, be a periodic requirement for some foreign military activities to be considered discretely. It is anticipated that for the most part this will be able to be achieved via internal Defence environmental assessment processes and the issue of an ECC, within the boundaries of EPBC Act requirements. In such circumstances, this SEA and other standard Defence environmental management procedures provide substantial guidance for the assessment of potential environmental significance and the application of appropriate risk mitigation measures.

### 3.5.2 ADF Activities Conducted Within GBRWHA and Contiguous Areas

Principal users of the GBR region are ships and aircraft of the RAN and RAAF aircraft with a maritime role. Regular use is also made by DSTO and DMO for research and evaluation tasks, and by a limited number of specialist Army units.
RAN ships and aircraft use the GBRWHA to conduct a broad spectrum of activities, ranging from simple single unit serials, to complex, multi-unit, multi facet exercises. Different ship classes use the GBR and its DPA to various extents, primarily dictated by sensor and weapons fits and ship roles.

92 Wing of the RAAF’s Surveillance and Response Group, operating MPAs, is the main Air Force operator over maritime areas. The GBR region is also used periodically by fast jets involved in maritime strike, interdiction, Fleet air defence and aviation support exercises. Periodic activity is also undertaken by other RAAF aircraft, such as C-130 Hercules, engaged in maritime SF or SAR training, and tankers. It may be anticipated that the future AEW&C capability to be provided by Project Wedgetail will also require specific training and evaluation activities to be conducted over sea areas.

Army aviation units conduct training activities over marine areas, and Army water transport units operate landing craft which undertake amphibious operations. Army Special Forces units also use DPA for a range of training activities, such as beach reconnaissance, parachute drops and submarine insertion. Army aviation and short-range surface-to-air missile units periodically embark in RAN ships and while so embarked conduct activities within the GBRWHA.

Miscellaneous users include Defence Maritime Services and other contractors using ships and aircraft involved in the provision of targets and other range and trials support activities.

Activities typically, or potentially, occurring in the GBRWHA and contiguous areas include:

**Weapons Practice**
- Naval Gunfire Support (NGS) firing exercises at various shore targets on Townshend Island.
- Gun firings (40/60 Bofors, 30 mm, 20 mm and 0.50 cal.) at towed and floating targets.
- Aircraft strike (using guns, rockets, missiles and bombs) of shore targets.
- HULKEXs (although these will only occur in the Coral Sea), typically involving the use of an old ship as a target for the delivery of gunfire (from ships and aircraft), bombs (live and inert), rockets, missiles and warshot torpedoes (as previously noted, individual HULKEXs will be individually assessed for the issue of a Sea Dumping Permit).

**Aviation Training and Exercises**
- Flying training, including supersonic flight, low-level flying and air combat.
- Air Defence Exercises (ADEX) and other Fleet support activities involving aircraft.
- Helicopter (‘Helo’) transfers (of personnel and small items) and VERTREPs (the transfer of stores between ships using helicopters for vertical lift).

**Submarine Training and Exercises**
- ASW training (usually within the framework of major exercises) involving ships, submarines, helicopters and fixed wing aircraft conducting significant sonar operations at varying frequencies, beam patterns and transmission powers. Active and passive sonar, sonobuoys, marine sound signals, expendable bathythermographs, smoke floats and submarine launched flares (SLFs) are used.
- Submerged submarine operations. May involve the use of active and passive sonar, noise making decoys, SLFs, sonobuoys and marine sound signals. May also involve Special Forces operations and submarine bottoming.
- Naval helicopter and P3 Orion long-range MPA submarine search activities using helicopter dipping sonar (if fitted as an upgrade to S-70B-2s) and sonobuoys. Aircraft
used also periodically involve Royal Air Force Nimrods and Orions from New Zealand and Canada (CP-140 Aurora).

- Streaming of towed sonar arrays and towed decoys (eg. SLQ-25 Nixie) astern while underway.
- Sonar development trials.
- Sonobuoy / Raptor (acoustic processing and analysis equipment) trials.
- Use of underwater Signals, Underwater Sound (SUS), Marine Sound Signals (MSSs) and Underwater Telephone (UWT) transmissions.
- The deployment of non-recoverable stores and equipment, such as:
  - Expendable Bathythermographs (XBTs);
  - Submarine Expendable Bathythermographs (SSXBTs);
  - Expendable Mobile ASW Training Targets (EMATTs);
  - SLFs, MSSs and other pyrotechnics;
  - Submarine bubble decoys; and
  - Sonobuoys.

**Miscellaneous Activities of a Military Nature**

- Amphibious warfare (including Special Forces activities, the use of conventional landing craft and hovercraft [LCACs], helicopter assaults and logistic support) and Logistics-Over-The-Shore (LOTS) operations.
- Minelaying, and detection (i.e. minehunting) and neutralisation (i.e. by mechanical and influence minesweeping, or mine disposal charges [MDCs] placed by mine clearance divers or remotely operated vehicles).
- Minefield transit exercises involving ships and submarines.
- Use of VINEMs - a visual indicator discharged from Stonefish Exercise Mines (small charge releases smoke canister, flare and dye to surface to signal triggering of exercise mine).
- Exercises involving diving operations and occasional use of scare charges (i.e. MSSs).
- Explosive demolition activities in designated areas.
- Exercise boardings, involving ships’ boats and/or helicopters.
- DSOTS (Daily Systems Operability Tests, of ship weapon and sensor systems).
- Various RAN, RAAF, Army, DSTO and DMO trials and tests of sensors, weapons, tactics, and other equipment.

**Miscellaneous Activities of a Non-Military Nature**

- Various seamanship activities including:
  - Jackstay transfers (day and night);
  - Replenishment-at-Sea (RAS) (involving the transfer of liquid fuels);
  - Towing Exercises (TOWEXs);
  - OOW Manoeuvres (coordinated, close ship manoeuvres); and
  - Ship handling emergency drills, including man overboard exercises (MOBEX), laying and recovery of danbuoys, object recovery, seaboot and lifeboat drills.
- Search-and-Rescue (SAR) activities involving ships, boats, helicopters and fixed-wing aircraft.
- Firefighting drills and Damage Control Exercises (DCXs).
- High Seas Force Protection exercises using high speed support craft (i.e. RHIBS).
- Disaster Relief Exercises (DISTEXs) and Aid to the Civil Community Exercises.
- Permissible routine waste discharges from ships (bilge water, garbage, sewage and greywater).
3. **Defence Presence in the Great Barrier Reef Region**

### 3.5.3 Patterns and Annual Cycles of Use

There are two distinct components of the Defence exercise activities undertaken in the GBRWHA and contiguous areas. These are major or specialist exercises involving RAN and/or RAAF units not based in Cairns or Townsville, and small scale exercises and work-ups of locally based units, such as the Cairns-based patrol boats or Army helicopters based at RAAF Townsville. In addition to exercise activities, ADF units also transit through or over the GBRWHA, or undertake routine tasks such as surveillance patrols and hydrographic survey. These groups of activities are expended upon in this Section.

A ‘serial’ is a programmed activity undertaken by a single unit, such as a ship, submarine, aircraft, range support vessel or contractor aircraft. Thus a ship INDEXing (i.e. exercising independently) or conducting single-ship NGS practice would represent a single serial, whereas, for example, a more elaborate ASW activity involving a submarine, two frigates, an MPA and a shore-based helicopter (five units in all) would represent five serials.

#### 3.5.3.1 Individual Unit Activities and Small to Medium Exercises

ADF units are required to maintain minimal levels of operational effectiveness, and equipment and procedural familiarity in the interests of safety and military readiness. As would be expected, simple training activities undertaken within the GBRWHA are predominantly undertaken by those Navy, RAAF and Army units based within or near the GBR region; ADF units based elsewhere only tend to deploy to or transit through the area for specific tasks, although these units, particularly ships, would undertake simple, single-unit activities while passing through the GBR to maintain operational currency.

Activities in the GBR may involve only a single unit or small number of units, or be conducted by multiple units as a component of an exercise. Exercises grade from minor to major. Most operations in the GBRWHA are at the lower end of the activity spectrum, involving only a single ship or aircraft up to around three or four ships and about the same number of aircraft, although rarely with all operating simultaneously in the case of aircraft. Minor to mid-scale exercises may be considered as those which may involve up to around 10 or so ships, not all of which would be surface combatants such as FFGs and FFHs, possibly supported by from four or five and up to 30 or so aircraft of all types (although not all operating simultaneously). Minor to mid-scale exercises of all types occur probably less than a dozen or so times per year, with the largest of these being those in the *Squadex* and *Sea Lion* series of amphibious exercises.

The DPA located near Cairns are typically activated as required for ships to conduct specific training serials; these may be WUPs and OREs for patrol boats or small calibre gun shoots for larger ships transiting through the area. Other DPA, or the marine components of terrestrial exercise areas, are used as required for specialised training or trials, or the maritime elements of larger, joint forces activities. Similarly, island ranges in the Halifax Bay DPA are regularly used by Army helicopter crews for activities such as cabin-gunning.

The CBTA and SWBTA are activated as required for activities ranging from trials of new equipment and individual unit exercises up to large, multi-facet training exercises. Most of the SWBTA activities would not involve any marine component. A significant proportion of the ADF’s amphibious activities are conducted at the CBTA and SWBTA. A pattern of mid-scale amphibious activities is developing, whereby a large number of small amphibious units will participate in a medium scale amphibious activity, usually at CBTA, on an annual basis. These exercises usually involve at least one and sometimes all three of the RAN’s amphibious
3. DEFENCE PRESENCE IN THE GREAT BARRIER REEF REGION

ships (*Kanimbla*, *Manoora* and *Tobruk*) and possibly some minewarfare vessels and other Fleet units. It may be expected that the frequency and complexity of small to mid-scale amphibious exercises at SWBTA and CBTA will increase as a reflection of current ADF doctrine embracing amphibious warfare and as new amphibious warfare equipment enters service and new doctrine is developed.

The SWBTA and CBTA are also used periodically for amphibious activities, which may involve only one or two LCHs and/or LCM8s.

Underwater explosive training is undertaken at Triangular Island in the SWBTA. This training is usually initial training in explosive ordnance disposal (EOD) and mine clearance for Navy Clearance Divers. The Triangular Island range is also used when EOD is undertaken as a component of larger exercise activities.

Cordelia Rocks, in the Halifax Bay Training Area (situated within the GBRWHA) was once used as a target during aircraft bombing exercises. Cordelia Rocks has not been used for this purpose for a number of years and there is no plan to reinstate it has a target area.

3.5.3.2 Major Exercises

Once every two to four years a major exercise is programmed in the GBRWHA. These exercises are usually centred on the SWBTA and surrounding sea areas, such as the Capricorn Channel, but often involve other activities over a wide area of the GBRWHA and Coral Sea, such as the passage through the Inner Reef of a major amphibious task group. Major exercises are those in the *Tandem Thrust*, *Crocodile* and *Talisman Saber* (*sic*) series. These can involve up to forty or so Australian and Allied ships, possibly including a USN aircraft carrier, large Australian and US amphibious units, two or three submarines and around 10 to 15 surface combatants, ranging from cruisers to frigates, along with two to four afloat support ships. The submarines may be conventionally or nuclear-powered. A substantial number of the ships involved in these exercises are minor warfare vessels such as MHCs, LCHs, LCM8s and MS(A)s. Up to around 100 or more aircraft of all types may be involved in the maritime elements of these large exercises. Since the 1990s these major exercises have been subject to environmental assessment and tailored environmental management planning.

A representative selection of medium to major exercises conducted in the GBRWHA since 1981 are summarised in Table 3.9.

<table>
<thead>
<tr>
<th>Date</th>
<th>Exercise</th>
<th>Type of Exercise</th>
<th>ADF Arms/Other Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 81</td>
<td>KANGAROO III</td>
<td>Multi-facet</td>
<td>RAN/Army/RAAF</td>
</tr>
<tr>
<td>Aug 83</td>
<td>DIAMOND DOLLAR 83</td>
<td>Amphibious</td>
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</tr>
<tr>
<td>Jun 84</td>
<td>SEA STRIKE 84</td>
<td>Amphibious</td>
<td>RAN/Army/RAAF</td>
</tr>
<tr>
<td>Oct-Nov 84</td>
<td>DIAMOND DOLLAR 84</td>
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<td>RAN/Army/RAAF</td>
</tr>
<tr>
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<td>Amphibious</td>
<td>RAN/Army/RAAF</td>
</tr>
<tr>
<td>Oct-Nov 85</td>
<td>TASMAN WARRIOR</td>
<td>Major Exercise</td>
<td>RAN/Army/RAAF/NZ</td>
</tr>
<tr>
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</tr>
<tr>
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<td>Multi-facet</td>
<td>RAN/Army/RAAF</td>
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<tr>
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<td>Multi-facet</td>
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<td>Amphibious</td>
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<tr>
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<td>SWIFT EAGLE 92</td>
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<tr>
<td>Date</td>
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<td>Type of Exercise</td>
<td>ADF Arms/Other Countries</td>
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<td>TASMANEX</td>
<td>Amphibious</td>
<td>RAN/Army/RAAF/NZ</td>
</tr>
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<td>Mar 97</td>
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<td>Multi-facet</td>
<td>RAN/Army/RAAF/US</td>
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<td>Sep/Oct 99</td>
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<td>Multi-facet</td>
<td>RAN/Army/RAAF/US</td>
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</tr>
<tr>
<td>Aug – Sep 03</td>
<td>CROCODILE 03</td>
<td>Multi-facet</td>
<td>RAN/Army/RAAF/US</td>
</tr>
<tr>
<td>Mar 04</td>
<td>SEA LION</td>
<td>Amphibious</td>
<td>RAN/Army/RAAF</td>
</tr>
<tr>
<td>Sep 04</td>
<td>SWIFT EAGLE</td>
<td>Multi-facet</td>
<td>RAN/Army/RAAF</td>
</tr>
<tr>
<td>Jun 05</td>
<td>TALISMAN SABER</td>
<td>Multi-facet</td>
<td>RAN/Army/RAAF/US</td>
</tr>
</tbody>
</table>
4. THE GREAT BARRIER REEF WORLD HERITAGE AREA AND CONTIGUOUS AREAS: EXISTING ENVIRONMENTS

4.1 INTRODUCTION

This Section provides an overview of the natural and social values of the GBRWHA and contiguous areas. It begins with a detailed description of its World Heritage values of the GBRWHA followed by an overview of its biophysical and socio-economic environments. This is followed by a Section that focuses specifically on the significant biophysical environment of islands in DPA within the GBRWHA. Lastly, there is an overview of the biophysical and social environments of the three important contiguous areas to the GBRWHA, namely the Coral Sea, Torres Strait and sea areas off southeast Queensland.

4.2 EXISTING ENVIRONMENT

4.2.1 The Great Barrier Reef World Heritage Area

The following Section begins with a detailed description of the key values of the GBRWHA, followed by a summary of its key ecological and social values.

4.2.1.1 Great Barrier Reef World Heritage Area Values

World Heritage listings exist to identify, protect and promote natural heritage and cultural heritage values considered to be of global significance. The GBR is considered to possess significant natural heritage values. The World Heritage Council considers "natural heritage" to designate outstanding physical, biological, and geological features; habitats of threatened plants or animal species and areas of value on scientific or aesthetic grounds or from the point of view of conservation (World Heritage Council, 2004).

The GBR was inscribed on the World Heritage List in 1981. It should be noted that World Heritage assessment and listing criteria have changed since the GBR was inscribed, however the criteria against which the area was first listed remain extant. The World Heritage criteria are periodically revised and so current criteria are in some cases different to the original listing.

The full listing of the GBR is particularly extensive. The GBRMPA has listed representative example of the accepted World Heritage criteria of the GBR, which are presented in Table 4.1; these are considered to provide a suitable reflection of the range and diversity of World Heritage values existing within the GBR. Examples of the World Heritage values for which the GBR was originally listed are included in the Values Table for each criterion. Values listed in Table 4.1 do not provide a comprehensive list of these values.
Table 4.1 Representative World Heritage Values of the GBR

|---|---|
| Criterion (i) an outstanding example representing a major stage of the earth's evolutionary history. | The GBR is by far the largest single collection of coral reefs in the world. The World Heritage values of the property include:  
- 2,904 coral reefs covering approximately 20,055 km²;  
- 300 coral cays and 600 continental islands;  
- reef morphologies reflecting historical and on-going geomorphic and oceanographic processes;  
- processes of geological evolution linking islands, cays, reefs and changing sea levels, together with sand barriers, deltaic and associated sand dunes;  
- record of sea level changes and the complete history of the reef's evolution are recorded in the reef structure;  
- record of climate history, environmental conditions and processes extending back over several hundred years within old massive corals;  
- formations such as serpentinite rocks of South Percy island, intact and active dune systems, undisturbed tidal sediments and "blue holes"; and  
- record of sea level changes reflected in distribution of continental island flora and fauna. |
| Criterion (ii) an outstanding example representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment. | Biologically the GBR supports the most diverse ecosystem known to man and its enormous diversity is thought to reflect the maturity of an ecosystem, which has evolved over millions of years on the northeast Continental Shelf of Australia. The World Heritage values include:  
- the heterogeneity and interconnectivity of the reef assemblage;  
- size and morphological diversity (elevation ranging from the sea bed to 1,142 m at Mt. Bowen and a large cross-shelf extent encompass the fullest possible representation of marine environmental processes);  
- ongoing processes of accretion and erosion of coral reefs, sand banks and coral cays, erosion and deposition processes along the coastline, river deltas and estuaries and continental islands;  
- extensive Halimeda beds representing active calcification and sediment accretion for over 10,000 years;  
- evidence of the dispersion and evolution of hard corals and associated flora and fauna from the "Indo-West Pacific centre of diversity" along the north-south extent of the reef;  
- inter-connections with the Wet Tropics via the coastal interface and Lord Howe Island via the East Australia current;  
- indigenous temperate species derived from tropical species;  
- living coral colonies (including some of the world's oldest);  
- inshore coral communities of southern reefs;  
- five floristic regions identified for continental islands and two for coral cays;  
- the diversity of flora and fauna, including:  
  - Macroalgae (estimated 400-500 species);  
  - Porifera (estimated 1,500 species, some endemic, mostly undescribed);  
  - Cnidaria: Corals - part of the global centre of coral diversity and including:  
    - hexacorals (70 genera and 350 species, including 10 endemic species); |
### Natural Criteria Against Which GBR inscribed on the World Heritage List in 1981

<table>
<thead>
<tr>
<th>Examples of World Heritage values of the GBR inscribed on the World Heritage List in 1981</th>
</tr>
</thead>
<tbody>
<tr>
<td>o octocorals (80 genera, number of species not yet estimated);</td>
</tr>
<tr>
<td>• Tunicata: Ascidians (at least 330 species);</td>
</tr>
<tr>
<td>• Bryozoa (an estimated 300-500 species, many undescribed);</td>
</tr>
<tr>
<td>• Crustacea (at least 1,330 species from 3 subclasses);</td>
</tr>
<tr>
<td>• Worms:</td>
</tr>
<tr>
<td>o Polychaetes (estimated 500 species);</td>
</tr>
<tr>
<td>o Platyhelminthes: include free-living Tubellaria (number of species not yet estimated), polyclad Tubellaria (up to 300 species) and parasitic helminthes (estimated 1,000's of species, most undescribed);</td>
</tr>
<tr>
<td>• Phytoplankton (a diverse group existing in two broad communities);</td>
</tr>
<tr>
<td>• Mollusca (between 5,000-8,000 species);</td>
</tr>
<tr>
<td>• Echinodermata (estimated 800 extant species, including many rare taxa and type specimens);</td>
</tr>
<tr>
<td>• fishes (between 1,200 and 2,000 species from 130 families, with high species diversity and heterogeneity; includes the Whale shark <em>Rhynchodon typus</em>);</td>
</tr>
<tr>
<td>• seabirds (between 1.4 and 1.7 million seabirds breeding on islands);</td>
</tr>
<tr>
<td>• marine reptiles (including 6 sea turtle species, 17 sea snake species, and 1 species of crocodile);</td>
</tr>
<tr>
<td>• marine mammals (including 1 species of dugong (<em>Dugong dugon</em>), and 26 species of whales and dolphins);</td>
</tr>
<tr>
<td>• terrestrial flora (see Section 4.2.2) and;</td>
</tr>
<tr>
<td>• terrestrial fauna, including:</td>
</tr>
<tr>
<td>o invertebrates (pseudoscorpions, mites, ticks, spiders, centipedes, isopods, phalangids, millipedes, collombolans and 109 families of insects from 20 orders, and large over-wintering aggregations of butterflies); and</td>
</tr>
<tr>
<td>o vertebrates (including seabirds (see above), reptiles: crocodiles and turtles, 9 snakes and 31 lizards, mammals);</td>
</tr>
<tr>
<td>• the integrity of the inter-connections between reef and island networks in terms of dispersion, recruitment, and the subsequent gene flow of many taxa;</td>
</tr>
<tr>
<td>• processes of dispersal, colonisation and establishment of plant communities within the context of island biogeography (e.g. dispersal of seeds by air, sea and vectors such as birds are examples of dispersion, colonisation and succession);</td>
</tr>
<tr>
<td>• the isolation of certain island populations (e.g. recent speciation evident in two subspecies of the butterfly <em>Tirumala hamata</em> and the evolution of distinct races of the bird <em>Zosterops spp</em>);</td>
</tr>
<tr>
<td>• remnant vegetation types (hoop pines) and relic species (sponges) on islands.</td>
</tr>
<tr>
<td>• evidence of morphological and genetic changes in mangrove and seagrass flora across regional scales; and</td>
</tr>
<tr>
<td>• feeding and/or breeding grounds for international migratory seabirds, cetaceans and sea turtles.</td>
</tr>
</tbody>
</table>
### Natural Criteria Against Which GBR inscribed on the World Heritage List in 1981

#### Criterion (iii) contains unique, rare and superlative natural phenomena, formations and features and areas of exceptional natural beauty.

The GBR provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include:

- the vast extent of the reef and island systems which produces an unparalleled aerial vista;
- islands ranging from towering forested continental islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays;
- coastal and adjacent islands with mangrove systems of exceptional beauty;
- the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs;
- the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs;
- spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies; and
- migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish.

#### Criterion (iv) provides habitats where populations of rare and endangered species of plants and animals still survive.

The GBR contains many outstanding examples of important and significant natural habitats for *in situ* conservation of species of conservation significance, particularly resulting from the latitudinal and cross-shelf completeness of the region. The World Heritage values include:

- habitats for species of conservation significance within the 77 broadscale bioregional associations that have been identified for the property and which include:
  - over 2,900 coral reefs (covering 20,055 km²) which are structurally and ecologically complex;
  - large numbers of islands, including:
    - 600 continental islands supporting 2,195 plant species in 5 distinct floristic regions;
    - 300 coral cays and sand cays;
    - seabird and sea turtle rookeries, including breeding populations of green sea turtles and Hawksbill turtles; and
    - coral cays with 300-350 plant species in 2 distinct floristic regions;
  - seagrass beds (over 5,000 km²) comprising 15 species, 2 endemic;
  - mangroves (over 2,070 km²) including 37 species;
  - *Halimeda* banks in the northern region and the unique deep water bed in the central region; and
  - large areas of ecologically complex inter-reefal and lagoonal benthos; and
  - species of plants and animals of conservation significance.
4.2.1.2 Biophysical Environment

4.2.1.2.1 Climate

There is a distinct change in climate between Cairns to the north, which has an average annual rainfall of 2,028 mm, and Townsville, which has only 1,143 mm. There is a distinct seasonality of rainfall in Townsville. Mean monthly rainfall at Townsville airport ranges from 270 mm in January and 292 mm in February to only 10 mm in September. In contrast, there is much greater rainfall in the north (approx. 2,000 mm to 4,000 mm annually). Mean maximum temperatures range from 31.3°C in January to 25.0°C in July. The latter figure can be misleading, as Townsville can on occasion reach very low minimum air temperatures during winter. Cyclone occurrence in the region is between 1 and 1.5 annually (ANZECC 1998).

4.2.1.2.2 Oceanography

The South Equatorial Current (SEC) flows westward across the central Pacific Ocean (Figure 4.1). In summer, as it nears Australia most of the SEC in the area of Lizard Island shifts to a southerly flow to form the East Australian Current. There is also some inflow into the Coral Sea through Torres Strait at this time. During winter, most of the SEC still changes direction to the south, but there is also a component, which moves northwards towards the south coast of New Guinea, or flows westward through Torres Strait. Over the year there is a net flow westward through Torres Strait. Inshore, on the reef itself current patterns are poorly known. There can be considerable variation on small scales, with the density and structure of the local reefs affecting current structures (Bunt 1987).

Waters of the GBR are tropical, with the mean sea surface temperatures of this region ranging from 21-23°C in winter and 27-28°C in summer (Bureau of Meteorology 2004). Surface salinities are high, ranging in open water from 35.0 to 35.5 ppt. Tides are mixed semidiurnal, with the maximum range on spring tides at Townsville being about 3.5 m. The range on neaps is substantially lower, there are occasional periods of several hours with little or no tidal movement. Inshore conditions can be modified considerably by inflows from rivers such as the Ross River.

4.2.1.2.3 Seabed Topography

Only about 5% of the area of the GBRWHA is taken up by coral reefs, with most of the remaining 95% comprised of shelf characterised by soft sediments (Figure 4.2a-e). The seabed here can be divided into three broad categories:

- the Great Barrier Reef lagoon: relatively open water are of primary of soft sediment seabed covering the area between the mainland and the part of the seabed where the reefs begin
- the inter-reefal area: the seabed found between coral reefs at the outer edge of the lagoon and the reefs at the edge of the continental shelf; and
- the continental slope.

4.2.1.2.4 Islands

There are more than 600 continental (high) islands and 300 coral cays in the GBRWHA. The continental islands are primarily made of ancient igneous rocks similar to the uplands of the adjacent mainland. Most are composed of granites or mixtures of granites and acid volcanics. Coral cays are composed of broken coral and remains of other marine organisms such as Halimeda and Forminera.
A number of GBR islands occur within DPA. Some islands are directly affected by Defence activities because they are used as weapon impact areas or as landing sites for Defence personnel. There are three major island ‘groups’ that occur in DPA in the GBR region. The status, flora and fauna of these islands are described in Section 4.2.2.

4.2.1.2.5 Marine Ecosystems

The Australian and New Zealand Environment and Conservation Council (ANZECC) has proposed The Interim Marine and Coastal Regionalisation for Australia (IMCRA) (ANZECC 1998). IMCRA consists of three parts:

- a meso-scale regionalisation for inshore waters
- demersal provinces and biotones for inshore waters
- pelagic provinces and biotones for inshore waters

The GBRWHA waters have been classified into eight meso-scale regions: East Cape York; Ribbons; Wet Tropic Coast; Lucinda-Mackay Coast; Central Reef; Pompey-Swains; Mackay-Capricorn; and Shoalwater Coast. These meso-scale regions have been defined using biological and physical information and geographic distance along the coast. The GBR Region has been classified into two continental shelf demersal regions namely: North Eastern Biotone and North Eastern Province. The Great Barrier Region also forms two pelagic regions: Northern Pelagic Region and the Eastern Pelagic Biotone.

4.2.1.3 Marine habitats

4.2.1.3.1 Coastal and oceanic habitats

The GBRWHA waters can be divided into neritic and oceanic provinces, which include ecosystems of the continental shelf and slope respectively. The functional ecotonal boundary between these two provinces is deemed to approximately the 200 m isobath (water depth contour). The neritic zone contains four primary biomes (major ecological communities extending over large natural areas) estuaries, coastal marine, demersal shelf and pelagic shelf ecosystems. All four are represented in the region. The coastal marine biome includes habitats within the near-shore zone to the circalittoral fringe (depth 40 m). The dermal shelf and pelagic biomes lie beyond this depth between the 40 m and 200 m isobath. Animals occupying the demersal habitats live close to the bottom either in the substratum, on the bottom, or in the associated water column immediately above. Pelagic habitats are those of the open water column above.

The oceanic zone also consists of four biomes: continental slope, abyssal, epipelagic and meso/bathypelagic ecosystems. The continental slope and abyss contain demersal habitats that are usually separated by the 200 m isobath. The upper 200 m of the ocean is defined as the epipelagic biome. The deeper pelagic zone below consists of the mesopelagic (200-1,000 m) and bathypelagic (deeper than 1,000 m) that comprise meso/bathypelagic biome.

4.2.1.3.2 Coral reefs

Physical size and morphological diversity make the GBR unique amongst the world’s coral reefs. Within the GBRMP area alone are 20,055 km² of coral reefs and although this makes up only 3.25% of world’s reefs (total 617,000 km²) the latitude spread over a distance of 2,300 km or 14º means that it is generally regarded as the largest reef system the world has ever known.
Classification of reefs in the GBR has been based on the depth of the antecedent surface from which the modern reef grows. Where this is deep, reefs may have only just reached sea-level; where shallow the reefs have not only reached sea-level but also extend laterally to form crescents, lagoonal and planar reefs. No other reef province in the world provides such a range of reef morphology.

4.2.1.3.3 Seagrass beds

Seagrasses grow on a range of substratum, generally in localities that are sheltered from prevailing south-easterly trade winds, such as estuaries, coastal bays and inlets, on fringing and barrier platforms and behind islands. Seagrasses have been found in both intertidal and subtidal locations, from 2.2 m above to 28 m below mean sea level. Extensive deepwater seagrass meadows have been found in the Barrow Point-lookout Point and Hervey Bay regions. The reported extent of seagrass from Cape York to Hervey Bay, approximately 4,000 km², is comparable to the total cover of mangrove habitat in Queensland.

4.2.1.3.4 Mangrove forest

Mangroves are a diverse group of predominantly tropical trees and shrubs occupying the area above mean sea level in the marine intertidal zone. Mangroves offer feeding grounds and nurseries for a range of fauna, and contribute to a number of other important processes, such as banks and shore stabilisation, and primary production. The area of mangroves within or adjacent to the GBRWHA is approximately 2,069 km². This represents approximately 18% of Australia’s mangrove areas. Only the DPA encompassing the Shoalwater Bay area support mangroves (Figures 4.3a-e).

4.2.1.3.5 Seamounts

Seamounts are known areas of high biodiversity and endemism. Seamounts are defined as large isolated elevations, greater than 1000 m in relief above the seafloor, characteristically of conical form (Harris 2004). According to Harris et al. (2004) they are not common in the GBRWHA and none are named.

4.2.1.3.6 Submarine canyons and trenches

According to Harris et al. (2004) canyons are relatively narrow, deep depressions with steep sides, the bottom of which generally has a continuous slope, typically found on continental slopes. In the GBRWHA, canyons are found along the continental slope immediately east of the reefs fringing the continental shelf (Figures 4.2a, 4.2b, 4.2c, 4.2d and 4.2e).

Trenches are defined as long, narrow feature, characteristically very deep and asymmetrical depression of the seafloor, with relatively steep sides. None are named within the GBRWHA.

4.2.1.4 Marine Biota

4.2.1.4.1 Hard and soft corals

The GBR is part of a global centre of coral diversity located in the Indo-Pacific and includes more than 350 coral species representing 70 hard coral (Scleractinian) genera (Chin 2003). Most of the hard coral species are found elsewhere in the Indo-Pacific, but 10 species are considered endemic. Soft corals are also an important component of many reefs, however their taxonomy is not well documented.
Corals show marked changes in species composition moving from sheltered inshore fringing reefs to exposed shelf-edge reefs of the outer barrier in clear nutrient poor waters. Inshore waters are often characterised by relatively high abundance of corals such as *Galaxea, Montipora* and *Goniopora*, compared to mid-shelf reefs that have more plate-forming *Acropora* species, and outer-shelf reefs that are frequently dominated by digitate or sub-massive *Acropora* species (Chin 2003).

### 4.2.1.4.2 Other invertebrate marine fauna

Invertebrates, other than corals, that are abundant in the GBRWHA include crustaceans, molluscs, echinoderms, bryozoans, sponges and ascidians. The latter three form multispecies ‘natural isolates’ in the soft sediment environments of the GBR shelf. Although the taxonomy of many of these taxa are poorly known, species diversity appears high. As an example, there are approximately 300-500 species of bryozoan; 100 species of barnacles; 1,030 species of Decapoda, Stomatopoda and Euphausiacea; and 500 species of echinoderms (Lucas et al. 1997). There is estimated to be 5,000 to 8,000 species of molluscs in the GBR region (Lucas et al. 1997).

### 4.2.1.4.3 Algae

The major types of algae in the GBR region are phytoplankton, zooxanthellae, and benthic macroalgae such as seaweeds (e.g. *Halimeda*), turf algae and crustose coralline algae. Approximately 400-500 species of macroalgae are found in the GBR region. The red algae (Rhodophyta) are the most diverse macroalgae, with approximately as many species as there are brown algae (Phaeophyta) or green algae (Chlorophyta). More than 155 species of red algae from 25 families have been recorded from the Capricorn-Bunker region of the GBRMP. The macroalgae of the region is typical of that found in the Indo-West Pacific, and consequently levels of endemism are low.

### 4.2.1.4.4 Seagrasses

Of more than 30 species found within Australia, 15 species from eight genera are recorded from the GBR region. Most of the species found in the region are widespread throughout the Indo-Pacific region. However, *Halophila tricostata* is probably endemic. Species diversity of seagrass decreases with increasing latitude.

### 4.2.1.4.5 Mangroves

Worldwide, 69 species of mangroves from 21 plant families have been recorded. Within or immediately adjacent to the GBRMP, 37 species from 20 families have been recorded. This makes the GBR region one of the most diverse areas in the world for mangrove habitat. There are no species of mangrove endemic to the region, however one hybrid variety, *Lumnitzera X rosea* has only been recorded from Missionary Bay.

### 4.2.1.4.6 Fishes

Estimates for the number of species in the GBR region range from 1,200 to 2,000. More than 130 families of fishes are currently known. Coral reef habitats exhibit the greatest species richness, followed by mangroves and estuarine environments. The majority of coral reef fishes are cosmopolitan species distributed throughout the Indo-Pacific, accordingly endemism is low.

The Grey Nurse shark has conservation significance under the EPBC Act, based on declining population trends and continuing pressure from some sectors of the Australian commercial and...
recreational fishing industries. The shark has been recognised as having two distinct Australian populations: one on the east coast and another on the west coast. Given the serious decline in the east coast population it is now listed as critically endangered.

Grey Nurse sharks have a broad global inshore distribution, primarily in sub-tropical to cool temperate waters around the main continental landmasses, except in the eastern Pacific Ocean. The species is known to be migratory. In Australia they have been regularly reported from southern Queensland around most of the southern half of the continent, although uncommon in Victorian, South Australian and Tasmanian waters. The shark has been recorded as far north as Cairns and also in the Arafura Sea. Critical habitats of this species near the GBRWHA are shown in Table 4.2.

**Table 4.2** Identified Critical Habitat for East Australian Grey Nurse Sharks in or Near the GBRWHA

<table>
<thead>
<tr>
<th>Critical Habitat</th>
<th>Concurrent DPA</th>
</tr>
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<tbody>
<tr>
<td>Off Stradbroke Island, Queensland</td>
<td>nil</td>
</tr>
<tr>
<td>Off Moreton Island, Queensland</td>
<td>nil</td>
</tr>
<tr>
<td>Rainbow Beach, near Wide Bay, Queensland</td>
<td>nil (but near R665A-C, Wide Bay)</td>
</tr>
</tbody>
</table>

(Environment Australia 2002c)

Recognised key aggregation sites in Queensland include sites off Moreton and Stradbroke Islands and Rainbow Beach.

### 4.2.1.4.7 Cetaceans

There are about 80 species of cetaceans in 40 genera and 13 families. At least 26 species in 18 genera and five families visit or are residents in the GBRWHA, a level of diversity that is probably typical of other coastal regions in the Indo-Pacific. The humpback whale, which regularly visits the GBR, which is classified as vulnerable by the IUCN. Precise details of humpback over-wintering areas are yet to be described, but several aggregation areas, where the whales feed, breed and calve, have been located around the northern Australian coastline. Recognised east coast humpback aggregation areas are around Moreton Bay, Hervey Bay, and the area north of Shoalwater/Corio Bay to Bowen (Table 4.3).

Systematic, long-term observations of humpback migrations indicate steady increase in the Australian populations. The east coast population was estimated to be 3,160 to 4,040 in 1999 (Paterson et al. 2001), growing at 10% per annum. This suggests an east coast population in 2002 of 4,200 to 5,380.

**Table 4.3** Elements of DPA in Relation to Humpback Whale Migration Routes and Aggregation Areas

<table>
<thead>
<tr>
<th>Exercise Area</th>
<th>Northern Migration</th>
<th>Southern Migration - general</th>
<th>Southern Migration- Cow/calf Pairs</th>
<th>Aggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower QLD DPA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R676, R677A*, R677B* and R693</td>
<td>Late-May to August</td>
<td>August to November</td>
<td>October to November</td>
<td>Some over-wintering near R676 and R693</td>
</tr>
<tr>
<td><strong>Mid QLD DPA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R689</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>July to October</td>
</tr>
</tbody>
</table>

* Humpbacks expected to only pass through margins closest to coastline. (after Jebber et al. 1997; Patterson et al. 2001)
Dwarf minke whales (Balaenoptera arcturostrata) also occur frequently in the GBRWHA. GBRWHA
The Longman’s beaked whale (Mesoplodon pacificus), considered the rarest whale in the world, has
been recorded in GBR area.

Dolphins likely to occur in inshore waters of the GBRWHA are the bottle-nosed (Tursiops truncatus),
Indo-Pacific humpback (Sousa chinensis) and the Irrawaddy (Orcaella brevirostris).

The Indo-Pacific hump-backed dolphin (Sousa chinensis) usually inhabits shallow coastal waters of
less than 20 m depth and is often associated with tidal riverine and estuarine systems, enclosed bays
and coastal lagoons, mangrove areas and seagrass meadows (Corkeron et al. 1997). These habitats are
widespread in coastal areas of the GBRWHA and, thus, the GBRWHA is potentially an important area
for this species. Analysis of population structure using molecular genetic data indicates that
genetically distinct populations occur over discrete geographic ranges (Hale et al. 2004). Both genetic
data (Hale et al. 2004) and that obtained from monitoring populations in the field (Hale et al. 2004)
indicate that local populations are both small in size and discrete in geographic range. Thus, they are
not known to be highly migratory, although moderate seasonal changes in distribution and abundance
have been documented in Hong Kong (Jefferson & Leatherwood 1997). Diet studies have indicated
that Indo-Pacific hump-backed dolphins eat bony fishes, especially pelagic shoaling species such as
mullet (Mugil spp.), some cephalopods, and crustaceans (Bannister et al. 1996; Hale et al. 1998).

The Irrawaddy River dolphin (Orcaella brevirostris) is documented from much of Queensland and
other areas throughout its range as occurring in rivers, estuaries, inshore waters (Marsh et al. 1989,
Perrin et al. 1996) and shallow offshore waters (Freeland & Bayliss 1989). Morphological variants of
Orcaella in different parts of their range have been described (Perrin et al. 1996), with Stacey and
Arnold (1999) proposing that Orcaella in Australian waters are at least a subspecies and perhaps a
separate species to those in South-east Asia. This evidence for restricted gene flow among localities
within the species range suggests the geographic range of distinct populations is small. They are not
considered to be highly migratory, although several populations of Irrawaddy dolphins in South-east
Asia appear to undertake limited seasonal migrations. They appear to be generalist feeders, consuming
mainly bony fishes, but also cephalopods (including octopus and squid) and crustaceans (Bannister et
al. 1996; Marsh et al. 1989). Demersal, benthic and pelagic prey items have been recorded from
stomach contents (Stacey & Arnold 1999). Limited surveys by Preen (reported in Parra et al. 2002)
failed to identify any Irrawaddy dolphins in Shoalwater Bay, although these results are unlikely to be
definitive.

Indo-Pacific humpback and Irrawaddy dolphins occupy a particularly vulnerable habitat (Klinowska
1991). As coastal animals, they are especially susceptible to the effects of human activities, including
coastal run-off and pollution, incidental catch in fishing gear (principally nets), habitat loss and
disturbance, underwater noise from a variety of sources, disturbance from boats, and disease (Bowater
et al. 2003) (Bannister et al. 1996; Klinowska 1991). For these reasons, the GBRWHA is likely be a
stronghold for these species, in the same vein that it is for dugongs and marine turtles.

4.2.1.4.8 Dugongs

The dugong (Dugong dugon) is listed as vulnerable to extinction by the IUCN. Northern Australia is
considered the dugong stronghold. The population estimate for northern Australia is around 80,000, of
which 12,000 (15%) occur in the GBR region. Within the region, more than 80% of dugongs occur
north of Cooktown, with a third of these occurring in Princess Charlotte Bay. South of Cooktown, the
number of dugongs has declined by approximately 50% over the past eight years, although the
Shoalwater Bay population is considered relatively stable.
Dugongs occur all along the coast of the GBR region and have been sighted more than 50 km offshore where the feed on deepwater and reefal seagrass beds.

The GBRMPA has prepared the *Turtle and Dugong Conservation Strategy for the Great Barrier Reef*. This Strategy describes the approach taken by the GBRMPA to conserve this animal in the Park. The GBRMPA has established dugong sanctuaries in coastal Queensland waters to protect important dugong habitat and populations. One of these is concurrent with the SWBTA and another adjoins the Halifax Bay DPA.

### 4.2.1.4.9 Sea turtle rookeries

Six of the world’s seven species of marine turtles are found in the GBR region. For four of the species, the loggerhead, green, hawksbill and flatback turtles, the GBR region provides feeding and nesting sites (GBRMPA 2001). Breeding periods are given in Table 4.4. The region also provides important habitat and food resources for the olive ridley and leatherback turtles. The southern GBR region supports approximately 70% of the south Pacific population of the loggerhead turtles. Raine Island accommodates the largest green turtle breeding population in the world. Approximately 10% of the endemic flatback turtles breed on a few islands in the southern region of the GBR. Most DPA in or adjacent to the GBRWHA do not support turtle nesting beaches (Figures 4.4a-e). DPA supporting nesting turtle beaches are R689 and R687, which are located at Shoalwater Bay.

#### Table 4.4 Turtle Breeding Periods and Major Nesting Areas

<table>
<thead>
<tr>
<th>Species</th>
<th>Nesting Season</th>
<th>Hatching Season</th>
<th>Major Nesting Sites (and Concurrent GBR DPA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>late October to February</td>
<td>December to May</td>
<td>Raine Island, Moulter Cay, Capricorn/Bunker group.</td>
</tr>
<tr>
<td>Loggerhead</td>
<td>late October to early March, peaks in December</td>
<td>December to April</td>
<td>Southern GBR incl. Capricorn/Bunker group and Bundaberg area.</td>
</tr>
<tr>
<td>Hawksbill</td>
<td>year round, mainly November to February, peaks in January (GBR); July to September (Arnhem Land)</td>
<td>year round, mainly February to April</td>
<td>Milman Island (GBR).</td>
</tr>
<tr>
<td>Leatherback</td>
<td>December to January</td>
<td>February to March</td>
<td>Nil major areas in Australia. Minor nesting occurs around Bundaberg, Mackay and Arnhem Land.</td>
</tr>
<tr>
<td>Flatback</td>
<td>October to February</td>
<td>December to April</td>
<td>Peak Island, Wild Duck Island, Curtis Island, Facing Island (Southern GBR); Crab Island.</td>
</tr>
<tr>
<td>Olive Ridley</td>
<td>Year round, mainly April to November</td>
<td>Year round, mainly June to January</td>
<td>Nil major areas in Australia.</td>
</tr>
</tbody>
</table>

### 4.2.1.4.10 Seabird rookeries

The GBR region supports breeding colonies of 22 species of seabirds, nesting on approximately 25% of GBR islands. It is estimated that between 1.4 and 1.7 million seabirds breed annually in the region, while non-breeding seabirds may add a further 425,000. King (1993) identified 54 islands with significant seabird colonies in the GBR region. (Figures 4.5a-e). Most DPA do not support seabird nesting areas. DPA containing nesting areas include R784 near Innisfail, R747 near Townsville and the Shoalwater Bay DPA.
4.2.1.4.11 Crocodiles

Only estuarine crocodiles (*Crocodylus porosus*) commonly occur in the GBRWHA. Although they are found over a wide area at low densities in the GBRWHA, no nesting in the GBRWHA has been recorded.

4.2.1.5 Terrestrial Habitats

4.2.1.5.1 Terrestrial Flora

Over 2,100 plant species occur on islands in the GBR region, representing about 25% of Queensland’s flora diversity in just 0.1% of its area. Over 75 species are rare or threatened, with a number of endemics. The most diverse region is the Whitsunday Region with 1,141 species followed by the northern region (976 species). The island flora shows a large degree of similarity with that of other Pacific islands, however the diversity in some families is better represented in GBR region.

4.2.1.5.2 Butterflies

The butterfly fauna of the Great Barrier Reef region have not been subject to detailed investigation. One hundred and eighteen species have been identified within the region, representing 30% of all known Australian butterflies (Lucas et al. 1997). Two endemic subspecies have been described, and several rare and little-known species occur with the region. The butterfly fauna have strong links with the coastal fauna.

4.2.1.5.3 Reptiles

At least nine snakes and 31 lizards are found on the islands of the GBR region. However, this estimate is likely to be incomplete (Lucas et al. 1997). The lizards of the islands include six species of geckos, one legless lizard, two goannas and 22 species of skinks. The nine snakes include a blind-snake, a python, three colubrids and four elapids. The snakes and some lizards are found on continental islands occupying habitats similar to which they would occupy on the mainland. Species richness in terrestrial reptiles decreases with both increasing latitude and increasing distance from the mainland shore.

4.2.1.6 Sensitive Marine Areas and Listed EPBC Act Marine Species

4.2.1.6.1 Marine protected areas

The GBR, from Torres Strait to Gladstone, is included in the GBRMP. Adjacent to the GBRMP are numerous Queensland designated marine parks (4.6a-e). DPA that substantially overlap state marine parks are at Cowley Beach, Halifax Bay and Shoalwater Bay.

Dugong sanctuary zones have been established in a number of areas along the Queensland coastline (Figure 4.7). The primary objective of these areas is to minimise mortality of dugong due to fishing activity. DPA in the Shoalwater Bay area overlap a dugong sanctuary area.

4.2.1.6.2 World Heritage Areas

See Section 4.2.1.1.
4.2.1.6.3 Ramsar Wetlands

There are two Ramsar wetlands in the GBRWHA: Shoalwater and Corio Bays, and Bowling Green Bay (Figure 4.8). Another three Ramsar sites exist within the wider study area:

- the Coringa-Herald and Lihou reefs and cays in the Coral Sea; and
- the Great Sandy Strait and Moreton Bay sites within the southern Queensland marine areas.

The Shoalwater Bay DPA overlaps the Shoalwater and Corio Bay Ramsar Wetlands.

4.2.1.6.4 EPBC Act Listed Species and Habitats

Many marine and avian species are afforded protection under the auspices of the EPBC Act. Those most likely to have relevance to the GBRWHA are presented in Table 4.5, together with their EPBC Act status.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>EPBC Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humpback whale</td>
<td>Megaptera novaeangliae</td>
<td>V, M</td>
</tr>
<tr>
<td>Dugong</td>
<td>Dugong dugon</td>
<td>L, M</td>
</tr>
<tr>
<td>Reptiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loggerhead turtle</td>
<td>Caretta caretta</td>
<td>E, M</td>
</tr>
<tr>
<td>Green turtle</td>
<td>Chelonia mydas</td>
<td>V, M</td>
</tr>
<tr>
<td>Flatback turtle</td>
<td>Natator depressus</td>
<td>V, M</td>
</tr>
<tr>
<td>Leathery turtle</td>
<td>Demochelys coriacea</td>
<td>V, M</td>
</tr>
<tr>
<td>Hawksbill turtle</td>
<td>Eretmochelys imbricata</td>
<td>V, M</td>
</tr>
<tr>
<td>Olive Ridley turtle</td>
<td>Lepidochelys olivacea</td>
<td>E, M</td>
</tr>
<tr>
<td>Estuarine or saltwater crocodile</td>
<td>Crocodylus porosus</td>
<td>MP</td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey nurse shark</td>
<td>Carcharias taurus</td>
<td>CE (East coast)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V (West coast)</td>
</tr>
<tr>
<td>Whale shark</td>
<td>Rhincodon typus</td>
<td>V, M</td>
</tr>
<tr>
<td>Birds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australian lesser noddy</td>
<td>Anous tenuirostris melanops</td>
<td>V</td>
</tr>
<tr>
<td>Gould’s Petrel</td>
<td>Pterodroma leucopetera</td>
<td>E</td>
</tr>
<tr>
<td>Flesh-footed Shearwater</td>
<td>Puffinus carneipes</td>
<td>M</td>
</tr>
<tr>
<td>Short-tailed Shearwater</td>
<td>Puffinus tenuirostris</td>
<td>M</td>
</tr>
<tr>
<td>Wedge-tailed Shearwater</td>
<td>Puffinus pacificus</td>
<td>M</td>
</tr>
<tr>
<td>White-bellied Sea-eagle</td>
<td>Haliaeetus leucogaster</td>
<td>M</td>
</tr>
<tr>
<td>Osprey</td>
<td>Pandion haliaetus</td>
<td>M</td>
</tr>
<tr>
<td>Eastern Reef Egret</td>
<td>Egretta sacra</td>
<td>M</td>
</tr>
<tr>
<td>Caspian Tern</td>
<td>Sterna caspia</td>
<td>M</td>
</tr>
<tr>
<td>Bridled Tern</td>
<td>Sterna anaethetus</td>
<td>M</td>
</tr>
<tr>
<td>Australian Lesser Noddy</td>
<td>Anous tenuirostris melanops</td>
<td>V</td>
</tr>
<tr>
<td>Little Tern</td>
<td>Sterna albifrons</td>
<td>M</td>
</tr>
<tr>
<td>Fairy Prion (southern)</td>
<td>Pachyptila turtur subantarctica</td>
<td>V, M</td>
</tr>
</tbody>
</table>

CE = Critically Endangered  L = Listed
E = Endangered               M = Migratory
V = Vulnerable               MP = Marine Protected
The EPBC Act also makes provision for the recognition and protection of Threatened Ecological Communities, of which 29 have been listed to date. None of these occur in marine areas.

Other marine species may be afforded special protection under the EPBC Act by promulgation as listed marine species. Listed marine species include: sea snakes, seals, sea lions, crocodiles, dugongs, marine turtles, seahorses, sea dragons, pipefish, ghost pipefish and all birds that occur naturally in Commonwealth marine areas.

### 4.2.1.7 Socio-economic Environment

#### 4.2.1.7.1 Commercial Fishing

Fishing is the predominant extractive activity in the GBRMP and includes the major commercial fisheries of prawning, trawling, reef line fishing and inshore netting and crabbing, as well as smaller dive-based fisheries for tropical rock lobsters, aquarium fishes, coral, sea cucumber, trochus and specimen shells (Figure 4.9). DPA overlap a number of these commercial fishing areas. Recreational fishing is an important activity with 56,000 privately registered boats in coastal communities adjacent to the GBR. Under the OCS the Queensland Department of Primary Industries/Queensland Fisheries Service (QFSS) has responsibility for the day-to-day management of these fisheries. The Commonwealth retains management responsibility for tuna and tuna like species and other Coral Sea fisheries.

#### 4.2.1.7.2 Commercial and other shipping

Commercial shipping activity in the GBR region, over a 36 month period, is shown in Figure 4.10. The GBRMP contains several important commercial trade routes, through which a range of products is carried to and from southern ports and communities along the Queensland coast. There are approximately 6,000 ships (greater than 50 m in length) transiting within the Great Barrier Reef Marine Park annually (GBRMPA 2004). About 75% of all ships navigate the inner route, the remainder using Grafton, Palm and Capricorn Channels and Hydrographers Passage. A number of DPA in or adjacent to the GBRWHA overlap ‘shipping routes’. These include R784 between Cairns and Townsville, R748 off Townsville, R689 near Shoalwater Bay and R677A&B off Brisbane.

#### 4.2.1.7.3 Civil aviation

Due to the large number of tourists coming to the area, Cairns is one of the leading airports in the country in terms of passengers with 130,000 aircraft movements transporting nearly three million passengers per year. Townsville airport handled 865,800 passengers in 2001/2002, all of whom were domestic. The main routes into the city are from Brisbane in the south and Cairns in the north, though some flights fly over Townsville on their way to ports further north or south. Aviation routes connecting these airports with other centres traverse the GBRWHA.

There is also a large amount of civil aviation activity connected to scheduled and charter services to island resorts within the GBR and tourist sightseeing flights.

#### 4.2.1.7.4 Petroleum Activities

There are no petroleum activities in the GBRMP. Government policy prohibits exploratory or production drilling for oil in or near the GBRWHA.
4.2.1.7.5 **Subsea infrastructure**

A subsea cable runs through Whitsunday Passage, linking some islands with the mainland. A number of subsea cables link Townsville, on the mainland, with Magnetic Island. A subsea cable links the mainland, near Mission Beach, with Dunk Island. Subsea cables run northeast of Cairns, through Trinity Opening, towards open sea.

4.2.1.7.6 **Tourism and recreation**

Tourism is the largest commercial activity in the GBRMP, generating up to $4.2 billion per annum. The marine tourism industry is a major contributor to the local economy. It is estimated that private recreational use on the GBR contributes at least an additional $240 million. Since initial establishment in 1975, tourism on the Reef has transformed from small operators in regional centres to a multi-billion dollar industry focused from Cairns, Port Douglas and the Whitsundays. Sailing, including bare boat charters, are a key feature of the tourism activity around the Whitsunday Islands. There are approximately 730 tourism operators with 1,500 vessels and aircraft permitted to operate in the GBRMP. Figure 4.11 shows areas where tourism activities occur within the World Heritage Area. Only the DPA near Shoalwater Bay overlap important tourism sites. Another indicator of high tourism activity in the GBRWHA are the location and density of moorings used by tourist boats. Moorings near Cairns are shown in Figure 4.12. No DPA significantly overlap major mooring locations.

4.2.1.7.7 **Historic shipwrecks**

A search of the Australian Historic Shipwreck Database revealed 716 records for the GBR region. The oldest wreck is the *HMS Pandora*, which sank in 1791 near the Cape York Peninsula.

4.2.1.7.8 **Places of cultural heritage**

The entire reef is heritage listed and is managed as a marine park by GBRMPA. The GBRMP extends from the low water mark on the continental shoreline out beyond the limit of the reef, and includes all the waters and islands on the reef. GBRMPA does not manage the areas that have been designated by the Queensland Government as State parks. The GBR is managed as a multipurpose marine park that allows multiple uses and ecologically sustainable development while maintaining the overall conservation objective.

4.2.1.7.9 **Places of indigenous heritage**

Places of indigenous heritage significance are widespread throughout the World Heritage Area.

4.2.1.7.10 **National Native Title Claims**

The GBRMP, or sections thereof, is subject to numerous native title claims (Figure 4.13). These range from Torres Strait to Fraser Island, and out to the continental shelf. Only the DPA in the Shoalwater Bay area overlap Native Title Claims.

4.2.1.7.11 **Dumping sites and unexploded ordnance**

The website of the Australian Hydrographic Service notes that chemical warfare agents were dumped in the late 1940s into the sea off the towns of Bowen and Proserpine (Figure 4.14). Major ordnance dumps took place off Cairns. However, offshore dumpsites of all categories occur within the GBR
region from Torres Strait to Gladstone. DPA overlapping disposal sites include R677A, R778 and those in the Shoalwater Bay area.

### 4.2.2 Islands within GBR DPA

#### 4.2.2.1 Introduction

There are more than 600 continental (high) islands and 300 coral cays in the GBRWHA and most have high ecological values because they support seabird rookeries and provide nesting sites for marine turtles. There are 20 DPA in Queensland fully or partially overlying marine waters; eight of these encompass islands (Table 4.6).

<table>
<thead>
<tr>
<th>Table 4.6 Queensland Maritime Exercise Areas and Occurrence of Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DPAs with islands</strong></td>
</tr>
<tr>
<td>R689</td>
</tr>
<tr>
<td>R680</td>
</tr>
<tr>
<td>R682</td>
</tr>
<tr>
<td>R683</td>
</tr>
<tr>
<td>R686</td>
</tr>
<tr>
<td>R747</td>
</tr>
<tr>
<td>R748</td>
</tr>
<tr>
<td>R784A</td>
</tr>
</tbody>
</table>

Table 4.7 lists the exercise areas and the islands found in each. For convenience these are sorted into three groups based on their proximately to one another or to their proximity to a major geomorphological feature, such as Halifax Bay.

<table>
<thead>
<tr>
<th>Table 4.7 DPA and Associated Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For convenience these have been categorised into three groups or sections – Shoalwater Bay, Halifax Bay and Barnard Group.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DPA</th>
<th>Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shoalwater Bay Group</strong></td>
<td></td>
</tr>
<tr>
<td>R680</td>
<td>Akens Is and Skull Is.</td>
</tr>
<tr>
<td>R682</td>
<td>Townshed Is, Leicester Is and Raynham Is.</td>
</tr>
<tr>
<td>R683</td>
<td>Clara Group – Dome Is, Delcomyn Is, Entrance Is and Quoin Is.</td>
</tr>
<tr>
<td>R686</td>
<td>Triangular Is and one small unnamed island.</td>
</tr>
<tr>
<td><strong>Halifax Bay Group</strong></td>
<td></td>
</tr>
<tr>
<td>R747</td>
<td>Rattlesnake Is, Herald Is and Acheron Is.</td>
</tr>
<tr>
<td>R748</td>
<td>Havannah Is.</td>
</tr>
<tr>
<td><strong>Barnard Group</strong></td>
<td></td>
</tr>
<tr>
<td>R784A</td>
<td>North Barnard Islands – Lindquist Is, Jessie Is, Bresnahan Is, Kent Is and Hutchison Is. South Barnard Islands – Stephen Is and Sisters Is.</td>
</tr>
</tbody>
</table>
The following section provides a detailed description of the three island groups listed in Table 4.7.

4.2.2.2 Shoalwater Bay Group

4.2.2.2.1 Introduction

Five exercise areas in this region contain at least 25 named islands (Table 4.7), and numerous small areas of named and unnamed emergent rocks.

4.2.2.2.2 Land tenure and current use

All islands are understood to be under Commonwealth jurisdiction (jointly managed by Defence and GBRMPA). Defence primarily uses only a very small number of islands (Christine Bell, Defence, pers. comm. February 2004), as follow:

- Townshend Island (live fire and bombing activities);
- Leicester Island (gun positions);
- Raynham Island (practice bombing activities); and
- Triangular Island (underwater demolition activities).

All of the marine areas including the islands are within either the Great Barrier Reef Marine Park (GBRMP) or State Marine Park. The surrounding waters vary in their GBRMP zoning classification: northeast of Townshend Island is Habitat Protection; southwest and east of Townshend Island is Marine National Park; and south and south east is Conservation Park (http://www.reefed.edu.au/rap/maps.html). In addition much of the eastern coastal and estuarine areas are listed under the Ramsar Convention for the protection of wetlands of international importance.

4.2.2.2.3 Bio-physical description

There is little information on the physical nature of islands in the Shoalwater Bay region. Akens Island, 3.5 km long and 1 km wide, is a continental island situated close to the western shore of Shoalwater Bay. The underlying geology is metamorphic with predominantly sandy soils (Paul O’Neill, Queensland Parks and Wildlife Service, pers. comm. February 2004). The islands to the east of Shoalwater Bay are rocky in nature and surrounded by cliffs.

Flora

The flora on the islands in the western section of Shoalwater Bay reflects that found on the adjacent mainland. Flora types on Shoalwater Bay islands consist of predominantly open woodland and forest. Akens, Townshend, Marquis and Triangular Islands are known to contain the rare and threatened species *Xylosma Ovatum*. Hoop pine can be found on Island Head. Townshend Island supports mainly
open woodland, with areas of swamp vegetation (wet and heath), paperbark, mangroves, heath, forest and coastal flat vegetation. Leicester Island supports mainly open woodland, with areas of wet swamp vegetation, paperbark, mangroves, forest and coastal flat vegetation. Raynham Island supports mainly open woodland and paperbarks. Triangular Island supports open woodland, forest and wet swamp vegetation (Joy Brushe, Queensland Herbarium, SWBTA Flora Survey GIS Data, 2003). Islands east of Shoalwater Bay are rocky with little vegetation cover (Paul O’Neill, Queensland Parks and Wildlife Service, pers. comm. February 2004).

The following description pertains to Akens Islands, which is probably the most studied of the islands. Low microphyll vine thicket, with a canopy characterised by burdekin plum Pleiogynium timorense, native celtis (Celtis paniculata), tuckeroo (Cupaniopsis anacardiodes) and alectryon (Alectryon connatus), covers much of the eastern and south-western parts of the island. Parts of this area contain the rare plant Xylosma ovatum, and the canopy emergent Corymbia dallachiana.

The gently sloped hillslopes of the central and southern areas contain woodland characterised by Corymbia clarksoniana, red ash (Alphitonia excelsa) and Corymbia dallachiana, with a ground stratum dominated by kangaroo grass (Themeda triandra), and woodland containing Corymbia clarksoniana, Acacia lepocarpa, red ash (Alphitonia excelsa), C. dallachiana, Melaleuca nervosa, broad-leafed tea-tree (M. viridiflora) and quinine tree (Petalostigma pubescens).

The northern, higher parts of the island are dominated by low closed windsheared forest and dwarf open woodland containing Corymbia clarksoniana, Melaleuca nervosa, coast banksia (Banksia integrifolia), Xanthorrhoea sp., and kangaroo grass (Themeda triandra).

The beach ridges and parallel dunes of southern areas are characterised by coast she-oak (Casuarina equisetifolia), Melaleuca nervosa, broad-leafed tea-tree (M. viridiflora) and screw pine (Pandanus tectorius).

**Fauna**

Akens Island, Bay Island and Pelican Rock contain rookeries supporting colonies of various bird species, some of which are rare and threatened species. Pelican Rock and Akens Island are the largest pelican breeding colonies on the east coast of Australia. On Akens Island, the Australian pelican Pelecanus conspicillatus nest mostly in the summer months between October and March, although 41 nests were recorded in August 1990, 442 nests in May 1990 and 300 nests in April 1998. The largest number of nests recorded was 1,024 in March 1990, with between 300 and 700 nests recorded in most years. Evidence of nesting, including nests and bodies, was observed during the ground inspections. No photographs were taken in 1991 or 1997 although nesting occurred in these years. Of interest is the lack of nesting in the three years between 1992 and 1996.

The islands west from Townshend Island offer different habitats and many are important for beach stone-curlew, sooty oystercatcher and Caspian tern nesting. In 1995, Paul O’Neill (pers. comm. February 2004) counted 10 beach stone-curlew pairs on Leicester Island, which is an extraordinary number for such a relatively small area. He also found a small colony of about 50 pairs of lesser-crested terns breeding on Annie Islet (on the northern side of Collins Island). The islands are also important breeding habitat for a number of raptor species including osprey, brahminy kite, white-breasted sea-eagle and peregrine falcon. Numbers of birds on individual islands is not high but holistically the area is quite important for the species described above. The low level of human disturbance is a key factor, and this is reflected in standing airspace restrictions promulgated by Defence.

High Peak Island contains an important bridled tern colony (at least 1000 pairs). It also is a roost site for brown boobies in summer (about 500 birds) and has a pair of white-breasted sea-eagles (Paul O’Neill, Queensland Parks and Wildlife Service, pers. comm. February 2004).
Shoalwater Bay has been identified as one of the most important inshore turtle habitats in the GBR Region. Four species of marine turtle have been recorded in Shoalwater Bay: hawksbill turtle (*Eretmochelys imbricata*), loggerhead turtle (*Caretta caretta*), flatback turtle (*Natator depressa*) and green turtle (*Chelonia mydas*). The area supports the largest feeding population of the green turtle on the east coast of Australia. Confirmed nesting beaches on islands include Bay Island (Paul O’Neill, Queensland Parks and Wildlife Service, pers. comm. February 2004).

### 4.2.2.3 Halifax Bay Group

#### 4.2.2.3.1 Introduction

This group comprises four islands, situated in Halifax Bay. Three of the islands (Rattlesnake Island, Herald Island and Acheron Island) are situated approximately 10-15 km north of Townsville, while the fourth (Havannah Island) is approximately 50 km north.

#### 4.2.2.3.2 Land tenure and current use

Rattlesnake Island, Herald Island and Acheron Island are situated in a General Use ‘A’ Zone of the Central Section of the GBRMP. These islands are leased from the Crown for Defence purposes. Havannah Islands is in the Palm Island Archipelago and is part of the Palm Islands Aboriginal reserve.

#### 4.2.2.3.3 Biophysical Description

Rattlesnake (178 ha), Herald (77 ha) and Acheron Islands (32 ha) are inselbergs derived from residual rock types that are dominated by units of Permian intrusive porphyritic microgranite. These residual rock types form the basement of the islands and have weathered to form most of the existing soil.

**Flora**

A vegetation survey of Rattlesnake, Herald and Acheron Islands was undertaken by the Australian Centre for Tropical Freshwater Research during May and June 1999. A total of 362 vascular plants were recorded for the islands, including 48 grasses, 37 peas and 21 weeds. Thirteen major vegetation communities were recorded (Table 4.8), seven of which matched the regional ecosystems of the Brigalow Belt North and Wet Tropic ecosystems. Two of the vegetation communities present on the islands were consistent with regional ecosystems that are conservation significant and rated as ‘of concern’. These were the closed forest community found on Rattlesnake Island and the vine thicket found on Rattlesnake, Herald and Acheron Islands.

**Table 4.8 Vegetation Communities Recorded for Rattlesnake, Herald and Acheron Islands**

<table>
<thead>
<tr>
<th>1. Mangroves</th>
<th>8. Scrub with <em>Acacia nesophila x spirorbis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Strandline woodland and scrub</td>
<td>9. Scrub or low woodland with <em>Acacia leptocarpa</em></td>
</tr>
<tr>
<td>3. Grassland on old dunes</td>
<td>10. Woodland with <em>Eucalyptus drepanophylla</em> and <em>E. tessellaris</em></td>
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<tr>
<td>4. Open woodland</td>
<td>11. Woodland with <em>Eucalyptus erythrophloia</em></td>
</tr>
<tr>
<td>5. Closed forest</td>
<td>12. Vine thicket</td>
</tr>
<tr>
<td>7. Very open low scrub</td>
<td></td>
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Seven of the vegetation communities identified (3, 4, 6, 7, 8, 9 and 13) represent unusual structural and/or floristic associations, which could be unique to the islands surveyed.

A review of the Queensland Herbarium records revealed seven species of conservation status under the Nature Conservation (Wildlife) Regulations 1994. Two of these were listed as Vulnerable species (*Croton magneticus* and *Marsdenia brevifolia*) and five Rare species (*Acacia jackesiana*, *Cassia* sp., *Grewia granitica*, *Peripleura scabra* and *Solanum sporadotrichum*). None of these were located during the 1999 survey.

**Fauna**

The terrestrial fauna of Rattlesnake, Herald and Archeron Islands, as well as Cordelia and Bramble Rocks, was assessed during a six-day field trip in June 1999. A total of 46 vertebrate species were recorded from the survey, representing two amphibian species, nine reptiles, 31 birds and four mammals. None of the recorded species were introduced.

Eight species of conservation significance were recorded from the survey, six of listed conservation status and three of regional or scientific conservation concern:

- Green turtle (*Chelonia mydas*) (listed as Vulnerable under the EPBC Act)
- Beach stone-curlew (*Esacus neglectus*) (listed under the *Queensland Nature Conservation Act 1992*)
- Rufous owl (*Ninox rufa queenslandica*)
- Coastal Sheathtail bat (*Taphozous australis*)
- Sooty oystercatcher (*Haematopus fuliginosus*)
- White-breasted sea-eagle (*Haliateetus leucogaster*)
- Osprey (*Pandion haliaeetus*)
- Brown booby (*Sula leucogaster*)
- Canefield rat (*Rattus cf. sordidus*)

### 4.2.2.4 Barnard Group

#### 4.2.2.4.1 Introduction

Located between 10 km southeast of Mourilyan and around 4 km off the coast between Cowley and Kurrimine beach, this island group consists of seven islands, Lindquist, Bresnahan, Hutchinson, Jessie, Kent, Stephen and Sisters Islands. These islands are divided into two groups, the North Barnard’s and the South Barnard’s.

#### 4.2.2.4.2 Land tenure and current use

The group as a whole has been gazetted as a National Park since 1936 and is protected under the *Queensland Nature Conservation Act 1992* and the *Great Barrier Reef Marine Park Act 1975*. All the islands within the group are State National Parks with the exception of Lindquist and Kent, both Commonwealth islands. Lindquist is gazetted as defence reserve and Kent as a lighthouse reserve.

A Marine National Park Zone extends for 100 m from the low tide mark around the island. Within this zone collecting, fishing and spear fishing is prohibited. This zone is surrounded by a buffer zone that extends 500 m out from the reef edge that provides for trolling but all other forms of fishing are excluded.

The Barnard’s are part of the 'sea country' of the local Mamu Aboriginal people. The islands are a component of the local traditional cultural landscape and are still the focus of traditional use of natural
resources. There is at least one fish trap, a stone wall designed to trap fish as the tide falls, making them easy to catch.

4.2.2.4.3 Biophysical description

These high continental islands were once peaks of the mainland coastal mountain range. They were separated from the mainland by a rise in sea level. Heights of the islands vary from 19 m to 95 m. The Barnard Islands are geologically very interesting. The rocks of the South Barnard Islands are relatively young. About one million years ago explosive volcanic events dumped these rocks on to an ancient landscape. Layers of volcanic tuff (consolidated volcanic ash) can be seen clearly at the coast of Stephens Island which is considered a spectacularly well-preserved example of this type of volcanic deposit. Volcanic bombs can be seen embedded in these layers. Containing broken pieces of the more ancient metamorphic rocks, these were hurled into the air during volcanic explosions. In places steeply dipping basalt dykes cut through these layers. These dykes typically run east – west and these rocky ridges are clearly exposed on the south-western and north-eastern margins of Stephens Island.

By contrast to the relatively recent origin of the South Barnard’s, the materials forming the North Barnard’s date back about 420 million years, when sediments were deposited on the sea floor. About 60 million years later strong geological forces compressed, folded and faulted these sediments creating the metamorphic rocks that we see today.

Flora

The rocky slopes of the Barnard’s are densely cloaked with rainforest, diversity increasing with the size of the island. Exposure to cyclones, such as Cyclone Winifred (which occurred in 1986), has damaged some of the forest and led to extensive 'vine towers', composed largely of the introduced yam (Dioscorea alata) on Sisters Island. This vine and the Morning Glory (Ipomoea indica) has been bought under control through weed and revegetation programs and is no longer as visible as vine towers. This saved the rainforest on Sisters Island that in 1997 was suffering 80-90% cover. Destruction of the forest canopy, allowing extra light to reach the forest floor, has promoted the growth of these clambering vines, which overwhelm the remaining vegetation.

Mangrove species fringe parts of the islands and there are a number of coastal plants next to the shore. Typical are the pandanus (Pandanus tectorius), with their prickly leaves, the hair-like coastal she-oaks (Casuarina equisetifolia), octopus bushes (Argusia argentea) and sprawling goat's foot convolvulus (Ipomea pes-caprae) with its distinctive purple-pink trumpet flowers. A little further up the beach, look out for the bright red flowers of the coral tree (Erythrina variegata) blossoming on bare leafless branches in late winter Significant stand of these behind the camp ground on Stephens island, has smooth glossy dimpled trunks and the large finely-veined green leaves of Alexandrian laurel (Calophyllum inophyllum). A small glossy-leaved tree, the sea hearse (Hernandia nymphaeifolia), has been given its common name because its unusual fruit are thought to resemble a coffin surrounded by a pale shroud. These are produced in September.

Fauna

The South Barnard’s (Sisters and Stephens Islands) are an important breeding site for seabirds with six species of terns recorded nesting there, mainly in the dense vegetation next to the shore. It is thought that some seabird species can only breed when large numbers gather together, crowding possibly providing some sort of hormonal cue. Over 10,000 bridled terns (between half and one-sixth of the Australian breeding population) 2,000 lesser-crested terns (between half and one-quarter of the Australian breeding population) and 2,000 black-naped terns have been counted here. Smaller numbers of roseate terns and crested terns as well as one pair of little terns have also been seen nesting on the islands.
Because nesting seabirds are vulnerable to disturbance, access to Sisters Island and most of Stephens Island is prohibited during the nesting season from 1 September to 31 March each year.

Some islands, notably Sisters Island, are host to nesting colonies of pied imperial-pigeons. These birds migrate to Australia from New Guinea each summer to nest in safety on the islands of the GBR.

Twenty-two species of seabirds and 23 species of woodland birds have been recorded on and around the Barnard’s. Among the woodland birds are the migratory pied imperial-pigeon, the rose-crowned fruit dove and the emerald dove. Orange-footed scrubfowl create nesting mounds by scratching up leaf litter while the azure, forest and mangrove kingfishers contribute bright splashes of colour.

4.2.3 The Coral Sea

4.2.3.1 Biophysical Environment

4.2.3.1.1 Climate

Due to its tropical location and the oceanic influence there is little variation in daily or annual temperatures. The Australian Bureau of Meteorology operates eight automatic weather stations within the Coral Sea Islands Territory.

Mean annual rainfall at Willis Islet is 1,094 mm, with 68% of rainfall falling from January to April (Bureau of Meteorology 2004). Mean daily temperatures during the two hottest months range from a minimum of 35.3°C for December and 25.6°C for January to a maximum of 30.7°C for both months. The mean daily minimum and maximum during August, the coldest month, are 21.9°C and 26.4°C respectively (Bureau of Meteorology 2004).

Southeast winds predominate over the Coral Sea from March to November and the northwest monsoon prevails from December to February.

4.2.3.1.2 Oceanography

The geostrophic current (a current induced at the seashore from outside the observed area) in the western Coral Sea immediately adjacent to the GBR is westward towards the Reef (see Figure 4.1), with a subsurface maximum at 150 m (Wolanski 1994). The westward-flowing current has a discharge of about 12 Sv (1 Sv = 1,000,000 m³ s⁻¹) and is created by the westward barocline influx of the South Equatorial Current between the Solomon Islands and Vanuatu. This current splits up at a bifurcation point and exists as two longshore currents, each of about 6 Sv, along the Great Barrier Reef Slope, one southward and one northward.

While the Coral Sea’s surface waters are generally oligotrophic, as typical of coral reefs, water masses below the thermocline are nutrient rich. Nutrient concentrations tend to increase with depth below the thermocline and upwelling events may be an important source of nutrients for the GBR continental shelf.

4.2.3.1.3 Seabed topography

The seabed topography represents a complex environment of ridges, basins, platform reefs and pinnacles, occasionally forming islands (Figure 4.15). The main features of the western Coral Sea are the Queensland Plateau off the GBR with depths less than 2,000 m (much of it less than 1,000 m), the Papuan Plateau in the northwest, and the Coral Sea Basin with depths of more than 4,500 m.
The islets and cays of the Coringa-Herald National Nature Reserve (NNR) rise steeply from three separate platform reef systems (situated on the Queensland Plateau), each representing a distinct stage of reef formation. The reefs support three separate islet/cay groups: the Herald Cays; the Corigna Islets; and the Magdelaine Cays. Each of the cays has a fringing coral reef.

The Lihou Reef, a south-easterly facing horse-shoe shaped reef with 18 small sand cays along its perimeter, is the largest reef structure in the Coral Sea. It is located approximately 575 km east southeast of Cairns and 1,000 km southeast of Coringa-Herald NNR.

4.2.3.1.4 Islands

A number of islets and cays are found in the western Coral Sea. In the Coringa-Herald NNR these include South West Cay, North East Cay, South West Islet, Chilcott Islet, North West Islet and South East Cay. Southeast of Coringa-Herald is Lihou Reef which supports approximately 18 cays and islets. Most of the islets and cays are composed of sand, rock and coral rubble, which rise no higher than five metres above sea level.

4.2.3.1.5 Marine ecosystems

The IMCRA does not include the Coral Sea.

4.2.3.2 Marine habitats

4.2.3.2.1 Coastal and oceanic habitats

The Coral Sea can be divided into neritic and oceanic provinces, which include ecosystems of the continental shelf and slope respectively. The functional ecotonal boundary between these two provinces is deemed to approximately the 200 m isobath (water depth contour). The neritic zone contains four primary biomes (major ecological communities extending over large natural areas) estuaries, coastal marine, demersal shelf and pelagic shelf ecosystems. Only the latter three are represented in the Coral Sea. The coastal marine biome includes habitats within the near-shore zone (close to cays and islets in the study area) to the circalittoral fringe (depth 40 m). The dermal shelf and pelagic biomes lie beyond this depth between the 40 m and 200 m isobath. Animals occupying the demersal habitats live close to the bottom either in the substratum, on the bottom, or in the associated water column immediately above. Pelagic habitats are those of the open water column above.

The oceanic zone also consists of four biomes: continental slope, abyssal, epipelagic and meso/bathypelagic ecosystems. The continental slope and abyss contain demersal habitats that are usually separated by the 200 m isobath. The upper 200 m of the ocean is defined as the epipelagic biome. The deeper pelagic zone below consists of the mesopelagic (200-1,000 m) and bathypelagic (deeper than 1000 m) that comprise meso/bathypelagic biome.

4.2.3.2.2 Coral reefs

In terms of spatial area, coral reefs are an uncommon, yet highly productive, habitat in the western Coral Sea. They are mainly restricted to shallow areas of the Queensland Plateau, typically fringing islands and cays. This habitat supports a diverse range of fauna and flora, described in Section 4.2.3.3.
4.2.3.2.3 **Seagrass beds**

Probably occur in limited abundance on shallow marine features such as Coringa and Lihou Reefs.

4.2.3.2.4 **Mangrove forest**

None recorded

4.2.3.2.5 **Seamounts**

Seamounts are known areas of high biodiversity and endemism. Seamounts are defined as large isolated elevations, greater than 1000 m in relief above the seafloor, characteristically of conical form (Harris 2004). Seamounts are abundant in the Coral Sea. Here, a series of seamounts, known as the Tasmanid Seamounts (Harris 2004), runs in a north - south direction (Figure 4.15).

4.2.3.2.6 **Submarine canyons and trenches**

According to Harris et al. (2004) canyons are relatively narrow, deep depressions with steep sides, the bottom of which generally has a continuous slope, typically found on continental slopes. In the Coral Sea canyons are uncommon because of the lack of continental slope. The closest are those fringing the Australian continental shelf off Queensland (Figure 4.15).

Trenches are defined as long, narrow feature, characteristically very deep and asymmetrical depression of the seafloor, with relatively steep sides. Trenches, and the similar feature troughs, are widespread within the Coral Sea.

4.2.3.3 **Marine biota**

4.2.3.3.1 **Hard and Soft Corals**

The corals of the Coral Sea have been little-studied. The following summaries relate to surveys conducted in the Coringa-Herald NNR and Lihou Reef National Nature Reserve. The hard corals in the Reserves are not abundant or diverse when compared with the GBRMP. They cover a relatively small proportion of reef area compared to the hard corals of the GBR, with average maximum estimates ranging from 19.2% to 25.9% (EA 2001d). The dominant hard coral families are Acroporidae and Pocilloporidae (ANPWS 1989).

Soft corals are more abundant in sheltered areas, such as the deeper reef slopes and deeper reef flats. They provide approximately 3.5% of the total cover of North East Herald Cay (Byron et al. 2001) and primarily comprise *Sarcophyton* sp.

4.2.3.3.2 **Other invertebrate marine fauna**

Sponges form an important part of the reef fauna and in some places form large sponge gardens. In contrast to shallow reefal areas of the GBR, sponges are often more abundant than coral.

The marine mollusc fauna is moderately rich and represents a subset of a more widely distributed tropical mollusc fauna. Lock (2001) recorded 717 species of marine mollusc from North East Herald Cay. An additional 28 species were recorded from an earlier survey (EA 2001d).
The decapod crustacean fauna is rich. One hundred and twenty-eight species of marine, semi-terrestrial and terrestrial decapod crustaceans were recorded during the 1997 survey of North East Herald Cay (Davie & Short 2001). Nine of these species were undescribed and 17 new records for Australian waters.

4.2.3.3.3 *Algae*

Algae are an important component of the marine flora found in the Coringa-Herald NNR and Lihou Reef NNR. Millar (2001) recorded a total of 66 species from the Reserves.

4.2.3.3.4 *Seagrasses*

None recorded

4.2.3.3.5 *Mangroves*

None recorded

4.2.3.3.6 *Fishes*

Oxley et al. (2003) recorded 342 species of reef fishes from five reefs in the Coringa-Herald NNR. Nine of these represent new records from the Coral Sea. The reef fish assemblages showed low diversity and density compared to the GBR. Fishes of the open water habitat have not been described in detail for the western Coral Sea.

4.2.3.3.7 *Cetaceans*

A number of cetaceans have a range that includes the Coral Sea. A pilot whale (*Globicephala macrorhynchus*) was washed up on North-East Herald Cay in 1989. Whales and dolphins likely to occur in the area include humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), dwarf minke whale (*Balaenoptera arctocephalus*), spinner dolphin (*Stenella longirostris*), striped dolphin (*S. coeruleoalba*), spotted dolphin (*S. attenuata*), common dolphin (*Delphinus delphis*), bottlenose dolphins (*Tursiops truncatus*) and Risso’s dolphins (*Grampus griseus*) (EA 2001d).

4.2.3.3.8 *Dugongs*

Much of the Coral Sea is too deep and devoid of seagrass to provide habitat for large populations of dugong.

4.2.3.3.9 *Sea turtle rookeries*

The green turtle (*Chelonia mydas*) is listed as vulnerable under the EPBC Act and is the only species of marine turtle recorded mating and nesting within the Coringa-Herald NNR and Lihou Reef NNR. Genetic studies indicate that nesting population within the Reserves is of the same genetic stock as the green turtle in GBR and Torres Strait (EA 2001d).
4.2.3.10 Seabird rookeries

The Coringa-Herald and Lihou NNRs contain extensive seabird colonies of great significance to the ecological balance of the Coral Sea region. Fourteen seabird species use the cays of the Reserves for breeding. While some of these species (such as the red-footed booby, red-tailed tropic bird, lesser frigatebird and greater frigatebird) have extensive distributions outside Australia, they are uncommon within Australia and the Reserves contain a significant proportion of the region’s breeding population. Breeding of the red-footed boobies, red tailed tropicbirds and frigatebirds is largely seasonal on North-East Herald Cay. Most breeding commences at the end of the cyclone season in March-April and continues during the cooler months.

4.2.3.4 Terrestrial habitats

Most of the islets and cays are composed of sand, rocks and coral rubble that rise no higher than five metres above sea level. The terrestrial habitats common to both Reserves are beachrock, sandy beach, coral rubble, grassland and herb field. Some islets in Coringa-Herald NNR also have shrubland and forest habitat.

4.2.3.4.1 Terrestrial flora

The flowering plants recorded from the Reserves are primarily widespread tropical shoreline species of the Indo-Pacific Region (EA 2001d). The exception is Digitaria ctenantha, a grass native to northern Australia. Twenty-three terrestrial plant species have been recorded from Coringa-Herald NNR and seven from Lihou Reef NNR.

The vegetated islets in Coringa-Herald NNR are fringed with the shrub Argusia argentea and have a grass understorey. Pisonia grandis forest occurs in two cays in Coringa-Herald NNR and South East Magdelaine Cay. The P.grandis forest ecosystem is relatively uncommon, both in Australia and globally.

4.2.3.4.2 Invertebrate terrestrial fauna

The composition of the terrestrial invertebrate fauna of the Reserves is not well known, although preliminary surveys suggest that it is not rich. Of the four cays surveyed with Coringa-Herald NNR, North-East Herald Cay had the greatest invertebrate diversity with insects the dominant group and probably the dominant herbivore.

Within Lihou Reef NNR, only Turtle Islets has been surveyed in any detail and the greatest diversity was for spiders, beetles and flies. Of particular interest is a species of Pseudoscorpion belonging to the genus Nannochelifer, which was previously known from a single species from Kenya.

4.2.3.4.3 Vertebrate terrestrial fauna

The Gecko Gehyra mutilata is common on South West Coringa Islet. The buff-banded rail Galliratus philippensis subsp. and the purple swamphen are the only known land birds that breed in the Reserves. Seabirds are common on the islets and are described in Section Seabird Rookeries.
4. THE GREAT BARRIER REEF WORLD HERITAGE AREA AND CONTIGUOUS AREAS: EXISTING ENVIRONMENTS

4.2.3.5 Sensitive Marine Areas and Listed EPBC Act Marine Species

4.2.3.5.1 Marine protected areas

There are two marine protected areas in the Coral Sea: Coringa-Herald NNR and Lihou Reef NNR (Figure 2.3). They are located approximately 440 km east of north Queensland.

4.2.3.5.2 World Heritage Areas

There are no World Heritage Areas in the western Coral Sea, however the Coral Sea adjoins the Great Barrier Reef World Heritage Area.

4.2.3.5.3 Ramsar Wetlands

There are two Ramsar Wetlands in the Coral Sea: Coringa-Herald NNR and Lihou Reef NNR (Figure 2.3).

4.2.3.5.4 EPBC Act Listed Species and Habitats

A search using the DEH Protected Matters Search Tool revealed 10 threatened species and 13 migratory species likely to occur in the western Coral Sea. No threatened ecological communities were recorded.

Seventeen of the 28 species of birds recorded from Coringa-Herald NNR and 16 of the 24 recorded from Lihou Reef NNR are listed in the JAMBA and CAMBA agreement.

4.2.3.6 Socio-economic environment of the Coral Sea

4.2.3.6.1 Commercial fishing

AFMA manages the Coral Sea Fishery and Eastern Tuna and Billfish Fishery. The Coral Sea Fishery is a multi-species and multi-method fishery, which, in June 2000, had 13 permit holders endorsed to fish in one or more of the following categories: finfish trawl (one permit); crustacean trawl (two permits); drop line and demersal longline fishing (nine permits); hand collection (e.g. lobster, seacucumber) (four permits); and aquarium fish collection (three permits) (see Figure 4.9).

4.2.3.6.2 Commercial and other shipping

Important commercial shipping ‘routes’ traverse the Coral Sea (Figure 4.10). The most frequently used is that linking Brisbane and the southeast islands of Papua New Guinea and passages through these islands.

4.2.3.6.3 Civil aviation

Important civil aviation routes that cross the Coral Sea include routes between the international airport in Carins and the USA, Papua New Guinea and other Pacific nations.
4.2.3.6.4 **Petroleum activities**

The Queensland, Halifax and Townsville Basins, which flank the Queensland Plateau, appear to have reasonable prospects for petroleum generation and entrapment. However, there is no active petroleum exploration within these basins.

4.2.3.6.5 **Subsea infrastructure**

A subsea cable from Cairns runs northwest then east through the central Coral Sea. Another cable runs north from Cairns to Port Moresby.

4.2.3.6.6 **Tourism and recreation**

There is little tourism and recreational activity in the Coral Sea due to its remoteness from the Australian mainland. However, some organised diver operators and fishing charter operators run trips to the Coringa-Herald NNR and other offshore reef areas.

4.2.3.6.7 **Historic shipwrecks**

A search on the National Shipwreck Database Australia using the key term ‘Coral Sea’ revealed 106 historic shipwrecks.

4.2.3.6.8 **Places of cultural heritage significance**

A search of the Australian Heritage Database, using the key term ‘Coral Sea’ revealed no heritage sites.

4.2.3.6.9 **Places of indigenous heritage significance**

None listed.

4.2.3.6.10 **Native Title Claims**

No Native Title Claims extend into the Coral Sea.

4.2.3.6.11 **Dumping sites and unexploded ordnance**

Plunkett (2003) records no known sub sea dumpsites in the Coral Sea.

4.2.4 **The Torres Strait**

4.2.4.1 **Biophysical Environment**

4.2.4.1.1 **Climate**

The climate is tropical with a distinct dry (May to November) and wet season (December to April). Rainfall can range between 1,400 mm and 2,000 mm. Thursday Island has a monthly average rainfall of 311 mm. Between five and 10 cyclones pass through the region every decade (ANZECC 1998). The
prevailing winds for the two seasons are also distinct with south-east trade winds blowing from E to SE 90% of the time during the dry season whereas winds are more variable during

4.2.4.1.2 Oceanography

The reefs of Torres Strait form a narrow wave-guide, separating the Gulf of Carpentaria to the west from the GBR continental shelf to the east (Wolanski 1994). Current-metre data from sites in Torres Strait show periods of alternative eastward (from the Gulf of Carpentaria to the GBR) and westward currents. These currents are small, <0.1 m s\(^{-1}\). These oscillations are incoherent on either side of Torres Strait. These resulted in fluctuations of up to 0.6 m of the low frequency sea-level difference on either side of Torres Strait. In the Torres Strait, shallow waters and strong tidal currents maintain vertical homogeneity in temperature and salinity.

4.2.4.1.3 Bathymetry

Within the Torres Strait area the shelf is 100 km wide, shallow (depth seldom exceeding 20 m), and largely uncharted (Wolanski 1994). In Torres Strait, the water depth is seldom greater than 15 m. The northern half is no more than 10 m deep, with numerous shoals and reefs (Figure 4.16).

4.2.4.1.4 Islands

Torres Strait is a 150 km wide, shallow passage between Cape York and Papua New Guinea. It contains over 100 islands, islets, refs and cays.

4.2.4.2 Marine habitats

The IMCRA classified the Torres Strait into three meso-scale regions: Torres Strait; East Cape York; and West Cape York. It falls into the North Eastern Demersal Biotone and the Northern Pelagic Province.

4.2.4.2.1 Coastal and oceanic habitats

The spatial distribution marine benthic habitats in the central Torres Strait have been extensively mapped by CSIRO (CSIRO 1997; Long & Taranto 1997). These habitats were classified according to four habitat attributes: water depth, substrate type, abundance of epibenthos, and presence/absence of seagrass. The habitats include:

- rocky areas with dense epibenthos and no seagrass;
- rubble areas with little epibenthos and no seagrass;
- rocky with dense epibenthos and seagrass;
- rubble areas with epibenthos and seagrass;
- sandy areas with epibenthos and seagrass;
- muddy areas with little epibenthos and no seagrass;
- bare bud at 20-30 m depth;
- sandy areas with little epibenthos and no seagrass; and
- bare sand and 10-20 m depth.
4.2.4.2.2 Coral reefs

Torres Strait supports major coral reef habitats that include fringing reefs (around continental and volcanic islands, mud banks and macroalgal reefs), platform coral reefs and associated cays, and dissected coral reefs on the GBR. Based on reef types, there are six biogeographic areas: western reefs (shallow reefs, shoals, and fringing reefs); northern reefs (shallow sand banks and shoals); western inter-reefs (shallow sandy bottom); Warrior Reefs (shallow shoals, reefs separated by deep channels); central reefs (many platform reefs and san cays); and eastern reefs (platform reefs and dissected reefs of the GBR).

4.2.4.2.3 Seagrass beds

Seagrasses are widely distributed throughout the shallow and deep waters of Torres Strait, but are usually very sparse and patchy. Pitcher et al. (1992) reported that extensive, very dense, seagrass beds may be uncommon.

4.2.4.2.4 Mangrove forest

Long and McLeod (1997) reported 15,663 ha of mangroves on islands and reefs of the central Torres Strait. The largest areas of mangrove, 4,744 ha, 3,209 ha, 1,484 ha and 1,142 ha were mapped on islands of Boigi, Saibai, Moa and Turnagain respectively, which accounted for over two-thirds, or 68%, of the mangroves of the central Torres Strait. Approximately one-third (49) of the 174 islands in the central Torres Strait had mangroves. Other major mangrove forests are found on the Australian and New Guinea mainlands.

4.2.4.2.5 Submarine canyons and trenches

A number of canyons are found on the Queensland continental shelf, which lies east of the Torres Strait (Figure 4.16).

No trenches are known to exist in the Torres Strait area.

4.2.4.3 Marine biota

4.2.4.3.1 Hard and soft corals

About 70 genera of hermatypic corals have been recorded from the region (ANCEZZ 1998).

4.2.4.3.2 Other invertebrate marine fauna

Pitcher et al. (1992) reported that epibenthic macrofauna, including hard corals and sponges, in deeper areas, were extremely diverse. The distribution and abundance of the epibenthic fauna closely reflect the rockiness of the substratum. This is not surprising given that epifauna require a secure attachment to the substratum and because fine silts may interfere with feeding (Pitcher et al. 1992).

4.2.4.3.3 Algae

Pitcher et al. (1992) provided the most detailed description of the distribution of macroalgae in Torres Strait. They reported that the most abundant macroalgae in Torres Strait were Halimeda, Caulerpa and
Sargassum. The Halimeda species were widespread, whereas Caulerpa species were uncommon in the south-eastern quarter of the study area.

**4.2.4.3.4 Seagrasses**

Pitcher et al. (1992) reported that seagrass beds in Torres Strait tended to be monospecific, dominated by either Halophila spinulosa or one of the strap-form species. Other species recorded during their study included H. ovalis, Cymodocea, C. rotunda, Halodule uninervis, Thalassia hemprichii and Enhalus acaroides.

**4.2.4.3.5 Mangroves**

Approximately 27 mangrove tree species have been recorded from the region (ANZECC 1998) with the larger stands restricted to the adjoining mainland (Figure 4.17).

**4.2.4.3.6 Fishes**

Fish diversity in Torres Strait is high; with most species representing widespread Indo-pacific fauna much like the GBRWHA.

**4.2.4.3.7 Cetaceans**

According to the ERINE Environmental Database there are 11 whales and other cetaceans which may occur in the region. This includes the blue whale, humpback whale and Irrawaddy dolphin.

**4.2.4.3.8 Dugongs**

The waters of northern Australia are internationally recognised as the stronghold of the dugong (*Dugong dugon*), which is listed as vulnerable to extinction by the IUCN. Torres Strait is almost certainly the most important single dugong habitat in the world (Marsh et al. 2001). In 2001, the estimated population of dugong in Torres Strait was 14,106 ± s.e. 2,314. Results of tracking studies in 2001 suggest that dugong in Queensland and Western Australian waters undertake large-scale movements, which correlate with changes in the distribution of their seagrass food (Marsh et al. 2001).

**4.2.4.3.9 Sea turtle rookeries**

There are six species of sea turtle found in Torres Strait; the green, hawksbill, loggerhead, flatback, olive ridley and leatherback (which is rare) (Harris et al. 2000). Important rookeries of the green, hawksbill and flatback are found on islands in the Torres Strait. The green turtles nest on almost all islands in the Torres Strait that are large enough to support beaches suitable for nesting. Important rookeries are found on Bramble Cay and in the Murray Islands (Harris et al. 2000). Significant nesting sites of the hawksbill turtle are on islands of the central and eastern Torres Strait. The Torres Strait hawksbill nesting sites and those in the adjacent GBR constitute the largest nesting population in the world (Harris et al. 2000). Flatback turtles nest widely in Torres Strait, but the three northwestern Torres Strait Islands of Warul Kawa (Deliverance Island), Kerr Islet and Yur Cay are major rookeries (Harris et al. 2000).

**4.2.4.3.10 Seabird rookeries**

Important seabirds colonies are found throughout the islands of the Torres Strait.
4.2.4.4 Terrestrial habitats

Information on the terrestrial habitats on islands in the Torres Strait is limited. NRA (2003) provides detailed descriptions for two islands Mer (Murray) and Moa. They identified vine forest on sand, grassland on basalt and vine forest on basalt as the major terrestrial habitats on Mer Island. Moa Island is much larger than Mer and, therefore, supports many more habitats. These include rainforest, woodland, grassland, herbland and low woodland (NRA 2003).

4.2.4.4.1 Terrestrial flora

NRA (2003) described in detail the flora of Mer and Moa Islands. They identified six species on Mer Island were identified as conservation significant. Nine species on Moa Island were identified as conservation significant.

4.2.4.4.2 Terrestrial fauna

The terrestrial invertebrate fauna of the Torres Strait region is poorly known. NRS (2003) identified fauna of conservation significance on Mer and Moa Islands. These species include mammals, birds and reptiles.

4.2.4.5 Sensitive Marine Areas and Listed EPBC Act Marine Species

4.2.4.5.1 Marine protected areas

The northern boundary of the GBRMP is situated near the southeastern corner of Torres Strait. Round Island is also a Queensland Conservation Park.

4.2.4.5.2 World Heritage Areas

The northern boundary of the GBRWHA (this is the same as the GBRMP) is situated near the southeastern corner of Torres Strait.

4.2.4.5.3 Ramsar Wetlands

There are no Ramsar Wetlands in the study area.

4.2.4.5.4 EPBC Act Listed Species and Habitats

According to the ERIN Environmental Database, there are 23 threatened, 29 migratory and 93 listed marine species in the Torres Strait region.

4.2.4.6 Socio-economic environment of the Coral Sea

4.2.4.6.1 Commercial and traditional fishing and hunting

The estimated value of commercial and community fisheries in Torres Strait in 1998/99 was $35 million, of which prawns contributed $26 million. The sustainability of current or projected
harvest rates is not clear for most fisheries. Tropical rock lobster and bêche-de-mer are currently over-exploited and concerns exist about reef line and mackerel fisheries. Future development of fisheries in Torres Strait requires urgent resolution of the status of natural populations of harvested species and ecological sustainability of alternative development and management options. Because of catch sharing arrangements with the peoples of the Western Province of Papua New Guinea, satisfactory resolution of these issues also impacts on Australia’s treaty with Papua New Guinea. Annual dugong and green turtle harvest by Torres Strait peoples averages about 1,000 and 3,000 animals respectively. These species are threatened globally. The current levels of harvest of dugong are considered unsustainable and the sustainability of current harvest rates of turtles is uncertain. Consequently, prudent future management requirements and monitoring arrangements need to be developed as a matter of urgency. Torres Strait populations of dugongs and turtle are important for the maintenance of healthy populations of these species in Australian waters and are central to the maintenance of the traditional lifestyle of Torres Strait peoples.

4.2.4.6.2 Commercial and other shipping

Commercial shipping activity in Torres Strait, over a 28 month period, is shown in Figure 4.10. Torres Strait is a major shipping route for transit to east-coast ports of Australia. Shipping movements averaged between 1,500 and 2,000 per annum in recent years, including oil tankers of up to 100,000 dead weight tons. In March 1970 the oil tanker Oceanic Grandeur ran aground in Torres Strait and between 1,400 and 4,000 tonnes of crude oil was discharged. This is believed by some to have destroyed the productive pearl shell beds of Torres Strait, though conclusive evidence of such an impact is absent.

4.2.4.6.3 Civil aviation

There are civil aviation routes between the Australian mainland and some Torres Strait islands.

4.2.4.6.4 Petroleum activities

There is no petroleum exploration or production activity in Australian Torres Strait waters.

4.2.4.6.5 Subsea infrastructure

A subsea cable links the Australian mainland, near Cape York, with Horn Island.

4.2.4.6.6 Tourism and recreation

Much of Torres Strait is remote from large human populations and therefore tourism is limited. Marine based recreational activities are localised to areas close to towns and settlements.

4.2.4.6.7 Historic shipwrecks

The Australian Shipwreck Database identified 133 wrecks. The oldest is Mersey, which sunk in 1804.

4.2.4.6.8 Places of cultural heritage significance

According to the ERIN Environmental Database, there are six Australian Heritage Sites in the Torres Strait region. These include lightstations and cemeteries on islands in the Torres Strait. North East Cape York is listed as a natural heritage site.
4.2.4.6.9 **Places of indigenous heritage significance**

Although there are numerous places of indigenous heritage sites in Torres Strait, none listed in the ERIN Environmental Database.

4.2.4.6.10 **Native Title Claims**

The waters of Torres Strait (not including the islands) are claimed under the Torres Strait Regional Sea Claim (QC01/42). Most islands are claimed (e.g. Murray Islands) or under claim.

4.2.4.6.11 **Dumping sites and unexploded ordnance**

No sea dumping sites are recorded for the Torres Strait.

4.2.5 **Southeast Queensland Sea Areas**

4.2.5.1 **Biophysical environment**

4.2.5.1.1 **Climate**

Southeast Queensland experiences a subtropical climate with hot summers and predominantly summer-autumn rains (ANZECC 1998). The average annual rainfall is approximately 1,400 mm to 2,000 mm, but is generally less north of Fraser Island. Summer air temperatures range between 24 and 27°C and the winter range is 15–18°C (Bureau of Meteorology 2004). Mean sea surface temperatures in the region range between 21°C in winter and 26°C in summer (Australian Oceanographic Data Centre 2003).

4.2.5.1.2 **Oceanography**

The East Australian Current (EAC) dominates the coastal oceanography bringing warm, low nutrient, tropical water to the region (see Figure 4.1). This produces longshore southwards flow of Coral Sea waters into southeast Queensland waters (ANZECC 1998). This movement of tropical water affects the surrounding water temperature, current direction, and velocity. Wave heights range between 1.4 m and 3.0 m, and wave energy peaks in July with a secondary peak in February.

Localised centres of upwelling occur where warm-core eddies are generated in southeast Queensland waters as the EAC meanders away from the coast (CSIRO 2001, Brandt 1983). The upwelling events bring nutrient rich deep water to the surface, important in sustaining high levels of phytoplankton production (Edgar 2001). Isolated warm-core eddies differ from the surrounding Coral Sea in species composition, and therefore may be responsible for large-scale patchiness in pelagic distributions in the area.

The tidal range in southeast Queensland varies considerably, with the south experiencing a tidal range of 1 to 3 m and the north experiencing 4 to 9 m tidal ranges.

4.2.5.1.3 **Seabed topography**

The inner continental shelf slopes steeply from 0 to 40 m, followed by a flatter mid shelf plain at 40 m to 100 m with a steeper outer shelf at 100 m to 130 m (ANZECC 1998). The width of the continental shelf ranges from 25 km in the south, to 50 km in the north. A number of seamounts occur in offshore
waters. These include Brittania, Queensland, Brisbane, Moreton, and a number of unnamed seamounts at depths ranging from 390 m to 1,458 m in depth (Figure 4.18).

Near shore sediments of the continental shelf consists of well sorted sands that become poorly sorted muddy sands and carbonate-rich sands with shelly gravels as the shelf slopes seaward (ANZECC 1998). Sediments of the continental slope and abyssal plain have not been extensively studied.

### 4.2.5.1.4 Islands

The coastline of the study area incorporates major population centres (Byron Bay, the Gold Coast, Brisbane, Sunshine Coast, and Bundaberg). The coastline consists of numerous beaches and rocky headlands the most prominent of which is Cape Byron, Point Danger, and Double Island Point. Offshore islands occur to the north of Southport (North and South Stradbroke Island), north and east of Brisbane (Bribie Island and Moreton Island), and north of Double Island Point (Fraser Island). Several smaller islands also occur in association with these islands mentioned.

### 4.2.5.2 Marine habitats

#### 4.2.5.2.1 Marine ecosystems

The IMCRA classified Southeast Queensland waters into a single meso-scale region, namely the Tweed-Moreton region. The area falls into the Central Eastern Biotone (ANZECC 1998).

#### 4.2.5.2.2 Coastal and oceanic habitats

Southeast Queensland waters can be divided into neritic and oceanic provinces, which include ecosystems of the continental shelf and slope respectively. The functional ecotonal boundary between these two provinces is deemed to approximately the 200 m isobath (water depth contour). The neritic zone contains four primary biomes (major ecological communities extending over large natural areas) estuaries, coastal marine, demersal shelf and pelagic shelf ecosystems. All four are represented in the region. The coastal marine biome includes habitats within the near-shore zone to the circalittoral fringe (depth 40 m). The demersal shelf and pelagic biomes lie beyond this depth between the 40 m and 200 m isobath. Animals occupying the demersal habitats live close to the bottom either in the substratum, on the bottom, or in the associated water column immediately above. Pelagic habitats are those of the open water column above.

The oceanic zone also consists of four biomes: continental slope, abyssal, epipelagic and meso/bathypelagic ecosystems. The continental slope and abyss contain demersal habitats that are usually separated by the 200 m isobath. The upper 200 m of the ocean is defined as the epipelagic biome. The deeper pelagic zone below consists of the mesopelagic (200-1,000 m) and bathypelagic (deeper than 1000 m) that comprise meso/bathypelagic biome.

#### 4.2.5.2.3 Coral reefs

Temperate and subtropical reefs off southeast Queensland are equally as remarkable and diverse as coral reefs further north in the tropics (Edgar 2001). Many reef-associated groups of organisms have a greater taxonomic diversity than in any other region of a comparable size worldwide. Seaweeds transform reefs in temperate regions by adding vertical structure, just as corals do in subtropical and tropical areas to the north (Edgar 2001).
Offshore fringing reefs are found include Hutchison Shoal, Flinders Reef, Smith Rock, Brennan Shoal, and Roberts Shoal. These fringing reefs contain a variety of habitats associated with rocky reefs, including kelp, barrens habitat and sponge gardens, and coral reefs, including coral bommies, rocky rubble, and muddy/sandy lagoons. They are a popular public resource for fishing, snorkelling and SCUBA diving. The proximity and accessibility of these reefs off Moreton Island, and the presence of historic wrecks, suggest they are vulnerable to direct human disturbance.

4.2.5.2.4 Seagrass beds

According to the Queensland Department of Primary Industry CHRI-WEB site, the largest seagrass beds in southeast Australian waters are confined to Hervey Bay and Moreton Bay.

4.2.5.2.5 Mangrove forest

Mangroves are found in most estuaries and rivers months situated along southeast Queensland. Similar to seagrass beds, the largest mangrove forests are found in Hervey Bay and Moreton Bay (Figure 4.19).

4.2.5.2.6 Seamounts

A series of seamounts, known as the Tasmanid Seamounts, lies about 200 km off the southern Queensland coastline (Harris 2004) (Figure 4.18).

4.2.5.2.7 Submarine canyons and trenches

Canyons exist in a number of locations on continental shelf in southeast Queensland waters (Figure 4.18).

No trenches are known in the study area.

4.2.5.3 Marine biota

4.2.5.3.1 Hard and soft corals

Knowledge on the hard and soft corals in southeast Queensland is limited, with most studies restricted to the Moreton Bay area. Flinders Reef, situated north of Moreton Island has 119 coral species (Davie 1998). In contrast, only 40 species have been recorded from inside Moreton Bay.

4.2.5.3.2 Other marine invertebrate fauna

Information on marine invertebrate fauna, other than corals, in the region is scarce. Davie (1998) reported that the Moreton Bay region supports more than 3000 species of free-living marine invertebrates.

4.2.5.3.3 Algae

Two hundred and seventy-five species of macroalgae have been recorded in Moreton Bay (Phillips 1998). With increasing depth brown and then red algae predominate. Where light is further reduced sponges, hard corals, ascidians and red algae are common, especially on rocky seamounts such as the Moreton, Brisbane, Queensland, and Brittania seamounts off southeast Queensland (Butler 1995).
Animal assemblages in these habitats are likely to be determined by factors such as depth, slope and nature of the substratum, wave action, light levels, siltation, turbidity, and biological processes, particularly herbivory (Underwood et al. 1991).

4.2.5.3.4 Seagrasses

According to the Queensland Department of Primary Industry CHRI-WEB site, the species characterising the seagrass beds in Hervey Bay are *Halophila spinulosa*, *H. ovalis* and *Halodule uninervis*. Seagrasses in Moreton Bay are dominated by *Zostera capricornis*, *H. uninervis* and *H. ovalis*.

4.2.5.3.5 Mangroves

According to the Queensland Department of Primary Industry CHRI-WEB site, the most abundant mangroves in Hervey and Morteton Bay are: *Rhizophora*, *Avicennia*, *Ceriops* and *Aegiceras*.

4.2.5.3.6 Fishes

Many species of bony fishes and sharks frequent the surface waters of the continental shelf off NSW and Queensland. The distributions and abundances of these pelagic species varies seasonally. The occurrence of predominantly tropical species along the northern NSW and southern Queensland coasts coincides with the southward transport of warm Coral Sea water by the East Australia Current. At these times species such as black marlin (*Maikara indica*) and tiger sharks (*Galeocerdo cuvieri*) may be encountered. Large, migratory sharks that are seasonally abundant at other times in NSW and Queensland shelf waters include blue sharks (*Prionace glauca*), mako sharks (*Isurus oxyrhinchus*) and the hammerheads (*Sphyrna lewini* and *S. zygaena*) (Stevens 1984). Many species of pelagic fishes are found in NSW and Queensland shelf waters either as permanent residents or as migrants (Thomson 1960; Maclean 1974), including yellowfin tuna (*Thunnus albacares*), southern bluefin tuna (*T. maccocyti*), kingfish (*Seriola lalandi*), tailor (*Pomatomus saltator*), Australian salmon (*Arripsis trutta*), sea garfish (*Hyporhamphus australis*), and many species of baitfish such as pilchards (*Sardinops neopilchardus*), blue mackerel (*Scomber australasicus*) and yellowtail (*Trachurus novaezelandiae*). Large schools of sea mullet (*Mugil cephalus*), which spend much of their life cycle in estuaries, migrate northward to spawn through the shallow coastal waters of northern NSW and southern Queensland, usually in autumn (Thomson 1960; Maclean 1974). Many of these species, both sharks and bony fishes, support important recreational and/or commercial fisheries.

4.2.5.3.7 Cetaceans

Various species of marine mammals have been recorded in southeast Queensland waters. The most common cetaceans are the common dolphin (*Delphinus delphis*), the bottlenose dolphin (*Tursiops truncatus*) and the long-finned pilot whale (* Globicephala melaena*) (The Ecology Lab 1988). Lesser numbers of humpback whales (*Megaptera novaeanangliae*) and southern right whales (*Eubalaena australis*) also occur. Southern right whales prefer sheltered coastal embayments where they do occur. Humpback whales migrate annually along the east Australian coast. The northern migration occurs during winter months in inshore and coastal waters, whilst the southern migration happens in late spring and early summer (Baker 1983). Humpbacks calve in tropical waters of Queensland in winter and feed in subantarctic and Antarctic waters in summer. The northern migration of these whales in 1992 was estimated to have been in the order of 1,900 ± 250 individuals (Paterson *et al.* 1994), almost 20 times the number estimated at the cessation of whaling 30 years earlier. This indicates that the east
Australian stock is recovering well. Humpback migration activity in southeast Queensland waters is concentrated in the coastal margins.

Other cetaceans such as sperm whales (*Physeter macrocephalus*) and killer whales (*Orcinus orca*) also frequent the open seas off the northern NSW and Queensland coasts. Large cetaceans such as the blue whale (*Balaenoptera musculus*) and sperm whales typically occur in oceanic waters or on continental shelf breaks.

### 4.2.5.3.8 Dugongs

Moreton Bay and Hervey Bay are important dugong habitats in southeast Queensland waters. Not surprisingly, these Bays support the largest seagrass beds in the area, which is the primary source of food for the dugong. Marsh & Lawler (1999) undertook an aerial survey of dugong abundance and distribution of dugong in southeast Queensland. Compared with northern Australian waters, abundance were low. One hundred and sixty-one dugongs were recorded in Hervey Bay and only twelve in Moreton. The authors claimed that poor weather during the survey of Moreton Bay accounted for the low count.

### 4.2.5.3.9 Sea turtle rookeries

Various species of marine turtles have been recorded in southeast Queensland waters. The leatherback turtle (*Dermochelys coriacea*) nests in Queensland and on islands in Australia’s north, but it is commonly found in estuaries along the central east Australian coast. Other marine turtles that occur in the region include the loggerhead turtle (*Caretta caretta*), the green turtle (*Chelonia mydas*), the hawksbill turtle (*Eretmochelys imbricata*) and the flatback turtle (*Natator depressus*).

### 4.2.5.3.10 Seabird rookeries

Seabirds may forage in or migrate through southeast Queensland waters. At least six species have been recorded as actively breeding, or potentially breeding on islands in the region. They include the shearwater (*Puffinus pacificus*), crested terns (*Sterna bergii*), monarchs (*Monarcha melanopsis* and *M. trivirgatus*), flycatchers (*Myiagra cyanoleuca*) and fantails (*Rhipidura rufifrons*); all are listed as protected under the EPBC Act. Moreover, the tristen albatross (*Diomedea daddenna*) is listed as endangered and is recorded as foraging within southeast Queensland waters.

Seabirds known to occur in the region including herons, plovers, albatrosses, oystercatchers, storm-petrels, gulls, terns, noddies, Australian pelicans (*Pelecanus conspicillatus*), cormorants, grebes, petrels, prions, shearwaters, sandpipers, stints, curlwills, snipes, spoonbills, and ibises. Many of these seabirds are listed as endangered, vulnerable or protected under the EPBC Act and the Queensland Nature Conservation Act 1992.

### 4.2.5.4 Terrestrial habitats

The following sections relate to the terrestrial fauna and flora of the largest islands in the study area – Moreton, Stradbroke and Fraser Island. This information was provided by Dr. Rosemary Nieu from the Queensland Herbarium and can be accessed at:

4.2.5.4.1 Terrestrial flora

Moreton Island is 35 km long and 10 km at its widest. The vegetation is typical of other sandy islands, but notable features include mallee forms of eucalypts, an extensive area of heath and mallee heath in the north and central north. A small patch of rainforest is also found on the Island. North Stradbroke Island supports wallum forest and scrub. Ti-trees, scribbly gum and other eucalypts, bloodwoods and casuarinas are common. South Stradbroke Island has a uniform cover of wallum scrub down the centre and western shore, with low-growing dune vegetation on the ocean side. Fraser Island supports large areas of satinay and brush box forest. It also supports rainforest and wallum heathlands.

4.2.5.4.2 Invertebrate terrestrial fauna

There has been little published research done on the islands in the study area. The islands undoubtedly support a diverse range of these organisms.

4.2.5.4.3 Vertebrate terrestrial fauna

The islands in the study area support a range of mammal vertebrate fauna including grey kangaroos, swamp wallabies and native rats and mice. North Stradbroke Island supports the water mouse (*Xeromys myoides*), one of Australia’s rarest animals.

4.2.5.5 Sensitive Marine Areas and Listed EPBC Act Marine Species

4.2.5.5.1 Marine protected areas

Moreton Bay Marine Park is situated in the study area (see Figure 4.6a). There are no Commonwealth Marine Protected Areas in the study area. A dugong sanctuary is situated between the mainland and Fraser Island.

4.2.5.5.2 World Heritage Areas

The only World Heritage site in the study area is Fraser Island. In addition, the study area adjoins the southern boundary of the GBRWHA.

4.2.5.5.3 Ramsar Wetlands

There are two Ramsar wetlands in the study area: Moreton Bay and Great Sandy Strait (see Figures 4.8).

4.2.5.5.4 EPBC Act listed species and habitats

A search using the DEH Protected Matters Search Tool revealed 13 threatened species and 16 migratory species likely to occur in southeast Queensland waters. No threatened ecological communities were recorded.
4. THE GREAT BARRIER REEF WORLD HERITAGE AREA AND CONTIGUOUS AREAS: EXISTING ENVIRONMENTS

4.2.5.6 Socio-economic environment

4.2.5.6.1 Commercial fishing

The Commonwealth and State jointly manage commercial fisheries located in southeast Queensland waters (see Figure 4.9). These are the:

- Eastern Tuna and Billfish Fishery, which extends over the whole eastern seaboard. The target species are yellowfin tuna (*Thunnus albacares*), big-eye tuna (*T. obesus*), broadbill swordfish (*Xiphias gladius*) and skipjack tuna (*Katsuwonus pelamis*). The fishing gear used includes pelagic longlines and purse seines, and the estimated catch value of the fishery is approximately $55 million per annum (Australian Fisheries Management Authority 2003);

- Trawl fisheries, which targets prawns, scallops, and bugs, and extends the entire coast of Queensland and NSW (Queensland Department of Primary Industries 2003). This fishery is Queensland’s largest, producing up to 10,000 tonnes of product worth over $100 million each year;

- Reef-line and Rocky Reef Fisheries, which extend from the Gulf of Carpentaria, to the eastern seaboard of Queensland and NSW, targets species such as coral trout, red emperor, red throat, snapper, and pearl perch (Queensland Department of Primary Industries 2003). Over the past few years, fishers have harvested approximately 3,500 to 4,000 tonnes valued at $30 million to $40 million; and

- Queensland East Coast Inshore Finfish Fishery, which is multispecies covering all waters under Queensland jurisdiction. The species targeted include mullet, tailor, bream, whiting, flathead, mackerel, mulloway, shark, snapper, and threadfins (Queensland Department of Primary Industries 2003). The fishery is primarily a net fishery.

Other fisheries that operate in southeast Queensland waters include the crab fishery (targeting spanner, blue swimmer, and sand crabs), the harvest fishery (targeting tropical lobster, aquarium fish, sea cucumber, and trochus shells), and the bait fishery (targeting beach worms and bloodworms).

Some production of oysters (*Saccostrea amasa* and *S. echinata*) occurs on aquaculture leases at Hervey Bay.

Commercial trawling has the potential to be disrupted by solid debris on the seafloor. Moreover, trawlers occasionally collect unexploded ordnance, which can be a major risk.

4.2.5.6.2 Commercial and other shipping

Commercial shipping activity in southeast Queensland waters over a 36 month period, is shown in Figure 4.10. The most significant ports in the region where merchant ships trade include Moreton Bay and Brisbane. Important fishing ports in the region include Fraser Island, Moreton Bay, The Broadwater, Surfers Paradise and the Gold Coast.

Shipping within the area is that transiting between southern Australian ports and ports further north, forming a band of activity parallel to the coast. Merchant ships commonly sailing in the area include bulk carriers, container vessels and tankers.

4.2.5.6.3 Civil aviation
4.2.5.6.4 Petroleum activities

No petroleum exploration lease is located within southeast Queensland waters (Queensland Natural Resources and Mines 2003). To date, no wells have been drilled in the offshore area, and therefore no offshore petroleum infrastructure exists in region.

4.2.5.6.5 Subsea infrastructure

A subsea cable links the Australian mainland, near Bingham, with Fraser Island.

4.2.5.6.6 Tourism and recreation

Tourism and recreation are most important in the near shore waters of southeast Queensland waters, such as around Surfers Paradise, Brisbane and the Gold Coast. Tourism-based activities include dive charters, charter boat fishing, watercraft hire, dolphin and whale and watching cruises and ecotours and wild dolphin feeding at Moreton Island (Marine Parks Authority 1999). Recreational activities include swimming, fishing, beach activities, SCUBA diving, snorkelling, boating, sailing and surfing.

Recreational boating is common in the region, particularly in inshore waters. Weekends are the busiest times for recreational fishers, snorkellers and divers, particularly in summer and on public holidays. Boats can be chartered from most towns in the Moreton Bay area and nearby Surfers Paradise and Gold Coast. Many people also use their own boats. Boat launching areas are available in Moreton Bay, The Broadwater, Surfers Paradise, and the Gold Coast (Ross 1995). Several near shore reef areas that are popular with recreational fishers include Hutchison Shoal, Flinders Rock, Smith Rock, Brennan Shoal, and Roberts Shoal at Cape Moreton, and Shallow Tempest and Hendersons Rock east of Moreton Island (Ross 1995). These reefs attract high boating traffic throughout the year (CSIRO 2003 pers. comm.). The occurrence of recreational vessels is likely to decrease offshore.

4.2.5.6.7 Historic shipwrecks

A search of the Australian Historic Shipwreck Data Base revealed 173 records for the marine waters between Bundaberg and the New South Wales border. The oldest wreck is *Amelia*, which sank in the area in 1816.

4.2.5.6.8 Places of cultural heritage significance

A search of the Australian Heritage Database revealed no heritage listings for marine waters in the study area.

4.2.5.6.9 Places of indigenous heritage significance

Indigenous heritage places are found along the mainland and on the major islands.

4.2.5.6.10 National Native Title Claims

A search of the National Native Title Tribunal website revealed two claims covering large area of marine waters in the study area. These are the Turrabal People Claim (QC98/26) who have claimed
offshore waters between the New South Wales border and the southern tip of Fraser Island. The Darumbal People Claim (QC97/21) covers offshore waters north of Rockhampton.

### 4.2.5.6.11 Dumping sites and unexploded ordnance

Chemical warfare agents were dumped in southeast Queensland waters in the late 1940s, together with a considerable amount of unexploded ordnance. Most of these materials were dumped east of Brisbane, generally in deep water off the continental shelf (see Figure 4.14). Locations where major amounts of material in relatively shallow water have been dumped are shown in Table 4.9.

#### Table 4.9 Unexploded Ordnance and Chemicals Dumped in Southeast Queensland Waters

<table>
<thead>
<tr>
<th>Material dumped</th>
<th>Date dumped</th>
<th>Depth</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexploded depth charges</td>
<td></td>
<td></td>
<td>26.912°S</td>
<td>153.143E</td>
</tr>
<tr>
<td>662 tonnes unexploded depth</td>
<td>1962</td>
<td>284 m</td>
<td>Approx 27°S</td>
<td>Approx 153.7°E</td>
</tr>
<tr>
<td>charges</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000 tonnes mortars, ammunition</td>
<td>1962-1968</td>
<td>284 m</td>
<td>Approx 27°S</td>
<td>Approx 153.7°E</td>
</tr>
<tr>
<td>6,800 tonnes weapons parts</td>
<td>24/3/69</td>
<td>265 m</td>
<td>25.967°S</td>
<td>153.733°E</td>
</tr>
</tbody>
</table>
5. MANAGEMENT OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

5.1 INTRODUCTION

This Section provides an overview of the principle conservation management mechanisms applying within the GBRWHA.

5.2 RECOGNITION AND MANAGEMENT OF CONSERVATION SIGNIFICANT AREAS, COMMUNITIES AND SPECIES

5.2.1 Management of The Great Barrier Reef Marine Park

In mid-2003 the GBRMPA proposed adoption of a modified approach to management through zoning of representative areas. The draft of the new plan identified seven different zones (Table 5.1 and Figures 5.1a-e), afforded differing levels of protection and permitted uses. This draft was subsequently adopted in early 2004.

The 2004 zoning plan proposed dispensing with designated special management areas, including declared Defence Practice Areas. These are to be replaced by Special Management Areas (SMA). SMAs will be declared to restrict access or use within a specific area of the marine park, with special management provisions applying on a temporary, seasonal or permanent basis. SMA may be designated for a number of reasons including:

- conservation of a particular species or natural resource, e.g. turtle, bird nesting
- sites or fish spawning aggregation sites;
- restricting access due to public safety (NB: this may used to relate to Defence use);
- amenity reasons; and
- response to an emergency (e.g. a ship grounding, oil spill or marine pest outbreak).

Proposed SMA include the Port Clinton (Reef Point–Cape Clinton), Shoalwater Bay and Cleveland Bay Dugong Protection Areas.

Designation of any SMA will normally require GBRMPA to undertake formal community consultation followed by Gazettal and public notification. In an emergency situation requiring immediate management action, an SMA may be declared expediently via public notice, but this may only apply for a continuous period of up to 90 days.

Defence activities will still be permitted within the GBRMP, and any zone within the marine park may be used or entered for Defence purposes, without permission after notification to the Authority and subject to any directions given by the Authority to undertake Defence activities which may not otherwise be allowed without permission under the 2003 draft Zoning Plan.

Shipping and general navigation are to be restricted to defined Shipping Areas, although this restriction will not apply to ADF vessels. The proposed shipping areas reflect current and projected shipping routes, and allow for growth in shipping traffic.

Categories of proposed management areas, and their links with DPA within the GBRMP are summarised in Table 5.1.
5. MANAGEMENT OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

### Table 5.1 Proposed GBRMP Zones and Links With DPA

<table>
<thead>
<tr>
<th>Zone</th>
<th>Rationale and Purpose</th>
<th>Affected DPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>General use</td>
<td>Least restrictive of all the zones, provides for the conservation of areas of the Marine Park while allowing opportunities for reasonable uses, including trawling and shipping.</td>
<td>Portions of R778, R767 and R784. Most of R747 and R748. Most of R689 and portions of R680, R682 and R683 in SWBTA. Portion of R693.</td>
</tr>
<tr>
<td>Habitat protection</td>
<td>Provides for reasonable use including most commercial and recreational activities. Trawling and shipping (other than in a designated Shipping Area) are prohibited.</td>
<td>Portions of R783, R778, R767, R784, R747, R748 and R689.</td>
</tr>
<tr>
<td>Conservation park</td>
<td>Provides for appreciation, recreational and other limited uses including limited line fishing, spearfishing and collecting.</td>
<td>Portions of R783 and R784A. Portions of R682 and R683 (incl. Freshwater Beach) in the SWBTA.</td>
</tr>
<tr>
<td>Buffer</td>
<td>Provides for appreciation and enjoyment of an area in a relatively undisturbed state but permits gamefishing and certain types of commercial line fishing.</td>
<td>Portion of R767.</td>
</tr>
<tr>
<td>Scientific research</td>
<td>Primarily intended for scientific research conducted in association with a research station. Also allows for appreciation and enjoyment of the area by the public. Generally free from extractive activities, other than scientific research. Use of and entry to may also be restricted.</td>
<td>Nil</td>
</tr>
<tr>
<td>Marine national park</td>
<td>Allows for appreciation and enjoyment of areas in a relatively undisturbed state. The ‘look but don’t take’ zone is generally free from extractive activities.</td>
<td>Portions of R783, R778, R767, R748, R693, R689, R686, R68, R680 and Cowley Beach.</td>
</tr>
<tr>
<td>Preservation</td>
<td>Provide for the preservation of areas in an undisturbed state. Entry is prohibited, except in an emergency or for access to a Queensland port by the most reasonable route. Exceptions may be permitted for scientific research that is a priority for the management of the Marine Park and cannot be conducted elsewhere.</td>
<td>Nil</td>
</tr>
</tbody>
</table>

(Sources: GBRMPA 2003b, 2003c)

### 5.2.2 Conservation Management of Marine Species and Communities

The EPBC Act allows for the identification of processes that endanger the survival of species and ecological communities, and the development and implementation of measures designed to assist recovery and reduce threats to their survival. These individual measures are (Environment Australia, 2003c):

- Key Threatening Processes;
- Action Plans;
- Conservation Overviews;
- Recovery Plans;
- Declared Critical Habitat; and
- Threat Abatement Plans.
5. MANAGEMENT OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

These conservation measures are expanded upon below. These specific measures for threatened species are in addition to the general protection afforded by the EPBC Act for migratory species, cetaceans and listed marine species.

Key Threatening Processes
A Key Threatening Process is one that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

A process can be listed as a key threatening process if it could:

- cause a native species or ecological community to become eligible for adding to a threatened list (other than conservation dependent);
- cause an already listed threatened species or threatened ecological community to become more endangered; or
- adversely affect two or more listed threatened species or threatened ecological communities.

Once a threatening process is listed under the EPBC Act a Threat Abatement Plan can be put into place if it is proven to be "a feasible, effective and efficient way" to abate the threatening process.

Of the 14 Key Threatening Processes currently established under the EPBC Act, only one, *Injury and Fatality to Vertebrate Marine Life Caused by Ingestion of, or Entanglement in, Harmful Marine Debris*, has a possible link with military activities in the GBRWHA.

Action Plans
Action plans are management plans that have been produced by DEH since the commencement of the Endangered Species Program in 1989.

Action plans are strategic documents intended to arrest the decline of, stabilise and promote the recovery of populations of a defined group of related organisms. They review the conservation status of major Australian taxonomic groups against IUCN categories, identify threats and recommend actions to minimise those threats. Action plans assist in the establishment of national priorities for threatened species conservation.

A total of 11 action plans are currently in place, four of which have relevance to Defence activities in the GBR region. These are:

- The Action Plan for Australian Cetaceans – 1999; and

An action plan for dugong is in preparation.

It should be noted that due to changes in status since the time of preparation of the Plans, the conservation status of many of the species referred to in the above action plans may have changed.
Conservation Overviews
Conservation overviews are more general reviews of conservation issues for taxa where not enough is known to review the status of all individual species within that taxon. Two conservation overviews have been prepared to date (notwithstanding the combined Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes – 2002); neither of these overviews is of relevance to marine species.

Conservation overviews for marine invertebrates and marine algae are currently in preparation.

Recovery Plans
The Minister for the Environment and Heritage may make or adopt and implement recovery plans for threatened species (other than conservation dependent species) and threatened ecological communities listed under the EPBC Act.

Recovery plans set out the research and management actions necessary to stop the decline of, and support the recovery of, listed threatened species or threatened ecological communities. The aim of a recovery plan is to maximise the long-term survival in the wild of a threatened species or ecological community.

Recovery plans state what must be done to protect and restore important populations of threatened species and habitat, as well as how to manage and reduce threatening processes. Recovery plans achieve this aim by providing a framework for key interest groups and responsible government agencies to coordinate their work to improve the plight of threatened species and/or ecological communities.

To date 144 recovery plans have been established, with another four in the draft stage. Two recovery plans address marine or avian species that may be present in the marine sectors of GBRWHA. These are those concerned with:

- Abbott’s Booby; and
- Grey Nurse Shark.

Declared Critical Habitat
The Commonwealth Minister for the Environment and Heritage may identify and list habitat critical to the survival of a listed threatened species or ecological community. Details of such identified habitat are recorded in a Register of Critical Habitat maintained by DEH.

Declaration of habitat critical to the survival of a species or ecological community depends largely on the particular requirements of the threatened species or ecological community concerned. For example, areas only incidentally used by a threatened species, and which the species is unlikely to be dependent upon for its survival or recovery, may not be areas of habitat critical to the survival of that particular species.

Identification of Critical Habitat takes into account the following matters:

- whether the habitat is used during periods of stress (e.g. flood, drought, fire);
- whether the habitat is used to meet essential life cycle requirements (eg foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);
- the extent to which the habitat is used by important populations;
- whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;
5. MANAGEMENT OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

- whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;
- whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation; and
- any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.

Information on the Register of Critical Habitat is publicly available unless determined by DEH that it is necessary to keep the information out of the public domain in order to protect the species, community or the habitat, and/or to protect the interests of relevant landholders.

Under the EPBC Act, it is an offence to take an action that will significantly damage the Critical Habitat of a listed threatened species (except a species in the conservation dependent category), or a listed threatened ecological community, if the Critical Habitat is in a Commonwealth area.

No currently declared (publicly listed) Critical Habitat exists within or adjacent to any GBR DPA.

**Threat Abatement Plans**

Threat Abatement Plans provide for the research, management, and any other actions necessary to reduce the impact of a listed Key Threatening Process to a threatened species or ecological community. Implementing the plan is intended to assist the long term survival in the wild of the threatened species or ecological community.

Within 90 days of listing a Key Threatening Process the Minister for the Environment and Heritage must decide if a Threat Abatement Plan should be made or adopted for the species or ecological community concerned. This decision is based on whether having and implementing a plan is the most “feasible, effective and efficient way to abate the process”.

Six Threat Abatement Plans have been approved to date. These are:

- incidental catch (or bycatch) of seabirds during longline fishing operations;
- predation by feral cats;
- competition and land degradation by feral rabbits;
- competition and land degradation by feral goats;
- predation by European Red Fox; and
- dieback caused by the root-rot fungus (*Phytophthora cinnamomi)*.

The Threat Abatement Plans dealing with feral goats has relevance to some of the islands within DPA, and there may also be some linkages with those plans addressing rabbits and foxes. Townshend Island, within the SWBTA, was severely degraded as a result of a feral goat population until control measures were introduced in the mid-1990s.

None of the current Plans concern military maritime activities in the GBRWHA.

5.2.3 Exotic Species

5.2.3.1 Introduced marine pest risks

Introduced marine pests threaten the ecological integrity of Australia’s marine ecosystems, by direct predation of native species, or out-competing native species for habitat space and
5. MANAGEMENT OF THE GREAT BARRIER REEF WORLD HERITAGE AREA

resources. Introduced marine pests can also jeopardize the social and economic benefits derived from the marine environment. Elements at risk include aquaculture and commercial fisheries, industrial infrastructure, recreational activities and shipping. Potential marine pests include fish, marine invertebrates, algae and phytoplankton, and toxic dinoflagellates which can pose a threat to human health through paralytic shellfish poising. Apart from the exotic species themselves, introduced biota may act as a transport vector for pathogenic organisms that may in turn harm native species.

It has been estimated that over 200 exotic marine species, not all potential pests, have been introduced into Australian waters as fouling of ships and boats, in ballast water and ballast tank sediments, or imported deliberately for aquaculture or the aquarium trade.

5.2.3.2 Terrestrial quarantine risks

Troops, vehicles, aircraft and equipment involved in amphibious exercises in Australian training areas may sometimes arrive direct from overseas. Whether loaded overseas or elsewhere in Australia, the lodgement and extraction of forces ashore carries a risk of introducing or translocating non-native species or organisms into an area, for example, carriage of the Brown Tree snake (*Boiga irregularis*) from Guam to Shoalwater Bay, or the Cane toad (*Bufo marinus*) from Cowley Beach to Sydney. There is also the risk of introduction or translocation of exotic weeds and soil pathogens, which may be carried as plant material or within mud and grime attached to vehicles and equipment.
6. RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

6.1 INTRODUCTION

The outcomes of the identification and evaluation of environmental risks from Defence activities in the GBRWHA are discussed and placed into context within the overall significance of the potential environmental impacts. A comparison is also conducted between the environmental implications of Defence activities in the GBRWHA and other human activities in Australia’s coastal and oceanic areas.

6.2 DEFENCE ACTIVITIES IN THE GBRWHA

This section, supported by the Appendices A, B and C, provides an overview of Defence activities in the GBRWHA and contiguous areas, identifies potential vectors for degradation of the GBR’s World Heritage values arising from these activities, and concludes with analysis of the actual risk of adverse environmental outcomes arising from these actions. A substantial proportion of the technical information and analyses supporting the assessments made in this section is to be found in the Initial Environmental Review of the ADFMA EMP (URS 2004), particularly Appendices P and S.

As previously noted, Defence activities in the GBR region range from simple ‘evolutions’ (i.e. any exercise or training activity) involving single units, to large, complex, multi-faceted activities involving many air, sea and amphibious units spread over a number of days or sometimes weeks. Nevertheless, all of these activities can be reduced to a number of discrete actions, which are then compiled in the desired manner to produce the intended activity. For example, the release of a sonobuoy from a shipborne helicopter in order to track a submarine during an ASW can be considered to encompass:

- transit and manoeuvre of the ship to which the helicopter is attached;
- transit and manoeuvre of the submarine which the helicopter is searching for;
- launch and recovery of the helicopter;
- forward flight and periodic hovering of the helicopter;
- use of ship-mounted sonar in searching for a submarine; and
- use of helicopter deployed sonobuoys.

Therefore, it is germane to consider the environmental effects of military maritime activities in a reductionist sense, by considering the discrete components which constitute the whole, with due recognition of any cumulative effects which may occur. In this manner, consistent environmental risk reduction measures can be developed for, and applied to each of these discrete components. In accordance with this approach, Appendix A examines potential environmental impact vectors within the categories of:

- platforms (i.e. ships and aircraft);
- weapon systems;
- sensor systems;
- communications systems;
- countermeasures systems;
- target systems;
- instrumented ranges; and
- miscellaneous systems and activities (includes minesweeping, diver training, explosives training, acoustic markers, flares and marine markers) (Appendix B provides details of
the explosive training activities conducted in Shoalwater Bay and their known and predicted effects on values in this region).

In considering these discrete components, distinction is made between those activities which are:

- routinely or periodically conducted by Defence within the confines of the GBRWHA;
- infrequently conducted by Defence within the confines of the GBRWHA;
- routinely or periodically conducted by Defence in areas contiguous to the GBRWHA, but not within the confines of the GBRWHA; and those
- infrequently conducted by Defence in areas contiguous to the GBRWHA, but not within the confines of the GBRWHA.

Table 6.1 expands upon this theme.

**Table 6.1  Defence Activities and Their Likelihood of Being Conducted Within Waters and Islands of the GBRWHA or in Contiguous Areas**

<table>
<thead>
<tr>
<th>Activity/Equipment Use</th>
<th>Will or is Likely to Occur Within the GBRWHA</th>
<th>May Occur Within the GBRWHA</th>
<th>Will or is Likely to Occur Within the Coral Sea</th>
<th>May Occur Within the Coral Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ship general passage and seamanship activities</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of ship's boats and other small watercraft</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Oily waste discharges from ships</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewage discharges (iaw Annex IV of MARPOL 73/78)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewage discharges (iaw GBRMP Regulations but not MARPOL 73/78)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal of garbage (iaw Annex V of MARPOL 73/78)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal of plastics</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Ballast water discharge (iaw Australian regulations)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underway replenishment-at-sea</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refuelling while at anchor (minor vessels)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anchoring</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibious activities</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collision and grounding</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Submarine bottoming</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High altitude flight</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Low altitude flight and hover</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Supersonic flight</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air combat and intercept training</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical replenishment (VERTREPs) and helicopter transfers</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Inflight refuelling</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Ditching of aircraft</td>
<td>X</td>
<td>X</td>
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<td></td>
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<tr>
<td>Jettisoning or abnormal release of aircraft stores and fuel</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Medium calibre ship guns</td>
<td>X (1)</td>
<td>X</td>
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<tr>
<td>Small calibre ship guns</td>
<td>X</td>
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<tr>
<td>Small arms</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Aircraft guns</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Land-based guns and mortars</td>
<td>X (2)</td>
<td>X</td>
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<td></td>
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<tr>
<td>Surface-to-air missiles</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface-to-surface missiles</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Air-to-air missiles</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air-to-surface missiles and rockets</td>
<td>X (3)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavyweight torpedoes</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 6. RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

<table>
<thead>
<tr>
<th>Activity/Equipment Use</th>
<th>Will or is Likely to Occur Within the GBRWHA</th>
<th>May Occur Within the GBRWHA</th>
<th>Will or is Likely to Occur Within the Coral Sea</th>
<th>May Occur Within the Coral Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightweight torpedoes</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-explosive bombs</td>
<td>X (3)</td>
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<tr>
<td>Practice bombs</td>
<td>X (3)</td>
<td>X</td>
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<tr>
<td>Anti-ship mines (practice versions only)</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Depth charges and depth bombs</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Active sonar</td>
<td>X</td>
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<tr>
<td>Sonobuoys</td>
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<tr>
<td>Ship early warning, search and navigation radar</td>
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<td>X</td>
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<tr>
<td>Ship fire control and weapon guidance radar</td>
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<td>X</td>
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<tr>
<td>Airborne radar</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Lasers</td>
<td>X</td>
<td>X</td>
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<td>Radio frequency communication systems</td>
<td>X</td>
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<tr>
<td>Underwater telephones</td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>Chaff</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Infra-red flares</td>
<td>X</td>
<td>X</td>
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<td></td>
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<tr>
<td>Nulka</td>
<td>X</td>
<td>X</td>
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<tr>
<td>AN/SLQ-25 Nixie</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Submarine decoys</td>
<td>X</td>
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<tr>
<td>Radio frequency jamming</td>
<td>X</td>
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<tr>
<td>Kalkara target system</td>
<td>X</td>
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<tr>
<td>Supersonic air target system</td>
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<tr>
<td>Towed air targets</td>
<td>X</td>
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<td>Radio controlled surface targets</td>
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<td>Other surface targets</td>
<td>X</td>
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<td>EMATTs</td>
<td>X</td>
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<td>Portable signature measurement ranges</td>
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<td>Mine disposal vehicles</td>
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<td>Mine disposal charges</td>
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<td>Mechanical minesweeps</td>
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<td>Acoustic and magnetic influence minesweeps</td>
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<td>Diver training</td>
<td>X</td>
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<td>Demolition charges, demolition training and shock trials</td>
<td>X</td>
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<td>Pyrotechnic flares and marine markers</td>
<td>X</td>
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<td>Signals, Underwater Sound (SUS)</td>
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<td>Marine sound signals and thunderflashes</td>
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<td>Australian Submarine Rescue Vehicle (ASRV) Remora</td>
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<td>Parachuting</td>
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<td>XBTs and SSXBTs</td>
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<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Underwater acoustic markers and trackers and sound activated release systems</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Floating fuel bladders (exercise use only)</td>
<td>X</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>Dye markers</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Air sea rescue kits</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous other stores</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Will only occur when ships are firing into Townshend Island range.
2. Only in approved land/island ranges and not firing into the water.
3. Only in approved land/island-based air weapons ranges.

It should be noted that despite the potential for destruction and environmental disturbance posed by the weapon and sensor fits of ADF ships and aircraft, many of the activities and equipments described in this assessment are rarely, if ever, undertaken or employed within or near the GBRWHA. For the great majority of the time that ADF ships and aircraft are within the GBR region they are engaged in activities no different to that which are characteristic of...
their merchant marine or civil aviation equivalents. Weapons and decoys are rarely discharged, and most sensors are inactive for the majority of the time. The only exception to this state is the more frequent use of navigation radars and, to a lesser extent, long range air search radars.

6.2.1 Potential Receptors and Their Sensitivities

Possible adverse environmental impacts arising from Defence activities in or near the GBRWHA can be considered to fall into one of four categories. These are:

- An action that results in pollution of the air, water column or sediments via introduction of a contaminant or the accumulation of debris.
- An action that results in or leads to death of or injury to biota, either as a direct result of the Defence action or as a second order effect arising from the disturbance or destruction of habitat or life-sustaining processes.
- An action that causes harassment or disturbance to biota, such that it may have a deleterious effect, particularly at the species or population level.
- An action that results in substantive, long-term or irreversible changes to the physical substratum, coral reefs, seagrass beds or mangal and their habitat attributes.

Given the diversity, complexity and inter-connectedness of the World Heritage values of the GBR, it may be considered that any persistent, long-term and/or irreversible deleterious impact upon its biota, physical features or ecosystem processes may detract from its World Heritage values. The significance or otherwise of these potential effects will be dependent upon a number of factors, such as the spatial and temporal extent and persistence of any adverse impact and the degree of community acceptability (e.g. mooring tourist pontoons has a localised deleterious effect, but it is reasonable to assume that approval to place these pontoons accepts that there will be some adverse outcomes).

Although not related to World Heritage values, it is nevertheless pertinent to also consider the potential for Defence activities to impact upon social and economic uses of the GBR region. This is because human and socio-economic factors are considered within the totality of “environment” as defined by the EPBC Act. Appropriate categories for consideration of these components of the environment are:

- An action that displaces other human users within the GBR region, such that it causes sustained economic loss, diminution of recreational utility or compromise of traditional uses.
- An action that compromises the health and safety of non-Defence users.

Intrinsic to the determinations of potential impact upon the biophysical and socio-economic aspects of the environment is consideration of the potential effect upon the quality and characteristics of places and objects, especially any natural or cultural heritage values.

The environmental significance or otherwise of identified potential outcomes for each potential impact vector is considered in Appendix A.
6.3 QUALITATIVE RISK ASSESSMENT OF DEFENCE ACTIVITIES IN THE GBRWHA

Environmental issues attendant to Defence activities in the GBRWHA need to be objectively evaluated with regards to their significance. The criteria for assessing significance are based on the likelihood and consequence of adverse environmental impact occurring.

Environmental management issues pertaining to Defence activities in the GBRWHA were identified and assessed as relevant to:

- public safety;
- effect upon World Heritage features and other matters of National Environmental Significance;
- protection of iconic conservation dependent species (particularly in relation to the EPBC Act); and
- stakeholder and community interests.

These groupings focused upon the key attributes and values of the GBRWHA.

The method used for assessing risk is based on the concept that the significance of the environmental issue is a combination of the negative consequence and the likelihood of that negative consequence occurring: Hence the relationship: Risk = Consequence \times Likelihood

This methodology was adopted to ensure that the risk assessment process is repeatable and consistent with AS/NZS4360 and risk assessment procedures used within the Australian Defence Organisation.

Evaluation of the significance of an environmental issue can be facilitated by consideration of a number of factors:

- scale and severity of impact (NB: disturbance does not necessarily result in impact);
- probability of occurrence of adverse outcome;
- duration of disturbance;
- frequency of disturbance;
- the resistance and resilience of the impacted organisms or habitats;
- potential regulatory and legal exposure;
- difficulty of changing or removing the impact;
- cost of changing the impact;
- effect of change on other activities and processes;
- concerns of interested parties; and
- effects on the public perception of the organisation.

(after AS/NZS ISO 14004:1996)

Defence policies and procedures for environmental management and risk reduction were taken into account when assessing likelihood and consequence of possible adverse outcome. This is critical to ensure a valid appreciation of the likelihood of adverse occurrence and the severity of any outcomes within the framework of Defence risk reduction and response measures.

In September 2005, GBRMPA and Defence convened a joint risk evaluation workshop in Townsville. The objective of this forum was to reach consensus on the Defence activities considered most likely to pose a risk of adverse environmental outcomes for the GBRWHA, evaluate and articulate those risks, and determine the adequacy or otherwise of current management arrangements. The meeting focused upon 14 categories of activity which were
6. RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

agreed by GBRMPA and Defence beforehand as those most likely to represent a tangible risk of adverse environmental outcomes. The 14 activities or issues considered were:

- Operation of LCACs
- Ship collision
- Ship grounding
- Hydrographic survey
- Aircraft ditching
- Oil spill during refuelling
- Exclusion of civil activities during or arising from Defence activities
- Use of sonar
- Low level flying
- Hull fouling
- Ballast water
- Residual debris from the use of expendable military stores
- Explosive training
- Nuclear powered warships

Appendix C describes in detail the methods and results of the qualitative and semi-quantitative risk evaluation of the 14 Defence activities or associated issues. A summary of the findings is presented below.

Eleven of the 14 activities were deemed to have minor or negligible consequences on the GBRWHA. Ecological risks arising from the potential for the introduction or translocation in the GBR region of marine pest species via hull fouling or ballast water, and the operation of nuclear powered warships were predicted to have potentially major environmental consequence. Of these, only an impact associated with a nuclear powered warship was considered to have a rare likelihood of occurrence. The introduction of pest species via hull fouling was considered to have a reasonable chance of occurrence.

Apart from ecological consequences, three activities and associated issues were considered to present a risk of compromising the public reputation of both Defence and GBRMPA. These were exclusion of civil activities during or arising from Defence activities, oil spills and the operation of Nuclear Powered Warships in the GBR region.

All 14 assessed Defence activities and associated issues are currently managed in accordance with Defence and GBRMPA protocols to limit impacts to the GBRWHA. Importantly, the risk evaluations are based upon current levels of Defence activity (e.g. number of vessels, area of the GBRWHA used for Defence activities, volume of sewage discharged, etc). Current levels may not remain stable, however, and should there be an increase in the scale, tempo or intensity of Defence activities in the GBRWHA, the risk assessments would need to be revisited to ensure currency and adequacy of prevailing management measures.

6.4 RISK TO GBRWHA VALUES

Objective evaluation of all Defence activities known, likely or perceived to have potential for adverse environmental outcomes indicates that the biggest 'environmental' risk presented by Defence use of the GBRWHA is largely restricted to adverse consequences arising from public perception, often inaccurate and therefore not of actual environmental significance. Of the credible environmental risks, quarantine issues, particularly the potential for introduction of exotic marine pests, presents the highest risk to the environment stemming from Defence
activities in the GBRWHA. This conclusion takes into account standard Defence management practices and environmental risk reduction measures.

In addition to these relatively high risk issues, there are two cohorts of impacts that are either:

- small scale and inconsequential but unavoidable; or
- potentially large scale and severe, but only arising as a result of abnormal circumstances, such as an accident.

Examples of the former include:

- the debris and residues arising from the use of expendable stores and ordnance;
- lethal effects, such as fish kills, and sublethal effects, such as minor acoustic disturbance, arising from the use of explosive ordnance such as demolition charges;
- incidental and instantaneous acoustic disturbance which may occur if a loud, low-flying aircraft or hovering helicopter coincided in the same space and time as a noise sensitive animal; and
- lawful discharges of sewage from ships, particularly large amphibious units.

Impacts of these origins cannot be avoided, although they may not result in any tangible disturbance. These impacts occur as an unavoidable consequence of, for example, the use of the expendable store, the operation of the aircraft at low-level or the detonation of an HE charge. Management is effected by ensuring that these activities only occur at a time, place and/or intensity such that the environmental implications do not attain any significance.

Examples of unlikely but potentially severe events include:

- large oil spills, particularly following a grounding or collision involving a tanker, and especially if this occurs in a particularly sensitive area of the GBR; and
- public risk, particularly to civil aviation and other mariners, arising from exercise activities involving explosives and aerial vehicles (e.g. ADF aircraft, missiles, aerial targets, SLFs).

These impacts are managed by reducing the risk of occurrence to one that is as low as is reasonably practicable. This approach is consistent with that adhered to in other fields of potentially hazardous activities such as civil aviation and the petroleum industry. Risk is reduced through application of appropriate design and construction standards, effective maintenance, low risk standard operating procedures (in this case including proper notification of civil authorities and adherence to range clearance requirements), personnel training and awareness, and the preparation, exercise and provisioning of effective contingency response measures. Consideration of the low likelihood but severe consequence scenarios in the risk assessment recognises that significantly adverse environmental outcomes are possible from Defence activities in the GBRWHA, albeit improbable.

Very little Defence activity in the GBRWHA involves permanent coastal infrastructure or permanent human settlement, except in already established areas.

Most Defence activities are virtually benign, and if not so, of such low temporal and spatial intensity that significant adverse outcomes are unlikely. This conclusion is supported by:

- the small size of the ADF and the limited number of ships and aircraft actually exercising within or transiting in or over the GBRWHA at any one time or on an annual basis;
- the large size of the GBRWHA; and
6. RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

- the findings of detailed environmental impact analyses conducted both in Australia and overseas concerning the maritime, aviation and amphibious activities conducted by Defence and Defence support agencies in oceanic, littoral and coastal areas.

The public perception of environmental risk from Defence activities characteristically exceeds the reality, either by dint of the small actual impact, or the infrequent activation of weapons or sensor systems which may be the cause for concern. For example, actual use of guided weapons (missiles and torpedoes) is minimal in the Coral Sea and non-existent within the GBRWHA, and except for the very occasional use against a hulk target (only once every few years) ordnance involved in weapon practice at sea is invariably inert. Similarly, most gun ordnance used is practice ammunition with very low explosive potential.

Consistently, the findings of environmental impact studies of Defence maritime operations is that most activities occasion inconsequential impacts with minimal likelihood of significantly adverse outcomes. Where such outcomes are possible, these are easily avoided or mitigated by the implementation of suitable impact avoidance or risk reduction measures.

The history of use of the GBRWHA has proven that Defence activities can co-exist with civil activities including merchant shipping, civil aviation, commercial fishing and marine tourism and recreation. Most Defence activity within the GBRWHA is analogous to equivalent civil activities involving the operation of surface vessels and aircraft. Adverse consequences from Defence activities which may be incompatible with other users of the GBR and any mutual interference are largely avoided by spatial and temporal separation in planning stages, including timely public notices. Any displacement of civil users from exercise areas during the conduct of Defence activities is usually of short duration, and where flexibility allows, exercise planning aims to avert user conflict through avoiding areas and times of peak use. Where this separation in time and place is not possible, appropriate range clearance and adaptability in the schedule of activities (e.g. short-term suspension of activity until a fishing boat, for example, clears the area, or minor relocation of the activity) ensures minimal risk of adverse outcomes. Some direct interference with commercial fishing activities may occur when, for example, Defence vessels entangle with and damage or remove fishing pots and marker buoys, but the frequency of this occurrence is unlikely to be more than that occasioned by commercial and recreational vessels. Similarly, there is no evidence of damage to aspects or artefacts of heritage significance, including historic shipwrecks.

Tourism and recreation, the principal sources of economic activity in the GBR region, are also unlikely to be affected by Defence activities. Analysis of tourism activity indicates that most is clustered in nodes centred upon areas within reach of coastal centres at Port Douglas, Cairns, Townsville, Proserpine, the Whitsundays and Gladstone. There is only minimal overlap with existing DPA, and Defence activities in other areas of the GBRWHA are unlikely to detract from tourism operators or the amenity of tourists. The only notable exception to this is the periodic closure of SWBTA to surface vessels, although it should be noted this is primarily undertaken in the interests of public safety.

Defence activities in the GBR region are unlikely to detract from Native Title claims or from traditional uses, except to the extent that coastal DPA are periodically closed. Local Defence management authorities have established dialogue with local indigenous groups, and so the closures of Defence areas to traditional users is undertaken within a consultative framework.
6.4.1 Risks to Cetaceans and Other Sensitive Marine Fauna

Much has been made of beaked whale strandings purportedly caused by MF naval sonars. While there may indeed be some causal link, indicating the need for pragmatic risk avoidance measures, it is important to keep the strandings allegedly caused by sonar in context. The Whale and Dolphin Conservation Society (2003) holds that of more than 50 reported mass strandings of beaked whales world-wide, eight have been associated with naval activities, and all of those have involved Cuvier’s beaked whale (*Ziphius cavirostris*) as the principal species involved. This compares with the Australian record, where of around 200 reported beaked whale strandings, Cuvier’s beaked whales account for over 25% of all individuals. Thus, the speculated especial vulnerability of Cuvier’s beaked whales to adverse effects from sonar stimulus may only replicate the stranding propensity of Cuvier’s beaked whales in the absence of such stimulus, or may simply suggest that Cuvier’s are the most numerous and/or widespread of all the beaked whales or the most likely to school. No beaked whales are considered to have any specific status as endangered or vulnerable under Commonwealth law, and as a group, beaked whales are rarely observed and largely only known to science from strandings.

From the mid-1960s to mid-2003, 190 ships have been fitted with SQS-26 or SQS-53 sonar systems or derivatives. These are the high-power, lower MF band convergence zone sonars whose initial deployment in the mid-1960s has been linked by some commentators to observed mass strandings of beaked whales since that date. Most of these ships (184) have been units of the USN, the Navy which has maintained a global presence wider and larger than any other over this period, with a permanent presence in the Atlantic, Pacific and Indian Oceans, Mediterranean Sea and Arabian Gulf area over most if not all of this time, and with periodic operations in all other areas of the world’s oceans. Yet, despite what must amount to thousands of naval exercises and other activities involving perhaps hundreds of thousands of hours of operation of SQS-26 and SQS-53 systems, only eight multiple strandings involving a total of 82 beaked whales *may* be linked with sonar activities over a period of nearly forty years; this is not to consider the hundreds of other warships and trials vessels collectively with millions of hours of operation of other MF, and to a lesser extent LF, ASW active sonar systems which have never been linked with any observed or alleged adverse effects upon whales. Over the same period that SQS-26 and SQS-53 have been in naval service, there have been many thousands of strandings of whales as individuals and in groups of up to several hundred, including other mass strandings of beaked whales. Even if allowance is made for observed strandings possibly linked to sonar being only a fraction of the total, the unavoidable conclusion is that even if the operation of sonar may cause mass strandings its influence on the overall pattern of whale strandings and subsequent mortalities is insignificant, accounting for less than 1% of all recorded whale strandings; when compared with other losses of anthropogenic origin, such as fishing by-catch, the discrete risks from naval sonar are probably inconsequential. On this basis, operation of MF, and probably LF, ASW active sonars must be considered low risk and only likely to occasion adverse outcomes in exceptional circumstances. This risk is further reduced when it is considered that the GBR region is not recognised as a preferred habitat for beaked whales, these animals favouring deep, open ocean habitats. This observation is supported by the stranding record, which indicates only a handful of recorded beaked whale strandings along the Queensland coast compared to hundreds in other States (URS, 2004).

Another risk to cetaceans and other large marine animals is ship or boat strike. This risk is ameliorated to a great extent, however, by the improved manoeuvrability, shallower draught and increased number of watchkeeping personnel in warships compared with most merchant ships.
Most whale and dolphin species in Australian waters are rarely, if ever, observed in the vicinity of Defence activities. Some whale species have special conservation significance as either endangered or vulnerable, principally as a result of over-harvesting during the period of international commercial whaling. The threatened species of principal concern to the GBRWHA is the humpback whale. Both major Australian humpback migration routes straddle Australia’s two busiest MXA, and the area in the upper reaches of Shoalwater Bay (north of Akens Island) is recognised as an aggregation area. Anecdotal observations suggest that Australian Defence activities have neither the inherent impact potential nor intensity to have caused observable adverse effects upon humpbacks or other species of whales or dolphins.

Globally, the observed history of whale migration routes and aggregation areas is that these are resilient features of the life cycles of whale species. This conclusion can be drawn from the persistence of whales adhering to annual migration routes, and gathering and loitering in aggregation areas despite population depredation from commercial whaling or traditional hunting, intense whale watching activities, merchant shipping, recreational boating, and civil aviation activities centred upon coastal aerodromes. For example, the east coast humpback migration routes crosses the shipping paths into and out of the major ports of Port Kembla, Botany Bay, Sydney (Port Jackson), Newcastle, Brisbane, Gladstone, Mackay and Hay Point, and the migration route itself parallels the route taken by most east coast shipping traffic. Similarly, the western route straddles traffic into and out of the ports of Bunbury, Fremantle and Geraldton. As well as shipping, coastal settlements along both east and west coasts are the centres of recreational and commercial boating and fishing activity, yet the literature reports no detected alteration of migration activity as the intensity of shipping and boating activity has increased as a result of Australia’s population and economic growth. Despite these influences, Australian whale populations for which reliable data are available show strong and persistent growth in stocks since the cessation of commercial whaling. These observations are supported by the limited number of controlled experiments which indicate that although migrating whales may execute small deviations to avoid areas of disturbance, they quickly return to the main migration stream and do not abandon the migration. Similar observations have been made following disturbance in feeding and breeding aggregation areas.

Even though Defence activities may at times be more intense in time and space, and may encompass a greater diversity of activities that may be perceived as acting as some sort of threat to cetaceans, there is no evidence to date of any adverse effects from Australian Defence activities. Objective analysis of the potential mechanisms by which Defence activities may impact cetaceans indicates that most activities are essentially benign, and of those which may not be, the actual likelihood of adverse outcome and level of consequence, especially at the population level, makes for negligible to very low environmental risk.

The principal risks to dugongs and sea turtles are vessel strikes and disturbance or physical injury from the detonation of explosives. Although these risks can never be totally negated, they are minimised by adherence to standard Defence practices such as special briefings to boat coxswains, limits on the quantity of explosives permitted, area search procedures before the detonation of explosives and the use of designated sites for explosives training. A study of the interaction of Defence training activities at Triangular Island with dugongs and turtles (URS, 2001c and 2001d) found that risks were minimal and effectively mitigated by the standard procedures employed. The identification of Shoalwater Bay as a secure dugong habitat and its declaration as a Dugong Protection Area suggests that well managed Defence activities are not incompatible with dugong protection, and may in fact enhance it by reducing other threats from vessel strikes, net entanglement and coastal degradation and habitat
alteration. Similarly, Shoalwater Bay is an important area for turtles and remains so after nearly forty years of use as a Defence training area.

Incidental encounters between large marine fauna and vessels and aircraft of the ADF and Defence contractors in the GBRWHA are inevitable and the frequency of such encounters can only increase as whale populations continue to expand. Encounters between whales and ships and aircraft engaged in Defence activities are unlikely to represent any more than a small proportion of the total number of similar incidental interactions with commercial shipping, commercial fishing vessels and recreational boats, plus intentional interactions by whale watching charter operators. No significant adverse effects upon individuals or small groups of whales are likely, and it is highly improbable that any impact will operate at the population or species levels.

Acoustic disturbance from HE detonations, explosive SUSs and active ASW search sonars will have the most widespread spatial influence of any of the Defence vectors of potential environmental concern. Even during all but the most extended and intense periods of Defence activity, these acoustic influences are possibly not dissimilar to sensitive receptors from the acoustic perturbations caused by a severe thunderstorm encompassing agitation of the sea surface and lightning strikes, especially in the case of impulsive sources.

6.4.2 Cumulative and Persistent Impacts

Three categories of cumulative impacts are possible from Defence activities in the GBRWHA, namely:

- long-term accumulation of persistent contaminants and debris;
- chronic impacts resulting from continual or cyclical low-scale inputs in a specific area; or
- short periods of intense activity involving a large number of units, such as a major exercise which may result in additive or synergistic effects from individual potential impact vectors (e.g. several ships, landing craft, fixed-wing aircraft and helicopters involved in a large amphibious exercise).

The most likely cause of the first of these possible cumulative effects would be long-term use of sonobuoys, XBTs and other expendable stores in a small area. An example of an area subject to extremely intense use of this nature is the CFMETR at Nanoose, Canada. Environmental assessments were conducted in the mid-1990s following around 30 years of use during which the Range experienced some 60,000 sonobuoy drops and 30,000 torpedo firings (mostly of Otto Fuel II powered torpedoes) within its 226 km² area (Pacific Marine Technology Centre 1996). The environmental assessment found that despite the presence on the sea bottom and within the sediments of 2,200 tonnes of debris, such as copper torpedo guidance wire and sonobuoy traces, sonobuoy bodies, parachutes and smoke floats, there was no evidence of any adverse environmental outcomes or contamination of the sediments or water column; the only detectable impact was the physical presence of the debris itself. No equivalent area in Australia has been or is likely to be subject to the same longevity or intensity of debris accumulation as has the CFMETR. Inputs of expendable stores into GBR waters are dispersed over such a wide area and at such a low relative rate of input that accumulation of material to this degree will not happen.

Chronic cumulative impacts from Defence activities are unlikely to be of any significance within the GBR region. The nature of most Defence activities in the GBRWHA is that they are of extremely low to moderate temporal intensity, coupled with low spatial intensity as activities are typically spread over hundreds, if not thousands, of square kilometres of sea.
Exceptions to this are the nodes where some activities are concentrated by virtue of specific geographical features, training ranges or infrastructure such as:

- NGS activities at Townshend Island;
- amphibious exercises in portions of the SWBTA and Cowley Beach; and
- explosives training at Triangular Island.

Most of these nodes of concentrated activity are long-established, hence the Defence activities represent ongoing use. Where the concentrated use is only recently established or proposed, appropriate, focused environmental assessment has been undertaken.

It is conceivable that the annual exercise cycle, such as amphibious exercises at CBTA, could contain elements which coincide in an incompatible manner with some sensitive phase in an annual ecological or socio-economic cycle. Potential examples include bird migration or nesting periods, turtle nesting or hatching periods, whale migration and aggregation activity, or season peaks in commercial fishing or tourism activity. None of these possible conflicts are evident as a result of Defence activities in the GBRWHA. Thus, no chronic or cyclical deleterious impacts from Defence activities are apparent. In the case of major exercises in the Coral Sea, the mobile and dispersed nature of naval activities indicates minimal likelihood of cumulative environmental outcomes in all but exceptional circumstances.

Appropriate planning of the scale, intensity, location and timing of exercises of type must be sufficient to avoid any negative outcomes as a result of cumulative or cyclical impacts.

6.4.3 Public Perception

Notwithstanding quantifiable risks to the receiving environments, public perception of adverse environmental outcomes often overstates the reality or context of Defence impacts. Incorrect public perception may lead to unnecessary regulation aimed at managing a risk that simply does not warrant such control. Defence has established sound credentials as a capable and enduring environmental steward. This is evidenced by the many Defence areas which are listed in the Register of the National Estate or Ramsar wetlands and others which are refuge habitat for threatened species and ecological communities. The condition of the natural attributes of Shoalwater Bay is a prime example of this.

As previously noted, there is an inherent risk to the corporate reputations of both Defence and GBRMPA stemming from the perception and subjective assessment of what should, or should not be, permitted as acceptable activities within the GBRWHA. This may be considered acute in the case of activities which are assumed by sectors of the public as being ‘high risk’, such as oil fuel transfer operations, ship waste discharges (even when permitted by Australian legislation and international convention) and the operation of nuclear powered warships. It may be anticipated that the public reaction to any incident involving, for example, an oil spill or abnormal sewage discharge as a result of Defence activities, would be exacerbated by the intrinsic sensitivities of the public to events of this nature.

In a more tangible sense, public reputation of Defence as the instigator, and GBRMPA as the area manager, may be marred by periodic exclusion of some members of the public from some areas of the GBR as a direct result of Defence activities. Apart from temporary physical exclusion from areas or restriction on civil activities, an element of perception and subjective judgement is inherent to the public appreciation of ‘exclusion’. For example, the noise arising from military aircraft operating at low level, or indeed the visual observation of these aircraft,
is periodically reported by some members of the public as detracting from and interfering with their ‘wilderness experience’ of the GBRWHA.

The biggest environmental management risk for Defence activities in the GBRWHA so far as cetaceans are concerned, is public and regulatory perception of the ‘harmfulness’ of Defence activities. This largely stems from misunderstanding and an incomplete appreciation of how Defence activities are managed and conducted.

6.4.4 EPBC Act Implications

Matters of National Environmental Significance encompass the risk of significant adverse environmental outcomes to:

- World Heritage sites;
- Ramsar sites;
- nationally endangered or threatened species and ecological communities;
- migratory species;
- national heritage items and places;
- Commonwealth marine areas; and
- nuclear actions.

A full listing of matters of NES and the possible impacts upon these ecological values by Defence activities in the GBRWHA is presented in Appendix D. The category of nuclear actions has no nexus with Defence activities in the GBRWHA, and with the exception of one aspect of the Commonwealth marine environment, it is considered improbable that Defence activities in the GBRWHA of the type and scale currently undertaken or envisaged would have any adverse impact upon any matter of NES according to the criteria promulgated by DEH.

The exception to this conclusion is the potential for a known or potential pest species to become established in a Commonwealth marine area. Compared with other Commonwealth marine areas, which are typically open water areas some distance from the coast, waters within the GBR include shallow waters, reefs, mud and tidal flats which are more vulnerable to the establishment of many potential marine pests. The risk from Defence activities, however, would essentially reflect the character of that presented by other commercial and recreational craft operating within the GBR region.

There is also a risk that the integrity of the Ramsar wetlands within the SWBTA may be compromised by Defence activities. Although recognised as a risk, the possibility of this actually occurring should be assessed as minimal, considering the positive history of use of Shoalwater Bay and the practices employed by Defence to protect the conservation status of the SWBTA.

Other EPBC Act requirements have linkages with Defence activities in the GBRWHA. These include:

- general protection provisions for cetaceans, threatened species, migratory species and listed marine species, including reporting provisions in the case of injury or mortality of any of these species and specific EPBC cetacean protection regulations; and
- controls on access to and activities within Commonwealth marine protected areas.
These requirements are in addition to the general stipulation for any activity by a Commonwealth agency that may result in a significant effect upon the environment, or any activity which may have an environmental impact upon a Commonwealth area (e.g. the Australian EEZ), to undergo environmental assessment. Thus even though Defence activities in the GBRWHA are considered unlikely to occasion any significantly adverse outcomes upon matters of NES, any potential for significant adverse outcomes requires assessment and possibly referral and approval under the aegis of the EPBC Act.

Although the risks cannot be fully discounted, the range, scope and intensity of Defence activities currently conducted in the GBRWHA or those envisaged are considered unlikely to occasion any significant adverse environmental outcomes in general, let alone impact upon any matter of NES. This conclusion assumes adherence to current Defence environmental management policies and procedures.

Many of the marine species afforded protection by the EPBC Act are unlikely to ever be knowingly affected by Defence activities. Rather than risk-reduction measures focused upon individual animals, protection for many of these species, such as pipefish, is best afforded by protection of habitat and control of activities within that habitat.

A number of Defence activities may appear to be technically in breach of EPBC Act requirements. For example, any ship which fails to maintain an essentially steady course and speed while dolphins are riding in its bow-wave is in breach of the Act, and the release of objects from aircraft and weapons firing practices in DPA within the GBRMP also appear to be in breach of the EPBC Act, even though they are permitted under GBRMP legislation and zoning plans.

Immediate compliance with the letter of the EPBC Act as it stands is not a realistic possibility for the ADF, unless approvals are granted by way of Ministerial declaration or some other arrangement of permits and/or endorsed management plan/s. The general approach of seeking exemptions from environmental obligations has been neglected by Defence. It is anticipated that Defence will, over time, seek to accredit or otherwise gain authorisation for its activities in accordance with relevant legislation.

6.4.5 Implications of Defence Activities for World Heritage Values

Given the diversity and broad range of World Heritage values, and their spatial extent, it is unlikely that Defence activities in the GBRWHA or contiguous areas would detract from or degrade these in any tangible sense. Defence activities in the GBRWHA are well managed and responsibly conducted, and of relatively low spatial and temporal extent, with periodic concentrations in space and time. These usually occur with established DPA during larger exercises. Consequently, any impacts of a long-term or irreversible nature arising from Defence activities will be concentrated and contained within a small area. An example of this is the obvious alteration of mudflats around Triangular Island resulting from its long-term use for explosives training.

It may be considered that the effects of most Defence activities within the GBRWHA are subsumed in to the overall effects of other human activities within the region. For example, in most instances aircraft overflight and ship transit are subsets of the larger complex of other aircraft and shipping activity within the region. Similarly, permanent Defence infrastructure within the coastal hinterland of the GBRWHA is invariably established within larger coastal settlements.
By way of contrast, Defence activities have been demonstrated to actually enhance the conservation of World Heritage values. This is achieved by indirect means such as improving hydrographic charts and understanding of tidal and other oceanographic processes within the Reef area, and direct means such as the rendering safe of UXO and by limiting public access and coastal developments in Defence areas, the outstanding example of which is Shoalwater Bay. This latter conclusion is supported by the findings of the Commonwealth Commission of Inquiry examining Defence use of Shoalwater Bay.

6.4.6 Potential Environmental Effects of Other Human Activities in the GBRWHA

In considering issues such as scale, likelihood and frequency relevant to the environmental impacts of Defence activities and determining requisite impact avoidance and mitigation procedures, it is illustrative to consider other human activities and their effect upon the GBRWHA. This is essential as a precursor to the development and implementation of a balanced and appropriate environmental management regime that takes into account issues of sustainability and the precautionary approach.

Not all of the civil activities conducted in the GBRWHA are environmentally benign, and other activities external to these areas have the potential to cause disturbance or alteration of ecosystem processes within the GBRWHA. A synopsis of major human activities and their potential for environmental disturbance is presented in Table 6.2.

Table 6.2 Synopsis of Other Human Activities and Their Impacts Upon the Marine Environment

<table>
<thead>
<tr>
<th>Activity</th>
<th>Impact</th>
<th>Spatial and Temporal Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishing – trawling, netting, wet lining, etc</td>
<td>Direct killing of target and by-catch species. Direct physical disturbance of substratum and benthos. Source of solid waste, including lost nets which ‘ghost fish’</td>
<td>Widespread, often seasonal. Widespread, often seasonal. Chronic.</td>
</tr>
<tr>
<td>Shark netting</td>
<td>Direct kill of target species and by-catch, including dolphins, dugongs and turtles.</td>
<td>Localised and persistent.</td>
</tr>
<tr>
<td>Civil aviation</td>
<td>Potential disturbance to cetaceans and avian fauna.</td>
<td>Widespread but localised; especially intense in some areas (i.e. coastal airports).</td>
</tr>
<tr>
<td>Tourism</td>
<td>Vessel and aircraft activity and associated coastal, island and reef developments and infrastructure. Direct damage to some reefs from diver actions. Direct interaction with minke whales, potato cod and other species from interactive programs. May be managed and approved or unmanaged.</td>
<td>Concentrated in nodes. Concentrated in nodes. Concentrated in nodes.</td>
</tr>
</tbody>
</table>
6. RISKS TO GBRWHA VALUES FROM DEFENCE ACTIVITIES

<table>
<thead>
<tr>
<th>Activity</th>
<th>Impact</th>
<th>Spatial and Temporal Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional hunting</td>
<td>Harvesting of dugongs, fish and marine turtles.</td>
<td>Unknown, but particularly localised in vicinity of indigenous communities.</td>
</tr>
<tr>
<td>Agriculture and land clearing</td>
<td>Land-based source of sediments entering the marine environment, causing turbidity and introducing nutrients and persistent pollutants into the marine environment.</td>
<td>Seasonal inputs, with chronic and persistent effects. Restricted to agricultural catchments.</td>
</tr>
<tr>
<td>Coastal and island development</td>
<td>Source of waste and pollutants (including persistent floating materials, toxicants and nutrients) entering the marine environment. Long-term loss/alteration of habitat and coastal processes.</td>
<td>Localised and chronic. Persistent, long-term, irreversible.</td>
</tr>
</tbody>
</table>

It should be noted that conditions summarised in Table 6.2 refer only to environmental conditions arising from normal state conditions, and do not consider abnormal or emergency situations such as ship groundings or oil spills from ships, coastal installations, and so forth.

When placed in context of other activities in the GBRWHA, it is apparent that actual Defence activities have more parallels with civil actions than they have distinct differences. Distinctly Defence activities are essentially limited to:

- Amphibious activities.
- A greater frequency of low-level flying compared to civil aviation.
- The use of guns, bombs and other explosive ordnance, noting that the vast majority of training serials involve non-explosive practice versions of these weapons equipped with small spotting charges at worst.
- Use of MF active sonar.
- The use of expendable stores such as XBTs, sonobuoys, EMATTs and various countermeasure devices.

Of these activities noted above, analogous civil equivalents still exist. For example, meteorological and oceanographic research and monitoring agencies use expendable data-gathering buoys and probes, and landing craft acting in an amphibious capacity provide a means of supply for many island communities in the absence of suitable port facilities.

It may be concluded, therefore, that the vast majority of Defence activities in the GBRWHA are similar to civil activities, often at much lower temporal and spatial scales of activity and with correspondingly lower potential for significantly adverse environmental outcomes.
7. **CONCLUSIONS**

Defence Activities undertaken in the GBRWHA are unlikely to have significant negative effects on the World Heritage values of the area, nor upon other socio-economic values of the GBR region for the following key reasons.

- Most of the GBRWHA ecological values (Section 4) are widespread, and no rare or threatened species and or threatened ecological communities are known to occur solely in Defence Practice Areas (DPA).
- Intensive Defence training activities are restricted primarily to DPA (Section 3), which represents a small portion (< 0.01%) of the GBRWHA. Further, even in these spatially small areas, most Defence activities are unlikely to permanently alter the natural resources in these areas.
- Similarly, in terms of time, Defence activities in the GBRWHA occur over a small proportion of any one-year (Section 3). Thus, an individual DPA might be used as little as a few weeks of each year.
- Defence activities in GBR areas external to DPA are largely benign and effectively amount to transit by ships or overflight by aircraft.
- Many non-Defence related activities permitted in the GBRWHA, such as trawling and tourism, are chronic and widespread agents of disturbance (Section 6). In contrast, Defence related activities are spatially and temporally restricted. Impacts associated with Defence activities are typically short-lived.
- High conservation values potentially at risk from Defence activities include marine turtles and seabird nesting sites, and marine mammals. However, turtle and seabird nesting sites are not well represented in DPA (Section 4) and Defence planning permits flexibility to ensure Defence activities either do not occur during the main nesting periods or permit suitable allowances to minimise risks of disturbance.
- In general, Defence activities pose no more risk to cetaceans than current shipping/boat activities already undertake in the GBRWHA by bulk, fishing and recreational vessels (Section 6).
- DPA can provide strong conservation outcomes by restricting general public access to areas of high conservation value e.g. Shoalwater Bay. Also, potentially destructive commercial activities, such as trawling and net fishing are often prohibited from DPA.
- Defence recognises its obligation to protect the values of the GBRWHA through the development of high level dialogue with GBR MPA and DEH, a well-structured regime of environmental management policies and procedures, and the employment of environmental officers based in Brisbane, Rockhampton and Townsville able to give advice and assistance to ADF units operating in the GBR region.

Most activities performed by the ADO and Defence support contractors within the GBRWHA are environmentally benign or pose an extremely low risk of significantly adverse environmental outcomes. Similarly, there is minimal risk of cumulative outcomes attaining any degree of serious environmental significance. The potential for adverse outcomes is further reduced by the fact that most of the time that ADF ships and aircraft spend in GBRWHA is effectively ‘innocent passage’, which is essentially environmentally benign.

A number of DPA overly Marine National Park Zones derived in the revised GBRMP zoning plans. These are:

- R783 Lizard Island;
- R778 Cairns (Outer Reef);
- R767 Cairns;
- Cowley Beach;
7. CONCLUSIONS

- R748 Halifax Bay;
- R680 Shoalwater Bay;
- R682 Shoalwater Bay;
- R686 Shoalwater Bay (Triangular Island);
- R689 Shoalwater Bay; and
- R693 Elliott.

Defence activities are unlikely to pose any greater risk to marine national park zones than other current activities permitted to enter these zones without permission. Importantly, Defence units do no engage in fishing or the collection of plants, animals or marine products, activities which are permitted in these zones. No DPA overly any of the Preservation Zones.

Defence activities within the GBRWHA and contiguous areas are characteristically well planned, well controlled and cognisant of inherent environmental risks and responsibilities. Defence policies and procedures related to environmental protection within the GBR meet or exceed existing statutory requirements, a prominent example being the far more stringent controls applied by Defence to sewage discharges from ships compared with requirements in the GBRMP Regulations.

Risks do exist of adverse environmental outcomes, the most significant of which are the possibility of introducing potential marine pests into the marine environment or a large oil spill, particularly if this occurs in a sensitive area of the GBRWHA or nearby. Of greater likelihood is the risk of degradation of water following the discharge of sewage from a large ship or group of ships with many personnel onboard in circumstances where there may be limited water exchange. Areas where this scenario is most likely to arise are CBTA and SWBTA during major amphibious exercises. These do not occur often and Defence management measures are in place to reduce both the spatial and temporal occurrences. Accordingly, this vector is unlikely to lead to any long-term degradation of any portion of the GBR. Over time the environmental significance of this activity will diminish as new generation ships and waste management systems improve the quality of discharge effluent.

Defence activities occurring in the Torres Strait, Coral Sea or southern Queensland sea areas are unlikely to impact upon values of the GBRWHA. Potential vectors of impact upon the GBR region include overflight of aircraft and transit of ships to/from the GBR region to these external areas, or wider-scale impacts originating in these external areas and extending as far as the GBR region. Principal examples of the latter include a large oil spill or drifting of expendable material and debris. The possibility of pollution or debris from an external origin reaching the GBR and having some deleterious impact is an artefact of current and winds, distance of the source from the GBR, the nature of the material and any dispersion, dilution and degradation processes in operation. The only credible scenarios so far as major impacts are concerned are either an oil slick or a drifting ship hulk, which failed to sink during a HULKEX in the Coral Sea, reaching the GBR region. It should be recognised that the risk of these outcomes is low, given the planning and preparation inherent to these sorts of activities and the opportunity for intervention if the GBR was deemed to be at risk. Smaller scale impacts within the contiguous areas are unlikely to have sufficient spatial or temporal persistence to impact upon the GBRWHA.

Some Defence activities have the potential to cause severe environmental outcomes if environmental management strategies are not in place, albeit with a very low probability of occurrence. Conversely, other Defence activities have unavoidable adverse environmental outcomes which are almost universally of low to negligible environmental significance, small-scale, transitory and localised. These impacts do not represent any tangible ecological
or socio-economic threat to the sustainable use by Defence or other users of the Australian marine environment.

Compared to other human activities in the GBRWHA, Defence activities are generally conducted at low spatial and temporal scales. Accordingly, many observed or speculated impacts which may be connected by some observers with Defence actions are usually operating on a much smaller scale than those arising from some analogous civilian activity. Similarly, the scale and intensity of many of the conceivable negative outcomes from Defence activities are insignificant compared to those occurring as a result of natural events such as storms, sediment and nutrient deposition from river systems, or the unexplained natural phenomena of whale strandings.

Although a causal link has yet to be proven, it is possible that high-power active sonar may cause harm to cetaceans in exceptional circumstances. The precautionary principle dictates that a pragmatic approach be adopted in order to reduce such risk, but this should be done in a reasonable and practicable manner to ensure serious irreversible impacts are avoided. It is important to keep the observed record of possible deleterious impacts upon cetaceans, particularly beaked whales, in context, noting the many thousands of whales which strand annually without any apparent cause. Furthermore, only high-powered active LF and MF ASW sonars have been implicated in any way, indicating that the risk, if any, is lower for other sonars. Accordingly, risk reduction procedures for active sonars other than LF and MF ASW systems need not be as stringent.

Defence activities in the GBRWHA represent minimal risk of causing significant and adverse environmental outcomes. The risks that do exist can be readily managed by prudent planning and the adherence to reasonable risk recognition, avoidance and mitigation procedures.

Other human activities within the GBR region are not generally coincident with the nodes of Defence activities, and consequently, are not affected in any persistent or tangible manner.

Conversely, Defence activities in the GBRWHA have been demonstrated to improve the protection and conservation of components of the World Heritage values by both direct and indirect means.

On balance, it may be concluded that Defence activities and presence within the GBRWHA have an effectively neutral to positive effect upon World Heritage values.
8. CONSULTATION AND PROJECT STAFF

8.1 CONSULTATION AND ACKNOWLEDGEMENTS

It is not possible to name all of the people who have been consulted or contributed in some way during the preparation of this report, although all contributions have been gratefully accepted. Individuals named in this section are restricted to those who are considered to have made a notable contribution. Apologies are extended to any individuals who may have been omitted.

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
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</thead>
<tbody>
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<td>Colin Trinder</td>
<td>Director of Environmental Stewardship</td>
</tr>
<tr>
<td>Andrew McKinnon</td>
<td>Director, Navy Environment and Basing Policy</td>
</tr>
<tr>
<td>CMDR Ross Wendt</td>
<td>Fleet Environment and Occupational Health and Safety Coordinating Officer</td>
</tr>
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<td>CMDR Stephen Cole</td>
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</tr>
<tr>
<td>Mark Bolger</td>
<td>Australian Hydrographic Service</td>
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<tr>
<td>MAJ Susan Hickey</td>
<td>Army Environmental Officer</td>
</tr>
<tr>
<td>GPCAPT Grahame Carroll</td>
<td>AFHQ</td>
</tr>
<tr>
<td>SQNLDR Len Bowen</td>
<td>RAAF Environmental Officer</td>
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<tr>
<td>SQNLDR David Hombsch</td>
<td>HQAC</td>
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<td>CAPT Paul Scanlan</td>
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<tr>
<td>Matt MacFarlane</td>
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</tr>
<tr>
<td>Bronwen Manzi</td>
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<td>Steve Lawry</td>
<td>Directorate of Navy Platform Systems</td>
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<td>Owen Parker</td>
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<tr>
<td>Loraine Sciascia</td>
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<tr>
<td>Barbara Bock</td>
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<tr>
<td>Christine Bell</td>
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<td>Dr Doug Cato</td>
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<tr>
<td>Paul Clarke</td>
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<td>Jarrad Exelby</td>
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<td>John Lewis</td>
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<tr>
<td>Dr Adam Smith</td>
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</tr>
<tr>
<td>Judy Hassall</td>
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</tr>
<tr>
<td>Peter McGinnity</td>
<td>Great Barrier Reef Maine Park Authority</td>
</tr>
</tbody>
</table>
## 8.2 PROJ ECT TEAM

**URS Australia**

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
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<tbody>
<tr>
<td>Dr Kirstin Dobbs</td>
<td>Great Barrier Reef Maine Park Authority</td>
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<tr>
<td>Dave Lowe</td>
<td>Great Barrier Reef Maine Park Authority</td>
</tr>
<tr>
<td>Dr Tom Taranto</td>
<td>CSIRO</td>
</tr>
<tr>
<td>Dr Andrew Heap</td>
<td>Geoscience Australia</td>
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<tr>
<td>Dr Paul O’Neill</td>
<td>Queensland Parks and Wildlife Service</td>
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<tr>
<td>James Curtis</td>
<td>Queensland Parks and Wildlife Service</td>
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<td>Dr Niall Connolly</td>
<td>Centre for Tropical Freshwater Research, James Cook University</td>
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<tr>
<td>Dr Rosemary Niehus</td>
<td>Queensland Herbarium</td>
</tr>
<tr>
<td>Dr Joy Brushe</td>
<td>Queensland Herbarium</td>
</tr>
<tr>
<td>Victor McGrath</td>
<td>Island Co-ordinating Council</td>
</tr>
<tr>
<td>Steve Jones</td>
<td>Queensland Environment Protection Agency</td>
</tr>
<tr>
<td>Anna Morrison</td>
<td>Queensland Environment Protection Agency</td>
</tr>
<tr>
<td>Darren Burrowes</td>
<td>Advanced Technology Systems Australia</td>
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<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>John Polglaze</td>
<td>Project manager and principal consultant</td>
</tr>
<tr>
<td>Ian LeProvost</td>
<td>Technical review</td>
</tr>
<tr>
<td>Dr Tony Rouphael</td>
<td>Project staff</td>
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<tr>
<td>Damien Demunck</td>
<td>Project staff</td>
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<tr>
<td>Justin Dwyer</td>
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<tr>
<td>William Blackshaw</td>
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<tr>
<td>Jill Regazzo</td>
<td>Administrative support</td>
</tr>
<tr>
<td>Sharmalie Ranjithkumar</td>
<td>Clerical support</td>
</tr>
<tr>
<td>Vicki Ackermans</td>
<td>Clerical support</td>
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</table>
9. BIBLIOGRAPHY AND GLOSSARY

9.1 BIBLIOGRAPHY


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9. BIBLIOGRAPHY AND GLOSSARY


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### 9.2 GLOSSARY

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>4RAR(Cdo)</td>
<td>4 [Commando] Battalion, Royal Australian Regiment</td>
</tr>
<tr>
<td>AAG</td>
<td>Australian Acoustic Generator</td>
</tr>
<tr>
<td>AAM</td>
<td>Air-to-Air Missile</td>
</tr>
<tr>
<td>AAR</td>
<td>Air-to-Air Refuelling</td>
</tr>
<tr>
<td>AAW</td>
<td>Anti-Air warfare</td>
</tr>
<tr>
<td>ABR</td>
<td>Australian Book of Reference</td>
</tr>
<tr>
<td>ACG</td>
<td>Air Combat Group</td>
</tr>
<tr>
<td>AD</td>
<td>Air Defence</td>
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<tr>
<td>ADCAP</td>
<td>Advanced Capability</td>
</tr>
<tr>
<td>ADCP</td>
<td>Acoustic Doppler Current Profiler</td>
</tr>
<tr>
<td>ADD</td>
<td>Acoustic Deterrence Device</td>
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<td>ADEX</td>
<td>Air Defence Exercise</td>
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<td>ADF</td>
<td>Australian Defence Force</td>
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<td>ADFMA EMP</td>
<td>ADF Maritime Activities Environmental Management Plan</td>
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<td>Australian Defence Organisation</td>
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<td>Australian Fleet</td>
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<td>AFFF</td>
<td>Aqueous film forming foam</td>
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<td>AlAgO</td>
<td>Aluminium-Silver Oxide</td>
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<td>ALT</td>
<td>Aircraft-Launched Torpedo</td>
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### Bibliography and Glossary

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<td>Armour Piercing</td>
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<td>Armour Piercing Discarding Sabot</td>
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<td>Aircraft Research And Development Unit</td>
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<td>Armed Reconnaissance Helicopter</td>
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<td>ASM</td>
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<td>Trials and Safety Vessel</td>
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<td>CAS</td>
<td>Combined Antenna System</td>
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<td>Coordinated Anti-Submarine Exercise</td>
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<td>CASSTASS</td>
<td>Containerised Australian Surface Ship Towed Array Sonar System</td>
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<td>CFS</td>
<td>Central Flying School</td>
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<tr>
<td>CHT</td>
<td>Collect (and comminute), Hold and Transfer</td>
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<td>CIA</td>
<td>Cumulative Impact Assessment</td>
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<td>CJOPS</td>
<td>Chief, Joint Operations</td>
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<td>COMEX</td>
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<td>Corporate Services and Infrastructure Group</td>
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<td>CSIRO</td>
<td>Commonwealth Scientific And Industrial Research Organisation</td>
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<tr>
<td>CTD</td>
<td>Conductivity/Temperature/Depth</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>CTFM</td>
<td>Continuous Transmission Frequency Modulated</td>
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<td>STP</td>
<td>Sewage Treatment Plant</td>
</tr>
<tr>
<td>STS</td>
<td>Sail Training Ship</td>
</tr>
<tr>
<td>SUS</td>
<td>Signal, Underwater Sound</td>
</tr>
<tr>
<td>SWBTA</td>
<td>Shoalwater Bay Training Area</td>
</tr>
<tr>
<td>SWSR</td>
<td>Shallow Water Sound Range</td>
</tr>
<tr>
<td>SWTR</td>
<td>Shallow Water Tracking Range</td>
</tr>
<tr>
<td>SYSCOM</td>
<td>Navy Systems Command</td>
</tr>
<tr>
<td>TA</td>
<td>Training Area</td>
</tr>
<tr>
<td>TAMA</td>
<td>Training Area Management Authority</td>
</tr>
<tr>
<td>TFBS</td>
<td>Tank, Fuel, Barge System</td>
</tr>
<tr>
<td>TOPAT</td>
<td>Towed Passive Target</td>
</tr>
<tr>
<td>TOSEX</td>
<td>Towing Exercise</td>
</tr>
<tr>
<td>TRV</td>
<td>Torpedo Recovery Vessels</td>
</tr>
<tr>
<td>UHF</td>
<td>Ultra High Frequency</td>
</tr>
<tr>
<td>UNREP</td>
<td>Underway Replenishment</td>
</tr>
<tr>
<td>USAF</td>
<td>United States Air Force</td>
</tr>
<tr>
<td>USEPA</td>
<td>United States Environment Protection Agency</td>
</tr>
<tr>
<td>USMC</td>
<td>United States Marine Corps</td>
</tr>
<tr>
<td>USN</td>
<td>United States Navy</td>
</tr>
<tr>
<td>UWT</td>
<td>Underwater Telephone</td>
</tr>
<tr>
<td>UWTR</td>
<td>Underwater Tracking Range</td>
</tr>
<tr>
<td>UXO</td>
<td>Unexploded Ordnance</td>
</tr>
<tr>
<td>VDS</td>
<td>Variable Depth Sonar</td>
</tr>
<tr>
<td>VERTREP</td>
<td>Vertical Replenishment</td>
</tr>
<tr>
<td>VHF</td>
<td>Very High Frequency</td>
</tr>
<tr>
<td>VINEM</td>
<td>Visual Indicator Naval Exercise Mine</td>
</tr>
<tr>
<td>VLF</td>
<td>Very Low Frequency</td>
</tr>
<tr>
<td>VOC</td>
<td>Volatile Organic Compound</td>
</tr>
<tr>
<td>VTNF</td>
<td>Variable Timing Non-Fragmentation</td>
</tr>
<tr>
<td>WAXA</td>
<td>Western Australia Exercise Area</td>
</tr>
<tr>
<td>WEECD</td>
<td>Weapons Electrical Engineering Casualty Drill</td>
</tr>
<tr>
<td>WHA</td>
<td>World Heritage Area</td>
</tr>
<tr>
<td>WHC</td>
<td>World Heritage Council</td>
</tr>
<tr>
<td>WUP</td>
<td>Work-Up</td>
</tr>
<tr>
<td>WVR</td>
<td>Within Visual Range</td>
</tr>
<tr>
<td>XBT</td>
<td>Expendable Bathythermograph</td>
</tr>
</tbody>
</table>
9. Bibliography and Glossary

Aircraft Designations (US Nomenclature)

A Attack
B Bomber
C Cargo
E Electronic
F Fighter
H Helicopter (or Recovery, as in ‘HH’)
K Tanker
M Multi-mission
O Observation (i.e. battlefield reconnaissance)
P Maritime patrol
Q Target
R Reconnaissance
S Sea control (i.e. anti-submarine)
T Trainer
U Utility
V Vertical take-off and landing
W Weather surveillance

Equipment Designations (AN Codes)

<table>
<thead>
<tr>
<th>Installation Identifier</th>
<th>Type Identifier</th>
<th>Purpose Identifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Piloted aircraft</td>
<td>Invisible light/heat radiation</td>
</tr>
<tr>
<td>B</td>
<td>Underwater mobile/submarine</td>
<td>Carrier</td>
</tr>
<tr>
<td>D</td>
<td>Pilotless carrier</td>
<td>Radiac</td>
</tr>
<tr>
<td>F</td>
<td>Fixed ground</td>
<td>Telegraph/teletype</td>
</tr>
<tr>
<td>G</td>
<td>General ground</td>
<td>Interphone/public address</td>
</tr>
<tr>
<td>K</td>
<td>Amphibious</td>
<td>Electromechanical/inertial wire covered</td>
</tr>
<tr>
<td>M</td>
<td>Ground mobile</td>
<td>Telemetry</td>
</tr>
<tr>
<td>P</td>
<td>Portable</td>
<td>Countermeasures</td>
</tr>
<tr>
<td>S</td>
<td>Water</td>
<td>Meteorological</td>
</tr>
<tr>
<td>T</td>
<td>Ground transportable</td>
<td>Sound in air</td>
</tr>
<tr>
<td>U</td>
<td>General utility</td>
<td>Radar</td>
</tr>
<tr>
<td>V</td>
<td>Ground vehicular</td>
<td>Sonar/underwater sound</td>
</tr>
<tr>
<td>W</td>
<td>Water (surface/subsurface applications combined)</td>
<td>Radio</td>
</tr>
<tr>
<td>Z</td>
<td>Unmanned/piloted air vehicle combination</td>
<td>Special combination of purposes</td>
</tr>
<tr>
<td>T</td>
<td>Telephone (wire)</td>
<td>Identification/recognition</td>
</tr>
<tr>
<td>V</td>
<td>Visible light</td>
<td>Surveillance and control</td>
</tr>
<tr>
<td>W</td>
<td>Armament</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Facsimile/TV</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>Data processing</td>
<td></td>
</tr>
</tbody>
</table>

E.g. SQS-56 = the 56th registered water platform based, sonar/underwater sound system used for search/direction/range/bearing purposes (i.e. a ship-mounted search sonar).
### RF Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELF: Extremely Low Frequency</td>
<td>30-300 Hz</td>
<td>10,000-1000 km</td>
</tr>
<tr>
<td>VF: Voice Frequency</td>
<td>300-3000 Hz</td>
<td>1000-100 km</td>
</tr>
<tr>
<td>VLF: Very Low Frequency</td>
<td>3-30 kHz</td>
<td>100-10 km</td>
</tr>
<tr>
<td>LF: Low Frequency</td>
<td>30-300 kHz</td>
<td>10,000-1000 m</td>
</tr>
<tr>
<td>MF: Medium Frequency</td>
<td>300-3000 kHz</td>
<td>1000-100 m</td>
</tr>
<tr>
<td>HF: High Frequency</td>
<td>3-30 MHz</td>
<td>100-10 m</td>
</tr>
</tbody>
</table>

#### Historical Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF: Very High Frequency</td>
<td>30-300 MHz</td>
<td>10-1 m</td>
</tr>
<tr>
<td>UHF: Ultra High Frequency</td>
<td>300-1000 MHz</td>
<td>100-30 cm</td>
</tr>
<tr>
<td>L</td>
<td>1-2 GHz</td>
<td>30-13 cm</td>
</tr>
<tr>
<td>S</td>
<td>2-4 GHz</td>
<td>15-7.5 cm</td>
</tr>
<tr>
<td>C</td>
<td>4-8 GHz</td>
<td>7.5-3.75 cm</td>
</tr>
<tr>
<td>X</td>
<td>8-12 GHz</td>
<td>3.75-2.5 cm</td>
</tr>
<tr>
<td>Ku</td>
<td>12-18 GHz</td>
<td>2.5-1.6 cm</td>
</tr>
<tr>
<td>K</td>
<td>18-27 GHz</td>
<td>1.6-1.1 cm</td>
</tr>
<tr>
<td>Ka</td>
<td>27-40 GHz</td>
<td>1.1-0.75 cm</td>
</tr>
<tr>
<td>MM</td>
<td>40-100 GHz</td>
<td>0.75-0.3 cm</td>
</tr>
</tbody>
</table>

#### NATO/EW Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequency</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30-250 MHz</td>
<td>1000-120 cm</td>
</tr>
<tr>
<td>B</td>
<td>250-500 MHz</td>
<td>120-60 cm</td>
</tr>
<tr>
<td>C</td>
<td>500-1000 MHz</td>
<td>60-30 cm</td>
</tr>
<tr>
<td>D</td>
<td>1-2 GHz</td>
<td>30-15 cm</td>
</tr>
<tr>
<td>E</td>
<td>2-3 GHz</td>
<td>15-10 cm</td>
</tr>
<tr>
<td>F</td>
<td>3-4 GHz</td>
<td>10-7.5 cm</td>
</tr>
<tr>
<td>G</td>
<td>4-6 GHz</td>
<td>7.5-5 cm</td>
</tr>
<tr>
<td>H</td>
<td>6-8 GHz</td>
<td>5-3.75 cm</td>
</tr>
<tr>
<td>I</td>
<td>8-10 GHz</td>
<td>3.75-3 cm</td>
</tr>
<tr>
<td>J</td>
<td>10-20 GHz</td>
<td>3-1.5 cm</td>
</tr>
<tr>
<td>K</td>
<td>20-40 GHz</td>
<td>1.5-0.75 cm</td>
</tr>
<tr>
<td>L</td>
<td>40-60 GHz</td>
<td>0.75-0.5 cm</td>
</tr>
<tr>
<td>M</td>
<td>60-100 GHz</td>
<td>0.5-0.3 cm</td>
</tr>
</tbody>
</table>
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