2.0 ENVIRONMENTAL CONSIDERATIONS

This chapter is designed to provide the handbook user with an appreciation of the potential consequences of marina development upon the environment of the Great Barrier Reef. It also provides an overview of the environmental legislation and studies that need to be undertaken as an integral part of the design, construction and operation of a marina.

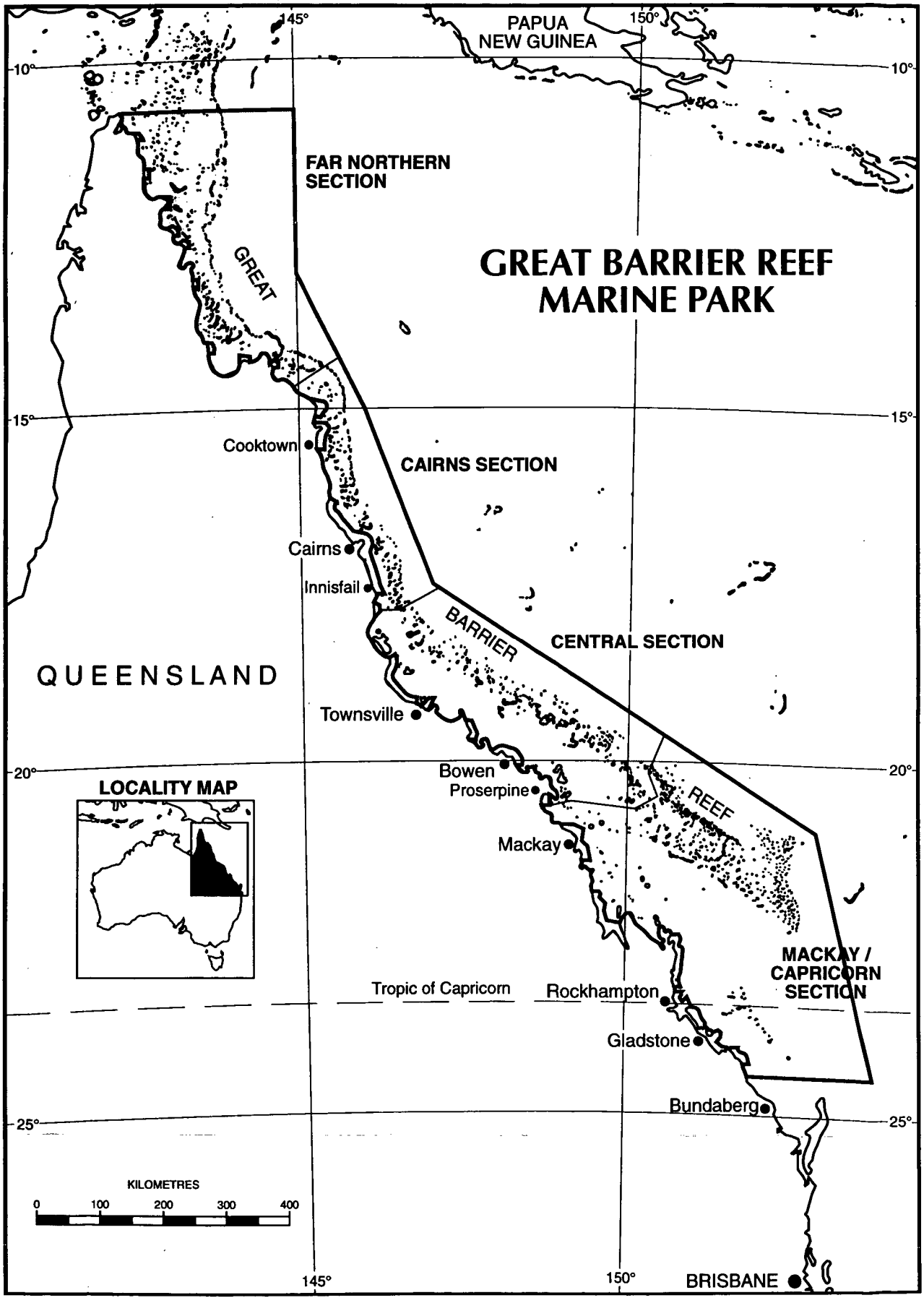
2.1 Background

The Great Barrier Reef Marine Park (GBRMP) is the largest marine park in the world. It includes most of the Great Barrier Reef region which is inscribed on the World Heritage List, in recognition of its outstanding universal value. The Great Barrier Reef Marine Park Authority (GBRMPA) which was established under the *Great Barrier Reef Marine Park Act 1975*, is a Commonwealth statutory body and is responsible for management of the Marine Park. The GBRMP stretches along some 2 800 km of the coast of Queensland. Figure 1 shows a map of the Queensland coast with the Great Barrier Reef Marine Park and Queensland Marine Park boundaries and areas marked. Under agreement between the Commonwealth and Queensland Governments a complementary approach to the management of the Marine Parks has been adopted. The GBRMPA is responsible for the management, planning, policy programs and general oversight of park management. Queensland Department of Environment and Heritage (QDEH) is the principal agency responsible to the Authority for day-to-day management of the Park and has responsibility for managing Queensland Marine Parks which are adjacent to the GBRMP. Due to the coastal siting of most marinas in or immediately adjacent to the Marine Park, they are under the jurisdiction of not only the GBRMPA, but also Queensland and Local Government Departments and legislation. As the design, construction and operation of a coastal marina may often overlap these three spheres of government jurisdiction, their development can be complex and involve a large number of government bodies and requirements. Section 2.3 of this document outlines the legislative framework which needs to be considered when developing a marina which may come under the jurisdiction of the GBRMPA, State and Local authorities. Appendix 1 lists administrative authorities for the relevant legislation and advisory bodies that should also be contacted when planning a marina development, and that will assist in determining the relevant planning legislation and jurisdiction applicable to the development.

2.2 Impact of Marinas

Most coastal construction projects, including coastal marinas, will impact the environment in a variety of ways. Impacts can be perceived or real, and may be either beneficial or detrimental to the environment - beneficial in as much as a previously degraded environment may be restored. One of the major concerns of the community is the alteration of the environment caused by marina construction and operation. Adverse impacts from dredge and fill operations may include coral reef, seagrass and other marine habitat loss or degradation, wetland alteration, destruction of shellfish beds, increased turbidity or siltation, reduced dissolved oxygen or resuspension of nutrients or toxic pollutants.

Figure 1. Map of Queensland coast showing Great Barrier Reef Marine Park



Shoreline and protective structures affect the physical, chemical and biological components of the environment and may alienate beaches and change flooding characteristics. Adverse effects may result from alterations in water circulation, deposition/erosion characteristics, blockage of migration routes or shading in shallow-water habitats or addition of toxic chemical preservatives. On the other hand, the marina structures may provide suitable habitats for colonisation which may help to compensate for natural habitat altered or lost during construction. Certain structures may also attract fish into the area.

Runoff from marinas and sewage discharged from boats may affect the natural productivity of a site. Coral, algae and other animals and plants are sensitive to elevated nutrient concentrations and can be killed, overgrown or out-competed by other plants and animals. As a result, the composition or structure of a community can be dramatically altered. Boat operation also may result in physical impacts to shorelines and to sensitive biota including intertidal oyster banks, reefs, seagrasses, mangroves, waterfowl, dugong and turtles.

The potential for environmental impacts is a function of many variables, including marina location, design, services offered, number and type of boats served, marina management and operational performance. As a result, the potential for, or the degree of environmental changes is not the same for all marinas. Inevitably there will be different sets of environmental circumstances for every project that is assessed. Thus the need for environmental studies (baseline data, planning, impact assessment, and monitoring studies) in the design, implementation and operation phases of marina development becomes apparent.

2.3 Legislative Frameworks

Commonwealth Government

A developer proposing to plan a marina development in, or adjacent to the Great Barrier Reef Marine Park, should contact the Great Barrier Reef Marine Park Authority as early as possible, supplying preliminary information about the proposed site and development. A developer should bear in mind from day one that the GBRMPA has no mandate for either the promotion or discouragement of development *per se*, but rather for the wise use of the GBRMP.

If a proposal for a site within or partly within the GBRMP has the potential for significant environmental impacts (this includes most marina proposals) then GBRMPA must recommend to the Minister responsible for the Commonwealth Department of the Environment, Sport and Territories (DEST) that the proposal be subject to the provisions of the Commonwealth *Environment Protection (Impact of Proposals) Act 1974* (EP(IP)Act). Note that the EP(IP) Act may also be involved if any Commonwealth level decision is required, for example, if approval by the Foreign Investment Review Board (FIRB) is needed.

The object of the EP(IP) Act is to ensure that matters affecting the environment to a significant extent are fully examined and taken into account in decisions by the Australian Government. Under this Act, environment is defined to include all aspects of the surroundings of human beings, whether affecting them as individuals or in their social groupings. It therefore encompasses social, economic, physical (built or natural) and biological aspects.

The EP(IP) Act specifies a formal process for the assessment of impacts. It allows for the assessment of a development proposal through public review, usually as either a Public Environment Report (PER) or an Environmental Impact Statement (EIS). A PER is more narrowly focussed than an EIS and may be required where there are not expected to be as many or as widely spread environmental impacts. An EIS or PER provides:

- information for interested people to understand the proposal and its likely impacts;
- a forum for public consultation; and
- a framework for decision makers to consider environmental and other aspects of the proposal.

The PER or draft EIS is made available to the public for comment and for official review (under terms of the EP(IP) Act). The Commonwealth Minister responsible for this Act makes recommendations to the GBRMPA on whether the project should be allowed to proceed and, if so, under what conditions. The GBRMPA then makes its own decision taking into account:

- the content of the proposal and conformity with the GBRMP Act and Regulations;
- assessment of the PER or EIS;
- the recommendation of the Minister responsible for the EP(IP) Act; and
- public comment.

The main procedural steps for project assessment under the EP(IP) Act are outlined in Figure 2. If a permit is granted, it will specify the conditions and restrictions on the development to which the developer must adhere. One such condition is usually that any construction conform to a Code of Environmental Practice which may involve an Environmental Monitoring and Management Program (EMMP). EMMPs are discussed in Section 2.4.

State and Local Government

Most of the marina proposals examined by GBRMPA are situated on the coastal margins of Queensland, often adjoining and sometimes straddling the boundaries of the landward margins of the Commonwealth GBRMP and Queensland Crown lands and waters including Queensland Marine Parks. In these cases, Queensland legislation is also applicable and the Queensland Government may require that an impact assessment be undertaken in accordance with the *Local Government (Planning and Environment) Act 1990.*

This Act specifies that marinas within Local Authority areas, which have more than 30 moorings or refuelling facilities, are 'designated developments' under the Act. As such, any application to the local authority for approval must contain an Environmental Impact Statement. The Act is administered by the Queensland Department of Housing, Local Government and Planning (QDHLGP). The steps involved in the environmental impact assessment process in Queensland under the Local Government (Planning and Environment) Act, are described in Figure 3. The process is initiated by a proponent submitting a 'Request for Environmental Impact Statement Terms of Reference' form to the QDHLGP or the local Council. A copy of this form is enclosed in Appendix 2. However, Terms of Reference and assessments are conducted in consultation with the Queensland Department of Environment and Heritage and other appropriate Government bodies called 'referral agencies'. Typical referral agencies for a marina development are listed in Appendix 4. (Note that although the above and the following are correct at the time of writing, new Coastal Protection (Queensland) legislation, into which parts of the Harbours Act, etc. will be amalgamated, is currently in preparation.)

For proposals involving only Crown Land, the Queensland Government may require an impact assessment in accordance with the State *Development and Public Works Organisation Act 1971* (Section 29), as Crown Land is not covered by local authority planning schemes.

In most marina development cases both Queensland and Commonwealth Governments will require impact assessments pursuant to their individual legislation. However, it will usually be agreed by both governments that only one environmental study is produced under a jointly coordinated set of guidelines and Terms of Reference which satisfy the separate and collective requirements of all the regulatory authorities concerned. Coordination for the project assessment and procedures may be designated to either State or Commonwealth in accordance with cooperative arrangements which exist between them.

Summaries of the requirements and typical Terms of Reference (TOR) for preparation of a joint Environmental Impact Statement (EIS) under Queensland and Commonwealth legislation for a typical marina development are outlined in Appendix 3.

Permits

As well as being assessed under the EP(IP) Act, a marina proposal is also assessed by GBRMPA, according to criteria set out in the GBRMP Regulations, to obtain a GBRMP permit. These criteria include the effect of the proposal on cultural and heritage values, on the environment and the conservation of resources, on existing and future use and amenity, and on the aptness of the project under the zoning plans. Conditions attached to Marine Park Permits are often used as a means of implementing recommendations forthcoming from the impact assessment process. It should be noted that acceptance of the EIS does not necessarily guarantee issue of a Marine Park permit. In addition, there are usually two permits: one for construction and another for operation - each with its own set of monitoring requirements. Similarly, permit conditions may specify contingency upon issue of other State and Commonwealth permits.

Permit Application Assessment Fees are charged by the GBRMPA and QDEH to cover the costs of assessing applications for permits. A single fee is charged for assessment of effects on the GBRMP and the adjacent Queensland State Marine Parks. Appendix 5 provides a brief guide to Permit Application Assessment Fees and Charges.

In June 1992, the Minister Mrs Ros Kelly announced the introduction of Marine Park Fees from 1 July 1993. These fees will be paid quarterly in arrears by all standard operators, including marina constructors and operators. As at 1 July 1993, the fee applicable for the establishment and operation of a marina consists of a flat fee of $190 per quarter or a scaled fee of $1 per berthed vessel per day (or part thereof), whichever is the higher. Operators will be required to complete a logbook (which will be supplied) on a daily basis, and submit a quarterly return.

2.4 Environmental Studies

Environmental planning, impact assessment, mitigation of adverse effects and judgement as to whether a proposed development constitutes 'wise use' of a resource clearly depend upon a knowledge of the resources at risk. It is assumed that developers applying for permission to undertake a project will provide a description of the environment sufficient to enable an assessment of the risk to be made. Experience indicates that these descriptions are often subjective and qualitative - in very few instances are they suitable for an adequate assessment of environmental impact. The ideal inter-relationship between various environmental studies for the environmental impact assessment process is shown in Figure 4.

Environmental planning studies are the first important step in the environment consideration process. These studies are generally based on qualitative descriptions of the environment. Proper environmental planning serves a number of important functions:

- it identifies environmental constraints and opportunities at the site which may affect the design/engineering of the marina;
- it allows preparation of initial advice information to both Commonwealth and State Government Approval Bodies, from which Terms of Reference (TOR) for the Environmental Impact Statements can be issued; and
- it allows the planning of pilot studies which will be a necessary precursor for the design of baseline studies.

Figure 2. Description of Project Assessment Process under Commonwealth Environment Protection (Impact of Proposals) Act

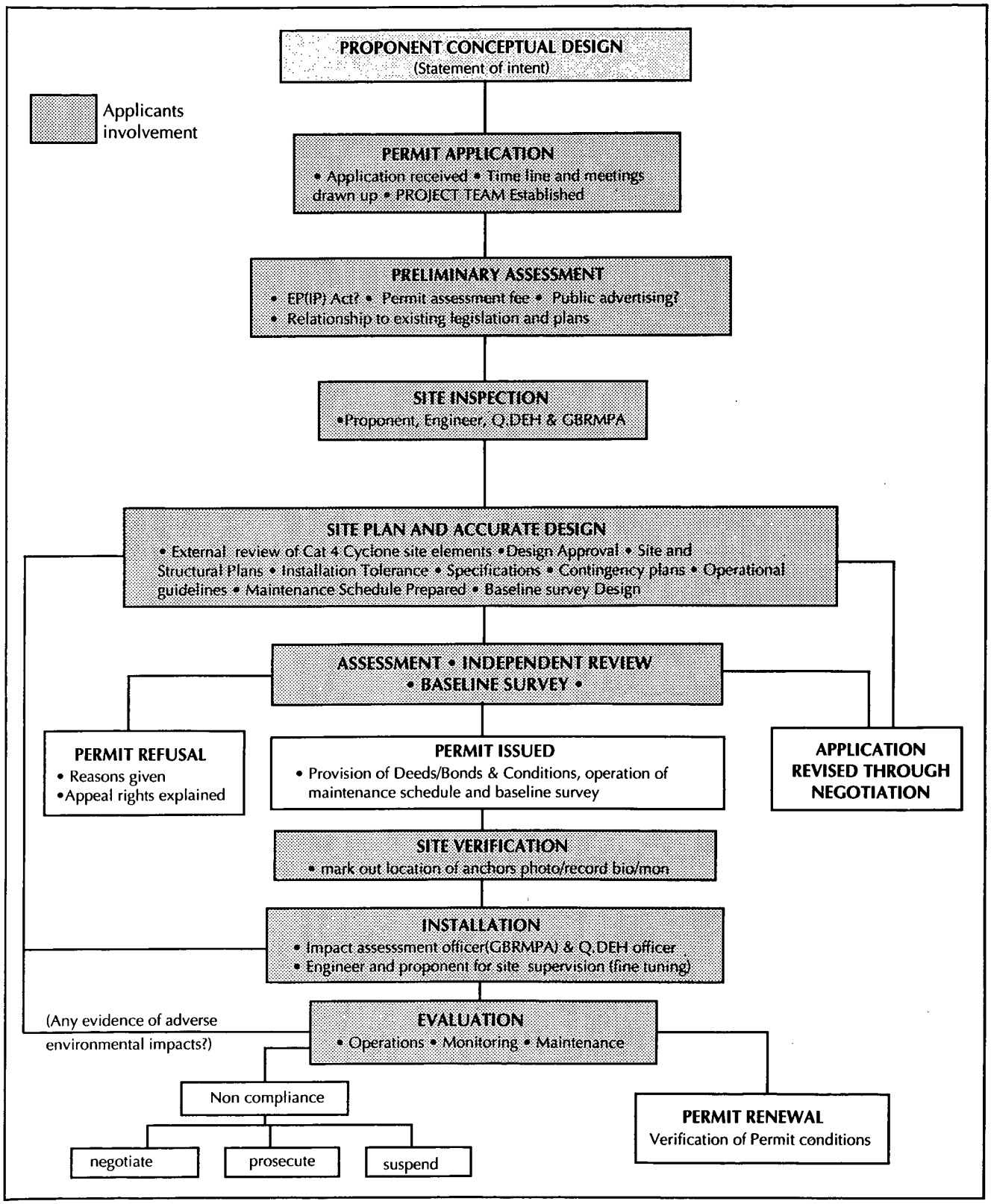


Figure 3. Description of EIA Process under Queensland Local Government (Planning and Environment) Act

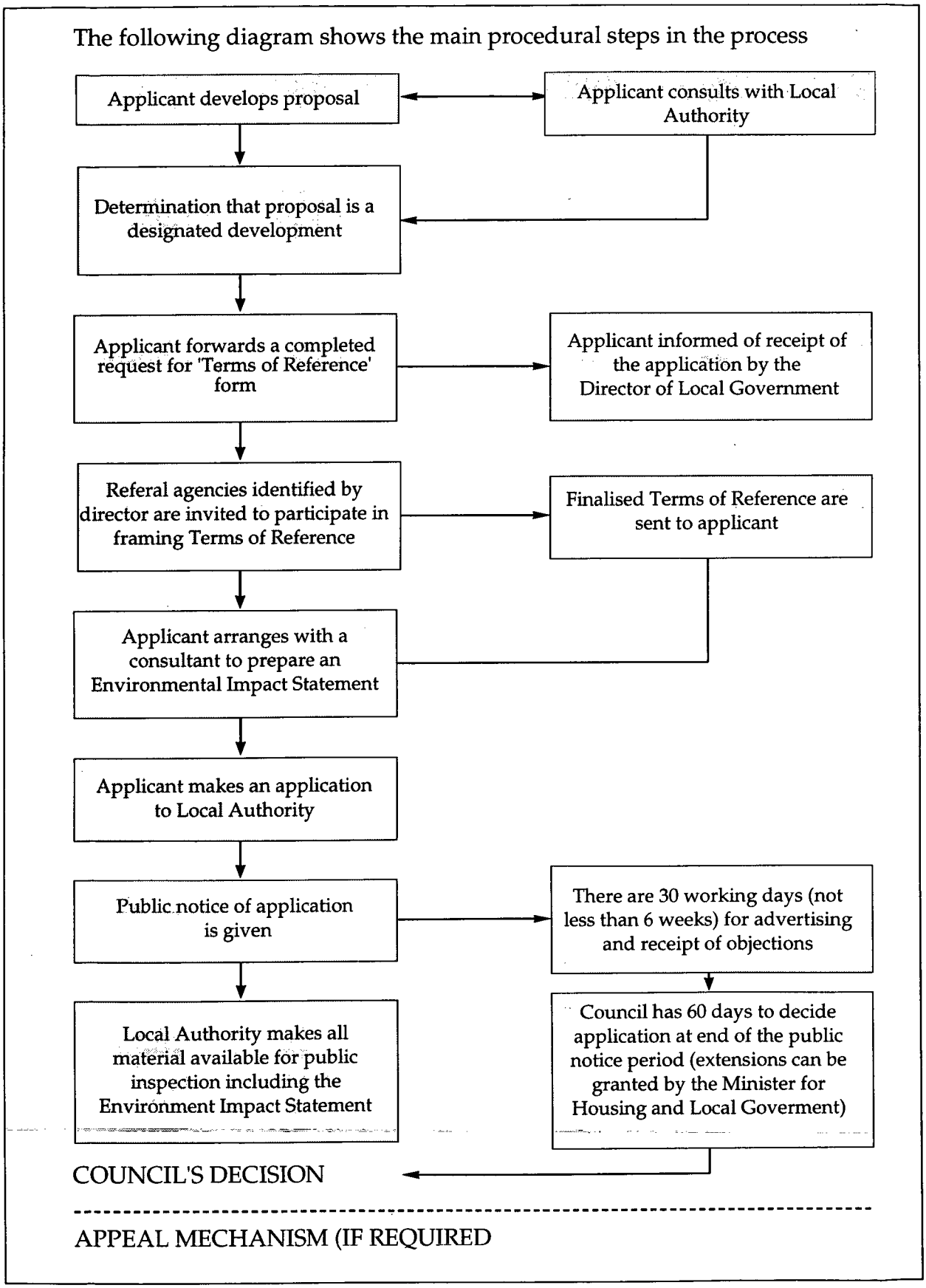
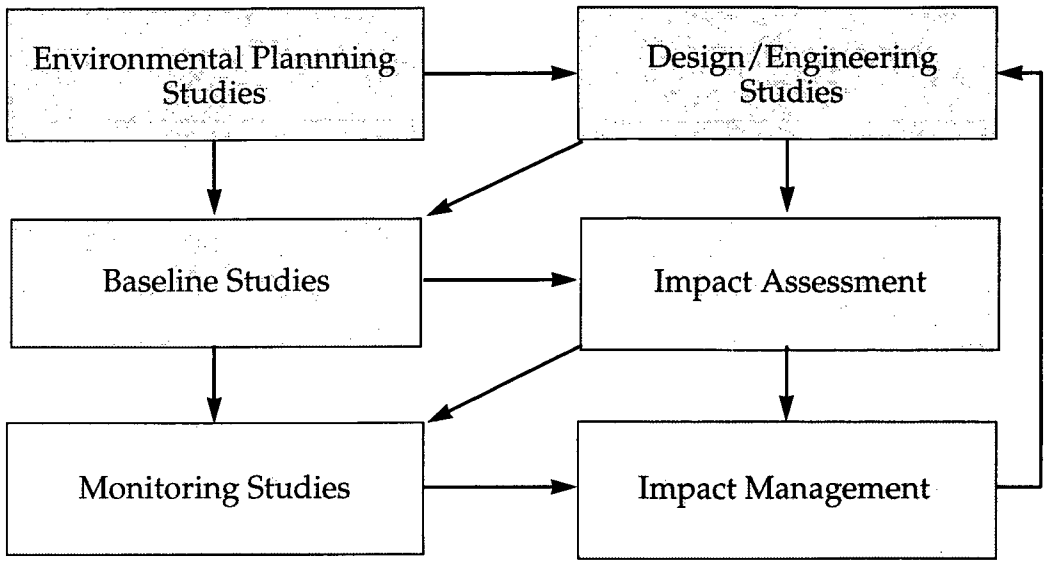


Figure 4. Ideal inter-relationship between environmental studies for the Environmental Impact Assessment Process



Since baseline studies must be demonstrated to be adequate for detecting change, 'pilot' studies are usually required to precede the baseline to test the selection of sites, parameters and times as being appropriate to detect change with reasonable confidence. Pilot study results are used to provide a statistical basis for the experimental design of the baseline and ongoing components of the monitoring program. Note that all monitoring is at the cost of the developer, and that monitoring program design will be subjected to peer review by GBRMPA to ensure its scientific validity.

Impact assessment is the integral part of the process by which development proposals are refined prior to submitting the EIS and seeking approval from regulatory authorities. As the mitigation of adverse impacts must be of serious concern to a developer, then impact assessment must become a key element of the ongoing process of concept and design refinement.

When considering the implications of a marina development proposal, or modifying concepts or designs to mitigate unacceptable or undesirable impacts, be aware that impacts are judged in many different ways. One important criteria for judging wise use' is to examine the reversibility of an effect. As a rule, permanent changes (whether apparently unacceptable or acceptable) constitute a 'primary concern' and should be more carefully assessed. Poor water quality, which can usually be remedied through design and/or management modification, is given a 'secondary level' rating, but dredging causes permanent change and has a permanent environmental effect, and therefore warrants a 'primary level' rating. Typical rankings for other categories of effects are provided in Table 2.1.

Table 2.1 Primary and secondary level effects as judged by 'reversibility' of impacts. (Primary level impacts are generally non-reversible and result in permanent or long-lasting changes to the existing environment. Secondary level effects are those which can be mitigated or reinstated over time.)

'primary' level effects	'secondary' level effects
Social and cultural impact Habitat destruction Aesthetics modification Reclamation/dredging impacts Changes in coastal process at construction	Coastal process changes (long-term) Changes in marine flora and fauna Water quality degradation Design parameters Construction and operational of management procedures

Other criteria for assessing 'wise use' include the size, intensity, specificity, duration and predictability of impacts (Table 2.2). When attempting to mitigate or to judge the acceptability of adverse impacts, those that affect a large region, that are extremely intense or that affect large portions of the community for long periods of time should be scrutinised most carefully. Pronounced or obvious benefits or enhancements that cover a large section of the community within a large region for an extended period of time are to be sought whenever possible.

There will inevitably be instances when marina design or assessment decisions must rely on incomplete data. In these circumstances it is critical that the reliability of the data or the questionable predictability of the impact be clearly identified. While it may be acceptable to adopt a particular course of action if the assessor or designer knows the risk of making an incorrect decision, it is never acceptable to make a decision when the likelihood of that decision being wrong is unknown.

The time taken to appropriately fulfil the statutory impact assessment processes (i.e. produce TOR and guidelines, have a report prepared, go through a public review process, comment on issues raised and receive a response from government agencies) can amount to a minimum of 6 months or, in the case of large projects, even several years. It is imperative that marina developers consider the likelihood of such an assessment and its effects on project timing and costs from the initial stages of concept development.

Table 2.2 General Impact Assessment Criteria

criteria	desired condition
size	small area of negative impacts, large area of positive impacts
specificity	small segment of the community negatively impacted, broad positive impacts
intensity	intensity weak or barely discernible negative impacts, pronounced or extreme positive impacts
reversibility	reversible negative impacts, irreversible for positive impacts
duration	short-term negative impacts, long term positive impacts
predictability	reliable predictions through appropriate monitoring in all cases

Baseline studies have a dual purpose:

- they provide a quantified description of the physical, biological, economic, social and cultural environment for the purpose of conducting the impact assessment study; and
- they provide a robust set of measurements prior to any site works, against which later monitoring can be compared.

Long-term monitoring relies upon a baseline of pre-existing conditions and subsequent comparisons with this during construction and operation. These studies must be quantitative and well structured to provide a standard against which to detect a change. GBRMPA usually invites peer review, at the developer's expense, of the design of baseline and other monitoring studies to ensure their scientific validity.

Baseline data can often be collected as part of the data collection for the preparation of the EIS. This can result in significant time and cost advantages to a developer. If the EIS does not provide sufficient information about the environment at the site and surrounding areas for future comparisons, then baseline surveys will need to be undertaken before the commencement of any construction or operation.

Once satisfactory baseline information has been obtained, environmental **monitoring studies** are initiated. These begin as soon as possible, no later than the commencement of construction and may continue in some form throughout the operational life of a project. These studies are designed to detect changes in specified aspects of the environment to determine whether those changes result from the construction or operation of the development - or are a natural environmental variation - and to trigger management actions that result in impact mitigation (see below). Usually the GBRMPA contracts an agreed environmental consultant to undertake the necessary baseline study and environmental monitoring program as approved by GBRMPA. The developer pays the costs of the program and pays the GBRMPA to oversee and manage that program.

Impact management and monitoring studies are intimately tied. The purpose of impact management is to verify predicted impacts and to prevent damage to the environment over and above a level predetermined to be the acceptable level of change. This requires the development of a response component within the environmental monitoring and management plan - a set of predetermined management responses for situations where monitoring detects adverse impacts that are approaching or exceeding the acceptable level of change. Impact management requires two types of monitoring studies: a) those longer term, regular event monitoring episodes that can detect gradual changes over prolonged periods against a high degree of natural variation; and b) reactive monitoring studies that detect the presence of damaging impacts in time to allow mitigation before the environment is degraded.

Baseline studies, monitoring studies and impact management are collectively referred to as an Environmental Monitoring and Management Program (EMMP). Descriptive studies may be suitable for impact assessment but they do not suffice for an EMMP study which needs to be quantitative, scientifically rigorous and able to detect environmental changes. EMMPs can be both time consuming and detailed. Therefore their timeframe and cost must be carefully considered by the developer in planning a marina development.

It is important that developers gain a clear understanding from the outset that long term baseline studies will have to be conducted prior to the commencement of any site works, and that some degree of **quantitative** monitoring may have to be continued throughout the construction and operational phases of a project. As all of these studies can take considerable time and effort, for which the developer is paying, it is imperative to carefully choose appropriately qualified and experienced consultants and assistance for these specialist areas. Failure by the developer (or their consultants) to provide appropriate data will mean that resurveys will be required at their cost and with obvious delays. Developers should seek specific guidance on monitoring requirements, approved and appropriate consultants, and should make specific allowance in project schedules and budgets for the conduct of these studies. Remember that program design will be subjected to peer review before it is cleared for implementation.

2.5 Design Planning and Engineering Studies

The other integral components in the environmental assessment process are the design planning and engineering studies. Initial designs and layouts should be influenced by biological, environmental, socio-economic, structural and aesthetic considerations. However the engineering of marinas will be dictated by physical environmental factors and feasibility. Design and construction of breakwaters will depend on proper calculation of wind and waves generated, type of materials used in construction and potential effects of failure of those designs under extreme events. The designs of structures will also have an impact on the environment. Design planning and initial

engineering studies should be carried out hand in hand with environmental studies. This will not only ensure a better design project but may prevent costly re-design and delays later in the project, if environmental constraints are discovered.

It should be remembered that although there exist standards for design and construction of marinas and their components, sometimes these standards are not appropriate or adequate for the provision of environmental protection. These standards and criteria can often be modified slightly, often at no additional cost, to better suit the existing environment and minimise adverse environmental effect on the site. Developers should seek the assistance of the relevant Commonwealth and State authorities, and published standards when designing, but should also be prepared to extend or improve designs to avoid interference with, or protect, sensitive environmental features.

Intending developers should always have concept plans and designs scrutinised by Commonwealth and State authorities prior to full design, engineering or construction. Similarly, all monitoring programs must be approved by GBRMPA and QDEH prior to implementation. Design planning and engineering considerations and criteria are discussed in the following chapters.