

6.0 OPERATION

A coastal marina designed and constructed using the most environmentally sound methods can still be environmentally harmful without proper operation and maintenance. Key areas of concern during the operational phase of a marina development are the conduct of day-to-day management and maintenance; user education to marina management goals; control over boating operations; maintenance dredging; runoff control; boat wastes; fuel management; noise management; and staff training. In an effort to keep water quality near the marina as high as possible, some or all of the following may form part of the Marine Parks operating permit for the facility in the form of an agreed Operations Procedures Manual. In addition, it is very likely that some form of quantitative water quality monitoring will be required. Remember that operating a marina, as well as construction, requires a Marine Parks permit and involves application fees, and probably a bond, insurance, and an operator funded monitoring program.

6.1 Marina Operations and Maintenance

Marina staff should be familiar with specified standard operational procedures.

The dock master and marina attendants should be completely familiar with specified standard operating procedures. It may be helpful for marina staff to receive training and certification from suppliers and equipment manufacturers on proper operation and maintenance of boats and specialised marina equipment. The specification of performance standards for marina equipment could be an effective management tool for controlling pollutant releases.

Ensure routine marina upkeep and maintenance.

Routine marina upkeep should include: the regular collection of all litter in covered containers; the regular maintenance of fuel pumps and spill prevention systems; the removal of debris that accumulates on the shore and in grease/solids traps; as well as maintenance of 'wear and tear' on structures and coatings.

6.2 User Education

Inform boaters of regulations regarding sewage discharge.

An effective means of controlling sewage pollution from boats is to educate boaters about the potential health and environmental hazards associated with the discharge of sewage and to encourage boaters not to discharge either treated or untreated wastes into a marina basin. It is important to note that, for waters actually within the GBRMP, sewage must be treated to tertiary level prior to release from point-source

discharges. Permanently moored live-aboard vessels may be considered point sources for discharge purposes and may be constrained from directly discharging wastes. Marina operators or harbour masters should post regulations prohibiting the discharge of any waste into marina waters and inform their clients of Federal and State regulations and policies when slips or dry storage spaces are rented. This would be very helpful in preserving water quality. It also makes good business sense to maintain an aesthetically pleasing environment.

6.3 Boat Operation and Maintenance

Inform boaters of benefits of unleaded fuels and well tuned engines.

Boat motor emissions can be reduced through the increased use of unleaded fuels. Public education directed toward the importance of well tuned engines is another mitigative measure to be considered for reducing emissions and increasing efficiency.

Encourage use of non-phosphate detergents.

Use of non-phosphate detergents for washing boats would greatly reduce the amounts of nutrients entering the water from this source.

Control hydrocarbons in bilge discharges.

Hydrocarbons entering the water from bilges may be controlled by using oil filtration devices on bilge pumps, or commercial oil-absorbent pads placed in the bilge to soak up oil and fuel prior to bilge water discharge. Sump plumbing should collect oil drainings before they enter the bilge.

Perform boat maintenance activities upland and confine or treat residues and spills.

Painting, sand blasting, engine repairs, boat washing and similar boat maintenance activities performed on shore either indoors or behind canvas screens would help confine any residue or spills from these operations. These operations should be conducted upland, away from marina waters and preferably behind areas enclosed with bunds, drainage channels and sediment traps. This would facilitate cleanup and help prevent contamination of marina waters from runoff during rain storms. Another desirable pollution control option is to regularly collect and remove particles (from sediment traps or the work area) or otherwise treat the runoff from boat painting and scraping areas.

Take measures to reduce copper levels.

Marina operators can reduce copper levels by eliminating the use of copper-based antifouling paints on floats, buoys, and other non-boat surfaces. This step may encourage additional fouling on these surfaces, however, these fouling communities are an important food source for foraging fishes which in turn attract sport fishes into the area.

Copper concentrations within the marina, as with detergents, sewage, and other pollutants, also can be reduced by proper marina siting and design that allows adequate tidal flushing.

Avoid use of air-based spray equipment.

Maintenance painting should not involve spray equipment, particularly air-driven spray guns which produce large volumes of over-spray drift.

Do not use tributyltin oxide based paints.

Use of tributyltin oxide based paints in Queensland requires approval from the Minister under the *Chemical Usage (Agricultural and Veterinary) Control Act 1988*, and can then only be used on vessels greater than 25 m in length and at prescribed levels. Disposal of all waste is also determined by the Minister. Guidelines for the use and disposal of these paints are currently being developed by QDPI.

6.4 Maintenance Dredging

Dispose of dredged material in upland areas (see Section 5.1).

Maintenance dredging may be necessary in some marinas. Provisions should have been made during marina planning to dispose of any dredged material in upland areas away from the marina. There is a general trend to reduce sea dumping of maintenance spoil. See Section 5.1 for possible impacts of dredging and options for disposal of dredged material. Remember that dredging to deliberately obtain material for beach nourishment is not allowable in the GBRMP.

Suction head dredges preferred.

Most maintenance dredging involves spot dredging of silt fines or sands. Suction head dredges have been used for this work around marina structures to prevent damage that dragline and clamshell dredges may cause. A suction head dredge uses high pressure water jets to loosen bottom material and compressed

air to operate pneumatic slurry pumps that force material in concentration through a discharge line. Turbidity can be a problem if such operations are not conducted with caution and adequate control.

6.5 Runoff

Employ an effective stormwater management plan.

Water quality in the marina basin can be impacted by pollutants in stormwater runoff from upland facilities, spills and discharges from boats. These pollutants include sediment, nutrients, petroleum hydrocarbons, metals and bacteria. Maintaining water quality within the marina basin requires effective use of a stormwater management plan. This plan would cover waste minimisation, use of vegetation and detention ponds, first-flush retention and trapping of wastes from specific problem areas.

Build and maintain pit traps from spoil disposal areas.

Drainage for dredge spoil deposit areas should include a collection pit from which waste can be removed. Maintenance must include regular cleaning of sediments trapped in this collection pit.

Minimise clearing and create vegetated buffers.

Clearing in the marina area should be minimised and vegetated buffers such as marsh, mangrove or natural vegetation retained or created on the site between land and water areas. Vegetation will reduce runoff and associated erosion effects. In addition there will be some assimilation of materials present in the runoff.

Take measures to decrease runoff velocity and increase infiltration.

Retain at least the first 2.5 cm of rainfall and route runoff through swales, wetlands, retention and detention ponds and other systems that will increase the time for assimilation of pollutants, decrease runoff velocity, increase infiltration, and allow suspended solids to settle and thereby remove particulate pollutants. The use of porous surfaces (crushed stone, shell) wherever possible, particularly in parking areas, will provide similar benefits. Stormwater discharges are not regulated by GBRMPA as yet, but may be in the future.

Locate outfalls in areas of high flushing rates.

When outfalls are necessary they should be located to discharge into areas with high flushing rates either externally adjacent or remote from the marina basin. This is most important for runoff of urban origin. Sewage outfalls within the GBRMP are regulated by GBRMPA. Effluent must be 'tertiary treated' (nutrients removed) or equivalent.

6.6 Boat Wastes

Sewage outfalls must conform to GBRMPA Sewage Discharge Regulations.

Controlling sanitary wastes from boats is one of the primary marina permitting issues because of the potential impacts from bacterial contamination. Overall faecal coliform counts should not exceed 200 per 100 ml of sample water within the facility at any time. Sewage outfalls within the GBRMP will be required to conform to GBRMPA's Sewage Discharge Regulations (the '20/30 standard' - 20 mg/l BOD₅, 30 mg/l suspended non filterable solids). This standard is coupled with maximum total nitrogen and total phosphorus levels of 4 and 1 milligrams per litre (ppm) respectively (refer 'Sewage Discharges into the Great Barrier Reef Marine Park, GBRMPA 1993'). This source of pollution can also potentially result in contraventions of Queensland water quality standards. Because of these regulatory concerns, proper management plans and designs for these wastes can be critical to marina development.

Prevent potential sanitary waste discharge.

On board marine sanitation devices (MSDs) are normally classified as Type I, Type II, or Type III. Type I and II MSDs treat and discharge the wastes to the water body. Type III devices are on board holding tanks which must be periodically emptied to an onshore facility. Potential sanitary waste discharge into marina waters can be mitigated by:

- posting and strict enforcement of discharge rules in the marina;
- requiring all boats with installed MSDs to be connected to a sanitary waste collection system when moored in the marina;
- sealing discharge outlets from Type I and Type II MSDs when boats enter the marina and/or requiring all boats berthed in the marina to have an approved Type III MSD or a portable toilet; and

- banning live-aboards or requiring that these boats be permanently connected to a slip side sanitary waste collection system.

Further tightening of marine pollution laws are likely in future.

Australia is part of the International Maritime Organisation (IMO) and is a participant in the *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78). MARPOL outlines specific limits on discharges of oil, some chemicals, garbage and sewage. A total ban on discharge of oil, some chemicals and garbage exists within the Marine Park.

Provide wastewater pumpout facilities.

With regard to boat holding tank wastes, marina experience has shown that collection facilities should be conveniently available at existing fuelling stations. Facilities for pumping out larger boats that remain in their slips and for handling wastes from small portable toilets should also be provided as required (see Section 4.11).

Provide convenient rest-room amenities.

Another method of handling boat wastes is to provide convenient shoreside rest room facilities of adequate size with hot showers and wash basins. Rest rooms, if well maintained, will tend to reduce boat toilet use (see Section 4.10).

Ensure control of pollutants from bilge water. Waste oil reception facilities must be provided as per IMO/MARPOL requirements.

Oily wastes can enter marina waters from the discharge of bilge water. This type of pollution can be reduced or eliminated through strict marina rules and management. Boats can be fitted with oil filtering sump plumbing and contain oil-absorbent pads in their bilges (see Section 6.3). Control of pollutants from bilge water can also be implemented through discharge of bilge water into a slip side vacuum system. These systems can handle wastewater at rates up to 75 litres per minute.

Provide adequate garbage disposal services as per IMO/MARPOL requirements.

Allowance should also be made for garbage disposal services capable of handling heavy weekend or seasonal usage. Strategically placed and serviced rainproof litter receptacles, convenient to boat users, should be installed and regularly emptied (see Section 4.10).

As a general rule, operators should assume that direct discharge of untreated matter from live-aboard vessels would not be permitted.

6.7 Ecological Considerations

Control vessel access and speed to protect banks, marine animals and safety values.

Enforcement of speed limits within marinas and adjacent waterways and clearly marked channels will assist in safety and the protection of aquatic organisms. In addition, control of boat speeds can help prevent shore erosion due to boat wash. Eroding areas should be immediately stabilised. Posting of no-wake zones can help prevent damage from boat-generated waves.

Establish grounds maintenance guidelines.

Grounds-keeping is an important maintenance responsibility. The marina grounds should be kept clean and attractive. Good maintenance practices should be extended to the marina waters and shoreline. In addition to the normal grounds-keeping duties, the maintenance staff should consider:

- utilising professional landscaping practices;
- conservative use of insecticides, herbicides and fertilisers which could create water quality problems by leaching;
- prevention and clean up of petroleum spills from upland fuelling stations; and
- maintaining a regular rubbish/garbage collection schedule.

Provide special facilities for fish cleaning.

Fish cleaning facilities (including waste disposal) should be provided at boat launching ramps. Care should be taken in northern regions when placing fish cleaning facilities as estuarine crocodiles may be attracted by them.

Prohibit fishing in marina.

Fishing should also be prohibited within the marina area to reduce the risk of accidents and rubbish production.

6.8 Fuel Management

Employ appropriate safety procedures.

Fuel docks and launching ramps are the primary sources of small spills of oil and fuel. See Section 4.9 for safety procedures which should be followed at fuelling facilities.

Train fuel attendants in prevention and handling of fuel spills.

Fuel spills at marinas are generally very small, but they may be frequent. Contamination from fuel spills may be avoided through training fuel attendants to prevent and to clean up any fuel spills. Fuelling of ramp-launched boats before launching would prevent spills going directly into the water.

Produce an oil spill contingency plan.

Management will be required to have an oil spill contingency plan and appropriate equipment for dealing with a spill, if fuelling points are provided. Oil spill contingency plans will be subject to review by GBRMPA and QDOT.

6.9 Staff Training

Carry out appropriate staff training.

Marina personnel should be sufficiently experienced, trained and familiar with marina operation and maintenance plans to:

- handle administrative requirements and problems;
- properly execute or manage marina services such as boat launching, fuelling and boat repairs;
- exercise necessary control over marina activities; and
- maintain the premises in good condition.

6.10 Noise Management

Publicise noise management guidelines.

Manufacturers have made significant progress in reducing the noise levels of boat engines. At marinas, consideration must be shown to both the neighbours and customers. As sound travels across water easily, management of noise is important, particularly after dark. Marinas in residential areas should maintain a 'good neighbour' policy by stipulating and enforcing rules to control noise. Buffers between marina sites and residential areas should be provided and maintained. If necessary, posting and enforcing rules can be used to limit noise.

Design buildings and install equipment to minimise noise.

Other than engine noises, the main sources of marina noise are: cutting, grinding, hammering, planing, sand blasting, air compressors and staple guns, and trucks and forklifts. The use of adequate amelioration measures can substantially reduce noise levels. These measures include: maintaining adequate separation distances between boat building/maintenance areas and neighbours; restricting hours of operation for noisy activities; designing buildings to contain noise; the use of acoustic barriers and damping and insulating materials; using optical signals instead of horns, alarms and telephone bells; and fitting efficient exhaust mufflers to vehicles and equipment.

6.11 Management Handbook

A clear and complete operations and maintenance plan should be available at all times.

Proper site planning can help avoid or minimise many of the impacts that can result from marina development. During marina operation and maintenance, implementation of a clear and complete operations and maintenance plan can contribute significantly to the environmentally sound performance of the marina facility. Dock masters and marina attendants should be fully familiar with all management practises and permit conditions. Attention to the agreed housekeeping standards by users should form a component of the duties of these employees. Monitoring of results can be used to help modify or add management procedures. It is likely that preparation of and adherence to an Operations Procedures Manual will form a permit requirement for larger marinas operating in the GBRMP.

Distribute management notes as berths are rented.

Management notes outlining the housekeeping standards and availability of dockside waste management facilities should be distributed as slips/berths are rented.

6.12 Role of Monitoring

Maintain ongoing monitoring reporting.

After approving a marina proposal for construction or operation, regulatory agencies typically seek feedback on the effectiveness of marina management at achieving the levels of environmental impact predicted by the developer. Operation of a marina may be subject to different Commonwealth and State permits and monitoring requirements although these are usually consolidated. These monitoring programs may examine the effects of maintenance dredging; water quality in relation to sewage discharge or runoff; monitoring for hydrocarbons and metals in sediments; changes to amenity and the social environment; and other project-specific factors. Monitoring requirements, discussed previously, are intended to ensure that resource managers can respond if unacceptable environmental degradation occurs. It is therefore necessary to continue with the approved monitoring program, constantly providing feedback to the required resource management agencies, throughout the operational life of the development. Site specific programs are paid for by developers/owners.

Table 6.1 Environmental concerns during operational phases

Activity	Consequence to Environment	Environmental Impacts	Human Health and Welfare Impacts	Mitigation
Maritime wastes and effluents	<ul style="list-style-type: none"> • Organic petroleum residues • Heavy metals • Sewage effluent • Antifouling compounds 	<ul style="list-style-type: none"> • Water quality degradation • Toxicity; species/habitat loss • Eutrophication • Change in ecosystem structure 	<ul style="list-style-type: none"> • Public health risk • Welfare losses <ol style="list-style-type: none"> 1. Subsistence 2. Recreation 3. Economic (fisheries, tourism) • Aesthetics • Clean-up costs 	<ul style="list-style-type: none"> • Discharge regulations • Shoreside collection facilities • Education • Enforcement
Oil Spills <ul style="list-style-type: none"> • Chronic • Catastrophic 	• Oil and oily wastes	<ul style="list-style-type: none"> • Acute toxicity; species/habitat loss 	<ul style="list-style-type: none"> • Public health risk (long-term) 	<ul style="list-style-type: none"> • Emergency response plan - clean-up and removal
	<ul style="list-style-type: none"> • Decomposition products • Floating, suspended, and dissolved pollutants • Detergents from clean-up action 	<ul style="list-style-type: none"> • Water quality degradation • Intertidal habitat degradation • Change in ecosystem structure • Coating of birds and animals 	<ul style="list-style-type: none"> • Welfare losses <ol style="list-style-type: none"> 1. Subsistence 2. Recreation 3. Economic (fisheries, tourism) • Catastrophic risk (cost of clean up) • Aesthetics of water and beach 	<ul style="list-style-type: none"> • Design-specific safeguards <ol style="list-style-type: none"> 1. Containment structures 2. Overflow controls
Coastline modification <ul style="list-style-type: none"> • Harbour configuration • Coastal topography 	<ul style="list-style-type: none"> • Altered physical oceanography • High residence times 	<ul style="list-style-type: none"> • Beach erosion/accretion • Sand transport • Change in ecosystem structure • Eutrophication • Accumulation of wastes 	<ul style="list-style-type: none"> • Public health risk • Welfare losses <ol style="list-style-type: none"> 1. Property 2. Recreation 3. Economic (e.g. nearshore fishery) • Aesthetics 	<ul style="list-style-type: none"> • Comprehensive predesign phase environmental survey • Appropriate site-specific design • Compensatory reserves
Runoff <ul style="list-style-type: none"> - from shore - delivery by stream 	<ul style="list-style-type: none"> • Sediments/organics - toxics - inorganic nutrients 	<ul style="list-style-type: none"> • Water quality degradation • Toxicity; species/habitat loss • Eutrophication • Change in ecosystem structure 	<ul style="list-style-type: none"> • Public health risk • Welfare losses <ol style="list-style-type: none"> 1. Subsistence 2. Recreation 3. Economic (fisheries, tourism) • Aesthetics 	<ul style="list-style-type: none"> • Drainage control system <ol style="list-style-type: none"> 1. Ponding basis 2. Storm drain maintenance
Land use changes	<ul style="list-style-type: none"> • Secondary development • Enhanced access 	<ul style="list-style-type: none"> • Urbanisation • Overfishing/ resources depletion • Change in ecosystem structure 	<ul style="list-style-type: none"> • Public health risk <ol style="list-style-type: none"> 1. Air pollution 2. Water pollution • Welfare losses <ol style="list-style-type: none"> 1. Quality of life 2. Loss of agricultural land 3. Overburdening of infrastructure • Aesthetics 	<ul style="list-style-type: none"> • Land use planning and control • Resource management <ol style="list-style-type: none"> 1. Catch limits 2. Education • Appropriate site selection avoiding sensitive areas

Activity	Consequence to Environment	Environmental Impacts	Human Health and Welfare Impacts	Mitigation
Solid waste disposal	<ul style="list-style-type: none"> • Waste from human activities pollutes water and soil • Leaching from landfills or dumps • Smoke and fumes from burning 	<ul style="list-style-type: none"> • Water and air quality degradation • Toxicity; species/habitat loss • Marine life entanglement 	<ul style="list-style-type: none"> • Public health risk • Welfare loss <ol style="list-style-type: none"> 1. Economic (tourism) • Aesthetics • Clean-up costs 	<ul style="list-style-type: none"> • Plentiful supply of litter receptacles • Routine clean-up • Adequate treatment and disposal technology
Land-based sewage effluent	<ul style="list-style-type: none"> • Suspended solids • BOD • Pathogenic organisms • Chlorine • Freshwater demand • Toxic industrial waste 	<ul style="list-style-type: none"> • Water quality degradation • Eutrophication • Toxicity; species/habitat loss 	<ul style="list-style-type: none"> • Public health risk <ol style="list-style-type: none"> 1. Pathogenic exposure transmission 2. Food web toxic accumulation • Welfare loss <ol style="list-style-type: none"> 1. Subsistence 2. Recreation 3. Economic (fisheries, tourism) • Aesthetics • Clean-up costs 	<ul style="list-style-type: none"> • Waste management program
Harbour operations (terrestrial and marine)	<ul style="list-style-type: none"> • Noise • Congestion/traffic • Hazardous material concentration 	<ul style="list-style-type: none"> • Welfare loss <ol style="list-style-type: none"> 1. Quality of life 2. Economic (time costs) • Public safety 	<ul style="list-style-type: none"> • Vessel operations management • Noise ordinances • Toxic substance controls 	