Appendix A

Best Management Practices Checklist for Marinas and Recreational Boating

BEST MANAGEMENT PRACTICES CHECKLIST FOR MARINAS AND RECREATIONAL BOATING

Name of marina: _____

Marina address: _____

Name of person doing assessment: _____

Date of assessment: _____

This best management practices (BMP) checklist is designed to help marina owners and operators review the general activities associated with developing or expanding recreational marinas and boat ramps and operating existing marinas. Several BMPs and combinations of BMPs might be necessary at a marina to prevent or reduce runoff pollutants. Professionals can also use this checklist to review new marina development or expansion.

The BMP tables in the guidance provide detailed descriptions and the applicability of various management measures and practices. The lists provided here can be used to assemble information on the BMPs installed or used at the marina. If BMPs other than those listed are used, they may be identified in the space provided.

The scope of this guidance is broad, covering diverse nonpoint source pollutants from marinas and recreational boating. Because it includes all types of waterbodies, it does not provide all practices and techniques suitable to all regional or local marina or waterbody conditions. Also, BMPs are continually being modified and developed as a result of experience gained from their implementation and the innovation of marina owners and operators across the country.

The guidance can assist marina owners and managers in identifying potential sources of nonpoint source pollution and offer potential solutions. Finding the best solution to any nonpoint source pollution problem at a marina requires taking into account the many site-specific factors that together compose the setting of the marina. The applicability of BMPs to any particular marina or situation can be determined based on site-specific factors unique to the marina site.

1. MARINA FLUSHING

Site and design marinas such that tides and/or currents will aid in flushing of the site or renew its water regularly.

Marina water quality depends on water circulation within the boat basin, the level of pollutants present, and new amounts of pollutants entering the water. In a poorly flushed marina, pollutants tend to concentrate in the water and/or sediments. In a basin with poorly flushed corners or secluded or protected spots, pollutants and debris can tend to collect in those locations. Stagnant, polluted water can be the consequence. The flushing rate is the time required to replace the water in a basin. In tidal waters flushing is driven primarily by the ebb and flow of the tide, whereas in inland lakes and rivers flushing depends on wind-driven circulation and current speed. Pollutants tend to concentrate in water and/or sediments in poorly flushed coves and marinas. Fine sediment and organic debris can collect in uncirculated water, which can deplete the amount of oxygen in the water. Reduced dissolved oxygen in stagnant water hinders biological activity and can result in lifeless shores and offensive odors. Adequate marina flushing greatly reduces or eliminates the potential for water stagnation and helps maintain the biological productivity and aesthetic value of a marina basin. Good flushing can reduce pollutant concentrations in a marina basin by from 70 percent to almost 90 percent over a 24-hour period.

BMPs that should be considered and used where appropriate:

- ☐ *Ensure that the bottom of the marina and entrance channels are not deeper than adjacent navigable channels.*
- ☐ *Consider design alternatives in poorly flushed waterbodies to enhance flushing (open design instead of a semienclosed design, wave attenuators instead of fixed breakwaters).*
- ☐ *Design new marinas with as few enclosed water sections or separated basins as possible to promote circulation within the entire basin.*
- ☐ *Consider the value of entrance channels in promoting flushing when designing or reconfiguring a marina.*
- ☐ *Establish two openings at the most appropriate locations within the marina to promote flow-through currents.*
- ☐ *Consider mechanical aerators to improve flushing and water quality where basin and entrance channel configuration cannot provide adequate flushing.*
- ☐ *Other (describe):*

2. WATER QUALITY ASSESSMENT

Assess water quality as part of marina siting and design.

Water quality is assessed during the marina design phase to predict the effect of marina development on the chemical and physical health of the water and aquatic environment. Marina development can cause changes in flushing and circulation; and boat maintenance, boat operation, and the human activities in and around boats can be sources of solid and liquid wastes, pathogenic organisms, and petroleum compounds. The results of water quality predictions or sampling are compared to state or federal water quality standards. Water quality assessments for dissolved oxygen concentration and pathogenic organisms can be used as indicators of the general health of an aquatic environment. Water quality assessments can be useful in determining the suitability of a location for marina development, the best marina design for ensuring good water quality, and the causes and sources of water quality problems.

BMPs that should be considered and used where appropriate:

- ☐ *Use water quality sampling and/or monitoring to measure water quality conditions.*
- ☐ *Use a water quality modeling methodology to predict postconstruction water quality conditions.*
- ☐ *Monitor water quality using indicators.*
- ☐ *Use rapid bioassessment techniques to monitor water quality.*
- ☐ *Establish a volunteer monitoring program.*
- ☐ *Other (describe):*

3. HABITAT ASSESSMENT

Site and design marinas to protect against adverse effects on shellfish resources, wetlands, submerged aquatic vegetation, or other important riparian and aquatic habitat areas as designated by local, state, or federal governments.

The construction of a new marina in any waterbody type has the potential to disrupt aquatic habitats. These habitats include fish spawning areas, shellfish harvesting areas, designated wetlands, beds of submerged aquatic vegetation, and the habitats of threatened or endangered species. Marinas can be designed and located to help support the aquatic plants and animals that were present in the waters before the marina's construction. A marina can be operated as a valuable habitat for plants and animals that do well in quiet, sheltered waters.

BMPs that should be considered and used where appropriate:

- ☐ *Conduct habitat surveys and characterize the marina site, including identifying any exotic or invasive species.*
- ☐ *Assess habitat function (e.g., spawning area, nursery area, feeding area) to minimize indirect effects.*
- ☐ *Use rapid bioassessment techniques to assess effects on biological resources.*
- ☐ *Redevelop waterfront sites that have been previously disturbed and expand existing marinas.*
- ☐ *Consider alternative sites where adverse environmental effects will be minimized or positive effects will be maximized.*
- ☐ *Create new habitats or expand habitats in the marina basin.*
- ☐ *Minimize disturbance of riparian areas.*
- ☐ *Use dry stack storage.*
- ☐ *Other (describe):*

4. SHORELINE AND STREAMBANK STABILIZATION

Where shoreline or streambank erosion is a nonpoint source pollution problem, shorelines and streambanks should be stabilized. Vegetative methods are strongly preferred unless structural methods are more cost-effective, considering the severity of wave and wind erosion, offshore bathymetry, and the potential adverse impact on other shorelines, streambanks, and offshore areas.

Protect shorelines and streambanks from erosion due to uses of either the shorelands or adjacent surface waters.

Erosion in any waterbody is a natural process that results when moving water and waves undermine, collapse, and wash out banks and shorelines. Banks erode along nontidal lakes, rivers, and streams; shorelines erode along intertidal portions of coastal bays and estuaries. Eroding streambanks and shorelines and streambanks do not protect the land and structures during storm events. Such erosion contributes to nonpoint source pollution problems, turbidity, and shoaling and increases the need for maintenance dredging in marina basins and channels. Vegetation and structural methods have been shown to be effective for mitigating shoreline erosion and for filtering pollutants from overland and storm water runoff.

BMPs that should be considered and used where appropriate:

- ☐ *Use vegetative plantings, wetlands, beaches, and natural shorelines where space allows.*
- ☐ *Where shorelines need structural stabilization and where space and use allow, riprap revetment is preferable to a solid vertical bulkhead.*
- ☐ *Where reflected waves will not endanger shorelines or habitats and where space is limited, protect shorelines with structural features such as vertical bulkheads.*
- ☐ *At boat ramps, retain natural shoreline features to the extent feasible and protect disturbed areas from erosion.*
- ☐ *Other (describe):*

5. STORM WATER RUNOFF MANAGEMENT

Implement effective runoff control strategies that include the use of pollution prevention activities and the proper design of hull maintenance areas.

Reduce the average annual loadings of total suspended solids (TSS) in runoff from hull maintenance areas by 80 percent. For the purposes of this measure, an 80 percent reduction of TSS is to be determined on an average annual basis.

Sanding dust, paint chips, metal filings, and other such solids that drop on the ground during boat repair and maintenance can all be swept into the water by the next rainstorm's runoff. Oils, grease, solvents, paint drippings, and fuel spilled or dripped onto the ground are also be carried away in runoff. Unless runoff is treated in some manner, all of these pollutants end up in the marina basin, where they create unsightly surface films or float until they adhere to a surface, such as a boat hull. Some of these pollutants sink to the bottom, where they can be eaten by bottom-feeding fish or filter-feeding shellfish, or settle onto the leaves of aquatic vegetation and clog their pores.

BMPs that should be considered and used where appropriate:

- ☐ *Perform as much boat repair and maintenance work as possible inside work buildings.*
- ☐ *Where an inside work space is not available, perform abrasive blasting and sanding within spray booths or tarp enclosures.*
- ☐ *Where buildings or enclosed areas are not available, provide clearly designated land areas for boat repair and maintenance.*
- ☐ *Design hull maintenance areas to minimize contaminated runoff.*
- ☐ *Use vacuum sanders both to remove paint from hulls and to collect paint dust and chips.*
- ☐ *Restrict the types and/or amount of do-it-yourself work done at the marina.*
- ☐ *Clean hull maintenance areas immediately after any maintenance to remove debris, and dispose of collected material properly.*
- ☐ *Capture and filter pollutants out of runoff water with permeable tarps, screens, and filter cloths.*
- ☐ *Sweep and/or vacuum around hull maintenance areas, roads, and driveways frequently.*
- ☐ *Sweep parking lots regularly.*
- ☐ *Plant grass between impervious areas and the marina basin.*
- ☐ *Construct new or restore former wetlands where feasible and practical.*
- ☐ *Use porous pavement where feasible.*
- ☐ *Install oil/grit separators to capture petroleum spills and coarse sediment.*
- ☐ *Use catch basins where storm water flows to the marina basin in large pulses.*
- ☐ *Add filters to storm drains that are located near work areas.*
- ☐ *Place absorbents in drain inlets.*

- ☐ *Use chemical and filtration treatment systems only where necessary.*
- ☐ *Other (describe):*

6. FUELING STATION DESIGN

Design fueling stations to allow for ease in cleanup of spills.

Spills of gasoline and diesel oil during boat fueling are a common source of pollution in marina waters. Usually these are very small spills that occur from overfilling boat fuel tanks, but these small spills can accumulate to create a larger pollution problem. The hydrocarbons in oil harm juvenile fish, upset fish reproduction, and interfere with the growth and reproduction of bottom-dwelling organisms. Oil and gas ingested by one animal can be passed to the next animal in the food chain, ultimately resulting in a potential risk to human health. In a marina, petroleum spills also deteriorate the white Styrofoam in floats and docks and discolor boat hulls, woodwork, and paint. Gasoline spills are also a safety problem because of the flammability of this product. The most effective way to minimize fuel spills and petroleum hydrocarbon pollution at a marina is to locate, design, build, and operate a boat fuel dock or station so that most spills are prevented and those that do occur are quickly contained and cleaned up.

BMPs that should be considered and used where appropriate:

- ☐ *Use automatic shutoffs on fuel lines and at hose nozzles to reduce fuel loss.*
- ☐ *Remove old-style fuel nozzle triggers that are used to hold the nozzle open without being held.*
- ☐ *Install personal watercraft (PWC) floats at fuel docks to help drivers refuel without spilling.*
- ☐ *Regularly inspect, maintain, and replace fuel hoses, pipes, and tanks.*
- ☐ *Install a spill monitoring system.*
- ☐ *Train fuel dock staff in spill prevention, containment, and cleanup procedures.*
- ☐ *Install easy-to-read signs on the fuel dock that explain proper fueling, spill prevention, and spill reporting procedures.*
- ☐ *Locate and design boat fueling stations so that spills can be contained, such as with a floating boom, and cleaned up easily.*
- ☐ *Write and implement a fuel spill recovery plan.*
- ☐ *Have spill containment equipment storage, such as a locker attached or adjacent to the fuel dock, easily accessible and clearly marked.*
- ☐ *Other (describe):*

7. PETROLEUM CONTROL

Reduce the amount of fuel and oil from boat bilges and fuel tank air vents entering marina and surface waters.

Although more than half of the oil that spills into the water evaporates, less than a cup of oil can create a very thin sheen over more than an acre of calm water. Small amounts of oil spilled from numerous boats can accumulate to create a large oil sheen, which blocks oxygen from moving through the surface of the water and can be harmful to animals and larvae that must break the surface to breathe. The hydrocarbons in oil harm juvenile fish, upset fish reproduction, and interfere with the growth and reproduction of bottom dwelling organisms. Oil and gas ingested by one animal can be passed to the next animal in the food chain, ultimately resulting in a risk to human health. In a marina, petroleum spills also dissolve the white Styrofoam in floats and docks and discolor boat hulls, woodwork, and paint. Gasoline spills, which evaporate quickly, are also a safety problem because of the flammability of gasoline.

BMPs that should be considered and used where appropriate:

- ☐ *Promote the installation and use of fuel/air separators on air vents or tank stems of inboard fuel tanks to reduce the amount of fuel spilled into surface waters during fueling*
- ☐ *Avoid overfilling fuel tanks*
- ☐ *Provide doughnuts or small petroleum absorption pads to patrons to use while fueling to catch splashback and the last drops when the nozzle is transferred back from the boat to the fuel dock.*
- ☐ *Keep engines properly maintained for efficient fuel consumption, clean exhaust, and fuel economy. Follow the manufacturer's specifications.*
- ☐ *Routinely check for engine fuel leaks and use a drip pan under engines.*
- ☐ *Avoid pumping any bilge water that is oily or has a sheen. Promote the use of materials that either capture or digest oil in bilges. Examine these materials frequently and replace as necessary.*
- ☐ *Extract used oil from absorption pads if possible, or dispose of it in accordance with petroleum disposal guidelines.*
- ☐ *Prohibit the use of detergents and emulsifiers on fuel spills.*
- ☐ *Other (describe):*

8. LIQUID MATERIALS MANAGEMENT

Provide and maintain appropriate storage, transfer, containment, and disposal facilities for liquid material, such as oil, harmful solvents, antifreeze, and paints, and encourage recycling of these materials.

Liquid material such as fuels, oils, solvents, paints, pesticides, acetone, cleaners, and antifreeze are potentially harmful or deadly to wildlife, pets, and humans and are toxic to fish and other aquatic organisms when they enter a waterbody. This is true for other types of liquid waste, such as waste fuel, used oil, spent solvents, battery acid, and used antifreeze. Waste oils include waste engine oil, transmission fluid, hydraulic fluid, and gear oil. Waste fuels include gasoline, diesel, gasoline/oil blends, and water contaminated by these fuels.

BMPs that should be considered and used where appropriate:

- ☐ *Build curbs, berms, or other barriers around areas used for liquid material storage to contain spills.*
- ☐ *Store liquid materials under cover on a surface that is impervious to the type of material stored.*
- ☐ *Storage and disposal areas for liquid materials should be located in or near repair and maintenance areas, undercover, protected from runoff with berms or secondary containment, and away from flood areas and fire hazards.*
- ☐ *Store minimal quantities of hazardous materials*
- ☐ *Provide clearly labeled, separate containers for the disposal of waste oils, fuels, and other liquid wastes.*
- ☐ *Recycle liquid materials where possible.*
- ☐ *Change engine oil and suction oily water from bilges using nonspill vacuum-type systems for spill-proof oil changes.*
- ☐ *Use antifreeze and coolants that are less toxic to the environment.*
- ☐ *Use alternative liquid materials where practical.*
- ☐ *Follow manufacturer's directions and use nontoxic or low-toxicity pesticides.*
- ☐ *Burn used oil used as a heating fuel where permitted by law.*
- ☐ *Prepare a hazardous materials spill recovery plan and update it as necessary.*
- ☐ *Keep adequate spill response equipment where liquid materials are stored.*
- ☐ *Other (describe):*

9. SOLID WASTE MANAGEMENT

Properly dispose of solid wastes produced by the operation, cleaning, maintenance, and repair of boats to limit entry of solid wastes to surface waters.

Boat maintenance, painting, and repair can result in a range of waste materials, such as sanding debris, antifoulant paint chips, scrap metal, fiberglass pieces, sweepings, and battery lead and acid. Other solid waste such as bottles, plastic bags, aluminum cans, coffee cups, six-pack rings, disposable diapers, wrapping paper, glass bottles, cigarette filters, and fishing line can come from general boating activities and marina use. Living organisms and the habitats of aquatic animals and plants are harmed by this type of debris after it enters the water. A litter-free marina is more attractive to present and potential customers. Reducing a marina's solid wastes also reduces overall disposal costs.

BMPs that should be considered and used where appropriate:

- ☐ *Encourage marina patrons to avoid doing any debris-producing hull maintenance while their boats are in the water. When maintenance is done with the boat in the water (for small projects and where necessary), prevent debris from falling into the water.*
- ☐ *Place trash receptacles in convenient locations for marina patrons. Covered dumpsters and trash cans are ideal.*
- ☐ *Provide trash receptacles at boat launch sites.*
- ☐ *Provide facilities for collecting recyclable materials.*
- ☐ *Provide boaters with trash bags.*
- ☐ *Use a reusable blasting medium.*
- ☐ *Require patrons to clean up pet wastes and provide a specific dog walking area at the marina.*
- ☐ *Other (describe):*

10. FISH WASTE MANAGEMENT

Promote sound fish waste management through a combination of fish-cleaning restrictions, public education, and proper disposal of fish waste.

Sportfishing is very popular, but fish cleaning produces waste that can create water quality problems in marinas with poor circulation. Too much fish waste in a confined area can lower oxygen levels in the water, which leads to foul odor and fish kills. Floating fish parts are also an unsightly addition to marina waters.

BMPs that should be considered and used where appropriate:

- ☐ *Clean fish offshore where the fish are caught and discard of the fish waste at sea (if allowed by the state).*
- ☐ *Install fish cleaning stations at the marina, and at boat launch sites.*
- ☐ *Compost fish waste where appropriate.*
- ☐ *Freeze fish parts and reuse them as bait or chum on the next fishing trip.*
- ☐ *Encourage catch-and-release fishing, which does not kill the fish and produced no fish waste.*
- ☐ *Other (describe):*

11. SEWAGE FACILITY MANAGEMENT

Install pumpout, dump station, and restroom facilities where needed at new and expanding marinas to reduce the release of sewage to surface waters. Design these facilities to allow ease of access and post signage to promote use by the boating public.

Boat sewage can be a problem when dumped overboard without any treatment. Although the volume of sewage discharged from boats is not as massive as a typical sewage treatment plant outfall, boat sewage is very concentrated and can add to the overall problem of fecal coliform bacteria loading to the water body. Boat sewage also adds extra nutrients that use dissolved oxygen and can stimulate the growth of algae, which in the worst case can grow so fast that they use oxygen needed by fish and other organisms. When untreated sewage goes overboard, it can contaminate shellfish, leading to potentially serious human health risks.

BMPs that should be considered and used where appropriate:

- ☐ *Install pumpout facilities where needed. Use a system compatible with the marina's needs (fixed-point systems, dump stations for portable toilets, portable systems, dedicated slipside systems).*
- ☐ *Provide pumpout service at convenient times and at a reasonable cost.*
- ☐ *Keep pumpout stations clean and easily accessible, and consider having marina staff do pumpouts.*
- ☐ *Provide portable toilet dump stations near small slips and launch ramps.*
- ☐ *Provide restrooms at all marinas and boat ramps.*
- ☐ *Consider declaring marina waters to be a "no discharge" area.*
- ☐ *Establish practices and post signs to control pet waste problems.*
- ☐ *Avoid feeding of wild birds in the marina.*
- ☐ *Establish no discharge zones to prevent any sewage from entering boating waters.*
- ☐ *Establish equipment requirement policies that prohibit the use of Y-valves on boats on inland waters.*
- ☐ *Other (describe):*

12. MAINTENANCE OF SEWAGE FACILITIES

Ensure that sewage pumpout facilities are maintained in operational condition and encourage their use.

When faced with nonfunctioning sewage collection and disposal facilities, boaters whose holding tanks are full have three choices: (1) go elsewhere to find an operable pumpout or dump station, which is inconvenient; (2) discharge sewage directly overboard, which is illegal in no discharge zones and legal otherwise only through an approved marine sanitation device in nearshore waters; or (3) cease using their boat toilets, which to some would mean "stop using the boat." In addition, one inoperable pumpout might overload another pumpout nearby, tempting boaters to discharge illegally, particularly if the other one is not free or charges a higher fee.

BMPs that should be considered and used where appropriate:

- ☐ *Maintain a dedicated fund and issue a contract for pumpout and dump station repair and maintenance (applies to government-operated marinas, pumpout stations, and dump stations only).*
- ☐ *Regularly inspect and maintain sewage facilities.*
- ☐ *Disinfect the suction connection of a pumpout station (stationary or portable) by dipping it into or spraying it with disinfectant.*
- ☐ *Maintain convenient, clean, dry, and pleasant restroom facilities in the marina.*
- ☐ *Other (describe):*

13. BOAT CLEANING

For boats that are in the water, perform cleaning operations to minimize, to the extent practicable, the release to surface waters of (a) harmful cleaners and solvents and (b) paint from in-water hull cleaning.

Many boat cleaners contain harsh chlorine, ammonia, phosphates, and other chemicals that can harm fish and other aquatic life. Some chemicals in these cleaners become more concentrated in aquatic organisms as they are ingested by other animals and might eventually find their way into fish and shellfish that are eaten by people. Chemicals and debris from washing boat topsides, decks, and hull surfaces can be kept out of the water with some common sense boating practices.

BMPs that should be considered and used where appropriate:

- ☐ *Wash boat hulls above the waterline by hand. Where feasible, remove boats from the water and clean them where debris can be captured and properly disposed of.*
- ☐ *Buy and use detergents and cleaning compounds that will have minimal impact on the aquatic environment.*
- ☐ *Avoid in-the-water hull scraping or any abrasive process that is done underwater that could remove paint from the boat hull.*
- ☐ *Switch to long-lasting and low-toxicity or nontoxic antifouling paints.*
- ☐ *Minimize the impacts of wastewater from pressure washing.*
- ☐ *Other (describe):*

14. BOAT OPERATION

Manage boating activities where necessary to decrease turbidity and physical destruction of shallow-water habitat.

Boat and personal watercraft traffic through very shallow water and nearshore areas at wake-producing speeds can resuspend bottom sediments and erode shorelines, all of which can increase turbidity in the water column. Turbid waters block the penetration of sunlight to underwater plants that need light for survival, and they reduce visibility for fish that rely on sight to catch their prey. Vessel traffic can also uproot submerged aquatic vegetation which is habitat for fish and shellfish and food for waterfowl, recycles nutrients released from matter decomposing in the waterbody, and reduces wave energy at shorelines, thus protecting them from erosion. Vessel traffic might also churn up harmful chemicals that have been trapped in the sediments and might contaminate fish and shellfish that people eat. Propellers or jet drives, when in contact with the bottom, dig visible furrows across the soil and the vegetation, which can take years to recover.

BMPs that should be considered and used where appropriate:

- ☐ *Restrict boater traffic in shallow-water areas.*
- ☐ *Establish and enforce no wake zones to decrease turbidity, shore erosion, and damage in marinas.*
- ☐ *Other (describe):*

15. PUBLIC EDUCATION

Public education, outreach, and training programs should be instituted for boaters, as well as marina owners and operators, to prevent improper disposal of polluting material.

A boating public that understands the causes and effects of pollution is more likely to want clean waters and healthy aquatic environments. If they are told about the simple and effective ways that they can reduce their impact on the environment, they will usually be happy to do their part. Public education is one of the most effective ways to reduce pollution in and around marinas and from recreational boating.

BMPs that should be considered and used where appropriate:

- ☐ *Use signs to inform marina patrons of appropriate clean boating practices.*
- ☐ *Establish bulletin boards for environmental messages and idea sharing.*
- ☐ *Promote recycling and trash reduction programs.*
- ☐ *Hand out pamphlets or flyers, send newsletters, and add inserts to bill mailings with information about how recreational boaters can protect the environment and have clean boating waters.*
- ☐ *Organize and present enjoyable environmental education meetings, presentations, and demonstrations.*
- ☐ *Educate and train marina staff to do their jobs in an environmentally conscious manner and to be good role models for marina patrons.*
- ☐ *Insert language into facility contracts that ensures that tenants use certain areas and clean boating techniques when maintaining their boats. Use an environmental agreement that ensures that tenants will comply with the marina's best management practices.*
- ☐ *Have a clearly written environmental best management practices agreement for outside contractors to sign as a precondition to working on any boat in the marina.*
- ☐ *Participate with an organization that promotes clean boating practices.*
- ☐ *Provide MARPOL placards to boaters.*
- ☐ *Paint signs on storm drains indicating that anything placed in it or runoff to it drains directly to surface waters (where drainage is not to a treatment plant).*
- ☐ *Establish and educate marina patrons about rules governing fish-cleaning.*
- ☐ *Educate boaters about good fish cleaning practices.*
- ☐ *Provide information on local waste collection and recycling programs.*
- ☐ *Hold clinics on safe fueling and bilge maintenance.*
- ☐ *Teach boaters how to fuel boats to minimize fuel spills.*
- ☐ *Stock phosphate-free, nontoxic cleaners and other environmentally friendly products.*
- ☐ *Place signs in the water and label charts to alert boaters about sensitive habitat areas.*
- ☐ *Other (describe):*

Appendix B

Example
Oil Spill Response Plan

(*Note that text in* Arial *font should be replaced by facility-specific information.)*

Oil Spill Response Plan

Name of Marina

EMERGENCY RESPONSE ACTION:

Reaction

- Identify the source of the spill if possible.
- Attempt to secure the source of the spill.
- If a spill is observed at the fueling dock, immediately cease all fueling activities.
- Make a preliminary assessment as to what the spill material is and approximately how much has entered the waterway. This information will dictate what equipment needs to be deployed.
- Advise the facility manager or spill response manager if necessary.

Reporting

• U.S. Coast Guard	1-800-424-8802
• State department of environmental protection	Business hours; 24 hours

All spills that result in a slick or a sheen on the water require that the Coast Guard and state department of environmental protection be contacted and provided with pertinent information.

Note: All fuel spills, no matter how small, must be reported to the U.S. Coast Guard.

Response

Gasoline spill:

If the spill is small (5 gallons or less):

- Allow natural weathering to reduce and eliminate the spill.
- Do not allow smoking during any spill.
- Do not contain or collect gasoline because confined gasoline might create a risk of explosion and fire.

For larger spills (more than 5 gallons):

- Implement the reporting requirements.
- Secure all electricity.
- Make sure everyone is away from the affected area.
- Do not allow anyone to enter the affected area.
- Use water hoses to wash the spill away to protect docks and boats.
- Contact the fire department and harbormaster.

Other oil spills (crude and refined residual oils, diesel fuel, and kerosene):

- Contain the oil spill using a curtain boom to prevent spreading. When possible, completely surround the source.
- If the oil was spilled in an upland area, use an absorbent boom and pads to contain the material and prevent it from entering the waterbody.
- If more oil than can be contained by the boom was spilled, contact: name of primary contact for additional spill equipment.
- Once the spill is contained, use absorbent material to collect the oil. Absorbent pads can be placed within the boomed area, retrieved, wrung out, and placed back in the boomed area.
- If spreading is occurring too rapidly or other conditions prevent the containment of the oil, use the boom to deflect the oil from critical or sensitive areas.

PERSONNEL

Spill Manager

Name of person responsible for maintaining plan and equipment inventory.

Qualified Staff

List marina staff authorized to implement the spill plan.

Marina spokesperson: One person who is responsible for communicating to enforcement officials, customers, and the media. Using one person helps to ensure a consistent message.

Contact for Additional Assistance

In the event that this facility needs the services of a professional oil spill response company, contact: list the name of a professional oil spill response company with whom prior arrangements exist.

This service should be requested only by the facility manager or the spill response manager.

THREATS

Maximum Threat(s)

Overfilling of gasoline during fueling, creating explosion hazard: The most common spill occurrence will result from overfilling of gasoline and diesel fuel tanks at the fueling dock. Gasoline, because of its flammability, is the greatest threat.

Vessel spill

Under a worst-case scenario, the largest on-board fuel tank is aboard a 50-foot powerboat that carries approximately 200 gallons of diesel fuel and 20 gallons of crankcase oil. This would pose a maximum threat if this vessel was to sink within the marina perimeter.

Spill from fuel storage tank or connections to pumping station

On-site there is a ___gallon in-ground storage tank that is connected to the fuel pumping station by a series of flexible and rigid hoses. A fuel spill could result from the failure of one of the connections. A spill could also result when the fuel tank is being filled.

Minimum Threats

Spill from waste oil receptacle: On site there is a 200-gallon waste oil receptacle. It is located 100 yards from the coastal edge and is surrounded by an impervious berm designed to retain 110 percent of the receptacle's volume.

SPILL RESPONSE EQUIPMENT

Available On-site Resources

(1) 150-foot harbor curtain boom (3 times the length of the vessel with the largest fuel tank)

Operational characteristics: deflects and contains oil in the water. Curtain boom is susceptible to wind, waves, and current. These factors can cause oil to escape over the top and under the bottom of the boom.

Deployment: Can be attached to a fixed structure or to an anchor. Place downstream of oil spill. If surface current is moving greater than 0.7 knot, the boom will not contain oil acting at a right angle to it. The boom angle will need to be adjusted to decreasing angles as the speed of the current increases.

Disposal: The boom, if maintained properly, can be used multiple times. The average life span for the boom is approximately 5 to 10 years, depending on the use it receives.

Maintenance: Rinse thoroughly with fresh water. Be sure to collect with absorbents any remaining oil on the boom. Store out of sunlight in a manner that allows quick deployment.

(2) 80 feet of 5-inch absorbent boom (37.5 ft^3; 84 lb)

Operational characteristics: Boom has little inherent strength and might need extra flotation to keep from sinking when laden with oil.

(3) 200 individual absorbent pads (3/8 in. x 18 in. x 18 in.)

Operational characteristics: Use absorbents only in low current velocity situations.

Deployment: Place absorbents on spilled oil. Recovery efficiency decreases rapidly once outer layer is oil-soaked.

Disposal: May be wrung out and reused. (See manufacturer's specifications.) At the end of the useful life, wring out and store in a sealed container. The container will be disposed of by a contracted waste hauler.

Maintenance: When possible, wring out and dry after use. (See manufacturer's specifications.) Otherwise, material will be disposed of properly.

(4) Empty 55-gallon drum with lid for storage of collected oil

(5) Gloves

(6) Pitchfork

(7) Two 15-lb Danforth anchors

(8) Mooring lines

(9) Standard mop or laundry wringer

Location

The spill response equipment is stored in the spill response shed located adjacent to the maintenance shed. Key number 000, which the manager holds on the master ring, opens the spill response shed.

Additional Equipment

If the rapid deployment of additional resources is necessary, we have secured permission to use equipment from: List local sources of equipment and how they can be reached, e.g., neighboring marina, they can be reached on VHF CH 68 or by calling 555-0000.

Coast Guard oil spill response trailer is also available as a first-aid measure.

NOTES

Do not use dispersants on oil/fuel spills. Dispersants include products manufactured specifically for that purpose and more common products such as detergent. Using them simply forces the oil into the water column, where it might be more harmful. Dispersants may be used only with the approval of the Coast Guard federal on-scene coordinator.

On the downstream side of the marina is a salt marsh that should be protected from a large oil spill. A floating oil boom should be used to deflect spilled oil away from this critical area.

This response plan will be tested twice a year, with a least one test occurring at the beginning of the boating season. All of the spill response equipment will be inspected at the time of the tests.

RECORDS

Staff Readiness Drills

Date	Drill Simulation	Who participated	Supervisor
date	Sinking vessel	List of staff members who participated	Signature

Inspection

Date	Inspected by:	Condition/Notes
date	Name	Notes on equipment condition

Emergency Phone List

- United States Coast Guard, Marine Safety Office: (###) ### - ####
- State Department of Environmental Management: (###) ### - ####
- Local Harbormaster Department: (###) ### - ####
- Local Police Department: (###) ### - ####
- Local Fire Department: (###) ### - ####

Plan last updated: date

Updated by: name

Appendix C

Table of Costs and Benefits of Marina Best Management Practices

(*Originally published in USEPA, 1996: Clean Marinas—Clear Value*)

Appendix C: Costs and Benefits of Clean Marina Examples (Source: USEPA, 1996)

Environmental change(s)	Initial investment	Years to amortize	Annualized cost of investment	Change in annual operations costs	Change in annual revenue	1995 net benefits from environmental change	Notes
1. Trash recycling - All Season's Marina, NJ	$5,000	10	$648	($4,100)	$0	$3,452	Net benefit is estimated by avoided trash removal cost less estimated labor costs for recycling.
2. Closed-loop hull-blasting system with reused plastic blasting medium - Associated Marine Technologies, FL	$25,849	5	$5,971	$8,617	$58,173	$43,585	Income from entire hull-blasting operation; difference in costs and revenues from conventional system revenues unknown; system installation required by county to continue service.
3. Pumpout service used as staff incentive - Battery Park Marina, OH	$2,450	10	$317	$20	$12,500	$12,163	Improved staff morale and productivity.
4. Sewage meter for pumpout station and entire marina - Brewer's Cove Haven Marina, RI	$6,800	10	$881	($2,603)	$0	$1,722	Savings from metered sewage flow; federal and state grants paid for installation of meter; however, initial cost included here to demonstrate benefits even with full cost.
5. Public education and free recycling - Cap Sante Boat Haven, WA	$0	N/A	$0	($10,800)	$0	$10,800	Waste disposal savings, less the cost of renting recycle bins.
6. Habitat assessment and scallop farming under docks - Cedar Island Marina, CT	$0	20	$0	$33,500	$46,000	$12,500	Cost of docks no more than conventional docks; operations costs are biologists' salaries; cost savings from extended dredging season; in addition to net benefits, $5,000 of annual "free publicity" is attributed to improvements.
7. Inland boatyard and repair sites - Conanicut Marine Services, RI	($1,807,000)	20/10	($138,688)	($72,125)	$75,000	$285,813	Initial land savings on buying inland versus waterfront, including permit saving; land amortized over 20 yr, trailer over 10 yr; property tax and land value savings are estimated to demonstrate benefit of inland yard.
8. Overall changes: pumpout service, dustless sanders, grounds maintenance - Deep River Marina, CT	$21,000	10/5	$3,329	$13,000	$86,800	$70,471	Additional benefits from new slip rentals, winter storage, added fuel sales; additional value was realized from "free publicity"; pumpout amortized over 10 yr, sanders over 5 yr.
9. Overall changes: environmental contract, pumpout service, solid waste and liquid materials management - Edwards Boatyard, MA	$116,400	20/10	$9,459	$18,100	$100,000	$72,441	Pumpout cost amortized over 10 yr, other investments over 20 yr; also attributed the equivalent of $10,000 of "free publicity."
10. Overall changes: habitat creation, pollution control, water conservation, etc. - Elliot Bay Marina, WA	N/A	1	N/A	($3,620)	$0	$3,620	Savings from avoided hazardous waste pickup paid for labor time; dog waste bags, distributed free to customers, save labor costs.
11. Overall changes: wash water recycling, trash recycling, portable pumpout station - Green Cove Marina, NJ	$6,800	10	$881	($750)	$28,700	$28,569	Change in costs are added labor and service costs less savings from decrease in disposal services; initial outlay for portable pumpout and recycling setup less permit savings; pumpout partially paid for with state grant but full initial cost included here to demonstrate benefits even with the full cost.
12. Pumpout capabilities at every dock - Hall of Fame Marina, FL	$16,200	10	$2,098	$3,788	$300,000	$294,114	Increased revenue due to special dockside pumpout service.

Appendix C: Costs and Benefits of Clean Marina Examples (Source: USEPA, 1996)

Environmental change(s)	Initial investment	Years to amortize	Annualized cost of investment	Change in annual operations costs	Change in annual revenue	1995 net benefits from environmental change	Notes
13. Seaweed recycled as garden fertilizer and mulch - The Hammond Marina, IN	$0	N/A	$0	($800)	$0	$800	Expected to save $17,500 on weed control in 1996.
14. Filtration of pressure wash water - Harbour Towne Marina, FL	$46,415	10	$6,011	$24,000	$270,000	$239,989	Difference in revenues and costs compared to conventional system unknown; system installation required by county to continue service.
15. Full-service pumpout and fueling - Kean's Detroit Yacht Harbor, MI	$12,000	10	$1,554	$1,040	$11,000	$8,406	New revenue from dockside pumpout and fuel services.
16. Recycled crushed concrete controls runoff - Lockwood Boat Works, NJ	($360,000)	20	($28,888)	$0	$0	$28,888	Initial investment is negative because of savings of using recycled concrete surfacing rather than blacktop.
17. Dustless vacuum sanding - The Lodge of Four Seasons Marina, MO	$3,724	5	$860	$8,643	$20,000	$10,497	Net of initial outlay and estimated labor and materials cost; saved 30% of conventional costs; difference in revenues unknown.
18. Floating pumpout and restroom barge to serve transients - Oak Harbor Marina, WA	$0	N/A	$0	($5,230)	$0	$5,230	State grant funded $58,600 cost of pumpout barge. The city hauls the marina's septic waste for free, which saved an equivalent of $8,220 in septic hauling cost.
19. Outdoor boat repairs done over screen tarps - Port Annapolis Marina, MD	$2,000	1	$2,000	($2,000)	$2,000	$2,000	Savings on cleanup costs, less the cost of labor and screen tarps.
20. Opening in breakwater to improve flushing - Puerto del Rey Marina, PR	$30,000	20	$2,407	$0	$50,000	$47,593	Additional dock rental income attributed to better water quality.
21. Wash water recycled without chemicals - Summerfield Boat Works, FL	$30,075	10	$3,895	$3,300	$93,750	$86,555	Savings in water cost.
22. Used oil burner installed to heat boat repair building - West Access Marina, IL	$7,000	10	$907	($9,894)	$9,495	$18,482	Cost savings on disposal and energy, less annual maintenance costs, plus additional boat repair income.
23. Floating personal watercraft (PWC) fueling dock prevents spillage - Winter Yacht Basin, NJ	$3,138	10	$406	$400	$6,366	$5,560	Additional personal watercraft fuel sales business.
24. Environmental changes at boatyard chain - Brewer Yacht Yards; NY, CT, RI, MA, ME	N/A	N/A	N/A	N/A	N/A	+	No calculations because chain-wide efforts made it difficult to attribute benefits to any one particular change; owners, however, felt strongly that chain-wide improvements made good business sense.
25. Environmental changes at marina chain - Westrec Marinas, Inc.; national	N/A	N/A	N/A	N/A	N/A	+	

Appendix D

Federal Laws Related to Marinas and Recreational Boating

Table D. Federal Laws Related to Marinas and Recreational Boating

Activity	Permit, License or Title	Authority	Purpose	Requirements
Any construction activity that disturbs 1 or more acres	NPDES Storm water Permit for Construction Activity	Clean Water Act, Section 402, for storm water discharge permits and 40 CFR 122.26	Maintains after development, as nearly as possible, the predevelopment runoff conditions.	All projects that disturb 1 or more acres must submit a Notice of Intent
Discharge of boat and equipment wash water, storm water runoff from boat maintenance areas, noncontact cooling water, and condensate discharges	NPDES General Permit for Discharges from Marinas	Clean Water Act, Section 402, for storm water discharge permits and 40 CFR 122.26	Controls pollution generated from runoff associated with industrial activity.	Any marina or boat yard that conducts boat maintenance activities, including washing, and has wastewater or storm water discharges must apply for coverage under this permit unless they have a valid individual discharge permit or coverage under 97-SW(1). To receive coverage under this permit, applicants must develop and implement a storm water pollution prevention plan
Operate a paint spray booth	Air Quality Permit to Construct	Clean Air Act, Section 110, and Title V, 42 U.S.C. 7401 et seq.	Ensures that any new, modified, replaced, or relocated source of air pollution complies with all air quality requirements. Air quality standards have been adopted to protect public health, vegetation, and forests.	Pre-Approval: Before an air pollution source is constructed or modified, a permit must be obtained from the state environmental agency. Post-Approval: Periodic emission tests and /or reports may be required depending on the nature of the operation and its emissions.
Any of the following activities in a nontidal wetland or its buffer: grading or filling; excavating or dredging; changing existing draining patterns; disturbing the water level or water table; and destroying or removing vegetation.	Proposed Activities in Nontidal Wetlands (Nontidal Wetlands and Waterways Permits)	Rivers and Harbors Act of 1899, Section 10; Clean Water Act, Section 404 Section 10 of the Rivers and Harbors Act of 1899 gives the Army Corps of Engineers authority to regulate all work and structures in navigable waters of the U.S. Section 404 of CWA regulates discharges of dredged or fill material into navigable waters, including wetlands. If USACE Section 404 permit is required, the state must investigate the site prior to construction.	Prevents, wherever possible, further degradation and losses of nontidal wetlands due to human activity; and wherever practical and feasible, to offset unavoidable losses or degradations through the deliberate restoration or creation of nontidal wetlands.	Wetland mitigation construction or monitoring requirements may be required in many instances and may extend well beyond construction of an approved mitigation project.
Discharge of sewage and grey water from a marina's private sewage treatment plant to surface water	Surface Water Discharge Permit	Clean Water Act	Maintains water quality standards in the water receiving the discharge.	Must be included in county water and sewer plan. Must meet all effluent limits, monitoring requirements, and other permit conditions

Table D. Federal Laws Related to Marinas and Recreational Boating (cont.)

Activity	Permit, License or Title	Authority	Purpose	Requirements
Apply antifoulant paints containing tributyl tin (TBT)	TBT Applicators License	Organotin Antifoulant Paint Control Act of 1988 (33 U.S.C. 2401) EPA is required to certify that each antifouling paint containing organotin does not release more than 4.0 micrograms per square centimeter per day.	Prohibits the use of antifouling paints containing organotin (TBT) on vessels that are 25 meters or less in length, unless the vessel hull is aluminum. .	It is unlawful for any person other than an owner or agent of a commercial boatyard to possess, distribute, sell, offer for sale, use, or offer for use any paint containing a TBT compound (except for spray can less than or equal to 16 ounces).
Generate 100 kg of hazardous waste in a calendar month or accumulate this amount at any one time	Notification of Hazardous Waste; EPA Identification Number for Generators, Transporters, and Treatment/Storage/ Disposal (TSD) Facilities	RCRA, Section 3010; 40 CFR 262.12, 263.11, and 264.11	Ensures proper storage and disposal of hazardous wastes.	A generator may not treat, store, dispose of, transport, or offer for transportation hazardous waste without having received an EPA Identification Number. A generator may not offer hazardous waste to transporters or to a TSD facility that has not received an EPA Identification Number.
Construction where the habitat of an endangered species or the species itself could be affected	N/A	Federal Endangered Species Act, (16 U.S.C. 1531-1543; P.L. 93-205) National Marine Fisheries Service (NMFS) regulations concerning ESA listing procedure are published at 50 CFR Parts 217-227. Joint regulations (USFWS and NMFS) - 50 CFR Parts 402 and 424-453. FWS coordinates ESA activities for terrestrial and freshwater species, while NMFS is responsible for marine species and Pacific salmon.	Provides conservation of species which are in danger of extinction throughout all or a significant portion of their range. All proposed development sites must be assessed by USFWS and USDOC for endangered and threatened species and habitat protection areas.	A species must be listed if it is threatened or endangered - because of present or threatened destruction, modification, or curtailment of its habitat or range - overutilization for commercial, recreational, scientific, or educational purposes - disease or predation - inadequacy of existing regulatory mechanisms - other natural or manmade factors affecting its continued existence.
Fueling, bilge water discharge, oil changing	N/A	Clean Water Act	Prohibits discharge of oil or oily waste into or upon the navigable waters of the U.S.	Prohibits discharge of oil or oily waste into or upon the navigable waters of the U.S. or the waters of the contiguous zone if such discharge causes a film or sheen upon, or discoloration of, the surface of the water, or causes a sludge or emulsion beneath the surface of the water.
Boat cleaning	N/A	Clean Water Act, (33 CFR 153.305)	Prohibits the use of soaps or other dispensing agents.	Prohibits the use of soaps or other dispensing agents to dissipate oil on the water or in the bilge without the permission of the Coast Guard.

Table D. Federal Laws Related to Marinas and Recreational Boating (cont.)

Activity	Permit, License or Title	Authority	Purpose	Requirements
Fueling, liquid material management	Spill Prevention, Contaminant, and Countermeasure (SPCC) Plan	EPA, Oil Pollution Prevention Regulation 40 CFR Part 112	Develops and implements plan to prevent discharge of oil into or upon navigable waters of the U.S. or adjoining shorelines.	Requires that marinas prepare and implement a plan to prevent any discharge of oil into navigable waters or adjoining shorelines if the facility has: - an above-ground oil capacity storage > 660 gal in a single container - an aggregate above-ground storage capacity of > 1,320 gal or a total underground storage capacity of > 42,000 gal.
Pumpouts, sewage discharge	N/A	Clean Vessel Act of 1992, Subtitle (V)(F) of P.L. 102-587 The Clean Vessel Act is a cost-reimbursable program, i.e., the grantees must spend their money to conduct approved activities and then request reimbursement for up to 75% of the costs. Grantee must provide at least 25% of project funding from a non-federal source.	Allows the Secretary of Interior to issue grants to coastal and inland states for pumpout stations and waste reception facilities to dispose of recreational boater sewage.	Directs the Secretary of Interior to provide grants to states to pay for the construction, renovation, operation, and maintenance of pumpout stations and waste reception facilities; requires each coastal state to conduct a survey to determine the number and location of all operational pumpout facilities and the number of recreational vessels with MSD Type III or portable toilets; requires each coastal state to develop and submit a plan for the construction and/or renovation of an adequate number of pumpout stations and waste reception facilities within the coastal zone of the state.
Pumpouts, boat toilet use, sewage discharge	Marine Sanitation Device Standard	Clean Water Act, Section 312, U.S.C., Title 33, Section 1322, 40 CFR Part 140 The Water Quality Act of 1987 requires EPA to develop standards designed to prevent the discharge of untreated or inadequately treated sewage into the U.S. waters. Section 312 requires the U.S. Coast Guard (USCG) to promulgate and enforce regulations governing the design, construction, installation, and operation of MSDs.	Eliminates discharge of untreated sewage from vessels into the U.S. waters, including the territorial seas (within 3 miles of the coast). It is illegal to discharge raw sewage in U.S. territorial waters.	Requires the installation of a U.S. Coast Guard certified MSD Type I, Type II, or Type III on all vessels with installed toilet systems operating in the navigable waters of the U.S. Portable toilets are not considered installed toilets; however, direct overboard discharge of portable toilet wastes is a violation of state water quality regulations.
Sewage discharge	Marine Sanitation Device Standard, Complete Prohibition, No Discharge	Clean Water Act, Section 312 (f) (3), U.S.C. Title 33, Section 1322, 40 CFR, Part 140.4 The EPA may allow a state to prohibit all discharges from marine toilets, thus declaring the area a “No Discharge Zone”	Eliminates discharge of untreated sewage from vessels into the U.S. waters, including the territorial seas (up to 3 miles).	Part 140.4 indicates that a state may completely prohibit the discharge from all vessels of any sewage, whether treated or not, into some or all of the waters within such state by making a written application to the EPA Administrator and by receiving the Administrator’s affirmative determination pursuant to Section 312(f)(3) of the Act.

Table D. Federal Laws Related to Marinas and Recreational Boating (cont.)

Activity	Permit, License or Title	Authority	Purpose	Requirements
MSD design	Marine Sanitation Devices; General, Certification Procedures, Design, Construction, and Testing	Clean Water Act, Section 312, U.S.C. Title 33, Section 1322, 40 CFR Part 159 The U.S. Coast Guard will maintain and make available a list that identifies certified MSDs.	Prescribes regulations governing the design and construction of marine sanitation devices and procedures for certifying that the MSDs meet the regulations and the standards of EPA promulgated under Section 312.	Section 159.7 (a) addresses requirements for vessel operators. It states that no person may operate any vessel equipped with installed toilet facilities unless it is equipped with: - an operable Type II or III device that has a label on it under Sec. 159.12 or Sec. 159.12a; or - an operable Type I device that has a label on it under Sec. 159.16 or that is certified under Sec. 159.12, if the vessel is 65 feet or less in length.
Sewage discharge	Marine Sanitation Device Standard, Establishment of Drinking Water Intake No Discharge Zone	Clean Water Act, Section 312 (f) (4) (B), U.S.C. Title 33, Section 1322, 40 CFR Part 140	Eliminates discharge of untreated sewage from vessels into the U.S. waters, including the territorial seas (up to 3 miles). The discharge of sewage from a vessel, whether treated or untreated, is prohibited in No Discharge Zones.	Section 312 (f)(4)(B) provides that "Upon application by a State, the EPA Administrator shall, by regulation, establish a drinking water intake zone in any waters within such State and prohibit the discharge of sewage from vessels within that zone."
Oil discharges from boats	N/A	Oil Pollution Act of 1990 (OPA), Public Law 101-380 (33 U.S.C. 2701 et seq; 104 Stat. 484) OPA requires FWS consultation on developing a fish and wildlife response plan for the National Contingency Plan, input to Area Contingency Plans, review of Facility and Tank Vessel Contingency Plans, and conducting of damage assessments associated with oil spills.	Establishes new requirements and amended the Federal Water Pollution Control Act to provide enhanced capabilities for oil spill response and natural resource damage assessment by the FWS. Addresses commercial oil shipping (e.g., tankers must be double-hulled, captains may lose their license if operating vessel under the influence of drugs or alcohol).	Some requirements are applicable to recreational boating. The responsible party for any vessel or facility that discharges oil is liable for the removal costs of the oil and any damages to natural resources; real or personal property; subsistence uses; revenues, profits, and earning capacity; and public services such as providing increased or additional public services.

Table D. Federal Laws Related to Marinas and Recreational Boating (cont.)

Activity	Permit, License or Title	Authority	Purpose	Requirements
Garbage dumping at sea	Chapter 33: Prevention of Pollution from Ships	Marine Plastic Pollution Research and Control Act,1987, MPPRCA (Title II of P.L. 100-220), U.S.C. Title 33, Chapter 33 MPPRCA is the U.S. Law implementing MARPOL Annex V, an international pollution prevention treaty. The U.S. Coast Guard is primarily responsible for enforcement of the law and development of the regulations.	Restrict garbage dumping at sea. Applies to all domestic and international ships operating in the U.S. Exclusive Economic Zone (EEZ) and in U.S. navigable waters.	Prohibits ocean dumping of plastics by ships and restricts the ocean dumping of other types of garbage within 25 miles from any land. Requires ports and terminals to provide garbage reception facilities. It is prohibited to discharge garbage in inland waters or in the ocean within 3 nautical miles of shore. A placard which notifies the crew and passengers of the MARPOL Annex V is required on vessels 26 feet and over. A plan and logbook are required on vessels 40 feet and over.
Ocean Dumping; research	N/A	Marine Protection Research and Sanctuaries Act of 1972, 33 U.S.C. 1441-1445; Title II of P.L. 92-532, as amended	Authorizes research and monitoring related to ocean dumping as well as research on possible effects of pollution, overfishing, and human-induced changes of the ocean system.	Provides for long-range research on the effects of human-induced changes to the marine environment and authorizes research and demonstration activities related to phasing out sewage and industrial waste dumping in marine environment.

Appendix E

Web Sites with Information Related to Marinas and Recreational Boating

SOME WEBSITES TO VISIT

U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds

http://www.epa.gov/owow/

Information on the control of nonpoint source pollution, the condition of the water-related environment, and the management and restoration of watersheds.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response

http://www.epa.gov/swerrims/

Provides policy, guidance, and direction for the land disposal of hazardous wastes, underground storage tanks, solid waste management, encouragement of innovative technologies, source reduction of wastes, and the Superfund Program.

U.S. Environmental Protection Agency,Office of Wetlands, Oceans, and Watersheds Publications On Line

http://www.epa.gov/OWOW/info/PubList/publist4.html

http://earth1.epa.gov/OWOW/info/NewsNotes/

A variety of EPA publications related to Nonpoint Source Pollution that can be ordered or read on the Internet.

U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds Publications On Line

http://www.epa.gov/OWOW/info/PubList/publist4.html

http://earth1.epa.gov/OWOW/info/NewsNotes/

A variety of EPA publications related to Nonpoint Source Pollution that can be ordered or read on the Internet.

U.S. Environmental Protection Agency, Index of Watershed Indicators

http://www.epa.gov/surf/iwi

Maps and information about watersheds nationwide. Locate your own watershed and learn about the quality of the waters in it, sources of pollution, and organizations active in protecting it.

U.S. Coast Guard Kids' Corner

http://www.uscg.mil/hq/g-cp/kids/kidindx.html

Activities and information for kids about safety and clean boating practices; "The Adventures of Captain Cleanwater: An Activity Book for Kids About Clean and Safe Boating" and "The True Story of Inky the Whale."

National Sea Grant National Depository

http://nsgd.gso.uri.edu

Searchable archive of all Sea Grant-funded documents since 1967, including hundreds of studies on boating, marinas, and the environment, plus many educational flyers, brochures, and fact sheets; well worth the visit.

National Sea Grant College Program

http://www.mdsg.umd.edu/NSGO/

Information about the National Sea Grant program and links to state Sea Grant programs nationwide.

U.S. Fish and Wildlife Service, Clean Vessel Act Program

http://fa.r9.fws.gov/cva/cva.html

Information on the CVA program, which provides grants for pumpout and dump stations for boaters to dispose of human waste in an environmentally safe manner.

Tennessee Valley Authority

http://www.tva.gov/river/recreation/index.htm

Information on the camping and recreation areas operated by the TVA. TVA operates some 100 public recreation areas throughout the Tennessee Valley, including campgrounds, day-use areas, and boat launching ramps. Their opening and closing dates are listed at this site, as well as contact numbers.

U.S. Army Corps of Engineers

http://www.usace.army.mil/inet/functions/cw/cecwo/recrea.htm

Information about all of the lakeside parks that are administered by the Army Corps of Engineers. The Lakeside Recreation Resource page shows a map. Just click on an area of the country that you are interested in and the maps will show you all the information you need about the USACE park system.

Canadian Coast Guard

http://www.pacific.ccg-gcc.gc.ca/Epages/offboat/pae/pme.htm

Protecting the Aquatic Environment: A Boater's Guide with valuable information on managing waste, boat maintenance, antifouling paint, batteries, introduced species, tips for protecting the aquatic environment, spill reporting, and more.

Florida Department of Environmental Protection

http://www.dep.state.fl.us

Information and management practices for managing the following types of waste:
- Distress signal flares
- Batteries (lead acid marine/auto and rechargeable)
- Mercury-containing devices: bilge pump float switches, air conditioning thermostats
- Mercury containing lamps: fluor-escent and high-intensity discharge
- Refrigerants and asbestos.

Maryland Department of Natural Resources

http://www.dnr.state.md.us/boating/

Links to a variety of pages with information of interest to boaters, including:
- Boating Regulations
- Boating Safety
- Clean Marina Initiative
- Public Boating Facilities
- Pumpout Program
- Vessel Requirements
- Weather.

National Safe Boating Council

http://www.safeboatingcouncil.org/

The mission of the NSBC is to provide a forum for advancing and fostering safe boating, and for educating the public in safe boating principles, by developing and facilitating an ongoing series of campaigns to promote safe boating principles and practices; facilitating the distribution and dissemination of information on safe boating; promoting the development of research initiatives to support boating education and safety awareness; improving the professional development of boating safety educators; and encouraging the development and implementation of outstanding boating safety programs.

Marina Operators Association of America (MOAA)

http://www.nmma.org/affiliates/usa/moaa

MOAA works for the enhancement of the recreational marina industry through:
- Stimulating a continuing exchange of ideas
- Updating marina operators on new information
- Banding together to maintain a strong national voice
- Encouraging marina operators to institute the best management practices
- Joining to establish a clean marina program
- Encouraging marina operators to be proactive in their customer's boating experience.

National Marine Manufacturers Association

http://www.nmma.org

NMMA members—more than 1,600 companies—produce every conceivable product used by recreational boaters. NMMA provides a wide variety of programs and services tailored to member needs: technical expertise, standards monitoring, government relations avocation, industry statistics, and more. NMMA produces boat shows, including the world's largest marine trade show, the International Marine Trades Exhibit & Convention (IMTEC), in key North American markets.

International Marina Institute

http://www.imimarina.com

IMI is a nonprofit membership organization serving the global marine industry. It offers management training, education, and information about research, legislation, and environmental issues affecting the marina industry. IMI is a marine trade organization that encompasses all segments of the marina business both nationally and internationally.

Marine Environmental Education Foundation

http://www.meef.org

MEEF is a national, nonprofit, tax-exempt, charitable foundation founded to bring together national specialists to develop education programs and research on marine environmental issues. Its goal is to create and present educational programs that will result in cleaner waters for the boating public. MEEF is the creator and sponsor of the National Clean Boating Campaign.

National Boating Federation

http://outdoorsource.com/nbf

The largest nationwide alliance of recreational boating organizations, yacht and boating clubs, and individual members focused on promoting recreational boating activities. The National Boating Federation often appears before congressional committees to testify on boating matters.

Boat Owners Association of the United States

http://www.boatus.com

Provides services including representing the interests of boat owners on Capitol Hill; insuring members' boats; operating an on-the-water towing network; and providing discount boating equipment through the Internet, mail order, and marine centers. BoatU.S. publishes widely circulated publications for boaters, serves as an educator in marine safety and environmental issues, and routinely tests and reports on boating safety equipment and other products.

Marine Retailers Association of America

http://www.mraa.com

MRAA is the nation's largest marine retailers trade association, representing an industry with more than 100,000 employees and nearly $20 billion in sales annually. The mission of the MRAA—Progress through Participation with Industry Partners—is accomplished by promoting programs and services and helping create an environment that helps marine retailers to operate. MRAA promotes and furthers the interests of all its member companies and the marine industry in general.

Center for Marine Conservation

http://www.cmc-ocean.org

The Center for Marine Conservation is committed to protecting ocean environments and conserving the global abundance and diversity of marine life. Through science-based advocacy, research, and public education, CMC promotes informed citizen participation to reverse the degradation of our oceans.

BoatFacts Online

http://www.boatfacts.com/home.asp

Information on boating products, publications, marinas, classifieds, engines, boats, legislative issues, organizations, discussion forums, and a boating calendar.

Appendix F

Storm Water Runoff Management Practice Tables

Table F-1. Advantages and disadvantages of management practices (MDE, 2000).

Management Practice	Advantages	Disadvantages	Comparative Cost[a]
Runoff control ponds			
Wet pond	• Can provide peak flow control • Can serve large developments; most cost-effective for larger, more intensively developed sites • Enhances aesthetics and provides recreational benefits • Little ground water discharge • Permanent pool in wet ponds helps to prevent scour and resuspension of sediments • Provides moderate to high removal of both particulate and soluble urban runoff pollutants	• Not economical for drainage area less than 10 acres • Potential safety hazards if not properly maintained • If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors • Requires considerable space, which limits use in densely urbanized areas with expensive land and property values • Not suitable for hydrologic soil groups “A” and “B” (USDA-NRCS classification) unless a liner is used • With possible thermal discharge and oxygen depletion, may severely impact downstream aquatic life	Moderate to high compared to conventional runoff detention
Infiltration practices			
Infiltration basin	• Provides ground water recharge • Can serve large developments • High removal capability for particulate pollutants and moderate removal for soluble pollutants • When basin works, it can replicate predevelopment hydrology more closely than other BMP options • Basins provide more habitat value than other infiltration systems	• Possible risk of contaminating ground water • Only feasible where soil is permeable and there is sufficient depth to rock and water table • Fairly high failure rate • If not adequately maintained, can be and eyesore, breed mosquitoes, and create undesirable odors • Regular maintenance activities cannot prevent rapid clogging of infiltration basin	Construction cost moderate but rehabilitation cost high
Infiltration trench	• Provides ground water recharge • Can serve small drainage areas • Can fit into medians, perimeters, and other unused areas of a development site • Helps replicate predevelopment hydrology, increases dry weather baseflow, and reduces bankfull flooding frequency	• Possible risk of contaminating ground water • Only feasible where soil is permeable and there is sufficient depth to rock and water table • Since not as visible as other BMPs, less likely to be maintained by residents • Requires significant maintenance	Cost-effective on smaller sites Rehabilitation costs can be considerable
Porous pavement	• Provides ground water recharge • Provides water quality control without additional consumption of land • Can provide peak flow control • High removal rates for sediment, nutrients, organic matter, and trace metals • When operating properly can replicate predevelopment hydrology • Eliminates the need for runoff drainage, conveyance, and treatment systems off-site	• Requires regular maintenance • Possible risk of contaminating ground water • Only feasible where soil is permeable, there is sufficient depth to rock and water table, and there are gentle slopes • Not suitable for areas with high traffic volume • Need extensive feasibility tests, inspections, and very high level of construction workmanship (Schueler, 1987) • High failure rate due to clogging • Not suitable to serve large off-site pervious areas	Cost-effective compared to conventional asphalt when working properly
Concrete grid pavement	• Can provide peak flow control • Provides ground water recharge • Provides water quality control without additional consumption of land	• Requires regular maintenance • Not suitable for areas with high traffic volume • Possible risk of contaminating ground water • Only feasible where soil is permeable, there is sufficient depth to rock and water table, and there are gentle slopes	Information not available

Table F-1. (cont.)

Management Practice	Advantages	Disadvantages	Comparative Cost[a]
Filtering practices			
Filtration basin	• Ability to accommodate medium-size development (3-80 acres) • Flexibility to provide or not provide ground water recharge • Can provide peak volume control	• Requires pretreatment of stormwater through sedimentation to prevent filter media from prematurely clogging	Information not available
Open channel practices			
Grassed swale	• Requires minimal land area • Can be used as part of the runoff conveyance system to provide pretreatment • Can provide sufficient runoff control to replace curb and gutter in single-family residential subdivisions and on highway medians • Economical	• Low pollutant removal rates • Leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients	Low compared to curb and gutter
Structural management practices that do not fully meet the 80% TSS requirement			
Vegetated filter strip	• Low maintenance requirements • Can be used as part of the runoff conveyance system to provide pretreatment • Can effectively reduce particulate pollutant levels in areas where runoff velocity is low to moderate • Provides excellent urban wildlife habitat • Economical	• Often concentrates water, which significantly reduces effectiveness • Ability to remove soluble pollutants highly variable • Limited feasibility in highly urbanized areas where runoff velocities are high and flow is concentrated • Requires periodic repair, regrading, and sediment removal to prevent channelization	Low
Water quality inlet: catch basin with sand filter	• Provide high removal efficiencies of particulates • Require minimal land area • Flexibility to retrofit existing small drainage areas • Higher removal of nutrient as compared to catch basins and oil/grit separator	• Not feasible for drainage areas greater than 5 acres • Only feasible for areas that are stabilized and highly impervious • Not effective as water quality control for intense storms	Information not available
Water quality inlet: oil/grit separator	• Captures coarse-grained sediments and some hydrocarbons • Requires minimal land area • Flexibility to retrofit existing small drainage areas and applicable to most urban areas • Shows some capacity to trap trash, debris, and other floatables • Can be adapted to all regions of the country	• Not feasible for drainage area greater than 1 acre • Minimal nutrient and organic matter removal • Not effective as water quality control for intense storms • Concern exists for the pollutant toxicity of trapped residuals • Require high maintenance	High, compared to trenches and sand filters
Extended detention dry pond with micropool	• Can provide peak flow control • Possible to provide good particulate removal • Can serve large development • Requires less capital cost and land area when compared to wet pond • Does not generally release water or anoxic water downstream • Provides excellent protection for downstream channel erosion • Can create valuable wetland and meadow habitat when properly landscaped	• Removal rates for soluble pollutants are quite low • Not economical for drainage area less than 10 acres • If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors	Lowest cost alternative in size range

[a]Comparative cost information from Schueler, 1992

Table F-2. Costs of selected management practices (Claytor and Scheuler, 1996; Brown and Schueler, 1997).

Management practice	Construction costs[a]	Useful life (years)	Total annual costs
Infiltration basin[b]			
Average	$0.55/ft^3 storage	25[c]	–
Report range	$0.22–$1.31/ft^3	–	$0.03–$0.05/ft
Probable range	$0.44–$0.76/ft^3	–	–
Infiltration trench[b]			
Average	$4.36/ft^3 storage	10[c]	–
Report range	$0.98–$10.04/ft^3	–	$0.03–$0.10/ft
Probable range	$2.73–$8.18/ft^3	–	–
Infiltration practices[d]			
Average	$2.99/ft^3 storage	–	–
Report range	$2.13-4.27/ft^3 storage	–	–
Vegetated swales[b]			
Established from seed			
Average	$7.09/linear ft	50[e]	$1.09/linear ft
Report range	$4.91–$9.27/linear ft	–	–
Established from sod			
Average	$21.82/linear ft	50[e]	$2.18/linear ft
Report range	$8.73–$54.56/linear ft	–	–
Porous pavement[b]			
Average	$1.64/ft^2	10[f]	$0.16/ft
Report range	$1.09-$2.18/ft^2	–	–
Concrete grid pavement[b]			
Average	$1.09/ft^2	20	$0.05/ft
Report range	$1.09–$2.18/ft^2	–	–
Filtration basins[b]			
Average (probable)	$5.46/ft^3 storage	25[g]	–
Report range	$1.09–12.00/ft^3	–	$0.11–$0.87/ft
Probable range	$2.18–9.82/ft^3	–	–
Filtration practices[d]			
Average	$2.63/ft^3 storage	–	–
Range	$2.13-6.40/ft^3 storage	–	–
Water quality inlet[b,h]			
Average	$2,182 each	–	$164 each
Report range	$1,200–3,273 each	–	–
Probable range	–		–
Water quality inlet with sand filter[b,h]			
Average (probable)	$10,900/drainage acre	50	$764/drainage acre
Oil/grit separator[b,h]			
Average	$19,640/drainage acre	50	$1,091/drainage acre
Report range	$16,370–$21,820/ drainage acre	–	–

Table F-2. (cont.)

Management practice	Construction costs[a]	Useful life (years)	Total annual costs
Stabilization with ground cover[b,h]			
From existing vegetation	$0	50	Natural: $109/acre
Average	–	–	Managed: $873/acre
Report range			
From seed	$436/acre	50	Natural: $131/acre
Average	$218–$1,091/acre	–	Managed: $900/acre
Report range			
From seed and mulch	$1,637/acre	50	Natural: $218/acre
Average	$872–$3,819/acre	–	Managed: $982/acre
Report range			
From sod	$12,330/acre	50	Natural: $764/acre
Average	$4,910–$52,375/acre	–	Managed: $1,528/acre
Report range			
Ext. Detention Dry Pond[b,h]			
Average	$0.55/ft^3 storage	50	–
Report range	$0.05–$3.49/ft^3	–	$0.008–$0.33/ft
Probable range	$0.10–$5.46/ft^3	–	–
Wet Pond and Extended Detention			
Wet Pond[b]			
Storage vol. < 1 million ft^3			
Average	$0.55/ft^3 storage	50	$0.009–$0.08/ft
Report range	$0.05–$1.09/ft^3	–	–
Probable range	$0.55–$1.09/ft^3	–	–
Storage vol. > 1 million ft^3			
Average (probable)	$0.27/ft^3 storage	50	–
Report range (probable)	$0.05–$0.55/ft^3	–	$0.009–$0.08/ft
Probable range	$0.11–$0.55/ft^3	–	–

[a]Costs updated to 2000 dollars using the Bureau of Labor Statistics Consumer Pricing Indexes Inflation Calculator (BLS, 2000).
[b]Claytor and Schueler, 1996.
[c]References indicate the useful life for infiltration basins and infiltration trenches at 25-50 and 10-15 years, respectively. Because of the high failure rate, infiltration basins are assumed to have a useful life span of 25 years and infiltration trenches are assumed to have a useful life span of 10 years.
[d]Brown and Schueler, 1997.
[e]Useful life is assumed to equal the life of the project, assumed to be 50 years.
[f]No information was available for porous pavement. It is assumed to be similar to infiltration trenches.
[g]No information was available for filtration basins. It was assumed to be similar to infiltration basins.
[h]These practices do not meet the 80 percent TSS removal, thus it is recommended that they be used with other management practices in a treatment train.