This document includes Section 5: Phase I Discharge Determinations from the "Phase I Final Rule and Technical Development Document of Uniform National Discharge Standards (UNDS)," published in April 1999. The reference number is EPA-842-R-99-001.

Phase I Final Rule and Technical Development Document of Uniform National Discharge Standards (UNDS)

Section 5: Phase I Discharge Determinations

April 1999

5. PHASE I DISCHARGE DETERMINATIONS

This chapter summarizes the 39 discharge types listed in Table 3-1 and the UNDS Phase I decisions made regarding whether MPCDs are required. Section 5.1 provides this information for the discharges that EPA and DoD determined to require MPCDs; section 5.2 provides information for the discharges determined not to require MPCDs; and section 5.3 lists the chapter 5 references.

5.1 Discharges Determined To Require MPCDs

For the reasons discussed below, EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD to control 25 types of discharges from vessels of the Armed Forces. Except where noted, the pollutant characteristics of these discharges indicate a potential to cause adverse environmental impacts. Table 5-1 lists those discharges for which EPA and DoD determined it was reasonable and practicable to require the use of an MCPD, and identifies the characteristics of each discharge that formed the basis of the determination.

For the Phase I rule, EPA and DoD identified at least one potential MPCD control option for each discharge that could mitigate the environmental impacts of the discharge from at least one class of Armed Forces vessel. In Phase II of the UNDS rulemaking, EPA and DoD will perform a more detailed assessment of MPCD control options. EPA and DoD will consider options that are being evaluated as part of research and development programs in addition to those that are currently available. EPA and DoD will evaluate MPCDs for all classes of vessels and promulgate the specific performance standards for each MPCD that are reasonable and practicable for that class of vessel. In developing specific MPCD performance standards, EPA and DoD will consider the same factors considered in Phase I. The Phase II rule may distinguish among vessel types and sizes, between new and existing vessels, and may waive the applicability of Phase II standards as necessary or appropriate to a particular type or age of vessel (see CWA section 312(n)(3)(B)).

A MPCD is a control technology or a management practice that can reasonably and practicably be installed or otherwise used on a vessel of the Armed Forces to receive, retain, treat, control or discharge a discharge incidental to the normal operation of the vessel.

The discussions below provide a brief description of the discharges and the systems that produce the discharges EPA and DoD propose to control. The discussions highlight the most significant constituents released to the environment, and describes the current practice, if any, to prevent or minimize environmental effects. Because of the diversity of vessel types and designs, these control practices are usually not uniformly applied to all vessels generating the discharge. In addition, these controls do not necessarily represent the only control options available. A more detailed discussion of the discharges is presented in the NOD reports in Appendix A.

Table 5-1. Discharges Requiring the Use of a MPCD and the Basis for the Determination[a]

	Chemical Constituents						
Discharge	**Oil**	**Metals**	**Organic Chemicals**	**Thermal Pollution**	**Bioaccum-ulative Chemicals of Concern**	**Nonindigenous Species**	**Other**
Aqueous Film-Forming Foam							(b)
Catapult Water Brake Tank Discharge and Post-Launch Retraction Exhaust	X						
Chain Locker Effluent							(c)
Clean Ballast						X	
Compensated Fuel Ballast	X						
Controllable Pitch Propeller Hydraulic Fluid	X						
Deck Runoff	X						
Dirty Ballast	X						
Distillation and Reverse Osmosis Brine		X					
Elevator Pit Overboard Discharge	X						
Firemain Systems		X					
Gas Turbine Washdown Discharge	X		X				
Graywater			X				
Hull Coating Leachate		X					
Motor Gasoline Compensating Overboard Discharge	X					X	
Non-Oily Machinery Wastewater							(d)
Photographic Laboratory Drains							(d)
Seawater Cooling Overboard Discharge		X		X			
Seawater Piping Biofouling Prevention							(e)
Small Boat Engine Wet Exhaust			X				
Sonar Dome Discharge							(c)
Submarine Bilge Water	X						
Surface Vessel Bilge Water/Oil-Water Separator Discharge	X						
Underwater Ship Husbandry		X				X	
Welldeck Discharges	X						

Notes:

(a) This table provides a simplified overview of the basis for requiring the use of MPCDs for particular discharges. It is not intended to fully characterize the discharges or describe the analyses leading to the decision. More complete characterizations of the discharges and the analyses leading to the decisions are presented in this section and in Appendix A.
(b) Discharge may produce floating foam in violation of some State water quality standards.
(c) Discharge was determined to have a low potential to adversely affect the environment, but an existing MPCD is in place on at least one type of vessel to reduce this low potential even further.
(d) No conclusion was drawn on the potential of the discharge to adversely affect the environment, but EPA and DoD determined a MPCD is reasonable and practicable to mitigate any possible adverse effects.
(e) Chlorine and chlorination byproducts.

5.1.1 Aqueous Film-Forming Foam (AFFF)

This discharge consists of a mixture of seawater and firefighting foam discharged during training, testing, and maintenance operations. Aqueous film forming foam (AFFF) is the primary firefighting agent used to extinguish flammable liquid fires on surface ships of the Armed Forces. AFFF is stored on vessels as a concentrated liquid that is mixed with seawater to create the diluted solution (3-6% AFFF) that is sprayed as a foam on the fire. The solution is applied with both fire hoses and fixed sprinkler devices. During planned maintenance of firefighting systems, system testing and inspections, and flight deck certifications, the seawater/foam solution is discharged either directly overboard from hoses, or onto flight decks and then subsequently washed overboard. These discharges are considered incidental to the normal operation of Armed Forces vessels. Discharges of AFFF that occur during firefighting or other shipboard emergency situations are not incidental to normal operations and are not subject to the requirements of the rule.

AFFF is discharged from all Navy ships, those MSC ships capable of supporting helicopter operations, and Coast Guard cutters, icebreakers, and tugs. AFFF discharges generally occur at distances greater than 12 n.m. from shore, and in all cases more than 3 n.m. from shore due to existing Armed Forces operating instructions. The constituents of AFFF include water, 2-(2-butoxyethoxy)-ethanol, urea, alkyl sulfate salts, amphoteric fluoroalkylamide derivative, perfluoroalkyl sulfonate salts, triethanolamine, and methyl-1H-benzotriazole. Because the water used to mix with the AFFF concentrate comes from the vessel's firemain, the discharge will also include bis(2-ethylhexyl)phthalate, nitrogen (measured as total Kjeldahl nitrogen), copper, nickel, and iron from the firemain piping.

The AFFF discharge produces an aqueous foam intended to cool and smother fires. Water quality criteria for some States include narrative requirements for waters to be free of floating materials attributable to domestic, industrial, or other controllable sources, or include narrative criteria prohibiting discharges of foam. AFFF discharges in State waters would be expected to result in violating such narrative criteria for foam or floating materials. At present, the Navy uses certain management practices to control these discharges, including a self-imposed prohibition on AFFF discharges in coastal waters by most Armed Forces vessels. These management practices to control discharges of AFFF demonstrate the availability of a MPCD to mitigate the potential adverse impacts that could result from the discharge of AFFF. Therefore, EPA and DoD have determined that it is reasonable and practicable to require use of a MPCD for this discharge.

AFFF discharges occur beyond 3 n.m. but within 12 n.m. from shore infrequently and in relatively small volumes, and preliminary investigation indicates that the diluted (3-6%) AFFF solution does not exhibit significant toxic effects. Further, any discharges that do occur take place while the vessel is underway and will be dispersed in the turbulence of the vessel wake.

5.1.2 Catapult Water Brake Tank and Post-Launch Retraction Exhaust

This intermittent discharge is the oily water skimmed from the catapult water brake tank, and the condensed steam discharged when the catapult is retracted. Catapult water brakes are used to stop the forward movement of the steam-propelled catapults used to launch aircraft from Navy aircraft carriers. The catapult water brake system includes water brake cylinders and a water brake tank that contains freshwater. During flight operations, water from the catapult water brake tank is continuously injected into the catapult water brake cylinders. At the end of a launch stroke, spears located on the front of the catapult pistons enter the water brake cylinders. The water in the cylinders builds pressure ahead of the spears, cushioning the catapult pistons to a stop. The catapult brake water is continuously circulated between the catapult water brake tank and the catapult water brake cylinders.

Prior to the launch stroke, lubricating oil is applied to the catapult cylinder through which the catapult piston and piston spear are driven. As the catapult piston is driven forward during the launch stroke, the catapult piston and spear carries lubricating oil from the catapult cylinder into the water brake cylinder at the end of the stroke. Over the course of multiple launchings, the oil and water circulating through the water brake cylinder and tank leads to the formation of an oil layer in the water brake tank. The oil layer can adversely affect water brake operation by interfering with the cooling of water in the water brake tank. To prevent excessive heat buildup in the tank, the oil is periodically skimmed off and discharged overboard. Additionally, as the catapult piston is retracted following the launch, expended steam from the catapult launch stroke and some residual lubricating oil from the catapult cylinder walls are discharged below the waterline through a separate exhaust pipe.

Only aircraft carriers generate this discharge. Catapult operations during normal flight operations generate both the water brake tank discharge and the post-launch retraction exhaust; however, flight operations take place beyond 12 n.m. from shore. Catapult testing which occurs within 12 n.m. always discharges the post-launch retraction exhaust, but usually does not add sufficient quantities of oil to the water brake tank to require skimming.

The water brake tank is used within 12 n.m. for dead-load catapult shots when testing catapults on new aircraft carriers, and following major drydock overhauls or major catapult modifications. This testing requires a minimum of 60 dead-load shots each and may occur over a period of several days within 12 n.m. from shore. New carrier testing occurs only once, and major overhauls generally occur on 5- to 7-year cycles in conjunction with drydocking. Major modifications to catapults may occur during an overhaul or pierside and are also infrequent events. Carriers also routinely perform no-load shots when leaving port. The number of no-load shots conducted when leaving port, however, usually do not add enough lubricating oil to the water brake tank to require skimming the oil while the ship is within 12 n.m. from shore.

The Water Brake Tank and Post-Launch Retraction exhaust discharge includes lubricating oil, a limited thermal load associated with the heated oil and water (or condensed steam, in the case of the post-launch retraction exhaust), nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), and metals such as copper and nickel from the piping systems. EPA and DoD analyzed the thermal effects of this discharge and concluded they were unlikely to exceed thermal mixing zone criteria in the States where aircraft carriers most frequently operate. The post-launch retraction exhaust discharge can contain oil, copper, nickel, ammonia, bis(2-ethylhexyl)phthalate, phosphorus, and benzidine in concentrations exceeding State acute water quality criteria. The post-launch retraction exhaust discharge can also contain nitrogen in concentrations exceeding the most stringent State water quality criteria.

The Navy has imposed operational controls limiting the amount of oil applied to the catapult cylinder during the launch stroke, which directly affects the amount of oil that is subsequently discharged from the water brake tank or during the post-launch retraction exhaust. The Navy has also established requirements prescribing when catapult testing is required within 12 n.m. from shore. These operational constraints minimize discharges of oil from the water brake tank and post-launch retraction exhaust in coastal waters. These existing management practices demonstrate the availability of controls for this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require use of a MPCD to mitigate potential adverse environmental impacts from this discharge.

5.1.3 Chain Locker Effluent

This discharge consists of accumulated precipitation and seawater that is occasionally emptied from the compartment used to store the vessel’s anchor chain.

The chain locker is a compartment used to store anchor chain aboard vessels. Navy policy requires that the anchor chain, appendages, and anchor on Navy surface vessels be washed down with seawater during retrieval to prevent onboard accumulation of sediment. During washdown, some water adheres to the chain and is brought into the chain locker as the chain is stored. The chain locker sump accumulates the residual water and debris that drains from the chain following anchor chain washdown and retrieval, or washes into the chain locker during heavy weather. Water accumulating in the chain locker sump is removed by a drainage eductor powered by the shipboard firemain system.

All Armed Forces vessels housing their anchor chains in lockers, except submarines, can generate this discharge. Since submarine chain lockers are always open to the sea, water is always present in the chain locker and there is no “collected” water to be discharged as effluent. Navy policy prohibits discharging chain locker effluent within 12 n.m. Other vessels of the Armed Forces are currently authorized to discharge chain locker effluent within 12 n.m.;

however, most Armed Forces vessels also observe the 12 n.m. discharge prohibition. A recent review of practices on several Navy ships found no water accumulation in the chain locker sump, and the ships' crew confirmed that discharges of chain locker effluent occur outside 12 n.m.

In addition to water, materials collecting in the chain locker sump can include paint chips, rust, grease, and other debris. Chain locker effluent may contain organic and inorganic compounds associated with this debris, as well as metals from the sump and from sacrificial anodes installed in the chain locker to provide cathodic protection. If the anchor chain washdown is not performed and the chain locker effluent is subsequently discharged in a different port, the discharge could potentially transport nonindigenous species. Discharge volume will vary depending upon the frequency of anchoring operations, the number of anchors used, and the depth of water (which determines the amount of chain that will be lowered into the water).

Given the manner in which water collects in the chain locker sump and remains there for extended periods of time, it is possible that the discharge could contain elevated levels of metals at concentrations exceeding State water quality criteria. However, given the small volume of the discharge and the infrequency of anchoring operations, it is unlikely that discharges of chain locker effluent would adversely impact the environment. Nevertheless, the Navy and other Armed Forces already have management practices in place for most vessels requiring anchors and anchor chains to be washed down with seawater during retrieval, and prohibiting the discharge of chain locker effluent until beyond 12 n.m. from shore. DoD has chosen as a matter of policy to continue prohibiting the discharge of chain locker effluent within 12 n.m. from shore. This prohibition, while not considered necessary to mitigate an existing or potential adverse impact, will eliminate the possibility of discharging into coastal waters any metals, other contaminants, or nonindigenous aquatic species that may have accumulated in the chain locker sump. EPA and DoD have determined that the existing management practices demonstrate that it is reasonable and practicable to require use of a MPCD for chain locker effluent.

5.1.4 Clean Ballast

This discharge is composed of the seawater taken into, and discharged from, dedicated ballast tanks used to maintain the stability of the vessel and to adjust the buoyancy of submarines.

Many types of Armed Forces vessels store clean ballast in dedicated tanks in order to adjust a vessel's draft, buoyancy, trim, and list. Clean ballast may consist of seawater taken directly onboard into the ballast tanks or seawater received from the vessel's firemain system. Clean ballast differs from "dirty ballast" and "compensated ballast" discharges (described below) in that clean ballast is not stored in tanks that are also used to hold fuel. Many surface vessels introduce clean ballast into tanks to replace the weight of off-loaded cargo or expended fuel to improve vessel stability while navigating on the high seas. Amphibious ships also flood clean ballast tanks during landing craft operations to lower the ship's stern, allowing the well deck to be accessed. Submarines introduce clean ballast into their main ballast tanks when submerging, and introduce clean ballast into their variable ballast tanks to make minor adjustments to buoyancy, trim, and list while operating submerged or surfaced. The discharge occurs when fuel or cargo is taken on and the ballast is no longer needed, when amphibious operations are concluded and the vessel is returned to its normal operating draft, when submarines surface, or when submarines make some operational adjustments in trim or list while submerged or surfaced.

Clean ballast discharges are intermittent and can occur at any distance from shore, including within 12 n.m. Constituents of clean ballast can include materials from tank coatings (e.g., epoxy), chemical additives (e.g., flocculant chemicals or rust inhibitors), and metals from piping systems and sacrificial anodes used to control corrosion. Based on analytical data for firemain system discharges, metals expected to be present in the discharge include copper, nickel, and zinc. These data indicate that the pollutant concentrations in the discharge may exceed State water quality criteria.

Previous studies have documented the potential of ballasting operations to transfer nonindigenous aquatic species into receiving waters. Ballast water potentially contains living microorganisms, plants, and animals that are native to the location where the water was pumped aboard. When the ballast water is transported to another port or coastal area and discharged, the surviving organisms are released and have the potential to invade and impact the local ecosystem.

The Navy, MSC, and Coast Guard either currently implement or are in the process of approving a ballast water management policy requiring open-ocean ballast water exchange, based on guidelines established by the International Maritime Organization.[1] These management practices demonstrate the availability of controls to mitigate the potential adverse environmental impacts from this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require a MPCD for discharges of clean ballast.

5.1.5 Compensated Fuel Ballast

This intermittent discharge is composed of the seawater taken into, and discharged from, tanks designed to hold both fuel and ballast water to maintain the stability of the vessel.

Compensated fuel ballast systems are configured as a series of fuel tanks that automatically draw in seawater to replace fuel as it is consumed. Keeping the fuel tanks full in this manner enhances the stability of a vessel by using the weight of the seawater to compensate for the mass of ballast lost through fuel consumption. During refueling, fuel displaces the seawater, and the displaced seawater is discharged overboard.

Compensated fuel ballast is discharged by approximately 165 Navy surface vessels and submarines. In most cases, surface ships with compensated fuel ballast systems discharge directly to surface waters each time they refuel. However, in some situations that discharge is collected for processing on shore. Surface vessels are refueled both in port and at sea. All at-sea refueling is accomplished beyond 12 n.m. from shore. For submarines, refueling occurs only in port and the compensated ballast is transferred to shore facilities for processing.

The compensated fuel ballast discharge can contain 2-propenal, phosphorus, thallium, oil (and its constituents, such as benzene, phenol, and toluene), copper, mercury (a bioaccumulative chemical of concern), nickel, silver, and zinc. Concentrations of 2-propenal, benzene, copper, nickel, phosphorus, silver, thallium, and zinc can exceed acute Federal criteria or State acute water quality criteria. The compensated fuel ballast discharge can also contain nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) in concentrations exceeding the most stringent State water quality criteria.

To reduce the discharge of fuel in compensated fuel ballast discharge, the Navy has instituted operational guidelines intended to reduce the potential for overfilling tanks or discharging excessive amounts of fuel entrained in the displaced compensating water while refueling surface vessels. These guidelines limit the amount of fuel that can be taken on in port (i.e., to prevent "topping off" the fuel tanks) and establish maximum allowable rates for in port refueling. Additionally, submarines transfer all compensated fuel ballast water to shore facilities when refueling diesel fuel oil tanks. These operational controls for surface vessel refueling and the practice of transferring the discharge to shore for submarines demonstrates the availability of MPCDs to mitigate potential adverse environmental impacts; therefore, EPA and DoD have determined it is reasonable and practicable to require the use of a MPCD for compensated fuel ballast.

5.1.6 Controllable Pitch Propeller Hydraulic Fluid

This discharge is the hydraulic fluid that is discharged into the surrounding seawater from propeller seals as part of normal operation, and the hydraulic fluid released during routine maintenance of the propellers.

Controllable pitch propellers (CPP) are used to control a vessel's speed or direction while maintaining constant propulsion plant output (i.e., varying the pitch, or "bite," of the propeller blades allows the propulsion shaft to remain turning at a constant speed). CPP blade pitch is controlled hydraulically through a system of pumps, pistons, and gears. Hydraulic oil may be released from CPP assemblies under three conditions: leakage through CPP seals, releases during underwater CPP repair and maintenance activities, or releases from equipment used for CPP blade replacement.

Over 200 Armed Forces vessels have CPP systems. Leakage through CPP seals can occur within 12 n.m., but seal leakage is more likely to occur while the vessel is underway than while pierside or at anchor because the CPP system operates under higher pressure when a vessel is underway. Blade replacement occurs in port on an as-needed basis when dry-docking is unavailable or impractical, resulting in some discharge of hydraulic oil. Approximately 30 blade replacements and blade port cover removals (for maintenance) are conducted annually, fleetwide.

CPP assemblies are designed to operate at 400 psi without leaking. Typical pressures while pierside range from 6 to 8 psi. CPP seals are designed to last five to seven years, which is the longest period between dry-dock cycles, and are inspected quarterly to check for damage or excessive wear. Because of the hub design and the frequent CPP seal inspections, leaks of hydraulic oil from CPP hubs are found to be negligible. During the procedure for CPP blade replacement, however, hydraulic oil is released to the environment from tools and other equipment. In addition, hydraulic oil could also leak from the CPP hub during a CPP blade port cover removal.

The Navy's repair procedures impose certain requirements during blade replacement and blade port cover removal to minimize the amount of hydraulic oil released to the extent possible. In addition, booms are placed around the aft end of the vessel to contain possible oil release during these procedures. Nevertheless, EPA and DoD have determined that the amount of hydraulic oil released during underwater CPP maintenance could create an oil sheen and exceed State water quality criteria. Constituents of the discharge could include paraffins, olefins, and metals such as copper, aluminum, tin, nickel, and lead. Metal concentrations are expected to be low because hydraulic oil is not corrosive, and the hydraulic oil is continually filtered to protect against system failures.

EPA and DoD have determined that pollution controls are necessary to mitigate the potential adverse environmental impacts that could result from releases of hydraulic oil during underwater maintenance on controllable pitch propellers. The existing repair procedures and the staging of containment booms and oil skimming equipment to capture released oil demonstrate the availability of MPCDs (i.e., best management practices) for this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require MPCDs to control discharges of CPP hydraulic fluid.

5.1.7 Deck Runoff

Deck runoff is an intermittent discharge generated when water from precipitation, freshwater washdowns, wave action, or spray falls on the exposed portion of a vessel such as a weather deck or flight deck. This water is discharged overboard through deck openings and washes overboard any residues that may be present on the deck surface. The runoff drains overboard to receiving waters through numerous deck openings. All vessels of the Armed Forces produce deck runoff, and this discharge occurs whenever the deck surface is exposed to water, both within and beyond 12 n.m.

Contaminants present on the deck originate from topside equipment components and the many varied activities that take place on the deck. This discharge can include residues of gasoline, diesel fuel, Naval distillate fuel, grease, hydraulic fluid, soot, dirt, paint, glycol, cleaners such as sodium metasilicates, and solvents. A number of metal and organic pollutants may be present in the discharge, including silver, cadmium, chromium, copper, nickel, lead, benzene, ethylbenzene, toluene, xylene, polycyclic aromatic hydrocarbons, and phenol. Mass loadings and concentrations of these constituents will vary with a number of factors including ship operations, deck washdown frequency, and the frequency, duration, and intensity of precipitation events.

Based on the results from limited sampling from catapult troughs (a component of runoff from aircraft carrier flight decks), oil and grease, phenols, chromium, cadmium, nickel, and lead could be present in this discharge at levels exceeding acute Federal criteria and State acute water quality criteria. If not properly controlled, oil collecting in catapult troughs can cause deck runoff from aircraft carrier flight decks to create an oil sheen on the surface of the receiving water, which would violate State water quality criteria. Armed Forces vessels already institute certain management practices intended to reduce the amount of pollutants discharged in deck runoff, including keeping weather decks cleared of debris, immediately mopping up and cleaning spills and residues, and engaging in spill and pollution prevention practices. These practices demonstrate the availability of controls to mitigate adverse impacts from deck runoff. Therefore, EPA and DoD have determined it is reasonable and practicable to require a MPCD for deck runoff.

5.1.8 Dirty Ballast

This intermittent discharge is composed of the seawater taken into, and discharged from, empty fuel tanks to maintain the stability of the vessel. The seawater is brought into these tanks for the purpose of improving the stability of a vessel during rough sea conditions. Prior to taking on the seawater as ballast, fuel in the tank to be ballasted is transferred to another fuel tank or holding tank to prevent contaminating the fuel with seawater. Some residual fuel remains in the tank and mixes with the seawater to form dirty ballast. Dirty ballast systems are configured differently from compensated ballast and clean ballast systems. Compensated ballast systems continuously replace fuel with seawater in a system of tanks as the fuel is consumed. Clean ballast systems have tanks that carry only ballast water and are never in contact with fuel. In a dirty ballast system, water is added to a fuel tank after most of the fuel is removed.

Thirty Coast Guard vessels generate dirty ballast as a discharge incidental to normal vessel operations. These Coast Guard vessels do so because their size and design do not allow for a sufficient volume of clean ballast tanks. The larger of these vessels discharge the dirty ballast at distances beyond 12 n.m. from shore, while the smaller vessels discharge the dirty ballast between 3 and 12 n.m. from shore. Coast Guard vessels monitor the dirty ballast discharge with an oil content monitor. If the dirty ballast exceeds 15 parts per million (ppm) oil, it is treated in an oil-water separator prior to discharge.

Expected constituents of dirty ballast are Naval distillate fuel or aviation fuel. Based on sampling results for compensated fuel ballast, which is expected to have similar constituents to dirty ballast, this discharge can contain oil (and its constituents such as benzene and toluene); biocidal fuel additives; metals such as copper, mercury (a bioaccumulative chemical of concern), nickel, silver, thallium, and zinc; and the constituents 2-propenal, nitrogen (in the form of ammonia and total Kjeldahl nitrogen), and phosphorus.

Uncontrolled discharges of dirty ballast would be expected to exceed acute Federal criteria or State acute water quality criteria for oil, benzene, , copper, nickel, phosphorus, 2-propenal, silver, thallium, and zinc. Concentrations of nitrogen would be expected to exceed the most stringent State water quality criteria. The use of oil content monitors and oil-water separators to reduce the concentration of oil (and associated constituents) demonstrates the availability of MPCDs to control this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require the use of MPCDs to control discharges of dirty ballast.

5.1.9 Distillation and Reverse Osmosis Brine

This intermittent discharge is the concentrated seawater (brine) produced as a byproduct of the processes used to generate freshwater from seawater.

Distillation and reverse osmosis plants are two types of water purification systems that generate freshwater from seawater for a variety of shipboard applications, including potable water for drinking and hotel services, and high-purity feedwater for boilers. Distillation plants boil seawater, and the resulting steam is condensed into high-purity distilled water. The remaining seawater concentrate, or “brine,” that is not evaporated is discharged overboard. Reverse osmosis systems separate freshwater from seawater using semi-permeable membranes as a physical barrier, allowing a portion of the seawater to pass through the membrane as freshwater and concentrating the suspended and dissolved constituents in a saltwater brine that is subsequently discharged overboard.

Distillation or reverse osmosis systems are installed on approximately 540 Armed Forces vessels. This discharge can occur in port, while transiting to or from port, or while operating anywhere at sea (including within 12 n.m.). Distillation plants on steam-powered vessels may be operated to produce boiler feedwater any time a vessel’s boilers are operating; however, operational policy limits its use in port for producing potable water because of the increased risk of biofouling from the water in harbors and the reduced demand for potable water. MSC steam-powered vessels typically operate one evaporator while in port to produce boiler feedwater; most diesel and gas-turbine powered MSC vessels do not operate water purification systems within 12 n.m.

Pollutants detected in distillation and reverse osmosis brine include copper, iron, lead, nickel, , and zinc. The sampling data indicate that copper, lead, nickel, iron, and zinc can exceed acute Federal criteria or State acute water quality criteria. The distillation and reverse osmosis brine discharge can also contain nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) and phosphorus in concentrations exceeding the most stringent State water quality criteria. The mass loadings of copper and iron are estimated to be significant. Thermal effects modeling of distillation plant discharges indicates that the thermal plume does not exceed State water quality criteria.

Review of existing practices indicate that certain operational controls limiting the use of distillation plants and reverse osmosis units can reduce the potential for this discharge to cause adverse environmental impacts in some instances. Additionally, it appears that, for some vessels, reverse osmosis units may present an acceptable alternative to the use of distillation plants. Reverse osmosis units discharge brines are expected to contain lower concentrations of metals because these systems have non-metallic membranes and ambient operating temperatures, resulting in less system corrosion. Further analysis is necessary before determining whether distillation plants should be replaced by reverse osmosis units. Nevertheless, existing operational practices for distillation and reverse osmosis plants and the availability of reverse osmosis units to replace distillation units on some vessels demonstrates the availability of MPCDs to reduce the effects of this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require the use of MPCDs to control discharges from distillation and reverse osmosis plants.

5.1.10 Elevator Pit Effluent

This discharge is the liquid that accumulates in, and is occasionally discharged from, the sumps of elevator wells on vessels. Most large surface ships have at least one type of elevator used to transport supplies, equipment, and personnel between different decks of the vessel. These elevators generally can be classified as either a closed design in which the elevator operates in a shaft, or an open design used to move aircraft between decks. Elevators operating in a shaft are similar to the conventional design seen in many buildings. For these elevators, a sump is located in the elevator pit to collect liquids entering the elevator and shaft areas. Deck runoff and elevator equipment maintenance activities are the primary sources of liquids entering the sump. On some vessels, the elevator sump is equipped with a drain to direct liquid wastes overboard. On others, piping is installed that allows an eductor to pump the pit effluent overboard. However, most vessels collect and containerize the pit effluent for disposal onshore or process it along with their bilgewater.

The elevators used on aircraft carriers to move aircraft and helicopters from one deck to another are an open design (i.e., there is no elevator shaft). The elevator platform is supported by cables and pulleys, and it operates on either the port or starboard side of the ship away from the hull. Unlike elevators with pits, the aircraft elevators are exposed to the water below and there are no systems in place for collecting liquid wastes.

Coast Guard, Army and Air Force vessels do not have elevators and therefore do not produce this discharge. The discharge of elevator pit effluent may occur at any location, within or beyond 12 n.m. from shore. Constituents in elevator pit effluent are likely to include grease, lubricating oil, fuel, hydraulic fluid, cleaning solvents, dirt, paint chips, aqueous film-forming foam, glycol, and sodium metasilicate. The discharge can also contain nitrogen (measured as total Kjeldahl nitrogen) and metals from firemain water used to operate eductors draining the elevator pit.

The concentrations of copper, iron, nickel, and bis(2-ethylhexyl)phthalate in firemain water (discussed in section 5.1.11) may exceed acute Federal criteria or State acute water quality criteria. The elevator pit effluent discharge can also contain nitrogen in concentrations exceeding the most stringent State water quality criteria. Constituent concentrations and mass loadings vary among ship classes depending on the frequency of elevator use, the size of the elevator openings, the amount and concentration of deck runoff, and the frequency of elevator equipment maintenance activities. Material accumulated in elevator pits is either collected for disposal onshore or directed to the bilgewater system for treatment through an oil-water separator prior to discharge. These existing practices demonstrate the availability of controls to reduce the potential for this discharge to cause adverse impacts on the environment. Therefore, EPA and DoD have determined that it is reasonable and practicable to require MPCDs for elevator pit effluent.

5.1.11 Firemain Systems

This discharge is the seawater pumped through the firemain system for firemain testing, maintenance, and training, and to supply water for the operation of certain vessel systems.

Firemain systems distribute seawater for firefighting and other services aboard ship. Firemain water is provided for firefighting through fire hose stations, sprinkler systems, and foam proportioners, which inject aqueous film-forming foam (AFFF) into firemain water for distribution over flammable liquid spills or fire. Firemain water is also directed to other services including ballast systems, machinery cooling, lubrication, and anchor chain washdown. Discharges of firemain water incidental to normal vessel operations include anchor chain washdown, firemain testing, various maintenance and training activities, bypass flow from the firemain pumps to prevent overheating, and cooling of auxiliary machinery equipment (e.g., refrigeration plants). UNDS does not apply to discharges of firemain water that occur during firefighting or other shipboard emergency situations, because they are not incidental to the normal operation of a vessel.

Firemain systems aboard Armed Forces vessels are classified as either wet or dry. Wet firemain systems are continuously charged with water and pressurized so that the system is available to provide water upon demand. Dry firemains are not continuously charged with water, and consequently do not supply water upon demand. Dry firemain systems are periodically tested and are pressurized during maintenance or training exercises, or during emergencies.

With the exception of small boats and craft, all Armed Forces vessels use firemain systems. All Navy surface ships and some MSC vessels use wet firemain systems. Submarines and all Army and Coast Guard vessels use dry firemains. Firemain system discharges occur both within and beyond 12 n.m. from shore. Flow rates depend upon the type, number, and operating time of the equipment and systems using water from the firemain system.

Samples were collected from three vessels with wet firemain systems and analyzed to determine the constituents present. Because of longer contact times between seawater and the piping in wet firemains, and the use of zinc anodes in some seachests and heat exchangers to control corrosion, pollutant concentrations in wet firemains are expected to be higher than those in dry firemain systems. Pollutants detected in the firemain discharge include nitrogen (measured as total Kjeldahl nitrogen), copper, nickel, iron, and bis(2-ethylhexyl)phthalate. The concentrations of iron exceeded the most stringent State chronic water quality criteria. The concentrations of nitrogen exceeded the most stringent State water quality criteria. Copper, nickel, and bis(2-ethylhexyl)phthalate concentrations exceeded the relevant chronic Federal criteria and State chronic water quality criteria. These concentrations contribute to a significant total mass loading in the discharge due to the large volume of water discharged from wet firemain systems. Circulation through heat exchangers to cool auxiliary machinery increases the temperature of the firemain water, but the resulting thermal effects do not exceed State mixing zone criteria.

Firemain systems have a low potential for transporting nonindigenous aquatic species, primarily because the systems do not transport large volumes of water over great distances. In addition, stagnant portions of the firemain tend to develop anaerobic conditions that are inhospitable to most marine organisms.

EPA and DoD believe that dry firemain systems may offer one means for reducing the total mass of pollutants discharged from firemain systems. The use of dry firemains for Coast Guard vessels demonstrates that, for at least some types of vessels, this option may be an available control mechanism. Another possible MPCD option for achieving pollutant reductions is the use of alternative piping systems (i.e., different metallurgy) that provide lower rates of pipe wall corrosion and erosion. The use of dry firemains and the potential offered by alternative piping systems demonstrates the availability of controls to mitigate potential adverse impacts on the environment. Therefore, EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD for firemain systems.

5.1.12 Gas Turbine Water Wash

Gas turbine water wash consists of water periodically discharged while cleaning internal and external components of propulsion and auxiliary gas turbines. Approximately 155 Armed Forces vessels use gas turbines for either propulsion or auxiliary power generation. Gas turbine water wash is generated within 12 n.m. and varies by the type of gas turbine and the amount of time it is operated. Because the drain collecting system is limited in size, discharges may occur within 12 n.m. On most Navy and MSC gas turbine ships, gas turbine water wash is collected in a dedicated collection tank and is not discharged overboard within 12 n.m. On ships without a dedicated collection tank, this discharge is released as a component of deck runoff, welldeck discharges, or bilgewater.

Expected constituents of gas turbine water wash are synthetic lubricating oil, grease, solvent-based cleaning products, hydrocarbon combustion by-products, salts from the marine environment, and metals leached from metallic turbine surfaces. The concentration of naphthalene (from solvents) in the discharge is expected to exceed State acute water quality criteria. To limit the impacts of gas turbine water wash discharge while operating in coastal areas, most vessels direct the discharge to a dedicated holding tank for shore disposal. This containment procedure demonstrates the availability of controls for this discharge. Therefore, EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD for gas turbine water wash.

5.1.13 Graywater

Section 312(a)(11) of the CWA defines graywater as “galley, bath, and shower water.” Recognizing the physical constraints of Armed Forces vessels and the manner in which wastewater is handled on these vessels, graywater is more broadly defined for the purposes of

UNDS. For the purposes of this regulation, the graywater discharge consists of graywater as defined in CWA section 312(a)(11), as well as drainage from laundries, interior deck drains, water fountains and miscellaneous shop sinks. All ships, and some small boats, of the Armed Forces generate graywater on an intermittent basis. Graywater discharges occur both within and beyond 12 n.m. from shore. Most Armed Forces vessels collect graywater and transfer it to shore treatment facilities while pierside. Some vessel types, however, have minimal or no graywater collection or holding capability and discharge the graywater directly overboard while in transit. Graywater is discharged pierside when collection facilities are not available.

Less than half of all graywater discharged within 12 n.m. occurs pierside from vessels lacking graywater collection holding capability. The remainder of the discharge in coastal waters occurs during transit within 12 n.m. from shore. Copper, lead, mercury (a bioaccumulative chemical of concern), nickel, silver, and zinc were detected in concentrations that exceed acute Federal criteria and State acute water quality criteria. Graywater also contains conventional and nonconventional pollutants, such as total suspended solids, biochemical oxygen demand, chemical oxygen demand, oil, grease, ammonia, nitrogen, and phosphates. Due to the large volume of graywater generated each year, the mass loadings of these constituents may be significant. The use of containment systems to transfer graywater to shore treatment facilities demonstrates the availability of controls to mitigate adverse impacts on the environment. Therefore, EPA and DoD have determined that it is reasonable and practicable to require a MPCD to control graywater discharges.

5.1.14 Hull Coating Leachate

This discharge consists of constituents that leach, dissolve, ablate, or erode from hull paints into the surrounding seawater.

Vessel hulls that are continuously exposed to seawater are typically coated with a base anti-corrosive coating covered by an anti-fouling coating. This coating system prevents corrosion of the underwater hull structure and, through leaching action releases antifouling compounds. Ablative coatings allow the paint surface to erode or dissolve to release antifouling compounds. These compounds inhibit the adhesion of biological growth to the hull surface.

The coatings on most vessels of the Armed Forces are either copper- or tributyl tin (TBT)-based, with copper-based ablative paints being the most predominant coating system. The Armed Forces have been phasing out the use of TBT paints, and currently it is found only on approximately 10-20 percent of small boats and craft with aluminum hulls. Small boats and craft that spend most of their time out of water typically do not receive an anti-corrosive or anti-fouling coating.

Hull coating leachate is generated continuously whenever a vessel hull is exposed to water, within and beyond 12 n.m. from shore. Priority pollutants expected to be present in this discharge include copper and zinc. TBT is also expected to be present in this discharge for those vessels with TBT paint. The release rate of the constituents in hull coating leachate varies with the type of paint used, water temperature, vessel speed, and the age of the coating. Using average release rates derived from laboratory tests, the wetted surface area of each vessel, and the number of days the vessel is located within 12 n.m., EPA and DoD estimated the mass of copper, zinc, and TBT released in the leachate and concluded that the discharge has the potential to cause an adverse environmental effect.

Annual releases of TBT are expected to decrease since TBT coatings are being phased out by DoD and the Coast Guard. Both DoD and the commercial industry have conducted research on the use of advanced antifouling coatings such as easy release coatings (e.g., silicone) that resist biofouling when the vessel is in motion and a critical speed is reached. The combination of phasing out TBT paints, the potential to establish limits on copper release rates for copper-based coating systems, and the potential for alternative coating systems to reduce copper discharges demonstrates the availability of controls to mitigate potential environmental impacts from hull coating leachate. Thus, EPA and DoD determined that it is reasonable and practicable to require use of a MPCD for hull coating leachate.

5.1.15 Motor Gasoline Compensating Discharge

This intermittent discharge consists of seawater taken into, and discharged from, motor gasoline tanks. Motor gasoline (MOGAS) is used to operate vehicles and equipment stored or transported on some Navy amphibious vessels. MOGAS is stored in a compensating fuel tank system in which seawater is automatically added to fuel tanks as the gasoline is consumed in order to eliminate free space where vapors could accumulate. The compensating system is used for MOGAS to provide supply pressure for the gasoline and to keep the tank full to prevent potentially explosive gasoline vapors from forming. During refueling, gasoline displaces seawater from the tanks, and the displaced seawater is discharged directly overboard.

The Navy has two classes of vessels with MOGAS storage tanks. Eleven of these vessels are homeported in the U.S. Based on operational practices, vessels with MOGAS storage tanks typically refuel once per year, and the refuelings are always conducted in port. Therefore, all discharges from the MOGAS compensating system occur in port.

Seawater in the MOGAS compensating system is in contact with the gasoline for long periods of time. MOGAS discharges are expected to contain components of gasoline, including benzene, ethylbenzene, toluene, phenols, and naphthalenes at concentrations that exceed acute water quality criteria.

Specific operating procedures are followed when refueling MOGAS tanks to reduce the potential for discharging gasoline. These procedures require MOGAS tanks to be filled slowly and prohibit filling the tanks beyond 80 percent of the total tank capacity. Containment is placed around hose connections to contain any releases of gasoline, and containment booms are placed in the water around the vessel being refueled. Diffusers are used within the tanks to prevent entraining fuel into the discharged compensating water. These management practices demonstrate the availability of controls to mitigate potential adverse impacts to the environment. Therefore, EPA and DoD have determined that it is reasonable and practicable to require MPCDs for the MOGAS compensating discharge.

5.1.16 Non-Oily Machinery Wastewater

This intermittent discharge is composed of water leakage from the operation of equipment such as distillation plants, water chillers, valve packings, water piping, low- and high-pressure air compressors, and propulsion engine jacket coolers. Only wastewater that is not expected to contain oil is collected in this system. The discharge is captured in a dedicated system of drip pans, funnels, and deck drains to prevent mixing with oily bilgewater. Non-oily machinery wastewater from systems and equipment located above the waterline is drained directly overboard. Non-oily machinery wastewater from systems and equipment below the waterline is directed to collection tanks prior to overboard discharge. In limited cases, steam condensate generated when a vessel is in port is directed to the non-oily machinery wastewater collection tank. See section 5.2.10 for additional information on steam condensate discharges.

Nuclear-powered Navy surface vessels and some conventionally powered vessels have dedicated non-oily machinery wastewater systems. Most other Armed Forces vessels have no dedicated non-oily machinery wastewater system, so this type of wastewater drains directly to the bilge and is part of the bilgewater discharge.

Non-oily machinery wastewater is discharged in port, during transit, and at sea. This discharge is generated whenever systems or equipment are in use, and varies in volume according to ship size and the level of machinery use.

Pollutants, including copper, nickel, silver, bis(2-ethylhexyl)phthalate, and zinc were present in concentrations that exceed acute Federal criteria or State acute water quality criteria. Nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) and total phosphorus were present in concentrations exceeding the most stringent State water quality criteria. Mercury (a bioaccumulative chemical of concern) was also detected, but at concentrations that did not exceed Federal or State water quality criteria. There was significant variability in sampling data, and flow rate data were insufficient for reliably estimating mass loadings for this discharge. System design changes to control the types and numbers of contributing systems and equipment, and implementation of management practices to reduce the generation of non-oily machinery wastewater are potential options for reducing the potential impact of this discharge on the environment. For this rule, EPA and DoD have determined that it is reasonable and practicable to require MPCDs for non-oily machinery wastewater.

5.1.17 Photographic Laboratory Drains

This intermittent discharge is laboratory wastewater resulting from processing photographic film. Typical liquid wastes from these activities include spent film processing chemical developers, fixer-bath solutions and film rinse water.

Navy ship classes such as aircraft carriers, amphibious assault ships, and submarine tenders have photographic laboratory facilities, including color, black-and-white and x-ray photographic processors. The Coast Guard has two icebreakers with photographic and x-ray processing capabilities. The MSC has two vessels that have photographic processing equipment onboard, but the equipment normally is not operated in U.S. waters. Army, Air Force, and Marine Corps vessels do not use photographic equipment aboard their vessels and therefore do not produce this discharge.

Photographic laboratory wastes may be generated within and beyond 12 n.m. from shore, although current practice is to collect and hold the waste onboard within 12 n.m. The volume and frequency of the waste generation varies with a vessel's photographic processing capabilities, equipment, and operational objectives.

Expected constituents in photographic laboratory wastes include acetic acid, aluminum sulfate, ammonia, boric acid, ethylene glycol, sulfuric acid, sodium acetate, sodium chloride, ammonium bromide, aluminum sulfate, and silver. Concentrations of silver can exceed acute Federal criteria and State acute water quality criteria; however, the existing data are insufficient to determine whether drainage from shipboard photographic laboratories has the potential to cause adverse environmental effects.

The Navy has adopted guidance to control photographic laboratory drains, including containerizing for onshore disposal all photographic processing wastes generated within 12 n.m., and is transitioning to digital photographic systems. The current handling practices and the availability of digital photographic systems demonstrates that MPCDs are available to mitigate potential adverse effects, if any, from photographic laboratory drains. Therefore, EPA and DoD have determined that it is reasonable and practicable to require use of a MPCD for this discharge.

5.1.18 Seawater Cooling Overboard Discharge

This discharge consists of seawater from a dedicated system that provides noncontact cooling water for other vessel systems. The seawater cooling system continuously provides cooling water to heat exchangers, removing heat from main propulsion machinery, electrical generating plants, and other auxiliary equipment. The heated seawater is discharged directly overboard. With the exception of some small, non-self-propelled vessels and service craft, all Armed Forces vessels discharge seawater from cooling systems. Typically, the demand for seawater cooling is continuous and occurs both within and beyond 12 n.m. from shore.

Seawater cooling overboard discharge contains trace materials from seawater cooling system pipes, valves, seachests, pumps, and heat exchangers. Pollutants detected in seawater cooling overboard discharge include copper, zinc, nickel, arsenic, chromium, lead, and nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen). Copper, nickel, and silver were detected in concentrations exceeding both the chronic Federal criteria and State chronic water quality criteria. Nitrogen was detected in concentrations exceeding State chronic water quality criteria. These concentrations contribute to a significant total mass released by this discharge due to the large volume of cooling water. In addition, thermal effects modeling indicates that some vessels may exceed State thermal mixing zone requirements. The seawater cooling water system has a low potential for transporting nonindigenous species, because the residence time for most portions of the system are short. However, a strainer plate is used to minimize the inflow of larger biota during system operation. The strainer plate is periodically cleaned using low pressure air or steam to dislodge any accumulated material. This procedure may result in releasing biota that have attached to the plate.

A potential MPCD option for achieving pollutant reductions is the use of alternative piping systems (i.e., different metallurgy) that provide lower rates of pipe wall corrosion and erosion. The potential substitution of materials demonstrates the availability of controls to mitigate potential adverse impacts on the environment. Based on this information, EPA and DoD have determined that it is reasonable and practicable to require use of a MPCD for this discharge.

5.1.19 Seawater Piping Biofouling Prevention

This discharge consists of the additives used to prevent the growth and attachment of biofouling organisms in seawater cooling systems on selected vessels, as well as the reaction byproducts resulting from the use of these additives. Fouling reduces seawater flow and heat transfer efficiency. Aboard some vessels, active biofouling control systems are used to control biological fouling of surfaces within the seawater cooling systems. Generally, these active biofouling control systems are used when the cooling system piping does not have inherent antifouling properties (e.g., titanium piping). The most common seawater piping biofouling prevention systems include chlorination, chemical dosing, and anodic biofouling control systems. All three systems act to prevent fouling organisms from adhering to and growing on interior piping and components. Chlorinators use electric current to generate chlorine and chlorine-produced oxidants from seawater. Anodic biofouling control systems use electric current to accelerate the dissolving of an anode to release metal ions into the piping system. Chemical dosing uses an alcohol-based chemical dispersant that is intermittently injected into the seawater system.

Twenty-nine Armed Forces vessels use active seawater piping biofouling control systems. Nine vessels use onboard chlorinators, 19 vessels use anodic biofouling control systems, and one vessel employs chemical dosing. Chlorinators operate on a preset schedule of intermittent operation, a few hours daily. Chemical dispersant dosing is performed for one hour every three days. Anodic systems normally operate continuously.

Seawater discharged from systems with active biofouling control systems is likely to contain residuals from the fouling control agent (chlorine, alcohol-based chemical additives, or copper), in addition to constituents normally found in cooling water. Based on modeling of the discharge plume, EPA and DoD estimate that receiving water concentrations of residual chlorine could exceed chronic Federal criteria and State chronic water quality criteria. Because of the large volume of seawater discharged from these systems, the resulting mass loading of chlorine released to the environment is considered significant.

Existing operational controls that limit the residual chlorine discharged to the environment demonstrate the availability of a MPCD to mitigate the potential for adverse impacts from this discharge. EPA and DoD have determined that it is reasonable and practicable to require a MPCD for seawater piping biofouling prevention systems.

5.1.20 Small Boat Engine Wet Exhaust

This discharge is the seawater that is mixed and discharged with small boat propulsion engine exhaust gases to cool the exhaust and quiet the engine. Small boats are powered by either inboard or outboard engines. Seawater is injected into the exhaust of these engines for cooling and to quiet engine operation. Constituents from the engine exhaust are transferred to the injected seawater and discharged overboard as wet exhaust.

Most small boats with engines generate this discharge. The majority of inboard engines used on small boats are two-stroke engines that use diesel fuel. The majority of outboard engines are two-stroke engines that use a gasoline-oil mixture for fuel. This discharge is generated when operating small boats. Due to their limited range and mission, small boats spend the majority of their operating time within 12 n.m. from shore.

Wet exhaust from outboard engines contains several constituents that can exceed acute Federal criteria or State acute water quality criteria including benzene, toluene, ethylbenzene, and naphthalene. Wet exhaust from inboard engines can contain benzene, ethylbenzene, and total polycyclic aromatic hydrocarbons (PAHs) that can exceed State water quality criteria. Mass loadings of these wet exhaust constituents are considered large. Potential MPCD options include replacing existing outboard engines with new reduced-emission outboard engines, and ensuring all new boats and craft have inboard engines with dry exhaust systems. Therefore, EPA and DoD have determined that it is reasonable and practicable to require use of a MPCD for small boat engine wet exhaust.

5.1.21 Sonar Dome Discharge

This discharge is generated by the leaching of antifoulant materials from the sonar dome material into the surrounding seawater and the discharge of seawater or freshwater from within the sonar dome during maintenance activities. Hull-mounted sonar domes house the electronic equipment used to navigate, detect, and determine the range to objects. Sonar domes are composed of either rubber impregnated with tributyltin (TBT) anti-foulant, rubber without TBT, steel, or glass-reinforced plastic, and are filled with freshwater and/or seawater to maintain their shape and internal pressure. The discharge is generated when materials leach from the exterior surface of the dome, or when water containing leach materials from inside the dome is pumped overboard to allow for periodic maintenance or repairs on the sonar dome or equipment housed inside the dome.

Only Navy and MSC operate vessels with sonar domes. Sonar domes are currently installed on approximately 225 vessels, including eight classes of Navy vessels and one class of MSC vessels. Sonar domes on MSC vessels are fiberglass and do not contain TBT.

The leaching of materials from the exterior surface of the dome is a continuous discharge and occurs both within and beyond 12 n.m. from shore. Discharges from the interior of the dome are intermittent and occur while the vessel is pierside as water inside the dome is removed to allow for periodic maintenance or repairs (approximately twice per year per dome).

Expected constituents of sonar dome water discharge are TBT, dibutyl tin, monobutyl tin, and metals such as copper, nickel, zinc, and tin. Based on sampling data in the record, concentrations of TBT, copper, nickel, and zinc can exceed acute Federal criteria or State acute water quality criteria, although fleetwide mass loadings of these constituents are not considered large (15 pounds/year of TBT, 23 pounds/year of copper, 11 pounds/year of nickel, and 122 pounds/year of zinc). Nevertheless, the Navy has instituted a program to install new sonar domes that do not have TBT-impregnated internal surfaces as existing domes require replacement. This practice demonstrates the availability of a control to mitigate potential adverse environmental impacts, if any, from sonar dome discharges. Therefore EPA and DoD have determined that it is reasonable and practicable to require a MPCD for sonar dome discharges.

5.1.22 Submarine Bilgewater

The submarine bilgewater discharge contains a mixture of wastewater and leakage from a variety of sources that are allowed to drain to the lowest inner part of the hull, known as the bilge. These sources can include condensed steam from steam systems, spillage from drinking fountains, valve and piping leaks, and evaporator dumps (i.e., evaporator water that fails to meet specifications for use). From the various collection points in the bilge, this bilgewater is transferred via an auxiliary drain system to a series of holding tanks. Most submarines have the capability to segregate oily wastewater from non-oily wastewater. The non-oily waste is discharged directly overboard and the oily wastewater is collected in a tank that allows gravity separation of the oil and water. The separated water phase is then discharged overboard, as needed, and the oil phase held onboard until it can be transferred to shore facilities for disposal.

This discharge is generated by all submarines, all of which are operated by the Navy. Approximately 60 of the submarines (the SSN 688 class) discharge the separated water phase from the bilgewater collection tanks within and beyond 12 n.m. from shore. The remaining submarines generally hold all bilgewater onboard until they are beyond 50 n.m. from shore. The frequency and volume of the discharge is highly variable, depending upon crew size, operating depth, and equipment conditions.

Sampling conducted onboard submarines showed concentrations of cadmium, chlorine, copper, cyanide, heptachlor, heptachlor epoxide, mercury (a bioaccumulative chemical of concern), nickel, oil, phenol, silver, and zinc that exceeded acute Federal criteria or State acute water quality criteria. Submarines use gravity separation to reduce the concentration of oil in bilgewater prior to discharge; however, this method apparently does not consistently produce a discharge that meets water quality criteria. The adequacy of existing gravity separation treatment to provide effective environmental protection will be addressed by the Phase II rulemaking. The nature of this discharge is such that submarine bilgewater, if untreated, could potentially impact the environment. Because of this potential to cause adverse environmental impacts, coupled with the demonstration that pollution controls are available to reduce the oil content of the discharge, EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD for submarine bilgewater.

5.1.23 Surface Vessel Bilgewater/OWS Discharge

The Surface Vessel Bilgewater/OWS Discharge consists of a mixture of wastewater and leakage from a variety of sources that are allowed to drain to the lowest inner part of the hull, known as the bilge. The sources of surface vessel bilgewater are generally similar to those discussed above for submarines. An additional source of bilgewater for surface vessels is water from the continual blowdown of boilers (i.e., boiler blowdown). On surface vessels, bilgewater is usually transferred to an oily waste holding tank, where it is stored for shore disposal or treated in an oil-water separator (OWS) to remove oil before being discharged overboard. Some vessels also have an oil content monitor (OCM) installed downstream from the OWS to monitor bilgewater oil content prior to discharge. Vessels with OCMs have the capability to return bilgewater not meeting a preset oil concentration limit to the OWS for reprocessing until the limit is met. Oil collected from the OWS separation process is held in a waste oil tank until transferred to shore facilities for disposal.

All vessels of the Armed Forces produce bilgewater and most of the larger vessels have OWS systems. Small craft bilgewater is collected and transferred to shore facilities while pierside.

Bilgewater accumulates continuously; however, vessels of the Armed Forces do not discharge untreated bilgewater. Under current policy, bilgewater treated by an OWS can be discharged as needed within 12 n.m., while untreated bilgewater is held for transfer to a shore facility for treatment. For vessels with an OWS and OCM, oil concentrations in the treated bilgewater must be less than 15 ppm prior to overboard discharge.

Sampling data for OWS effluent show oil, copper, iron, mercury (a bioaccumulative chemical of concern), nickel, and zinc exceed acute Federal criteria or State acute water quality criteria. Sampling data also show concentrations of nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) and phosphorus exceed the most stringent State water quality criteria. The estimated mass loading for oil is considered to be large.

The existing policies prohibiting the discharge of untreated bilgewater, and the extensive use of oil-water separators and oil content monitors demonstrate the availability of pollution controls for bilgewater. The data in the record indicate that untreated bilgewater would likely cause adverse environmental impacts. Therefore, EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD for this discharge.

5.1.24 Underwater Ship Husbandry

The underwater ship husbandry discharge is composed of materials discharged during the inspection, maintenance, cleaning, and repair of hulls and hull appendages performed while the vessel is waterborne. Underwater ship husbandry includes activities such as hull cleaning, fiberglass repair, welding, sonar dome repair, propulsor lay-up, non-destructive testing, masker belt repairs, and painting operations.

Underwater ship husbandry discharge is created occasionally by all Navy surface ships and submarines, and some Coast Guard vessels. These ship husbandry operations are normally conducted pierside. With the exception of underwater hull cleaning and propulsor (i.e., propeller) lay-up, other ship husbandry discharges have a low potential for causing an adverse environmental effect. Underwater hull cleaning is conducted by divers using a mechanical brush system. Copper and zinc are released during cleaning in concentrations that exceed acute Federal criteria and State acute water quality criteria and produce a significant mass loading of constituents. The copper and zinc in this discharge originate from the anti-fouling and anticorrosive hull coatings applied to vessels. Data from commercial vessels indicate that underwater hull cleaning also has the potential to transfer nonindigenous aquatic species. Propulsor lay-up requires the placement of a vinyl cover over the propulsor to reduce fouling of the propulsor when the vessel is in port for extended periods. Chlorine-produced oxidants are generated from impressed current cathodic protection systems and can build up within the cover to levels exceeding State water quality criteria. However, discharges from this operation, as well as other ship husbandry operations (excluding hull cleaning) are infrequent and small in terms of volume or mass loading.

The Navy has established policies to minimize the number of hull cleanings, based on the degree to which biological fouling has occurred. In addition, the Navy has established procedures to use the least abrasive cleaning equipment necessary as a means for reducing the mass of copper and zinc in the discharge. These practices represent available controls to mitigate adverse impacts from underwater ship husbandry operations, and EPA and DoD have determined that it is reasonable and practicable to require the use of a MPCD to control this discharge.

5.1.25 Welldeck Discharges

This discharge is the water that accumulates from the seawater flooding of the docking well (welldeck) of a vessel used to transport, load, and unload amphibious vessels, and from the maintenance and freshwater washings of the welldeck and equipment and vessels stored in the welldeck.

Amphibious operations by the Armed Forces require transport of vehicles, equipment, and personnel between ship and shore on landing craft. The landing craft are stored in a docking well, or welldeck, of some classes of amphibious warfare ships. To load or unload landing craft, amphibious warfare ships may need to flood the welldeck by taking on ballast water and sinking the aft (rear) end of the ship. Water that washes out of the welldeck contains residual materials that were on the welldeck prior to flooding. Other welldeck discharges are created by routine operations such as washing equipment and vehicles with potable water, washing the gas turbine engines of air-cushion landing craft (LCACs) in the welldeck with mild detergents, and graywater from stored utility landing craft (LCUs). Additionally, the U.S. Department of Agriculture (USDA) requires washing welldecks, vehicle storage areas, and equipment upon return from overseas locations. The washing is required to ensure that there is no inadvertent transport of nonindigenous species to land. USDA-required washes of welldecks and vehicle storage areas occur pierside, while vehicles and equipment are washed onshore in a USDA-designated area. Effluent from such shipboard activities drain to unflooded welldecks and are discharged directly overboard.

The Navy is the only branch of the Armed Forces with ships having welldecks. Thirty-three amphibious warfare ships produce this discharge, which is released both within and beyond 12 n.m. from shore.

Depending upon the specific activities conducted, welldeck discharges contain a variety of residual constituents, including oil and grease, ethylene glycol (antifreeze), chlorine, detergents/cleaners, metals, solvents, and sea-salt residues. The volume of welldeck washout varies depending upon the type of landing craft to be loaded or unloaded. The greatest volume of welldeck discharge occurs when LCUs are being loaded into, or unloaded from the welldeck. Loading and unloading of LCACs does not require the welldeck to be flooded. Instead, a small "surge" of water enters the ship during these operations. Constituent concentrations in welldeck washout are expected to be low due to dilution in the large volume of water discharged, and because of general housekeeping procedures that require containment and cleanup of materials spilled on the welldeck.

Other discharges from the welldeck include vehicle and craft washwater, gas turbine engine washes, and USDA washes. Constituents of these discharges are expected to be identical to those in welldeck washout. Of the various welldeck discharges, gas turbine water washes and USDA washes may result in hydrocarbon, or metal concentrations that exceed acute water quality criteria. In addition, there is a potential for nonindigenous species to be introduced from USDA-required welldeck washes, although it should be noted that the viability of any species introduced is questionable since they generally would have been exposed to air for extended periods of time prior to their introduction into U.S. coastal waters (i.e., for the most part, these species would have been removed from vehicles and deck surfaces and thus it would not be a water-to-water transfer, in contrast to species transfers from ballast water systems).

Existing practices for containment and cleanup of welldeck spills demonstrate the availability of controls to reduce contamination of welldeck discharges and the potential for causing adverse environmental impacts (e.g., oil sheens). EPA and DoD have determined that it is reasonable and practicable to require a MPCD for welldeck discharges.

5.2 Discharges Determined To Not Require MPCDs

For the reasons discussed below, EPA and DoD have determined that it is not reasonable and practicable to require the use of a MPCD to control 14 discharges incidental to the normal operation of Armed Forces vessels. These discharges have a low potential to adversely affect the environment by introduction of chemical constituents, thermal pollution, bioaccumulative chemicals of concern, or nonindigenous species.

As discussed below, in some cases, the concentration of one or more constituents in the undiluted discharge exceed water quality criteria at the point of discharge. However, such discharges occur in low volumes or infrequently. In all of these instances, either the pollutant concentration in the discharge plume quickly falls below water quality criteria once the dilution effect of mixing zones is taken into account, or the low mass loading of the discharge is unlikely to adversely affect the environment.

These 14 discharge types do not require control, and no control standards will be set for them, in Phase II of UNDS development. Upon promulgation of this Phase I rule, States and their political subdivisions are prohibited from adopting or enforcing any statute or regulation to control these discharges, except by establishing no-discharge zones. States can petition EPA and DoD to review the determination not to require MPCDs for these discharges.

The discussion below provides a brief description of the discharges and the systems that produce the discharge and highlights the most significant constituents released to the environment and other characteristics of the discharge. A more detailed discussion of these discharges is presented in Appendix A.

5.2.1 Boiler Blowdown

This discharge is the water and steam discharged during the blowdown of a boiler or steam generator, or when a safety valve is tested. Boilers are used to produce steam for propulsion and a variety of auxiliary and hotel services. Water supplied to the boiler system (feedwater) is treated with chemicals to inhibit corrosion and the formation of scale in the boiler and boiler system piping. Periodically, water must be removed from the boiler to control the buildup of particulates, sludge, and treatment chemical concentrations. The term “blowdown” refers to the minimum discharge of boiler water required to prevent the buildup of these materials in the boiler to levels that would adversely affect boiler operation and maintenance. There are four types of boiler blowdown procedures employed on Armed Forces vessels: 1) surface blowdowns for removing materials dissolved in the boiler water and for controlling boiler water chemistry; 2) scum blowdowns for removing surface scum; 3) bottom blowdowns for removing sludge that settles at the bottom of boilers; and 4) continuous blowdowns for removing dissolved metal chelates and other suspended matter. The type of blowdown used is a function of the boiler water chemistry and thus varies among vessel classes. With the exception of continuous blowdowns, boiler blowdowns are discharged below the vessel waterline. Continuous blowdowns are discharged inside the vessel and are directed to the bilge. These are addressed as part of the surface vessel bilgewater/OWS discharge (see section 5.1.23). Another discharge occurs during periodic testing of steam generator safety valves on nuclear-powered vessels. The safety valve discharge is a short-duration release of steam below the vessel waterline.

Approximately 360 surface vessels and submarines discharge boiler blowdowns directly to receiving waters. These blowdowns occur both within and beyond 12 n.m. from shore. Nuclear-powered ships perform steam generator safety valve testing only in port once every five years.

Boiler blowdown is discharged intermittently in small volumes (approximately 300 gallons per discharge), at high velocities (over 400 feet/second), and at elevated temperatures (over 325 degrees Fahrenheit). Boiler water treatment chemicals used by Armed Forces vessels include ethylenediamine-tetraacetic acid (EDTA), hydrazine, sodium hydroxide, and disodium phosphate. Sampling data for boiler blowdowns indicate the presence of nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), phosphorus, hydrazine, iron, bis(2-ethylhexyl)phthalate, copper, lead, nickel, and zinc. Boiler blowdown discharges from conventionally powered boilers can exceed Federal criteria or State water quality criteria for copper, iron, lead, nickel, zinc, bis(2-ethylhexyl)phthalate, nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) and phosphorus. Blowdown discharges from nuclear-powered steam generators exceed acute Federal criteria and State acute water quality criteria for copper, and the most stringent State acute water quality criteria for lead and nickel. For nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen) and phosphorus, the most stringent State water quality criteria was exceeded. However, the turbulent mixing resulting from the high velocity discharge, and the relatively small volume of the boiler blowdown causes pollutant concentrations to rapidly dissipate to background levels or below acute Federal criteria and State acute water quality criteria within a short distance from the point of discharge.

Based on thermal modeling of the discharge plume, boiler blowdowns are not expected to exceed State standards for thermal effects. Thermal effects from safety valve testing are substantially less than those from blowdowns, thus safety valve testing also will not exceed State standards for thermal effects.

While the pollutant concentrations in the boiler blowdown discharges exceed acute Federal criteria and State acute water quality criteria, they are discharged intermittently and in small volumes. Further, these discharges are distributed throughout the U.S. at Armed Forces ports, and each individual port receives only a fraction of the total fleetwide mass loading. Based on the information in the record regarding the low mass of pollutants discharged during boiler blowdowns and safety valve discharges, and the manner in which the discharges take place, there is a low potential for causing adverse environmental impacts. Therefore, EPA and DoD have concluded that it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.2 Catapult Wet Accumulator Discharge

This discharge is the water discharged from a catapult wet accumulator, which stores a steam/water mixture for launching aircraft from an aircraft carrier.

The steam used as the motive force for operating the catapults for launching aircraft is provided to the catapult from a steam reservoir, referred to as the catapult wet accumulator. The catapult wet accumulator is a pressure vessel containing a steam/water mixture at a high temperature and pressure. The accumulator is fed an initial charge of boiler feedwater and provided steam from boilers. As steam is released from the accumulator for the catapult launch, the pressure reduction in the accumulator allows some of the water to flash to steam, providing additional steam to operate the catapult. During operation of the system, steam condenses in the accumulator and causes the water level in the accumulator to gradually rise. Periodic blowdowns of the accumulator are required to maintain the water level within operating limits. This steam/water mixture released during the blowdown is discharged below the vessel waterline. In addition to blowdowns required during catapult operation and testing, wet accumulators are emptied prior to major maintenance of the accumulator or when a carrier will be in port for more than 72 hours. When emptying the accumulator, multiple blowdowns are performed over an extended period (up to 12 hours) to reduce pressure prior to draining the tank.

The Navy is the only branch of the Armed Forces with vessels generating this discharge. Eleven of the aircraft carriers are homeported in the United States.

Wet accumulator blowdowns are performed during flight operations, which occur beyond 12 n.m., and during catapult testing, which occurs within 12 n.m. from shore. Wet accumulators are emptied outside 12 n.m. when returning to port for accumulator maintenance or when the carrier will be in port for more than 72 hours. If catapult testing is conducted in port, and the carrier will remain in port for more than 72 hours following the testing, the accumulator will be emptied in port.

Catapult wet accumulator blowdowns have little potential for causing adverse environmental impacts because of the low pollutant loadings and thermal effects of this discharge. Because boiler feedwater is used for the initial charge of water to an empty accumulator, the constituents of the discharge include water treatment chemicals present in boiler feedwater. These chemicals include EDTA, disodium phosphate, and hydrazine. During normal operation, the boiler feedwater chemicals are diluted by the supplied steam. Additional constituents present in the blowdowns originate from the steam provided to the accumulator. Based on sampling data for steam condensate (a similar discharge discussed below in section 5.2.10) and the volume of wet accumulator blowdowns performed within 12 n.m., the combined mass loading for all metals is estimated at less than 0.01 pounds/year. Constituents found in steam condensate include benzidine, bis(2-ethylhexyl)phthalate, copper, nickel, nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), and phosphorus. The concentrations of benzidine, copper, and nickel in steam condensate were found to exceed acute Federal criteria and State acute water quality criteria. The concentration of bis(2-ethylhexyl)phthalate was found to exceed State acute water quality criteria. The concentrations of nitrogen and phosphorus were found to exceed the most stringent State water quality criteria. However, using steam condensate data may overestimate wet accumulator pollutant concentrations because of the shorter contact time between catapult steam and its associated piping system (resulting in less opportunity to entrain corrosion products from the piping). Based on thermal modeling of the discharge plume, catapult wet accumulator blowdowns are not expected to exceed State standards for thermal effects.

Catapult wet accumulator blowdowns have little potential for causing adverse environmental impacts because of the very low pollutant mass loadings in this discharge and because of the low thermal effects from this discharge. Therefore, EPA and DoD determined that it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.3 Cathodic Protection

This discharge consists of the constituents released into the surrounding water from sacrificial anodes or impressed current cathodic protection systems used to prevent hull corrosion.

Steel-hulled vessels require corrosion protection. In addition to anti-corrosion hull paints, these vessels employ cathodic protection which is provided by either sacrificial anodes or Impressed Current Cathodic Protection (ICCP) systems. The most common cathodic protection system for vessels of the Armed Forces is the zinc sacrificial anode, although a few submarines use aluminum anodes. With the sacrificial anode system, zinc or aluminum anodes attached to the hull will preferentially corrode from exposure to the seawater and thereby minimize corrosion of the vessel's hull.

In ICCP systems, the vessel's electrical system passes a current through inert platinum-coated anodes. This current protects the hull in a manner similar to sacrificial anodes by generating current as the anodes corrode. Depending on the type of cathodic protection used, the discharge will include either zinc or aluminum from sacrificial anodes, or chlorine-produced oxidants (CPO) from ICCP systems. Zinc anodes are approximately 99.3% zinc and contain small amounts of zinc, silicon, and indium (for activation). Aluminum anodes can contain 0.001% mercury as an impurity; mercury is a known bioaccumulator.

Approximately 2,170 large Armed Forces vessels use cathodic protection. Of these, nearly 270 have ICCP systems, fewer than five use aluminum sacrificial anodes, and the remaining use zinc sacrificial anodes. The discharge is continuous while the vessel is waterborne and occurs both within and beyond 12 n.m. from shore.

EPA and DoD modeled the discharge from cathodic protection systems to determine the range of constituent concentrations that could be expected in the water surrounding a vessel. This discharge is best described as a mass flux of reaction byproducts emanating from the electro-chemical reaction that occurs at the anodes. Two separate modeling techniques were used for both sacrificial anodes and ICCP systems. The first technique was a dilution model for harbors that takes into account the number of homeported vessels and harbor-specific volume and tidal flow information. Three Navy ports were modeled, representing a range of port sizes. The resulting constituent concentrations calculated for the three ports in this dilution model were below chronic Federal criteria and State chronic water quality criteria.

The second technique modeled mixing zones around a vessel using calculations for a hull size typical of vessels using cathodic protection systems. The mixing model results indicate that a mixing zone of five feet for CPO and 0.5 feet for zinc results in concentrations below the chronic Federal criteria or State chronic water quality criteria. For vessels with aluminum anodes, a mixing zone of less than 0.1 feet achieves concentrations below chronic Federal criteria and State chronic water quality criteria. Concentrations of mercury will be 1,000 times lower than the acute State water quality criteria and 35 times lower than the chronic criteria. The total amount of mercury discharged from aluminum anodes on all Armed Forces vessels is estimated to be less than 0.001 pounds annually.

For ICCP calculations, the modeling is based on an assumption that 100 percent of the supplied electrical current results in CPO generation. Less CPO is actually expected to be generated because the efficiency of the chlorine generation process is known to be less than 100 percent. In addition, using the generation rate alone does not account for the rapid decay of CPO in water through chemical reactions involving CPO, which occur within minutes.

The dilution and mixing zone modeling performed for this discharge indicates that cathodic protection has a low potential for causing adverse impacts on the marine environment. Therefore, EPA and DoD determined that it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.4 Freshwater Lay-Up

This discharge is the potable water that is periodically discharged from the seawater cooling system while the vessel is in port, and the cooling system is in a lay-up mode.

Seawater cooling systems are used onboard some Armed Forces vessels to remove heat from main propulsion machinery, electrical generating plants and other auxiliary equipment. These are single-pass, non-contact cooling systems whereby the seawater enters the hull, is pumped through a piping network and circulated through one or more heat exchangers, then exits the vessel. On certain vessels, the seawater cooling systems are placed in a stand-by mode, or lay-up, when the machinery is not in use. The lay-up is accomplished by blowing the seawater from the condenser with low-pressure air. The condenser is then filled with potable water and drained again to remove residual seawater as protection against corrosion. Then, the condenser is refilled with potable water for the actual lay-up. After 21 days, the lay-up water is discharged overboard and the condenser refilled. The condenser is discharged and refilled on a 30-day cycle thereafter. The volume of each condenser batch discharge is approximately 6,000 gallons.

The Navy is the only branch of the Armed Forces with vessels discharging freshwater lay-up. All submarines generate this discharge, which only occurs while in port. Eight aircraft carriers also lay-up their condensers; however, these condensers are drained to the bilge and the water is handled as bilgewater. Generally, the cooling system is only placed in a lay-up condition if the vessel remains in port for more than three days and the main steam plant is shut down.

Sampling data for submarine freshwater lay-up indicate the presence of chlorine, nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), and the priority pollutants chromium, copper, lead, nickel, and zinc. The concentrations of chlorine, copper, nickel, and zinc can exceed acute Federal criteria or State acute water quality criteria. For nitrogen and phosphorus, the most stringent State water quality criteria was exceeded. Chlorine was detected in the initial flush discharge, but was not found in the extended lay-up discharge. Mass loadings for the priority pollutants (copper, nickel, and zinc) were estimated using total annual discharge volumes and average pollutant concentrations. The total mass loading from all discharges of freshwater lay-up from submarines is estimated at 7 pounds/year of copper, 36 pounds/year of nickel, 29 pounds/year of zinc, 55 pounds/year of nitrogen, 0.58 pounds of total chlorine, 8.3 pounds/year total phosphorus. The mass discharge from any individual freshwater lay-up discharge event would be a fraction of that total. Because of the low total annual mass loading, the low frequency at which the discharge occurs, and the volume of an individual discharge event, discharges of freshwater lay-up have a low potential for causing adverse environmental impacts. Therefore, EPA and DoD determined that it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.5 Mine Countermeasures Equipment Lubrication

This discharge consists of the constituents released into the surrounding seawater by erosion or dissolution from lubricated mine countermeasures equipment when the equipment is deployed or towed. Various types of mine countermeasures equipment are deployed and towed behind vessels to locate and destroy mines. Lubricating grease and oil applied to this equipment can be released into surrounding seawater during its deployment and use, including during training exercises.

The Navy is the only branch of the Armed Forces with a mine countermeasures mission. The Navy uses two classes of vessels, totaling 23 ships, to locate, classify, and destroy mines. The discharge is generated during training exercises, which are normally conducted between 5 and 12 n.m. from shore. Depending on the class of vessel and the type of mine countermeasures equipment being used, the number of training exercises conducted by each vessel ranges from 6 to 240 per year.

Using estimates of the amount of lubricant released during each training exercise, EPA and DoD calculated the annual mass loading of lubricant discharges to be approximately 770 pounds of grease and oil. Using the estimates of the pollutant mass loading released during an exercise, and the volume of water through which the countermeasures equipment is towed or operated during an exercise, EPA and DoD estimated the oil and grease concentrations resulting from mine countermeasures training exercises. These estimated concentrations of oil and grease in the receiving water range from 0.688 to 7.3 µg/l and do not exceed acute water quality criteria.

An additional calculation was performed for the lift cable for the SLQ-48 mine neutralization vehicle (MNV). This lift cable is lubricated with grease; however, the cable is not towed through the water and is only used to deploy or recover the MNV while a vessel is stationary. Using the maximum predicted release of 0.15 ounces of grease per deployment, modeling results indicate that the grease released from the lift cable would disperse in the surrounding receiving waters and be at concentrations below the most stringent State acute water quality criteria within 3 to 5 feet from the cable.

Most discharges from mine countermeasures equipment occur while vessels are underway and the pollutants are quickly dispersed in the environment due to the turbulent mixing conditions caused by the wake of the vessel and towed equipment. Further, these discharges take place beyond 5 n.m. from shore in waters with significant wave energy, allowing for rapid and wide dispersion of the releases. The manner in which these releases occur, coupled with the relatively small amounts of lubricants released, results in this discharge having a low potential for causing adverse impacts on the marine environment. Therefore, EPA and DoD determined that it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for the mine countermeasures equipment lubrication discharge.

5.2.6 Portable Damage Control Drain Pump Discharge

This discharge consists of seawater pumped through the portable damage control drain pump and discharged overboard during periodic testing, maintenance, and training activities.

Portable damage control (DC) drain pumps are used to remove water from vessel compartments during emergencies or to provide seawater for shipboard firefighting in the event water is unavailable from the firemain system. The types of pumps used are described in section 5.2.7, Portable Damage Control Drain Pump Wet Exhaust. Discharges from drain pumps being used during onboard emergencies are not incidental to normal vessel operations, and therefore are not within the scope of this rule. These pumps are, however, periodically operated during maintenance, testing, and training, and pump discharges during these activities are within the scope of this rule. To demonstrate that the pumps are functioning properly, the suction hose is hung over the side of the vessel and the pump operated to verify that the pump effectively transfers the seawater or harbor water. This pump effluent is discharged directly overboard during this testing.

All large ships and selected boats and craft of the Armed Forces generate this discharge. As part of equipment maintenance, testing, and training, the pumps are operated both within and beyond 12 n.m. from shore. Navy, Army, and MSC vessels operate portable DC drain pumps for approximately 10 minutes per month and an additional 15 minutes/year to demonstrate working order and condition. Coast Guard vessels operate their portable DC drain pumps for approximately 30 minutes/month for maintenance and testing.

This discharge consists of seawater/harbor water that only briefly passes through a pumping process. The drain pump discharge is unlikely to cause adverse impacts because the water has a residence time of less than five seconds in the pump and associated suction and discharge hoses, and no measurable constituents are expected to be added to the seawater/harbor water. Therefore, EPA and DoD determined it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.7 Portable Damage Control Drain Pump Wet Exhaust

This periodic discharge is seawater that has mixed and been discharged with portable damage control drain pump exhaust gases to cool the exhaust and quiet the engine.

Portable, engine-driven pumps provide seawater for shipboard firefighting in the event water is unavailable from the firemain. Two models of these portable damage control (DC) drain pumps are used: P-250 and P-100. The P-250 pumps operate on gasoline, injected with oil-based lubricants. Part of the seawater output from these pumps is used to cool the engine and quiet the exhaust. This discharge, termed wet exhaust, is typically routed overboard through a separate exhaust hose and does not include the main discharge of the pump which is classified separately as Portable Damage Control Drain Pump Discharge and discussed in section 5.2.6.

Fuel residuals, lubricants, or their combustion byproducts are present in P-250 engine exhaust gases, condense in the cooling water stream, and are discharged as wet exhaust. The P-100 model operates on diesel fuel. Although the engine that drives the P-100 pump is air-cooled and no water is injected into the exhaust of the pump, a small amount of water contacts the engine during pump priming. Up to one-seventh of a gallon of water may be discharged during each priming event. This water discharged during P-100 priming is considered part of the portable DC drain pump wet exhaust.

The Navy operates approximately 910 drain pumps, the MSC approximately 140 drain pumps, and the Coast Guard approximately 370 drain pumps.

Portable DC drain pump wet exhaust discharges occur during training and monthly planned maintenance activities both within and beyond 12 n.m. from shore. During monthly maintenance activities, the pumps are run for approximately 10 to 30 minutes. The use of portable DC drain pumps during onboard emergencies is not incidental to normal operations, and therefore not within the scope of this rule.

Based on data in the record, the wet exhaust discharge is likely to include metals, oil and grease, and volatile and semi-volatile organic compounds. The concentrations of copper, lead, nickel, silver, and zinc in portable DC drain pump wet exhaust can exceed acute Federal criteria and State acute water quality criteria. Concentrations of oil and grease, benzene, toluene, ethylbenzene, and naphthalene can exceed State acute water quality criteria. Concentrations of these constituents in receiving waters are not expected to exceed water quality criteria because they will dissipate quickly since the mass loadings per discharge event are small and the discharge locations are dispersed fleetwide. The discharge from each of the 500 P-250 pumps occurs separately at different discharge locations. On average, each P-250 pump discharges less than 0.3 pounds of pollutants per discharge event. The duration of each discharge is short, averaging less than 30 minutes. These factors allow the pollutants to dissipate rapidly. Based on this information, the portable DC drain pump wet exhaust is expected to have a low potential for exhibiting adverse environmental impacts on the marine environment. Therefore, EPA and DoD determined it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.8 Refrigeration and Air Conditioning Condensate

This discharge is the drainage of condensed moisture from air conditioning units, refrigerators, freezers, and refrigerated spaces. Refrigerators, refrigerated spaces, freezers, and air conditioning units produce condensate when moist air contacts the cold evaporator coils. This condensate drips from the coils and collects in drains. Condensate collected in drains above the vessel waterline is continuously discharged directly overboard. Below the waterline, condensate is directed to the bilge, non-oily machinery wastewater system, or is retained in dedicated holding tanks prior to periodic overboard discharge.

Approximately 650 Navy, MSC, Coast Guard, Army, and Air Force vessels produce this discharge. The condensate may be discharged at any time, both within and beyond 12 n.m. from shore.

Condensate flow rates depend on air temperature, humidity, and the number and size of cooling units per vessel. The discharge can contain cleaning detergent residuals, seawater from cleaning refrigerated spaces, food residues, and trace metals leached from contact with cooling coils and drain piping. Because evaporator coils are made from corrosion-resistant materials and condensation is non-corrosive, condensate is not expected to contain metals in significant concentrations. Discharges of refrigeration and air conditioning condensate are expected to have a low potential for causing adverse environmental impacts, therefore EPA and DoD determined it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for condensate discharges.

5.2.9 Rudder Bearing Lubrication

This discharge is the oil or grease released by the erosion or dissolution from lubricated bearings that support the rudder and allow it to turn freely. Armed Forces vessels generally use two types of rudder bearings, and two lubricating methods for each type of rudder bearing: 1) grease-lubricated roller bearings; 2) oil-lubricated roller bearings; 3) grease-lubricated stave bearings; and 4) water-lubricated stave bearings. Only oil-lubricated roller bearings and grease-lubricated stave bearings generate a discharge.

Approximately 220 Navy vessels, 50 Coast Guard vessels, and eight MSC vessels use a type of rudder bearing that generates this discharge. The discharge occurs intermittently, primarily when a vessel is underway or its rudder is in use, although some discharges from oil-lubricated roller bearings could potentially occur pierside even when the rudder is not being used because the oil lubricant is slightly pressurized.

This discharge consists of oil leakage and the washout of grease from rudder bearings. EPA and DoD developed an upper bound estimate of the fleetwide release of oil and grease based on allowable leakage/washout rates and the amount of time each vessel spends within 12 n.m. from shore. The maximum allowable oil leak rate for oil-lubricated roller bearings is one gallon/day when the vessel is underway and one pint/day while in port. In practice, these leakage rates are not reached under normal conditions. The grease washout rate for grease-lubricated stave bearings is based on Navy specifications limiting grease washout to 5 percent. Grease washout estimates for this rule are based on releasing 5 percent of the grease over a two-week period, which corresponds to the time between grease applications.

EPA and DoD calculated the expected receiving water concentrations of oil and grease from this discharge to evaluate the potential for the discharge to cause adverse impacts. The underway receiving water volume was determined using an average size vessel and estimating the volume of water displaced by the vessel while transiting from port to a distance of 12 n.m. from shore. In port, discharges are not expected since the lower bearing seals are designed to prevent leakage and, as noted above, the oil to the bearings is kept at a low pressure while in port. The resulting estimated pollutant concentrations do not exceed acute Federal criteria or State acute water quality criteria. The rudder bearing lubrication discharge has a low potential for causing adverse environmental impacts. EPA and DoD determined that it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.10 Steam Condensate

This discharge is the condensed steam discharged from a vessel in port, where the steam originates from shore-based port facilities. Navy and MSC surface ships often use steam from shore facilities during extended port visits to operate auxiliary systems such as laundry facilities, heating systems, and other shipboard systems. In the process of providing heat to ship systems, the steam cools and condenses. This condensate collects in drain collection tanks and is periodically discharged by pumping it overboard. The steam condensate is discharged above the vessel waterline and a portion of the condensate can vaporize as it contacts ambient air.

This discharge is generated only in port because vessels only discharge the condensed steam if it was generated by a shore facility. Ships producing their own steam will recycle their condensate back to the boiler. Vessels take on shore steam when their own boilers are shut down, and thus they have no means for reusing the condensate. There are no systems in place that would allow vessels to return steam condensate to shore for reuse.

Depending on the steam needs of individual vessels, the discharge can be intermittent or continuous whenever shore steam is supplied. Approximately 180 Navy and MSC vessels discharge steam condensate. Coast Guard vessels do not generate this discharge because they operate their auxiliary boilers to produce their own steam even while in port. Army and Air Force vessels do not have steam systems and therefore do not discharge steam condensate.

The constituents of steam condensate include metals from onshore steam piping, ship piping, and heat exchangers, and may have some residual water treatment chemicals. Constituents found in the discharge include nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), phosphorus, bis(2-ethylhexyl)phthalate, benzidine, copper, and nickel. Sampling of steam condensate from four vessels found copper concentrations that exceed both chronic Federal criteria and State chronic water quality criteria. Nickel concentrations exceeded the most stringent State chronic water quality criteria, but not the chronic Federal criteria. Benzidine, bis(2-ethylhexyl)phthalate, nitrogen (in the form of ammonia, nitrates and nitrites, and total Kjeldahl nitrogen), and phosphorus concentrations exceeded the most stringent State water quality criteria.

The potential for steam condensate to cause thermal environmental effects was evaluated by modeling the thermal plume generated by the discharge and then comparing the model results to State thermal discharge water quality criteria. Results of the modeling indicate that only the largest generator of steam condensate (an aircraft carrier) may exceed state thermal mixing zone criteria, and then, only in the State of Washington. The models predict that the thermal plume from an aircraft carrier moored at the pier in Bremerton, Washington would extend a distance of 80 m from the discharge port along the vessel hull, not extending past the end of the hull. The plume would also extend outward no more than a distance of 30 m from the vessel hull at any point along the hull. Results of the modeling indicate that the aircraft carrier may exceed Washington criteria in an area that only covers 5% of the width, 2% of the length, and 0.07% of the total surface area of Sinclair Inlet.

The EPA and DoD do not consider that the plume results in a significant environmental impact. Such a localized plume would have a low potential for interfering with the passage of aquatic organisms in the water body and would have a limited impact on the organisms that reside in the upper water layer (sea surface boundary layer). In addition, because the discharge is freshwater (no salinity) and warmer than the receiving water, the plume floats in the surficial layer of the water body and has no impact on bottom-dwelling organisms.

The low mass loadings in the discharge and the thermal effects modeling results indicate that steam condensate has a low potential for causing adverse environmental impacts. Therefore, EPA and DoD determined that it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.11 Stern Tube Seals and Underwater Bearing Lubrication

This discharge is the seawater pumped through stern tube seals and underwater bearings to lubricate and cool them during normal operation.

Propeller shafts are supported by stern tube bearings at the point where the shaft exits the hull (for surface ships and submarines), and by strut bearings outboard of the ship (for surface ships only). A stern tube seal is used to prevent seawater from entering the vessel where the shaft penetrates the hull. The stern tube seals and bearings are cooled and lubricated by forcing seawater from the firemain or auxiliary cooling water system through the seals and over the bearings. On submarines, potable water (freshwater) may be supplied from pierside connections for stern tube seal lubrication during extended periods in port.

Strut bearings are not provided with forced cooling or lubrication. Instead, strut bearings use the surrounding seawater flow for lubrication and cooling when the vessel is underway. Submarines do not have strut bearings and instead use a self-aligning bearing aft of the stern tube that supports the weight of the propeller and shafting outboard of the vessel.

Almost all classes of surface vessels and submarines have stern tube seals and bearings that require lubrication, and these discharges are continuous. The discharge can contain synthetic (Buna-N) rubber used in the construction of the bearings. Metals such as copper and nickel, the materials of construction of the stern tube, can also be present in the discharge. When freshwater is used for lubricating submarine seals, the freshwater may contain residual chlorine. Based on estimates of chlorine concentrations in potable water, fleetwide approximately 0.8 pounds/year of chlorine exit through the stern tube seals and bearings.

Total annual mass loadings for the metal constituents of seawater lubrication were calculated based on materials of construction in the stern tube, corrosion rates for those materials, and the surface area of the material exposed to seawater for a DDG 51 Class ship. While the copper concentrations can exceed chronic Federal criteria and State chronic water quality criteria, the rate at which the water is discharged through a vessel's stern tube seal and bearings is relatively small - 20 gal/min each shaft, 2 shafts per ship -- resulting in a low pollutant mass loading exiting through the seals and bearings. Further, these discharges are distributed throughout the U.S. at Armed Forces ports, and each individual port receives only a fraction of the total fleetwide mass loading. Given the low rate of the discharge and the low mass loadings, this discharge has a low potential for causing adverse environmental impacts. Therefore, EPA and DoD determined it is not reasonable and practicable to require the use of a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.12 Submarine Acoustic Countermeasures Launcher Discharge

This intermittent discharge is composed of seawater that mixes with acoustic countermeasure device propulsion gas after launching an acoustic countermeasure device, and subsequently discharged either through exchange with the surrounding seawater or while draining from an expended device being removed from the submarine.

Navy submarines have the capability to launch acoustic countermeasures devices to improve the survivability of a submarine by generating sufficient noise to be observed by hostile torpedoes, sonars, or other monitoring devices. The only countermeasures systems that generate a discharge within 12 n.m. are the countermeasures set acoustic (CSA) Mk 2 systems, which launch the countermeasure devices by gas propulsion through a launch tube. Following the launch, a metal plate closes the launch tube forming a watertight endcap. To equalize pressure, a one-way check valve allows water to flow into the tube after launch, but does not allow any of the water to be released through the opening. The launch tube cap contains three, 3/8 inch, bleed hole plugs that dissolve approximately three days after the launch. This allows exchange between the launch tube and the surrounding seawater while the submarine is moving. The bleed holes also allow some launch tube water to drain into the surrounding water when the assembly is removed from the submarine for replacement. The CSA Mk2 system is installed on 24 Navy submarines.

Constituents found in the CSA Mk2 launch tubes after launching countermeasures devices include copper, cadmium, lead, and silver. The discharge may also contain constituents from the propulsion gas including hydrochloric acid, carbon dioxide, carbon monoxide, nitrogen, alumina, iron (II) chloride, titanium dioxide, hydrogen, and iron (II) oxide. Sampling indicates that copper, cadmium, and silver concentrations are above both Federal acute water criteria and the most stringent State acute water quality criteria; lead concentrations are above the most stringent State water quality criteria. The total annual mass loadings from all discharges from submarine CSA Mk2 countermeasure launcher systems are estimated at 0.0005 pounds/year cadmium, 0.0009 pounds/year lead, 0.0007 pounds/year copper, and 0.00009 pounds/year silver.

Because of the low annual mass loading, the low frequency at which the discharge occurs, and the volume of the individual discharge event (17 gallons), discharges from submarine CSA launcher systems have a low potential for causing adverse environmental impacts. Therefore EPA and DoD determined it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.2.13 Submarine Emergency Diesel Engine Wet Exhaust

This discharge is seawater that is mixed and discharged with exhaust gases from the submarine emergency diesel engine for the purpose of cooling the exhaust and quieting the engine.

Submarines are equipped with an emergency diesel engine that is also used in a variety of non-emergency situations, including electrical power generation to supplement or replace shore-supplied electricity, routine maintenance, and readiness checks. This wet exhaust discharge is generated by injecting seawater (or harbor water) as a cooling stream into the diesel engine exhaust system. The cooling water mixes with and cools the hot exhaust gases, and is discharged primarily as a mist that disperses in the air before depositing on the surface of the water body.

All submarines generate this discharge. Diesel engines must be operated for equipment checks that occur prior to submarine deployment, monthly availability assurance, and periodic trend analyses. On average, each submarine will operate the diesel engine for approximately 60 hours/year while within 12 n.m. from shore. Most of the operating time (54 hours/year) occurs while the submarine is pierside.

Typical constituents of diesel engine exhaust include various hydrocarbon combustion by-products, measured as volatile and semi-volatile organic compounds. The priority pollutants expected to be present in the discharge include polycyclic aromatic hydrocarbons (PAHs), toluene, and possibly metals. Although no individual pollutant exceeds water quality criteria, the total concentration of PAHs in the discharge is predicted to exceed State acute water quality criteria. Nevertheless, the discharge of PAHs is unlikely to cause adverse impacts on the marine environment because the total fleetwide annual mass loading of PAHs is calculated to be less than 0.06 pounds/year. Therefore, EPA and DoD determined that it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for submarine diesel engine wet exhaust.

5.2.14 Submarine Outboard Equipment Grease and External Hydraulics

This discharge occurs when grease applied to a submarine's outboard equipment is released to the environment through the mechanical action of seawater eroding the grease layer while the submarine is underway, and by the slow dissolution of the grease into the seawater. This discharge also includes any hydraulic oil that may leak past the seals of hydraulically operated external components of a submarine (e.g., bow planes).

Outboard equipment grease is discharged by all submarines, but the discharge of oil from external hydraulic equipment is limited to 22 submarines. This discharge occurs continuously both within and beyond 12 n.m. from shore, although the rate of discharge depends upon the degree of contact between seawater and the greased outboard components, and how fast the submarine is traveling. Most hydraulically-operated outboard equipment, for example, does not contact seawater within 12 n.m. from shore because submarines generally operate on the surface in this region, and the hydraulically-operated equipment producing this discharge is located mostly above the waterline.

This discharge consists of grease (Termalene #2) and hydraulic oil. Termalene #2 consists of mineral oil, a calcium-based rust inhibitor, thickening agents, an antioxidant, and dye. Using an assumption that 100 percent of all grease applied to outboard equipment is washed away at a constant rate during submarine operations, the amount of grease released fleetwide within 12 n.m. is approximately 520 pounds/year. This value is believed to overstate the actual mass of grease discharged within 12 n.m. because submarines operate at lower rates of speed in coastal waters (thus leading to less erosion of the grease) and a surfaced submarine exposes a lesser amount of grease to the water than is exposed by a submerged submarine.

Hydraulic oil consists of paraffinic distillates and additives. Using a calculation that assumes all hydraulic system seals leak oil at the maximum allowable leak rate, approximately 0.4 pounds/year of hydraulic oil is released fleetwide within 12 n.m. from shore. (Based on discussions with Navy hydraulic system experts, such oil leakage rates are not common and thus this calculation overestimates the amount of oil actually leaked.) The submarine will displace approximately 120 million cubic feet of water as it travels within 12 n.m. from shore. Assuming that hydraulic oil and outboard grease are leaked at a constant rate, this will result in concentrations below the levels established in acute Federal criteria and State acute water quality criteria.

In addition, the turbulence created by the vessel wake is expected to result in rapid dispersion of the constituents released. As a result, the submarine outboard equipment grease and external hydraulics discharge has low potential for causing adverse environmental effects. EPA and DoD determined it is not reasonable and practicable to require a MPCD to mitigate adverse impacts on the marine environment for this discharge.

5.3 References

1. International Maritime Organization. "Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharge." 10 May 1995.