

Freshwater Lay-up Discharge Summary

Description of Discharge

How is this discharge generated? 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.

Which vessels generate this discharge? 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.

How often and where is this discharge generated? 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.

Analysis

Nature of Discharge: 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.

**Freshwater Lay-up
Discharge Summary (continued)**

Analysis (continued)

The following table lists the initial and extended lay-up concentrations and the resulting fleetwide annual mass loadings for constituents that can exceed acute Federal criteria and/or State water quality criteria:

Constituent	2 Hour Lay-up Concentration (µg/l)	21 Day Lay-up Concentration (µg/l)	Annual Mass Loading (lbs)
<i>Copper</i>			
Dissolved	137	107	5.3
Total	150	148	6.5
<i>Nickel</i>			
Dissolved	409	1175	35
Total	433	1175	36
<i>Zinc</i>			
Dissolved	463	784	27
Total	451	851	29
Ammonia as Nitrogen	1300	600	41
Nitrate/Nitrite	680	400	23
Total Nitrogen ^A	1310	1210	55
Total Chlorine	28	--	0.58
Total Phosphorus	190	190	8.3

^A Total nitrogen is the sum of nitrate/nitrite and total Kjeldahl nitrogen.

Discussion and Discharge Determination

Discussion: 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.

Determination: A marine pollution control device is not required.