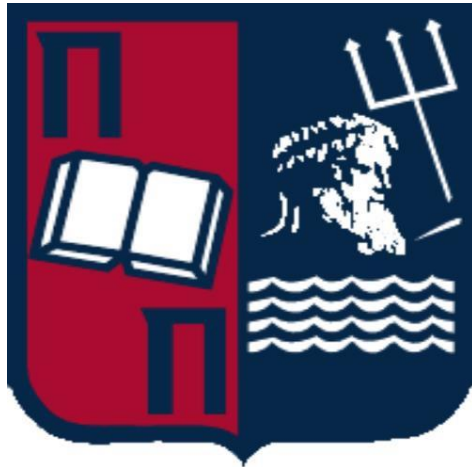


UNIVERSITY OF PIRAEUS

**MSc in Sustainability and Quality in Marine Industry, Dept of
Maritime Studies, University of Piraeus**



Master's thesis:

***DEVELOPMENT AND IMPLEMENTATION OF COMPANY'S
ENVIRONMENTAL MANAGEMENT PLAN, REGULATORY
REQUIREMENTS***

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Abstract

We will endeavor, will analyze the process to develop an environmental management plan. The purpose of this assignment is to discuss the role of environmental management in a shipping Company and how all relevant regulations could be effective through the implementation of this system. More specifically, we will define and describe international regulations, standards defined from Flag Administrations and or Port States, Coastal States and relevant laws that are in force reference to the protection of the environment in shipping. Therefore, a dedicated Environmental Management System plan will be presented in detail. In conclusion, the effectiveness, performance and the benefits of adapting and follow an Environmental Management System in a shipping Company will be explicated.

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Introduction

The goal of this dissertation is to thoroughly describe the meaning of pollution in the marine environment, as well as its influence on people and the economy. Pollution is defined as anything detrimental that has a major environmental impact. The most typical meaning is as interference in other usage. Pollution is defined as the penetration of chemicals or energy into the water, with consequent negative spread and probable health impacts on living species and ecosystems, as well as material destruction as a result of the environment being unfit for its functions. Our generation has witnessed significant consequences of global warming and environmental consequence of earth's overpopulation, along with worldwide efforts to minimize this phenomenon in all industries and applications. In this respect, shipping industry also has a vast number of regulations and environmental pollution prevention procedures which can be either be issued by counties individually or by worldwide organizations.

This work's material is divided into several sections. The effect of maritime accidents to the environment, as well as their impacts on individuals, quality water and marine species, and the economy, will be attempted firstly for the full investigation of the pollution phenomena and subsequently to the development of a relevant manual and plan to be followed from shipping Companies. The other section will provide a historical overview of specific regulations and standards that has been posed from international maritime organization, Flag administrations, Class societies and or Coastal States and Port State Controls. More specifically, it is mentioned how commercial ships contributed to a rise in pollution in the most important tanker accidents throughout the world wars. In the last and final sections will concentrate on the importance of developing an environmental management plan that would meet both worldwide regulation

and could be tailormade to any counties individual requirements that given shipping company is aiming to trade and operate in their waters. Any shipping company wishing to successfully get involved in transportation of goods around the globe should implement and dedicate significant efforts to produce such a plan and prove that all its contents are being met and followed by all involved personnel both ashore in on the vessel.

Literature review

Historical background of marine pollution

The shipping industry is the set of transport-related activities people or goods using ships by sea (seagoing vessels). In addition, the word/ term “shipping” also refers to the government and operation of the ship itself. Shipping is an industry that has influenced our society since ancient times. It is essential to mention that as the 90% of worlds commodities are carried on ships and plentiful as there are approximately 55.000 merchant ships, tankers, passenger ships, container ships, fishing vessels, bulk carriers and general cargo ships, playing the seas. It is also a major to note that more than 1.5 million people are employed by the shipping industry. For Greece, being a maritime nation by tradition as shipping is arguably the oldest form of occupation in our country and a key element of Greek economic activity since ancient times. Bearing in mind that Greek archipelago contains over 6000 individual islands 200 of which people actually live on, constitutes actual necessity the use of ships hence this has been documented over the ages and through Greek ancient history. Greece is considered to have started from "Ancient Greece", the oldest journey that expresses shipping, 10,000 years ago and specifically in the Aegean Open Sea. Shipping is a big part of international trade, and therefore the economy and as they say “source of life”. Global shipping is considered to include many ships for commercial purposes, contributing to great supply to the world economy due to low costs and secure transactions. International law has established regulations to ensure that modern ships provide safe travel, both for the crew and for the passengers, such as regulations that contribute to the construction ships but also in conducting voyages as far as possible less polluting for the environment. Constant attempts to enhance shipping, like any other industry, have been made

and are being made in areas such as the environment, the working conditions of seafarers, and the reduction of operating expenses. This is a continuous and progressive issue, and the industry does demonstrate major improvements and adjusts to the world and market needs, either through rules and operating standards or through technology. However, environmental issues have always been one of the most significant aspects to consider, especially in our day when overpopulation and excess demand in transportation have left their imprint on the environment. The following are some common causes of pollution from ships:

- Marine Emission from engine and machinery
- Accidental oil or chemical spill
- Ballast and de-ballast of water from around the globe
- Garbage accumulation on board during sea passages
- Hazardous material on board and in vessel operation

Despite efforts to reduce shipping costs, even today there are some basic sources of pollutants from ships:

- Gas pollutants
- Oil spill
- The ships themselves

Ship emission has trying to control it has been a major aspect of shipping as it affects the environment and is related to overall costs related to transport of goods. The main pollutants

from ships emission are Nitrogen oxides (NOx) and sulphur oxides (SOx), affecting the ozone layers which results to greenhouse effect and global warming. Newer technologies and methods are constantly being proposed to reduce and try to control this phenomenon from retrofitting equipment handling emissions or reducing speeds and taxing vessels producing excess emissions. It is worth to mention the meaning of the accidental pollution, which is defined as the pollution caused by shipping to the environment during their operation when an unfortunate event occurred for example an accident. To exist of course danger and or pollution to the environment, the incident must be serious. A serious maritime accident could be an explosion on the ship and or a fire onboard, a collision with another vessel that is happening too often in large ports such as in Singapore, where the risk is enormous the most vessels are taking bunkers or oils, they are being supplied, charging and or discarding cargoes. Accidental pollution can also arise from the weather where serious damage can be caused to mechanisms of the ship but also cracks in its hull resulting in create fuel and cargo leaks to the environment. Furthermore, an accident is the sinking of a ship as its skeleton is injured or it can still be left unattended if the propulsion systems fails and cruising, which can lead to very unpleasant situations for the environment. The human factor and the personnel/ crewmember's knowledge may also stand a significant role against bad weather conditions and unpleasant situations that may occurred to the vessel and to her cargo. Of course, the maintenance of the vessel, her systems and mechanisms are important. For example, a fire must be extinguished before it can be spread to a vessel, as there are flammable materials almost everywhere along her. Therefore, human perception is the most important factor in terms of prevention of accidental pollution in shipping. Furthermore, ships require load and balancing constantly to

move and for hull to function properly during sea passage. This is achieved either by controlling the cargo or by adding sea water from one port to another and or discharging seawater from one port to another depending on the operation in hand and task available. This parameter affects the marine life significantly and over the past years' regulations have been implemented and technologies have been created to treat this water and minimize its affection that might have in marine life worldwide. Moreover, vessels are run by seafarers and each ship depending on its type and size required significant number of people to operate, which also results in production of garbage. This parameter also required planning and handling to be able to accumulate and manage it. Again, industry has been implementing methodologies on this matter and constantly trying to improve handling of same. Also, part of the garbage management plan on seagoing vessels has been the past years the identification and categorization of material, among which some is deemed hazardous and requires special handling.

Early investigations in the field of marine pollution

During the First World War, the first attempt is dated for the implementation of an agreement and its establishment at international level with ultimate purpose of tackling marine pollution mainly by oil. From a historical point of view, the first signs of the development of such an institutional framework appear in the year 1921 when the British Council convened a conference with executives of petroleum companies and between shipowners to address the issue. Many argued that the sovereignty of marine resources was the cause for the contribution of the former agreements. As a result, the first law that came into force in 1922 was "The Oil in." Navigable Waters Act "(1922), which prohibited the dumping of oil on maritime waters

between Britain and Northern Ireland, making it mandatory the use of a special book with a relevant inscription to which it would refer every detail regarding loading, unloading and transport oil. Otherwise, anyone who disobeyed that regulation had to pay a fine. The first move made internationally to draft a contract on offshore took place at a Shipping Conference he attended in Washington, DC, in 1926, during Harding's presidency, because of her US concern over their coastal issue from operational dumping passing merchant ships. The final decision taken by the above conference was the adoption of zones where splashing would be prohibited oil mixture as well as the use of separators in oil-carrying tankers and oil-burning ships. During the period after the end of the war, the year 1945 was felt need for a contract related to marine pollution from oil. This convention entered into force ten (10) years later, as in the year 1948. The Geneva Conference, where the IMO is founded, took place much delayed as a process. Pollution incidents are increasing increased with the existence of several complaints during the period 1946-1949. The International Maritime Chamber (ICS) in 1952 recognized the problem codification of rules for oil pollution, as the IMO does not have officially started operating. The British Government proceeded to setting up a Faulkner Committee to deal with the proposal solutions to the issue of marine water pollution. The conclusion in which the commission concluded was that crude oil and its components were causing it the biggest pollution.

Pollution accidents over years

The year 1967 is a milestone year as it was then caused by pollution from oil tanker accidents and in particular the loss of the Torrey Canyon. From the year 1886 the fleet of deep-sea tankers fleet increased rapidly resulting in the year 1920 to appear the private property

(independent tanker owners), which broke the monopoly of petroleum companies which were primarily intended for secondment money (freight) through the transport of oil by sea. The year 1914 there was not a sufficient number of tankers to meet its needs Europe for oil during the war. The only thing that is recorded is that there was an upward trend in production oil compared to 1900 and 1927, with a significant increase 177.000.000 tons from 20.000.000 tons per year. Additionally, in 1900 the world fleet of tankers consisted of 109 ships with a total capacity of 500,000 dwt, for example the size of a current one ULCC. Economic slump was found during the period 1931-1936, resulting in many tankers they had to be decommissioned (laid up). During World War II, marine pollution was a key issue discussion in order to find new methods of minimizing it collection of waste due to oil from ships and tankers in order to avoid focusing oil spills from submarines. During the war, it was found that about 4.000.000 tons of oil were spilled and derivatives in the marine environment, the occasion was also the attempt sinking of any vessel carrying cargoes of fuel. According to their lists from the Lloyd's, major tanker accidents were caused during the same period. For example, in 1957 the "World Spendour" tanker with a capacity of 25.583 GRT sank in the Mediterranean and in 1960 the tanker "Sinclair Petrolore", with a capacity of 35.477 GRT, which exploded near Brazil, spilling 420.000 barrels of crude oil in the marine environment. These phenomena sinking of tankers due to oil pollution was unusual and first appeared in the regions of Western Europe and the Pacific, with the consequent escalation of this problem. As the demand for oil was constantly increasing and so was the need for offshore transfer was great, this was the reason for the training of the first international IMO Convention, OILPOL (1954).

First international regulations against marine pollution

The International Maritime Organization is a United Nations specialized organization in charge of maritime regulation. The IMO was constituted 10 years after the decision at a United Nations conference held in Geneva in 1948, and it was formally established for the first time in 1959.

The IMO, which is headquartered in London, United Kingdom, has 174 member countries and three associate members. The fundamental goal of the IMO is to provide a framework for shipping, and its work tries to standardize issues such as marine safety, environmental concerns, and potential legal challenges. Its management consists of a board of directors that makes critical decisions for members via committees. Some of the most significant conventions reached are the following:

Convention on the Prevention of pollution of the sea By Oil - This convention is a text of historical importance, as it was the springboard of the international framework for the protection of sea waters from maritime activities leading to the solution of pollution problems.

The purpose of this is to deal with operational pollution from oil discharges or any type of petroleum mixture. Convention on intervention by States on the high seas to prevent pollution.

Also known as intervention, which was drawn up in 1969 and entered into force in 1975, it requires each state to take measures in the high seas that are necessary to eliminate the danger that threatens the sea from pollution from oil or any kind of pollutants substances. The measures are not implemented on warships or government ships that do not use them for commercial purposes. States' jurisdiction was increased with the institutionalization of the intervention protocol in the year 1973. The said convention was criticized for giving discretion to coastal states and for limiting the right of defense.

International Convention on Civil Liability for Oil Pollution Damage - At the Brussels Conference in 1969, the IMO adopted the Convention on Civil Liability for Oil Pollution Damage and is known as CLC48. It specifically applies to pollution damage arising from the inflow of oil pollutants from laden tankers onto land and not from the discharge of oil from fuel on a ballast voyage. Its guideline is the place and not the flag of the ship or the nationality of the owner.

Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material.

Known as NUCLEAR, it was established in the year 1975 on the basis of which the liability of a natural person who manages a nuclear facility was adopted and excluded the ship owner from any possible damage due to maritime transport of nuclear substances. It successfully replaced the Paris Conventions on Third Party Liability in the field of nuclear energy in 1960 and the Vienna Convention on Civil Liability for Nuclear Damage in 1963.

International Convention for the Prevention of pollution from Ships - MARPOL is considered the main convention that refers to the convention from merchant ships and covers the prevention of pollution of the sea from ship discharges either as operational pollution or as an accidental form. Entered into force on 2 November 1973. Under the International Conference on Marine Pollution to replace the 1954 Convention for the Prevention of Pollution from Marine Oil (OILPOL) and consists of 6 annexes. In particular, it includes an annex on oil pollution, on pollution from harmful liquid substances, pollution from dangerous substances emanating from the transport of goods by sea in packaging either in goods or in vehicles, on pollution from waste or residues, on pollution from waste and for air pollution.

International regulations

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the primary international treaty governing the prevention of pollution of the marine environment by ships due to operational or unintentional reasons. On November 2, 1973, the IMO adopted the MARPOL Convention. The 1978 Protocol was enacted in reaction to a series of tanker incidents in 1976-1977. The 1978 MARPOL Protocol absorbed the parent Convention because the 1973 MARPOL Convention had not yet come into force. The combined instrument went into effect on October 2, 1983. A Protocol to amend the Convention was agreed in 1997, and a new Annex VI was inserted, which entered into force on May 19, 2005. MARPOL has been changed throughout time by revisions. The Convention, which now has six technical Annexes, includes provisions aimed at avoiding and minimizing pollution from ships, including accidental and routine contamination. Most Annexes feature Special Areas with severe limits on operating discharges.

- Annex I Regulations for the Prevention of Oil Pollution (entered into force 2 October 1983) Covers the avoidance of oil pollution from operating measures as well as accidental discharges; the 1992 modifications to Annex I made double hulls necessary for new oil tankers and introduced a phase-in timetable for existing tankers to fit double hulls, which was later updated in 2001 and 2003.
- Annex II Regulations for Pollution Control by Noxious Liquid Substances in Bulk (entered into force 2 October 1983) Details the discharge criteria and measures for controlling pollution caused by noxious liquid substances transported in bulk; approximately 250 substances were evaluated and included in the list appended to the Convention;

discharge of their residues is permitted only to reception facilities until certain concentrations and conditions (which vary depending on the category of substance) are met. In any case, no hazardous substance-containing residues may be discharged within 12 kilometers of the nearest land.

- Annex III: Pollution Prevention from Harmful Substances Transported by Sea in Packaged Form (entered into force 1 July 1992) General requirements for producing specific rules on packaging, marking, labeling, documentation, stowage, quantity constraints, exceptions, and notifications are included. The term "harmful substances" refers to compounds that are classified as marine pollutants in the International Maritime Dangerous Goods Code (IMDG Code) or that meet the criteria in Annex III's Appendix.
- Annex IV: Ships' Sewage Pollution Prevention (entered into force 27 September 2003) The discharge of sewage into the sea is prohibited, except when the ship has an approved sewage treatment plant in operation or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land; sewage that has not been comminuted or disinfected must be discharged at a distance of more than 12 nautical miles from the nearest land.
- Annex V: Ships' Garbage Pollution Prevention (entered into force 31 December 1988) The Annex deals with various types of rubbish and specifies the distances from land and the way in which they may be disposed of; the most important element of the Annex is the total ban put on the disposal of all forms of plastics into the sea.

- Annex VI: Ships' Air Pollution Prevention (entered into force 19 May 2005) Limits
Sulphur oxide and nitrogen oxide emissions from ship exhausts and forbids intentional emissions of ozone-depleting compounds; designated emission control areas have stricter regulations for SO_x, NO_x, and particulate matter. A chapter adopted in 2011 addresses mandatory technical and operational energy efficiency measures targeted at lowering ship-generated greenhouse gas emissions.

SO_x Emission Control Areas (ECAs) - (Oxides SO_x)

In relation to all the above mentioned it is worth to mention the controls on SO_x and particulate matter emissions which apply to all fuel oil, as defined in regulation 2.9, combustion equipment and devices onboard and both includes main and auxiliary engines, as well as boilers and inert gas generators. These controls are divided into those that apply inside Emission Control Areas (ECA) established to limit SO_x and particulate matter emissions and those that apply outside such areas, and are primarily achieved by limiting the maximum Sulphur content of the fuel oils as loaded, bunkered, and then used onboard. These fuel oil Sulphur restrictions (stated in percent m/m, or by mass) have been subject to a series of step modifications over the years, according to rules 14.1 and 14.4:

Outside an ECA established to limit SO_x and particulate matter emissions	Inside an ECA established to limit SO_x and particulate matter emissions
4.50% m/m prior to 1 January 2012	1.50% m/m prior to 1 July 2010
3.50% m/m on and after 1 January 2012	1.00% m/m on and after 1 July 2010
0.50% m/m on and after 1 January 2020*	0.10% m/m on and after 1 January 2015

* As required under regulation 14, a review as to the availability of the required fuel oil was undertaken. MEPC 70 (October 2016) considered an assessment of fuel oil availability and it was decided that the fuel oil standard (0.50% m/m) shall become effective on 1 January 2020 (resolution MEPC.280(70)).

The ECAs established are:

- Baltic Sea area – as defined in Annex I of MARPOL (SOx only);
- North Sea area – as defined in Annex V of MARPOL (SOx only);
- North American area (entered into effect 1 August 2012) – as defined in Appendix VII of Annex VI of MARPOL (SOx, NOx and PM); and
- United States Caribbean Sea area (entered into effect 1 January 2014) – as defined in Appendix VII of Annex VI of MARPOL (SOx, NOx and PM).

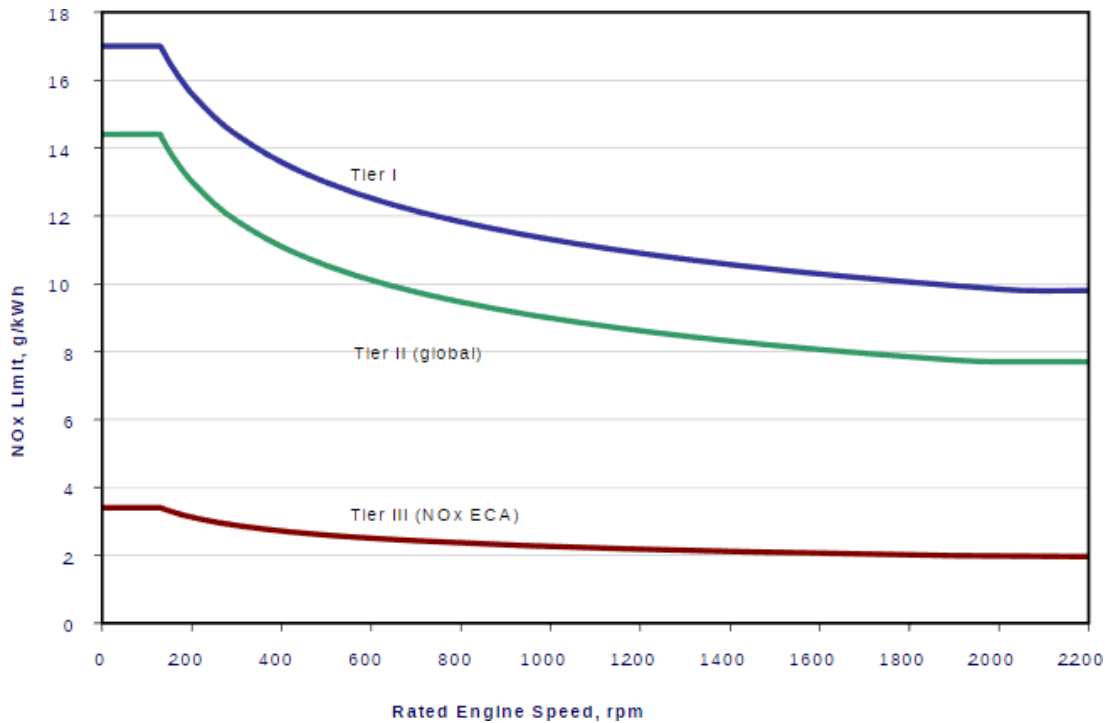
NOx emission standards

The NOx emission restrictions of MARPOL Annex VI Regulation 13 apply to any marine diesel engine with a power output more than 130 kW installed on a ship. Any reciprocating internal combustion engine that runs on liquid or dual fuel is considered a marine diesel engine. Engines used purely for emergencies and engines on ships operating strictly inside the seas of the state in which they are registered are the only exceptions. The last exception applies only if these engines are subject to a different NOx control method. NOx emission limits are set for diesel engines depending on the engine maximum operating speed (n, rpm).

Tier I and Tier II limits are global, while the Tier III standards apply only in NOx Emission Control Areas.

Tier	Date	NOx Limit, g/kWh		
		n < 130	130 ≤ n < 2000	n ≥ 2000
Tier I	2000	17.0	$45 \cdot n^{-0.2}$	9.8
Tier II	2011	14.4	$44 \cdot n^{-0.23}$	7.7
Tier III	2016†	3.4	$9 \cdot n^{-0.2}$	1.96

† In NOx Emission Control Areas (Tier II standards apply outside ECAs).



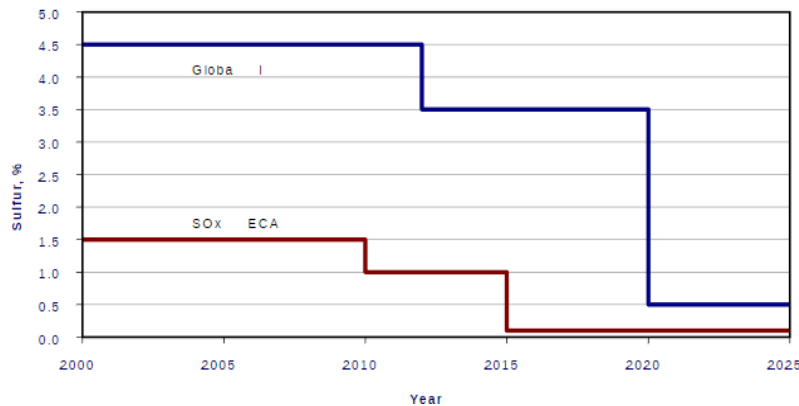
The combustion process optimization is projected to meet Tier II criteria. Engine designers look at aspects such fuel injection time, pressure, and rate (rate shaping), fuel nozzle flow area, exhaust valve timing, and cylinder compression volume. Tier III requirements are likely to need specific NOx emission control technology such as water induction (with fuel, scavenging air, or in-cylinder), exhaust gas recirculation, or selective catalytic reduction. Testing. ISO 8178 cycles are used to evaluate engine emissions (E2, E3 cycles for various types of propulsion engines, D2 for constant speed auxiliary engines, C1 for variable speed and load auxiliary engines). The inclusion of not-to-exceed (NTE) testing criteria in Tier III standards is being discussed. NOx

emissions would be subject to NTE restrictions multiplied by 1.5 at every particular load point in the E2/E3 cycle. Even though residual fuels are typically utilized in real-world operation, engines are tested using distillate diesel fuels. Additional technical information about NOx emissions, such as emission control measures, are provided in the required "NOx Technical Code," which was enacted under the guise of "Resolution 2."

Sulfur content of fuel

As a tool to decrease SOx emissions and, indirectly, PM emissions, Annex VI rules contain limitations on the sulfur content of fuel oil (there are no explicit PM emission limits). SOx Emission Control Areas have special fuel quality requirements (SOx ECA or SECA). Table 2 lists the sulfur limitations and implementation dates, and Figure 2 depicts them.

Date	Sulfur Limit in Fuel (% m/m)	
	SOx ECA	Global
2000	1.5%	4.5%
2010.07	1.0%	
2012		3.5%
2015	0.1%	
2020		0.5%



Heavy fuel oil (HFO) is permitted as long as it fulfills the appropriate sulfur level (i.e., there is no mandate to use distillate fuels). Alternative solutions to minimize sulfur emissions are also permitted (both in the SOx ECAs and internationally), such as the use of exhaust gas cleaning systems (EGCS), also known as scrubbers. Ships, for example, can equip an exhaust gas cleaning system or utilize any other technical approach to reduce SOx emissions to 6 g/kWh instead of utilizing the 0.5 percent S fuel (2020 as SO₂).

Greenhouse gas emissions

MARPOL Annex VI, Chapter 4 establishes two necessary methods to assure an energy efficiency standard for ships: (1) the Energy Efficiency Design Index (EEDI) for new ships, and (2) the Ship Energy Efficiency Management Plan (SEEMP) for all ships. The EEDI is a performance-based

system that compels new ships to have a specific level of energy efficiency. Ship designers and builders have complete freedom in selecting technology to meet EEDI standards in a given ship design. The SEEMP creates a method for ship operators to increase ship energy efficiency. The restrictions apply to all ships with a gross tonnage of 400 or more and go into effect on January 1, 2013. Flexibility exists during the initial period of up to six and a half years following the entrance into force, when the IMO may exempt the obligation to comply with the EEDI for certain new ships, such as those already under construction. The IMO established an Initial Strategy on the reduction of GHG emissions from ships [3949] in April 2018, with the goal of reducing overall yearly GHG emissions by at least 50% by 2050 compared to 2008. The policy calls for strengthening EEDI regulations as well as a variety of other emission-cutting initiatives, including operational efficiency measures, additional speed reductions, efforts to address CH₄ and VOC emissions, alternative low-carbon and zero-carbon fuels, and market-based measures (MBM).

Ozone depleting substances

Annex VI restricts the intentional release of ozone-depleting chemicals such as halons and chlorofluorocarbons (CFCs). On all ships, new installations containing ozone-depleting compounds are forbidden. However, new installations that use hydro-chlorofluorocarbons (HCFCs) are authorized until January 1, 2020. Annex VI also forbids the combustion of some items on board ships, including contaminated packaging materials and polychlorinated biphenyls (PCBs). Periodic inspections and surveys are used to assess compliance with Annex VI provisions. The ship is awarded a "International Air Pollution Prevention Certificate" after

passing the surveys, which is valid for up to 5 years. The ship operator (rather than the engine manufacturer) is responsible for in-use compliance under the "NOx Technical Code."

Particularly Sensitive Sea Areas

The designation of a Particularly Sensitive Sea Area (PSSA) is an international management tool for reviewing attributes within an area that are vulnerable to damage from international shipping and determining the most appropriate protective measures available through the International Maritime Organization (IMO) to address that vulnerability. To be designated as a PSSA, three elements must be present: (1) the area must have certain attributes (ecological, socioeconomic, or scientific); (2) it must be vulnerable to damage by international shipping; and (3) the IMO must have measures in place to protect the area's attributes from damage by international shipping. If authorized by the IMO, the ultimate result will be a "Specially Sensitive Sea Area" and one or more IMO-adopted measures for ships to follow. It is crucial to highlight that the designation of an area as a PSSA has no legal ramifications; nonetheless, the actions that are implemented must have a legal foundation.

List of adopted PSSAs:

1. The Great Barrier Reef (MEPC 30, September 1990, Resolution MEPC.44(30))
 - Mandatory ship reporting system (REEFREP)
 - IMO-recommended Australian pilotage system
2. Torres Strait as an extension of the Great Barrier Reef (MEPC 53, July 2005 Resolution MEPC.133(53))
 - Two-way shipping route through the Torres Strait

- IMO-recommended Australian pilotage system
3. South-west Coral Sea as an extension of the Great Barrier Reef and Torres Strait (MEPC 68, May 2015 Resolution MEPC.268(68))
 - Two-way route in the Prince of Wales Channel
 - Two-way route in Diamond Passage
 - Two-way route to the West of Holmes Reef
 - Area to be avoided north-east of the Great Barrier Reef, between Palm Passage and Hydrographers Passage
 4. The Sabana-Camagüey Archipelago (MEPC 40, September 1997 Resolution MEPC.74(40))
 - Traffic separation schemes off Costa de Matanzas, in the Old Bahama Channel, and the Punta Maternillos
 - Discharge prohibition
 - Area to be avoided in the access routes to the ports of Matanzas and Cardenas
 5. Malpelo Island (MEPC 47, March 2002 Resolution MEPC.97(47))
 - Area to be avoided around Malpelo Island
 6. The sea around the Florida Keys (MEPC 47, March 2002 Resolution MEPC.97(47))
 - Mandatory no anchoring areas in the Tortugas Ecological Reserve and the Tortugas Bank in the Florida Keys
 - Areas to be avoided off the Florida coast
 7. The Wadden Sea (MEPC 48, October 2002 Resolution MEPC.101(48))

- Existing protective measures, including but not limited to: mandatory ship reporting systems; deep water routes, traffic separation schemes, recommended and mandatory pilotage, MARPOL Special Area, and other national measures
8. Paracas National Reserve (MEPC 49, July 2003 Resolution MEPC.106(49))
 - Area to be avoided (by ships > 200 gt carrying hydrocarbons in bulk)
 - Traffic separation scheme in the approaches to Puerto Pisco
 9. Western European Waters (MEPC 52, October 2004 Resolution MEPC.121(52))
 - Ship reporting system for single-hull tankers carrying heavy grades of fuel oil
 10. Canary Islands (MEPC 53, July 2005 Resolution MEPC.134(53))
 - Mandatory ship reporting system (CANREP)
 - Traffic separation schemes
 - Five areas to be avoided off Lanzarote Island; off the island of Tenerife; off the island of Grand Canary; off La Palma island; and off the island of El Hierro
 11. The Galapagos Archipelago (MEPC 53, July 2005 Resolution MEPC.135(53))
 - Recommended tracks, mandatory as a condition of port entry
 - Mandatory ship reporting system (GALREP)
 - Area to be avoided
 12. The Baltic Sea area (MEPC 53, July 2005 Resolution MEPC.136(53))
 - Existing protective measures, including but not limited to: existing routing and pilotage systems; mandatory ship reporting systems; MARPOL Special Area; Emission Control Area
 - Traffic separation scheme and associated routing measures in the South-west Baltic Sea

- Deep-water route of Gotland Island
 - Areas to be avoided in the Southern Baltic Sea
13. The Papahānaumokuākea Marine National Monument (MEPC 57, April 2008 Resolution MEPC.171(57))
- Mandatory ship reporting system (CORAL SHIPREP)
 - Six areas to be avoided
14. The Strait of Bonifacio (MEPC 62, July 2011 Resolution MEPC.226(64))
- Mandatory ship reporting system (BONIFREP)
 - Routing Measures
 - Recommendation on navigation through the Strait of Bonifacio
15. The Saba Bank (MEPC 64, October 2012 Resolution MEPC.226(64))
- Existing MARPOL Annex V Special Area
 - Mandatory no anchoring area for all ships
 - Area to be avoided (by ships 300 gt and over)
16. The Jomard Entrance (MEPC 70, July 2016 Resolution MEPC.283(70))
- Two-way route to the north of Jomard Entrance
 - Three two-way routes to the south of Jomard Entrance
 - Precautionary area that lies between the northern and southern two-way routes
17. Tubbataha Reefs Natural Park (MEPC 71, July 2017 Resolution MEPC.294(71))
- Area to be avoided (enters into force on 01 January 2018)

Ports and Waterways Safety Act

The Ports and Waterways Safety Act of 1972 (PWSA) authorizes the U.S. Coast Guard to establish vessel traffic service/separation schemes (VTSS) for ports, harbors, and other waters subject to congested vessel traffic. The VTSS apply to commercial ships, other than fishing vessels, weighing 300 gross tons (270 gross metric tons) or more. The Oil Pollution Act amended the PWSA to mandate that appropriate vessels must comply with the VTSS. At general, the PWSA applies in any port or site subject to US jurisdiction, or in any region covered by an international agreement. Waterways subject to US jurisdiction are defined in Title 33 C.F.R. 2.05-30 as navigable waters, other waters on US lands, and waters inside US territory and possession. The Port and Tanker Safety Act (PTSA) of 1978 revised the PWSA (Public Law 95-474). The PTSA was enacted after Congress determined that increased oversight of vessel and port operations was required to reduce the possibility of vessel or cargo loss, or damage to life, property, or the marine environment, and to ensure that the handling of dangerous articles and substances on structures in, on, or immediately adjacent to the navigable waters of the United States is carried out in accordance with established standards and requirements. The PTSA provided broader regulatory authority over regulated and non-regulated areas such as improvements in the supervision and control of all types of vessels operating in U.S. navigable waters, and in the safety of foreign or domestic tank vessels that transport or transfer oil or hazardous cargoes in ports or places subject to United States jurisdiction. The PTSA also reflects certain tank vessel standards and requirements accepted internationally, specifically those developed by the International Conference on Tanker Safety and Pollution Prevention.

Act to Prevent Pollution from Ships

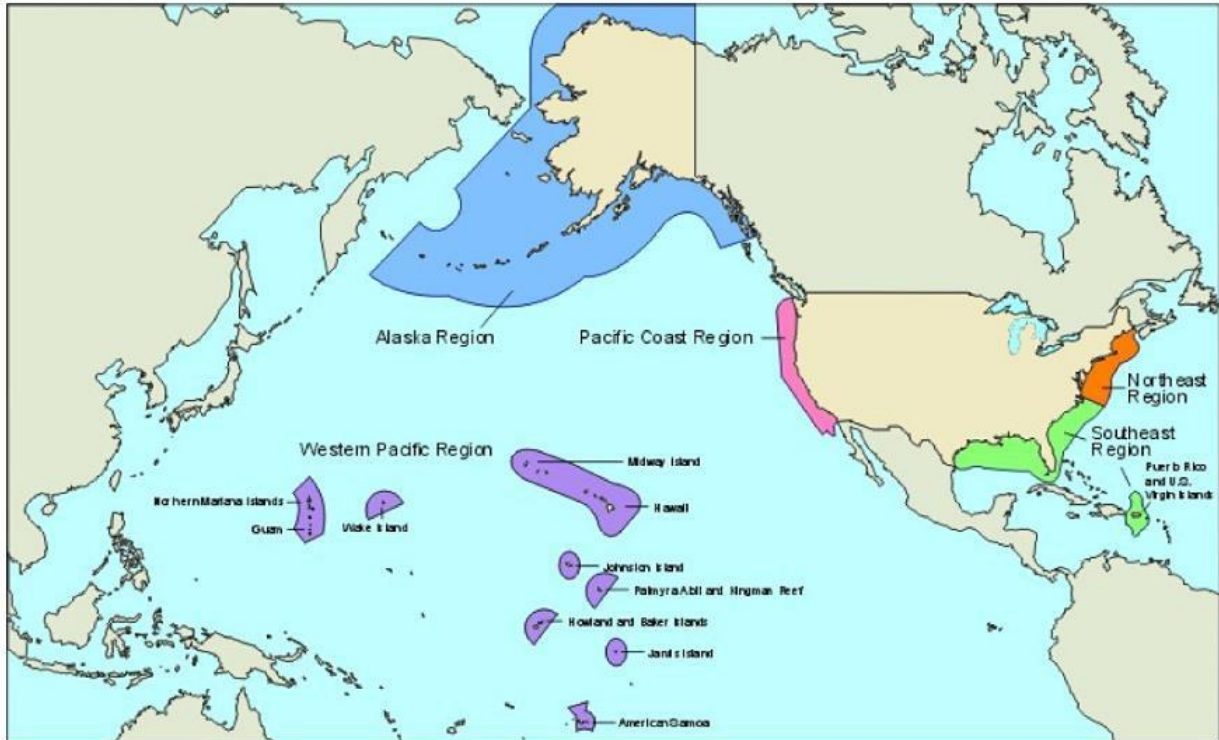
MARPOL, or the International Convention for the Prevention of Pollution from Ships, is focused with reducing ship-related maritime pollution. Annex VI of MARPOL specifically covers air pollution from ocean-going ships. The Annex VI international air pollution rules set limits on nitrogen oxides (NOx) emissions and regulate the use of gasoline with reduced sulfur content, preserving people's health and the environment by lowering ozone-producing pollution, which causes smog and aggravates asthma. The rules apply to ships operating in US seas as well as ships operating within 200 nautical miles of the North American coast, often known as the North American Emission Control Area (ECA).

Memorandum of Understanding EPA - Coast Guard

The EPA and USCG signed a Memorandum of Understanding (MOU) on June 27, 2011 to implement Annex VI MARPOL. The Annex VI MOU states that the EPA and USCG will implement Annex VI and APPS regulations jointly and collaboratively. USCG and EPA efforts will include inspections, investigations, and enforcement measures if a violation is discovered. Oversight of maritime fueling stations, on-board compliance inspections, and record reviews are all part of the efforts to assure compliance with Annex VI and APPS. The EPA issued a punishment policy for breaches of the sulfur in fuel standard and associated rules for ships on January 16, 2015. This action reaffirms the agency's commitment to investigate breaches of US and international air pollution regulations by ships operating in the Emissions Control Areas of the North Atlantic and Caribbean Seas. The regulation applies to violations of the new international sulfur emission rules for ships, which come into effect on January 1, 2015, as well as violations of prior norms. This policy is designed to dissuade future offenders, ensure that the EPA imposes fair and equitable fines, and allow for the prompt settlement of noncompliance-related claims. The

EPA is dedicated to enforcing marine emission rules in order to protect public health in American communities from harmful air pollution.

Exclusive Economic Zone



This NOAA map shows the U.S. exclusive economic zone.

**National Ocean Service, National Oceanic and Atmospheric Administration US Department of Commerce, What is the EEZ?*

The exclusive economic zone is the area over which the United States and other coastal countries have authority over natural resources. The United States Exclusive Economic Zone (EEZ) extends no more than 200 nautical miles from the territorial sea baseline and is adjacent to the United States' 12 nautical mile territorial sea, which includes the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Commonwealth of the Northern Mariana Islands, and any other territory or possession over which the United States has sovereignty.

OPA 90 marine environmental protection requirements

The Oil Pollution Act of 1990 (OPA 90), 33 U.S.C. ch. 40 2701, was enacted to prevent oil leaks from ships and installations. It required the removal of spilled oil and allocated responsibilities for cleaning and damages. The act establishes a fund for damages, cleanup, and removal costs; requires specific operating procedures; defines responsible parties and financial liability; implements processes for measuring damages; specifies damages for which violators are liable; and establishes a fund for damages, cleanup, and removal costs. This law has had an impact on the oil production, transportation, and distribution businesses. Under the Oil Pollution Act, a responsible party is defined as someone who is held liable for the discharge or serious danger of discharge of oil from a vessel or facility into navigable waterways, exclusive economic zones, or the shorelines of such covered waters. The persons who are responsible are strictly, jointly, and severally accountable for the expense of removing the oil as well as any damages caused by the discharge. In contrast to the unlimited responsibility for removal expenses, liability for damages is restricted, as detailed further below. Furthermore, the Oil Pollution Act provides for further obligation imposed by other applicable state statutes. The Oil Pollution Act allows federal, tribal, state, and other entities to recover removal expenses from a responsible party if such entity incurred expenditures from carrying out oil removal actions in compliance with the Clean Water Act National Contingency Plan. Claims for reimbursement must first be made to the accountable party. If the potentially liable party denies culpability or fails to disburse the compensation within 90 days after the claim, the claimant may sue in court or submit a claim with the Oil Spill Liability Trust Fund, as outlined below. In rare cases, applications for removal cost reimbursement can be filed with the Oil Spill Liability Trust Fund first, bypassing the liable

party. Claimants recommended by the EPA, governors of impacted states, and American claimants for events involving foreign vessels or facilities, for example, may first bring their claims to the Oil Spill Liability Trust Fund. When submitting a claim for removal cost reimbursement to the fund, the claimant must demonstrate that the removal costs were incurred as a result of activities required to avoid or mitigate the effects of the incident, and that such actions were approved or directed by the federal on-scene coordinator. Damage expenses can be recovered from a responsible party in a manner similar to that detailed above. The Oil Pollution Act, on the other hand, only covers specific types of damages. Natural resource damages, damage to real or personal property, loss of subsistence usage, loss of government income, loss of profits or reduced earning potential, damaged public services, and damage assessment expenses are among these categories. Furthermore, certain categories are recoverable by anybody affected by the occurrence, and others are only recoverable by the federal, tribal, and state governments. Furthermore, the Oil Pollution Act establishes responsibility limitations for damages based on the guilty party, the specific occurrence, and the kind of vessel or facility from which the discharge occurred. The Oil Spill Liability Trust Fund is a federal government-managed trust fund supported by a per-barrel tax on crude oil produced domestically in the United States and petroleum products imported to the United States for consumption. The fund was established in 1986, but its usage was not permitted until the Oil Pollution Act was passed in 1990. The monies might be used to pay for federal, tribal, state, and claimant oil spill cleanup efforts and damage assessments, as well as outstanding responsibility and damages claims. Per spill occurrence, no more than one billion dollars may be withdrawn from the fund. Over the last two decades, court decisions have shown that securing

cash from the Oil Pollution Spill Liability Fund can be challenging. The Oil Pollution Act has long-term consequences because of the possibility for infinite responsibility and statutes that require insurers to serve as guarantors, which has resulted in insurance firms refusing to offer financial liability agreements to vessel operators and owners. As a result of the difficulty to obtain proof of financial culpability, boats are unable to lawfully enter US waters. Because the OPA does not exclude vessel creditors from entering US waters, any lender is hesitant to fund fleet modernization or replacement. Finally, because of the stringent offshore facility regulations, OPA has the potential to have a direct influence on the local oil production business.

Vessel response plan

This plan provides the emergency response procedures for a vessel under the OPA 90 act. A vessel response plan (VRP) is a document that specifies what the vessel will do if an offshore leak occurs. The United States Coast Guard requires VRPs for maritime operators transporting particular volumes of chemicals and/or refined petroleum products. The VRP includes vessel information (such as name, country of registry, call sign, and more), contact information for the vessel's owner or operator, a list of zones that the vessel intends to operate in, and a clear identification of the incident management team - the people or group who will be notified in the event of a spill. The identifying contact will contain who is to be alerted, how to reach them most quickly, and secondary communication effort instructions to utilize if the initial contact is inaccessible. The VRP will also include information on the vessel's chosen insurance carrier. According to a recent article from The United States Coast Guard, VRPs are not confined to oil spills. "It is critical to recognize that, while hazardous situations such as an engine casualty, grounding, fire, or flooding may not immediately result in a discharge, plan activation is still

necessary since they may result in a discharge if left unresolved". In which situations the Company requires to handle a VRP activation are setted below:

- When the master judges that the resources and personnel onboard are insufficient to fulfill the demands of an actual discharge or a significant danger of discharge, he or she must activate the VRP. Although hazardous events such as an engine casualty, grounding, fire, or flooding may not directly result in a discharge, plan activation is still necessary since they may result in a discharge if left unresolved.
- Accurate situation evaluation by the master is crucial for beginning an appropriate reaction. Despite vessel masters' reservations, timely and proper VRP activation will ultimately cost less.
- When a VRP is activated late, the services listed in the plan may not get on site in time to minimize a worst-case discharge. Plan holders spend a substantial amount of effort selecting the necessary resources for a vessel's VRP, and good activation ensures that the relevant resources are engaged to manage the crisis.
- If the USCG detects any hesitancy in the master's decision to activate a VRP, the port's captain may issue an order to activate the plan. The choice is based on resource availability, and delaying may impede the ability to be on site quickly enough.

Vessel general permit

On December 4, 2018, the President signed into law the Vessel Incidental Discharge Act (VIDA). VIDA requires EPA to develop new national standards of performance for commercial vessel incidental discharges and the U.S. Coast Guard USCG to develop corresponding implementing

regulations. Pursuant to VIDA, the following interim requirements apply until EPA publishes future standards and the USCG publishes corresponding implementing regulations under VIDA:

- For large, non-fishing commercial vessels: The existing vessel discharge requirements established through the EPA 2013 Vessel General Permit (VGP) and the USCG ballast water regulations, and any applicable state and local government requirements.
- For small vessels and fishing vessels of any size: The existing ballast water discharge requirements established through the EPA 2013 VGP and the USCG ballast water regulations, and any applicable state and local government requirements.

On April 12, 2013, the EPA released the 2013 VGP, which was valid from December 19, 2013 through December 18, 2018. The VGP provides countrywide NPDES permit coverage for discharges incidental to the regular operation of commercial vessels longer than 79 feet. However, as previously stated, the VIDA Act extends the requirements of the 2013 VGP, keeping them in effect until new rules are definitive and enforceable. Prior to VIDA, Notices of Intent (NOIs) continued to offer needed VGP coverage. A fresh NOI is only necessary to repair any errors or supply any information updates. The 2013 VGP gives vessel owners/operators two alternatives for obtaining permit coverage:

- Notice of Intent (NOI) – Vessels of 300 gross tons or more or that have the ability to hold or discharge more than eight cubic meters of ballast water must submit an NOI to obtain permit coverage. The NOI must be submitted electronically using EPA's 2013 VGP eNOI system.

- Final 2013 VGP Permit Authorization and Record of Inspection (PARI) Form – Vessels less than 300 gross tons and that do not have the capacity to hold or discharge more than eight cubic meters of ballast water are not required to submit an NOI. Instead, operators of these vessels must complete a PARI Form (Fill and Print), as provided in Appendix K of the 2013 VGP, and keep a copy of that form onboard the vessel at all times. Doing so provides coverage under the 2013 VGP for these vessels.

Code of federal regulations

The Code of Federal Regulations (CFR) is a codification of the general and permanent regulations published in the Federal Register by the Federal Government's executive departments and agencies. It is organized into 50 titles that reflect large sectors governed by federal law. Each volume of the CFR is revised once every calendar year and published quarterly. Each title is broken into chapters, which are normally labeled with the issuing agency's name. Each chapter is further broken into sections that address specific regulatory issues. Large portions can be broken into smaller sections. All parts are divided into sections, and the majority of citations in the CFR are given at the section level.

The Clean Water Act

As amended by OPA 90 and 33 CFR makes it a crime to knowingly discharge oil in quantities determined by regulation to be harmful in “navigable waters” or within the “contiguous zone” of the US waters. The Clean Water Act (CWA) defines the fundamental structure for controlling pollution discharges into US waterways as well as surface water quality criteria. The Federal Water Pollution Control Act, which served as the foundation for the CWA, was passed in 1948,

although it was considerably restructured and enlarged in 1972. With modifications in 1972, the Act's common name was changed to "Clean Water Act". The EPA has developed pollution control measures under the CWA, such as defining wastewater limits for industry. The EPA has also published guidelines for national water quality criteria for contaminants in surface waterways. The CWA made it illegal to dump any pollutant from a point source into navigable waterways without a permit:

- Discharges are regulated by the EPA's National Pollutant Discharge Elimination System (NPDES) permit program.
- Pipes and man-made ditches are examples of discrete conveyances.
- Individual residences that are linked to a municipal system, utilize a septic system, or do not have a surface discharge do not require an NPDES permit; however, industrial, municipal, and other entities that discharge directly to surface waterways must get permits.

No Discharge Zones

Attention shall be paid also in the US waters, where specific waters are designated as "no discharge zones". A "No Discharge Zone (NDZ)" or area is a body of water where the discharge of treated and untreated boat sewage is prohibited. An NDZ is a zone where vessel discharges of both treated and untreated sewage are forbidden. Within the NDZ, vessel operators must keep their sewage discharges onboard for release at sea (more than three miles from coast) or onshore at a pump-out station. The discharge of untreated sewage from vessels is prohibited by federal law in all navigable waterways of the United States, including territorial seas within

three miles of land. The requirements for vessel operators are described in 33 CFR. The regulations allow for four methods of securing a Type I or II marine sanitation device (MSD) while in an NDZ, including:

- Closing the seacock and removing the handle
- Padlocking the seacock in the closed position
- Using a non-releasable wire-tie to hold the seacock in the closed position or
- Locking the door to the space enclosing the toilets with a padlock or door handle key lock
- Closing valves leading to overboard discharge and removing the handle
- Padlocking any valves leading to overboard discharge in the closed position or
- Holding overboard discharge valves closed using a non-releasable wire-tie

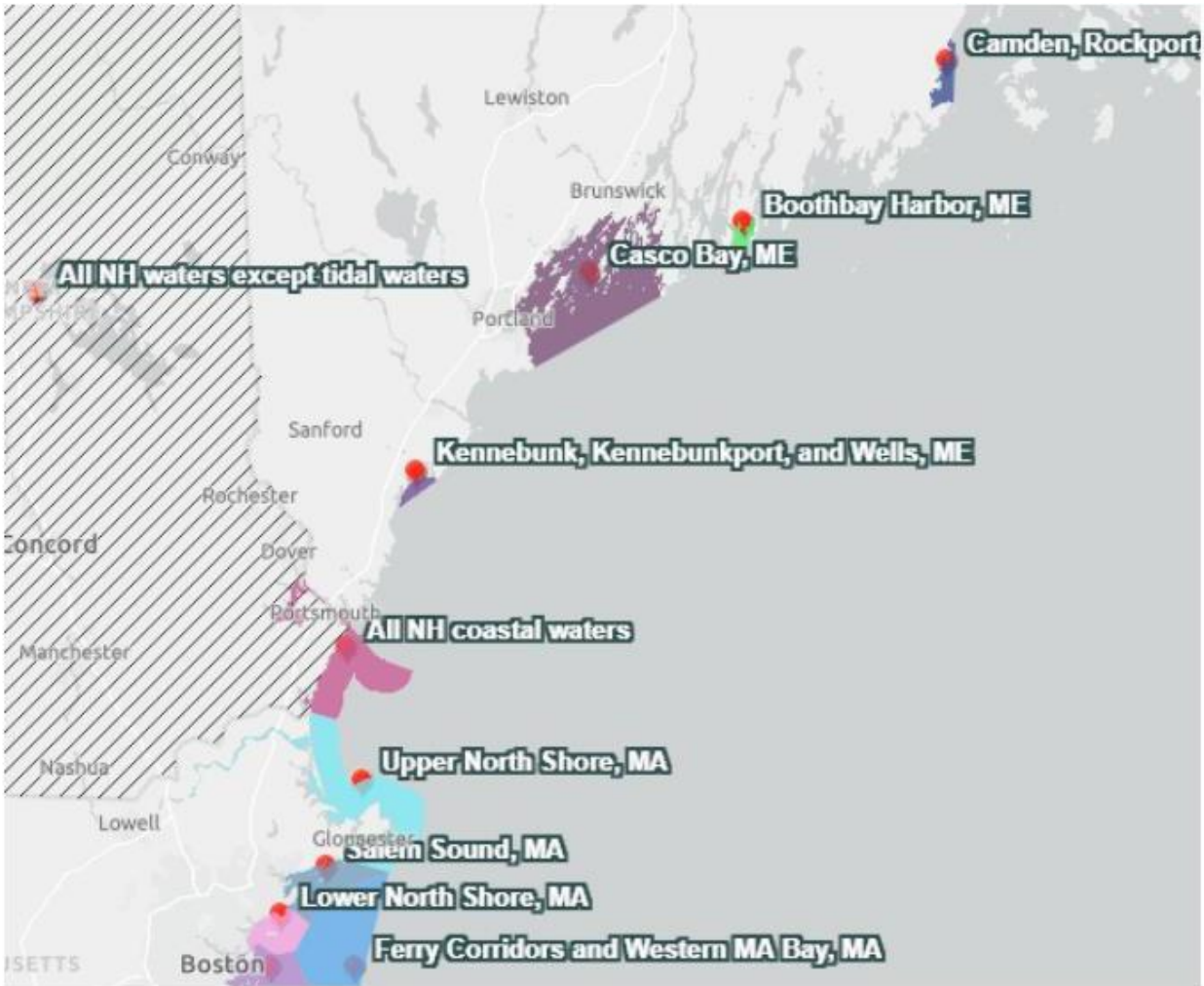
List of no-discharge zones by state:

- California
- Connecticut
- Florida
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri

- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- Rhode Island
- Texas
- Vermont
- Virginia
- Washington
- Wisconsin

List of no-discharge zones shared by more than one state:

- California/Nevada
- Kentucky/Tennessee
- Minnesota/Wisconsin
- South Carolina/North Carolina/Georgia
- South Carolina/Georgia
- Utah/Arizona



A screenshot of the map zoomed in on the northeast United States.

*EPA United States Environmental Protection Agency, No-Discharge Zones (NDZs)

Materials, methods and results

The need for establishing an EMS manual

An Environmental Management System (EMS) is a framework that assists a business in achieving its environmental goals by regularly reviewing, evaluating, and improving its environmental performance. The notion is that this constant analysis and evaluation will discover possibilities for improving and implementing the organization's environmental

performance. The EMS does not specify a standard of environmental performance that must be met. Each Company's EMS is suited to its own goals and objectives.

An EMS assists a Company in meeting its regulatory requirements in a methodical and cost-effective manner. This proactive strategy can assist to lower the risk of noncompliance while also improving health and safety standards for employees and the general public. An EMS may also aid in the resolution of non-regulated concerns like as energy saving, as well as the promotion of tighter operational control and employee stewardship. The following are the basic elements of an EMS:

- examining the organization's environmental objectives
- examining its environmental impacts and duties or legal and other requirements
- setting environmental goals and targets in order to decrease environmental impacts and meet compliance responsibilities
- creating programs to achieve these goals and objectives
- monitoring and assessing progress toward reaching the goals
- ensure environmental awareness and competency among staff
- reviewing the EMS's progress and making improvements

Your organization may experience considerable improvements in environmental performance, increased compliance, and a more internationally cognizant public image with a robust EMS framework for monitoring and analyzing environmental operations. An Environmental Management System offers a comprehensive strategy to managing your company's

environmental effect, as well as a favorable relationship with authorities and a strong, forward-thinking corporate reputation and image.

With environmental problems becoming more serious than ever, it is critical for businesses and especially shipping Companies, to remain compliant while also displaying understanding of environmental issues and obligations. Aside from the obvious environmental benefits of reduced pollution and resource conservation, installing an EMS could also:

- increase efficiency
- reduce costs
- improve employee morale
- make your organization more attractive to investors

The most commonly used framework for an EMS is known as ISO 14001, which specifies certain requirements for Environmental Management Systems. Developed and established in 1996 by the International Organization for Standardization (ISO), the framework includes five main stages, together creating a cycle of continuous improvement:

1. Commitment and policy - The first step in the framework is for the top management of the organization, like the board of directors and shareholders, to make a commitment to environmental improvement and create an environmental policy. This policy then becomes the foundation of the company's EMS.
2. Planning - Identifying the environmental aspects of your company's operations and activities is crucial to creating a strong EMS. Being aware of the negative impacts on people and the environment means the organization can then determine which aspects

are most significant to address in working towards enhancing environmental performance. These most significant criteria become the foundation for setting objectives and targets in the planning stages. The final part of the planning phase is devising an action plan, clearly defining steps and designating responsibilities for meeting these targets.

3. Implementation - Following through with the action plan requires implementing the necessary resources, such as human, legal and financial. This could include employee training and awareness, creating documentation, policies, communication procedures and operating procedures.
4. Evaluation - The fourth step in the framework involves your company monitoring its operations and evaluating whether the objectives and targets are being reached. If not, the company takes action, and the cycle continues.
5. Review - Using the results of the evaluation, top management will review and determine whether the company's environmental policy is consistent with its values and primary goals. If not, the plan is revised, creating a loop of continuous improvement.

Environmental Management Plan

Terms, definitions and abbreviations

BHT : *Bilge Holding Tank*

CCM : *Corporate Compliance Manager*

C/E : *Chief Engineer*

C/O : *Chief Officer*

ECP : Environmental Compliance Plan

ECR : Engine Control Room

EMS : Environmental Management System

E/R : Engine Room

EPI : Environmental Performance Indicator

ETS : Environmental Tag System

FO : Fuel Oil

GRB : Garbage Record Book

GM : General Manager

IC : Independent Consultant

IOPPC : International Oil Pollution Prevention Certificate

LO : Lube Oil

MRC : Management Review Committee

OCM : Oil Content Meter

OOW : Officer of the Watch

ORB : Oil Record Book

OWS : Oil Water Separator

PSSA : Particularly Sensitive Sea Area

SMS : Safety Management System

SOP : Standard Operating Procedures

SOPEP : Shipboard Oil Pollution Emergency Plan

STP : Sewage Treatment Plant

TPA : Third Party Auditor

US : United States (of America)

USCG : United States Coast Guard

VGP : Vessel General Permit

APPS: Act to Prevent Pollution from Ships. MARPOL Protocol, an international treaty is implemented in the US by the APPS at 33 US Code (USC) §1901, et. seq.

CFR: Code of Federal Regulations. It is a codification of the general and permanent rules by the Executive departments and agencies of the Federal Government of US.

Company: Client

Corporate Compliance Manager (CCM): is the person responsible for monitoring the environmental issues of the operations of the Company and the managed vessels, as well as for ensuring the development, implementation and documentation of the EMS.

CWA: The Clean Water Act (CWA) as amended by OPA 90, 33 USC 1321(b)(3), 1319(c)(2), 1362 (7, 8, 9) and 33 CFR 2.05-15 makes it a crime to knowingly discharge oil in quantities determined by regulation to be harmful in “navigable waters” or within the “contiguous zone” of US.

Deficiency or non-conformity: is any breach of marine environmental protection requirements and the additional requirements and policies established by this EMS.

EEZ: Exclusive Economic Zone.

EMS Audit: is a systematic and documented verification process of objectively obtaining and evaluating evidence to determine whether Company’s EMS conforms to the audit criteria set by the Company, and for communication of the results of this process to management.

Environment: surroundings in which the Company operates, including air, water, land, natural resources, flora [collective term for plant life; the term refers to a listing of the species of plants found in a specified area], fauna [the typical collection of animals (and sometimes plants) found in a specific time and/or place, flora plus fauna is biota], humans, and their interrelation.

Environmental Assessment: A systematic, documented, periodic and objective review by Company’s Management of facility operations and practices related to meeting environmental requirements. The assessment is a systematic, documented verification process of objectively obtaining and evaluating evidence to determine whether specified environmental activities, events, conditions, management systems, or information about these matters conform with selected criteria, and communicating the results of this process to management.

Environmental Management System (EMS): part of Company's management system used to develop and implement its environmental policy and manage its environmental issues. The Company's EMS is a set of interrelated elements used to establish policy and objectives as well as to achieve those objectives. It focuses on the implementation of the applicable environmental rules and regulations and includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources.

Environmental Performance: measurable results of Company's management of its environmental issues. These results can be measured against Company's environmental policy and other environmental performance requirements.

Environmental Performance Indicator (EPI): Indicator that provides information about Company's environmental performance. However, all those indicators may be included in SMS KPIs (Key Performance Indicators)

Environmental Policy: overall intentions and direction of the Company related to its environmental performance as formally expressed by Top Management. It provides a framework for action and for the setting of environmental excellence.

Environmental Target: Detailed performance requirement, quantified wherever practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Major Non-Conformity: In the context of this EMS, a Major Non-Conformity is a violation of marine environmental protection requirements or procedures and policies established by the EMS that consists of or contributes to the discharge or potential discharge of oil, or oily wastes,

or other prohibited wastes. It may also include the discovery of pollution prevention equipment determined to be inadequate in terms of processing and monitoring capabilities or inadequate with respect to the quantities of wastes such equipment may be required to process.

Non-conformity: non-fulfilment of or a deviation from a requirement or an error, or any identified lack of a plan or instruction for a key shipboard operation, which could endanger the safety of people, the ship, its cargo or the environment or a deviation from specific legislation.

Material breakdowns, due to fair wear and tear with no impact on work tasks shall not be regarded as non-conformities.

Vessel Response Plan (VRP). This plan provides the emergency response procedures for a vessel under the OPA 90 act.

OPA 90: The US Oil Pollution Act (OPA) established provisions that expand the federal government's authority, and provide the money and resources necessary, to respond to oil spills.

OPA provided new requirements for contingency planning both by government and industry.

PSSA: Particularly Sensitive Sea Areas.

PWSA: Ports and Waterways Safety Act.

Purpose of the Environmental Management Plan

The EMS applies to all vessels that are managed by the Company and to all Company's shore side employees and crews. The purpose of the EMS is to ensure that all vessels fully comply with all applicable marine environmental protection requirements established under applicable international, Flag State, Port State, Coastal State and US laws including, but not limited to

MARPOL and all applicable Federal and state statutes and regulations including, also not limited to PWSA, APPS, CWA, and OPA 90 (collectively, "marine environmental protection requirements"), and to the additional requirements and policies established by the EMS.

In the case of a conflict between the EMS and any of the aforementioned requirements, such that the EMS is less restrictive, then the more restrictive authority shall govern. Furthermore, the purpose of the EMS is to:

- Increase environmental training and awareness of all personnel involved with these vessels;
- Develop and implement management and engineering controls to better manage, identify and prevent environmental violations;
- Manage and control activities and processes that have a significant influence on the environment, minimize the effect of these activities, and achieve continual improvement of the EMS and Company's environmental performance.

The EMS covers and applies to all Company's operations, including all subsidiaries, affiliated business entities, and agents (owned wholly or partially by the Company), involved in the operation of seagoing vessels that are operated or managed by the Company.

It also includes all persons working for the Company, its subsidiaries, affiliated business entities, agents, and any other individuals or organizations who are involved in the operation, maintenance and repair of aforesaid vessels as direct employees or independent contractors.

The implementation of a robust EMS and the achievement of sound environmental performance require all activities, operations and personnel to be in the frame of

environmental awareness and care. Consequently, all Company's employees should understand, implement and continually support any requirements of the EMS.

All Officers and crew of each vessel, and all shore side employees involved with the operation, maintenance, or repair of the managed vessels should diligently comply with the EMS and the associated requirements in their entirety.

Environmental requirements and voluntary undertakings

The EMS identifies and provides for the planning and management of all Company's operations with a view to achieving the EMS objectives and targets. The EMS provides means to identify explain and communicate all environmental requirements and voluntary undertakings to all employees and to all vendors, technicians, and other non-crewmembers whose work could affect Company's ability to meet those requirements and undertakings.

Environmental requirements include statutes, regulations, permits, and agreements such as the EMS. Voluntary undertakings include the adaptations of additional best practices or industry norms that the Company may choose to adopt.

The EMS includes procedures for ensuring that the organization meets such environmental requirements, voluntary undertakings and the additional requirements of the EMS. The EMS and the Company's SMS also specify procedures for anticipating changes to environmental requirements, including new requirements that may apply as a result of changes in operations and incorporating these changes into the EMS.

In the course of implementing the EMS, should inadequacies in the size and capabilities of vessel crews be proven as a contributing factor to their inability to manage waste streams, the

Company shall supplement crews as needed, consistent with vessels' lifesaving arrangements, and/or shall provide additional shore side resources.

Environmental policy

All Company's personnel ashore and onboard shall execute their duties responsibly. They must conduct themselves in an honest, integral and ethical manner at all times while working for the Company or onboard the vessels. They should cooperate with the relevant authorities carrying out inspections, reviews or audits for the purpose of ensuring proper implementation of the EMS. They have an affirmative duty to answer all questions posed to them honestly and forthrightly.

The Company has documented within the EMS the procedures for implementing and complying with its policy, and is committed to a clean and healthy environment by taking all appropriate measures to ensure compliance with all environmental regulations and best practices, so that the environment will not be endangered by pollution risk.

Any Company personnel who become aware of any unethical conduct or conduct which is contrary to applicable environmental requirements shall immediately advise his supervisor and/or the Master of the vessel for seagoing personnel and/or to the designated shoreside responsible person, as per the open reporting procedures set forth herein, of the situation. The Company and the vessel shall keep a dated record of such incidents as well as a brief summary of the incident reported and the remedial action instituted to address any such report.

Subject to applicable labor laws, the Company shall take appropriate action, up to and including dismissal, against any employee who obstructs, hinders, or presents false information or makes

false statements during any auditing or inspection function required by the EMS or to any governmental authority performing an inspection or PSC activity.

An example for implementing an environmental policy could be the following:

The Company aspires to a cleaner marine environment and shall strive for continuous performance improvement to every aspect, including pollution prevention. It is Company's policy to promote environmental awareness and to protect the environment in all its operations. Company is committed to pollution prevention, emphasizing on source reduction, by controlling emissions and wastes to below harmful levels, eliminating spills and environmental incidents, and by identifying and continuously reducing key environmental risks.

The policy of the Company is to manage and operate vessels so as to ensure avoidance of damage to the environment and "Zero-Spills", in particular, to the marine environment. In order to achieve these goals, we:

Create and maintain an Environmental Management System taking into account ISO 14001 which is continually improved, provide training to all persons involved in our operations, and support conduct of operations in a manner that safeguards the environment and prevents pollution.

Comply with all applicable environmental laws, regulations and legal requirements and apply responsible standards where laws, regulations and legal requirements do not exist.

Are well trained to respond quickly, effectively and with care to any environmental incidents that may occur from our operations, in co-operation with industry organizations and authorized governmental agencies.

Provide funds and human resources as necessary in order to effectively maintain and repair the systems, equipment and components in the machinery spaces of our vessels and discourage our employees from minimizing the related operational costs and thereby sacrificing environmental compliance.

Stress to all our employees, contractors and others working on our behalf that they are responsible and accountable to respect and protect the environment whilst involved in our operations.

Review and assess each of the areas of our operations, measure progress and compliance with this policy and evaluate practices from industry leaders in order to continually revise and improve our Environmental Management System.

The Company is against any incentive or bonus programs based on minimizing operational costs associated with the operation, maintenance and repair of machinery space systems, equipment and components without ensuring that efficiency and performance are maintained. Employees shall not avoid such costs and thereby sacrifice environmental compliance.

Potential consequences for departure from specified operating policies/procedures, include possible termination of employment; and liability for criminal/civil/administrative penalties as a result of noncompliance.

The Company is committed to sharing information with external stakeholders on environmental performance.

This policy shall be displayed in Company's offices. The vessel shall display this policy on the Bridge, in the Engine Control Room, and in the Officers' and Crew smoking rooms.

Objectives and targets

The Company shall establish in the beginning of each year specific objectives and targets (and time frames to meet them) for:

- achieving and maintaining compliance with all marine environmental protection requirements and the requirements of the EMS
- continuous training in order to update the environmental needs and requirements, when appropriate
- environmental performance demonstrating continuous improvement in regulated and non- regulated areas
- pollution prevention that emphasizes source reduction with respect to machinery space waste streams and effective management of cargo related wastes
- sharing information with external stakeholders on environmental performance against EMS objectives and targets

The time frames will be updated as environmental requirements change, or as modifications occur in activities and structures within the Company that may affect environmental performance, or as a result of recommendations made by any internal or external auditor or any governmental authority.

General responsibilities

The Company's Management is totally committed to implementing the mandates of the EMS.

All Company personnel, ashore and onboard, are encouraged to identify and adopt material substitutions or processes which reduce occasions of equipment malfunction and deterioration, operators' errors or deliberate malfeasance. Such reports of concern are to be sent to the CCM immediately. The CCM shall review the report(s) or concerns with the appropriate head(s) of department(s) and shall monitor the actions implemented, where necessary and appropriate.

The Company will ensure that it has sufficient personnel and other resources to meet its objectives and targets. The EMS describes the procedures and steps for achieving those objectives and targets and defines the compliance roles and responsibilities of all vessels and shore side personnel involved with the operation, maintenance and repair of vessels, and indicates how they and other Company's personnel are accountable for achieving and maintaining compliance with the EMS, and other marine environmental protection requirements. Additionally, it describes how environmental performance and compliance information is communicated to all vendors, technicians, and super-numerus onboard vessels. The EMS also establishes procedures for receiving and addressing concerns raised by these personnel regarding environmental performance and compliance.

Responsibilities of Company's General Manager

- Allocating the necessary resources for the implementation of the Environmental Policy.
- Monitoring the proper implementation of Company's Environmental Policy and EMS.

- Communicating Company's commitment to the environmental protection and EMS to all sea and shore staff.
- Approving the budget prepared by the CCM.
- Promoting and communicating the concept of environmental excellence through out the Company's organization by monitoring, motivating and encouraging all Company's personnel on board and ashore.

At least annually the Board of Directors shall receive and review reports from the CCM and any applicable report from the IC and TPA concerning the implementation of the EMS, including environmental compliance, and Managers'/Directors', Officers' and crew training.

Responsibilities of Company's managers

- Demonstrating their commitment to safety and environmental excellence through their actions and behavior.
- Overseeing the proper monitoring of the managed fleet environmental performance related to their activities.
- Ensuring that all relevant findings of EMS audits and inspections are timely and effectively handled.
- Following up developments of international and national environmental regulations and proposing to GM schedules for the execution of any improvement work required.

Corporate Compliance Manager

The CCM is thoroughly familiar with the EMS requirements and other maritime environmental laws and regulations, and is responsible to ensure full implementation and compliance

therewith. He is responsible to develop a budget related to ECP requirements part of this budget can be handled by the CCM. He shall demonstrate his commitment to safety and environmental excellence through his behavior and shall report directly to the GM for EMS issues. Furthermore, he:

- Is authorized to access all records, documents, facilities, and vessels throughout the Company's organization for the purpose of implementing the EMS.
- Shall ensure that the Company's internal environmental audits are properly carried out.
- Shall ensure that observations and recommendations resulting from any audit are appropriately documented, tracked, and resolved and that such resolutions are thoroughly documented in a format that can be readily audited.
- Shall develop a tracking mechanism to ensure that the Company takes corrective and preventive action on any recommendations within a time frame of 30-60 days after a report or other information of non-compliance is received. Where corrective or preventive action takes longer than 60 days, he shall ensure relevant action is taken as soon as possible, and in not more than 90 days from the event.
- Shall oversee the Open Reporting System, as described below.
- Shall review, investigate and document in a timely fashion report of non-compliance and shall initiate, monitor, and document all actions taken as a result of such reports. The CCM shall maintain records of such reports and actions taken.
- Shall ensure that each employee, or hire, is aware that Environmental Policy compliance, and accurate and truthful record-keeping are extremely important and the Company will take appropriate disciplinary actions for any violations.

- Shall ensure the development and implementation of the familiarization, Training and Engineering requirements mentioned in the EMS.
- Shall make annual reports to GM concerning compliance with and implementation of the EMS, and other maritime environmental protection requirements. Annually, he shall provide a summary of the reports to Company's Board of Directors. All issues of non-compliance will be communicated, along with any corrective action taken. The CCM shall supervise the annual reviews and "focused" reviews of key environmental areas to promote the adoption of best practices.
- Shall evaluate the Fleet Engineers' responses and shall establish a plan to evaluate, test and implement viable tamper-proofing solutions and methods to reduce and handle waste accumulations. He shall also address all suggested maintenance concerns. A summary of the reported information and corrective actions will be provided to GM.
- Shall take all necessary steps to ensure the full cooperation of all employees during all activities required by the EMS.
- Shall ensure the development and maintenance of a system to track and report each vessel's machinery space waste quantities and capacities.
- Shall make recommendations and propose improvements to the EMS
- Investigate Open Reports.
- Investigate all vessels' casualties and oil pollution incidents.
- Shall monitor the applicable environmental regulatory framework and ensure the Company's timely compliance.

- Shall communicate with 3rd parties (PSC, Flag Administrations etc.) for issues related to EMS compliance.
- Shall issue Circulars / Bulletins / work instructions / interoffice memos etc., in order to communicate issues of environmental concerns to the entire Company's organization.
- Shall ensure that all documentation required by the EMS is maintained and available for inspection when required.
- Shall provide Company's environmental consultants and contractors with documents and training to make them aware of the EMS, as necessary.
- Shall ensure that necessary notifications are forwarded, as required by applicable international and/or US laws and regulations. In the event of violations of US laws and regulations, he shall ensure that the US Government and the USCG are immediately notified.

Shore side personnel serving in any capacity

All shore staff having routine involvement with any aspect of the operation, maintenance and repair of covered vessels shall report in writing any information related to vessels' or crew's failure and/or inability to comply with the EMS or any other environmental protection requirement. This may include, but is not limited to:

- information gathered from reviewing or working on orders to purchase LO,
- spare parts for pollution prevention equipment or
- equipment having oil-to-sea interfaces,

- reviewing or receiving information related to repairs or replacement of pollution prevention equipment, piping, or related systems,
- discussions with shipboard personnel, or
- any reports received from crewmembers through the Master or through the Open reporting system.

Such information shall also include knowledge obtained during any ship visits, audits or inspections, regardless of the stated purpose of the particular visit, audit or inspection.

Furthermore, all Company's Superintendents shall report to the CCM any information related to environmental releases or inadequate performance of environmental pollution protection equipment, system casualties resulting in internal spills, excessive waste development and leaking equipment with oil-to-sea interfaces.

The Company's Superintendents are also responsible for:

- Demonstrating their commitment to safety and environmental excellence.
- Conducting inspections and audits onboard managed vessels related to EMS issues.
- Providing onboard training on issues related to EMS.
- Providing instructions to the Masters and Senior Officers of the managed vessels on issues of proper maintenance and operation of environmental related equipment.

Master's responsibilities

In addition to any other statutory and regulatory requirements, the Master shall ensure that prompt reports are made to USCG of any equipment malfunction related to environmental protection requirements, in its 96-hour Electronic Notice of Arrival (eNOA) into a US Port. The

Masters, with the assistance of CCM, shall ensure that timely reports are made to the USCG of any non-compliant condition of any of the managed vessels that calls upon any port or place in the US or sails into any waters under the US jurisdiction. In addition, he shall:

- Ensure crewmembers' compliance with the EMS, MARPOL, Ballast Water Management and all applicable marine environmental protection requirements, including VGP requirements in US waters. Crewmember compliance with such requirements will be incorporated as a positive factor in performance evaluations. Failure to comply with such requirements will be incorporated as a negative factor in performance evaluations and may lead to dismissal or non-rehire.
- Maintain on board the vessel all records required by international conventions and treaties, and any additional documents or records required under the EMS, for the period specified by the vessel's Flag Administration or the relevant law.
- Ensure that every crewmember has received appropriate training necessary to ensure compliance with the EMS, MARPOL and other pollution prevention requirements and that the proper records of all training on environmental matters are maintained.
- Maintain replacement numbered Environmental Tags and used Environmental Tags, as well as an inventory list of used and unused Tags, in the Master's day room and inspect each damaged Tag number to ensure Tags having identical numbers are never used.
- Include an inventory of the unused Tags in his handover form.
- Ensure the use of, and personally review, handover forms for the Master, C/O, C/E and 2nd Engineer, which shall include a descriptive environmental compliance component.

Chief Engineer's responsibilities

Chief Engineers on board all Company's vessels shall:

- Ensure full compliance with the EMS engineering requirements, as applicable to their vessel.
- Ensure full compliance with the various EMS policies and procedures.
- Measure, monitor and manage machinery space generated wastes and the conditions of any equipment having oil to sea interfaces on a daily basis (weather & safety permitting).
- Report to the CCM and cooperate with the Company to timely resolve environmental concerns, such as inoperative or ineffective pollution prevention equipment and document all efforts to do so in a log that is available for review and audit at all times.
- Ensure that all E/R wastes that are subject to special handling requirements are properly managed in accordance with all applicable regulations and the EMS.
- Ensure that all shipboard E/R personnel have appropriate training on environmental policies and procedures, including but not limited to training on the operation and use of pollution prevention equipment, Incinerator, OWS, STP and the recording of entries in the Oil Record Book, GRB or any other logs required by the EMS or other maritime environmental protection requirements. The Chief Engineer shall prepare independent written verification that all engine room crew members have received the required training. All engine room crew members shall sign and date a statement acknowledging completion of the training. This written verification, together with the signed

acknowledgement, shall be completed semi-annually and maintained in the engine room of each vessel.

- Ensure that his handover form includes an environmental component and description of the current status of operation, maintenance and repair, for the Incinerator, STP, OWS, OCM and other pollution prevention procedures or equipment, as well as the status of spare parts for the aforementioned equipment.
- Ensure that all E/R records, soundings and tank measurements are accurate, recorded truthfully and properly maintained.
- Report to the CCM all instances where inadequate Company's response associated with spare parts delivery, maintenance and repair or other factors caused conditions leading to excessive production in shipboard waste streams.

Open reporting of non-compliance by employees and crewmembers

- The Company shall maintain an Open Reporting System by which shore side and vessel employees may report, anonymously or otherwise, issues of non-compliance with the EMS, and other marine environmental protection regulations and/or requirements.
- The Company shall provide crew members with information and training in regards to the Open Reporting System prior to each term of employment, and shall inform its crewmembers of the availability of this reporting system by posting notices in lounge spaces of officers and crewmembers, the ECR and common areas of the vessels.
- The Open Reporting System policy specifically prohibits retaliation against those who report non-compliance and makes failure to notify either the Master or through the Open Reporting system regarding any violation of the EMS or other maritime

environmental protection requirements grounds for discipline or dismissal, subject to applicable labor laws.

- The CCM is responsible to maintain this System and shall be informed of each such Open Report, always taking immediate and effective actions. Furthermore, he is responsible for receiving and responding appropriately to all relevant Open Reports *(A dedicated report should be available to all concerned parties. Thus, a relevant controlled and documented form should be attached to this plan).
- He shall make arrangements to ensure anonymity of such reporting when desired by the individual making the report.
- The Company shall publish reports to the fleet on a quarterly basis concerning the Open Reporting System, to demonstrate that the system is working. Such reports to the fleet shall be generated even if no open reports have been received during the preceding quarter.
- The Master is required to report all verbal or written environmental suggestions or concerns received from the Officers and crew aboard his vessel to the CCM.
- Any reports of suspected violation of the EMS and/or any applicable environmental regulation may be reported through a dedicated phone number and mobile or in general with an open line 24/7 and through an email address only for relevant matters.

Furthermore:

- All crew members will be provided with a thorough briefing on the Open Reporting System during onboard familiarization*(A dedicated report should be available to all concerned parties. Thus, a relevant controlled and documented form should be

attached to this plan). The Non-crew members, who are going to stay for a long time on board during vessel in port or to sail with the vessel, will be familiarized (see Ch. Environmental Familiarization).

- An investigation of any report shall be timely initiated by the CCM in order to verify the substance and reliability of the provided information. The CCM shall confirm receipt to the reporting person, when possible, together with information about further handling of the report.
- In the event that the information is substantiated, the issue shall be reported to the GM and shall be investigated in order to identify its root cause. Upon identification of the root cause, a plan of action shall be established to eliminate the root cause and to ensure that there are no future recurrences throughout the fleet.
- Failure to notify regarding any violation of Company's policies / procedures or other environmental requirements constitutes grounds for dismissal.
- No individual who truthfully reports non-compliances or concerns for suspected violations shall be disciplined or otherwise retaliated against for such reporting.
- Top management, Managers/Directors or employees are not permitted to engage in retaliation, retribution or any form of harassment directed against an employee who reports a compliance concern.
- Anyone who is involved in any act of retaliation or retribution against an employee that has reported suspected misconduct will be subject to disciplinary action, including up to dismissal.

Internal and external audits

Internal audits of the EMS are conducted in no later than annual intervals to determine whether the EMS conforms to planned arrangements for the environmental management.

Audit programs are planned, established, implemented and maintained, taking into consideration the environmental importance of the operations concerned and the results of previous audits. EMS internal audits can be held simultaneously to safety related audits.

Selection, training and qualification of internal environmental auditors and conduct of audits ensure objectivity and impartiality of the audit process.

The results of the audits will be brought to the attention of all personnel having responsibility in the area involved. The management personnel responsible for the area involved shall take timely corrective/preventive actions on deficiencies found.

If, during the internal audits, it is determined that the Company has inadequate policies, procedures and equipment in place to ensure compliance with the EMS and regulatory requirements, to correct or to prevent non-compliance, the Company will provide all necessary funding and resources to facilitate implementation of corrective measures recommended.

The internal auditors shall produce an audit report for each vessel and for the Office audit conducted pursuant to the EMS. Such report shall contain detailed audit findings, including the basis for each finding, and shall identify any areas of concern. Audit reports shall include recommendations to correct any major non-conformities, non-conformities and observations identified. The Company shall take action on all recommendations made. The Auditors shall include information on any immediate corrective measures taken.

Audit reports shall identify and explain in narrative form all deficiencies noted during the audit process. In the event of the determination of a Major Non-Conformity, the Auditor shall make immediate notifications to the CCM, which may include a recommended course of action. The CCM shall establish and provide a corrective action plan for any deficiencies, taking into account any recommendations received from the Auditors. The Company shall address immediately any Major Non-Conformities. Corrective action shall be taken with regard to deficiencies within 30-60 days from their identification. The CCM shall report annually on the status of implementation of each corrective action to the GM.

At the conclusion of each annual round of external audits, the external auditors shall develop a Report of Findings summarizing these audits. The Report of Findings must be completed within 60 days of completion of each annual round of audits, shall incorporate information obtained from the individual audit reports, and shall provide the Company any recommendations to improve the EMS, including recommendations for follow-up audits where deemed necessary.

Auditing process

Taking into account that the Initial Environmental review met the below requirements, it would be a best practice to always consider and fulfill the following:

- All waste streams developed from any system, equipment and components found in each machinery space on board must be identified. This will include observation and documentation describing the leakages apparent on each system that can contribute to bilge loading. The audit will determine the status and quantify leakages stemming from:
 - all pump and valve seals and glands during operation,

- all piping systems, flanges, gaskets, fittings and joints,
 - all equipment casings such as main and auxiliary engines, and reduction gears,
 - operation of engines, boilers, incinerators, and evaporators, and
 - all other mechanical components found on the vessels.
- The adequacy and performance of the Oily Water Separator (OWS) and Incinerator, Sewage System, and any other pollution prevention equipment to handle the quantities and types of wastes developed during normal operations, must be ensured. It is required to conduct an operational test using the normal tank or bilge well supply as would be used in normal operations, on annual basis, at least. The supply tank or bilge well must not be diluted. It will include an evaluation of the capacities for all tanks or containers associated with the management of sludges, bilges and oily wastes or other Wastes. It will include an evaluation of documentation tracking, maintenance and repair, and modifications of all pollution prevention equipment, and notification of equipment failure to the CCM or other shoreside personnel.
- It must be ensured that even the least significant leakages contributing to waste streams are remedied in a prompt and effective manner by the responsible crew personnel.
- It must be ensured the adequacy of the policy, procedures, current practices and equipment, including storage capabilities used to manage shipboard solid wastes generated in all areas of the vessel and the effectiveness of garbage management plans.

- It must be ensured the adequacy of the policy, procedures, current practices and equipment associated with cargo management developed during all evolutions of cargo operations must be ensured.
- The ability of each vessel's crewmembers to create, devise or implement an unauthorized process to dispose of a shipboard waste including regular garbage, machinery space and cargo-generated wastes must be ensured.
- The following records must be kept, as required:
 - Oil Record Book
 - Engine room Alarms
 - Tank sounding logs (if vessel not so equipped, then it must start maintaining such a log)
 - Personal work records and lists
 - Maintenance records
 - Vendor service records
 - Bilge waste and sludge receipts
 - Deck Log
 - Garbage Record Book
 - Wastewater Discharge Log
 - Oil to Sea Equipment Interface Logs
 - Hazardous waste manifests
 - Solid waste discharge receipts
 - Content Monitor (OWS) calibration logs

- Training records
 - Vetting documents
 - Inspection Documents
 - SMS and EMS documents
- It shall assess the adequacy of the policy, procedures, and current practices used to store and dispose of the following, if applicable:
- Solvents
 - Degreasers
 - Cleaning wastes
 - Batteries
 - Paints
 - Oily rags
 - Fluorescent and incandescent bulbs
 - Expired boiler and engine chemicals
 - Used boiler and engine chemicals
 - Galley greases
 - Pyrotechnics
 - Medical supplies
 - Contaminated bunkers
 - Used Oils and greases
 - Incinerator ash
 - Transformer oils

- Contaminated refrigerants
- Hazardous materials

Moreover, the following must be always checked and to be verified:

- Environmental Familiarization for all shipboard personnel must be ensured and relevant forms must be kept accordingly. Signed statements by responsible officers attesting that they understand that false entries in the Oil Record Book for machinery space operations is a violation of law.
- Policy, procedures, and current practices associated with the Master and Chief Engineer's capability to communicate with shoreside personnel, including the CCM and designated persons.
- Frequent and adequate training sessions for crewmembers, related to pollution prevention and environmental protection.
- All personnel (shore and shipboard) are familiar to Reporting procedures related to MARPOL violations
- The handling of methods to report individual for remaining anonymous, as per "Open Reporting System" procedures.
- All environmental basic procedures, Policy and current practices are followed by all visitors and Technicians who are going to stay for a long time on board to sail with the vessel.
- It shall assess the policy, procedures, and current practices used to manage the existing seal tracking and valve locking program, including the storage of seals and preventing the use of duplicate seals.

- Procedures, current practices, and equipment used to maintain refrigeration units, including availability and status of refrigerant recovery units are in satisfactory condition whilst procedures for recovering refrigerants, and maintenance of a leak log are implemented.
- Policy, procedures, current practices, and equipment used to handle emergency releases of hazardous fluids or pollutants on deck or within machinery spaces of vessels are in order. In addition, a review of the Shipboard Oil Pollution Emergency Plan and evaluation of personnel performing such duties must be conducted, as appropriate.
- Procedures and current practices associated with ballast water management and invasive species requirements are followed.
- All fleet engineers at all levels must be aware on how to make the OWS, OCM, associated systems and waste management processes tamperproof and for methods on reducing or handling waste accumulations within machinery spaces. Participation to specific requirement shall be mandatory for all engineering personnel. The opinions of the vessels' engineers into their ability to adequately maintain the vessel systems, equipment and components will be requested. The survey will emphasize non-retaliation for open and honest opinions and reports of current noncompliant circumstances. The responses will be maintained in original format and made available to the IC.

Corrective and preventive actions

The Company has established and maintains documented procedures for preventing, detecting, investigating, and reporting (both internally and externally), any occurrence that may affect the

organization's ability to achieve the EMS objectives and targets, and for promptly initiating corrective and preventive action. Such measures must focus particular attention on incidents that may have an effect on compliance with environmental requirements as well as on environmental performance in regulated and non-regulated areas, including requirements of the EMS, or other marine environmental protection requirements.

Emergency procedures

The SMS has established and maintains procedures for mitigating any adverse impacts on the environment that may be associated with accidents or emergency situations, and for ensuring that similar incidents are avoided.

If the environmental violation or incident resulted from an identified weakness in the system, the EMS and/or the SMS shall be updated and refined to minimize the likelihood of such problems recurring in the future. The SMS also provides for the testing and evaluation of emergency procedures.

Environmental familiarization

Upon signing on, all Masters, Senior Officers and crewmembers shall complete and sign the an “Policy Acceptance” and “Environmental Commitment” declarations.

Prior to assigned duties, but not more than 7 days after joining the vessel, all Masters, Senior Officers and crewmembers shall make rounds with their predecessors, visiting all pertinent vessel locations and familiarize themselves with all equipment and machinery they will operate during their assignment onboard. Where possible, each on-signer should operate the relevant equipment alongside their predecessor to achieve hands-on familiarity.

All visitors, who are intent to sail with the vessel or to stay on board for a long time when at port, must be familiar or trained with the EMS basic procedures (i.e. garbage segregation), and the relevant forms for familiarization issues as per Company's EMS shall be completed. Upon disembarkation, all Masters, Senior Officers and crewmembers shall also complete and sign a "Declaration on Disembarkation", as well.

Training, awareness and competence

All Company's personnel (including vendors, technicians, and other non-crewmembers) whose job responsibilities affect the ability to achieve the EMS objectives and targets shall receive sufficient training and familiarization regarding the EMS requirements to enable such persons to meet their specific EMS responsibilities, as per position.

The training and familiarization should enable such personnel to be aware of, and comply with, environmental requirements specific to their duties under the EMS and other marine environmental protection requirements.

- The CCM is responsible for ensuring there are training programs in place to educate and train vessel and shore side employees.
- Training shall occur annually for all employees and may be performed by qualified instructors at a training facility and/or through Computer Based Training. Crewmembers shall receive such training before signing on board a Vessel, or if unable to receive such training due to unforeseen circumstances beforehand, within 7 days of signing on board. Existing shore-side employees associated with the technical management of the

vessels must also receive such training. New shore staff associated with the operation and management of the vessels must receive such training before assuming duties.

- The training shall include pertinent sections of the EMS and existing marine environmental protection requirements as well as discussion of the consequences to the Company and its employees for failure to comply with the requirements of the EMS. The training shall include shipboard-related technical and practical information associated with pollution prevention and the operation, maintenance and repair of pollution prevention equipment and systems, as appropriate for the work responsibilities and department in which an employee works, as well as instructions regarding:
- Corporate environmental compliance structure, including the CCM and contact details
 - Comprehensive overview of the EMS, and other marine environmental protection requirements
 - The reporting system used to report non-compliance
 - Sanctions and consequences for violations such as remedial training, suspension, termination, and civil and criminal liability
 - Pollution prevention and minimization programs specifically relating to steward, deck, and engine department procedures and operations
 - All engineering requirements of the EMS
 - Position specific training in the operation, maintenance and repair of OWS, incinerator, STP, and other pollution prevention equipment

- Procedures for solid and hazardous waste segregation and storage, disposal, and reporting of releases and
 - All other shipboard environmental protection related procedures described in the EMS.
- A basic initial training program shall be provided to vessel employees currently onboard vessels in an effort to promptly mitigate pollution risk and ensure environmental protection. Employees must also receive the full instruction described in the preceding paragraph prior to returning to a vessel on a new contract.
- The CCM will maintain a list that provides an overview of the training courses; identifies the person responsible for delivering the training; and establishes a tracking system to monitor the type, frequency and successful completion of training.

Record keeping and document control

A copy of the EMS must be kept at all times in pre-designated locations within each vessel where it can be readily accessed by shipboard personnel. Such locations must include the Master's office, the C/E's office, the Officers' smoking room and the Crew smoking room.

The CCM shall ensure maintenance of appropriate documentation relating to Company's objectives and targets; these records will be adequate for subsequent evaluation and improvement of the operation of EMS. Additionally, the CCM must document the Company's state of compliance with the EMS and other marine environmental protection requirements.

All records will be maintained and made available to Port and Flag State personnel. All Sounding Records (including draft records or forms used when taking soundings) and Logs required by the

EMS shall be maintained onboard the vessel for a period of 3 years from the date of the final entry. All E/R alarm printouts and records shall also be maintained on board for a period of 3 years from the date of generation.

Organizational decision-making and planning

The various EMS elements will be integrated into the Company's overall decision-making and planning, in particular, decisions on capital improvements or recommendations on capital improvements, training programs, vessel operations, and maintenance and repair activities. Specific information shall be provided relating to the additional resources and oversight required of older vessels within the fleet, when required.

Communication of environmental requirements

The CCM is responsible to identify, explain and communicate all environmental requirements, and any additional best practices or industry norms that the Company may choose to adopt, to all employees and other vendors, technicians or non-crewmembers engaged in the waste-stream management of the managed vessels. Changes of the EMS, as well as changes in operations or environmental requirements, shall be also communicated, as appropriate.

Operational control

The EMS will identify and provide for the planning and management of all Company's operations and activities with a view to achieving its objectives and targets. For example, vessel deck department and E/R machinery space maintenance and repair will be an important aspect in achieving and maintaining compliance and enhancing environmental performance.

Continuous evaluation and improvement

The EMS includes methods to perform periodic, documented and objective auditing of the organization's performance in achieving these objectives and targets and on how well the EMS assists the Company in achieving its objectives and targets. The goal of such internal audits and reviews is to allow management to continuously monitor and assess vessel systems, equipment and components, and the ability and proficiency at which vessel crewmembers and personnel ashore comply with the EMS.

Additionally, the EMS and the SMS:

- identify an ongoing process for assessing operations for the purposes of preventing and controlling or minimizing waste stream development and releases, ensuring environmental protection, and maintaining compliance with a primary emphasis on marine engineering, vessel machinery space systems, equipment and components and any shipboard systems having oil-to-sea interfaces, including criteria for when a vessel is to be taken out of service for an environmental discharge-related repair such as when caused by leaking stern tubes, thrusters or other equipment;
- make employee compliance with environmental policies of the EMS and other marine environmental protection requirements a positive factor, and failure to comply a negative factor, in all evaluations undertaken for the performance of all its employees; and
- provide a system for conducting and documenting routine, objective, self-inspections by the internal auditors, supervisors and trained staff to check for malfunctions,

deterioration, and inadequate maintenance of pollution prevention equipment, adherence to SOPs, unusual situations, and unauthorized releases.

Measures for engine room operation and engineering requirements

The Company implements the following engineering operation measures to ensure successful waste stream management:

Tank sounding log

E/R crewmembers are required to sound twice per day (at 08.00 and 16.00) all waste, sludge, soot, clean and oily bilge tanks associated with bilge water, oil wastes or sludge. The Tank Sounding Log shall be initialed by the crewmember that obtained the reading, and maintained in the ECR. Relevant controlled and documented form is to be forwarded to the Technical Dpt/CCM on a weekly basis, together with the appropriate page(s) of the ORB for review.

The C/E is responsible for reviewing and signing daily the entries made in the Tank Sounding Log. The soundings of tanks shall be recorded in a column "Soundings (cm)". In another column titled "Volume" the quantity is to be entered in cubic meters (m³) that corresponds to sounding figures, after utilizing the tank sounding conversion tables. All entries in this Log shall be made in ink. Corrections made to entries shall be crossed out, dated, initialed by the C/E, and the proper entry should be inserted alongside.

Oil-to-sea interface logbook

Equipment having oil-to-sea interfaces include oil lubricated stern tubes, bow or stern thrusters, stabilizers, hydraulically operated controllable pitch propellers, and similar

equipment whereby the leakage of a sealing component may cause a loss of operating medium into the surrounding waters of the vessel.

Any replenishment of oil into the head tanks, operating systems reservoirs or other receivers associated with equipment having oil-to-sea interfaces shall be logged, regardless of quantity, in a controlled and documented Oil-to-Sea Interface Log. Ingress of water or drainage of water into or from these systems shall also be logged.

Routine stern tube lube oil loss must be logged and reported immediately by the C/E to CCM on each occasion. Any non-routine (i.e. exceeding the maker's allowable limits) losses of oil from these systems shall be also logged in the relevant form. When known, an explanation of the loss shall be provided, along with date/time the loss occurred, and signature of the C/E. If any C/E fails to promptly and accurately report these conditions, the Company will investigate and take appropriate action, which may include termination of employment.

Soot tanks shall not be used for the collection of oil residue or oily bilge water. As such, all soot tanks and clean drain tanks shall have no direct connection overboard and should only be capable of being discharged through a standard discharge connection or other approved means of disposal.

This controlled and documented form is to be forwarded to the office at the end of each month, even if there was neither oil replenishment nor any water ingress during that month. In the latter case, a duly signed log with only the name of the vessel and the month must be sent to the Technical Dpt/ CCM.

Leakage log

Anytime any line or component on a fuel, lube, or waste oil system fails due to a structural failure or due to an operational error, including high pressure lines on diesel engines, as well as any significant leakage (that may have an impact on environmental issues) that occurs on board from pump and valve seals and glands, flanges, gaskets, pipes, hydraulic winches, hatch cover hydraulic motors, hydraulic jacks, cranes, control valves, deck pipes, etc. (except those necessary for packing cooling) must be identified, reported to the senior officers and rectified as soon as possible, in order to minimize the waste stream. Additionally, any other unintended releases of salt or fresh water, condensate, or cooling fluid shall also be recorded.

For each of the above situations, a record shall be made in a relevant controlled and documented Leakage Log with a notation given as to the quantity released and an explanation on how the unintended released fluid was handled. The most senior engineer involved in any of the circumstances previously described will make the entry and provide his signature.

Leakages, however minor, shall be attended to as soon as practicable, the purpose being to reduce the amount of water or oil contributing to engine room bilges. The C/O and the C/E of the vessel shall communicate such procedures amongst the deck and engine crew through their standing orders and training sessions.

Environmental Tag System

The Company has implemented an ETS and vessel personnel, under the supervision of the Master, are responsible for installing non-re-usable and uniquely numbered seals to prevent

the unauthorized usage or connections within the E/R and machinery spaces to, and discharge through, piping systems that are or may be connected to the oily bilge system.

The C/E shall maintain an Engine Room Seals Log, which will be a controlled and documented, to track and account for seals used on valves, flanges, cross-connections, etc. The log records each time a seal is affixed or removed, including the date, seal number removed, personnel involved, and reason for any seal removal / replacement, for tracking purposes.

The Master shall maintain an additional controlled and documented Master's Spare Seals Inventory indicating when seals are handed over to the C/E and their respective numbers.

When dispatching seals to the vessel, the CCM shall additionally provide a formal letter from the Company indicating the type and serial numbers of seals dispatched. Upon delivery of the seals, the Master shall confirm receipt of seals with subject type(s) and serial numbers by signing the formal letter and sending a copy to the CCM. The Master shall retain the unused environmental tags under his control in his day room.

The CCM shall ensure that no duplication occurs on ETS seal numbers fleetwide and shall have a Master tracking document indicating which series have been supplied to each vessel.

The forms Master's Spare Seals Inventory and Engine Room Seals Log are to be forwarded to the CCM at the end of each month.

Overboard valve operation

The overboard valve of the OWS shall, when not in use, be fitted with an environmental seal and kept locked with a chain and pad lock arrangement. Prior to the operation of the OWS, the engine room staff shall request permission from the Bridge OOW, so as to ensure that

discharges only take place in authorized geographical areas. The C/E is responsible and shall personally operate the padlock arrangement, prior to and after completion of the use of the OWS in an authorized geographical area. For safekeeping and preventing inadvertent operation of the OWS, the key to the padlock should be in the custody of the C/E at all times.

Bilge main cross-connections

The non-emergency use of cross-connections from the E/R bilge mains to the suction piping of pumps such as the 'fire and general service pump' or the 'fire, bilge and ballast pump' is strictly prohibited onboard the vessels. The use of cross connections from E/R bilge mains to the suction piping of larger pumps and to educt or systems or any other system capable of pumping out bilge waste directly over board, is also prohibited.

The deck plates above or near the locations of these cross connections or other interconnected systems and the valve bodies and associated hand wheels shall be painted international orange. A brightly colored sign with 3-inch (7,6 cm) letters shall be permanently fixed nearby stating: "Bilge System Piping Crossover - Emergency Use Only".

To prevent unauthorized usage, the C/E shall place ETS tags on these valves. The Seal log book shall track anytime a crossover to the bilge main is opened. If the valves are remotely operated from the ECR, the associated push button must be unable to be used without breaking an Environmental Tag. A suitable sign must be posted near the associated push buttons or switches providing similar restrictive language as to its use as stated above.

Emergency bilge suction valves

All other bilge suction valves not connected to the bilge main, and independent emergency suction to the vessel's E/R bilges, like those that may be connected to sea water circulating pumps, shall also be painted international orange. A brightly colored sign with 3-inch letters (7,6 cm) shall also be permanently fixed nearby and labeled: "Emergency Bilge Suction – Emergency Use Only". Their valve wheels will also have a numbered and logged ETS tag capable of breakaway during emergency, testing and maintenance. Environmental tag numbers shall be kept in form Engine Room Seals Log and explanations given for breakage or replacement of any tag.

Bilge and sludge lines

All other crossover valves, direct suction valves of the bilge line, overboard shore connection valves and all flanges of the bilge line and the sludge line will be fitted with numbered seals and maintained in accordance with the Engine Room Seals Log guidance.

Blank flanges

To prevent unauthorized connections within the engine room and machinery spaces, every blank flange or potentially removable flange associated with any piping leading overboard, on systems such as salt-water service, main engine raw water cooling or other systems shall be permanently secured, removed or fitted with a numbered seal through the flange bolts that will break when such bolts are removed, to prevent unauthorized connections and discharges. Alternative sealing methods, such as numbered foil-coated sticker seals for flanges, may be also considered. The blank flange securing the bilge and sludge transfer system shore connection

discharge valve at the discharge stations shall also require a numbered Environmental Tag. The applicable ETS tag numbers shall be kept in the Engine Room Seals Log.

Bilge holding tank

Every effort shall be made in order the Bilge Holding Tank (i.e. OWS source tank) to be cleaned and any accumulated oil to be removed annually as well as when needed. The cleaning operation and any accumulated oil transferred to the sludge tank for incineration or delivered ashore shall be timely recorded in the ORB.

Whenever a test is conducted, filter is replaced, BHT is cleaned, maintenance is performed, etc. then an appropriate timely entry shall be made in the PMS and in the ORB. Any malfunction and/or discrepancy must be reported immediately to the CCM.

Sewage treatment

The Company's procedures for sewage management, disposal and discharges, include the identification of persons responsible for environmental compliance and describe applicable EMS requirements, domestic and international laws and regulations, including applicable portions of the CFR, other pollution prevention laws and MARPOL regulations. Furthermore, the EMS and the SMS describe:

- internal and external reporting requirements relating to discharges
- the basic and general functions of sewage systems/equipment, and system schematics
- fundamentals and maritime practices of sewage system management in accordance with the requirements of MARPOL and the EMS

- system operation and procedures including the SOP for usage of all sewage equipment and systems, and operational checklists
- maintenance of sewage system, including routine, daily and preventative maintenance, record-keeping, and the identification and required inventory of critical spares.

The C/E shall verify that the STP is maintained in good working order at all times, and planned maintenance works are carried out regularly as per Maker's recommendations and recorded.

The following requirements which concern the discharge of sewage (black water) and grey water must be followed, in conjunction with the VGP:

- For vessels that have a STP certified as per Regulations 9 & 10 of MARPOL, Annex IV:
 - The STP shall be used when the vessel is sailing within a Special Area; any discharge of sewage shall be made only through the STP.
 - A seal shall be placed at any overboard discharge valve that bypasses the STP, when the vessel is within 12 miles from the nearest shore, or within a Special Area, or when she is sailing at a PSSA.
 - When the vessel is sailing at a distance greater than 12 miles from the nearest shore, or outside a Special Area, use of the STP is not required when the vessel has a speed of 4 knots or more and the discharge rate is approved. However, it is recommended that the STP continues to operate at all times.
- For vessels that have a holding tank and not a STP:

- When the vessel is sailing at a distance greater than 12 miles from the nearest shore, or outside a Special Area, then the discharge of sewage may take place at the approved discharge rate, when the vessel has a speed of 4 knots or more.
- When the vessel is sailing within 12 miles from the nearest shore, or at a Special Area or a PSSA, or wherever special restrictions apply, then no discharge of sewage will take place, and the holding tank will be used. In this case, the seal shall be placed at the overboard discharge valve (key to padlock to be held in the C/E's possession at all times).

The maximum permissible discharge rate of untreated sewage is 1/200,000 of swept volume, calculated as: $DR_{max} = 0.00926VDB$, where:

- DR_{max} is the maximum permissible discharge rate (m³/h). V is the ship's average speed (knots) over the period
- D is Draft (m)
- B is Breadth (m)

Each time the direct overboard valve is opened or closed, a relevant controlled and documented form Sewage Discharge Log, should be completed by the responsible person. All updated pages of the form shall be forwarded to the CCM at the end of each month.

Important notification:

- Any stricter regulations / requirements which are in force in PSSAs or at any other part of the world shall supersede the above-mentioned requirements.

- Attention shall be paid in the US, where specific waters are designated as "no discharge zones" or NDZs. Sewage discharges are prohibited in these areas. E.g. California, Florida, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New Mexico, New York, North Carolina, Virginia etc.
- Grey water is waste water generated from domestic activities such as from laundry, galley, bathing, sinks, etc., and do not contain any fecal matter or urine, or hospital drains.
- Used cooking oils from galley are not considered grey water and shall be retained on-board and discharged to port reception facilities or incinerated.
- The C/E shall ensure that the sewage overboard valves are locked in the closed position and sealed if the vessel operates in a prohibited area, to avoid any accidental discharge.
- On vessels that are fitted with a sewage holding tank and before the vessel enters a prohibited area, the Engineer on duty shall ensure that sewage is directed into the sewage holding tank and that the sewage overboard valve(s) are closed and sealed.
- The C/E is responsible for ensuring that crewmembers, who may be assigned with duties relevant to sewage processing equipment, handling and disposal of sewage, are familiarized with the equipment and trained properly.
- Each time the overboard discharge valve is opened or closed or chemicals are added, an entry to the E/R Logbook must be recorded by the person in charge of the operation.
- Any malfunction and/or discrepancy must be reported immediately to CCM.

Incinerator

The C/E shall verify that the following requirements are always met:

- The Incinerator shall be maintained in good working order at all times, and planned maintenance works are carried out in accordance with the manufacturer's recommendations. All maintenance must be recorded timely. Routine checks should be carried out as per a controlled and documented form Waste Oil Incinerator Checklist, which shall be forward to the CCM, as scheduled. Any malfunction must be reported immediately to the CCM.
- The Incinerator shall be routinely utilized to minimize the quantity of waste oil residues (sludge) and for burning of oily rags, cooking oil and garbage, as appropriate.
- Quantities of the sludge incinerated are recorded in the ORB, while quantities of other waste incinerated, such as garbage, oily rags, etc. are recorded in the GRB.
- The C/E must assess the adequacy of the capacity of the Incinerator to burn the generated sludge, and if found insufficient, the CCM must be informed.
- Chamber cleaning and other maintenance shall be recorded as per Company's PMS.

Deck and engine room flexible hoses

The Master and the C/O are responsible for the storage of all flexible hoses of one (1) inch in diameter or more. These hoses must be kept in secure location(s) under lock and key. The inventory of Flexible Hoses is maintained on different controlled and documented forms for deck and engine accordingly, by the responsible Officer and the Master. The flexible hoses' use must be minimized, monitored, and their use is permitted only after Master's authorization of the C/E or C/O.

Refrigerant log

During installation, maintenance and final disposal of equipment containing Ozone Depleting Substances, the deliberate emission of these substances to air is prohibited. ODS must be recovered and disposed to appropriate shore reception facilities for further treatment. ODS commonly encountered onboard ships (as refrigerants or firefighting substances) include the following:

- Chlorofluorocarbons (CFCs)
- Halon
- Carbon tetrachloride, Methyl chloroform
- Hydrobromofluorocarbons (HBFCs)
- Hydrochlorofluorocarbons (HCFCs) (R22, R141b)
- Methyl Bromide
- Bromochloromethane (BCM).

The use of CFCs and Halons is prohibited. Halons are prohibited both for refrigerant and firefighting applications. Use of HCFCs in existing installations is permitted until 1/1/2020, subject to phase-out scheme as per the following list. However, there are more substances subject to restriction of emissions to the atmosphere. In case of maintenance by the shipboard personnel, if in doubt that a substance is subject to emission restrictions, the C/E must contact the Company. Refrigerants are categorized as follows with respect to their contribution on Ozone Depletion:

- Category 1 / Prohibited in new installations from 19/5/1995: Halon, R11, R12, R13, R111, R112, R113, R114, R115, R211, R212, R213, R214, R215, R216, R217.
- Category 2 / Prohibited in new installations from 1/1/2020: R21, R22, R31, R121 to R124, R131 to R133, R141 to R142, R151, R221 to R226, R231 to R235, R241 to R244, R251 to R253, R261 to R262, R271
- Category 3 / No restriction apply: R290, R134a, R32, R404a, R407a, R407b, R407c, R410a, R413, R417, R507, R600, R717, CO2.

The substances of Category 3 are not considered and controlled as ozone depleting.

For monitoring purposes, the following records must be maintained onboard regarding ODS:

- A list of equipment containing ODS as per a relevant controlled and documented form.
- An Ozone Depleting Substances Record Book, when rechargeable systems containing ODS are available onboard. A controlled and documented form may be used for this purpose, unless the vessel's Flag Administration specifies otherwise.
- A controlled and documented Refrigerant Leakage Log when no rechargeable systems containing ODS should available onboard.

Weekly test of the vessels' systems for refrigerant leakage should be carried out. The test should be recorded in the Engine Log Book. Any malfunction/ leakage detected must be immediately reported to the Technical Dpt & CCM.

OWS & OCM operation

Any discharge into the sea of oil or oily mixtures shall be prohibited, except when the ship is proceeding e-route, and under the following conditions:

- The oily mixture is processed through the OWS, which is equipped with an OCM, and the oil content does not exceed 15 parts per million without dilution.
- Any emergency discharge permitted under MARPOL regulations, provided that any such emergency and action taken in connection therewith is timely and properly recorded in the ORB.
- When the vessel is in a MARPOL Annex I Special Area, the OWS shall be provided with arrangements to ensure that any discharge of oily mixture is automatically stopped when the oil content of the effluent exceeds 15 ppm.
- Any stricter local regulations shall supersede the above-mentioned requirements.
- When the vessel is closer than 12 miles from US shore, the overboard discharging of any treated bilge water is prohibited.

The C/E shall verify that the following requirements are always met:

- No improper or illegal discharges of oil or untreated bilge water into the sea ever occurs.
- All entries in the ORB must be accurately, timely and properly completed, each time the OWS is used. The person who performs the operation must sign the entry.
- No unauthorized tampering of the OWS or OCM or the associated piping shall be permitted.
- Accurate reports for the condition of OWS and OCM shall be sent to the Company as per PMS.
- All numbered seals are properly installed at the OWS and OCM piping and recorded in the form Engine Room Seals Log.

- Prior to the operation of the OWS, permission must be requested from the bridge in order to ensure that discharges take place in authorized geographical areas.
- The sample line from the OWS discharge to the OCM will be painted with orange color, so that it is distinguished from other tubing and piping.
- The OWS discharge lines are painted with orange color, so that they are distinguished from other piping.
- No additional connections or tees of any kind are attached to the sample line from the OWS to the OCM.
- All the critical spares for the OWS and OCM are to be retained on board.
- All engineering Officers are trained at least annually to ensure their familiarity with the operation of the OWS and OCM (including its memory card, where applicable), and the relevant environmental policies and procedures.
- The OCM should be calibrated in accordance with the manufacturer's instructions by an external authorized vendor and recorded by the C/E in the ORB under Code I. A file must be maintained onboard and ashore for calibration certificates.
- No piping interconnecting the Sludge and Bilge system is allowed.
- A poster shall be posted on the OWS stating that the OWS shall not be operated without C/E's permission.
- USCG pollution warning poster shall be posted close to the overboard discharge valve.
- A copy of OWS piping diagram shall be posted on the OWS.

The rate of discharge of the OWS and any other parameters mentioned in the maker's manual must be monitored continuously, in case the observed parameters deviate from those set forth in the manual, the reasons must be investigated and reported to the CCM immediately.

Routine checks should be carried out as per a controlled and documented form for Oily Water Separator and Bilge Alarm Checklist, which shall be forward to the Technical Dpt / CCM at the end of each month. Any malfunction should be immediately reported to the Technical Dpt and CCM.

Additional OWS / OCM requirements

The sample line from the OWS discharge connection to the sample/flush line control valve shall be painted with orange color to distinguish it from other tubing and piping in the area. The line must be routed so it is clearly visible to the extent possible for its entire length. No additional connections or tees of any kind may be added to the line and any tampering with the line shall be prohibited. Environmental seals should be placed on both ends of the sample line to avoid tricking the OCM with fresh/clean water flow. The FW flushing line should be painted with blue color, to be distinguished from other lines.

The end connecting to OWS discharge pipe may be fitted with a manual valve or petcock, or tamper proof automatic valve. The tube end fittings and the valve handle must be fitted with a numbered seal that will break if the valve is closed, removed or if the tubing connection nut is loosened. The end nearest the sample/flush line control valve and any tubing in between the control valve and the OCM will be similarly protected to prevent any disassembly of the sensing system.

The C/E shall ensure that the OCM will sample the OWS discharge after entire discharge stream is filtered and before control action of the main discharge 3-way valve. Placement of filters in the sample line leading to the OCM is prohibited.

When ordering chemicals for cleaning the OWS, air cooler, purifiers and for de-carbonizing, etc., it is important to understand that these can affect the environment as well as the operation of equipment. Thus, special care must be given in choosing the appropriate cleaning agent. Detergents are treated as chemicals and placed in a special locker along with their MSDS. Preference shall be given to environmentally friendly products.

Every vessel shall perform weekly operational tests of the OWS and OCM. The test shall be logged in the vessel's ORB accordingly.

Every vessel shall conduct an annual operational test of the OWS system under actual operational conditions, in accordance with the manufacturer's recommendations. The test shall include an hour of continuous processing of the contents of BHT without dilution, conducted by the C/E in the presence of a Superintendent, if any, and the 2nd Engineer; provided that if an actual discharge is not feasible due to the vessel's location or the levels of BHT, then the discharges shall be through a recirculation line, as per the procedures approved by Class, and provided further that soundings of the BHT shall be made before and after the test and shall be made a part of the test record; any alarms shall be recorded and made part of the test record, and all of the above shall be recorded in the ORB. In the event that the assessment determines that the OWS is not adequate, then an immediate report shall be made to the CCM, with a copy of the E/R alarm printout to be retained and appended to the ORB page documenting the test.

A test performed where the source tank is diluted with water or does not contain a representative sample of bilge water is prohibited.

Bunkering

Whenever bunkering takes place, the operation must be carefully planned and executed in accordance with all international and national regulations which may apply. The Chief Engineer is directly responsible for all bunkering operations but it should be borne in mind that Master carries ultimate responsibility and is liable to prosecution in the event of spillage.

The Chief Engineer shall prepare the a relevant controlled and documented form for Bunkering Plan and ensure that copies of same are handed to all personnel engaged in the procedure. Additionally, a copy is to be conspicuously posted in a suitable location. The Bunkering Plan must include the following information:

- fuel information (name, color, odor)
- hazards involved
- identification, location and capacity of the vessel's tanks designated to receive bunkers during the procedure
- level and type of oil in each tank before bunkering
- calculated final sounding, ullage and percentage of filling of each tank
- sequence by which the tanks are to be filled
- procedure by which tank levels are to be regularly monitored

The Chief Engineer will ensure that framed copies of the Bunker Transfer Procedure are posted in the Upper Deck Alleyway (P & S) and near the Manifolds as required by USCG CFR33 Part 155.

The Chief Engineer shall ensure that actions taken before, during and after bunkering are in accordance with the relevant controlled and documented Bunkering Checklist with an entry made in the Engine logbook. Another controlled and documented form for Sulphur Content Monitoring Log should always be kept updated. Copies of Bunker Delivery Notes (BDN) and sample detail forms should be sent by email to head office after bunkering.

Fuel change-over procedure

All managed vessels' operations shall fully comply with the MARPOL Annex VI regarding requirements for Sulphur Oxides (SO_x) emissions, both inside and outside SO_x Emission Control Areas (ECAs), as well as with the relevant regional requirements imposed by local authorities.

Before entering an area where emission restrictions apply, Chief engineer should switch over to low Sulphur fuel allowing sufficient time to flush the fuel piping system after switching over. At entrance into ECA control area the ship must operate on low Sulphur fuel oil. The Chief Engineer shall ensure that actions as per the controlled and documented ECA Fuel Change over Plan must be executed.

On completion of the procedure, a relevant controlled and documented Fuel Change over Log should be completed as evidence of the proper implementation with the procedure.

Critical Equipment

The following are identified as Environmental Critical Equipment:

- OWS & OCM
- Incinerator
- Sewage treatment plant
- Bilge pump
- Sludge pump
- E/R bilges alarm

The C/E ensures that the critical equipment is kept in good working order at all times. Relevant SMS forms document the maintenance plan and working condition.

A spare parts identification and rapid replacement program for the vessels' pollution prevention equipment is established by the Company. In this respect, minimum spare parts for each vessel's environmental critical equipment are defined. It is the C/E's responsibility to ensure that minimum spare parts, as described below, are available onboard, so, in case such a spare part is used, the C/E must inform the Company and attach a spare parts requisition form. He shall also ensure that adequate number of spare pumps' seals and flange gaskets (as identified by the Company's Superintendents), that require rapid replacement in order to minimize leakages and reduce waste stream development in every machinery space, are available onboard. All relevant requisitions shall be treated as high priority.

Critical Spare Parts:

- OWS & OCM:

- 1 full set of new filters
- 1 discharge 3-way valve
- 1 bilge pump pressure gauge
- Incinerator:
 - 1 set of ignition electrodes
 - 1 photocell
 - 1 burner nozzle
- Sewage Treatment Plant:
 - Chlorinating tablets or powder for 30 days
- Leakage Remedy (Rapid Replace Material):
 - 1 set of mechanical seals for each shaft diameter
 - 1 meter of seal packing of each size used
 - 0.5 sq. meter of flange packing for steam, water, oil and fuel

All environmental critical spare parts should also be identified in the PMS.

Especially, for the vessels that are equipped with Aux. Boiler being capable to be utilized for incineration as specified in respective IOPP certificate, the Aux. Boiler should be considered as back-up/stand by equipment for the incinerator, leading to cancelling of the requirement for the incinerator critical spare parts.

Bilge & Sludge Delivery

The Company shall arrange for the disposal ashore of bilge and sludge, whenever needed.

Whenever bilge or sludge quantities are delivered to shore reception facilities, a receipt shall be

demanded by the Master from the facility stating the date and time of the transfer and the quantities delivered ashore. These receipts shall be maintained attached to the ORB.

Oil Record Book Entries

Entries in the ORB shall be made and signed by the Officer(s) in charge of the operation, in accordance with applicable regulations, flag requirements and industry guidance. Each page shall be signed on completion at the bottom by the vessel's Master.

- All entries should be made in English.
- Operations to be recorded in chronological order as they have been executed on board.
- Dates should be entered in dd-MONTH-yyyy format, e.g. 15-NOV-2016.
- The Code "C" refers to the management of oil residues (sludge and other residues) such as transfer, collection, disposal, evaporation and incineration.
- Code "H" (Bunkering of FO or bulk LO) must be completed in every case of bunkering.
- Code "F" refers to failure and restoration of operation of OWS, OCM or stopping device.
- Code "I" refers to Additional operational procedures, general remarks, de-bunkering of FO or entries pertaining to earlier operational entries.
- Details of all E/R bilge and sludge handling operations shall be recorded in the ORB.
- Reference to cooking oil is clearly stated that: It must be disposed to a shore reception facility. The receipt will be filed in GBB. If not disposed as above, then it may be mixed with garbage (rags) in order to be incinerated and relevant entries must be recorded in GRB.

- When bunkering operations are carried out, it is important that the operation is entered in the ORB upon completion of the operation, in order to maintain chronological sequence in the ORB. Quantity of bunkers or lubricants should be entered in metric tons.
- Draining of any tank included in the supplement of the IOPPC is considered to be a transfer operation. Any such movement of liquid from one location to another shall be recorded in the ORB under Code C12.2.
- In the event that water is evaporated during the heating of the waste oil tank, the quantity shall be recorded in the ORB under Code C.12.4.
- For the overboard discharge of bilge water accumulated in machinery spaces, Code “D” (non-automated discharge) shall be used. It means that the overboard discharge takes place through the OWS which is equipped with automatic stopping device and the operation is carried out under the supervision of the C/E. All items concerning code "D" must be filled correctly by entering the quantity, start and stop time and the method of discharge or disposal.
- If a wrong entry has been recorded in the ORB, it should immediately be struck through with a single line in such a way that the wrong entry is still legible. The wrong entry should be signed and dated, with the new corrected entry following. The ORB shall have correct entry codes without erasures, tipex use or missing pages.
- Sufficient space shall be used for all entries in the ORB; where required, several lines may be used. No entries should be “squeezed” into one line making the entry illegible. Do not leave any full lines empty between successive entries.

- Tank nomenclature should be recorded as per the format noted within the IOPPC.
- The Engineers should pay attention to any additional Flag requirements.
- Attention should be paid to the recorded quantities of bilge water managed through the OWS, the duration of operation and OWS capacity according to maker's specifications.
- Attention to be also paid to the recorded quantities of sludge managed through the Incinerator, duration of operation and Incinerator's capacity as per maker's specifications.
- Records of sludge and bilge disposal to shore facilities shall be maintained in the ORB.
- Failure to keep proper records when completing the ORB is itself an offence rendering the ship and her crew liable to penalties. If the records have not been entered as required by MARPOL or are not easily legible, fines and investigations may result.
- Masters must be aware that as they sign the bottom of each page, they are attesting to the accuracy and correctness of the entries. The rule is ALWAYS: Read carefully before you sign anything.
- All entries shall be made in ink immediately after the operation takes place. Oil Record Book entries should be made promptly upon completion of each operation.
- In the event of an accidental or other extraordinary discharge of oil, a statement shall be made in the ORB of the circumstances and the reasons for the discharge under code "1". An immediate report to the CCM must also be made explaining the situation.
- The ORB shall be preserved onboard for 3 years after the date of the last entry.
- In the event that the ORB entries are found by ship personnel to be in error at a later date or which require to be clarified, the Company should be notified immediately.

Important notification: Falsification of entries in the ORB is a violation of law and Company's policy, and the responsible persons will be prosecuted by governmental authorities.

Criteria for taking out of service a vessel for environmental related repairs

When the oil replenished in the oil-to-sea interface systems is above the manufacturer recommended limits, or close to them with an upward trend, the following measures shall be taken:

- Investigation shall be conducted for the cause of leakage, which may be allocated to a defect of internal piping and tank system and may be rectified in situ.
- If above investigation does not reveal the cause of leakage, further investigation may include use of divers for underwater examination of the propeller sealing system, for the presence of foreign objects (fishing nets, ropes, etc.), if feasible. In case of positive findings, removal of the foreign objects may rectify the leakage.
- The secondary means of oil sealing (back-up oil sealing ring) may be activated, in case the primary oil sealing ring has been damaged.
- The oil level of the gravity tank may be decreased, in order to reduce the positive oil pressure until the oil leakage is reduced within limits or eliminated.
- If required, high viscosity oil shall be added in the system, in order to reduce or eliminate the leakage of oil at sea.
- Depending on each case, if the above prove to be insufficient, repair works may be decided, which might include dry-docking of the ship.

When there is significant ingress of sea water in the ship, through the oil to sea interface systems, the following measures shall be taken:

- Investigation shall be conducted for the cause of leakage, which may be allocated to internal piping / system defect and rectified in situ.
- If above investigation does not reveal the cause of leakage, further investigation may include use of divers for underwater examination of the propeller sealing system, for the presence of foreign objects (fishing nets, ropes, etc.), if feasible. In case of positive findings, removal of the foreign objects may rectify the leakage.
- The aft seal tank (leakage indicating tank) inlet valve may be closed, in order to control the leakage and avoid excessive accumulation of sea water in the engine room.
- If required, water absorbent and tolerant high viscosity oil may be added in the system, in order to maintain lubricity and reduce or eliminate the ingress of water.
- Depending on each case, repair works shall be decided, which may include dry-docking of the ship if necessary.

When such sea water or oil leakage has been restricted below the above-mentioned manufacturer recommended limits, the environmental defect can be closed and the case be considered as a usual machinery defect.

Fleet engineers survey

The Company shall survey all fleet engineers on its vessels, at all levels, for information on how to make the OWS, OCM, and associated systems and waste management processes tamper-proof, and for recommended methods on reducing or handling waste accumulations within

machinery spaces. An assessment requesting the frank opinions of the vessels' engineers into their ability to adequately maintain the vessels' systems, equipment, and components will be included. The survey will emphasize non-retaliation for open and honest opinions and reports of current non-compliant circumstances.

Participation is mandatory for all Engine Officers. The responses will be maintained in original format and made available to the IC. The original survey responses shall be included in the Report of Findings. The CCM shall evaluate the responses and establish a plan to evaluate, test and implement viable tamper-proofing solutions and methods to reduce and handle waste accumulations and slops and shall also address all suggested maintenance concerns. A summary of the reported information and corrective actions will be provided to GM.

A relevant controlled and documented Fleet Engineers Survey report is to be filled by Engine Officers when requested (once during their service on board, at least).

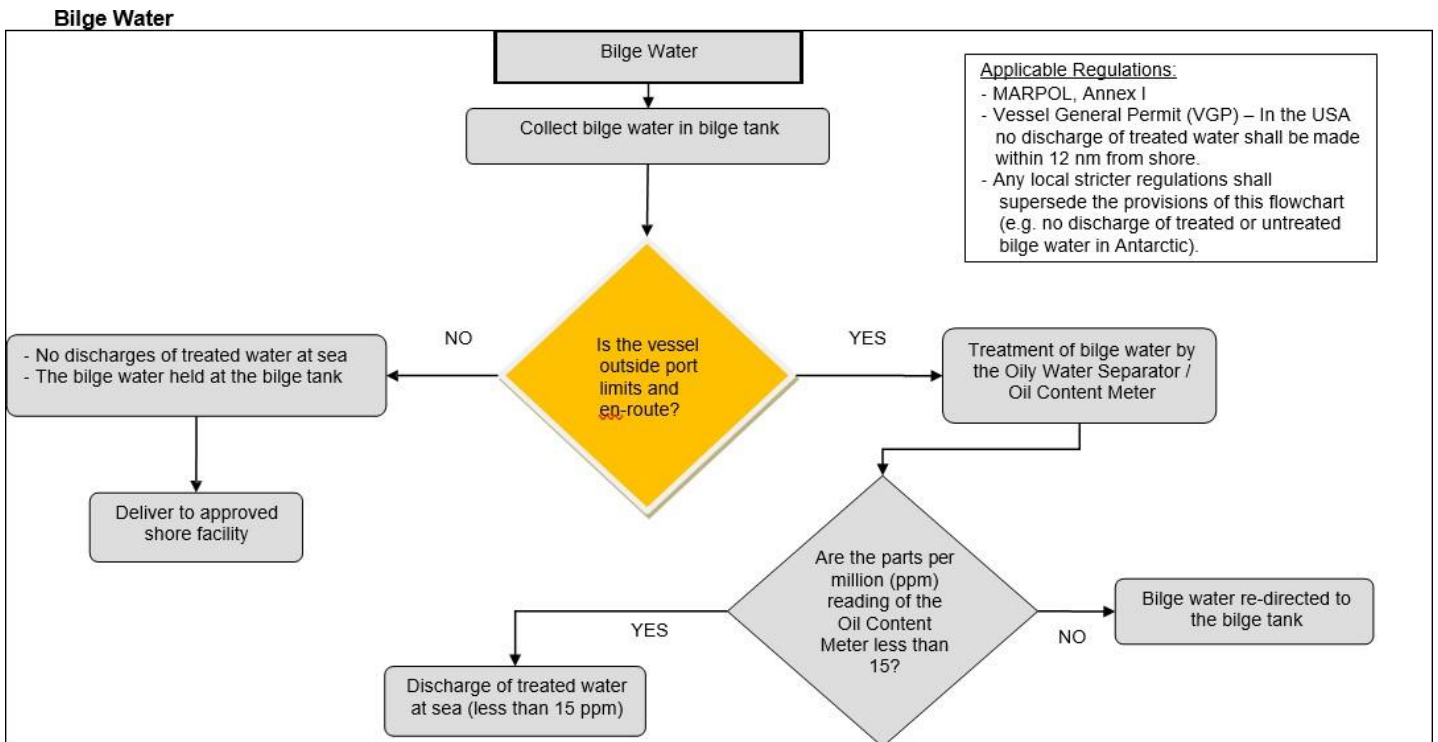
Waste stream management plan

Company has identified procedures regarding the management and disposal of the Waste Stream, in compliance with the applicable rules and regulations and other EMS standards.

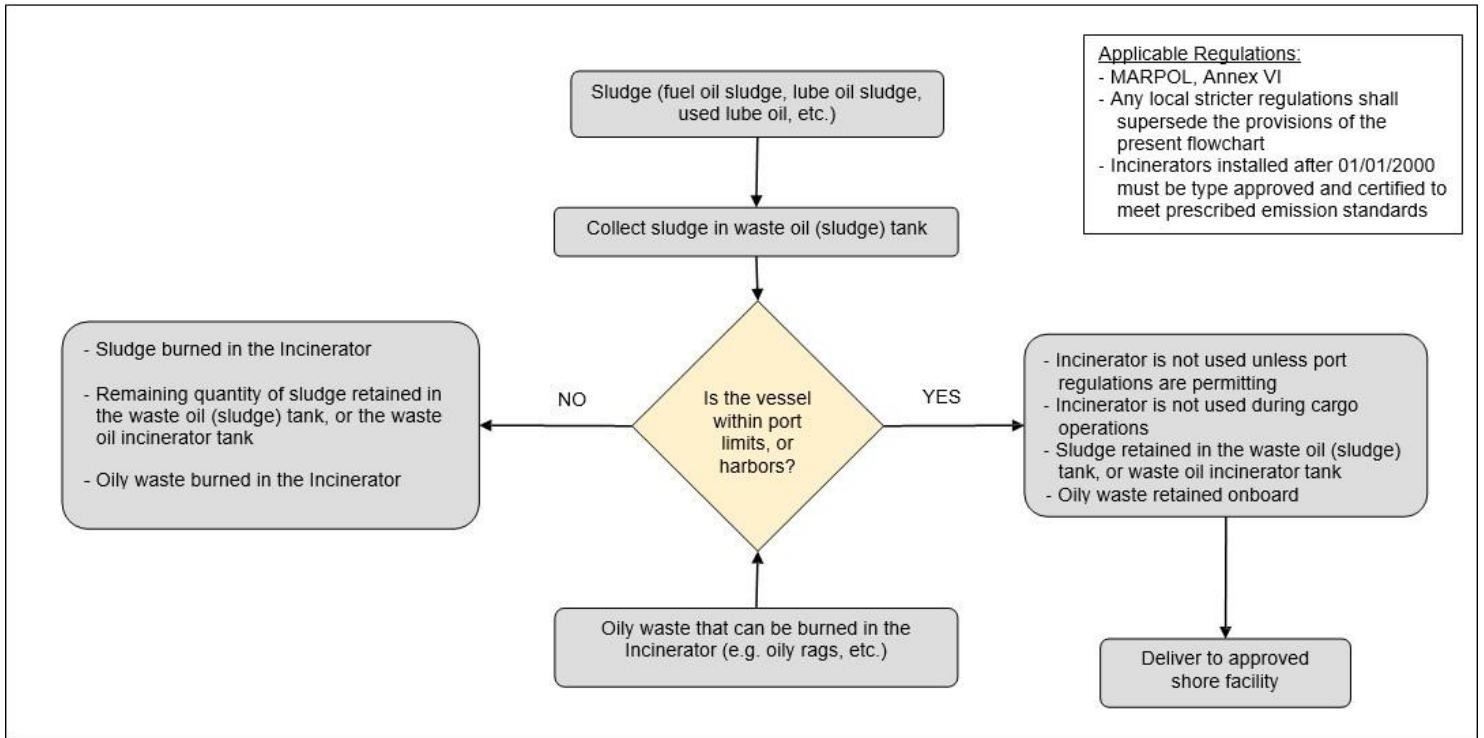
Below management plans have been developed and relevant flowcharts have been created in order to depict management of wastes on board vessels:

- Bilge Water (The present flow chart was created on condition that the OWS and OCM are properly operating. In case of defect of the OWS and / or OCM, then the bilge water shall be held on board, or delivered at approved shore facilities.)

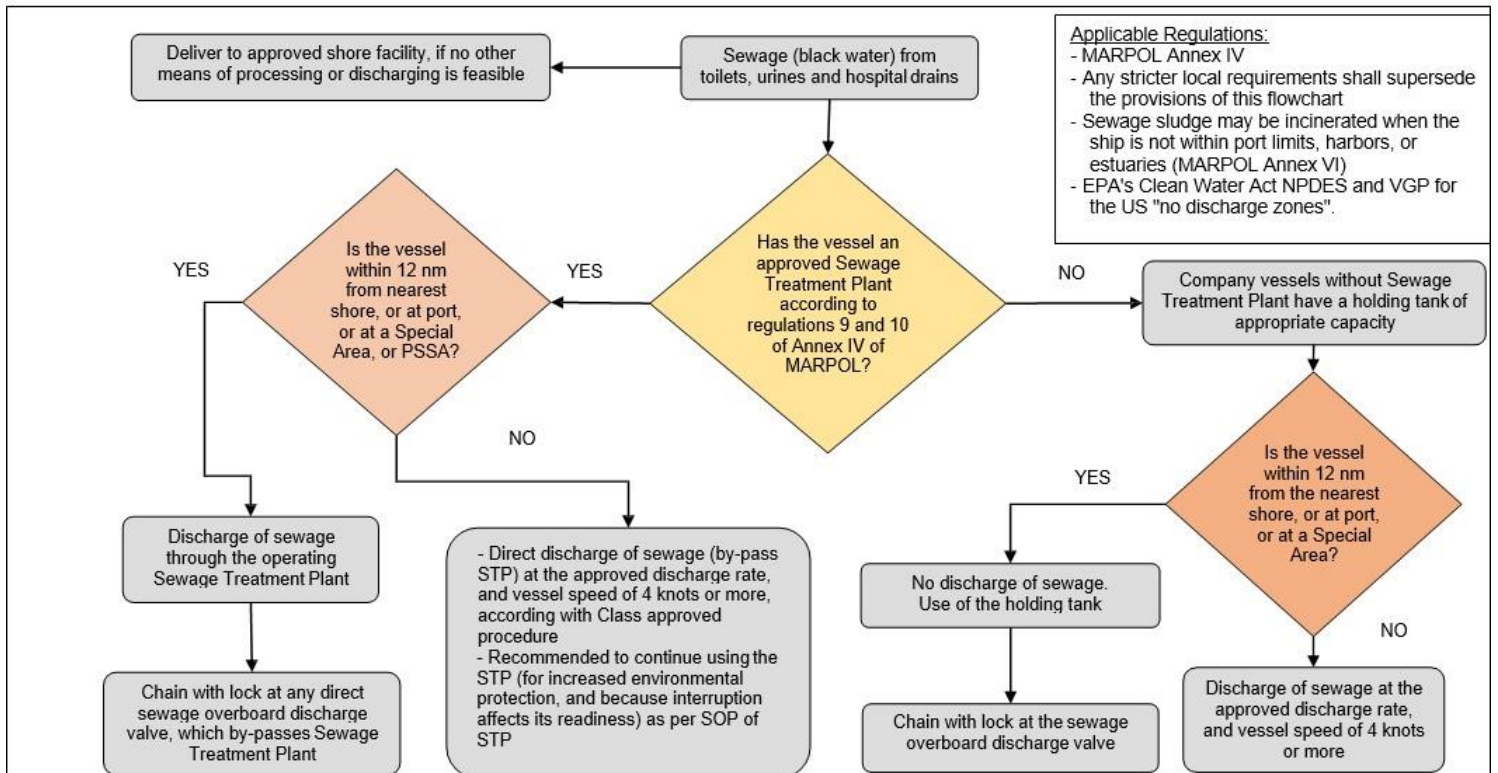
- Sludge (When the Incinerator is not operable, sludge shall be retained on board or delivered to approved shore facilities.)
- Black Water – Sewage (The present flow chart was created on condition that the Sewage Treatment Plant is properly operating. In case of defect of the Sewage Treatment Plant, any discharges shall take place outside 12 nm from the nearest shore, or outside a Special Area, when the vessel has a speed of 4 knots or more, and at an approved discharge rate, or the sewage shall be delivered at approved shore facilities.)
- Grey Water (PSSA stands for Particularly Sensitive Sea Area, where any particular requirements should be followed.)



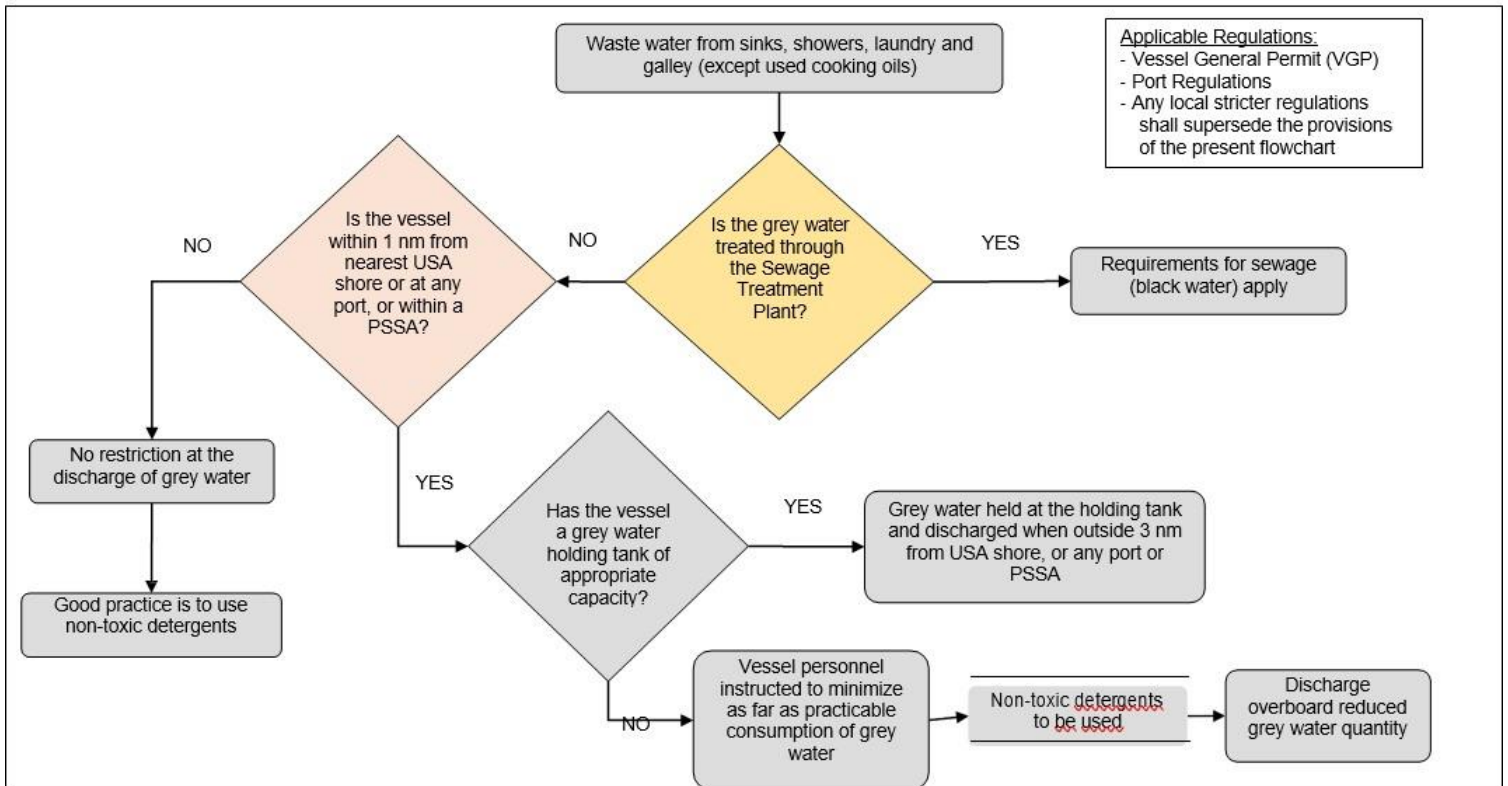
Sludge



Black Water (Sewage)



Grey Water



Standard operating procedures

The company has created processes for certain operations that specify the actions required to perform tasks in compliance with rules, laws, and standards, as stated below:

Standard Operating Procedure for the OWS

The C/E shall personally supervise the operation of the OWS. No one operates the OWS and OCM, unless:

- The Chief Engineer every time instructs this person to do so, under his supervision.
- He has received appropriate training in the operation of the OWS and OCM.
- He has reviewed and understood the posted operating instructions.

- He has read and understood the Company's requirements for the operation of the OWS and OCM, which also include check of the calibration date of the sensing unit and determination that the calibration took place within the last year.
- He opens/closes the overboard discharge valve only after C/E's instructions / supervision.
- He understands that the discharge of oil or of untreated bilge water into the sea in excess of legal limits is against Company's policy and against the law. Also, he understands the civil and criminal liabilities and penalties of such actions.

Rate of discharge of OWS must be monitored continuously; in case the observed discharge rate varies substantially with the rated discharge capacity of the OWS, necessary checks to be made and the Company must be informed regarding the situation.

On each occasion OWS is used, entries must be made in ORB immediately thereafter.

The OWS and the OCM must be maintained in good working order at all times. Maintenance should be carried out on a regular basis and recorded in the PMS. Routines and procedures of OWS filter cleaning / renewal shall be carried out as recommended by the makers. As per maker's recommendations, after use of the OWS it must be flushed with clean water to remove remaining oil in order to keep the coalescer elements and the unit clean.

The FW flushing line to the OCM is to be painted with blue color and the sampling water line to the OCM with orange color (to distinguish them from the other lines).

Operating procedures of the OWS must be posted in the vicinity of the equipment. The Maker's manual shall be available in the ECR for reference by the engine crew.

Ship staff shall report any malfunction of the OWS or OCM as top priority and immediate steps shall be taken for rectification. The malfunction must be entered in the ORB under section F. In the event of a failure of the OWS, all E/R bilges must be retained onboard and disposed ashore to reception facilities, and relevant entries shall be made in ORB. In the event the OWS or OCM cannot be repaired on board, proper notices must be placed next to the malfunctioning equipment prohibiting its use and the Class Society/Flag must be informed. Any malfunction shall be also reported to the Port Authorities of the arrival port, as per MARPOL relevant requirements.

Operational tests of the OWS and OCM must be carried out as per maker's instructions prior any discharge and recorded in the ORB. The OCM is tested, depending of the maker, either:

- Through a function that simulates a value higher than 15 ppm or
- By the use of an object or liquid that activates the optical sensor.

When this simulation is taking place, and the value of the OCM exceeds 15 ppm, then the discharge of the OWS should be redirected to the bilge tank, or the bilge pump feeding the OWS should be automatically stopped.

Standard Operating Procedure for the Incinerator

No one operates the Incinerator unless:

- The Chief Engineer every time instructs this person to do so.
- He has received appropriate training.

- He has reviewed and understands the posted operating instructions as well as the Company's policies.

Vessels shall ensure that Incinerators are fully functioning and properly used in order to minimize the quantity of waste oil residues to be disposed ashore.

Incineration of the following substances is strictly prohibited for avoiding pollution of air:

- Cargo residues of substances subject to MARPOL Annexes I, II and III or related contaminated packing material.
- Chemical substances included in Chapter 17 of the IBC Code and presenting an environmental pollution threat according to Annex II, and harmful substances identified as marine pollutants in the IMDG Code.
- Polychlorinated biphenyls (PCBs) which are mainly liquid substances used as coolants and lubricators in electrical apparatus like transformers. Trade names are Aroclor (USA), Clophen (Germany) and Kanechlor (Japan).
- Garbage as per Annex V of MARPOL when containing more than traces of heavy metals.
- Refined petroleum products containing halogen compounds.
- Polyvinyl Chlorides (PVCs) unless the Incinerator is IMO type approved for burning this category of substances. Check that the Incinerator Certificate states approval as per MEPC 59(33) or MEPC 76(40) prior to processing PVCs. (PVCs are used for manufacturing plastic products. Onboard ships, it may be mainly found in plastic bugs and packing, furniture, appliance external construction, plastic pipes, etc.).

Incineration of garbage and oil sludge is permitted, but shall not take place in ports, harbors and estuaries. The Incinerator is used only outside the areas bounded by the local requirements. It should be noted that burning of sludges of HSFO inside ECA areas is permitted.

Incineration is only allowed in Class-approved Incinerators specially built for the type(s) of waste intended to be incinerated and the operation must strictly follow the makers' procedures.

Regarding documentation to be kept onboard for Incinerator's operation for burning garbage the following should be recorded in the GRB: Incineration operations, date and time of starting/stopping of the operation, position of vessel, type and amount of garbage in m3.

If any abnormalities are observed in the operation or testing of the Incinerator, the CCM must be informed immediately, and if necessary, maker's attendance must be arranged. If required, the Port Authorities of the arrival port have to be notified as per MARPOL relevant requirements and dispensation obtained from the Flag Administration.

Any maintenance work on the Incinerator must not compromise the type approval certification.

Entry for evaporation of water from incinerator waste oil tank must be made in the ORB, under Code C 12.4.

Standard Operating Procedure for the STP

To avoid pollution from sewage while the ship is in port, the STP and holding tank should be checked to ensure correct operation and that the level of the holding tank is as low as

practicable prior to arrival in port. Manufacturer’s instructions on maintenance and cleaning should be complied with.

Requirements for Sewage discharge:

SEWAGE STATUS	DISTANCE FROM LAND	SHIP'S SPEED	DISCHARGE POSSIBILITY OR CAPACITY
Sewage not comminuted or disinfected from a holding tank	12 miles	>4knots	The sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when ship is en-route
Sewage comminuted and disinfected from a holding tank	3 miles	>4knots	The sewage that has been stored in holding tanks shall not be discharged instantaneously but at a moderate rate when ship is en-route
From an approved STP	**No restrictions	**No restrictions	The effluent shall not produce visible floating solids nor cause discoloration of the surrounding water

- Ships equipped with STP shall comply with local port regulations before discharging processed effluent within port area.
- In case of any doubt, sewage effluent should be retained onboard and discharged at sea as applicable.

A Defect Report shall be submitted to the office in case of defects of the STP. Any malfunction shall be also reported to the Port Authorities of the arrival port, as per MARPOL and EPA’s VGP relevant requirements.

Chemical dosing / adding should be as recommended by the Maker.

Chemicals used for cleaning of toilets should be as per recommended by the Maker. Supply of equivalent chemicals from another approved supplier can be considered in case the original chemicals are not available.

Where sewage is to be discharged at a different combination of draft and speed, one or more secondary discharge rates may also be approved as per the table below:

DISCHARGE RATE (m ³ /h)					
SPEED (kt)	4	6	8	10	12
DRAFT (m)					
5	4.63	6.94	9.26	11.57	13.89
6	5.56	8.33	11.11	13.89	16.67
7	6.48	9.72	12.96	16.20	19.45
8	7.41	11.11	14.82	18.52	22.22
9	8.33	12.50	16.67	20.83	25.00

Standard Operating Procedure for the Seal Program

All flanges in the E/R sludge lines, bilge lines, and boiler blow-down line should be sealed with Company's numbered seals.

A seal is placed between the flanges in such a way that every opening of the flanges necessitates breakage of a seal.

The Engine Room Seal Log Book, is maintained by the Chief Engineer.

The Master's Spare Seals Inventory, is maintained by the Master.

Emergency bilge suction valve must also be fitted with numbered seals. The seals must be replaced after trying - out the Emergency suction valve.

'EMERGENCY BILGE SUCTION - EMERGENCY USE ONLY' must be stenciled near the Emergency Bilge suction valve.

Only one seal should be used at one location. The use of multiple seals is to be avoided where possible.

Every blank flange associated with bilge and sludge systems shall be sealed and the seal number shall be noted in the Engine Room Seal Log Book.

Any existing seals that are found to have deteriorated or had their numbers partially/ completely erased shall be replaced immediately, with the reason for replacement entered in the Seal Log.

The Master must initiate an investigation for any missing/broken seal.

Standard Operating Procedure for Waste Disposal

Aerosol Cans: Landed as hazardous waste for recycling or landed as hazardous waste (Do not incinerate).

Batteries/ Nickel cadmium, alkaline, carbon-zinc and other universal waste batteries: Landed as hazardous waste for recycling, or landed as hazardous waste (Do not incinerate).

Cooking Oil: Incinerate (Note 1).

Galley Greases: Incinerate (Note 1), or landed ashore.

Dunnage, lining and packing materials that floats: Incinerate (Note 1), or landed as non-hazardous waste.

Dunnage, lining and packing materials that do not float: Incinerate (Note 1), landed as non-hazardous waste.

Expired chemicals products (i.e. expired shelf life): Landed as hazardous waste, or returned to vendor or distributor, or landed as non-hazardous waste, if non-hazardous status confirmed by vendor or distributor or by the CCM.

Used Engine Chemicals: They should be clearly marked in order to ensure proper handling by the shore facilities.

Expired Pharmaceuticals: Landed as hazardous waste.

Fluorescent lamps/bulbs (spent): If unbroken, land as hazardous waste, or if broken, containerize and land as regular waste.

Food waste comminuted or ground: Discharged to sea in "Sea Condition". Ships outside special areas - Discharge permitted 3 nm from the nearest land, en route and as far as practicable. Ships within special areas - Discharge permitted 12 nm from the nearest land, en route and as far as practicable. In the US, Food wastes must be separated from other wastes and disposed of to an authorized food waste handler.

Food waste not comminuted or ground: Discharged to sea in "Sea Condition". Ships outside special areas - Discharge permitted 12 nm from the nearest land, en route and as far as practicable. Ships within special areas - Discharge prohibited. In the US, Food wastes must be separated from other wastes and disposed of to an authorized food waste handler.

Fumigant bags or containers: Incinerated (Note 1), or landed as hazardous waste for recycling.

Glass, bottles and crockery: Landed as non-hazardous waste.

Incinerator ash and residue, excluding the residue from plastic products: Landed as non-hazardous waste.

Maintenance waste (materials collected by the engine and deck department while maintaining and operating the vessel, such as soot, machinery deposits, scraped paint, deck sweeping, wiping wastes, sand blast grit, and rags, etc. that do not contain oil or other hazardous substances): Landed as non-hazardous waste if non-hazardous status, or landed as hazardous waste.

Maintenance wastes collected by the engine and deck department while maintaining and operating the vessel, which contain or may contain oil or other hazardous materials: Landed as hazardous waste.

Medical wastes (appliances): Landed as medical waste.

Oily filters and fuel filters: Landed as hazardous waste after draining of residual oil or fuel.

Oily rags: Incinerated (Note 1), or landed as hazardous waste.

Paint brushes, paint-soaked items, except rags: Clean and store in paint locker, let dry and land as regular waste.

Paint and thinners: Landed as hazardous waste, or landed as non-hazardous waste if cans are “empty” under applicable laws.

Paper, cardboard and trash: Incinerated (Note 1), or landed as non-hazardous waste.

Pesticides: Landed as hazardous waste.

Plastics, including synthetic lines, and non-plastic garbage mixed with plastics as well as incinerator ash from plastic products: Landed as hazardous waste.

Solvents: Containerize and landed as hazardous waste.

Solvent laden items: Land as hazardous waste.

Degreasers: Land as hazardous waste.

Sludge: Incinerate or discharge to proper shore facilities.

Contaminated Fuels: The Company shall make all necessary arrangements in order for the contaminated fuel to be discharged in an environmentally and friendly manner.

Used oils and greases: Landed ashore. Used oils can be recycled.

Transformer Oils: To be handled with great caution, appropriately labeled and delivered to shore facilities for appropriate chemical disposal.

Contaminated Refrigerants: Cylinders containing contaminated refrigerants should be delivered ashore to suppliers' representative workshop or another appointed subcontractor's laboratory for appropriate disposal.

Expired Pyrotechnics: Out-of-date pyrotechnics must be disposed of ashore by one of the following means, returning them to the supplier, requesting a life raft service station to accept any of the ship's out of date pyrotechnics (when life rafts are being sent ashore for servicing).

Hazardous materials: The information contained in each material MSDS, for proper disposal should be always taken in account.

Waste Stream: Waste Management Practice

Cargo residues not contained in wash water: Discharged to sea in “Sea Condition”. Ships outside special areas - Discharge permitted 12 nm from the nearest land, en route and as far as practicable (Note 2). Ships within special areas - Discharge prohibited.

Cargo residues contained in wash water: Discharged to sea in “Sea Condition”. Ships outside special areas - Discharge permitted 12 nm from the nearest land, en route and as far as practicable (Note 2). Ships within special areas - Discharge permitted 12 nm from the nearest land, en route and as far as practicable. (Note 2 and Note 3)

- Note 1: Incineration should only be conducted when in the “Sea Condition” and according to the international regulations and local requirements. Every effort should be made to ensure that visible smoke is kept to a minimum.
- Note 2: These substances must not be harmful to the marine environment.
- Note 3: According to MARPOL Annex V the discharge shall only be allowed if: both the port of departure and the next port of destination are within the special area and the ship will not transit outside the special area between these ports and if no adequate reception facilities are available at these ports.

Index of proposed forms

- 1) Tank Sounding Log
- 2) Oil to Sea Interface Log
- 3) Leakage Log
- 4) Master’s Spare Seals Inventory

- 5) Engine Room Seals logbook
- 6) Deck Flexible Hoses Inventory
- 7) Engine Flexible Hoses Inventory
- 8) Refrigerant Leakage Log
- 9) Open Reporting Form
- 10) Fleet Engineers' Survey
- 11) EMS Familiarization/ Training with EMS procedures – Non Crew
- 12) Sewage Discharge Record
- 13) Waste Oil Incinerator Checklist
- 14) Oily Water Separator & Bilge Alarm Checklist
- 15) Record Book of Ozone Depleting Substances
- 16) List of Equipment Containing Ozone Depleting Substances
- 17) Bunkering Plan
- 18) Bunkering Checklist
- 19) Sulphur Content Monitoring Log
- 20) ECA Fuel Change Over Plan
- 21) Fuel Change Over Log

Analysis

Taking all that has been spoken into account, the regulations and standards developed in order to adapt an environmental component of shipping. After big blunders and/or accidents, all international, national, port and coastal standards, flag or class recommendations, and marine legislation were developed. Furthermore, as the industry grows more serious and conscientious

about maritime safety and environmental conservation, norms and standards will continue to exist and evolve.

Shipping has a multitude of effects on our planet and the ecosystem, and with climate change, unpredictable and usually unfriendly weather conditions, and the influence on human existence, there is a rising threat to the environment and the safety of life at sea as human activities increase.

This Environmental Management System was created to give an alternative perspective on sea-related concerns while still addressing the current situation in marine pollution.

On the other hand, the current state of frozen jurisdiction by all parties involved renders the application of responsibility and compensation regimes, as well as other international environmental protection mechanisms, impossible. In terms of accountability and compensation for accidents caused by shipping activities, the establishment of an Environmental Management System might be considered a first step toward addressing this issue.

Although the establishment of an Environmental Management System in a company is not yet necessary, its area of authority has not properly dealt with the global environmental problem in a comprehensive manner. Its technological breadth in terms of safety and environmental protection is unrestricted. As a result, the IMO, as a recognized competent authority, plays a critical role in tightening legislation pertaining to safety and environmental concerns, allowing the initial measures to be taken properly. Another advantage of IMO instruments is their

general acceptability; hence, increased collaboration between environmental specialists and the IMO is desirable and likely to be productive in the future.

The most serious environmental issues now are connected to climate change and the rapid expansion of maritime activity in recent decades. In terms of maritime activities, current regulatory frameworks make it impossible to adequately handle safety and environmental protection. Several concerns are currently unsatisfactorily addressed or unregulated.

With the increasing number of ships in the waters, operational ship-source pollution has become a problem. Furthermore, invasive species have been shown to migratory to various water zones, with unanticipated implications. The problem is especially concerning because only few sections of the planet and oceans surrounding the continent are monitored by any monitoring systems capable of detecting ecological changes.

Several incidents have already occurred and will continue to occur as the number of ships operating across seas increases. Fortunately, no human lives have been lost up to this point. Nonetheless, there are significant evidence that environmental concerns are worsening, as are the frequency of ship-related catastrophes. This has raised awareness in the international community about the absence of an acceptable legislative framework, technical issues in the area, and growing environmental dangers.

Because some waterways have the legal status of the High Seas, the issue of jurisdiction and enforcement cannot be fully addressed, because shipping has always been governed by the freedom of the high seas. However, the role of flag administrations and port states in achieving conformity with international treaties is critical. Regrettably, not all Flag administrations and

Port States adhere to international agreements. As a result, the likelihood of accidents and environmental consequences rises. To guarantee future environmental management requirements are met, international organizations should collaborate with flag administrations and port states, where the PSC also plays an essential role.

Finally, the author believes that the environmental management of shipping on the high seas should be oriented toward precaution rather than prevention, because prevention accepts and deals with certain levels of risk, whereas precaution necessitates a higher level of commitment to deal with environmental and safety threats.

Finally, it would be worthy to analyze the MARPOL annex violations which may be split to five different approaches, the description of violations, the reasons behind the violations, the forensic evidence, the new era of MARPOL violations and the proposed action that we should take. MARPOL specifies strict conditions and procedures that must be followed before any discharge into the sea of oil or oily mixtures. However, the system and especially the OWS piping may be easily modified and be “bypassed” with the usage of a “magic pipe” so as, the untreated bilges to be discharged overboard. Another, very known way to illegally discharge overboard is by tricking the Oil Content Monitor by shutting off the sample supply and leaving on the flushing water. The monitor is fooled into thinking the oil content of the effluent is 15ppm or less and allows discharge overboard regardless of the actual oil content. In addition, if the flushing water remains flowing through the monitor whilst the OWS is in operation, there is no measurement or control of the actual effluent. For a better understanding here below are some of the main reasons/excuses behind the use of magic pipe on ships:

- Excessive leakage in the engine room, filling up the tanks

- Chief Engineers sometimes do not want to run oily water separators as they are not aware of its operation or terrified of using as it has a record system in oil content monitor
- The condition of the oily water separator is not maintained properly, or the machinery is malfunctioning.

Of course, other reasons may also include the lack of seriousness/respect about environmental issues and laws because of the wrong attitude, the lack of environmental awareness and MARPOL trainings and just because it is convenient. The forensic evidence that illegal environmental action is taking place on board a vessel may include the following:

- Forensic material (flexible pipes/ piping modification/ bypass etc.)
- Forensic material (waste stream analysis to identify oil traces and origin, sewage/ gray water/ flexible pipe samples/ ballast water)
- Defected equipment (OWS, Incinerator etc.)
- ORB entries analysis
- ORB entries VS scrap soundings logs and OWS memory card
- Discharges vs dirty bilge tanks and OWS memory card
- Bilge alarm log vs ORB entries and OWS memory
- OWS OCM - No calibration/ wrong calibration records

- PMS records indicating defective/ incapacitated equipment
- Inaccurate shore receipts/ fabricated certificates
- Crew interview/ testimony

It is worth to also note the new era of MARPOL violations and the methods of verifying compliance. Shipping companies should verify the sulfur content of the ship's fuel, e.g. by reviewing procedures, bunker delivery notes (BDN), log book recordings. In addition, they should analyze MARPOL on board their vessels and use samples, measure the sulfur content in the ship's exhaust gas, e.g. by use of remote sensing equipment such as sulfur-sniffing drones or similar. As for the aspect of documentation the following information should be reviewed and crosschecked:

- International Air Pollution Prevention Certificate (IAPPC)
- Written procedures for fuel change-overs
- Tank plans and piping diagrams
- Fuel Oil Non-Availability Report FONAR
- Voyage records: ECDIS and navigation charts
- Oil Record Book Part I - all entries for internal fuel transfers, bunkering, retention, disposal should be entered appropriately and signed
- Engine logbooks
- Tank sounding records

- Equivalent arrangements or alternate fuel.
- IAPPC and Supplement
- Designate “In use” and “on board” sampling points & define handling procedures and records to be kept
- Also PSC officers make mistakes – Don’t sign before making sure correctness of deficiency

Summarizing the “must” proposed actions that should be followed from any shipping company and vessel owner, recommended by the author are the following:

- Develop Necessary Company Culture – ZERO TOLERANCE
- Train & Educate company’s Human Resources – Ashore & On Board
- Voluntarily implement ECP / EMS
- Systematically review OCM vs ORB vs Scrap Sounding Records
- On board MARPOL audits – Unannounced & during sailing
- If you identify a violation , follow the correct procedure!

Conclusion

Taking everything that has been mentioned into consideration, the codes and standards that should be established in order to adapt an environmental point of view in shipping are already known. All international maritime regulations were established after major mistakes and/or accidents. As the industry becomes additional serious towards the safety of the environment,

conservation of establishing mandatory policies and regulations forced to shipping companies will ensure vessel's readiness against environmental hazards.

Do it today, be proactive!

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