Report to the Legislature

Regulation of Large Passenger Vessels in California

July 2003

State Water Resources Control Board
California Environmental Protection Agency

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ABBREVIATIONS	DEFINITIONS
<	Less Than
≤	Less Than or Equal To
≥	Greater Than or Equal To
µm	Micrometer
AAC	Alaska Administrative Code
Act	Ballast Water Management for Control of Nonindigenous Species Act
ADEC	Alaska Department of Environmental Conservation
AEL&P	Alaska Electric Light and Power Company
AQMP	Air Quality Management Plan
ARB	Air Resources Board
Bay Area AQMD	Bay Area Air Quality Management District
BOD	Biochemical Oxygen Demand
BOE	Board of Equalization
Cal/EPA	California Environmental Protection Agency
CCR	California Code of Regulations
Certificate	International Pollution Prevention Certificate
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board
CMC	Criteria Maximum Concentration
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CPVECP	Commercial Passenger Vessel Environmental Compliance Program
CSLC	California State Lands Commission
CUPA	Certified Unified Program Agencies
CWA	Clean Water Act
DFG	Department of Fish and Game
DPF	Diesel Particulate Filters
DTSC	Department of Toxic Substances Control
EEZ	Exclusive Economic Zone
EU	European Union
FDEC	Florida Department of Environmental Conservation
FKNMS	Florida Keys National Marine Sanctuary

ABBREVIATIONS	DEFINITIONS
G/hp-hr	Grams per Horsepower-hour
G/kw-hr	Grams per Kilowatt-hour
GAO Report	A Report by the U.S. General Accounting Office
GHG	Greenhouse Gases
HAM	Humid Air Motor
HC	Hydrocarbons
ICCL	International Council of Cruise Lines
IFO	Intermediate Fuel Oil
IMO	International Maritime Organization
Kg	Kilogram
MARPOL	International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978
MEPC	Marine Environment Protection Committee
Mg/l	Milligrams Per Liter
MGO	Marine Gas Oil
Ml	Milliliter
MMA	Marine Managed Areas
Monterey Sanctuary	Monterey Bay National Marine Sanctuary
MOU	Memorandum of Understanding
MPA	Marine Protected Areas
MPN	Most Probable Number
MPPP	Marine Pollution Prevention Program
MSD	Marine Sanitation Device
MSW	Municipal Solid Wastes
MT	Metric Tons
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act
NAS	Nonindigenous Aquatic Species
NISA	National Invasive Species Act
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
Ocean Plan	California Ocean Plan
OES	State Office of Emergency Services

ABBREVIATIONS	DEFINITIONS
OSPR	Office of Spill Prevention and Response
OWS	Oil-Water Separator
PBWG	Pacific Ballast Water Group
Permit	Hazardous Waste Facility Permit
PM	Particulate Matter
PPM	Parts Per Million
PRC	Public Resources Code
Program	Cruise Ship Pollution Prevention Enforcement Program
RRC	Royal Caribbean Cruises
RWQCB	Regional Water Quality Control Board
San Diego APCD	San Diego Air Pollution Control District
Sanctuaries	National Marine Sanctuaries
SCR	Selective Catalytic Reduction
SECA	Sulfur Emission Control Area
SERC	Smithsonian Environmental Research Center
SIP	State Implementation Plan
SMP	Sanctuary Management Plans
South Coast AQMD	South Coast Air Quality Management District
SOx	Sulfur Oxides
Standards	Cruise Industry Waste Management Practices and Procedures
SWQPA	State Water Quality Protection Areas
SWRCB	State Water Resources Control Board
TAC	Toxic Air Contaminant
Task Force	Cruise Ship Environmental Task Force
TSS	Total Suspended Solids
U.S. EPA	U.S. Environmental Protection Agency
Ug/l	Micrograms Per Liter
USC	United States Code
USCG	U.S. Coast Guard
VE	Visible Emission
WQO	Water Quality Objectives

EXECUTIVE SUMMARY

Public Resources Code (PRC) section 72300 et seq. establishes the multi-agency Cruise Ship Environmental Task Force (Task Force) to evaluate environmental practices and waste streams of large passenger vessels (cruise ships). The law requires the California Environmental Protection Agency (Cal/EPA) to convene the Task Force for the purpose of gathering information from the cruise industry and to prepare a report to the Legislature by June 1, 2003, utilizing the information gathered by the Task Force. The law requires the owner or operator of a vessel to submit quarterly reports to the State Water Resources Control Board (SWRCB) regarding any release of graywater or sewage that occurred during the previous calendar quarter in the state's marine waters. The Air Resources Board (ARB) is required to measure and record the opacity of visible emissions of a sample of cruise ships while at berth in a port of California.

Cal/EPA delegated the responsibility of convening the Task Force and preparing the report to SWRCB. The Task Force, as required by PRC section 72301, consists of representatives of SWRCB, ARB, the Department of Fish and Game (DFG), the Department of Toxic Substances Control (DTSC), the California Integrated Waste Management Board (CIWMB), the California State Lands Commission (CSLC), and the U.S. Coast Guard (USCG). The Task Force is required to gather reports and manifests of waste released and offloaded that are submitted by cruise ships to state entities under state and federal law. The Task Force is also authorized to request an owner or operator to submit additional information to the extent permitted by state and federal law.

The Task Force held several public meetings in 2002 to receive public comments and mailed questionnaires to the International Council of Cruise Lines (ICCL) and individual cruise lines to collect specific information. Task Force members also visited two cruise ships to acquire first-hand information on how those vessels handle the wastes generated on-board. The Task Force researched existing federal and state laws, and laws of other states, and reviewed all information submitted by the industry.

This report provides a background for regulation of the cruise industry (Section 1), a discussion of the public meetings conducted by the Task Force and summary of public comments received (Section 2), a discussion of the existing regulatory framework and current environmental practices by the industry and their potential impacts on California's environment (Sections 3, 4, and 5). Section 6 of this report provides the Task Force's recommendations for actions necessary to address the existing and potential environmental impacts of cruise ship operations.

Information regarding each subject matter discussed in this report – wastewater, air emissions, hazardous waste, solid waste, ballast water, and marine resources – is provided by the Task Force members representing the state agencies with jurisdiction over those issues.

Conclusions

The Task Force has reached the following conclusions:

- Cruise ships generate considerable quantities of sewage, gray/black water, bilge and ballast water, and solid wastes including hazardous materials.

- Many large passenger vessels have installed Marine Sanitation Devices (MSDs), which are required to be approved by USCG. MSDs treat sewage before it is discharged to the sea. However, they frequently fail to meet current federal standards for discharge of effluent. In addition, MSD effluent is not subject to regular monitoring, except for those vessels that have received USCG approval to discharge in Alaska state waters.

- Monitoring data published by the State of Alaska indicate that graywater discharges frequently exceed standards set for MSD effluent. Current state and federal laws have no established effluent standards that graywater is required to meet.

- Cruise ships, along with other marine vessels, are a significant source of air pollutants in California, including criteria pollutants and toxic air contaminants.

- Cruise ship engines are subject to little regulatory control compared to landside sources of emissions. If feasible controls are not implemented on cruise ships, a greater burden will be shifted to less cost-effective strategies for land-side sources of emissions.

- State laws and regulations are intended primarily to address land-based hazardous waste facilities and generators. They are not specifically designed to regulate hazardous waste management activities in the cruise industry.

- There is no state regulatory authority for disposal of solid waste, “garbage”, while a ship is at sea.

- The transfer of ballast water is an important issue in California and can lead to unwanted biological invasions through the discharge of large volumes of ballast water at ports throughout the state.

Therefore, the Task Force recommends that cruise ships be regulated by the state and that an inspection and monitoring program be implemented to protect the state’s air and water quality and marine environment.

Recommendations

The following is a summary of the Task Force’s recommendations which are grouped into Priority Recommendations and Task Force Member Recommendations. An estimate of cost and funding source follow each Priority Recommendation. A detailed discussion of the Task Force recommendations is provided in Section 6.

Priority Recommendations

- Establish an interagency Cruise Ship (or Vessel) Pollution Prevention and Enforcement Program with two options for implementation. Option 1: To assign a lead agency to implement the program, including on-board inspections. Option 2: To work within existing regulatory and enforcement programs through cross-media coordination and assess a regulatory fee.

  Cost – lead agency costs $550,000 to 960,000 annually (Equipment and personnel) or cross-media coordination $150,000 annually. The funding source to establish this program would be a regulatory fee based on the number of cruise ship passenger berths.

- Establish a funding mechanism for the Cruise Ship Prevention and Enforcement Program.

  Cost – Already included in the first bullet above. The funding source to establish this program would be a regulatory fee based on the number of cruise ship passenger berths.

- Amend the federal Clean Water Act (CWA) to allow California to establish a statewide discharge prohibition zone for sewage discharge from cruise ships only.

  Cost – Minimal. SWRCB would request the California congressional delegation to sponsor legislation. The funding source to establish the prohibition would be the National Pollutant Discharge Elimination System (NPDES) Program fees and U.S. Environmental Protection Agency (U.S. EPA) grants.

- Graywater should be required, through statute, to meet the same standards required of MSD effluent or discharge should be withheld while in state waters.

  Cost – Minimal and can be absorbed by existing resources if state legislation is enacted requiring prohibition of graywater discharge; or alternatively, a prohibition can be established, without legislation, by amending SWRCB's California Ocean Plan at a one-time cost of $200,000 (personnel) to meet CEQA requirements. The funding source for these standards would be NPDES Program fees and U.S. EPA grants.

- Wastewater discharge should be prohibited in California's National Marine Sanctuaries.

  Cost – Minimal. The best method to establish this prohibition is through the Sanctuary Management Plans administered by the National Oceanic and Atmospheric Administration (NOAA). Through this method, discharges of sewage, graywater, bilgewater, ballast water, hazardous waste and solid wastes could all be prohibited in both federal and state waters in the marine sanctuaries. The funding source for this prohibition would come through NPDES Program fees and U.S. EPA grants.

- More stringent exhaust emission standards for new marine vessel engines need to be quickly established on a national or international level.

Cost – No additional cost to ARB since proposals are already planned. The funding source for more stringent standards will be absorbed through existing programs at ARB.

- Evaluate and implement the use of cleaner fuels and other feasible approaches to reduce air emissions from the existing oceangoing ship fleet in the 2004-2010 timeframe.

  Cost – No additional cost to ARB since proposals are already planned. The funding source for implementing the use of cleaner fuels will be absorbed through existing programs at ARB.

- Clarify that the cruise industry is subject to hazardous waste generator requirements and inspections by Certified Unified Program Agencies (CUPAs) or DTSC at ports where cruise ships take on or disembark passengers; and provide education and outreach to the cruise industry regarding hazardous waste generator requirements.

  Cost – Minimal. The funding source for education and outreach will be absorbed through existing programs at DTSC.

- Continue the state's mandatory ballast water program through legislative reauthorization.

  Cost – The estimated cost to run the ballast water program is $3.63 million in Year One and $3.2 million annually thereafter until January 1, 2010. The proposed budget applies to all commercial vessel voyages entering California ports or places after operating outside state waters. Cruise ships average approximately 5 percent of all voyages entering California waters. The funding source to run this program would be the Exotic Species Control Fund, which is supported by fees assessed on all vessels on qualifying voyages into California waters.

- Prohibit the discharge of any waste, food, or otherwise macerated waste into any marine sanctuary and within California coastal waters. Specify that any solid waste offloaded for disposal at a solid waste facility must meet the definition of solid waste in PRC 41091.

  Cost – Minimal. The funding source for these standards would be NPDES Program fees and U.S. EPA grants.

Task Force Member Recommendations
(including priority recommendations)

SWRCB - Wastewater

- Amend the federal CWA to allow California to establish a statewide discharge prohibition zone for sewage discharge from cruise ships only.

- When a discharge occurs in state waters, ships should report the discharge to the appropriate California Regional Water Quality Control Board (RWQCB) and provide monitoring data.

- Graywater should be required to meet the same standards required of MSD effluent or discharge should be withheld while in state waters.

- Wastewater discharge should be prohibited in California's National Marine Sanctuaries.

- Cruise lines should consider following the same practices required of NPDES permittees.

ARB – Air Emissions

- More stringent exhaust emission standards for new marine vessel engines need to be quickly established on a national or international level.

- Evaluate and implement all feasible approaches to reduce air emissions from the existing oceangoing ship fleet in the 2004-2010 timeframe, including:

    - Operational controls such as speed reduction zones;
    - Use of cleaner fuels in California coastal waters;
    - Implementation of incentive programs to encourage cleaner vessels;
    - Opacity limits within California coastal waters; and
    - Cold ironing (use of dockside electrical power instead of shipboard diesel generators).

DTSC – Hazardous Waste

- Clarify that the cruise industry is subject to hazardous waste generator requirements and inspections by CUPAs or DTSC at ports where cruise ships take on or discharge passengers.

- Provide education and outreach to the cruise industry regarding hazardous waste generator requirements.

- Notify the cruise industry that it is required to comply with hazardous waste generator requirements including submission of generator reports regarding generation, treatment, and disposal of hazardous wastes. New regulations will be developed if they are determined to be necessary.

- Clarify that existing requirements apply to the burning or incineration of hazardous waste to mitigate the effects along the California Coast, and provide education and outreach to the cruise industry regarding these requirements.

CSLC – Ballast Water

- Continue the state's mandatory ballast water program through legislative reauthorization.
- Broaden the state's program to include coastwise (i.e., domestic) traffic.
- Broaden the ballast water reporting requirements to include reporting for each port of arrival.
- Remove selected exemptions listed under PRC section 71202.
- Improve the accuracy of ballast water reporting data.
- Continue the "fee-based" program to fund the state's Exotic Species Control Fund.
- Utilize enforcement components to improve compliance.
- Expand and coordinate research efforts with other federal and state agencies.
- Establish interim and final ballast water treatment technology performance standards.
- Support research promoting technology development.
- Continue biological surveys to monitor the success of the program.

CIWMB – Solid Waste

- Solid wastes should be managed within two categories: large "non-dissolving" wastes and chemical wastes.
- Avoid duplication of regulation of wastes.
- State prohibition of the discharge of any type of plastics or rubber products into the water within the three-mile California coastal waters zone.
- No discharge of any waste, food, or otherwise macerated waste into any marine sanctuary within California coastal waters.
- All materials intended for recycling must be properly separated prior to disposal onshore at any portside receiving facility.
- All biohazard wastes and infirmary/sickbay wastes must be properly processed for disposal in compliance with California solid waste disposal regulations for hospital wastes.

- Prohibit hazardous wastes in “Municipal Solid Wastes” quality solid wastes.

- Encourage recycling of lubricants and other waste oils from the oils storage systems.

- Handling and disposal of batteries, special chemicals, etc., must be in accordance with state solid waste regulations.

DFG – Marine Resources

- Implement regulations that require reporting of all discharges of hazardous materials and bilge water into state waters or waters that could effect state waters.

- No waste or other substance should be allowed to be added to the normal bilge water that would be discharged by a vessel.

- Conduct research into the environmental impacts of discharges of graywater, blackwater, or bilge water on the marine environment.

- Conduct a study to look into the pollution impacts on the marine environment from all other types of vessels.

- Regulations imposed on the cruise industry should be similarly imposed on all vessels.

- Expand the California jurisdictional limits from three miles to reflect or include those waters that are affected by discharges or that will pose a potential impact to state waters or the biological resources located within state waters.

SECTION 1. INTRODUCTION

The management and handling of the various forms of wastes generated by cruise ships has increasingly become a public concern due to the large number of cruise ships calling on California ports. In 2000, the Legislature enacted Division 37 of PRC (section 72300 et seq.) for the purpose of gathering information regarding cruise ships' waste management practices and evaluating their potential impacts on California's environment. The law requires the Cal/EPA to convene the multi-agency Task Force to carry out this responsibility and to utilize the information gathered by the Task Force to prepare a report to the Legislature by June 1, 2003. The report must include the following information:

(a) A summary review of environmental rules, regulations, reports, reporting procedures, and mechanisms for the management of waste applicable to cruise ships based on international, federal, and state law.

(b) A review and analysis of information related to waste management contained in the reports submitted to state or federal entities by the owner or operator of a cruise ship.

(c) Identification of areas of concern that are not covered by existing reporting requirements that should be included in federal or state reporting requirements.

(d) Identification of mechanisms to better coordinate the activities of various state and federal agencies regulating the operation of cruise ships.

(e) Observations regarding the potential impacts of reported quantities and characteristics of releases of waste on water quality, the marine environment, and human health, taking into consideration applicable water quality standards.

(f) An evaluation of the air contaminant emissions on air quality and human health, taking into consideration applicable air quality standards.

(g) Recommendations to USCG and state agencies, as appropriate, to address any areas where additional regulations or reporting may be appropriate.

Cal/EPA subsequently assigned SWRCB to lead the Task Force, which consists of representatives of SWRCB, DFG, DTSC, CIWMB, CSLC, ARB, and USCG. The Task Force is required to gather reports and manifests of waste released and offloaded that are submitted by cruise ships to state entities under state and federal law and is authorized to request an owner or operator to submit supplemental or additional information, to the extent permitted by law. The Task Force is also required to establish a process for receiving comments from the public and the cruise industry.

The Task Force sent questionnaires to ICCL and individual cruise lines to collect specific information and held two public meetings to receive public input. Task Force

members also attended a related meeting organized by the staff of NOAA in Monterey. Details of comments received at those meetings are discussed later in this report.

Information regarding each subject matter discussed in this report such as air emissions, wastewater, hazardous waste, solid waste, ballast water, and marine resources, is provided by the Task Force members representing the state agencies with jurisdiction over those issues.

Background for Regulation of the Cruise Industry

The cruise industry is a rapidly growing multi-million dollar business. California ports handled an estimated 650,000 cruise ship passengers in 2001, making California the second largest market for the cruise industry in the United States. The sizes of cruise ships are reaching record proportions with the population of crew and passengers equaling many small towns. Some ships can carry up to 5,000 persons. The number of cruise vessels operating is also growing. There are over 31 new large cruise ships under construction world-wide that are due for delivery between now and 2005. About 50 percent of those new vessels will be operating out of the United States (Marine Log, November 2003, Princess Picks a Prince Charming).

Cruise ships travel the entire length of the California coast and now make ports of call to at least six locations in California – Los Angeles/Long Beach (San Pedro), San Francisco, San Diego, Avalon Bay (Catalina Island), Monterey Bay, and Humboldt Bay. These cruise ships travel between South America, Mexico, Canada, and Alaska. Presently there are eight major cruise ship lines operating out of California, involving over 20 vessels. In 2002, there were approximately 280 port calls scheduled by those vessels in the ports of San Diego, Long Beach/Los Angeles, San Francisco, and Monterey. The cruise industry estimates a 25 percent increase in the number of vessels that will operate in the waters of the state over the next 10 years.

Most cruise lines with port calls in California belong to ICCL. ICCL member lines adopted a set of “Cruise Industry Waste Management Practices and Procedures” (Standards) in 2001 (Attachment 1). These Standards incorporate legal requirements and voluntary practices for waste management on the part of the cruise industry, and they were designed to meet or exceed legal standards. Acceptance of ICCL Standards as standard operating procedure is now mandatory for ICCL membership.

The Standards discuss vessel waste streams and acceptable methods of handling those waste streams. These Standards will be discussed in Section 4 of this report.

While regulatory activities have made some progress in reducing the flow of sewage and waste materials released into the ocean from the shore, one source that has had little or no state regulation is pollution from vessels. Sewage, sludge, blackwater, graywater, bilge water, and other waste materials are routinely discharged from vessels into California’s coastal waters. Other nations have taken first steps to improve the water quality of the ocean by reducing vessel waste. The European Union prohibits the

dumping of sewage and effluents in the waters of all its member nations. All ships must use waste reception facilities in port. IMO, which is a project of the United Nations, has international sewage regulations that will become effective in 2004. These regulations require the mandatory use of port reception facilities if they are available. Currently, California does not have reception facilities capable of handling ship-generated sewage and wastewater.

The Canadian province of British Columbia is exploring the development of regulations on the cruise industry. Waste control regulations have been passed in Alaska, and similar regulations are being developed in Maine. Florida and Hawaii have signed Memoranda of Understanding with the cruise industry to address cruise activities in their waters. Washington State has established a vessel inspection program.

Types of Wastes Discharged from Vessels

Large passenger vessels are capable of discharging over 100,000 gallons of wastewater into state marine waters on a daily basis. They also generate significant volumes of other waste materials and dispose of these wastes on shore, by incineration, and/or releasing them into the ocean. The Task Force has identified the following wastes from vessels and sought to determine quantities generated, handled, regulated, and disposed of:

Air emissions
Hazardous waste
Oil sludge and slops
Oily waste
Oil filters
Sewage or blackwater
Dry cleaning solvents
Used sand or bead blasting residue
Plastics
Photographic processing chemicals
Batteries
Swimming pool chemicals
Miscellaneous spray cans
Cardboard and paper products
Printer cartridges
Graywater
Medical waste
Bilge water
Used oil
Ballast water
Incinerator residue
Paint and solvents
Food wastes
Scrap metals
Fluorescent light bulbs
Glassware, bottles, and crockery
Cleaning agents
Expired medicines/drugs
Miscellaneous garbage
Insecticides

Air Emissions

Cruise ships, along with other marine vessels, are a significant source of criteria pollutants and toxic air contaminants in California. Cruise ships, like other marine vessels, also contribute to the overall emissions of greenhouse gases, primarily in the form of carbon dioxide from engine exhaust. In fact, the emissions contribution from a single vessel can be significant if it operates frequently in California coastal waters. This impact is due to the high power output of typical cruise ships (comparable to many

land-based power plants), as well as the ships' high emissions levels compared to other diesel sources.

Cruise ship engines are subject to little regulatory control compared to landside sources of emissions. This is probably due to a number of factors, including the fact that cruise ships operate internationally, often far offshore, and they are primarily foreign-flagged vessels traditionally regulated by international lawmaking bodies such as IMO.

Cruise ships and other oceangoing vessels are under increasing pressure from a number of fronts to reduce their air emissions. Portside communities are expressing concerns about the risk associated with diesel particulate matter (PM) from marine vessels and other sources. Port authorities are working to mitigate potential emission increases as they expand their terminals to accommodate increased trade. Finally, regulatory agencies are finding it necessary to reduce emissions from marine vessels to meet ambient air quality standards and to reduce the risk associated with diesel PM.

Wastewater

The operation of cruise ships, like other oceangoing vessels, generates a significant amount of wastewater. These waste streams can come from lavatory use by passengers, galley functions in preparation and handling of foods, dishwashing and laundry facilities, ship maintenance, deck washing, and swimming pool and spa operation. Some of these waste streams are treated on-board ship for removal of harmful substances and human waste products.

Many vessels have installed sewage treatment facilities, which are required to be certified by USCG. These MSDs are used to treat the sewage produced on-board ships. The quality of the effluent produced from MSDs installed on vessels may vary significantly, depending on the type of system installed and the maintenance performed. Graywater – the water generated from showers, galley, or other non-sewage waste streams – is unregulated except in Alaska. Some ships treat graywater to remove pollutants, and some do not.

Unlike shoreside facilities, vessels are exempt from NPDES permitting requirements. NPDES permits are required in order to discharge wastewater effluent from municipal or industrial sources into the waters of the state. The unregulated discharges of wastewater from cruise ships have caused concerns over water quality of the oceans and coastal waters. Beach closures are a daily occurrence because of sewage or other forms of pollution. Most species of fish, many of commercial value, have suffered severe reductions in numbers to the extent that many species cannot be commercially harvested. Public health restrictions have been placed on most species of edible fish due to the bioaccumulated toxins in the flesh of the fish. Consumption of fish with these accumulated toxins can adversely affect human health.

Solid Wastes

Cruise ships generate solid wastes in volumes comparable to a small city. These wastes include cardboard, glass, metal cans, paper, and food wastes, etc.

Annex V of MARPOL (International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978) includes regulations for managing "garbage" from ships. Compliance with Annex V has been codified into Federal Regulations and is mandatory. Annex V and Federal Regulations set specific minimum distances for the disposal of the principal types of garbage. Disposal of plastics into the sea is prohibited by Annex V and Federal Regulations.

A report by the U.S. General Accounting Office (GAO Report) dated February 2000 summarizes a five-year period of marine pollution cases by cruise ships. The GAO Report includes descriptions of 87 confirmed illegal discharge cases in United States waters from 1993 through 1998. Of these discharges, six events involved discharge of solid wastes – "garbage" – from cruise ships. In one incident, approximately 30 large plastic garbage bags full of waste were dumped overboard and washed onto a beach. The wastes were tracked back to a cruise ship that had passed through the area. The GAO Report is available on the internet at http://www.epa.gov/owow/oceans/cruise_ships/gaofeb00.pdf.

Hazardous Waste

Cruise ships sustain a broad variety of activities that use or generate hazardous wastes including batteries, fluorescent lighting, photographic chemicals and their related byproducts, and dry cleaning chemicals. These substances can inflict harm to the waters and the environment along California's coast.

MARPOL Annex V does not specifically refer to hazardous waste requirements for storage, transportation, and disposal. However, it does refer to restrictions and controls of operational waste, which includes the discharge of harmful substances, maintenance waste, oily and contaminated rags, and ash from incinerators. Annex V, Section 7.1 of MARPOL, states that governments should identify appropriate enforcement agencies, providing legal authority and adequate training, funding, and equipment to incorporate the enforcement of Annex V regulations into their responsibilities. It also encourages governments to consider the economic impacts of domestic regulations intended to force compliance with Annex V. It states that maintaining the greatest range of options for complying would seem appropriate because of the highly variable nature of ship operations and configurations.

In California, DTSC regulates the generation, treatment, storage, disposal, transportation, and handling of hazardous waste. The jurisdictional boundary of the California hazardous waste laws and regulations extends to three nautical miles from the California coastline. Any person, as defined by law, who conducts one of these activities in California, would be regulated by the state's hazardous waste laws and

regulations. Cruise ships are responsible for complying with the state's hazardous waste requirements when traveling within three miles of the California coastline. However, many of the state laws and regulations are intended primarily to address land-based hazardous waste facilities and generators. They are not specifically designed to regulate hazardous waste management activities in the cruise industry or shipping in general.

Oil Related Discharges

Nationwide, there were 87 illegal discharge cases between the years 1993 to 1998. Oil or oil based products were involved in 81 of those cases, and 12 of the reported incidents occurred in California (GAO Report RCED-00-48 February 2000).

In a recently released book, "Oil in the Sea: Inputs Fates and Effects," the National Research Council Committee on Ocean Studies and Transportation stated that 15 to 30 percent of all vessels over 100 gross tons are non-compliant with international regulations prohibiting the discharge of oil into the sea. The operational discharges from non-compliant vessels - oil from machinery, bilges, fuel sludge, dirty ballast tanks, etc., are estimated to exceed 1,086,730 tons per year.

Numerous recent cases of vessels, including cruise ships, intentionally discharging oily wastes and hazardous wastes into United States waters have been discovered and investigated by state and federal agencies.

- April 2002, Oregon - a crew member tipped off authorities of an illegal bypass hose used to discharge oily wastes into the sea.

- October 2002, Washington - a crewman aboard a chemical tanker turned on a sewage pump, resulting in a discharge of oil into state waters from an illegally fabricated bypass hose. A criminal investigation also found that legally required log books documenting oil discharges from the vessel had been falsified.

- Fall 2002, Alaska - a company owning 12 large refrigerated vessels admitted to 7 years of intentional dumping of oil and falsified records for oil and hazardous waste disposal.

Brief details of recent cruise ship-specific cases adjudicated by the U.S. Department of Justice (DOJ) are noted below. The dates noted are from DOJ press releases, and more information about these cases is available on the DOJ website.

- December 1996, Royal Caribbean Cruises (RCC) indicted on charges of conspiracy to dump waste oil in United States waters from five of its ships, making false statements to USCG, falsifying oil record book entries, and related charges. A pipe was used to bypass the ship's oil water separator. Ships involved had itineraries in Puerto Rico, Alaska, and Canada, among other destinations. RCC was assessed

over $9 million in fines and penalties in a plea bargain in this case and was ordered to undergo third-party environmental audits for the five-year term of its probation.

- June 1998, Holland America Line (HAL) agreed to pay $2 million in fines and penalties for discharging untreated oily bilge wastes into Alaskan state waters and for failing to keep oil discharge records as required by law.

- July 1999, RCC agreed to pay $18 million in fines in a 21 federal felony count plea agreement. The charges involved the routine dumping of waste oil from its fleet of ships and deliberate dumping of hazardous chemicals into United States harbors and coastal waters. Los Angeles was one of the jurisdictions listed in the charges.

- April 2000, three HAL employees were each sentenced to two years probation and fined $10,000 for negligently violating the CWA by discharging bilge water containing a harmful quantity of oil into waters of the United States.

- April 2002, Carnival Corporation was sentenced to five years probation and ordered to pay $18 million in fines and penalties for falsification of oil discharge records. The charges were made in connection with the practice, conducted on numerous ships, of flushing the oil content sensors with water so the true oil concentration of the discharge would not register. This practice continued over a five-year period, from 1996 to 2001. The company was also required to undergo third-party audits and to implement an environmental compliance program with specific court-ordered requirements as a result of the plea agreement.

- July 2002, Norwegian Cruise Line agreed to pay a $1 million criminal fine for falsification of oil record book entries.

Contributions of the Cruise Industry to California's Economy

ICCL recently commissioned a study of the economic contributions of the cruise industry in the United States, which included a separate evaluation for each state experiencing cruise ship traffic. According to the report produced by the study, "The Contribution of the North American Cruise Industry to the U.S. Economy in 2001," California received 10 percent of the economic benefits from the cruise industry in the United States, ranking second after Florida. Direct spending by the cruise industry in 2001 was estimated at over $1.1 billion for goods and services provided by California businesses. Employment generated by the industry was estimated at 9,215 employed in the travel sector and 2,150 employed by various suppliers of products and services. The total California wages for those employees was estimated at $399 million.

SECTION 2. PUBLIC INPUT PROCESS

Pursuant to the requirement of PRC section 72301, the Task Force held two public meetings to receive public input. A third related meeting was organized by the staff of NOAA, responsible for the administration of the Monterey Bay National Marine Sanctuary (Monterey Sanctuary). Additional comments were received from various public agencies, legislators, environmental advocacy groups, and the general public.

Public Input Sessions

The first public input session organized by the Task Force was held at the Port of Los Angeles on April 24, 2001, and the second was at the Bay Model Visitor Center in Sausalito on May 3, 2001. Notices were mailed to approximately 150 individuals, organizations, and businesses to inform them about the sessions and the evaluation process that the Task Force was undertaking. The notice was also posted on SWRCB's website and sent to all cruise lines known to call on California ports. The notice included instructions on how to submit written comments.

Persons giving comments at the public meetings included industry representatives, industry vendors, employees of California ports visited by cruise ships, and individuals representing environmental advocacy groups. Written comments were also received at those meetings (Attachment 2). Table 2.a below categorizes the comments received at the two meetings.

Table 2.a - Comments Received at Public Meetings

Need for New Regulations	• ICCL member lines have taken a proactive role in developing detailed internal environmental standards, some of which exceed existing regulations. • Industry is already highly regulated by numerous regulatory bodies. • If new regulations are to be developed, consider the difficulty for industry to follow differing regulations for each port state visited. It would be easier to comply with a standardized set of regulations for the entire United States instead of different regulations for each state. • Industry supports federal regulations enabling standards on graywater if it is found harmful to the environment. • Any new regulations proposed should be reasonable and achievable, so as not to drive cruise ships from California ports. • Recent growth within the cruise industry heightens need for increased environmental regulation. • Use Alaska's legislation as a model of what California should regulate. Alaska had two relevant laws passed, HR 4577 in year 2000 on the federal level (the Murkowski legislation), and Alaska's HB 260. • California waters deserve the same protection as Alaskan waters now receive. • Cruise lines are making progress, but enforceable regulations are needed.

Need for New Regulations	State and federal laws to prohibit all untreated discharges similar to HR 4577 are recommended. • The state could inspect ships and require monitoring and reporting of wastewater discharges. A passenger head tax could be used to pay for enforcement.
Solid Waste	• All wastes are sorted on board ship. Recyclable wastes are recycled if facilities exist at port. Reusable waste materials are donated when possible. Hazardous wastes are properly disposed. Medical wastes are incinerated on board. Sharps are properly disposed shoreside. • Incineration of wastes is done in international waters. • The Task Force should look at the landside disposal of recyclable materials. • Incinerator ash is typically landed for disposal. • An Alaska report stated that 12 percent of ocean pollution is from marine sources, and most of that is from recreational vessels.
Wastewater	• ICCL policy, effective July 1, 2001, dictates that graywater may only be discharged while underway at a speed of six knots or greater. Graywater discharges will not be made in port. Exceptions may be made in emergency situations, if needed. This voluntary performance standard required member lines to incur significant costs to renovate their ships to enable them to withhold graywater discharges while in port. • Voluntary ICCL practices are better than those called for in the Murkowski legislation. • Monitoring and reporting of graywater and MSD effluent should be conducted periodically to ensure water quality is protected. • Pursue voluntary agreements with the cruise lines to withhold graywater discharges in California waters. • Evaluate impacts from legal, incidental discharges such as swimming pool drainage, deck wash, etc. • Conduct wastewater monitoring on effluent from ships that discharge in California waters. • The volume of wastewater discharged from the larger ships is equivalent to that discharged by a small city, yet vessels are exempt from NPDES permitting regulations, along with monitoring and reporting requirements. • MSDs are frequently operated incorrectly or improperly maintained.
ICCL Policy	• As of July 1, 2001, conformance with the ICCL Cruise Industry Waste Management Practices and Procedures (rev. December 1, 2001) is mandatory for ICCL member lines. • Voluntary ICCL practices are better than those called for in the Murkowski legislation.

General	• It is in the industry's own best interests to maintain a clean marine environment. • The cruise industry confers significant economic benefits to the ports in which they call. The economic benefits extend to numerous support vendors and businesses. • Most ocean pollution is from land-based activities. • A representative from the Port of San Francisco estimated that 60 jobs and $500,000 are generated locally for each cruise ship visit. • Pursue voluntary agreements with the cruise lines to minimize environmental impacts related to cruise operations in California. • Monitoring has been conducted as a result of the plea agreement by Royal Caribbean. The Task Force should review records of this monitoring as part of its evaluation. • Review the records of monitoring conducted recently in Alaska. Many of the monitored ships also visit California. • Cruise ships are a significant and growing source of marine pollution. • Cruise ships can cause measurable harm in sensitive areas. • Land-based sources of pollutants are a problem, but that does not negate the need to reduce impacts from vessels.
Enforcement	• The Environmental Director for the Port of Los Angeles reported that he had the least problems with cruise ships as opposed to other types of vessels. • Obtain records from other states to see which ships have violated environmental laws in other states. Use this information to target those ships for special scrutiny by the Task Force. • Develop a dialogue with the California port authorities and ask that they communicate with the regulatory agencies about any environmental compliance problems they have had with cruise ships. • USCG should conduct more inspections of cruise ships, and increase the focus on environmental compliance during the inspection.
Air Emissions	• Incinerators are not run in port. • Cruise lines are investigating alternative power sources including solar and fuel cells. • Ships should plug into the local power grid when in port to reduce air impacts, especially in non-attainment areas.
Hazardous Wastes	• Amend USCG hazardous waste checklist to ensure California regulations are followed.
Oil Discharges	• International regulations mandate that discharges from the oil-water separator (OWS) do not exceed 15 parts per million (ppm); however, ICCL member lines set a target to discharge at no greater than 5 ppm. • Discharges from OWS are carried out at least 12 nautical miles from shore. Some lines do not discharge when the oil content exceeds 5 ppm.

Monterey Meeting

NOAA staff administering the Monterey Sanctuary organized a meeting on April 10, 2002 to discuss concerns about three upcoming cruise ship visits to Monterey that had recently been announced by the local news media. Cruise ships had visited Monterey in the past but had not called at that port for about five years. Approximately 60 people attended the meeting, representing local, state and federal agencies, local government, community and business interests, and environmental advocacy groups, as well as private citizens. Five Task Force members attended this meeting.

Discussions at the meeting were mostly focused on the facilities at the Monterey Bay harbor and on local regulations. Comments on issues in general that were presented at the meeting include:

- There should be a legally binding agreement that includes monitoring for no discharge of MSD effluent, graywater, and untreated ballast water in California waters.
- Use of cleaner fuels should be required.
- More regulatory attention should be given to ensure the safety of whales.
- There is an extensive no-discharge zone for land-based wastewater discharges encompassing much of Monterey Bay (Attachment 3). There are also a number of designated State Water Quality Protection Areas (SWQPA), previously known as Areas of Special Biological Significance, in close proximity to Monterey Bay (Attachment 4). Land-based discharges are prohibited in SWQPA. These discharge restrictions do not apply to the discharge of vessel wastes.
- Concerns were expressed about the level of training provided to MSD operators.
- Samples should be taken where MSD discharge occurs.

Letters Received

The Task Force has received a number of letters from environmental advocacy organizations, individual citizens, city and county governments, legislators, and a RWQCB. Many of the letters expressed concern regarding cruise ships visiting the Monterey Bay area because of the ecologically sensitive Monterey Sanctuary.

Commenters stated that they acknowledged that increased cruise ship visits to the Monterey Bay region could have positive economic benefits, but they are concerned that this could also increase cruise ship associated pollution. Several commenters expressed a desire that all California coastal waters, plus all National Marine Sanctuaries off the California coast, be included in a zero discharge area. Others specified that the Monterey Sanctuary should be designated a “zero discharge” area for future cruise ship visits. Many of those requesting designation of a zero discharge area for cruise ships specified that discharge of treated or untreated sewage, graywater, oily bilge waste, food wastes or other solid wastes, and ballast water be included in the designation. Commenters expressed appreciation that cruise lines visiting Monterey in 2002 had committed to a voluntary no-discharge policy; however, they believed a legally

binding no-discharge zone was needed. At least one comment asked that any cruise ship visiting the Monterey Sanctuary voluntarily commit to a zero-discharge policy within the Sanctuary until such a policy becomes law. Commenters requested that any discharge from cruise ships be monitored and that monitoring to ensure compliance with voluntary no-discharge agreements should be undertaken. Concern was expressed that a new potential for the transfer via ballast water of invasive aquatic species into the Monterey area exists because large vessels had not previously visited the region.

Some commenters stated that the industry's recent history of illegal dumping of wastes demonstrates a need for strict monitoring and regulation. Voluntary agreements and policies are helpful but are no substitute for enforceable regulations. A commenter pointed out that cruise ship sewage discharges are regulated under the same laws and subject to the same standards as pleasure craft, such as small sailboats and motorboats, even though the volumes of wastewater produced by cruise ships are more similar to some small cities' discharges that are subject to NPDES regulations. Cruise ship MSDs are inadequately inspected and discharges are almost never sampled or monitored. Graywater, the largest source of cruise ship discharges, is completely unregulated by CWA. Concerns about potential impacts to threatened and endangered species, particularly sea otters, were expressed. The potential impacts could be from pollutants as well as from physical disturbance of the species and their habitat. Finally, there were concerns that if any legal or illegal dumping were to occur, it could have serious economic consequences for tourism, the fishing industry, and others who earn their living from the sea.

The commenters suggested that legislation was needed in the following areas:

- Prohibit the discharge of untreated sewage into state waters.
- Prohibit the discharge of treated sewage and graywater unless a cruise ship is underway, traveling at least six knots and is at least one mile from shore.
- Undertake a vigorous inspection program to verify that pollution control equipment is working properly.
- Undertake a vigorous monitoring and reporting program to ensure that discharges meet state and federal air and water quality standards.
- Provide incentives for third-party reporting of environmental violations.
- Levy a passenger head tax to pay for sampling, inspection, and enforcement activities.
- Require ships to plug into the local power grid to reduce air emissions when in port.
- Establish no-discharge zones to prevent impacts on ecologically sensitive marine areas such as marine protected areas, sea grass beds, fish habitat, and SWQPA.

SECTION 3. EXISTING REGULATORY FRAMEWORK

There are many state, federal, and international laws that currently regulate the environmental management practices of the cruise industry. These regulations also apply to other types of vessels, such as cargo ships. The only environmental regulations applicable solely to commercial passenger vessels are those for certain waters of the State of Alaska. The international regulations fall under the aegis of the United Nation's IMO. Generally, exemptions from pollution control regulations are granted in the case of an emergency threatening life or property. These exemptions appear in state, federal, and international laws.

International Regulations on Shipping

IMO

IMO was created in 1958 as a project of the United Nations. Currently, the primary goals of IMO are to enhance shipping safety and to protect the ocean environment from shipping impacts. One of the necessary elements to achieve these goals is a legal framework of international treaty instruments dealing with safety and the environment. These treaties are called "conventions." IMO currently has oversight over 40 conventions, including several that pre-date the formation of IMO. IMO develops new conventions and updates those already in existence as warranted by advances in technology and other considerations. The current focus is on achieving greater compliance with existing conventions rather than developing new ones. IMO has no authority to enforce the conventions.

In addition to the main body, IMO has six committees, including the Marine Environment Protection Committee (MEPC). MEPC is the entity that would develop and begin the adoption and ratification process for new conventions dealing with environmental protection or to update previously ratified conventions.

The process followed to adopt a new convention requires agreement by a given number of shipping nations plus a given percentage of world shipping tonnage. The number of nations and percentage of tonnage vary depending on the importance and complexity of the convention. After adoption, the convention is submitted to the individual governments for ratification. Once adopted and ratified, a convention enters into force after certain conditions stipulated within the convention are satisfied. A new convention can take more than a decade to enter into force. Once the convention enters into force, federal laws must be enacted to enforce the provisions of the convention. Amendment of existing conventions is sometimes effected by tacit acceptance. An amendment is entered into force by tacit acceptance if no more than a given percentage of contracting governments object to its provisions within a given time frame. The applicable percentages and time frames differ from one convention or amendment to another. Due to the use of tacit acceptance, the time required for an amendment to enter into force has been greatly reduced.

The main set of treaties relating to ship-generated pollution is known as the MARPOL convention, which consists of a set of six annexes. Each of the MARPOL annexes applies to a different type of potential pollutant. See Table 2.b below. Each annex will be discussed in detail in the subsection to which it relates. Two of the annexes are mandatory for signatories; the others are voluntary. One is not yet in force (not ratified). Annex II and III apply to cargo ships and will not be discussed in this report. Those noted as mandatory have regulations written and codified in the federal Code of Federal Regulations (CFR).

Table 3.a - MARPOL 73/78. List of Annexes and Their Status

Annex I	Regulations for the Prevention of Pollution by Oil	Mandatory
Annex II	Regulations for the Control of Pollution by Noxious Liquid Substances In Bulk	Mandatory
Annex III	Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form	Mandatory
Annex IV	Prevention of Pollution by Sewage from Ships	In force as of September 2003
Annex V	Prevention of Pollution by Garbage from Ships	Mandatory
Annex VI	Prevention of Air Pollution from Ships	Voluntary. Not yet in force

European Union (EU)

EU has developed regulations that prohibit the discharge of wastes into the North Sea. The overall goal of EU is protection of the marine environment from operational pollution from ships by eliminating such pollution. In order to reach that goal, EU has outlined key requirements including:

- All EU ports are to provide adequate reception facilities and develop waste reception plans;
- All wastes are to be delivered to the waste reception facility unless there is capacity on board the vessel for retention until the next port of call;
- All ships are required to notify ports in advance of intention to use facilities and of quantities of waste on board;
- A fee system will be introduced to encourage the use of facilities; and
- There will be a system of monitoring compliance, adequate sanctions for non-compliance, and non-compliance data will be forwarded to the vessel's next port of call.

All EU member nations have installed waste reception facilities to handle all of the vessels that call upon their ports. In addition, the nations have developed various methods to pay for the construction and operation of their facilities and a disincentive

fine process for vessels that do not use the waste reception facilities. The individual countries have an inspection process to verify wastes contained aboard the vessels, vessel's records of waste disposal, and a facilities records cross-check procedure.

U.S. Supreme Court Decisions

***U.S. v. Locke*, 529 U.S. 89 (aka Intertanko)**

In 1989, the supertanker Exxon Valdez ran aground in Alaska, causing the largest oil spill in United States history. The United States Congress responded by enacting the Oil Pollution Act of 1990. The State of Washington also responded by creating a new agency tasked with establishing new standards to provide the "best achievable protection" from oil spill damages. The regulations developed by Washington covered general watch procedures, crew English language skills and training, and maritime casualty reporting. However, as a result of *U.S. v. Locke*, those regulations were subsequently pre-empted by federal regulations governing oil tankers.

The Supreme Court's decision in the case of *U.S. v. Locke* stated, in part, "The State has enacted legislation in an area where the federal interest has been manifest since the beginning of the Republic and is now well established." It further stated, "The authority of Congress to regulate interstate navigation, without embarrassment from intervention of the separate States and resulting difficulties with foreign nations, was cited in the Federalist Papers as one of the reasons for adopting the Constitution. e.g. The Federalist Nos. 44, 12, 64…. The Court in Cooley v. Board of Wardens…12 How. 299 (1852), stated that there would be instances in which state regulation of maritime commerce is inappropriate even absent the exercise of federal authority, although in the case before it the Court found the challenged state regulations were permitted in light of local needs and conditions. Where Congress had acted, however, the Court had little difficulty in finding state vessel requirements were pre-empted by federal laws which governed the certification of vessels and standards of operation."

This opinion relates specifically to tanker vessel operations. It is uncertain if the Court would make the same decision when considering regulations pertaining to cruise vessels.

3.1. SWRCB

Existing Water Quality Regulatory Framework

International

MARPOL Annex IV - Prevention of Pollution by Sewage from Ships

Annex IV will enter in force in September 2003. For ships over 200 gross tons and above, Annex IV will apply immediately to new ships and will apply to existing ships ten years after entry into force. IMO will develop operational requirements for vessel

sewage treatment plants or MSDs for ships with installed MSDs. If the MSD simply comminutes and disinfects sewage prior to discharge, that system must be of an approved type. Ships will be equipped with a pipeline and standard discharge connection to allow discharge of sewage to land-based treatment facilities. Ships will be required to obtain an International Sewage Pollution Prevention Certificate (Certificate) after being surveyed to ensure compliance with Annex IV. The ships will be periodically re-surveyed at an interval not to exceed five years to ensure continued compliance.

Ships that comminute then disinfect sewage will be prohibited from discharge unless they are four nautical miles from land and underway at four knots; or at a distance of 12 nautical miles, discharge may commence without treatment. Ships with other types of MSDs will be required to meet such standards as may be developed by the IMO Administrator; they must have test results from the MSD recorded in their Certificate; and they must not produce visible floating solids or cause discoloration in the waters surrounding the discharge. If other types of wastes are mixed with the sewage, the more stringent requirements for the different types of waste will apply to the discharge.

Governments that are party to the convention are directed to provide adequate port reception facilities for discharging sewage to land-based treatment facilities. These governments are also required to notify IMO where reception facilities are inadequate. The United States is not a party to MARPOL Annex IV.

Federal

NPDES Permits

Typically, a land-based point source discharger is required to obtain an NPDES permit. A point source is typically a discharge from a pipe; for example, a wastewater treatment plant. NPDES permits specify caps on the allowable amount of some pollutants to be discharged. These limits are different for each permit, depending on characteristics of the discharge, the volume of wastewater to be discharged, and characteristics of the receiving water. Development of a permit includes determination of the reasonable potential for a given pollutant to exceed water quality criteria. A pollutant may be known to be associated with a given industry, or laboratory analysis may have identified the pollutant's presence in a water sample. Conventional pollutants are defined as biochemical oxygen demand (BOD), total suspended solids, pH, fecal coliform, and oil and grease (40 CFR 401.16). In California, a permittee must run a full suite of laboratory analyses to detect the presence and concentrations of priority pollutants prior to determining whether these pollutants have a reasonable potential to exceed water quality criteria, thus necessitating a permit limitation. Priority pollutants are a list of specific toxic pollutants that are a high priority for elimination in discharges. This list is enumerated in 40 CFR 401.15.

A typical permit may include limits on discharge of BOD, suspended solids, and nitrogen ammonia along with limits on metals and toxic chemicals. There are several

wastewater treatment plants in California that are held to strict standards by the terms of their NPDES permits even though their discharge pipe extends three or more miles into the ocean. NPDES permit holders are required to periodically monitor and report levels of pollutants in their discharge. If pollutant levels exceed permit limits, the permit holder is subject to mandatory minimum penalties of $3,000 per violation. Greater penalties can be assessed in specific circumstances. Vessels are exempt from NPDES permit requirements by 40 CFR 122.3 (a).

Wastewater treatment processes employed on land and on vessels leave a residue of sludge, also known as biosolids. Sludge can have concentrations of metals, pathogens, or other pollutants that warrant concern. Land-based NPDES permit holders are subject to regulations in 40 CFR 503. These regulations establish standards, which consist of general requirements, pollutant limits, management practices, and operational standards for the final use or disposal of sewage sludge generated during the treatment of domestic sewage at a treatment plant. These regulations include standards for sewage sludge applied to the land, placed on a surface disposal site such as a landfill, or fired in a sewage sludge incinerator. Vessels are exempt from these regulations, because they are exempt from NPDES regulations [40 CFR 122.3 (a)]. Dumping sewage sludge into the ocean was prohibited after 1991 under 33 United States Code (USC) 1414(b). This prohibition extends throughout the 12 nautical mile limit of federal waters.

MSDs

MSDs are devices designed to treat, retain, or discharge sewage produced on board a vessel. All vessels with an installed toilet are also required to install an MSD (33 CFR 159.7). There are three types of MSDs available for different applications. A Type I MSD is a flow-through treatment device required for vessels less than 65 feet in length. A Type II MSD is a flow-through treatment device required for vessels greater than 65 feet in length. Type III devices retain the sewage and are required when sewage must be stored for eventual pump out. When a vessel is operating on a body of water where U.S. EPA under 40 CFR 140.3 prohibits discharge of treated or untreated sewage, the vessel operator must secure the MSD to prevent discharge, regardless of which type of MSD is in use (see Discharge Prohibition Zones).

Cruise ships under the purview of Division 37 of PRC are required to install a Type II MSD to treat their sewage. In accordance with 33 CFR 159.53(b), a Type II MSD must be certified as capable of producing an effluent having a fecal coliform bacteria count not greater than 200 per 100 milliliters and suspended solids not greater than 150 milligrams per liter under specified testing conditions. The conditions for effluent testing of Type II devices are detailed in 33 CFR 159.126. There are other requirements under 33 CFR 159 to ensure that the MSD will perform in a shipboard installation, and that the unit will have sufficient strength characteristics to withstand breakage under most operating conditions. Alternatively, foreign flagged vessels may have a “Certificate of Type Test” issued under MARPOL Annex IV. The Certificate of

Type Test is considered equivalent to meeting the 33 CFR 159.7 (b) or (c) regulations. There are no regulations requiring periodic effluent monitoring once the MSD is installed.

Discharge Prohibition Zones

A procedure allowing a state to prohibit discharge of treated or untreated sewage from all vessels into all or portions of the waters of the state is available under CWA section 312. Establishment of a discharge prohibition zone applies only to discharge of treated or untreated sewage; discharges of graywater, ballast water, or oily bilge water are not subject to prohibition under this procedure. Discharge prohibition zones established under CWA do not distinguish between classes of vessels. If cruise ships were prohibited from discharging sewage, all vessels in the zone would fall under the prohibition.

Three methods are available to designate a no discharge area. Under each method, a state or local authority that has determined that some or all state waters require greater environmental protection must submit an application to the Administrator of U.S. EPA to prohibit discharges. The first method falls under CWA section 312 (f)(3). Based on the application, the Administrator must make a determination whether the subject waters have available adequate pumpout and treatment facilities for vessel sewage. The Administrator has 90 days to make this determination. The second method falls under CWA section 312 (f)(4)(A). Under this method, the Administrator will base the determination solely on whether or not the protection and enhancement of the subject waters require such a prohibition without regard to the adequacy of existing pumpout and treatment facilities. The third method applies to drinking water intake zones; therefore, it is irrelevant to this report. U.S. EPA publication 842-B-94-004 includes a full description of how to establish a no-discharge area using CWA section 312.

Some northeastern states have established extensive no-discharge areas, encompassing most of their state waters. California has established eleven no-discharge areas, ten of which are located in marine waters. Discharge prohibition zones specific to a given class of vessels (i.e., cruise ships) were not found while conducting research for this report.

No-Discharge Areas in California Marine Waters

1. Mission Bay
2. San Diego Bay – Less than 30 feet mean lower low water
3. Oceanside Harbor
4. Dana Point Harbor
5. Upper and Lower Newport Bay
6. Sunset Aquatic Park – Inland of Pacific Coast Highway Bridge
7. Huntington Harbor
8. Channel Islands Harbor
9. Avalon Bay Harbor
10. Richardson Bay

Currently, there are 132 vessel pumpout stations in California (see Department of Boating and Waterways website). Some of the stations serve inland waterways or lakes. Federal guidelines recommend one pumpout/dump station for every 300-600 boats over 16 feet long. The Department of Boating and Waterways has established a goal of one pumpout station for every 300 boats with a Type III MSD. A Type III MSD retains sewage for shore-based disposal or discharge beyond the three-mile limit of state waters. Currently, there is a statewide ratio of one pumpout station for every 558 boats with Type III MSDs. These figures do not distinguish between marine or freshwater pumpout stations. The main California ports – Los Angeles/Long Beach, San Francisco, and San Diego – currently do not have sewage pumpout facilities adequate to service the cruise ships that do business there.

Marine Sanctuaries

There are currently thirteen areas designated as National Marine Sanctuaries (Sanctuaries) in the United States. Many of the Sanctuaries extend past the state waters, which are typically defined as three nautical miles from shore. Four of the Sanctuaries are located off the coast of California. These four are the Cordell Bank, Gulf of the Farallones, Monterey Bay, and Channel Islands National Marine Sanctuaries.

Sanctuaries are subject to the regulations in CFR Title 15, "Commerce and Foreign Trade." The purpose of the Sanctuary program is to manage areas of the marine environment that are of special significance due to their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities. One objective of the Sanctuary program is to facilitate public and private uses of the marine resources of the Sanctuaries that are not prohibited pursuant to other authorities, if these activities are compatible with protection of the resource [15 CFR 922.2 (b)(5)]. Designation of a Sanctuary does not constitute a claim to territorial jurisdiction on the part of the United States for designated sites beyond the United States territorial sea. Regulations implementing the designation are to be applied in accordance with international law and treaties to which the United States is a party (15 CFR 922.4).

The Secretary of the United States Department of Commerce is responsible to implement management plans and applicable regulations, to carry out enforcement activities, and to conduct research, monitoring, and other programs necessary to carry out the purposes of the National Marine Sanctuaries Act [15 CFR 922.30 (a)]. A provision enabling emergency regulations to prevent or minimize the destruction or injury to a Sanctuary resource is contained within 15 CFR 922.44. These regulations may, as necessary, prohibit or temporarily regulate activities conducted within the Sanctuary.

A regulation in 15 CFR 922.47 (a) provides that the rights of use or access in existence when a marine area is designated as a Sanctuary shall not be terminated by the director of NOAA. However, the director may regulate the exercise of such rights consistent with the purposes for which the Sanctuary was designated.

Each of the Sanctuaries has a set of site-specific regulations in addition to the regulations applicable to the entire Sanctuary system. The site-specific regulations are set forth in 15 CFR 922 Subparts F through R.

Channel Islands, Gulf of the Farallones, and Cordell Bank National Marine Sanctuaries

These three Sanctuaries are off the coast of California. The Gulf of the Farallones and Cordell Bank Sanctuaries are contiguous to the Monterey Bay National Marine Sanctuary. Each of these Sanctuaries is situated at least partly in federal waters. The regulations specific to these Sanctuaries are contained in 15 CFR 922 Subparts G, H, and K. The Sanctuaries encompass a combined area of about 2,600 square nautical miles.

The regulations governing these Sanctuaries are very similar. In general, there are prohibitions against taking or disturbing any bird, sealife, or minerals in the Sanctuaries; disturbing the seafloor unless incidental to anchoring or bottom trawling; and exploring or drilling for oil except if the oil lease was executed prior to March 30, 1981. Activities conducted by the Department of Defense necessary for national defense are exempted from the prohibitions. Other activities, such as exercises, conducted by the Department of Defense that are not deemed necessary for national defense are generally subject to prohibitions unless specifically permitted. Operations conducted during an emergency are also generally exempted from prohibitions. Discharge of water and other biodegradable effluents incidental to vessel use, including effluent from marine sanitation devices, deck wash down, engine exhaust or meals on board vessels is allowed. Disposal of bilge water with any concentration of oil is prohibited within these Sanctuaries. Disposal or discharge of any harmful substance is prohibited.

Monterey Sanctuary

The Monterey Sanctuary encompasses over 4,000 square nautical miles of coastal and ocean waters, and its boundaries are defined in 15 CFR 922.130 (b). The boundary coordinates are listed in Appendix A of Subpart M of 15 CFR Section 922. All of Monterey, Pillar Point, and Santa Cruz harbors as well as part of Moss Landing Harbor are excluded from the Monterey Sanctuary designation.

Regulations governing prohibited or regulated activities within the Monterey Sanctuary are contained in 15 CFR 922.132. Biodegradable effluent from MSDs approved in accordance with 33 USC 1322 et seq. is exempt from a discharge prohibition applicable within the boundary of the Monterey Sanctuary [15 CFR 922.132 (a)(2)(i)(B)]. Discharge of graywater and deck wash down water also is exempt from the discharge prohibition. Discharge of any oily bilge wastes is prohibited within the Monterey Sanctuary. Incidental damage to the seabed resulting from anchoring a vessel is not subject to prohibition [15 CFR 922.132 (a)(4)(i)]. There are no prohibitions regarding the exchange or release of ballast water into the Monterey Sanctuary waters. The Monterey Sanctuary is in the process of updating its management plan. The priorities were established through an extensive public process (Attachment 5). The

Monterey Sanctuary may prohibit or otherwise regulate discharges through its management plan. On February 7, 2003, the Sanctuary Advisory Council resolved to recommend prohibiting discharge of all wastewater, ballast water, water discharged from an oil-water separator, and all solid waste within the Monterey Sanctuary.

Florida Keys

The state waters of the Florida Keys National Marine Sanctuary (FKNMS) were recently declared a no-discharge zone under CWA section 312, due to actions of the Florida Governor and U.S. EPA. FKNMS is now in the process of declaring its federal waters a no-discharge zone. The authority for this action is within the Marine Sanctuary Protection Act. FKNMS is currently updating its management plan, and this action is part of the update process. The City of Key West has also declared a no-discharge zone for city waters.

States

California

There are 34 locations along the California coast and offshore islands that SWRCB has officially designated as having unique biological value or fragility. These locations are termed State Water Quality Protection Areas (SWQPA). Waste discharge is prohibited within an SWQPA, and nearby discharges of waste must be located a sufficient distance from an SWQPA to assure maintenance of natural water quality conditions. Limited term discharges or activities may be approved by RWQCBs if there is no permanent degradation of the water quality and all practical means of minimizing degradation are implemented (California Ocean Plan [Ocean Plan], SWRCB, 2001).

A method is available under state law to prohibit or otherwise regulate vessel disposal of wastes, excluding sewage, into state waters. The Porter-Cologne Water Quality Control Act (Water Code section 13000 et seq.) has two sections that are relevant to regulating disposal of non-sewage wastes from vessels into state waters.
Section 13260 authorizes a RWQCB to require a discharger or proposed discharger of wastes to file a report of waste discharge. The RWQCB may require the report of waste discharge to contain information it needs to quantify the discharge and assess the potential threat posed by the discharge on the state environment. Section 13263 gives authority to a RWQCB to impose requirements that must be met in order to commence or continue a discharge. These requirements may be regulated individually or as general waste discharge requirements for a specific category of discharges.

Alaska

Alaska conducted an extensive research effort to assess cruise ship environmental impacts in Alaskan waters. The Commercial Passenger Vessel Environmental Compliance Program (CPVECP) was established in the Alaska Administrative Code (AAC) (18 AAC 69) as a result of this assessment process. Alaska's program covers

large and small passenger vessels with overnight berths as well as ferries. The discussion below focuses on aspects of the program covering large passenger vessels with overnight berths. Federal legislation expanding Alaskan authority over cruise ship discharges was passed in 2000. The federal legislation is known alternatively as the Murkowski bill or HR 4577 and is codified as 33 CFR 159 Subpart E. Full information on Alaska's program is available on the internet at the following address: http://www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/cruise.htm .

Murkowski Bill

The Alexander Archipelago is a chain of islands stretching from the southeast coast of Alaska in a southwestwardly direction. Doughnut holes are waters of the United States that are surrounded by Alaska state waters due to the geography of the archipelago. There had been reports of passenger vessels going to doughnut holes specifically to discharge wastewater, then returning to state waters. The Murkowski bill redefines waters of Alaska to include waters of the Alexander Archipelago and the Kachemak Bay National Estuarine Research Reserve that are part of the navigable waters of the United States. Other provisions of this legislation prohibit the discharge of untreated sewage into the waters of Alaska (33 CFR 159.307) and places new limitations on the discharge of treated sewage and graywater. The discharge limitations include that the vessel must be at least one nautical mile from shore and underway at a minimum speed of six knots (33 CFR 159.309).

The Murkowski legislation enacted interim discharge standards that apply to cruise vessel discharges until the Administrator of U.S. EPA promulgates new standards. Discharges from cruise vessels must meet secondary treatment standards applicable to land-based dischargers as outlined in 40 CFR 133.102. The applicable secondary treatment standards are as follows:

(1) BOD shall not exceed 30 milligrams per liter (mg/l) for a 30-day average, or 45 mg/l for a 7-day average, and there shall be a minimum of 85 percent removal of BOD over a 30-day average. Alternatively, at the discretion of the permitting authority, the Carbonaceous BOD shall not exceed 25 mg/l for a 30-day average, or 40 mg/l for a 7-day average.
(2) Suspended solids shall not exceed 30 mg/l for a 30-day average, or 45 mg/l for a 7-day average, with an 85 percent removal over a 30-day average.
(3) The effluent pH shall be maintained within the limits of 6.0 to 9.0.

In addition to meeting secondary treatment standards, the geometric mean of discharge samples may not exceed 20 fecal coliform per 100 milliliters and not more than 10 percent of the samples may exceed 40 fecal coliform per 100 milliliters; total residual chlorine may not exceed 10.0 mg/l; and a minimum of five samples over a 30-day period must be taken to demonstrate conformance with these standards prior to commencement of any discharge. The regulations also specify that continued compliance be demonstrated periodically by monitoring conventional pollutants and residual chlorine in treated sewage and graywater effluents (33 CFR 159.309).

The Murkowski legislation included a statement clarifying that cruise vessels operating in Alaska waters are subject to inspection by USCG to ensure compliance with 33 CFR 159 Subpart E. Vessels not in compliance are subject to monetary penalties and may be denied entry into applicable waters of Alaska (33 CFR 159.313). Cruise vessels operating in Alaska are required to maintain a Sewage and Graywater Record Book (33 CFR 159.315). Persons in charge of the discharge are to record information including the type of discharge, vessel location, time and date, volume and flow rate of discharge, and vessel's speed during the discharge. These records are to be maintained on board for a minimum of three years.

Sampling and reporting requirements include the following:

- A Quality Assurance/Quality Control Plan to ensure accuracy of laboratory analyses;
- Certification that the vessel's treated sewage and graywater effluents meet minimum applicable standards; and
- A Vessel Specific Sampling Plan.

Vessels are subject to unannounced sampling to detect the presence of priority pollutants in treated sewage and graywater effluents. Additionally, random sampling events may occur to determine concentrations of conventional or priority pollutants in treated sewage or graywater discharges (33 CFR 159.317). It is illegal to discharge treated sewage with a fecal coliform count greater than 200 per 100 milliliter (ml) or suspended solids greater than 150 mg/l in Alaskan waters (33 CFR 159.319).

Civil and criminal penalties apply if there are violations of 33 CFR 159 Subpart E. The civil penalties include fines of up to $125,000 per violation. A negligent violation is considered a Class A misdemeanor. A knowing violation, including making false statements, is considered a Class D felony.

Alaska Administrative Code

Vessels subject to 18 AAC 69 are required to annually register with the state and pay a fee that covers the costs of administering the program. The fee schedule is tiered based on the number of passenger berths on the vessel, and a fee is required for each voyage in Alaskan waters. The fee ranges from $75 for a vessel with at least 50 berths, up to $3,750 for a vessel with more than 3,500 berths.

Submittal of a plan detailing sampling techniques and analytical testing methods for monitoring of any wastewaters to be discharged in state waters is required at least every three years. Wastewaters include treated sewage, graywater, or other wastewaters. Discharge of untreated sewage is prohibited within state waters. A vessel specific sampling plan including a schematic of the vessel showing discharge ports and estimated daily water usage is required annually. These plans, and others submitted under 18 AAC 69, are subject to approval of the Alaska Department of Environmental Conservation. Records detailing the conditions of any discharge are

required to be kept on board the vessel for 12 months and be produced at the request of CPVECP. These conditions include the volume, type, rate, and location of the discharge. Vessels discharging wastewater in Alaskan marine waters are required to submit a minimum of two sampling reports annually for conventional pollutants, and one report for priority pollutants. Conventional pollutants requiring analysis include BOD, total suspended solids, pH, fecal coliform, and oil and grease.

Small commercial passenger vessels, defined as those with overnight berths for 50-250 passengers, are subject to different requirements regarding wastewater. Small vessels are assumed to be discharging continuously or nearly continuously because they do not have the holding tank capacity of large vessels.

Vessels that are required to submit a report or notice to the United States or Canada regarding a hazardous waste or substance that was generated, discharged, or offloaded in Alaskan marine waters are required to also submit a copy of the report or notice to the State of Alaska. Vessels must submit plans detailing their policies and procedures for offloading solid and hazardous wastes to the extent those wastes are not covered by reporting requirements in the provision above.

If a vessel is unable to comply immediately with provisions of CPVECP, they are allowed to extend time for compliance by annually filing an “interim protective measures” plan. This plan must detail steps the vessel is taking to comply with CPVECP and must include a schedule for compliance.

Vessels proceeding in innocent passage through Alaskan waters are exempt from these regulations.

Hawaii

Hawaii had a bill in its 2001-2002 legislature to establish a Cruise Ship Environmental Task Force; however, the bill failed passage. Some of Hawaii’s concerns regarding cruise ships are environmental impacts, particularly impacts on coral reefs, and cultural and infrastructure impacts. A memorandum of understanding (MOU) addressing some of these concerns was negotiated with industry and is now in force (Attachment 6).

Washington

The State of Washington Department of Ecology has a cargo and passenger vessel inspection program under its Spill Prevention, Preparedness, and Response Program. This program inspects vessels for compliance with safety and pollution prevention regulations of IMO, CFR, and the State of Washington. Vessels over 300 gross tons, including passenger vessels, are expected to conform with “Accepted Industry Standards” (Attachment 7). These standards were developed and agreed upon by an advisory committee that included industry representatives and state regulators. The standards address vessel operating procedures, personnel policies, and management practices applicable to safety and pollution prevention. A boarding checklist was

developed in conjunction with the inspection program (Attachment 8). The boarding checklist is designed for inspectors to evaluate vessel operating and management conditions to determine if such conditions pose a risk to the marine environment or public health and safety. The checklist includes citations to relevant state and federal laws and international treaties.

3.2. ARB

Existing Air Regulatory Framework

The regulations and air quality programs affecting passenger cruise ships ("cruise ships") operating off California's coastline are summarized below. These programs include international, national, state, and local measures. However, these existing regulations will achieve only modest emission reductions in California. Because of air quality concerns and the need for further reductions in air emissions from oceangoing ships, including passenger cruise ships, California is proposing an ambitious, multi-pronged approach to addressing these emissions (as described in Section 6).

IMO Regulation

IMO established nitrogen oxides (NOx) standards in MARPOL Annex VI in 1997. The standards apply to diesel engines over 130 kW (174 hp) installed on new vessels, which would apply to diesel engines used on cruise ships. As shown in Table 3.a below, the NOx standards range from 9.8 to 17 g/kW-hr, depending on the maximum rated engine speed.

Table 3.b - IMO NOx Standards

IMO NOx Standards	
Engine Speed (rpm)	NOx (g/kW-hr)
$n < 130$	17.0
$130 \leq n < 2000$	$45n^{(-0.2)}$
$n \geq 2000$	9.8

Technically, IMO standards do not become enforceable until ratified by 15 countries that represent at least 50 percent of the gross tonnage of the world's merchant shipping. To date, this has not happened and the United States is among the countries that have not ratified these standards. However, the standards are retroactive to January 1, 2000, if ratified, and engine manufacturers have generally produced IMO compliant engines since that date. The NOx emission reductions in California resulting from the IMO regulation are estimated to be modest. For example, this regulation is only expected to result in a 3 percent reduction in marine vessel emissions in the Los Angeles area (South Coast Air Basin) by 2010.

U.S. EPA Standards

U.S. EPA adopted a regulation in January 2003 for large category 3 diesel engines, such as those used in cruise ship engines. Under the rule, new category 3 engines built in 2004 or later on United States-flagged vessels would be subject to IMO NOx standards established in 1997. The regulation will not achieve significant emission reductions because manufacturers have already been making IMO compliant engines since 2000. In addition, the vast majority of oceangoing ships calling on California's ports are foreign-flagged vessels.

South Coast State Implementation Plan (SIP)

The South Coast Air Basin consists of Orange County, the urban portion of Los Angeles County, and the western portions of San Bernardino and Riverside Counties. The South Coast Air Quality Management District (South Coast AQMD) is preparing a comprehensive air quality plan update for this area in consultation with ARB and the Southern California Association of Governments. South Coast AQMD's Air Quality Management Plan or AQMP addresses federal Clean Air Act requirements for SIPs as well as California Clean Air Act requirements. The new SIP component of the AQMP will revise the region's demonstration of attainment for both the federal one-hour ozone standard by 2010 and the federal PM10 standard by 2006, as well as show maintenance of the federal carbon monoxide standard. ARB prepares the state and federal component of the SIP in consultation with the affected agencies. As described in detail in Section 6 of this report, ARB is proposing federal measures to reduce emissions from oceangoing ships, including passenger cruise ships. These proposals were released to the public in January 2003 and will be discussed at public workshops held by the South Coast AQMD and ARB prior to consideration by ARB.

Ports of Los Angeles/Long Beach Vessel Speed Reduction MOU

The Marine Vessel Speed Reduction MOU is a joint effort between the Ports of Los Angeles and Long Beach, the shipping industry, ARB, South Coast AQMD, and U.S. EPA. Under the MOU, oceangoing cargo ships, including passenger cruise ships, are requested to voluntarily limit their speeds while entering or leaving the Ports of Los Angeles and Long Beach. Specifically, ships are asked to reduce their speeds to 12 knots within 20 miles of the Ports. The reduced speeds reduce engine speed, power, and NOx emissions. It is estimated that the MOU will reduce emissions by two to four tons per day upon full implementation.

The MOU was implemented as a demonstration project beginning May 1, 2001. During this demonstration phase of the project, ARB staff is preparing the documentation necessary to finalize the MOU and include it in the SIP for the South Coast Air Basin. This documentation will include methodologies necessary to quantify the emission reductions resulting from MOU, enforcement mechanisms that will be implemented if the compliance rate falls below expectations, and quantification of SIP.

State and Local Visible Emissions (VE) Rules

VEs are comprised of a variety of PM ranging in sizes from 0.1 micrometer (µm) to 20 µm. Cruise ships at berth or at anchor are subject to both state and local restrictions on VEs. VEs from any source are restricted by California law from exceeding specified opacity standards, as cited in the California Health and Safety Code section 41701. Unless otherwise exempted under Health and Safety Code section 41701, no emission shall exceed Ringelmann 2 or 40 percent opacity for more than an aggregate period of 3 minutes in any 1 hour. The local air pollution control districts also have regulations for VEs that are in most cases more restrictive than state law. Each of the local districts with active cruise ship terminals [Bay Area Air Quality Management District (Bay Area AQMD), South Coast AQMD, and San Diego County Air Pollution Control District (San Diego County APCD)] have specific rules establishing a 20 percent opacity or Ringlemann 1 limit. These apply to cruise ships hotelling or at anchor in the district as well as to other sources of VEs. A summary of the applicable rules is provided in Table 3.b below. To measure the VEs, U.S. EPA Method 9, "Visual Determination of the Opacity of Emissions from Stationary Sources (40 CFR 60, Appendix A) is used. This method was adopted by U.S. EPA to standardize the training and certification of observers and to ensure that reliable and repeatable opacity observations could be conducted anywhere in the United States. In California, U.S. EPA Method 9 is used to measure VEs; however, in establishing a violation a modified time aggregation of three minutes in any period of 60 consecutive minutes is used, whereas federal rules require observation for a minimum of six contiguous minutes.

Table 3.c - California VE Rules

Jurisdiction	Rule	Opacity Limit	Time Period
California	Health and Safety Code section 41701	Ringelmann 2	Aggregate 3 minutes in 1 hour
Bay Area AQMD	Rule 6-300	Ringelmann 1	Aggregate 3 minutes in 1 hour
South Coast AQMD	Rule 401	Ringelmann 1	Aggregate 3 minutes in 1 hour
San Diego County APCD	Rule 50	Ringelmann 1	Aggregate 3 minutes in 1 hour

3.3. DTSC

Existing Toxic Substances Regulatory Framework

International

Annex V of MARPOL 73/78 includes regulations for the prevention of pollution by addressing garbage from ships. Garbage is defined as all kinds of victual, domestic, and operational waste, excluding fresh fish and parts thereof, generated during the normal operation of the ship and to be disposed of continuously or periodically. Annex V does not specifically refer to hazardous waste requirements for storage, transportation, and disposal. However, it does refer to restrictions and controls of operational waste, which includes the discharge of harmful substances, maintenance waste, oily and contaminated rags, and ash from incinerators.

Annex V encourages the offloading of garbage at port reception facilities and advises ship operators to become familiar with individual government requirements. Annex V provides guidelines for the disposal of non-hazardous garbage and recommends the incineration of garbage to reduce the volume of space necessary to store garbage.

Federal

DTSC is authorized by the U.S. EPA to administer and enforce a federally equivalent hazardous waste program. California hazardous waste regulations are equivalent to or more stringent than federal hazardous waste regulations.

California

DTSC regulates the generation, treatment, storage, disposal, transportation, and handling of hazardous waste. Hazardous waste law is contained in the California Health and Safety Code, Division 20. The hazardous waste regulations are contained in Title 22, Division 4.5, California Code of Regulations (CCR Title 22). The state hazardous waste law authorizes DTSC and local Certified Unified Program Agencies (CUPAs) to enforce the state hazardous waste management requirements.

The regulations define a hazardous waste generator in CCR Title 22, section 66260.10, as any person, by site, whose act or process produces hazardous waste. Cruise ships will be regulated as hazardous waste generators if they generate hazardous waste within three miles of the California coastline.

Hazardous waste generators are required to determine if the wastes they generated are hazardous. They also must know how much hazardous waste is generated each month. The amount of waste generated each month will determine the extent of the requirements listed below that apply to each generator:

1. Obtain a site-specific hazardous waste identification number.
2. Container storage requirements and accumulation times.
3. Proper labeling and marking of containers.
4. Preparing emergency procedures and contingency plans.
5. Employee training.
6. Hazardous waste shipping and tracking requirements using hazardous waste transporters and manifests.
7. Biennial reporting to DTSC.

DTSC also regulates the storage, treatment, and disposal of hazardous waste. These activities require a hazardous waste treatment facility permit (Permit) or other forms of authorization from DTSC. Storage Permits are required when wastes are stored longer than specified time frames. The amount of time that a generator may store waste without a storage permit depends on the amount of waste generated each month.

The regulations define treatment as any method, technique, or process, which changes or is designed to change the physical, chemical, or biological character or composition of any hazardous waste. Generators who treat hazardous waste are required to obtain a Permit or other forms of authorization from DTSC. Cruise ships would need a permit if they treat hazardous waste within three miles of the California coastline.

Hazardous waste laws and regulations only allow disposal of hazardous waste at permitted or otherwise authorized hazardous waste facilities. The regulations do not allow disposal of hazardous waste at sea.

Florida

The Florida Department of Environmental Conservation (FDEC) had negotiated an MOU with the industry in March 2000. The MOU primarily covered aspects of hazardous waste management and disposal practices. A new MOU was signed in December 2001 (Attachment 9). FDEC has assisted USCG with vessel inspections related to Resource Conservation and Recovery Act issues and provided training in hazardous waste regulations. This was a pilot program, but this training and assistance will be expanded nationwide.

3.4. CSLC

Existing Ballast Water Regulatory Framework

International

IMO adopted Resolution (50) 31 “International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships’ Ballast Water and Sediment Discharges” in November 1993. The Resolution recommends the

exchange of coastal ballast water in water at least 2,000 meters deep, along with other operational procedures related to the uptake and discharge of ballast water and sediment (IMO, 1991).

In 1989, the Canadian Coast Guard adopted "Voluntary Guidelines for the Control of Ballast Water Discharges from Ships Proceeding via the St. Lawrence Seaway to the Great Lakes," which recommends vessels bound for ports along the St. Lawrence Seaway, and in the Great Lakes, exchange their ballast at sea.

New Zealand has had voluntary guidelines in place since 1992, while Australia adopted mandatory ballast water management rules in July 2001.

Federal

The Congress, after the discovery of the zebra mussel in the Great Lakes, passed the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) of 1990. NANPCA set voluntary ballast water guidelines, which became mandatory in 1993 for vessels arriving from oversea ports and entering the Great Lakes. In 1994, the mandatory regulations were extended to the upper Hudson River (Federal Register, 1993).

Congress expanded NANPCA in 1996 and passed the National Invasive Species Act (NISA), which set voluntary ballast water management guidelines and mandatory ballast water reporting requirements for vessels entering the United States after operating outside the Exclusive Economic Zone (EEZ) (Federal Register, 1998). NISA required USCG to report to Congress on the effectiveness of the program. USCG submitted a report to Congress in June 2002 that assessed the effectiveness of the voluntary guidelines and mandatory reporting in preventing the introduction and spread of nonindigenous aquatic species (NAS) in United States waters. The report documents a low nationwide compliance with the mandatory reporting requirements and the voluntary management guidelines (Ruiz et al., 2001).

California

Recognizing the threat of new invasions from ballast water and the absence of a mandatory national ballast water management program, the Legislature in 1999 enacted the Ballast Water Management for Control of Nonindigenous Species Act (the Act), (PRC section 71200 et seq.) which became effective on January 1, 2000. The Act was modeled loosely on the USCG program. The Act established a statewide multi-agency program with the intent to control the introduction and spread of NAS in the waters of the state. Responsible agencies identified in the Act include the CSLC, DFG, SWRCB, and the Board of Equalization (BOE). Each agency is required to work in cooperation with the others in developing reports and conducting research into the extent of current invasions and potential long-term solutions to the problem of NAS introductions.

The Act applies to all United States and foreign vessels that enter California waters after operating outside the EEZ. Unlike the federal law, the California law prohibits vessels from discharging ballast water into state waters unless the master, operator, or person in charge has carried out a mid-ocean ballast water exchange procedure or is using an environmentally sound alternative shipboard treatment technology approved by the CSLC. Vessels also have the option of discharging ballast water to an approved shore-based treatment facility.

The Act only applies to those vessels that enter California waters after operating outside the EEZ, ignoring the importance that coastal shipping plays in transporting NAS. Coastal shipping has been linked to the spread of NAS within the region. Examples include the transport of the Asian copepod (*Pseudodiaptomus inopinus*) and Japanese eelgrass (*Zostera japonica*) in ballast waters from the Columbia River and from Pacific Northwest bays to San Francisco Bay (Cohen & Carlton, 1995). Similarly, coastal shipping may transport introduced NAS now found in the San Francisco Bay Estuary to other ports along the west coast. Coastal port-to-port exchange of ballast water may increase the potential for NAS establishment because of the similar conditions (salinity, temperature) found among West Coast ports.

Other States

Recognizing the risk of port-to-port NAS introductions, Washington and Oregon passed legislation applicable to coastal shipping in 2000 and 2001, respectively. The two programs have significantly different requirements for coastal traffic. Washington requires coastal traffic to exchange ballast water at least 50 nautical miles offshore prior to discharging in Washington waters (WDFW, 2002). Oregon also requires coastal traffic to exchange ballast water outside Oregon waters, though no distance from shore or water depth is mandated. The difference between the two state programs has led to frustration and confusion by the maritime industry. Consistency among the West Coast states would help ensure compliance by the maritime industry.

Regional Efforts

Coastal ballast water management is currently being addressed at the regional level. The Pacific Ballast Water Group (PBWG), of which CSLC is a member, hosted a technical workshop in March 2002 on near shore physical oceanography to identify processes that could influence the efficacy of ballast water exchange in coastal shipping. The physical oceanographers identified alternative exclusion zones that could provide the basis for the development of a regional ballast water management plan. In January 2003, a follow-up meeting was held in cooperation with California Sea Grant (West Coast Ballast Outreach Project 2003) to consider the results of the physical oceanography workshop as a basis for a uniform, coast wide approach to ballast water management along the West Coast of North America. Participants, representing the maritime industry, regulators, and scientists, concluded that although information gaps exist, these gaps did not preclude the development of a regional plan. Furthermore, the

participants agreed that the development of a regional plan must include a comprehensive monitoring effort to determine the effectiveness of the plan and measure potential impacts to coastal communities.

3.5. CIWMB

Existing Solid Waste Regulatory Framework

Solid Waste ("garbage") is covered under Annex V of MARPOL and 33 CFR 151. Compliance with Annex V is mandatory. Annex V and Federal Regulations set specific minimum distances for the disposal of the principal types of garbage. Perhaps the most important feature of Annex V is the complete prohibition placed on the disposal of plastics into the sea. In 1990, Amendments to Annex V (and Annex I) included identifying the Antarctic as a "special area." These amendments were adopted in November 1990 and enacted into force on March 17, 1992 (IMO 2002).

Additionally the amendments to Annex V of MARPOL designate the Wider Caribbean area as a Special Area. This gives the Wider Caribbean greater protection against the disposal into the sea of garbage from ships. A number of other seas have been given this status. Most areas designated as a Special Area have particular problems because of heavy maritime traffic or low water exchange caused by the land-locked nature of the sea concerned (IMO 2002).

The Wider Caribbean includes the Caribbean itself, the Gulf of Mexico, and a number of other seas and bays extending as far south as French Guiana (IMO 2002).

1995 amendments improved implementation of the Annex V, including placards and the recording of "garbage management plans and garbage records keeping" (IMO 2002).

U.S. Coast Guard Federal Regulations for Waste Disposal at Sea

CFR lists conditions and controls that must be complied with by all vessels that navigate on the oceans and "the Navigable Waters of the United States." These regulations are written to control all aspects of solid waste ("garbage") generation, handling, storage, and disposal as they pertain to vessels.

Section 151.63 pertains to the shipboard control of the garbage while underway. This includes records of its generation, storage, and eventual discharge either in port receiving facilities, or at sea. The methods by which these materials may be processed include grinders or comminuters and plans or educational programs in training shipboard personnel on waste handling.

Section 151.65 deals with the requirements of reporting procedures, including the advanced notification to ports of call of the ship's name and estimated volume of waste to be disposed.

Section 151.66 deals with the prohibitions of disposal of wastes into the navigable waters of the United States with referral to the definition of “Navigable Waters”.

Section 151.67 deals with the prohibition of plastics in wastes. This includes plastics alone, or plastics mixed in with other garbage. All wastes containing plastics must be disposed of onshore.

Section 151.69 deals with the prohibition of discharge of wastes within “special areas.” This section also stipulates the distances from shore where wastes may be discharged. Primarily the regulation identifies a distance of a minimum of 12 nautical miles from nearest land for “victual wastes” and other materials like paper, rags, metals, glass, crockery, etc. and 25 nautical miles for “dunnage,” lining or other packing materials.

Section 151.71 deals with standards for disposal of victual wastes by ships within special areas with stipulation of as far as practicable from land but a minimum distance of 12 nautical miles from nearest land or 3 nautical miles from the nearest land in the wider Mediterranean. In addition, these wastes must be passed through a grinder or comminuter to reduce materials to particle sizes that will pass through a 25 millimeter screen.

Section 151.75. Grinders and Comminuters. This section specifies the definitions of these devices and their operation and the approved particle size of the processed wastes.

Section 151.77 specifies the circumstances when wastes can be discharged in case of emergencies. These emergencies involve the security of the ship and those on board or saving life at sea. These circumstances also include accidental loss if all precautions are taken to secure that which was lost.

3.6. DFG

Existing Fish And Game Regulatory Framework

California

DFG’s Office of Spill Prevention and Response (OSPR) currently enforces the following regulatory requirements found in various provisions in the Government Code, Title 2, Division 1, Chapter 7, covering oil spills, oil spill response, and contingency planning for all vessels over 300 gross tons, including cruise ships:

- Vessels must have a California state issued Certificate of Financial Responsibility; in the case of cruise ships, they must have $300 million worth of insurance to cover an oil spill from the vessel.

- Vessels must have an oil spill contingency plan and a response manual to cover an oil spill incident that may affect state waters. The vessel oil spill contingency plan must include:

    - Operations risk analysis and corrective measures;
    - Use of vessel traffic service systems;
    - Navigational risk analysis;
    - Compliance with other state agency risk reduction programs;
    - Information on current risk reduction programs;
    - Summary of prevention measures, operational guidelines, and procedures;
    - Proof of compliance with Flag State requirements, certificate of Inspection, international safety certificates, and classification certification;
    - Proof of compliance with international requirements such as International Safety Management certification, Safety Management Certificates, International Oil Pollution Prevention documentation and/or American Waterways Operators Responsible Carrier Program compliance documentation;
    - Notification requirements for disabled vessels;
    - Contracts for salvage and emergency services to address such needs as emergency towing, firefighting services, oil transfer resources (lightering), professional marine salvors, de-watering resources, emergency repairs, harbor clearance, and wreck removal; and
    - Vessels that have an oil spill contingency plan must conduct a complete exercise of their contingency plan over a three year period. OSPR tracks all contingency plan drills and exercises and participates in the drill. In addition, all vessels are subject to unannounced drills conducted by OSPR headquarters and field staff.

Oil Transfers

Vessels must meet state regulatory requirements when transferring oil over the waters of the state. Vessels conducting a refueling operation (bunkering) must comply with the following requirements (see Marine Oil Transfer Checklist, Attachment 10):

- Have written oil transfer procedures;
- Have operations manuals;
- Use qualified personnel;
- Have emergency shutdown procedures;
- Use proper communications;
- Complete documentation called a Declaration of Inspection prior to start of oil transfers;
- Complete a pre-transfer agreement prior to transfer of oil;
- Have spill containment equipment immediately available during oil transfers; and
- Transfer operations are subject to inspections and monitoring by OSPR field inspectors.

Vessel Traffic Control

Vessels entering San Francisco Bay and Los Angeles/Long Beach harbors must use Vessel Traffic Services, which is a federal program operated by USCG similar to Air Traffic Control. All vessels entering state/federal waters are required to give 96 hours advance notice of arrival. This notification requirement can be met by notifying the Marine Exchanges located in each port.

Under the Government section 8670.21, the Administrator of OSPR required the installation of a Vessel Traffic System to be installed in the Los Angeles/Long Beach Ports. In addition, the OSPR supported the creation of a Marine Information Services program for the Port of San Diego, this program assists in the safe transits of vessels using the harbor.

Vessel Hazardous Material Discharges

All vessels are subject to the Fish and Game Code section 5650, regarding water pollution. Basically, the code prohibits the following from being passed into state waters:

- Any petroleum or any product of petroleum;
- Any refuse liquid or solid; and
- Any substance or material deleterious to fish, plant life, or bird life.

Marine Sanctuaries and Other Protected Marine Areas

In addition to the Sanctuaries, California has 104 designated Marine Life Reserves known as Marine Protected Areas (MPA) along the coast. These MPAs are defined as discrete geographic areas that have been designated by law, administrative action, or voter initiative to protect or conserve marine life and habitat. They are specially designated as no-fishing wildlife protection areas. MPAs are intended to protect or conserve marine life and habitat; these designated areas are considered particularly sensitive and must be protected from all pollution sources. In addition to MPAs, the state has Marine Managed Areas (MMAs). MMAs were previously known by a variety of names such as refuges, reserves, State Coastal Sanctuaries, State Parks, and State Beaches; their numbers are a part of the MPAs.

SECTION 4. EXISTING ENVIRONMENTAL PRACTICES OF CRUISE INDUSTRY

As previously mentioned in this report, ICCL member lines adopted a set of Standards in 2001 which incorporate legal requirements and voluntary practices for waste management on the part of the cruise industry and are designed to meet or exceed legal standards. Acceptance of ICCL Standards as standard operating procedure is now mandatory for ICCL membership. The Standards discuss vessel waste streams and acceptable methods of handling those waste streams. Incorporated into the Standards are MARPOL and United States regulatory requirements, waste minimization, recycling and use of recycled products, and crew and passenger education and training about appropriate environmental management practices. The Standards also stress environmentally sound design of new vessels and vessel equipment upgrades, and cooperative efforts within the industry to share information on new technologies and appropriate industry practices. A matrix illustrating waste streams and handling methods is provided in Attachment 11.

The Task Force sent a questionnaire to ICCL member lines to learn some of the treatment technologies and disposal methods used by their vessels. Some of the questions were answered directly by the cruise lines, and some answers were prepared and submitted by ICCL.

Industry representatives have stated that their ships generally do not cruise within the three nautical mile limit of state waters. They enter state waters to embark and disembark passengers, then exit state waters soon after leaving port.

Task Force members toured two ships in port to help them understand the shipboard environmental and waste handling practices. The ships toured were Carnival's Ecstasy and Holland America's Zaandam.

Ship design may vary significantly from one vessel to another, or even within a fleet. This fact should be noted while reading the discussion below. Many newer vessels have advanced wastewater treatment systems installed, and some older vessels have been upgraded with this technology. Some vessels have installed experimental ballast water treatment systems to attempt to reduce the unintended introduction of NAS into the waters where they sail. ICCL has stated that member lines are working together and sharing information on new technologies to improve the environmental performance of their ships.

4.1. SWRCB - Wastewater Discharge Practices

Wastewater Reports Required Under PRC section 72302

A table showing the companies and their ships that submitted reports under PRC section 72302 is provided in Attachment 12. The specified reporting period was calendar years 2001 and 2002. All but two vessels reporting under this section

indicated no discharges in California waters. The Spirit of Oceanus, owned by Cruise West, reported discharging 91 cubic meters (about 24,000 gallons) of graywater at 32N 118-43 W in October 2001. These coordinates are actually about seven nautical miles south of the California-Mexico border and 25 nautical miles offshore. The Spirit of Oceanus has a capacity of 114 passengers. The Holiday, owned by Carnival, reported graywater discharges at the San Pedro Cruise Terminal during the first two quarters of the reporting period. The graywater discharges occurred twice per week from January 1, 2001 until May 14, 2001, when work on the Holiday's graywater lines and tanks was completed. The Holiday was repositioned to San Juan, Puerto Rico shortly after completion of the work. The reported discharges consisted of 80 tons (about 19,200 gallons) of graywater per visit, twice weekly. The Holiday has a capacity of 2,052 passengers. Ships have about one crewmember per two passengers. No reports of treated or untreated sewage discharge were received from any of the reporting vessels.

After the September 11, 2001 attacks, many cruise lines adjusted their itineraries to reduce the necessity for air travel and to provide cruise vacations closer to home. Three lines decided to visit Monterey in 2002. Following an expression of public concern, all three of the lines agreed to adhere to a policy of withholding all discharges in the Monterey Sanctuary. Crystal Cruises later admitted that discharges had occurred in the Monterey Sanctuary at a distance of 14 nautical miles from shore (see Attachment 13). The discharges consisted of 129 cubic meters of graywater (about 34,000 gallons), one cubic meter of treated blackwater (about 264 gallons), and eight cubic meters of processed bilge water (about 2,100 gallons). Crystal Cruises management apologized for the incident and stated that the chief officer of the ship involved was terminated and other officers were given final warnings as a result of the incident. The Crystal Cruises Harmony was subsequently banned from using any of the City of Monterey facilities, including the port. Cruise ships visiting this port in the future will be required to immediately report to the Harbormaster any discharges into the Monterey Sanctuary as soon as they leave the Monterey Sanctuary waters.

Four non-ICCL member lines reported under the quarterly reporting system. They were NYK Cruises, Mitsui OSK Cruise Line, Cruise West, and Silver Seas Cruises. These lines visit California occasionally. During the two-year reporting period, three of these lines visited California once, and the fourth did not visit California. Because these lines seldom visit California, they were not sent copies of the questionnaire developed by the Task Force. Some of the smaller ICCL member lines did not respond to the questionnaire because they seldom visit California.

ICCL Standards and Practices

ICCL Standards require ships to withhold discharge of graywater and treated sewage until the vessel is four nautical miles from shore and underway at a minimum speed of six knots. Untreated sewage may be discharged when the vessel is more than 12 nautical miles from land, a coral reef, or MARPOL designated sensitive areas. Generally, ships with advanced wastewater treatment systems treat some or all

graywater as well as sewage. The sewage and graywater would be commingled at some point during the treatment process; therefore, the effluent would be required to meet MSD discharge standards. Some wastewater is reclaimed on-board for suitable non-potable water uses.

MSD and Graywater Treatment Systems - Description

All vessels with installed toilet facilities are required to install USCG certified MSDs to treat the sewage produced on board. Certification means that USCG has certified that type of MSD is capable of meeting legal standards upon installation.

There are many different types and brands of MSDs installed on cruise ships. Treatment processes used include the following:

- Ultrafiltration – This type of unit treats waste by filtering and removing particles from the waste stream. The effluent is disinfected with chlorine or subjected to ultraviolet radiation following filtration. Ultrafiltration is a type of advanced treatment that is approximately equivalent to tertiary treatment at a land-based treatment plant. Some land-based tertiary treatment plants reclaim the wastewater produced and recycle it for landscape watering, groundwater recharge, or other uses. Ultrafiltration frequently treats a combined blackwater and graywater waste stream. The waste stream may undergo other treatment processes prior to ultrafiltration.

- Reverse Osmosis – This type of unit treats waste by using osmotic pressure to push effluent through a membrane, removing microscopic particulate matter. The waste stream must undergo pretreatment to remove large particles prior to the reverse osmosis process. Reverse osmosis is a type of advanced treatment that is approximately equivalent to tertiary treatment at a land-based treatment plant. Reverse osmosis frequently treats a combined blackwater and graywater waste stream. The effluent is disinfected with chlorine or subjected to ultraviolet radiation following filtration.

- Biological & Chemical – This describes many types of treatment systems. Commonly, this treatment is similar to an activated sludge or bioreactor system at a land-based treatment plant and may be capable of producing secondary treatment quality effluent. If membrane filtration is added to the treatment train, tertiary quality may be achieved. Biological treatment uses aerobic microorganisms to metabolize organic material into carbon dioxide and other products. The resulting effluent has a reduced oxygen demand. The steps in treatment would be maceration > aeration > solids settling > sludge return > sludge generation > disinfection. Chlorine is commonly used to disinfect the effluent.

- Macerator/Chlorinator - This type of unit treats waste by comminuting it to a uniform, small size, then disinfecting the wastewater with chlorine prior to discharge. Ships with this type of unit would be required to discharge outside of 12 nautical miles

because the effluent would not meet federal standards. Only one ship reporting under PRC section 72302 has this type of unit, and that ship only came to California once during the two-year reporting period.

MSD effluent, as noted in Hamworthy Operation & Maintenance manuals for two different Biological & Chemical type MSDs, can achieve the following minimum ranges of quality:

Biochemical Oxygen Demand	30 – 50 mg/l
Total Suspended Solids	30 – 100 mg/l
Fecal Coliform	20 – 250 colonies per 100 ml
Turbidity	5 turbidity units
Chlorine Residual	2.5 – 6 mg/l

The actual USCG/IMO test results for one type of unit with membrane filtration were:

Fecal Coliform	10.6 colonies per 100 ml (average)
Biochemical Oxygen Demand	2.6 mg/l (average)
Total Suspended Solids	3.1 mg/l (average)

MSD effluent from the ROCHEM UF treatment system, a reverse osmosis system, can achieve the following quality:

Biochemical Oxygen Demand	less than 100 ppm
Total Suspended Solids	less than 5 ppm

There should be correspondingly low levels of turbidity and fecal coliform present in the effluent; however, specific data for these parameters were not listed in the operation & maintenance manual.

Ultrafiltration and reverse osmosis treatment processes are effective at removing some metals and other types of priority pollutants. Ultraviolet radiation is frequently used to disinfect the effluent from ultrafiltration and reverse osmosis systems; therefore, no chlorine residual is present in the effluent. Use of ultraviolet radiation as a disinfection process requires a very low level of turbidity to be effective, so it is not available as an option for systems producing higher turbidity levels in the effluent.

Effluent quality from an MSD is dependent on the type of system installed and adherence to an appropriate maintenance regimen. Effluent quality produced from actual systems installed on vessels may vary significantly from that noted above.

MSD and Graywater Treatment Systems - Use Practices

Vessels, by policy, withhold discharge of treated sewage and treated or untreated graywater within California waters. The estimated holding tank capacities reported ranged from 16 hours to five days of capacity for both sewage and graywater. Most

vessels have greater than 24 hours of holding capacity for these waste streams. Vessels are rarely at California ports for more than 10 hours during a single visit. When they are in Monterey, the port call may be extended to up to 24 hours.

When asked if MSDs are used regardless of a ship's location, ICCL responded that blackwater is treated by a properly working, approved MSD prior to discharge and that MSDs are tested periodically in accordance with certification standards. Presumably, the testing referred to is for USCG certification of the MSD type rather than an MSD installed on a vessel. ICCL stated that untreated blackwater may be discharged into the ocean at a distance greater than 12 nautical miles from any land, coral reef, or MARPOL designated sensitive area, or other such distance as agreed to with authorities having jurisdiction. Additionally, as stated in ICCL Standards, member lines agree to discharge blackwater only while the ship is underway at a speed of not less than six knots and in accordance with applicable regulation; blackwater will not be discharged in port and will not be discharged within four nautical miles from shore.

Chlorine use is not mandated outside of 12 nautical miles from shore. ICCL did not respond to the questions: "Are chlorine tablets used in the MSDs regardless of ship location? What is the concentration of chlorine in the effluent?" As stated in the MSD Description section above, chlorine residuals in the effluent may be in the 4–6 mg/l range when chlorine is used to disinfect effluent.

Placards are placed in all bathrooms instructing crew and guests not to dispose of plastics in MSDs. Crew and guests are also provided with additional information via other formats instructing them not to dispose of plastics in MSDs. Flushed plastics are removed during regular maintenance on ships with advanced treatment systems. There is no practical method of removing flushed plastics from MSD effluent produced from other systems. However, some plastics may settle to the bottom of the MSD and be removed at the same time sludge is removed.

When overboard discharge ports are opened or closed, these actions are recorded in the ship's logbook and in engineering logbooks. The date, time, and location of the vessel is noted. The pumping rate of wastewater discharges ranges from 40 to 200 cubic meters per hour. Typical daily quantities of graywater produced by ICCL member lines' vessels is 90,000 to180,000 gallons. Blackwater quantities range from 7,000 to 20,000 gallons.

All types of treatment units produce some amount of sludge. Sludge, also termed biosolids, is the semi-aqueous fraction of solids remaining in the treated sewage. Sludge settles to the bottom of a treatment unit. Accumulations of sludge must be periodically removed from the MSD units. Maintenance regimens call for the removal of sludge every two to six months, depending on the type of MSD and usage rates. Sludge contains organic materials, and unless further treated, tends to have high concentrations of bacteria and viruses. Municipal sludge may also contain metals or other contaminants. It is unknown if vessel-generated sludge would be likely to contain these other contaminants. ICCL states that sludge may be discharged at sea when the

vessel is 12 nautical miles from shore, or sludge may be landed ashore for disposal by an approved waste contractor. Individual lines did not respond to the questions: “How and when is sludge removed from the MSDs? Where is it disposed?”

MSD and Graywater Treatment Systems – Maintenance

ICCL stated that MSD operation & maintenance manuals specify the maintenance regimen to be followed by the vessel. Records of maintenance performed are kept with engineering maintenance records. They stated that MSDs are manually monitored on an hourly basis to determine if the equipment is operating properly. They did not elaborate on what type of monitoring is conducted.

ICCL stated the following when asked what methods are in place to ensure proper procedures are followed for use and maintenance of MSDs. “The US Coast Guard regularly inspects MSDs and determines whether the devices are properly installed, capacity is adequate for the number of persons on board, crew is properly trained, maintenance procedures are being followed, maintenance records are in order, units are operating within manufacturers design specifications and the crew is knowledgeable in the use of the equipment. If the Coast Guard has reason to believe that an MSD is not properly operating, it can require the vessel owner to have the effluent sampled and analyzed by a qualified wastewater laboratory, with the results reported to the Coast Guard. Ships are also built to specific standards set by a Class Society, such as Lloyd's Register, and these societies conduct periodic audits to ensure equipment is operated and maintained to manufacturer's standards.” In practice, USCG very rarely requests samples. Rather, if they see a problem with the equipment or personnel assigned to maintain the equipment, they will require correction of the problem. In the Alaskan district, USCG would report problems to the Alaska Department of Environmental Conservation, and the Department may require sampling.

A request that sampling results for 2000 and 2001 be forwarded to the Task Force was made. The response from ICCL was that results for sampling conducted in Alaska were available at www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/cruise.htm. This site contains sampling data for ships that visit Alaska. Many of those same ships visit California. The site does not include data for all ships that visit California. As noted in Section 3 of this report, Alaska requires that ships discharging in waters under its jurisdiction provide certain monitoring data prior to the discharge. The monitoring data will be discussed in Section 5.

According to P&O Princess Cruises Guidelines for Marine Sanitation Systems, some potential problems leading to poor effluent quality are:

1. Incorrect air supply to aeration chamber;
2. Incorrect sludge return rates;
3. Effects of daily high and low flow rates (high usage in the morning and early evening, low usage at other times);
4. Insufficient dilution water supplied for proper functioning of MSD; or
5. Use of biocides, including chlorinated products, resulting in anaerobic conditions.

Corrosion is always of concern on a vessel, and corrosion of sewage pipes and tanks can result in leakage of the effluent or untreated wastewater. An appropriate operation and maintenance regimen can reduce or eliminate these situations before they become problems.

Individual member lines did not respond to questions regarding maintenance regimens for MSDs, although most lines provided Operation & Maintenance manuals that detailed the suggested maintenance regimen. They did not respond to questions about whether or not periodic sampling of MSD effluent or graywater is conducted.

Oil-Water Separator System

Vessels generate considerable volumes of oil and cleaning agent-contaminated water through condensation, machinery seals and propeller shaft leakage, and wash down procedures used in the engine spaces. This oily wastewater tends to accumulate in the bottom of the ship, in spaces known as machinery space bilges, hence the terms “bilge water” or “bilge slops.”

The treatment process for this oily wastewater is fairly consistent among various types of vessels. The first step is to pump the bilge slops into a holding tank. Usually this tank is of sufficient size to allow several days of bilge slops to be stored. In order to dispose of bilge slops, the liquid is run through an oil-water separator. An oil-water separator uses different methods to separate the water from the oil and sludge in the slops. The most common methods of separation use centrifugal force, filtration, and gravity. Since oil is lighter than water, it tends to migrate to the top of the liquid in the holding tank. The bottom liquids in this tank are then pumped over the side into the ocean. The separated water pumped overboard may not have an oil content exceeding 15 ppm or produce a sheen, as required by MARPOL 73/78 Annex I, Reg. 9, or 33 CFR 151.10.

A device is added to the piping system that can detect oil in the liquid that is being discharged. This device is called a bilge alarm/bilge monitor, which senses oil in ppm. Once the bilge alarm/bilge monitor has sensed 15 parts of oil per million in the liquid, the system is designed to shut down the overboard discharge system, thereby preventing an illegal discharge of oil. Some of the more modern oil-water separator systems have included a series of filters to further scrub the oils from the liquids prior to discharging the liquids over the side of the vessel. All discharges from the oil-water separator system are required to be logged in the vessel’s “oil record log book.”

Potential problems associated with oil-water separator systems include the following:

- Data recorders can be manipulated or shut off and not record all discharges.
- Oil-water interface detectors can easily get out of calibration and allow more oil to be discharged than legally allowed.
- Piping systems can be re-routed to bypass the oil-water detectors.

- Substances such as cleaning solvents are not removed from the slops and are routinely discharged with the liquids into the ocean.
- The slop tanks are used to dispose of other hazardous materials, both liquids and solids, illegally since the bilge alarm/bilge monitor will not detect these other substances.

4.2. ARB

Existing Environmental Practices Related to Air

Cruise ships make numerous calls to California's ports, and traverse California's coastline on journeys north and south of the state. Cruise ships currently operate mainly out of four California ports: Los Angeles, Long Beach, San Diego, and San Francisco.

Cruise ships made about 375 calls to California ports in 2000 based on data provided by the California State Lands Commission (Attachment 14). Nearly 300 of these port visits were trips from Mexico to the Ports of Los Angeles or Long Beach. Cruise ships visiting California ports depart to (and arrive from) a variety of different destinations, including ports in Mexico, South America, Canada, Alaska, and Hawaii.

The operation of cruise ships (like other oceangoing vessels) results in significant air emissions in California coastal waters. These emissions occur during arrival and departure from ports, transiting the coastline, and while "hotelling" at dockside. There are several sources of emissions from cruise ship operations. However, the largest source by far is the exhaust from the vessel's main engines, which provide power for propulsion and on-board electrical loads. Additional sources of emissions, according to ICCL, include diesel generators, auxiliary boilers, and incinerators. Presumably, there would be additional smaller sources of emissions, such as dry cleaning and repair and maintenance operations. However, no information was provided about these sources of emissions.

Main Engines

Most cruise ships are propelled by multiple large diesel engines, which drive generators to produce electricity for both propulsion and on-board electrical loads. These engines may be two stroke or four stroke piston engines, or in some cases, combinations of diesel powered piston and turbine engines. The current trend among new cruise ships is toward four stroke engines, which tend to run cleaner than the two stroke engines used in most other oceangoing ships. The total combined power for the "diesel-electric" engines on a typical vessel ranges from 20,000 to 50,000 horsepower (Arcadis, September 1999; Wartsila, January 2003). Cruise ships reportedly use multiple engines so that they have the flexibility to cruise at slower speeds with fewer engines operating at full load for greater fuel efficiency, as opposed to running a single engine at lower loads less efficiently.

Cruise ship engines emit a variety of pollutants, including NOx, particulate matter (PM), hydrocarbons (HC), carbon monoxide and dioxide (CO and CO2), and sulfur oxides (SOx). Due to the relatively weak regulatory requirements mentioned in Section 3, these emissions are largely uncontrolled. These emissions are discussed in more detail in Section 5, "Potential Environmental Impacts."

Fuel Choices

Although the engines mentioned above are described as "diesel-fueled," cruise ships generally run their main engines on intermediate fuel oil (IFO 180 or IFO 380). This fuel is also referred to as "bunker fuel," and requires heating to reduce its viscosity to a point where it can be properly atomized and combusted. Bunker fuel typically contains much higher levels of sulfur, nitrogen, ash, and other compounds, which increase exhaust emissions compared to typical on-road diesel fuel. According to information submitted by ICCL, member cruise lines use fuel with a sulfur content ranging from about 1.5 to 3.3 percent and prefer lower sulfur fuel because it is less corrosive. ICCL also reported that fuels available in California and the United States have higher sulfur levels. According to one report, typical bunker fuel used by all oceangoing ships visiting the Ports of Los Angeles and Long Beach averages about 2.8 percent sulfur or 28,000 ppm (Arcadis, September 1999). This compares to a sulfur content of about 120 ppm for California on-road diesel. ICCL also reported that oily sludge may be burned in the ship's engine (or burned in the on-board incinerator or off-loaded on shore). Finally, ICCL reported that lower sulfur fuels such as marine gas oil (MGO) or a blend of MGO and bunker fuel may be used by some ships during maneuvering.

VE Observations

AB 2746 directed ARB to "measure and record the opacity of visible emissions, excluding condensed water vapor, of a representative sample of large passenger vessels while at berth or at anchor in a port of this state." This section addresses this requirement. To fulfill this requirement, ARB staff measured the VEs of twelve cruise ships during September and October 2001. The methodology followed to measure the VEs, and the results are provided below.

Method of Evaluation

The method selected to measure and record VEs is U.S. EPA Method 9, Visible Emission Evaluation. The method involves observation by a certified observer every fifteen seconds for a minimum of three minutes for state rules and six minutes for federal rules. The product of observation is a set of numbers between zero and five describing the darkness or opacity of the smoke plume. On the Ringelmann scale, zero indicates no smoke and 5 indicates complete obscuration by black smoke or 100 percent opacity. The state and federal standards are Ringelmann 2, or 40 percent opacity. The standard in each of the three air districts with cruise ship docks is Ringelmann 1, or 20 percent opacity.

While U.S. EPA Method 9 is an inexpensive and repeatable way of documenting and comparing emissions, it is not an accurate indicator of the total PM emissions from diesel engines, since some particle sizes are not visible. Diesel exhaust, as noted elsewhere in this report, has been identified as a toxic air contaminant and contributes to the non-attainment status of many regions of California for ambient PM levels. The toxicity of ship emissions and the total contribution of ships to airborne PM are not measured by U.S. EPA Method 9.

Findings

According to information supplied by ICCL, twenty-three ships operated by nine cruise lines visited California ports in 2001. As shown in Table 4.a below, the emissions from about half of these ships were observed over a two-month period in 2001. Table 4.a lists the date each ship was observed and the three-minute average on the Ringelmann scale. Ringelmann numbers are read as fractions no smaller than ¼ and ranging from zero to Ringelmann 5. The mathematical average of the 12 highest readings is presented in Table 4.a as a decimal. As can be seen in Table 4.a, all values measured during the study period were at or below Ringelmann 1. The raw observational data can be found in Attachment 15.

Table 4.a - Cruise Ships Visiting During 2001

Carrier	Vessel	Inspection Date	Port City *	3 min avg Ringelmann no.
Carnival	Ecstasy	10/19/01	SP	0.75
Carnival	Elation	Not inspected	N/A	N/A
Carnival	Spirit	10/20/01	SD	0.75
Celebrity	Infinity	9/28/01	SF	0
Celebrity	Mercury	10/21/01	SD	0.77
Holland America	Amsterdam	Not inspected	N/A	N/A
Holland America	Ryndam	10/18/01	SD	0.10
Holland America	Statendam	10/14/01	SD	0
Holland America	Veendam	Not inspected	N/A	N/A
Holland America	Zaandam	10/5/01	SD	0.58
Norwegian	Norwegian Sky	Not inspected	N/A	N/A
Princess	Crown Princess	Not inspected	N/A	N/A
Princess	Dawn Princess	9/21/01	SF	0.50
Princess	Sea Princess	9/27/01	SF	0.50
Princess	Sun Princess	Not inspected	N/A	N/A
Radisson Seven Seas	Seven Seas Mariner	10/14/01	SD	0.04
Royal Caribbean	Legend of Sea	Not inspected	N/A	N/A
Royal Caribbean	Rhapsody of Sea	10/14/01	SD	0.56
Royal Caribbean	Sun Viking/ Radiance	Not inspected	N/A	N/A
Royal Caribbean	Vision of Sea	Not inspected	N/A	N/A

Carrier	Vessel	Inspection Date	Port City *	3 min avg Ringelmann no.
Royal Caribbean	Viking Serenade	10/19/01	SP	1.00
Seabourn Cruise	Seabourn Sun	Not inspected	N/A	N/A
Silver Sea Cruises	Silver Whisper	Not inspected	N/A	N/A

* SP = San Pedro, SF = San Francisco, SD = San Diego

Ships were observed at ports in San Diego, San Francisco (Bay Area AQMD) and San Pedro (South Coast AQMD). No violations of local standards were observed in these inspections. Although staff from the South Coast AQMD and the Bay Area AQMD reported issuing few violations to cruise ships in recent years, district staff have responded to complaints of smoking ships. It is likely that these complaints are associated with ships maneuvering into or out of port. The process of maneuvering to and from the dock involves bursts of power that require variable output from the diesel engines for a number of minutes. Hotelling in contrast involves constant engine output for electrical generation for the length of the stay (up to a day). Because U.S. EPA Method 9 requires the stack to be stationary relative to the observer and the sun for the duration of the observation, the methodology followed to fulfill the AB 2746 mandate and existing district practice is to read VEs after the ship has come to a full stop. Therefore, the observations documented here may contrast favorably with casual observations of maneuvering ships. The method is best suited for stationary stacks.

Boilers and Generators

Cruise ships generally run boilers to produce heat for space heating, hot water, heating of bunker fuel, production of fresh water, and other uses. These boilers are generally fueled with bunker fuel and produce emissions similar to the main engines, although on a much smaller scale.

The main diesel-electric engines on cruise ships produce electrical power for both propulsion and on-board electrical loads, as mentioned above. However, cruise ships are also equipped with smaller emergency standby generators. These generators are expected to be used only infrequently during testing, maintenance, or an emergency power failure.

Waste Incineration

According to the ICCL submittal, solid waste (garbage), oil sludge, and biomedical hazardous waste may be incinerated on board cruise ships. See Section 4.3 for a discussion of waste incineration.

4.3. DTSC

Existing Environmental Practices Regarding Toxic Substances

ICCL and the individual cruise ships reported that each ship generates a variety of hazardous wastes. They also reported that many of the ships conducted hazardous waste treatment activities. The following hazardous wastes and treatment activities were reported to the Task Force:

Hazardous Wastes Generated On-Board

Hazardous wastes generated on-board include the following:

Used oil, oil/water mixtures, oily bilge sludge, photo processing wastes, pharmaceutical wastes, paints and solvents, cleaners, batteries, fluorescent lamps, expired products, photographic and x-ray development fluids, aerosol liquid waste from the crushing of aerosol cans, contaminated containers, incinerator ash, printer cartridges, rags, debris, and oil filters from engine maintenance; mercury from thermostat switches, filters, sludge, and water with perchloroethylene from dry cleaning machines; inks, dyes and solvents from printing; expired pyrotechnics; expired pharmaceuticals, de-scalers, acids, and bases from cleaning solutions.

Hazardous Waste Treatment On-Board

1. Incineration/burning of used oil, oily sludge, medical and bio-hazardous waste, and outdated pharmaceuticals.
2. Separation of oil and water mixtures.
3. Aerosol can crushing and the collection of liquids from the aerosol cans.
4. Silver recovery from photo and x-ray processing.
5. Crushing and sieving of spent fluorescent and mercury vapor bulbs.

Tracking the Shipment and Disposal of Cruise Ship Hazardous Waste

DTSC's Hazardous Waste Tracking System showed that 1,344 tons of hazardous waste was off-loaded from 2000 through 2002 in California by the cruise ships reviewed by the Task Force. The amount of hazardous waste off-loaded in California in the last two years was substantially less than the amount off-loaded in the late 1990s.

Hazardous waste generators in California are required to document all off-site shipments of hazardous waste on a shipping document known as a hazardous waste manifest. Generators send a copy of the manifest to DTSC when the waste leaves their site, and the receiving hazardous waste facility sends a copy to DTSC when the waste is received. Hazardous waste transporters also send copies of manifests to DTSC when they pick up waste from generators. The manifests create a paper trail that provides for a "cradle to grave" accountability of the hazardous waste shipped by each generator.

Unlike stationary hazardous waste generators, cruise ships that operate in California can off-load hazardous waste in other states or countries. Based on current law, the cruise ships are not required to provide out-of-state manifest information to California inspectors. It would be impossible for inspectors to track the disposal path of all on-board generated hazardous waste without the cooperation of the cruise ships. The cruise ships are not accountable to any one agency for reporting or documenting the disposal path of all on-board generated hazardous waste. It is unknown if the cruise ships report this information to their home government agencies. In a letter to the Task Force, ICCL declined to submit information on hazardous waste shipments outside California and stated that this information was beyond the scope of the Task Force's authority.

Illegal Disposal of Cruise Ship Generated Waste

There have been several successful prosecutions of cruise ships in recent years for the illegal discharge of garbage, oil, fuels, and hazardous wastes. As previously stated in this report, the February 2000 GAO Report summarizes a five-year period of marine pollution cases by cruise ships. The GAO Report includes descriptions of 87 confirmed illegal discharge cases in United States waters from 1993 through 1998. Ninety-three percent or 81 of the cruise ship cases involved illegal discharges of oil or oil-based products, while the remaining involved discharges of garbage and plastics. Seventy-two percent or 63 of the discharge events were judged accidental releases.

The Royal Caribbean Cruise Lines entered into a 21-count federal plea agreement in 1999 which included an $18 million criminal fine, which followed a 1998 plea and a resulting $9 million criminal fine. The cruise line was charged with the illegal discharge of waste oil, garbage, and hazardous waste. The cruise line admitted to routinely dumping hazardous wastes and to falsifying oil record logs and lying to USCG inspectors.

As a result of the agreement, Royal Caribbean was forced to off-load in port hundreds of thousands of gallons of oily bilge water waste, waste that had previously been dumped illegally at sea. The company admitted that at least eight of its cruise ships continued to dump oily bilge waste and falsify logs after the company was told that it was under investigation.

Treatment of Cruise Ship Hazardous Waste

Hazardous waste generators or facilities that treat hazardous waste in California may be required to obtain a Permit or other forms of authorization from DTSC depending on the type of waste treated and the type of treatment. Even though the cruise ships reported conducting various hazardous waste treatment processes on-board, none of them has applied for a Permit in California.

Incineration/Burning of Hazardous Waste

ICCL and individual cruise lines reported that they burned hazardous waste and other hazardous materials in their incinerators and boilers. It is unclear whether the burning occurs within California's waters. ICCL said they did not believe that oil sludge was incinerated in port areas but did not provide any conclusive information. In response to the Task Force's questionnaire, Holland America reported that they now incinerate or burn approximately one to 2.5 tons per day per ship of oily sludge in their incinerators and boilers. They did not report where the incineration took place or if they operated their boilers within California's waters, even though the questionnaire specifically asked for the information. Cruise ships may also burn lower quality recycled oil in their diesel engines or boilers.

It is unknown what effect the incineration or burning of hazardous waste or other hazardous materials may have on California coastal air quality. Annex V of MARPOL 73/78, section 5.4, states that the state of the art in marine incinerators is not highly advanced, primarily because the technology has not yet been subject to constraints either on air emissions or on the types of materials that could be incinerated. It states that marine incinerators in current use do not include any provision for air pollution control. It further advises that the use of incinerators in urban areas should be discouraged because their use will add to possible air pollution in these areas. MARPOL does not prohibit the use of incinerators in port areas.

Inspections

USCG conducts inspections on cruise ships in California. Presently, hazardous waste laws and regulations are not included in USCG's California inspections. No state or local environmental agencies are involved in the inspections.

USCG's inspections do include environmental compliance in other states. However, the GAO Report states that USCG is limited in its ability to detect illegal discharges or violations of environmental laws and regulations. The GAO Report states that a large focus of their inspections related to safety issues, leaving limited time and resources for inspectors to focus on environmental functions. Another limitation of detecting violations is that the element of surprise is missing. Inspections are scheduled weeks or even months in advance to correspond to sailing schedules and to ensure that key documents and personnel are available for the inspection.

According to the GAO Report, USCG uses four main methods to detect illegal discharges from cruise ships: passenger vessel inspections, aircraft surveillance, third-party reports, and self-reports. USCG officials in Miami said that during three of the four inspections they perform on each cruise ship each year, they limit pollution prevention checks primarily to inspections of documents. USCG inspectors said that they rarely had time to closely examine pollution prevention equipment and would have little time to lift floor plates and closely examine the piping for the oil-water separator to ensure that it was operating properly. They said that they allowed about half an hour of each four to

six hour inspection for environmental compliance issues and pollution prevention equipment, unless a problem or suspected violation caused them to look further.

4.4. CSLC

Existing Environmental Practices Regarding Ballast Water

The cruise lines' compliance with the Act is complicated by the coastal routes typically taken by cruise ships. In particular, vessels engaged in the Los Angeles to Mexico routes find it impossible to exchange ballast water beyond 200 nautical miles from shore because their typical routes take them only 40 to 50 miles offshore. CSLC staff worked with the cruise lines to try to identify potential environmentally sound exchange sites nearer to the routes of these vessels. After many months of work, the cruise lines declined to study the matter further.

Most of the cruise lines have been able to operate in California waters while maintaining their ballast water on board or by discharging ballast outside of state waters and using potable or graywater as ballast. Only a few of the older ships do not have the capacity to retain the water on board. The following statistics in Table 4.b apply to cruise ship operations in California waters. Volumes are in metric tons (MT). There are approximately 268 gallons of seawater per MT.

Table 4.b - Port Calls in California for 2000-2002

Port Zone	Port Calls for 2000	Port Calls for 2001	Port Calls for 2002
Los Angeles-Long Beach	305	267	240
San Diego	42	84	92
San Francisco	28	26	39
Catalina	-	1	-
Santa Barbara	-	-	1
Total Port Calls	375	378	371
# Discharging	309	243	192

Discharge Port	Amt (MT) for 2000	Amt (MT) for 2001	Amt (MT) for 2002
Los Angeles-Long Beach	200084	147569	105129
San Diego	18424	6830	5492
San Francisco	15402	1402	560
Avalon	2485	650	0
Total	236395	156450	111182

For comparison with all other ship types, Table 4.c shows the reported ballast water discharge amounts (in metric tons) per Vessel Type for the period January 1, 2000 to June 30, 2002. Cruise ship discharges amount to approximately 2.2 percent of the total ballast water discharged into California waters.

Table 4.c - Ballast Water Discharge Amounts Per Vessel Type

Vessel Type	Total Discharged By Type
Auto	145,154
Bulk	9,505,826
Container	6,316,546
General	717,676
Other	166,138
Passenger	454,211
Tank	3,241,463
Total Discharged by Port	20,547,013

4.5. CIWMB

Existing Environmental Practices Regarding Solid Waste

Currently, the cruise industry manages its solid waste streams in separate disposal practices. Solid wastes such as cans, glass, plastics, and paper are separated out aboard ship in the initial waste stream. Some ships separate the materials into the component groupings of glass, metals, and paper for recycling. Other ships keep these materials "commingled" for collection by a recycler. Upon arrival at port, these materials are transferred to the port facility where a contracted recycler collects the materials for recycling.

Paper products are processed for recycling or they may be incinerated if they are contaminated with food wastes. Food contaminated paper materials may not be accepted into recycled paper collection streams.

Food wastes are collected on-board ship and are processed through macerators, which reduce the material to fine particles. These materials can be disposed of in open ocean waters. It is being encouraged the materials be collected in port for composting feedstock. Hazardous solid waste materials such as E-waste (batteries, etc.) are collected and disposed of separately from the recyclables and food waste streams. These materials cannot be collected in the recyclable or food waste streams.

Biowaste from the "sick bay" or infirmary must be handled as hazardous medical waste. These materials are disposed of separately from the recyclables or food waste streams.

4.6. DFG

Existing Environmental Practices

Vessel operations can generate vast quantities of wastes. Some of these wastes may be disposed of at sea legally, but most must be offloaded in port at a waste reception facility. In many cases, it is easier and economically advantageous for the vessel operator to simply dispose of wastes at sea. There is no compliance verification process or state regulatory enforcement for vessels choosing to use the sea for disposal of wastes. Waste discharges, as a result of current practices by cruise ships, have a potential to affect fish and wildlife in the California's coastal waters. If wastes are discharged into state waters and they affect or could adversely affect fish, wildlife, or the environment, it is a violation of DFG Code.

The Task Force questioned the cruise industry regarding the types of wastes generated aboard vessels, the quantities generated, and the disposal methods currently used. The quantities of wastes generated varied from vessel to vessel. The cruise industry provided the following information:

Waste Product	Amount
Graywater	500 to 2100 tons storage capacity
Blackwater	400 to 1000 tons storage capacity
Bilge water	60 to 300 tons storage capacity
Oily sludge	1 to 2.5 tons per day
Photographic wastes	450 liters generated per month
Aerosol cans	0.10 tons generated per month
Print shop residues	25 liters generated per month
Dry cleaning chemicals	25 liters generated per month
Used batteries	7 kilograms (Kg) generated per month

Of the wastes listed above, only oil and petroleum derived products spilled in California waters are required to be reported to the State Office of Emergency Services (OES). Disposal of the above wastes has been discussed in detail under individual agency sections throughout Section 4. All these products are of concern to DFG if they are disposed of at sea; particularly if they are disposed of in state waters.

DFG regulates fuel oil transfers from vessel to vessel. Nearly all vessel refueling operations are conducted using a bunker oil barge. Oil is pumped from the barge via a large diameter hose and a cargo pump on the barge. State inspectors from DFG ensure that both vessels are complying with state and federal regulations and that specific safety requirements are being followed. The inspectors inspect hoses and hose connections and ensure that both the transfer vessel and the receiving vessel complete the required paperwork. At the completion of the state inspection, a copy of the oil transfer monitor report is left with each vessel involved in the transfer.

In normal vessel operations, the engine machinery leaks oil and sometimes cooling water. In addition, condensation from the inside of the hull creates water in the bilges of the ship. The water and oil from the bilges are pumped to a slop oil tank for storage and gravity separation. After the water in the slop tank has settled, the water under the head of oil is run through an oily water separator and pumped over the side into the sea. There are cases where other substances such as hazardous wastes are dumped into the slop tank and eventually disposed into the sea.

The fuel oil from the vessel's bunker tanks is run through filters and mechanical separators to remove sludge and water. The water is pumped to the slop tank for settling and disposal, while the sludge is collected to be disposed of ashore or burned in an incinerator or boiler. This sludge sometimes is illegally dumped at sea. The used filters are supposed to be disposed of in a hazardous waste dump.

The engine lubricating system uses oil filter to screen out particulate matter. The used oil is stored in a slop oil tank for further transfer ashore for recycling or burned in an incinerator or boiler. The used oil filters are treated the same as fuel filters above.

SECTION 5. POTENTIAL ENVIRONMENTAL IMPACTS

5.1. SWRCB

Wastewater Discharges in California Waters

Wastewater discharge reports indicated that cruise ships are currently withholding discharge of both blackwater and graywater waste streams while in California waters. This voluntary practice is commendable because the effects of wastewater discharge are greater in near-shore or shallow waters due to a lack of dilution and tidal flushing action. This section will discuss potential impacts if the ships were to discharge in state waters in addition to discussing potential impacts from current practices. Recent research conducted by the State of Alaska is the only available source of information specific to cruise ship wastewater impacts. The data considered in this section is attributable to the Alaska Department of Environmental Conservation's (ADEC) 2002 report titled *The Impact of Cruise Ship Discharge on Alaskan Waters* (Impacts Report) unless noted otherwise. The Impacts Report, and others, are available online at http://www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/cruise.htm.

Dilution

The State of Alaska used an equation to estimate dilution factors for cruise ship discharges. The equation for large cruise ships is dilution factor = 4 x (ship width x ship draft x ship speed)/(volume discharge rate), thus dilution achieved is a function of the ship's width, draft depth, speed, and the discharge rate. The State of Alaska requires ships to discharge at a minimum vessel speed of six knots. Using this equation, a ship discharging 200 cubic meters per hour and traveling at the minimum allowed speed of six knots would achieve a minimum dilution of 50,000:1.

U.S. EPA conducted a dye study in 2002 to estimate dilution occurring on cruise ship discharges (U.S. EPA 2002, Cruise Ship Plume Tracking Survey Report). The study measured dye concentrations in the wake of four cruise ships belonging to two corporations. The four ships were large vessels with differing types and configurations of propellers. Each ship traveled at a specific speed during the study, and these speeds ranged from nine knots to 19 knots. The dye penetrated to a maximum depth of 18 meters (59 feet). The depth of maximum dye concentration varied for each ship, presumably due to the different propeller configurations. Dilutions measured ranged from about 200,000:1 to 650,000:1. These dilutions exceeded the assumed dilutions calculated using the Alaskan equation. The secondary mixing action of the propellers is believed to be responsible for the higher dilution rates seen in the field.

ADEC's Science Panel noted that "dilution is not the solution to pollution," but they concluded that the effects of cruise ship discharges were limited due to dilution and Alaskan regulations governing discharges. These regulations require ships to discharge while underway at six knots and at least one nautical mile from shore and to meet discharge limits as noted in Section 3 of this report. Vessels with advanced

wastewater treatment systems that had been certified by USCG are allowed to discharge anywhere in Alaska. The Science Panel recommended that impacts continue to be evaluated and that sensitive areas be identified where more stringent discharge limitations may be appropriate. If cruise ships continue their practice of withholding discharge of wastewater until they are 12 nautical miles from shore, the mitigating effects of dilution would be even greater.

Cumulative Impacts

Most of the research on cruise ship impacts on receiving waters has been conducted in the State of Alaska. California experiences far more impacts to ocean waters from diverse sources than does Alaska. Alaska primarily experiences vessel traffic from cruise ships, fishing vessels, and oil tankers. California experiences more vessel traffic from cargo ships and recreational boating in addition to cruise ships, fishing vessels, and oil tankers. California experiences much more nonpoint source pollution from urban run-off, air deposition of pollutants, and other sources. California has more municipal wastewater treatment plants that discharge to the ocean or to rivers and streams that eventually flow to the ocean.

Quantifying the percentage of pollutant loading from cruise ships as compared to the other sources mentioned above would require an extensive process to allocate wasteloads to each source. If cruise ships continue to withhold discharge of wastewaters until they are four nautical miles from shore or more, the immediate impacts on California waters would be minimal. It is still important to consider cumulative impacts on the ocean environment because when the greater ocean is impacted, California's coastal waters are also impacted.

Areas that are Ecologically Sensitive or have Human Health Concerns

Some of the particularly ecologically sensitive areas in California are the four Sanctuaries and areas designated as SWQPA, both of which were discussed in Section 3 of this report. Some of the sea products harvested in near-shore environments in California include oysters, mussels, or other shellfish. Oyster culture is an important local industry in the Humboldt Bay area. If fecal coliform levels are high, oysters may not be harvested due to human health concerns. Mariculture is practiced in other regions of California, and fecal coliform levels would also be a concern in those regions.

Sampling Data from ADEC

ADEC began conducting voluntary sampling of effluent from large cruise ships in 2000. The sampling data being discussed in this report was from the years 2000 and 2001. The year 2002 data is not yet available.

Most of the data was analyzed using the minimum and maximum values and the geometric mean of all sampling. The geometric mean is often used to describe

environmental data. For example, there may be a wide range of data, with many very low numbers and perhaps a few very high numbers. The geometric mean calculated from such data would be in the lower range but still account for higher numbers obtained. This paints a more accurate picture of typical conditions than if an arithmetic mean, the minimum, or the maximum value is used for comparisons. The discussion below is based on the data contained in Appendices 2, and 6 through 8 of the Impacts Report.

The priority pollutant data from Appendix 2 of the Impacts Report was compared to the California Toxics Rule, which lists criteria applicable to California's inland surface waters, bays, and estuaries, and to the Ocean Plan criteria. The criteria used for comparison were the more stringent of the human health, aquatic life chronic or acute criteria for saltwater. There were either 48 or 95 sampling events for each pollutant that produced the data for Appendix 2. Many of the pollutants were not detected in any samples. When there were detections, the Impacts Report listed how many detections there were, the maximum detection, and the average of all samples taken for that pollutant. The majority of detected pollutants were detected at concentrations far below the water quality objective (WQO). A WQO accounts for dilution in the water column. This means that the number listed as a WQO would be the concentration in the water column after dilution has occurred. The sampling data obtained was for undiluted samples.

The undiluted metals samples exceeding the most stringent WQO were copper, nickel, zinc, lead, mercury, and silver. Other undiluted samples exceeding the most stringent WQO were cyanide, chloroform, carbon tetrachloride, 1,2-dichloroethane, tetrachloroethene, dibromochloromethane, and 2,4,6-trichlorophenol. Interference in the detection was suspected for the cyanide samples. After considering dilution, none of the samples would exceed the applicable WQO. The detected constituents of most concern are copper and zinc, because both of these metals are highly toxic to aquatic life at low concentrations. These metals were each detected in 23 of 48 samples taken. The copper concentration measured a maximum of 7100 micrograms per liter (ug/l) and an average of 790 ug/l compared to a six-month median WQO of 3. ug/l, and an instantaneous maximum of 30. from the Ocean Plan. The zinc concentration measured a maximum of 1800 ug/l and an average of 538 ug/l compared to a six-month median WQO of 20. ug/l and an instantaneous maximum of 200 ug/l, also from the Ocean Plan.

Conventional pollutants measured were ammonia, pH, BOD, COD, TSS, and fecal coliform. The sampling data, available in Appendix 6 of the Impacts Report, was categorized depending on the source of the sample. Sources included blackwater effluent from biological treatment systems and advanced treatment systems, combined blackwater and graywater from double bottom tanks (holding tanks), combined blackwater and graywater that was treated and immediately discharged, graywater from various sources including the accommodations and galleys, and graywater from double bottom tanks. Samples from the various sources had highly variable concentrations of the pollutants as compared to other sources, and also within a source class. Nearly all samples exceeded the federal MSD standards of a fecal coliform bacteria count not

greater than 200 per 100 milliliters and suspended solids not greater than 150 mg/l. An exception was the 2001 data from ships with advanced wastewater treatment systems. As shown in Table C16 (Attachment 16) of Appendix 6 of the Impacts Report, all samples met the standards and there was little variability of sampling results. In fact, the maximum sample result for fecal coliform was 2 per 100 milliliter, and for TSS all sample results were 0.7 mg/l.

Chlorine residual and free chlorine levels were measured, and full data are available in Appendix 6 of the Impacts Report. Effluents from MSDs using ultraviolet radiation and untreated graywater have no chlorine added, so chlorine would not be expected in the sample. Butcher and fish shop graywater samples tended to have high chlorine levels. This is likely due to use of chlorine to disinfect cutting boards and other kitchen items to prevent outbreaks of salmonella or other food borne diseases. The maximum chlorine residual measured was 100 mg/l, and the maximum free chlorine was 35 mg/l. Nearly all of the other samples had levels of chlorine residual below 5 mg/l and free chlorine below 1 mg/l. The 2001 Large Ship Summary Data shown in Table II-6 (Attachment 17) of the Impacts Report listed a maximum geometric mean of 0.49 mg/l for the various waste streams. For comparison, Alaskan standards are that total residual chlorine may not exceed 10.0 mg/l.

Most wastewater permits in California specify that a one-hour average may not exceed 0.019 mg/l and a 4-day average may not exceed 0.011 mg/l at the point of discharge. Fish and invertebrates are sensitive to chlorine at low concentrations. Salmonids are particularly sensitive. Juvenile coho salmon exposed to 32 ug/l experienced a 50 percent mortality rate. (Ambient Water Quality Criteria for Chlorine, U.S. EPA, 1984). U.S. EPA criterion for salt water is 12.62 ug/l as a criterion maximum concentration (CMC). Dilution and mixing experienced in the water column from a ship that is underway would be expected to bring chlorine levels below CMC.

Treated sewage contains ammonia, and nitrogen is one of the elements that make up an ammonia molecule. Fixed nitrogen levels in seawater tend to be very low; therefore, the limiting nutrient for algal growth in seawater is nitrogen at part per billion levels. If nitrogen levels are not very low, then the discharge of wastewater could promote algal blooms. Most samples did not exceed 1 mg/l of ammonia, but there were a number of exceptions where the ammonia level was quite high. The maximum sample contained 730 mg/l, and the highest concentrations were found in the blackwater waste streams that had not received advanced treatment. This would equate to 730,000 parts per billion of nitrogen. This level could promote algal growth if it was discharged from a stationary vessel in a near shore environment; however, industry policies prohibit discharge in this manner.

Geometric means of fecal coliform levels in various waste streams or tanks varied from a minimum of 2 per 100 ml up to 784,072 per 100 ml, most probable number (MPN). The highest levels were in the graywater samples. Many ships do not treat graywater prior to discharge. Body contact recreational activities and shellfish harvesting would be impacted if these levels of fecal coliform were discharged in a near shore environment.

The assumed initial dilution for a discharge from a moving ship is 50,000:1. For the maximum measured fecal coliform, the initial dilution would reduce the concentration to 16 per 100 ml MPN. For comparison, Alaskan standards require that the geometric mean of discharge samples at the point of discharge may not exceed 20 fecal coliform per 100 milliliters and not more than 10 percent of the samples may exceed 40 fecal coliform per 100 milliliters.

Geometric means of TSS levels ranged from 2.7 to 512.0 mg/l in the various waste streams. For comparison, the secondary wastewater treatment standards, now applicable to cruise ships in Alaska, are that TSS shall not exceed 30 mg/l for a 30-day average, or 45 mg/l for a 7-day average, with an 85 percent removal over a 30-day average.

Geometric means of BOD levels ranged from 6.7 to 1587.0 in the various waste streams. For comparison, the secondary wastewater treatment standards, now applicable to cruise ships in Alaska, are that BOD shall not exceed 30 mg/l for a 30-day average, or 45 mg/l for a 7-day average, and there shall be a minimum of 85 percent removal of BOD over a 30-day average.

Conclusions

Conventional MSDs rarely meet federal or Alaskan standards for discharge. The advanced design MSDs performed well overall, significantly reducing concentrations of conventional pollutants and removing some level of priority pollutants as well. Significant dilution of the waste stream occurred when ships discharged while underway at a distance greater than one nautical mile from shore. Dilution is not the solution to pollution; however, dilution effectively limits the impacts from discharges from a ship underway at a distance greater than one nautical mile from shore. For this reason, ships should not discharge in port or near the shore. While dilution minimizes any immediate impacts from discharges, the cumulative effects on the marine environment from chronic exposure to low concentrations of pollutants are currently unknown.

5.2. ARB

Potential Environmental Impacts to Air

Cal/EPA is required to include in this report to the Legislature "…an evaluation of the air contaminant emissions on air quality and human health, taking into consideration applicable air quality standards." This section addresses this requirement within the constraints of the limited information available to the Task Force.

Cruise ships emit air pollutants that can be broadly classified as "criteria pollutants," "toxic air contaminants," or "greenhouse gases."

Criteria Pollutants

Criteria pollutants are those for which ambient air quality standards have been set by either California or the federal government. These include ozone, PM, NOx, SOx, and CO. Air quality standards for criteria pollutants establish the concentration above which the pollutant is known to cause adverse health effects to sensitive groups such as children or the elderly.

Cruise ships, along with other marine vessels, are a significant source of emissions of criteria pollutants in California coastal waters. The estimated emissions of criteria pollutants (and precursors to criteria pollutants) from cruise ship main engines in California coastal waters are shown in Table 5.a. The emissions in Table 5.a were developed by estimating the total time cruise ships operate in California coastal waters in three different modes: cruising, maneuvering, and hotelling.

Attachment 18 provides more detailed information about the assumptions used to calculate these emissions estimates. Note that the emissions of NOx and HC combine in the atmosphere to produce ozone, a criteria pollutant that is not directly emitted. Also note that California coastal waters are the areas offshore within which pollutants are likely to be transported ashore and affect air quality in California's coastal air basins. This area ranges from 27 miles offshore to 102 miles offshore. More information about California coastal waters and California's authority to regulate marine vessels within this boundary is provided in the "Report to the California Legislature on Air Pollutant Emissions from Marine Vessels," Volume I, June 1984 and in the "Staff Report for a Public Meeting to Consider a Plan for the Control of Emissions from Marine Vessels," dated October 10, 1991. Both of these documents are available upon request from ARB.

Table 5.a - Estimated Emissions from Cruise Ship Main Engines (Tons per Day)*

Mode	NOx	SOx	PM	HC	CO
Cruising	3.6	3.4	0.41	0.14	0.44
Maneuvering	1.0	1.0	0.12	0.04	0.13
Hotelling	1.0	1.0	0.12	0.04	0.13
Total	5.6	5.4	0.65	0.22	0.70

* Year 2000 emissions in California coastal waters

The impact of these emissions is significant because most of the coastal areas where cruise ships travel are not in compliance with state and federal ambient air quality standards. This is particularly true of the South Coast AQMD, which experiences the state's worst air quality, and receives the majority of cruise ship port calls. In the South Coast AQMD and other areas of the state, virtually all sources of emissions, including cruise ships, will need to be controlled to attain state and federal ambient air quality standards.

Toxic Air Contaminants

A Toxic Air Contaminant (TAC) is defined as an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. Exposure to toxic air pollutants can cause many adverse health effects, including cancer, respiratory disease, birth defects, and neurological damage. TACs are usually present in small quantities in ambient air. However, their toxicity or health risk poses a threat to public health even at low concentrations. In general, there is no concentration at which a TAC is considered safe. Therefore, ARB's air toxics control program focuses on managing, or reducing, the health risk associated with TACs.

In 1988, following an exhaustive 10-year scientific assessment process, ARB identified PM from diesel-fueled engines as a TAC. On a statewide basis, the average potential cancer risk associated with these emissions is over 500 potential cases per million people. In the South Coast Air Basin, the potential risk associated with diesel PM emissions is estimated to be 1,000 per million. Compared to other air toxics ARB has identified and controlled, diesel PM emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk.

As shown in the previous section, cruise ship main engines are responsible for significant amounts of diesel PM emissions, contributing to the overall toxics risk from all diesel PM sources. Cruise ship emissions during "hotelling" at port, while closest to on-land receptors, are also much higher than for other vessels. Specifically, these loads have been estimated to be about five megawatts, compared to one megawatt for other ship types (Arcadis, May 6, 1999).

The impact of these emissions may be especially significant for the communities surrounding the Los Angeles/Long Beach Port Complex because a large percentage of the cruise ship emissions occur there, adding to the diesel PM emissions from cargo vessels, on-road heavy duty diesel trucks, and locomotives.

Another source of TACs is the incineration of garbage and hazardous waste, such as medical/infectious waste. Federal, state, and local regulations cover these activities for landside sources. More information is necessary to estimate the impacts of these activities from passenger cruise ships.

Greenhouse Gases (GHG)

An increasing body of scientific research attributes long-term climatological changes to GHGs; particularly those generated from the human production and use of fossil fuels. These changes could lead to widespread regional changes in temperature, humidity, and precipitation.

Emissions resulting from human activities are substantially increasing the atmospheric levels of GHGs such as CO2, methane, chloro-fluorocarbons, and nitrous oxide. For example, CO2 emissions have increased about 30 percent over the last century.

Cruise ships, like other marine vessels, contribute to the overall emissions of GHGs, primarily in the form of CO2 from engine exhaust. Cruise ships are estimated to release about 285 tons per day of CO2 within California coastal waters, using a methodology similar to that for the criteria pollutants mentioned above. However, unlike the other pollutants mentioned in this report (which primarily impact local or regional air quality), GHG emissions are of concern wherever they are emitted, not just within California coastal waters.

5.3. DTSC

Potential Environmental Impacts from Hazardous Waste

The cruise industry did not report any hazardous waste releases to the Task Force. Therefore, there is no available data to evaluate from the industry. In addition, the Task Force is unaware of any studies conducted on the environmental effects from the illegal discharge of hazardous waste.

It can be assumed that the environmental impacts of a release in port areas would have a far greater impact to the environment than a release far from shore where dilution effects are more efficient. The environmental effects of a hazardous waste release would depend on the chemical and toxicological characteristics of the particular waste involved. Non-specific environmental effects from the discharge of cruise ship hazardous waste are discussed in DFG's Section 5.6.

5.4. CSLC

Potential Impacts Due to Ballast Water and NAS

NAS (also known as introduced, invasive, exotic, alien, or aquatic nuisance species) are defined as "any species or other viable biological material that enters an ecosystem beyond its historic range, including any such organisms transferred from one country into another" (Stemming the Tide, 1996). The introduction of NAS into coastal marine and estuarine waters comes from a variety of sources, including aquaculture activities, aquarium trade, public aquaria, release by individuals, commercial, military, and recreational vessels, research institutions, and seafood commodity distribution. One of the most widespread mechanisms by which NAS introductions occur is through transport of ballast water in ships. Ballasting performs many functions including: reducing transverse stresses on the hull; providing for stability; aiding propulsion and maneuverability by controlling the submergence of the propeller and rudder and reducing the amount of exposed hull surface; and compensating for weight lost from fuel and water consumption.

Ballast water, necessary for ship safety, is usually taken on at the departure port and discharged into the arrival port. When ships unload cargo, they need to counteract the weight imbalance for the ship to travel safely. When ships load cargo, they subsequently discharge this water. Ballast is generally carried in a variety of different compartments. These tanks are usually designated ballast tanks, although some vessels use their cargo holds to carry ballast. Tank and total volumes of ballast water depends on the design and type of ship.

Impacts of NAS

Ballast water includes many species non-native to the arrival port. In United States ports, ships discharge their ballast water that was obtained from all over the world, including many ports with untreated sewage and other contaminants. A recent study conducted on oil tankers arriving in Prince William Sound, Alaska, found an average of 12,637 total organisms per cubic meter in the 169 vessels that were surveyed (Hines et al., 2000).

The risk of introduction of NAS has significantly increased in recent times because vessels are faster and carry a tremendous amount of ballast water relative to ships just a few decades ago. For example, in the Great Lakes, there were 90 known introductions during the 150 years between 1810 and 1959. In only 30 years between 1960 and 1990, there were 43 known introductions. This pattern is mirrored in the San Francisco Bay Estuary, where research indicates that prior to 1960 one new species became established about every 55 weeks. Since 1960, this has increased to one every 14 weeks. Once introduced, invasive species are likely to become a permanent part of an ecosystem that can cause ongoing economic and environmental impacts.

The freshwater zebra mussel (*Dreissena polymorpha*), probably the best-known NAS, is native to the Black Sea in southeastern Europe and was accidentally introduced to the Great Lakes in the 1980's via ballast water. It is now estimated to have infested over 50 percent of United States freshwater waterways. The mussels clog water systems, foul boat hulls, and accumulate in immense numbers on recreational beaches. The economic impact to the Great Lakes, primarily associated with physically clearing the mussels from power stations and other industrial cooling water pipes, is $5 billion annually. Of equal concern is the deleterious effect that the population explosion of the zebra mussel has had on the ecology of the Great Lakes, impacting numerous native species.

An example of a West Coast invader is the Asian clam (*Potamocorbula amurensi*). The Asian clam was probably introduced via ballast water from Southeast Asia at the beginning of the 20th century and is now found in 36 of the continental states. It was first identified in San Francisco Bay in 1986 and took only two years to spread throughout the bay forming a monoculture and displacing the former biological community. Like the zebra mussel, the Asian clam is extremely efficient at filtering nutrients out of the water and therefore affects habitat nutrient dynamics. Few studies

have been done on the ecological impacts of the Asian clam; however, it is suspected of causing the collapse of some fisheries in the area. Additionally, there has been considerable economic impact due to fouling of raw water systems, particularly power stations. The annual cost for control and repair efforts resulting from the Asian clam at these stations has been estimated at approximately $1 billion.

Introduction of marine species via ballast water is also of concern to the aquaculture industry. Aquaculture is the practice of raising aquatic organisms, such as clams, oysters, mussels, trout, salmon, etc., rather than harvesting them in their natural state. California and Washington states have a combined total aquaculture production of over $100 million annually. Mollusks account for nearly $33 million, while fishes and algae accounted for the remainder (U.S. Department of Agriculture, 2000). The European green crab (*Carcinus maenas*), or NAS, first identified on the East Coast in the early 1800's, now ranges up the entire West Coast of the United States. This species preys on native crabs, clams, and small oysters, causing considerable damage to commercial shellfish beds. The economic impact nationwide is estimated to be $44 million annually.

Ballast water has been documented to contain a number of pathogens causing economic impacts and public health concerns. In 1991, a strain of Vibrio cholera was found in the ballast water of three ships near Mobile, Alabama. Sometime thereafter, the bacterium was found in local oysters. A recent study of ballast water from vessels visiting the Chesapeake Bay showed V. cholera in planktonic samples collected from all ships. Ballast water and sediments can harbor toxic dinoflagellates (microscopic algae), which cause paralytic shellfish poisoning.

Modern vessels transport NAS not only in their ballast water, but also on their hulls, sea chests, chains, propellers, and the like. Though ballast water is generally considered the most widespread mechanism by which ships transport NAS, hull fouling is being considered of equal importance to ballast water. One example was the introduction, into the San Francisco Bay Estuary, of the shipworm, (*Teredo navalis*). This species entered San Francisco Bay attached to the wooden hull of a ship in the early 20th Century. Within three years, the worm caused an estimated $615 million (in 1992 dollars) of structural damage to maritime facilities, and current costs to control this worm is estimated at $220 million per year. At the recent 11th International Congress on Marine Corrosion and Biofouling held in San Diego (CQD Journal 2002), researchers are finding that hull fouling may represent a similar or perhaps worse threat of NAS, though all agreed that more research is needed on this pressing problem.

Though modern steel-hulled ships are less susceptible to boring organisms than wooden hulled ships, the phase-out of highly toxic anti-fouling paints is expected to result in an increase in hull fouling. Slow moving vessels and floating dry docks are particularly susceptible to hull fouling.

For some ship-mediated invasions, it is difficult to determine whether they occurred as a result of ballast water discharges or hull fouling. Often these invasions are by benthic invertebrates that have a planktonic larval stage. Unfortunately, little work has been conducted that addresses the diversity or survivability of organisms on the hulls of modern vessels.

5.5. CIWMB

Potential Environmental Impacts Due to Solid Waste

The potential impact from pollution by solid wastes, or "garbage," on the open ocean environment can be significant. On the local level, larger solid wastes disposed of in a port environment would create immediate aesthetic impacts. In local waters, if there is restricted current flow or specific current flows, these conditions can cause the aggregation and collection of wastes, either floating or sunken. Eddies and currents on the surface combined with prevailing winds can exacerbate collection of solid wastes on shore, or near shore. Submarine currents can collect less buoyant or neutral buoyant solid wastes into aggregations on the ocean floor. These materials, in the right conditions, would remain intact for years.

On the global scale, in the open ocean environment, accidental or intentional disposal of larger solid wastes can cause significant environmental damage. The physical presence of certain solid wastes, such as plastics, can expose sea life to potential harm from ingestion, asphyxiation, or physical injury. Abandoned netting ("ghost nets") causes serious loss of life from entrapment and entanglement. Smaller pieces of debris can also trap and entangle individual animals causing injury, and death. Packing mesh can cause similar consequences.

Floating debris such as plastics or foam is being implicated in the contamination of habitats by nonindigenous invasive species. These species contaminations are causing the extinctions of native species. This impact is evidenced from research in Australia, the Micronesian islands, and the arctic.

Accumulations of these materials into large "rafts" in the open ocean are being observed and recorded (Science and Technology "Trashing the Oceans"). In this particular study wastes are being trapped in a "gyre" or convergence of currents in the northern Pacific Ocean. Sea birds feeding upon this debris die of starvation or simple intestinal blockages or choking. Sea turtles mistake plastic bags for jellyfish, consume them and die of intestinal blockages.

These dangers even reach to the planktonic level. Small plastic pellets are ingested by zooplankton, which are mistaking them for fish eggs.

Continued disposal of food wastes in restricted environments can cause nutrient pollution, if the water is not freely exchanged.

5.6. DFG

Potential Environmental Impacts on Sealife and Marine Resources

The impacts on marine life from the waste streams generated by vessels are largely unknown. Few, if any, studies have looked at these pollution impacts on the marine

environment from vessels. However, by correlating other studies of marine pollution from shore side sources, we know that the effects can be devastating to the shoreline visually and to the marine life living in those areas. These effects are easily elevated up the food chain as contaminated animal and fish carcasses are consumed by other creatures such as seagulls and other carnivores.

Sewage and graywater pose further problems as microorganisms and diseases are passed from humans to marine mammals. Recent studies have found human diseases passed to sea otters supposedly through sewage outfalls in the ocean.

Local fisheries are affected and, in some cases, the local populace is impacted. These impacts can be seen by restrictions placed by the health departments upon the consumption of fish caught in bays and estuaries. Shellfish and finfish can become unfit for consumption due to bioaccumulation of contaminants. Bioaccumulation of contaminants can result in concentrations many times higher than those normally found in the environment.

The offshore impacts of waste disposal by ships are more difficult to measure. Graywater and blackwater, along with accumulated treated or untreated sludges from MSDs and sewage holding tanks dumped at sea, contain hazardous waste materials, fecal coliform colonies, and high concentrations of phosphorus and nitrogen. Phosphorus and nitrogen may act as nutrients or, in essence, a fertilizer to some types of marine plants and other species of marine life it encounters. This effect of excessive nutrients results in eutrophication leading to enhanced plant growth or a change in the composition of the plant or other species. Eutrophication will often progress through a sequence of stages characterized by: (1) a progression involving enhanced primary activity, (2) changes in the plant species composition, (3) very dense blooms, often very toxic, (4) anoxic conditions, (5) adverse effects on fish and invertebrates, (6) impact on amenity, and (7) changes in the structure of benthic communities. Not all of these changes will always be present or evident. Eutrophication is recognized as a growing problem in areas where effluents containing sewage and graywater constituents are continuously discharged.

The most visible indicator of coastal eutrophication is extensive blooms of phytoplankton and/or benthic macro algae. Some of these algae are toxic and may cause finfish kills or shellfish to become toxic, while others are aesthetic nuisance algae that may leave unsightly messes and odors along the shoreline.

While researchers have yet to tie cruise ship effluent discharges to toxic algae blooms, the quantities of effluents discharged offshore by all vessels dumping untreated sewage and graywater, or secondarily treated sewage, surely impact the quality of the water in the marine environment.

The Pew Report, “Marine Pollution in the United States,” reiterates the comments above on discharges of blackwater and graywater and the eutrophic impacts caused by the principal constituents, phosphorus and nitrogen.

SECTION 6. CONCLUSIONS AND RECOMMENDATIONS

General Conclusions

Cruise ships generate considerable quantities of sewage, graywater, bilge and ballast water, and solid wastes including hazardous materials. Disposal practices for these wastes include discharging them into the sea, off-loading in port, and incineration. The cruise industry declined to state the generation amounts and disposition of some wastes. Hazardous waste disposition was of particular concern. Industry stated that hazardous wastes were properly disposed, but refused to state where such wastes were disposed because they were not disposed of in California. This omission made it impossible to track these wastes and determine if they are properly disposed.

Cruise ships, along with other marine vessels, are a significant source of TACs in California. In fact, the emissions contribution from a single vessel can be significant if it operates frequently in California coastal waters. This is due to the high power output of typical cruise ships (comparable to many power plants), as well as their high emissions levels compared to other diesel sources. Cruise ship engines are subject to little regulatory control compared to landside sources of emissions. This is probably due to a number of factors, including the fact that they operate internationally, often far offshore, and they are primarily foreign-flagged vessels traditionally regulated by international lawmaking bodies such as IMO.

The jurisdictional boundary of the California hazardous waste law and regulations extends to three nautical miles from the California coastline. However, state law and regulations are intended primarily to address land-based hazardous waste facilities and generators. They are not specifically designed to regulate hazardous waste management activities in the cruise industry. Cruise ships are not required to report or provide documentation for hazardous waste that is off-loaded in other states or countries. Without this accountability, California inspectors would be unable to determine if all on-board generated hazardous waste was disposed of properly. USCG may already have this authority. However, because of limited resources and more emphasis on security, USCG may not have time during inspections to adequately review manifest information.

The transfer of ballast water from domestic sources is an important issue in California and can lead to unwanted biological invasions through the discharges of large volumes of ballast water at ports throughout the state.

CIWMB has regulatory authority for waste handling and disposal while a ship is berthed and is disposing of wastes to shore-side facilities. However, there is no clear-cut regulatory authority on the part of CIWMB for waste handling activities at sea, nor is there any other state regulatory authority for disposal of solid waste, “garbage,” while a ship is at sea.

Therefore, the Task Force recommends that cruise ships be regulated by the state and that an inspection and monitoring program be implemented to protect the state's air and water quality from unnecessary pollution and to deter illegal dumping practices.

General Recommendations

Establish and fund an interagency Cruise Ship (or Vessel) Pollution Prevention Enforcement Program (program) and assign a lead agency to implement the program.

This lead agency would be delegated limited authority to conduct onboard inspections for other participating agencies. Liaisons or participating inspectors within each agency would be available to advise, assist, and take enforcement actions when a potential violation is noted. Suggested lead agency is either DFG or CSLC, because these agencies have personnel with extensive experience in vessel pollution control measures and vessel operations.

Vessel pollution control equipment should be inspected periodically by state personnel, in addition to USCG inspections. These inspections should occur at least annually to ensure equipment is installed, maintained, properly functioning, and operated by crew with adequate knowledge of the equipment. Inspections should also include a review of MSD maintenance logs, the oil-water separator, and other pollution control equipment. Some inspections should be unannounced inspections. Currently, USCG inspects vessels with a primary focus on safety and national security. This proposed interagency program would focus solely on pollution control equipment and related matters, complementing the USCG inspection program.

The program should be funded with a fee imposed based on the number of passenger berths or similar funding mechanism. Initial funding levels should be based on the program parameters as established. A study should be conducted after three years to assess adequacy of funding, and fees should be adjusted in accordance with the findings of that study. If the fee mechanism is not established to provide adequate funding, this program should not be established.

Different jurisdictions should work together to reduce conflicting regulations.

Industry had commented that it is operationally difficult to stay in compliance when the regulations can change drastically from one port to another. The states receiving cruise ship traffic should work together to ensure that necessary environmental protections are put or kept in place, without unduly burdening the industry by having different regulations for each port. In particular, the Pacific port states (Mexico, Canada, California, Washington, Alaska, and Hawaii) should work together to standardize their regulation of cruise ships.

Ensure any proposed new regulations are feasible.

Proposals for new regulations should be discussed with USCG and industry to ensure that they are operationally feasible and will not compromise vessel safety.

Environmental practices and regulation of other types of commercial vessels should be evaluated.

In 2000 and 2001, over a twelve-month period, there were 7,557 ship port calls in California. Twenty-eight different cruise ships and 1,716 other commercial vessels of various types visited California ports for each year. Many vessels made repeated visits to California ports. Volumes of wastewater and solid waste are greater on cruise ships than other vessels, but other waste streams produce similar volumes and types of waste. For example, a similar-sized vessel would likely produce a similar quantity of oily bilge water and possibly several times the quantity of ballast water as a cruise ship.

Require vessels to immediately report discharges (both intentional and accidental) of wastes into State waters or into waters immediately adjacent to state waters.

The wastes required to be reported include all oil and petroleum byproducts, sewage (both treated and untreated), bilge and ballast water, and all solid and liquid wastes including hazardous materials. This report should be made to the State Warning Center operated by OES, which would notify the appropriate state agencies to take appropriate action. This reporting of discharges would not relieve the vessel from following up with written discharge reports required by state agency regulations.

The state should support establishing port waste reception facility construction in all major ports and that all vessels be required to use those facilities.

Phased in construction and use of facilities will take several years to accomplish. Recommend that the Legislature establish a realistic time line for the construction and mandatory usage of these reception facilities.

6.1. SWRCB

Conclusions

MSDs frequently fail to meet current federal standards for discharge of effluent. MSD effluent is not subject to regular monitoring, except for those vessels that have received USCG approval to discharge in Alaska state waters. Monitoring data published by the State of Alaska indicates that graywater discharges frequently exceed standards set for MSD effluent. Current state and federal laws have no established effluent standards that graywater is required to meet.

Recommendations

The federal CWA should be amended to allow California to establish a statewide discharge prohibition zone for sewage discharge from cruise ships only.

The state currently is unable to establish a statewide discharge prohibition zone along California's coast for cruise ships only because discharge prohibition zones established under CWA do not distinguish between classes of vessels. If U.S. EPA approves the state's application to establish a no discharge zone along the California coast, all vessels in the zone would fall under the prohibition. Establishing a discharge prohibition zone requires that a finding be made that adequate pump-out facilities exist to service all vessels subject to the prohibition. Such a finding cannot be made at this time because there are areas along California's coast where existing vessel pump-out facilities are not adequate. There are no pump-out facilities at ports to service cruise ships, cargo vessels, or other types of vessels.

As previously stated in this report, a federal legislation was passed in 2000 specifically for the State of Alaska. That law allows Alaska to prohibit the discharge of untreated sewage into the waters of Alaska by cruise ships and places new limitations on the discharge of treated sewage and graywater. California should request the support and assistance of its congressional delegation to change the federal law to allow the state to establish a discharge prohibition zone in the state's waters specifically for cruise ships.

When a discharge occurs in state waters, ships should report the discharge to the appropriate RWQCB and provide monitoring data.

Due to the large volumes of wastes processed, if a discharge occurs, the ships should submit a report to the appropriate RWQCB. The report should include the type and amount discharged, location of discharge, treatment received prior to discharge, and recent (within one year) monitoring results for that waste stream. This would enable the RWQCB to evaluate whether or not water quality was impaired due to the discharge. If the discharges are found to be impairing water quality, RWQCB could then impose waste discharge requirements on the ship under authority of the Porter-Cologne Water Quality Control Act.

Graywater should be required to meet the same standards required of MSD effluent, or discharge should be withheld while in state waters.

Results of graywater sampling conducted in Alaska indicate that graywater has higher levels of pollutants than previously known. The graywater samples frequently showed levels of fecal coliform and total suspended solids in excess of the standards in place for MSD effluent. Currently, there are no federal or state standards in place for graywater discharges. The state is not pre-empted from establishing regulations for graywater because there are no federal graywater regulations. Suggested standards are a fecal coliform bacteria count not greater than 200 per 100 milliliters and suspended solids not greater than 150 milligrams per liter. Graywater discharges should be subject to reporting and monitoring requirements.

Wastewater discharge should be prohibited in California's National Marine Sanctuaries.

Marine Sanctuaries are established to protect areas with unique or sensitive habitats or natural features. Cruise ships discharge large quantities of wastewater compared to other types of vessels. Due to public demand and the potential for harm to aquatic resources, a wastewater discharge prohibition for cruise ships should be instituted in California's four sanctuaries. An exception may be granted for sewage and graywater treated by a system certified for continuous discharge in Alaskan waters by USCG or a similar certification process. If an exception is granted for vessels with advanced treatment systems that have received certification, recent monitoring results from representative samples of discharging waste streams should be provided to the appropriate RWQCB.

The best method of instituting such a prohibition would be through NOAA's Sanctuary Management Plans. The prohibition instituted by this method could cover discharges of all wastes in both federal and state waters in the marine sanctuaries.

Repeal of the exemption from NPDES requirements is not recommended at this time, but federal actions to require monitoring and reporting are desirable.

Vessels, including cruise ships, are currently exempted from NPDES regulations under federal law. Repealing this exemption would require federal legislation. Regulatory jurisdiction over visiting cruise ships would need to be decided prior to repealing the exemption. The ships are not registered as United States flagged ships, and the location of their United States corporate headquarters does not necessarily imply that the ships primarily visit the state where the headquarters are located. If the NPDES exemption were repealed, U.S. EPA would be the most appropriate agency to issue NPDES permits to cruise ships and other vessels, since its jurisdiction extends throughout United States waters. Subjecting cruise ship operations to NPDES permitting requirements would raise the issue of whether freighters, pleasure craft, fishing vessels, and others should also be required to obtain an NPDES permit. While this is not within the scope of the Task Force's evaluation, SWRCB notes that NPDES permitting for all vessels would be extremely difficult to administer.

Although SWRCB does not recommend repeal of NPDES exemption at this time, it is apparent from Alaskan sampling results that some type of monitoring and reporting scheme should be developed for cruise vessels. Many cruise ships have a passenger/crew capacity of 2,000 to 3,000 persons. Land-based wastewater treatment plants processing similar volumes of waste are required to obtain and comply with the terms of an NPDES permit, which requires regular monitoring and reporting. Federal action to establish more regulations in this area, particularly in regards to monitoring requirements, would be desirable due to the mobility of the ships across state lines and their participation in international commerce.

Cruise lines should consider following the same practices required of NPDES permittees.

The Task Force has found two areas that are particularly troubling. The first is a lack of regular monitoring of effluent from MSDs and graywater. Without regular monitoring of effluent, the vessel operator has no way of knowing whether the discharge meets established standards or not. The second area is the discharge of sludge at sea (12 or more nautical miles from land). Although this practice may be legal for vessels, land-based treatment facilities are prohibited from disposing of sludge or transporting sludge to be disposed of into the ocean. The State of California cannot legally require cruise lines to adhere to NPDES regulations because of the NPDES exemption discussed above, but public concerns over cruise ship discharges may be reduced if the cruise lines take these measures voluntarily.

6.2. ARB

Conclusions

Cruise ships, along with other marine vessels, are a major source of criteria pollutants and TACs in California. In fact, the emissions contribution from a single port call can be significant. This is due to the high power output of typical cruise ships (comparable to many power plants), as well as their high emissions levels compared to other diesel sources.

As discussed in Section 3 of this report, cruise ship engines are subject to little regulatory control compared to landside sources of emissions, despite the availability of technology to control their emissions. This is probably due to a number of factors, including the fact that they operate internationally, and are primarily foreign-flagged vessels traditionally regulated by international lawmaking bodies such as IMO.

However, cruise ships and other oceangoing vessels are under increasing pressure from a number of fronts to reduce their emissions. Portside communities are expressing concerns about the risk associated with diesel PM from marine vessels and other sources. Port authorities are working to mitigate potential emissions increases as they expand their terminals to accommodate increased trade. Finally, it is necessary to reduce emissions from marine vessels to meet ambient air quality standards and to reduce the risk associated with diesel PM. Failing to reduce the emissions from cruise ships and other types of ships will only shift the burden to land-based sources that have, in most cases, already implemented all cost-effective and feasible measures to reduce their emissions. It is very important for California to take a leadership role in reducing air pollutants from this source because it is a large and growing source of emissions that is not being adequately addressed by national or international regulatory agencies.

Recommendations

ARB has proposed the following state and federal measures to reduce the emissions from oceangoing ships as a component of the South Coast AQMD's SIP:

1. Set more stringent emission standards for new marine vessel engines; and
2. Pursue approaches to clean up the existing oceangoing ship fleet.

These two proposed measures, which form the basis of the recommendations made in this report, are necessary for the South Coast Air Basin to meet federal air quality standards, and to reduce community impacts from ship emissions throughout the state. These measures are not crafted specifically for cruise ships but were intended to include cruise ships. If implemented, they would dramatically reduce the emissions from cruise ships, including criteria pollutants, TACs, and VEs (smoke).

The proposed measures do not address GHGs. While the science supports the need for worldwide reductions of GHGs, and the Legislature has recognized this need with the passage of AB 1493 (Chapter 200, Sections 42823 and 43018.5 of the California Health and Safety Code), which addresses passenger cars, ARB does not have any specific recommendations at this time to address GHG from passenger cruise ships. Passenger cruise ships, like other large marine vessels, generally use extremely efficient diesel engines that minimize fuel consumption and associated emissions of CO2 emissions compared to other mobile sources. At this time, ARB simply recommends that the proposals in this report to reduce other emissions be designed to prevent increases in GHGs. It should also be recognized that state-level development of programs to address GHGs are in the early stages, and measures to reduce GHG emissions from passenger cruise ships or other marine vessels may be considered in the future.

Set more stringent emission standards for new marine vessel engines.

As discussed previously, IMO and U.S. EPA have adopted exhaust emission standards for new marine diesel engines that apply to cruise ships. However, the current standards in these regulations only apply to NOx and will achieve minimal emission reductions.

Under this regulatory proposal, U.S. EPA would develop more stringent federal new engine standards for oceangoing ship engines ("category 3" engines). The category 3 engines discussed in this proposal would apply to cruise ships.

Two regulatory options would apply: (1) U.S. EPA could pursue more stringent IMO standards for marine vessels; or (2) U.S. EPA could adopt a second tier of more stringent future effective standards in its existing rule for category 3 engines on both United States and foreign-flagged ships. In all cases, ARB proposes new engine standards for NOx based on the federal Tier 2 and Tier 3 off-road standards, and PM standards based on state-of-the-art technology. Specifically, ARB suggests future

effective NOx+HC standards similar to the federal Tier 2 and Tier 3 off-road future-effective standards, which range from 4 to 6.4 g/kw-hr (grams per kilowatt-hour). Depending on the engine design, these standards can be met using a variety of technologies (alone or in combination) including: advanced fuel injection controls (common rail injection systems), combustion chamber design changes, injection timing retard, turbocharging and aftercooling, exhaust gas recirculation, selective catalytic reduction (SCR), direct water injection, and humid air motor (HAM) technology.

For PM, ARB recommends considering a standard of 0.03 g/kw-hr for four-stroke engines, and 0.10 g/kw-hr for two-stroke, slow speed engines. For four-stroke engines with access to low sulfur (15 ppm) diesel, this standard could be met by many engines with the use of catalyzed diesel particulate filters (DPFs). For other engines, alternative technologies could be utilized (in some cases in combination or along with alternative fuels). These technologies include: active/noncatalyzed DPFs, fuel-borne catalysts, diesel oxidation catalysts, and advanced fuel injection controls (common rail injection systems). Manufacturers of large slow-speed two-stroke engines are also investigating additional PM techniques, such as specialized scrubber designs.

Although the proposed limits would be challenging to manufacturers, they are still higher than the 2007 standards for on-road heavy-duty diesel trucks at about 0.2 g/hp-hr (grams per horsepower-hour) NOx and 0.01 g/hp-hr PM. ARB expects implementation of these revised engine standards to begin in 2008. The proposed standards would reduce emissions of NOx from cruise ship engines by approximately 70 percent, and emissions of HCs and PM by about 90 percent.

Given the importance of regulating emissions from oceangoing ships, both in California and other U.S. states, ARB also encourages U.S. EPA to work to identify innovative strategies in addition to traditional approaches to achieving emission reduction targets. For example, ARB encourages U.S. EPA to work with shipping companies to develop MOUs that would encourage faster turnover of older ships, or provide an incentive for shipping companies to send their cleaner ships to ports with greater air pollution problems. ARB also suggests that U.S. EPA work with manufacturers of category 3 engines. They could discuss agreements that would help accelerate the turnover of older ships, encourage the development of retrofit kits that could be installed to lower emissions from existing engines, and the manufacture of new engines exceeding IMO requirements.

Pursue approaches to clean up the existing oceangoing ship fleet.

Under this measure, U.S. EPA would reduce in-use emissions from oceangoing vessels. ARB expects that U.S. EPA would work closely with the maritime industry, ARB, the local districts, and other stakeholders on this measure. This collaboration is particularly critical for this measure since the majority of oceangoing ships frequenting California coastal waters (including cruise ships) are foreign-flagged vessels. Implementation of measures for oceangoing vessels may even require the formation of a national or international coalition, particularly for some of the proposed federal

incentive programs (which would be more effective if implemented on a national or west coast basis). ARB staff believes the options under this measure could be implemented in the 2005-2010 timeframe.

As a starting point, ARB staff has identified five emission reduction strategies that U.S. EPA should evaluate for applicability to oceangoing ships, including passenger cruise ships. The five proposals ARB has identified are:

- Operational controls such as speed reduction zones;
- Use cleaner fuels in California coastal waters;
- Implement incentive programs to encourage cleaner vessels;
- Set opacity limits within California coastal waters; and
- Cold ironing (electrical power for hotelling).

Operational Controls: Operational controls can provide emission reductions through a broad array of potential measures, including speed controls, idling time limits, and other changes to vessel activities. For example, U.S. EPA assisted in the development of a voluntary speed reduction demonstration project that was initiated in May 2001 at the ports of Los Angeles and Long Beach. The MOU that initiated the project calls for oceangoing vessels (including cruise ships) entering or leaving the ports to slow to 12 knots within 20 nautical miles of the ports. The speed reduction results in lower engine speeds, power, and associated NOx emissions. Upon full implementation, the MOU is expected to result in an emission reduction of two to four tons of NOx per day in the South Coast Air Basin. Currently, the parties to the MOU are developing a more detailed MOU that could serve as the basis for obtaining SIP credit.

Cleaner Fuels: Under this option, oceangoing vessels would use cleaner burning fuels in California coastal waters. Currently, most oceangoing ships visiting the ports of Los Angeles and Long Beach use bunker fuels (such as IFO 180, or IFO 380) with an average sulfur content of about 2.8 percent (28,000 ppm). Under this option, several opportunities exist to use cleaner fuels. For example, it may be possible for propulsion engines to switch to California on-road diesel fuel (or standard MGO, or lower viscosity and/or lower sulfur bunker fuel). Currently, many oceangoing ships, including cruise ships, switch to MGO or other lighter fuels for maneuvering at or near the ports, so it may be possible to extend the use of MGO to California coastal waters. PM and NOx emission reductions achieved by switching from bunker fuel to MGO would be expected to be 44 percent and 10 percent, respectively (U.S. EPA). Even further reductions would be expected with the use of California on-road diesel fuel. For example, PM and NOx emission reductions achieved by switching from MGO to California on-road diesel would be expected to be at least 25 percent and 7 percent, respectively (the reductions expected by switching from U.S. EPA on-road to California on-road diesel). There would also be a dramatic reduction in the sulfur content of the fuel and associated reductions in SOx emissions. For example, California on-road diesel currently averages about 140 ppm sulfur, compared to 28,000 ppm for bunker fuels. The introduction of cleaner, lower sulfur fuels would also enable the use of a wider range of control technologies to be used on either the propulsion or auxiliary engines.

International availability of the cleaner fuels mentioned above and separate fuel storage options are issues that will need to be addressed in considering these options. However, other countries have successfully taken steps to encourage the use of lower sulfur fuels. At a minimum, U.S. EPA could work with IMO to create a sulfur emission control area (SECA) under the existing provisions of MARPOL Annex VI. An existing SECA covering the Baltic Sea limits sulfur content to 1.5 percent.

Economic Incentive Programs that Reward Cleaner Ships: Economic incentive programs could be implemented to encourage oceangoing vessel owners to reduce the emissions from their ships. Under this option, a full evaluation of potential incentive programs would be explored – both existing programs and new programs that would be identified and evaluated with help from the maritime industry. Efforts would be directed to identifying the ships that will produce the greatest reductions for the dollars spent. Federal incentive programs could include programs which help finance the incremental cost of purchasing cleaner engines (compared to standard replacement engines) or installing pollution control equipment.

Another option would be a differential port fee structure under which cleaner vessels are charged lower fees. For example, in Sweden, several ports have implemented a port fee system that offers discounts for ships emitting lower NOx emissions and using lower sulfur bunker fuels. The loss in revenue from the discounted fees is compensated for by slight increases charged to higher emitting ships. Finnish and Norwegian ports have proposed or implemented similar programs which reduce port fees or taxes for cleaner vessels.

Federal incentive programs would have a greater degree of success if implemented throughout the west coast or nationally since most of the emissions from oceangoing ships will be emitted beyond California's boundaries, and the cost of emissions control is high for these very large diesel engines. Therefore, participation by a national coalition may be necessary in implementing an incentive program for oceangoing ships.

Currently, ARB staff is working with U.S. EPA, IMO, and several other regulatory agencies, shipping operators, and port representatives to provide funding for demonstration projects that will test emission control technologies on oceangoing ships. It is expected that successful demonstration projects will support federal economic incentive programs by providing information on the feasibility of currently available technologies.

Incentive programs may be particularly effective for cruise ships. Retrofitting a cruise ship to be significantly cleaner than its competitors may be a source of positive publicity for the entire cruise line. This positive publicity may be more important to a cruise line than a cargo operator and may be a selling point for consumers. Lack of visible smoke or exhaust odors would also help leave a positive impression with passengers. In addition, some cruise ships make very frequent port visits, such as those that regularly travel between Los Angeles/Long Beach and Mexican ports. These ships may attract

more funding for emission reduction projects because retrofit equipment would result in very large emission reductions to the affected ports and coastal areas. Finally, the four stroke engines used in many cruise ships are more amenable to many retrofit emission control systems, such as SCR. These emission control systems may also be retrofitted only on the engines likely to be utilized closest to shore, providing greater flexibility in achieving the most cost-effective emission reductions.

Opacity Requirement for Vessels in California Coastal Waters: Under this option, U.S. EPA would evaluate restrictions on opacity for vessels in California coastal waters. As an example, Alaska has established a requirement that cruise ships operating within three miles of the coastline may not release emissions that reduce visibility by more than 20 percent (18 AAC 50.070). To meet this requirement, cruise lines have employed a variety of techniques, including the use of fuel additives, lower viscosity bunker fuel (IFO 180), operational changes, and increased maintenance schedules. Cruise lines have also installed cleaner engines on some ships. For example, some cruise lines have installed combinations of both diesel electric and gas turbine-electric engines in their ships. With this arrangement, the ship owners can operate without VEs by using the gas turbine alone, or operating the diesel piston engines at constant high load and letting the gas turbine handle the variations. Engine manufacturers have also responded to the challenge by manufacturing new “smokeless” diesel engines using common-rail fuel injection.

Depending on the type of opacity limits ultimately proposed, cruise ship operators visiting California may be able to use some of the same techniques used by the cruise lines to meet Alaska’s opacity limit. In addition, clean fuel options such as those discussed previously in this section may be feasible.

Cold Ironing: Marine vessels typically run diesel generators when at rest in port (hotelling) to generate electrical power for lights and equipment on board. As mentioned previously, cruise ships use the same engines used for propulsion for power generation, and their hotelling loads are much greater than those of other vessels. Specifically, these loads have been estimated to be about five megawatts, compared to one megawatt for other ship types (Arcadis, May 6, 1999). Hotelling emissions are a significant contributor to diesel PM and NOx emissions at major ports in California. Under this proposed option, ships would use dockside electrical power (cold ironing) during hotelling. For dockside electrical power, the power plant emissions associated with providing dockside power would be a fraction of the emissions from a marine auxiliary engine. For example, NOx emissions per megawatt-hour from a diesel generator would be roughly 100 times greater than the emissions from power plants supplying electricity to California’s utilities.

Although there are technical challenges associated with providing cold ironing for ships, this process is currently being used by Princess Cruise ships that dock in Juneau, Alaska. The Alaska Electric Light and Power Company (AEL&P) and Princess Cruises joined forces to construct a shore-side power station that provides up to 13 megawatts of hydroelectric power produced by AEL&P. The Port of Los Angeles is also

investigating this option with several Asian cargo ship operators and the Los Angeles Department of Water and Power.

6.3. DTSC

Overall Hazardous Waste Enforcement and Regulatory Issues

The jurisdictional boundary of the California hazardous waste law and regulations extends to three nautical miles from the California coastline. However, the state law and regulations are intended primarily to address land-based hazardous waste facilities and generators. While state laws and regulations are not specifically designed to regulate hazardous waste management activities in the cruise industry, no additional specific requirements have been identified to be needed at this time.

Recommendation: Upon further review and after gathering sufficient generator data from the cruise industry, it may be necessary to promulgate hazardous waste regulations to clarify that cruise ships traveling within California's waters are subject to the state hazardous waste management requirements in the same manner and to clarify they are regulated to the same extent as other hazardous waste facilities and generators. Until the need for additional specific regulatory requirements are established, existing regulatory requirements apply to the cruise industry. In addition, DTSC should provide education and outreach to the cruise industry regarding these requirements.

Inspections

There should be a uniform inspection program in California to enforce hazardous waste laws and regulations as they apply to cruise ships. Coordination among DTSC, CUPAs, and USCG is necessary to determine the best way to insure that both the state and federal hazardous waste laws and regulations are fully enforced. There may be a need for CUPAs to conduct joint inspections with USCG and to provide inspector training under DTSC oversight.

Recommendation: Upon further review, new laws or regulations may be necessary to mandate or authorize a coordinated effort among federal, state, and local agencies to conduct hazardous waste inspections on cruise ships that travel in California waters.

Inspections / Illegal Disposal of Hazardous Waste

State and federal hazardous waste laws already prohibit the illegal discharge or disposal of hazardous waste. However, the laws do not specifically address cruise ships or offshore illegal disposal of hazardous waste. Also, adequate surveillance and enforcement may be lacking because of USCG's limited inspection resources.

Recommendation: Conduct a well-coordinated inspection program by DTSC or CUPAs and USCG to enforce generator reporting to promote cruise ships' accountability for all

off-loaded hazardous waste, to deter illegal disposal, and to identify if additional regulations are required to address offshore management of hazardous wastes.

Treatment of Cruise Ship Hazardous Waste

State hazardous waste laws already prohibit the incineration and burning of hazardous waste without a treatment permit or other authorization. However, cruise ships may not recognize their treatment activities within three miles of the coastline as a regulated activity.

Recommendation: Education and outreach should be conducted regarding regulations applicable to cruise ships including requirements to identify treatment activities, report the locations where treatment takes place, and obtain the appropriate hazardous waste permits or authorization if they operate the treatment units within California's waters.

California Coastal Air Quality Issues

Although coastal air quality is within the purview of ARB, its current focus is not on the effects of the burning or incineration of hazardous waste.

Recommendation: New laws or regulations would be required to mandate the cruise ships to report where the incineration and burning of hazardous waste, medical or bio-hazardous, recycled oil, and other hazardous materials takes place. The new laws or regulations could also require the cruise ships to measure the emissions and evaluate the impacts of this activity in ports and from a distance offshore.

6.4 CSLC

Recommendations for Future Actions

Continue the state's mandatory program through legislative reauthorization.

The success of the California Ballast Water Management Program as evidenced by high compliance with filing the ballast water reporting form (92 percent), submittal of the required fee (greater than 95 percent), low occurrence of vessels discharging unexchanged ballast water (5 percent) and the uncertainty over a timeline for the development of a federal mandatory ballast water management program strongly suggest the continuation of California's mandatory ballast water program.

The estimated cost to run the Ballast Water Management Program is $3.63 million in Year 1 and $3.2 million annually thereafter until January 1, 2010. The proposed budget applies to all commercial vessel voyages entering California ports or places after operating outside state waters. Cruise ships average approximately five percent of all voyages entering California waters. The program is funded by the Exotic Species Control Fund from fees assessed on all vessels on qualifying voyages into California waters.

Broaden the state's program to include coastwise (i.e., domestic) traffic.

The transfer of ballast water from domestic sources is an important issue in California and can lead to unwanted biological invasions through the discharges of large volumes of ballast water at ports throughout the state. Coastal traffic should be included under the state's program incorporating report form and fee submission, ballast water management requirements, alternative treatment, civil penalties, and liabilities. Some adjustments will be necessary regarding ballast water management requirements for these vessels and is being addressed at the regional level by PBWG, of which CSLC is a member. CSLC should continue to work with the PBWG on development of a consistent regional management program for coastal traffic.

Broaden the ballast water reporting requirements to include reporting for each port of arrival.

Under the current law, qualifying vessels are required to submit a form before they leave their first port of call in California. Information on the form should include any expected discharges at additional port calls in the state. Extending the ballast water reporting requirement to include all ports of call will improve the overall data quality and address important gaps in the current program.

Remove selected exemptions listed under section 71202 of PRC.

The following exemptions currently allowed under the law should be removed: a) crude oil tankers engaged in Trans-Alaskan Pipeline System trade – there is no biological basis for exempting these vessels from the Act; b) passenger vessels equipped with functional treatment systems – vessel type should not influence legislative requirements on ballast water management; furthermore, due to the uncertainties associated with existing treatment technologies, regulatory oversight is required; and c) vessels that discharge ballast water or sediments only at the location where the ballast water or sediments originated – due to the variable voyage routing of the worldwide fleet and the less than 100 percent efficacy of mid-ocean exchange, vessels operating in California waters are not able to meet the conditions for this exemption. Removal of these exemptions will further improve the overall data quality and reduce the confusion among the maritime industry regarding who should report.

Improve the accuracy of ballast water reporting data.

It has been noted by the staff of CSLC, the Smithsonian Environmental Research Center (SERC), and Oregon's Ballast Water Program that data submitted on report forms are highly variable with regard to completeness and accuracy. CSLC staff should work with USCG and other west coast states regarding changes to the current reporting form. CSLC has established a dialogue with the State of Oregon and USCG regarding changes to and simplification of the required ballast water reporting form. CSLC should review and adopt changes proposed by these groups. Additionally, efforts in the areas of education and outreach should be expanded. Working with USCG, instructions on

how to correctly fill out the form should be developed and include descriptions of common errors and how to avoid them. Formal training of CSLC staff, port staff, ship agents, operators, and crew should be developed.

Continue the "fee-based" program to fund the state's Exotic Species Control Fund.

The state's fee-based program has been cited as an important reason for the success of the program. The fund provides resources to enforce the Act, track vessel activity, manage ballast water, conduct biological surveys, and evaluate alternative treatment technologies.

Utilize enforcement components to improve compliance.

Although the California program is often cited by other state and federal agencies as highly successful, violations of the law continue. Recurring problems include: lack of report form submission (approximately 10 percent monthly), late filing of report forms (approximately 10 percent monthly), inaccurate or incomplete filing of report forms (approximately 5 percent monthly), no management plan on board, and the discharge of unexchanged ballast water (5 percent). Although it is expected that the adoption of the aforementioned recommendations will improve compliance, enforcement action should be taken as required. Additionally, language providing CSLC with enforcement authority should be included in any reauthorization bill.

Expand and coordinate research efforts with other federal and state agencies.

Research should be clearly specified in any reauthorization bill. Wherever possible the California program should work with other west coast states, the federal government, and the international community to standardize ballast water management programs.

Establish interim and final ballast water treatment technology performance standards.

It has been argued that identifying a solution to ballast water mediated NAS introductions is hampered by the lack of a standard for treatment technology. A timeline for developing regulations on treatment technology standards should be developed through legislation.

Support research promoting technology development.

Working with federal regulators, technology developers, and the maritime industry, California can significantly advance technology development, through the establishment of a Test and Evaluation Center.

Continue biological surveys to monitor the success of the program.

Monitoring of NAS in receiving waters is required to evaluate the efficacy of the state law at reducing the rate of introductions through ship-mediated vectors. Utilizing available data, a long-term coastwise biological monitoring program should be developed. Requirements for reporting the results of the monitoring program should be included in the reauthorization bill.

6.5. CIWMB

The cruise industry is growing rapidly. Evidence of violations by cruise ships is mounting with violations recently off Monterey. A regulatory framework needs to be established to oversee these activities. Currently, solid waste management by California regulatory agencies is not in place. Regulatory authority of CIWMB over solid waste management in the open ocean environment is not in place. Many issues of waste discharge in the open ocean will be under the aegis of SWRCB. CIWMB has regulatory responsibility over solid waste handling and disposal on land. There is no clear-cut regulatory authority on the part of CIWMB for waste handling activities at sea, nor is there any state regulatory authority for disposal of solid waste while a ship is at sea. CIWMB has regulatory authority for waste handling and disposal while a ship is berthed and is disposing of wastes to shore-side facilities.

A cooperative division of regulatory duties might be possible to alleviate some of the administrative load that would be placed on SWRCB due to the broad range of wastes that may be disposed at sea. As much of the waste that can be discharged from ships consists of larger solid wastes ("garbage") that is non-soluble, can float, or sink in the ocean, and if waste management regulation is expanded beyond just the cruise industry, possibly the regulation of solid waste discharge can be divided into two management categories:

- Larger "non-dissolving" wastes such as plastics, fabric, rubber, paper, wood, etc. that can float or sink into the ocean. These materials could be under the regulatory jurisdiction of CIWMB as "solid wastes" or Municipal Solid Wastes (MSW), as they are regulated on land.

- Chemical materials such as oils, fuels, solvents, detergents, or chemicals that can dissolve and become pollutants of the water. SWRCB would regulate these soluble substances.

Issues of waste management on board ship and how these wastes are processed and stored for disposal on shore, and disposal practices once the ship is in port, will be under the purview of CIWMB.

Items to be Regulated by CIWMB:

Open Ocean Waste Handling

- Discharge of larger waste materials into the water; and
- Improper discharge of macerated food wastes into the water.

On-board Ship and Port Activities

- Appropriate processing of commingled wastes for composting purposes (plastics and glass in potential compost "feedstock");
- Recyclables;
- Prohibition of food wastes in recyclables;
- Disposal on shore at facilities with proper waste handling capabilities;
- Encouraging recycling and composting; and
- Requiring port facilities to provide adequate waste management and disposal facilities for shipping.

These regulatory responsibilities would avoid overlapping with SWRCB regulatory authority but would provide assistance in open ocean issues regarding larger solid wastes with SWRCB to relieve some of the regulatory load.

Regulatory items that could be covered in a CIWMB perspective would include some of the federal and international requirements, integrating the latest from the Alaskan Cruise Ship regulations and with possibly more stringent standards when dealing with Marine Sanctuaries, etc.

Items that could fall under CIWMB Regulation:

- Prohibition of the discharge of any type of plastics or rubber products into the water within the three-mile California coastal waters zone. Under illegal dumping regulations.
- Release of any floating debris, dunnage, lining, or packing materials within the California offshore three-mile area. Under illegal dumping regulations.
- Large particulate food waste, paper, rags or cloth, and glass cannot be discharged within the three-mile California coastal waters limit. Under nuisance/illegal dumping regulations.
- Any other solid wastes may not be discharged into the waters within the three-mile zone of the California coast. Under illegal dumping regulations.
- No discharge of any waste, food or otherwise, macerated into any Marine Sanctuary within California coastal waters.
- No plastics will be permitted in feedstock materials intended for composting.
- No significant food waste will be permitted in feedstocks intended for recycling.
- All materials intended for recycling will be properly separated prior to disposal onshore at any portside receiving facility.

- All biohazard wastes, infirmary/sickbay wastes will be properly processed for disposal under compliance with California Solid Waste disposal regulations for hospital wastes (Medical Waste, Part 14, Div. 104 Health and Safety Code).
- Prohibition of hazardous wastes in “MSW” quality solid wastes (section 40191, Title 27, CCRs).
- Encourage recycling of lubricants and other waste water oils from the oils storage systems.
- Handling and disposal of batteries, special chemicals, etc. will be in accordance with solid waste regulations (CIWMB).

Solid Waste Specialists at CIWMB, who are specially trained for these regulatory and enforcement requirements, would handle the regulation and enforcement of these items.

These responsibilities could be carried out at the time other inspections are being conducted on cruise ships.

6.6. DFG

Conclusions

All vessels discharge wastes into the sea including sewage, oily water mixtures, hazardous wastes, and solid wastes such as garbage or left over cargo residue. If a vessel discharges any substance or material into state waters that is harmful or deleterious to fish, plant life, bird life, or the environment, it is a violation of the Fish and Game Code, Chapter 2 (Pollution), section 5650. The only exception to this violation is for those entities that have a valid permit to discharge from SWRCB pursuant to section 13263 of the California Water Code. Currently, there are no vessels that have been issued exemptions.

Current state law requires all vessels to notify OES of a discharge or spill of oil or petroleum based products into state waters. The OES then notifies state and federal agencies that have jurisdiction to respond to the spill.

Cruise ships generate large quantities of wastes and they dispose of these wastes, often times at sea. This leaves the state to guess at what happens to these wastes. Now is the time to require regulations and an inspection program to prevent these wastes from contaminating state waters and adversely affecting fish and wildlife and the marine environment.

In California, there is no single agency that monitors or regulates all of the waste streams, emissions, or discharges from a vessel. Most of the agencies that have regulations covering these areas do not have a program in place that monitors or enforces their regulations on vessel sources on a regular basis.

Many vessels are not complying with international, state, or federal standards in regards to handling hazardous materials, garbage, or graywater/blackwater treatment or discharges. Impacts from black or graywater discharges from vessels on the marine environment are largely unknown. The total quantity of black and graywater discharges from vessels into the marine waters is unknown.

Recommendations

- Implement regulations that require reporting of all discharges of hazardous materials and bilge water into state waters or waters that could effect state waters.

- No waste or other substance should be allowed to be added to the normal bilge water that would be discharged by a vessel.

- Conduct research into the environmental impacts of discharges of graywater, blackwater, or bilge water on the marine environment.

- Conduct a study to look into the pollution impacts on the marine environment from all other types of vessels.

- Regulations imposed on the cruise industry should be similarly imposed on all vessels.

- Expand the California jurisdictional limits from three miles to reflect or include those waters that are affected by discharges or that will pose a potential impact to state waters or the biological resources located within state waters.

DFG, Office of Spill Prevention and Response, endorses the concept of a Marine Pollution Prevention Program that is coordinated by a single agency that has law enforcement responsibilities in addition to pollution prevention duties.

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