REPORT OF THE STATE WATER RESOURCES CONTROL BOARD'S ADVISORY PANEL ON FUELING AND REFUELING PRACTICES AT CALIFORNIA MARINAS

January 1999

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EXECUTIVE SUMMARY

On 8 October 1997, Governor Pete Wilson requested the State Water Resources Control Board (SWRCB) to convene an advisory panel to review the refueling facilities and practices at marinas located on surface water bodies serving as drinking water sources. This is among one of many actions in response to the growing concern over the detection of methyl t-butyl ether (MTBE) in California's ground water and surface water bodies. The objective of the advisory panel was to determine if any further upgrades should be made to eliminate releases to the water body.

This panel was not asked to evaluate the cost of upgrading marina fueling systems to the standards that would reduce the releases of fuel from these facilities to water bodies. Therefore, an economic analysis to determine the implementation costs and financial impact of the recommendations on the marina industry has not been performed.

The marina work group was formed on December 17, 1997. This group held an information finding workshop on January 13, 1998 and has held many meetings and conference calls to review various aspects of marina fuel system construction and operations to complete this work. The group was divided into four working teams to review floating fuel and containment systems, fuel storage and transfer systems, vessel fueling, and vessel emissions. This report is divided into four sections and each section includes the recommendations of each team.

The panel was able to reach general consensus on the recommendations listed below. As can be expected from a panel of diverse interests, these recommendations often represent a compromise, and may not be the preferred option of any particular organization, group, or individual participating on the panel.

Fuel Storage and Transfer Systems

The scope of this team's work was to evaluate fuel storage and transfer systems at marinas and make recommendations if further upgrades are needed to prevent releases to surface water.

1. *Issue*: Inconsistencies exist between the statutory and regulatory requirements for aboveground and over-water marina piping (Underground Petroleum Storage: Chapter 6.7 of the California Health and Safety Code, Title 23, Division 3, Chapter 16 of the California Code of Regulations, Aboveground Petroleum Storage: Chapter 6.67 of the California Health and Safety Code, and Article 52 of the Uniform Fire Code, 1997 edition).

   Recommendation: The Underground and Aboveground Petroleum statutory and regulatory requirements for marina piping should be consistent and designed specifically for marinas.

2. *Issue*: The piping team reviewed several statutes and regulations related to fuel piping which have inconsistent requirements. The piping team's research was limited and may be incomplete.

   Recommendation: The SWRCB should complete this research prior to issuing new regulations for marina piping.

3. *Issue*: Each marina piping/hosing system is dynamic and unique, and therefore needs to be designed using the best practices, equipment, valving, technologies and monitoring systems to provide environmental protection due to breakage or separation of any system part. Currently, third party certified products are not available to meet this criteria.

   Recommendation: The SWRCB should meet with independent third party testing organizations, product manufacturers, marina industry representatives, and design professionals to develop appropriate standards for fuel transfer systems specific to marina requirements.

4. *Issue*: Due to the limited number of California Marinas, manufacturers may be unwilling to develop new products specifically designed for a marina fuel transfer system.

   Recommendation: The California Legislature, considering the importance of protecting our drinking water resources, should provide financial incentives to encourage research and development.

5. *Issue*: The implementation of more stringent standards that are protective of water quality may impose a financial hardship on marina operators with low sales volumes.

   Recommendation: The California Legislature, considering the importance of protecting our drinking water resources and the need for survival of the marina industry, should evaluate the feasibility of State grants or low interest loans to address this problem.

Floating Fuel and Containment Systems

The task of this team was to evaluate floating fuel systems, to assess existing applicable laws, regulations and standards and to consider what additional measures, if any, should be required for their use.

6. *Issue*: A floating fuel tank can be an environmentally safe method of storing and distributing fuel at many marinas, particularly those with significant lake level fluctuations. Currently, there are no specific standards for floating fuel systems used on California's waterways.

   Recommendation: Regulations should be developed by the SWRCB which provide consistency and adequate spill and fire prevention for California's waterways. These regulations should, at a minimum, incorporate the following requirements:

   a. Secondary containment for entire capacity of the tank.
   b. An overfill prevention device, with redundancy, on the tank, including a method of communication between the tank and the truck and a method for evacuating any residual fuel from the fill line.
   c. The tank fill system must be designed so that it will not result in a spill.
   d. Positive protection against siphoning of fuel from the tank through a leak in the subsequent distribution system.
   e. The system must be capable of withstanding the maximum credible weather conditions for the location.

f. The system must be capable of withstanding a collision from a boat under the worst conditions that could be expected in the location.

g. A leak detection system including monitoring of the fuel level in the tank.

7. *Issue*: The floating fuel team reviewed several statutes, regulations and codes. This research was limited and may be incomplete. In addition, the teams review of existing and proposed systems is also incomplete.

Recommendation: The SWRCB should complete this research, including an analysis of state vessel laws and regulations. The state should utilize existing regulations where possible to provide consistency in its regulation development process. Also, a more thorough analysis of existing and proposed systems should be undertaken, to insure that the new regulations address the widest variety of systems.

8. *Issue*: Because of the great variety of geographical conditions in which marinas may be found, each floating fuel tank system should be specifically designed to fit its particular location by a qualified engineer. Currently, there is no third-party inspection required of floating fuel systems.

Recommendation: Since it is not possible to develop specific requirements that will fit all situations, California professional engineers should be required to certify that the design complies with the regulations and that the system was constructed to the standards of design. In addition, the State should engage in discussions with third party entities to pursue the possibility of requiring a third-party certification for floating fuel systems.

Vessel Fueling

The scope of the this team's work was to evaluate fuel dispenser nozzles, vessel fuel system construction, best management practices and boater education.

9. *Issue*: Inconsistencies may exist in the statutory requirements for hold-open latches for use by recreational vessels. Section 135, Harbors and Navigation Code and Section 41960.6 of the Health and Safety Code appear to be in conflict. The provision in the Harbors and Navigation Code addresses fueling practices unique to water craft and, given the fuel-flow rate commonly encountered at fuel dispensing facilities on or adjacent to the water, hold-open latches should not be required. This will result in less fuel spilled into the waterway, and require more due diligence on those providing fueling services. The requirement for hold-open latches at marinas fueling recreational vessels may result in increased overfills and pollution.

Recommendation: The SWRCB should continue the fueling team's research and consult with the California Air Resources Board regarding gasoline exposure and the use of hold-open latches. If the fueling team's findings are confirmed, the California Legislature should consider re-evaluating the statutory requirement for hold-open latches at inland marinas.

10. *Issue*: The design of vessel fuel venting systems may result in direct petroleum discharges into drinking water sources. The State of New York has addressed this problem by legislating the installation of fuel/air separator systems.

Recommendation: The SWRCB should contact the National Marine Manufacturing Association (NMMA) and U.S. Coast Guard and consult with them regarding possible statutory requirements for vessel fuel/air separator systems.

11. *Issue*: Leakage from fuel dispenser nozzles, installed on marina docks, and portable fuel containers discharges directly into surface waters. Due to the limited market for specialized dispenser nozzles and portable fuel containers, manufacturers may be unwilling to develop new products which prevent leakage.

    Recommendation: The California Legislature, taking into consideration the importance of protecting our drinking water resources, should provide financial incentives to encourage research and development.

12. *Issue*: Vessel operators discharge wastewater from bilges directly to surface water due to the unavailability of bilge pump-out systems at marinas.

    Recommendation: The SWRCB should contact the California Integrated Waste Management Board and recommend they increase their grant program for bilge pump-out systems on surface waters that serve as drinking water sources.

13. *Issue*: Several organizations are developing educational materials for preventing pollution on California's waterways, however a common clearinghouse has not been established to distribute these materials to marinas located on drinking water sources.

    Recommendation: The manager for the SWRCB, Division of Clean Water Programs, Underground Storage Tank Program should contact the manager of the SWRCB, Division of Water Quality, Nonpoint Source Program and encourage the development of a clearinghouse to gather and distribute educational materials to California's inland marinas.

Vessel Emissions

The scope of work for this team was to gather MTBE contamination occurrence data from drinking water reservoirs that have motorized recreational activity and to develop voluntary management practices for agencies that own drinking water reservoirs, reservoir managers, and boat owners to help minimize motorized water craft emissions that could potentially contaminate reservoir water.

14. *Issue*: Gasoline fueled, motorized recreational water craft can contaminate surface waters through emission of gasoline (and MTBE) into the water. Such contamination can degrade the quality of the water resource.

    Recommendation: Promote the management practices for reducing emissions described in the Mobile Source Reduction Component and Engine Maintenance Practices sections of the MTBE

Management Practices Guide.* The recommended management practices include, but are not limited to, emission reductions through use of more efficient engines as certified by the CARB engine maintenance, limiting high emission water craft usage on the reservoir, and reduced boat speed operation on reservoirs.

Recommendation: Develop and implement a comprehensive education program for boaters and reservoir owners and managers which will encourage the implementation of the recommended MTBE management practices. In many cases boaters and reservoir owners and managers are unaware of the steps which can be taken to reduce emissions. The Information Communication & Distribution section of the MTBE Management Practices Guide describes the type of information that could be distributed and lists various information distribution channels.

Recommendation: Encourage reservoir owners (in conjunction with drinking water agencies that utilize the reservoirs, when appropriate) to establish a water quality goal for MTBE in the reservoir. The goal should be set a level which ensures consumers will have a high degree of confidence in the quality of their drinking water supplies and drinking water standards are met.

Recommendation: Promote implementation of reservoir monitoring programs for MTBE. Ongoing monitoring will facilitate evaluating the effectiveness of management practices, provide measurement of progress in meeting water quality goals, and help ensure drinking water standards are met.

Recommendation: Ensure that adequate research is undertaken to investigate the multi-media fate and transport of any new oxygenates or reformulated gasoline (RFG) components. The surface water impacts of substitute oxygenates and RFG components (and their decomposition and by-products) need to be well understood before sold and used commercially.

* Guidelines to assist California surface water management authorities in their efforts to deal with the issue of MTBE, prepared by a group made up of representatives from key California water agencies, the National Marine Manufacturers Association, and related California state boating and water agencies.

SECTION 1

FUEL STORAGE AND TRANSFER SYSTEMS

SECTION 1
FUEL STORAGE AND TRANSFER SYSTEMS

SCOPE OF WORK

The scope of this team's work was to evaluate fuel storage and transfer systems at marinas and make recommendations if further upgrades are needed to prevent releases to surface water. The research conducted by the team included:

- A telephone survey of California marina operators requesting information on their fuel storage and transfer system construction, design and type of monitoring.
- A regulatory file review and compilation of documented petroleum releases on California's waterways, with emphasis on marina fuel storage and transfer systems.
- A review of federal and state statutes and regulations applicable to underground and aboveground fuel storage and transfer systems.
- A review of available piping products and monitoring systems.

BACKGROUND INFORMATION

Marinas are operational on several of California's coastal and inland waterways. A review of the 1998 Marina Directory[1] reveals that 467 marinas are located on these waterways. Of the 467, the number of California marinas with fuel docks totals 220. Marinas with fuel docks on coastal (saline) waterways total 67. The total number of marinas with fuel docks on drinking water sources, including the California Delta, totals 153. The quantity of gasoline dispensed at recreational marinas ranges from 40,000 to 350,000 gallons per year per marina.[39] A few marinas also supply a yearly average of 2000 gallons of diesel.[2] A majority of the fuel dispensed at marinas occurs during the summer boating season.[2]

Typically, a marina uses land-based underground or aboveground tanks for gasoline, premix (a gasoline and oil mixture), and/or diesel fuel storage. These tanks may be installed in close proximity to the tidal influence of an ocean, bay, delta, or river system or the high water line of a lake, reservoir, or inland sea. The team's telephone survey[3] revealed that petroleum products are delivered from the tank through a system of underground, aboveground, under-water and over-water piping or hosing. The over-water piping/hosing is typically suspended in the marina dock framework, above the flotation, and below the dock covering. The over-water piping/hosing terminates at the fuel dispenser. Petroleum products are delivered to various types of water craft through the dispenser nozzle.

A few marinas use floating barge[4] or above-water fuel systems for gasoline and/or diesel storage. In contrast to the land-based storage systems, these floating tanks are generally self-contained with minimal piping. If piping is present, it is installed beneath the marina dock to connect the floating fuel system to the dock dispensers.

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[1] 1998 Marina Directory, State Of California, Department of Boating and Waterways
[2] Information provided by Marina Advisory Panel Member Dave S. Smith, Water Resorts, Inc.
[3] A Telephone Survey of Existing Petroleum Storage and Transfer Systems at California Marinas
[4] See Section 2 of the Report

POTENTIAL WATER QUALITY THREATS AND DOCUMENTED PETROLEUM RELEASES ASSOCIATED WITH MARINA PETROLEUM STORAGE AND TRANSFER SYSTEMS

Inland surface waters are a source of drinking water for California communities. Drinking water intakes for municipal, small community, and individual water systems may be constructed in close proximity to marinas. Discharges of petroleum products, from an inland marina's fuel storage and transfer system into surface waters, may result in pollution, nuisance, and ultimately degrade the water supply. In addition, other beneficial uses of the surface waters may be impacted as a result of petroleum releases from a marina to the environment.

The team obtained information from regulatory files containing documented petroleum releases on California's waterways, emphasizing marinas. The research was compiled[5] and, although incomplete, indicates petroleum releases from fuel storage and transfer systems have occurred. The source of the releases varies from the storage tank (underground, aboveground, floating) to the piping system (underground, aboveground, underwater, over-water), to the dispensers. The petroleum releases have contaminated soil, groundwater, and surface water.

STATUTORY AND REGULATORY REQUIREMENTS

Various federal and state statutes and regulations were examined to obtain the requirements for fuel storage and transfer systems. Although the team's research did not examine all statutes and regulations, a summary of our findings follows:

1. UNDERGROUND STORAGE TANK (UST):

   Federal Regulations (Code of Federal Regulations 40 CFR Part 280) and State Underground Storage Tank Statutes (Chapter 6.7, California Health and Safety Code) and Regulations (California Code of Regulations Chapter 16, Division 3, Title 23)

   Federal UST regulations are less stringent than the State regulations and do not extend to the aboveground piping section of the system. State UST statutes and regulations are applicable to all of California's marinas storing fuel in USTs and do not have special provisions for marina systems. On March 18, 1998, the SWRCB issued local guidance letter 152 (LG. 152).[6] LG 152 was issued in response to the team's request[7] for a written interpretation of the UST laws and regulations, and their applicability to the aboveground piping at marinas. The SWRCB's staff attorney reviewed LG 152 to verify correct interpretation of the statutes and regulations. LG 152 summarizes the existing, as well as the December 22, 1998, upgrade requirements for the UST and associated aboveground and underground piping at marinas.

   On September 29, 1998, Senate Bill 2198[8] was signed into the law. This law now exempts all "unburied fuel delivery piping" at marinas from the definition of piping in the UST Code

[5] Documented Petroleum Releases on California's Waterways, A Time-Limited File Review
[6] LG-152, Aboveground Piping Associated with an Underground Storage Tank System, SWRCB, March 18, 1998.
[7] Request for Interpretation of Underground Storage Tank Regulations as They Apply to Marinas, Letter from Team Leader Karen L. Clementsen to Shahla Farahnak, January 20, 1998
[8] SB 2198, Sher and Leslie, September 29, 1998

provided the operator performs daily visual inspections. This exemption terminates when the SWRCB adopts regulations addressing marina piping.

2. ABOVEGROUND STORAGE TANK (AST):

State and Federal Aboveground Storage Tank Statutes and Regulations (California Health and Safety Code Chapter 6.67 and Code of Federal Regulations CFR 40 Part 112)

Chapter 6.67 of the California Health and Safety Code, the Aboveground Storage of Petroleum requires marinas having a single AST greater than 660 gallons or cumulative petroleum ASTs exceeding 1,320 gallons to submit a storage statement and fee, have a Registered Professional Engineer prepare a Spill Prevention Control and Countermeasure plan (SPCC) in accordance with the Code of Federal Regulations (40 CFR Part 112), agree to periodic inspections by the Regional Water Quality Control Board (RWQCB), and establish a monitoring program if required by the Regional Water Quality Control Board. Chapter 6.67 exempts piping beyond the first flange of the AST from the definition of an aboveground storage tank system.[9] California has no aboveground storage tank regulations.

3. FIRE CODE

Uniform Fire Code 1997 Edition (UFC)[10]

The Uniform Fire Code (UFC) is the United States' premier model fire code. The UFC has become internationally recognized for its role in setting the pace of fire prevention, fire protection and public safety. The State of California has adopted the UFC and its standards with the States' amendments. The UFC sections which apply to marina fueling systems follow:

Article 52 - Motor Vehicle Fuel-Dispensing Station
The scope of the following section specifically addresses marinas:

Section 5201.1 "Scope. Automotive, marina and aircraft motor vehicle fuel-dispensing stations shall be in accordance with Article 52 and UFC Standards 52-1. Such operations shall include both public accessible and private operations. Flammable and combustible liquids and LP-gas shall also be in accordance with Articles 79 and 82." Article 79 deals with flammable and combustible liquids and piping systems, which more extensively covers piping systems. Article 82 deals with liquefied petroleum gases.

Section 52 covers the installation and location of dispensing devices, protection from sources of ignition and other safety requirements. This section continues by giving criteria for system design and construction. Section 5202.11, Marina Motor Vehicle Fuel-Dispensing Stations, is specific to marinas and covers materials and equipment which make up the fueling system. Portions of this section relating directly with piping systems are:

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[9] Aboveground Petroleum Storage at Marinas, Memorandum from Allan Patton , SWRCB, Sacramento to Team Leader Karen L. Clementsen, March 13, 1998.

[10] Motor Vehicle Fuel-Article 52, Uniform Fire Code, 1997 Edition.

Section 5202.11.3.3 "Piping. Piping at marine motor vehicle fuel-dispensing stations shall be protected against physical damage, external corrosion and excessive stress."

Section 5202.11.3.6 "Piping materials. Commodity piping at marine motor vehicle fuel-dispensing stations shall be welded or welded flanged steel construction." EXCEPTION: Pipe less than 2 inches (50.8mm) in diameter is allowed to be threaded provided it is constructed of steel or other approved material."

"Approved" as defined by the UFC: "Approved refers to approval by the chief as the result of investigation and tests conducted by the chief or by reason of accepted principles or tests by national authorities, or technical or scientific organizations."

Besides these references, there are additional items related to marina fueling stations covered by the UFC.

National Fire Protection Association (NFPA)

The National Fire Protection Association (NFPA) is an independent, voluntary membership, nonprofit organization. Its mission is to safeguard people, their property, and the environment from destructive fire using scientific and engineering techniques and education. NFPA codes and standards, which number about 275, have great influence because they are widely used as the local basis of legislation when adopted. Many NFPA documents are referred to in the Occupational Safety and Health Administration standards. The most common NFPA documents which are nationally recognized and adopted as the accepted codes are: NFPA 70 National Electrical Code, NFPA 13 Installation of Fire Sprinkler Systems and NFPA 101 Life Safety Code.

All NFPA documents are not accepted as codes and standards unless that particular document is adopted by the jurisdiction having authority. There are two NFPA documents which pertain to marina fueling systems. These are NFPA 30, Flammable and Combustible Liquids Code,[11] and NFPA 30A, Automotive and Marina Service Station Code.[12] Both of these documents are incorporated and expanded on in the UFC.

4. LABOR CODE

Code of Federal Regulations (CFR) (CFR 29 Part 1910 - Occupational Safety and Health Standards (OSHA), Subpart H - Hazardous Materials, 1910.106 - Flammable and Combustible Liquids)

Section 1910.106 covers all aspects of fueling stations, marina and otherwise. Section 1910.106(a) gives the definition of marina: "Marina service station shall mean that portion of a property where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft, and shall include all facilities used in connection therewith." Section 1910.106 refers to the

[11] Flammable and Combustible Liquids Code, NFPA 30
[12] Automotive and Marina Service Station Code, NFPA 30A

use of steel pipe, or piping with a high melting point during fires. This is a common thread in the fire and labor codes and standards.

TECHNOLOGIES AVAILABLE FOR MEETING THE EXISTING REQUIREMENTS

1. Piping and Hosing

On May 8, 1997, the SWRCB issued LG 130-2.[13] This LG transmitted survey information on flexible piping systems completed by a U.S. Environmental Protection Agency Contractor. LG 130-2 includes Appendix A, *Additional Information on UL and ULC Listings and UL 971 Test Requirements for Flexible Pipe*, which states: "Both UL and ULC listings are for "underground" piping. This means that it is assumed that the piping will be buried and not subject to fire exposure. Unless specifically tested for fire exposure, the UL and ULC listings for flexible piping do not apply to portions of flexible pipe that are exposed in underground sumps." The Uniform Fire Code requires metallic piping or other approved materials.

The team reviewed LG 130-2, contacted five manufacturers of double wall non-metallic flexible piping[14,15,16,17,18] and one manufacturer of rubber hosing,[19] requested and reviewed their product information,[20] and compared it to the statutory and regulatory requirements for marinas. The team findings follow:

A. Flexible double-wall non-metallic piping[14,15,16,17,18] does not meet the Fire or Labor Code requirements for aboveground use at marinas. In response to a SWRCB request[21] for clarification, the California Department of Forestry and Fire Protection, Office of State Fire Marshall, issued a memorandum[22] regarding marina aboveground piping which states "we would question if any of the current available offerings have the same strength and fire resistive characteristics as steel pipe." The Fire Marshall would require data submittal, from a nationally accepted testing firm, before approving any installation. Currently, the SWRCB has not requested additional clarification regarding the Labor Code's requirements for steel pipe.

B. Tank to transition (the area between the land-based tank and the high water line): Currently, steel pipe is most commonly used.[3] Materials are available for installing on shore, double wall underground piping from the tank to transition.[14,15,16,17,18] Most flexible piping manufacturers do not recommend their product for aboveground use.

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[13] LG-130-2, Flexible Piping Systems, May 8, 1997
[14] Advanced Polymer Technology, Inc. (APT), furnished ring binder of company literature
[15] Environ Products, Inc., furnished ring binder titled GeoFlex System
[16] Pisces by OPW, Inc., brochure of product literature
[17] Total Containment, Inc., ring binder titled Flexible Underground Piping and Secondary Containment Systems
[18] Western Fiberglass, ring binder of company literature
[19] Gates® Industrial Hose Products, Catalogue 39496-000 (5-96)
[20] Informal Survey of Manufacturers of Double Wall Flexible Piping to Determine Applicability to Shore/Dock Transition Connection in Marina Applications, team member Thomas P. Charles
[21] Aboveground piping, letter from Allan Patton, SWRCB, July 22, 1998.
[22] Aboveground Piping, Memorandum from Paul Ditzen, Office of State Fire Marshall, to Allan Patton, SWRCB, July 28, 1998

C. Transition (the area between the high water line and the floating dock): Most marinas use a combination of single-wall steel pipe and single-wall wall petroleum hose.[3] One flexible piping manufacturer[14] has used their double wall product for the transition. The team found that the UFC recognizes flexible connectors in a steel piping system. However, the UFC does not contain specifications and the team did not discover any independent third party standards for flexible connectors.

D. Dock (the floating part of the marina containing the fuel dispensers): Steel pipe and hosing are currently used and, where dock pivot conditions exist (fifth wheels), marinas use lengths of hose connected to steel piping.[3] Flexible non-metallic double-wall piping has been used on the dock and fifth wheels.[14,15,17] The UFC recognizes a need for flexible connectors as described in above item 1C.

2. Valves and Connectors: The use of in-line breakaway, ball valves, and solenoid valves are recommended by one flexible piping manufacturer.[17]

3. Dispenser Containment: Third party certified dispenser containment is available for land-based dispensers. Therefore, on 3 March 1998, five members of the piping team recommended the SWRCB revise LG 138-1[23] to require the use of containment beneath all marina dispensers.[24] However, the team discovered that third party certified products are not available for use on the marina docks.

4. Monitoring Systems

Visual: Many marina operators perform visual monitoring[3] to insure the aboveground fuel transfer system is in good condition. By inspecting for abrasion, corrosion, physical damage or displaced piping such conditions can be corrected before a leak occurs.

Electronic: The use of monitoring systems are recommended by one flexible piping manufacturer.[17] Sensors are available to shut off the pumps and close valves in the event of a detected leak in the product lines, or turbine, or dispenser sumps/pans. Depending on the type of material and length of lines, leak detectors may be available that can shut off the pumps if a leak is detected.

ISSUES AND RECOMMENDATIONS

1. *Issue*: Inconsistencies exist between the statutory and regulatory requirements for aboveground and over-water marina piping (Underground Petroleum Storage: Chapter 6.7 of the California Health and Safety Code, Title 23, Division 3, Chapter 16 of the California Code of Regulations, Aboveground Petroleum Storage: Chapter 6.67 of the California Health and Safety Code, and Article 52 of the Uniform Fire Code, 1997 edition).

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[23] LG-138, Regulation of Dispenser Piping and Related Equipment, SWRCB, January 20, 1995; Rescinded by SWRCB on May 17, 1995.

[24] Advisory Panel Evaluating the Refueling Practices at Marinas, Workgroup Team #2 Comments Regarding February 25, 1998 Draft LG 138-1, Correspondence to Shahla Farahnak from Five Team #2 Members, March3, 1998.

Recommendation: The Underground and Aboveground Petroleum statutory and regulatory requirements for marina piping should be consistent and designed specifically for marinas.

2. *Issue*: The piping team reviewed several statutes and regulations related to fuel piping which have inconsistent requirements. The piping team's research was limited and may be incomplete.

   Recommendation: The SWRCB should complete this research prior to issuing new regulations for marina piping.

3. *Issue*: Each marina piping/hosing system is dynamic and unique, and therefore needs to be designed using the best practices, equipment, valving, technologies and monitoring systems to provide environmental protection due to breakage or separation of any system part. Currently, third party certified products are not available to meet this criteria.

   Recommendation: The SWRCB should meet with independent third party testing organizations, product manufacturers, marina industry representatives, and design professionals to develop appropriate standards for fuel transfer systems specific to marina requirements.

4. *Issue*: Due to the limited number of California Marinas, manufacturers may be unwilling to develop new products specifically designed for a marina fuel transfer system.

   Recommendation: The California Legislature, considering the importance of protecting our drinking water resources, should provide financial incentives to encourage research and development.

5. *Issue*: The implementation of more stringent standards that are protective of water quality may impose a financial hardship on marina operators with low sales volumes.

   Recommendation: The California Legislature, considering the importance of protecting our drinking water resources and the need for survival of the marina industry, should evaluate the feasibility of State grants or low interest loans to address this problem.

SECTION 2

FLOATING FUEL CONTAINMENT AND DELIVERY SYSTEMS

SECTION 2
FLOATING FUEL CONTAINMENT AND DELIVERY SYSTEMS

SCOPE OF WORK

The task of this team was to evaluate floating fuel systems, to assess existing applicable laws, regulations and standards and to consider what additional measures, if any, should be required for their use. Research conducted by the team included:

- A review of design features, configurations and types of existing and proposed floating fuel systems.
- A review of federal and state spill and fire prevention regulations applicable to floating fuel systems.
- A review of available floating fuel system applicable products.

BACKGROUND INFORMATION

As marinas with USTs comply with the December 1998 deadline, many operators are investigating and determining what type of storage system is most appropriate for their facility. Marinas are unique due to their particular geographical location. Therefore, their fueling systems need to be individually engineered to address the needs of the location, as well as the fuel demand. For a marina, it is essential to choose the most appropriate alternative. Consideration should be given to all potential methods of storage, transfer and delivery, and other factors such as safety, spill prevention, effort of operation, and cost of installation, operation and maintenance.

Most marinas utilize land based tanks which require a piping system to connect the tank to the dispensers located on the dock.[4] For coastal marinas where water level fluctuations are moderate and dock systems are on fixed piers, tanks are often located on land and piping systems on land and in the dock are fixed. On inland lakes, some marinas may move as far as three miles from their point of origin in low water conditions. In these situations, where drawdown is extensive, piping systems associated with land based tanks may travel the length of the drawdown. Dock piping is often disconnected and reconnected along the land based piping system as the water level changes. In addition, as drawdown increases and the marina moves farther from the on shore tanks, pressure in pipelines increases. These conditions increase the risk of an accidental spill.

While land based fueling systems may be ideal for many marinas, floating fuel systems have proven to be an effective method of fuel storage and distribution for floating marinas, which, in the normal course of operations, may move laterally some significant distance. Other situations may also encourage the use of a floating fuel tank at a marina.

Currently, approximately 5% of marinas surveyed in California utilize floating fuel systems[4] and there are probably less than 50 locations in the State where a floating storage tank would be most appropriate.[2] Floating systems are also being used in Utah and New York. Currently, there is not a floating system that can be purchased off the shelf and, due to the small number of sites which a floating system is appropriate, it is unlikely that there will be such a product developed. Therefore, each floating system

must be individually designed for each application by a qualified engineer and constructed to the appropriate standards and design criteria.

Although federal regulations exist for design and operation of fuel vessels over 250 barrels (10,500 gallons) used in the marine environment, currently the corresponding regulations for the inland environment do not specifically address tank systems which are located on waterways. Inland spill and fire prevention regulations do not take into account factors such as tank stability and loading, fuel transfer operations over water, monitoring and maintenance of submerged equipment or other spill prevention measures associated with waterborne operations.

TYPES OF FLOATING FUEL SYSTEMS

The team's research determined that there are several different possible configurations of floating tank systems, each of which have their own benefits and drawbacks. Selection of each system depended on the needs of the particular facility, including but not limited to: geography, operation of the marina, number and type of vessels being fueled, and desired tank capacity. The following summary provides descriptions of the main features of floating fuel systems.[25]

I. Floating Fuel Tank Types

A. Displacement tank barge.

Displacement tanks barges have tanks within the hull of the vessel. This type of tank system has more stability due to the product's center of mass being located beneath the surface of the water. Floatation for the barge is usually provided by air filled compartments. In addition, since the tank barge is designed and constructed for the particular location, the size and number of fuel compartments can be chosen based on the facility's needs. One drawback to a displacement tank barge is the cost/difficulty of removing the barge from the water for inspection and maintenance. This problem grows with the capacity of the tank due to an increase in the overall weight. Therefore, this system may work better with smaller capacities, unless the facility has the equipment to remove a large barge from the water. Displacement barges in use on Lake Powell are 21,000 gallons in capacity.[26]

B. Tanks mounted on deck of a barge or platform.

The other type of floating fuel tank utilizes an aboveground storage tank mounted to the deck of a barge or floating platform. One benefit of a tank mounted on a platform is the platform does not have to be removed from the water to conduct inspections and minor maintenance of the tank. Major tank maintenance will still require at least the tank to be removed from the water and the platform itself will need to be inspected for integrity and maintained with scale removal and recoating. Use of a double-walled, fire rated (UL2085) aboveground tank may address compliance with some of the fire prevention requirements. Enclosed foam flotation may be utilized since there is little likelihood of fuel coming in contact with it and flotation could be replaced without removing the barge from the water if necessary.

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[25] Floating Fuel Tank Systems, Approved Systems for Shasta Lake Marinas, Memorandum from Fred Fortes, Shasta County Fire Department to Team Members, Floating Fuel Containment, February 24, 1998

[26] Oil Program Trip Report: Lake Powell, Arizona and Utah. Michelle Rogow, U.S. Environmental Protection Agency Region IX, San Francisco, California, August 26-28, 1996

This system requires more space on the water, since the height and weight of the tank above the water surface require a wider base to provide stability. In addition, aboveground tanks used in this type of application would need modifications such as baffling and additional bolting/anchoring.

II. Refueling the Tank

A. Tank transported to shore, filled via tank truck.

In this scenario, mobility is necessary to transport the barge from the location where fuel is dispensed to the shore where the tank is filled. The barge may be self-propelled or pushed by a boat. Although self-propulsion could be costly for the relatively infrequent need for mobility, it may be easier to operate than a tow boat. Relocation of the barge for refilling is more labor intensive than keeping the barge stationary, but it reduces the amount of hosing or piping that would be required to refill a stationary barge. Consideration must be given to anchoring the barge at the shore without the threat of grounding during the filling operation, and securing it to the dock system when it is in the dispensing location. If fuel is distributed via piping to dispensers on the dock, connections from the tank to the dock piping must be designed appropriately to prevent any fuel spillage during attachment and detachment of the barge.

B. Tank fixed to dock with hosing to shore, filled via tank truck.

With the tank system in a fixed location on the dock, the filling may be done through a hose or combination of pipe and hose, which connects the tank to the tank truck on shore. When the hose is in use, it should be attended on both ends as well as along the pathway and at any joints. When filling is complete, the hose should be drained and stored either on shore or on the dock. Although this method alleviates the need to move the tank system, it has some spill prevention concerns due to length of the piping systems required to fill the tank.

C. Tank fixed to dock with fixed piping to shore, filled via tank truck or on-shore tank.

Because this system utilizes fixed piping, it does not have the risk of incident due to issues related to use of flexible hosing. There is no movement of the barge and anchoring it at the shore, which reduces the likelihood of an incident due to relocation. There is also less labor involved with a stationary barge than a mobile barge with a hosing system utilized each time the tank is to be filled. Although this approach may be more challenging to configure because the piping system would need to address the land to water interface and the movement of the dock system along the shoreline.

III. Dispensing from the Tank.

A. Dispensers located on deck of barge or platform.

Using the barge as a dispenser platform eliminates the need for piping between the barge and remote dispensers, therefore reducing the risk of piping incident. A disadvantage to using the barge as a dispensing platform is that the number and size of boats that can be accommodated is limited. Dispensers could be located on each tank compartment, but the length of the barge and the length of dispenser hoses may still limit the fueling area.

B. Piping from barge or platform to dispensers on dock.

One benefit of attaching the platform to the dock is that the dispensing area is not limited to the length of the barge or platform. The distribution system can be hard plumbed (with a dry break connection for emergency situations requiring a separation of the barge from the dock) to a number of dispensing locations on the marina dock system. This system requires the monitoring and inspection of piping which is located beneath the dock to insure integrity and proper maintenance. Also, if the barge must be moved to shore to be filled, the pipe attachments must be designed for easy disconnection and reconnection and minimizing potential spillage.

POTENTIAL ENVIRONMENTAL QUALITY PROBLEMS OR THREATS ASSOCIATED WITH THESE SYSTEMS

As with any marina, aggressive spill prevention measures are necessary due to the proximity of a waterway to the facility. Floating fuel systems offer an increased challenge since the entire fuel system is located in or above the water. The most significant threat from any system would be a catastrophic spill of the entire contents of the storage tank, which would certainly result in a fuel release to the water. Therefore, spill prevention measures should be required to protect the tank and serve as secondary containment, to prevent the entire contents of the tank from releasing out of a pipe break or from being dispensed unless an operator has "turned on the pump". In addition, factors such as buoyancy, stability and anchoring need to be addressed, to prevent overturning or grounding of the tank. The potential for a spill also exists when the tank is being filled since most floating systems are fueled via piping from tank trucks located on shore. Although another potential source of spills at a marina, the piping, is greatly reduced from the amount required for a stationary land based tank to connect into the floating docks.

EXISTING LAWS AND REGULATIONS APPLICABLE TO THESE SYSTEMS

Although there are no laws specifically addressing floating fuel systems, all laws prohibiting the discharge of pollutants into water are be applicable. In addition, the team analyzed potentially applicable federal and state spill and fir prevention regulations. The research conducted by the team did not examine all statutes and regulations, a summary of the findings is contained in the piping team's report and additional findings follow:

1. Aboveground Storage Tanks (AST)

State and Federal AST Statutes and Regulations (California Health and Safety Code Chapter 6.67 and Code of Federal Regulations 40 CFR Part 112)

Most floating tank systems are considered to be non-transportation related facilities under federal (and state) regulations and therefore any floater at a marina which exceeds the applicability threshold is subject to the Spill Prevention Control and Countermeasures (SPCC) regulations found in 40 CFR 112.[27] These regulations primarily focus on onshore systems with some requirements for offshore production facilities. When compliance with SPCC is required, the regulations must be interpreted as they apply to

[27] Spill Prevention and Control for Marinas and Other Waterside Fueling Facilities, U.S. Environmental Protection Agency, May 1998.

the floating fuel system. Due to the complexity of marinas, a guidance document has been prepared by USEPA to provide some clarification on the provisions of SPCC as they apply to marinas.[27]

2. Vessel and Marine Transfer Facility

Federal vessel and marine transfer facility regulations (33 CFR 151-157) and tank vessel construction regulations (46 CFR 31) are administered by the U.S. Coast Guard (USCG).[28]

These regulations are the most appropriate and specific to floating fuel storage and transfer systems that the team identified. Unfortunately, these regulations do not apply to floating systems in the inland environment or those that are under 250 barrels (10,500 gallons) in the marine environment (although the USCG has the authority to issue notices of applicability for marine vessels under 250 barrels.) The USCG regulations address vessel and marine transfer operation, equipment, vapor control, and response preparedness. In addition, there are fire regulations found in 33 CFR 126.15 for USCG regulated facilities. There appear to be requirements for "inland oil barges" in 33 CFR 155, but the team was unable to determine the applicability and associated requirements in time for this report.

3. Fire Codes

The Uniform Fire Code (UFC), California Fire Code (CFC) and the National Fire Protection Association (NFPA) Codes do not recognize or have specific requirements for floating fuel systems.[25] Therefore, fire departments, who are often the primary permitting entity for floating fuel systems, provide interpretations of fire regulations as they apply to floating systems. The imposed requirements utilize fire department experience and aim to address the intent of the fire codes through the use of CFC Section 103.1.3 (Practical Difficulties) and CFC Section 103.1.2 (Alternative Materials and Methods). Some Fire Departments, such as Shasta County who has permitted 3 floating fuel systems, have developed comprehensive fire protection requirements which includes provisions for tank protection, connections, venting, grounding, electrical, floatation, isolation, signs and refueling. Floating systems in other counties which were inspected by team members were not designed and constructed to the same requirements which provides evidence of the inconsistencies between permitting entities.

REVIEW OF EXISTING TECHNOLOGIES AND FUTURE TECHNOLOGIES UNDER DEVELOPMENT

As discussed previously, the team was unable to identify a fuel tank on the market for use as a floating fuel system. Fuel tanks meeting UL2085 requirements are readily available and provide double wall leak protection as well as the necessary fire rating, although these tanks must be modified with baffling and additional bolting for safe installation on a float. There are third party entities, such as the American Bureau of Shipping, which can certify certain aspects of new construction of ships, and issue loadline or stability certifications.[28]

[28] Correspondence between to Michelle Rogow, U.S. Environmental Protection Agency and Lieutenant M.T. Cunningham, U.S. Coast Guard Chief, Port Operations Department, Marine Safety Office, San Diego, California, May 11, 1998 and July 6, 1998

If the floating system is to be hard plumbed into a dock with dispensers, or if the dispensers are located on the fuel tank float, then double wall pipe can be used, although available products may not address fire issues. In addition, marinas frequently utilize flexible piping from the fuel supply to the dispensers. The issues related to the use of piping and hosing and lack of products presently available are addressed further in the Piping Section of this report.

ISSUES AND RECOMMENDATIONS

1. *Issue*: A floating fuel tank can be an environmentally safe method of storing and distributing fuel at many marinas, particularly those with significant lake level fluctuations. Currently, there are no specific standards for floating fuel systems used on California's waterways.

   Recommendation: Regulations should be developed by the State which provide consistency and adequate spill and fire prevention for California's waterways. These regulations should, at a minimum, incorporate the following requirements:

   a. Secondary containment for entire capacity of the tank.
   b. An overfill prevention device, with redundancy, on the tank, including a method of communication between the tank and the truck and a method for evacuating any residual fuel from the fill line.
   c. The tank fill system must be designed so that it will not result in a spill.
   d. Positive protection against siphoning of fuel from the tank through a leak in the subsequent distribution system.
   e. The system must be capable of withstanding the maximum credible weather conditions for the location.
   f. The system must be capable of withstanding a collision from a boat under the worst conditions that could be expected in the location.
   g. A leak detection system including monitoring of the fuel level in the tank.

2 *Issue*: The floating fuel team reviewed several statutes, regulations and codes. This research was limited and may be incomplete. In addition, the teams review of existing and proposed systems is also incomplete.

   Recommendation: The SWRCB should complete this research, including an analysis of state vessel laws and regulations. The state should utilize existing regulations where possible to provide consistency in its regulation development process. Also, a more thorough analysis of existing and proposed systems should be undertaken, to insure that the new regulations address the widest variety of systems.

3. *Issue*: Because of the great variety of geographical conditions in which marinas may be found, each floating fuel tank system should be specifically designed to fit its particular location by a qualified engineer. Currently, there is no third-party inspection required of floating fuel systems.

   Recommendation: Since it is not possible to develop specific requirements that will fit all situations, California professional engineers should be required to certify that the design complies with the regulations and that the system was constructed to the standards of design. In addition, the State should engage in discussions with third party entities to pursue the possibility of requiring a third-party certification for floating fuel systems.

SECTION 3

VESSEL FUELING

SECTION 3
VESSEL FUELING

SCOPE OF WORK

The scope of the fueling team's work was to evaluate fuel dispenser nozzles, vessel fuel system construction, best management practices and boater education. The research conducted by this team included:

- A review of current practices for dispensing gasoline into differing types of vessels.
- An evaluation of documented petroleum releases on California's waterways, with emphasis on releases associated with vessel fueling and operations.
- A review of marina fuel dispenser nozzles.
- An evaluation of vessel fuel system construction and bilge operations.
- A review of available educational materials and an evaluation of their current usage at inland marinas.

BACKGROUND

As of December 31, 1997, there were 894,347 registered vessels in California.[29] The California Department of Boating and Waterways (DBW) estimates 85 percent of California's registered vessels are trailerable boats, many of which operate on the state's 107 water-supply reservoirs. Two-cycle engines power 550,000 of these vessels, of which 154,264 are personal water craft (PWC). A 1997 DBW study[30] reports California boating industry generates eleven billion dollars, which represents 1.2 percent of the state's economy.

VESSEL FUELING PRACTICES

Most vessels are trailered boats, which are launched and retrieved after each outing. These include inboard, outboard and inboard/outboard powered boats and personal water craft (PWC).[29] A much smaller segment of the vessel inventory is not trailered. These larger vessels are powered by gasoline or diesel engines.

Most trailered vessels are fueled prior to launching, and are refueled at marinas if more fuel is needed for an outing. The practice of fueling different types of vessels at marinas is similar. Vessels are typically tied to the marina dock and fueled with their engines off. Some marina owners/operators require boaters to fuel their own vessels,[31] others provide attendants. Marinas usually provide longer dispenser hoses than would be found at a land-based fueling station to access the various fuel inlets found on vessels.

Many vessels, particularly PWCs, are commonly operated from beaches with a number of operators. These vessels may refuel at marinas, but typically operators refuel their vessels on the water or along the shoreline using portable fuel containers. This practice greatly increases the likelihood of fuel being spilled into the water. An additional source of spills comes from the auxiliary fuel containers PWC

[29] Records review, California Department of Motor Vehicles, December 31, 1997.
[30] Public Research Institute of San Francisco State University and Planning and Applied Economics, Berkeley, 1997
[31] Information provided by team member Bob Rollins

operators bring to the shoreline for refueling their craft. If these containers are often overfilled, heat expansion of fuel can cause overflow from the container.

It is noteworthy that some boaters carry fuel to their marina-based vessels in auxiliary gas cans in order to save the difference in fuel cost between land-based and marina-based fuel stations. This practice could easily result in fuel spills and presents significant hazards in terms of transporting large amounts of supplementary fuel in vehicles.

DOCUMENTED PETROLEUM RELEASES ASSOCIATED WITH VESSEL FUELING

One fueling team member obtained, analyzed, and compiled data (Chart A) on fuel spills at marinas. The fuel spill volume varied from 0.5 to 400 gallons. The largest spill in the recreational marina-fueling category was 50 gallons. The 400 gallon spill occurred at a coastal location and involved a commercial vessel. There are probably many small spills occurring that are not reported. Chart B was compiled from 189 spill reports filed with the Office of Emergency Services.

Chart A - Petroleum Releases From Vessels From July 1975 to July 1998

Condition	Inland Waters	Coastal Waters
Vessel Sunk	10	4
Fueling (overfill)	6	5
Equipment Failure	3	1
Pumped Bilge	3	4
Unknown	1	-
Commercial Vessels	1	6
U.S. Navy Vessels	-	3
Vehicles on Ramp	3	-
Total	27	23

Chart B - Petroleum Discharges From Recreational Vessels January 7, 1997 to September 13, 1998

Inland Waters				
Fueling Spill	Vessel Sunk	Overboard Pumping	Leaking Vessel	Misc. Unknown
1	15	1	3	1
Coastal Waters				

MARINA FUEL DISPENSER NOZZLES

The fueling team conducted a limited review of marina fuel dispenser nozzles, including equipment types and statutory requirements. The team's findings follow:

1. Marina Dispenser Nozzles

   Generally, marina fueling stations use dispenser nozzles commonly found at land-based stations. Direct petroleum discharges to surface waters can occur when the operator transfers the nozzle from the vessel to the dispenser, tries to overfill or "top off" the vessel, or when "blow-back or spit-back" from the vessel occurs.

   The fueling team found a product[32] designed to prevent or absorb fuel spills during fueling. The device attaches over the fueling nozzle, between the nozzle and the vessel, and catches any fuel drips during fueling. The manufacturer recommends and provides a longer than usual fueling nozzle that compensates for the thickness of the absorbent pad. The longer nozzle is important, as metal to metal contact must be maintained during fueling to avoid static electricity sparking that could cause an explosion.

   The fueling team found one nozzle[33] specifically designed with a spill containment device to direct "blow-back/spit-back" back into the fuel tank. The manufacturer loaned one team member a demonstration nozzle to field test. The initial results of the testing were disappointing.[31] The nozzle's auto-shut-off feature failed to work properly during most fueling operations. Telephone discussions between the marina manager and the manufacturer revealed that nozzle shut-off pressure settings required higher flow rates than those commonly being used for vessel fueling. This resulted in the test nozzle failing to shut off correctly and subsequent fuel spills. The marina operator worked with the manufacturer during the test but the operator was unable to adjust the nozzle so that it would work properly.

   A discussion on fuel "blow-back or spit-back" is discussed later in the report under vessel fuel system design.

2. The fueling team conducted a time-limited review of statutes applicable to marina dispenser nozzles. Although the team's research did not examine all statutes, a summary of our findings follows:

   Health and Safety Code Section 41960.6, contains the following subsections:

   Section 41960.6(a). "No retailer...shall, on or after July 1, 1992, allow the operation of a pump...equipped with a nozzle from which gasoline or diesel fuel is dispensed, unless the nozzle is equipped with an operating hold-open latch."

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[32] Enviro Marine Inc.
[33] EcoloNozzle, OPW 11EN and 11ENP

Section 41960.6(b) "for purposes of this section, a hold-open latch means any device which is an integral part of the nozzle and is manufactured specifically for the purpose of dispensing fuel without requiring the consumer's physical contact with the nozzle."

Section 41960.6(c) "Subdivision (a) does not apply to nozzles at facilities which are primarily in operation to refuel marine vessels or aircraft." Health and Safety Code Section 39037.1, Chapter 2, Division 26 of the Health and Safety Code states a "marine vessel means any tugboat, tanker, freighter, passenger ship, barge, or other boat, ship, or water craft, except those used primarily for recreation."

Section 41960.6(d) "Nothing in this section shall affect the current authority of any local fire marshall to establish and maintain fire safety provisions for his or her jurisdiction."

The fueling team reviewed Division 26 of the California Health and Safety Code and discovered that dispenser nozzles, installed at recreational marinas, are statutoraly required to be equipped with a "hold-open latch". On February 6, 1998, the ARB issued a response[34] to the team's request[35] for interpretation of the hold-open latch requirement. ARB explained that the requirement for hold-open latches is not a CARB regulation or requirement and provided additional information indicating that over 300 local fire jurisdictions have authority, under Section 41960.6(d), to disallow the latches.

Due to time restrictions, the fueling team did not survey local fire jurisdictions to determine how may allow or disallow the "hold-open latches" required by the statute. However, the fueling team discovered that many marinas have disabled their "hold-open latches" so there is control of fuel delivery for overfill prevention. The fueling team is unaware if the marina operators obtained authorization from their local fire jurisdiction prior to their action.

Harbors and Navigation Code Section 135 contains the following subsections:

Section 135(a) states. "It is unlawful to cause or permit any petroleum... to be transferred between a vessel and a shore facility... by means of a pipeline or similar conduit unless the flow is continuously monitored by a properly maintained mechanism that will warn of the imminent occurrence of an overflow of the substance being transferred so that the flow can be terminated in time to avert the overflow, and unless the vessel and the shore facility are each equipped with a properly installed, operated, and maintained mechanism that will warn whenever any person is no longer properly discharging his duties in connection with the transfer, is inattentive, or becomes disabled for any reason." Section 135(c) states: "this section does not apply to any transfer of fuel to any self-propelled vessel of less than 65 feet in length at any facility equipped with dispensing nozzles of the automatic shut-off type that do not have catch-locks and meet all federal standards."

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[34] Vapor Recovery at Marinas, memorandum from Linda Mazur, Air Resources Board, to Karen Clementsen, marina workgroup chairperson

[35] CARB Statutes/Regulations related to Marina Activities, Seven Questions Emailed to Linda Mazur, Air Resources Board, from Karen Clementsen, marina workgroup chairperson, January 30, 1998.

Due to time restrictions, the fueling team was unable to seek additional clarification regarding the nozzle requirements in the Harbor and Navigation Code. However, it appears that conflicts may exist between the two statutes. In addition, the ARB reports[36] there are apparent public health benefits related to the requirement for hold-open latch systems. It should be noted that marina nozzles do not have vapor recovery systems, which reduce but do not eliminate the danger of breathing gasoline fumes.

VESSEL FUEL SYSTEM DESIGN AND BILGE OPERATIONS

1. Vessel Fuel System Design

Vessel fuel tanks typically are equipped with air relief tubes to relieve gas tank fumes displaced by incoming fuel during the fueling process and allow for expansion and contraction of the fuel and vapors. These air relief systems vent overboard for safety reasons, creating the potential for overboard fuel discharge. Fuel/air separation systems have been developed to avoid this from happening and are already in place on some new vessels. These devices also are available at marine stores as after market additions for vessels. Fuel/air separators are in line devices for vessels that prevent fuel "blow-back or kick-back" during fueling or during radical vessel maneuvers. The boat owner or marina staff can install these inexpensive devices which are readily available at marina supply stores.

The proper placement of the vessel's fueling inlet also is of considerable importance in relation to fuel spills. Marina owners report that many fuel inlets are placed too low or too far from the fuel tank, resulting in fuel fill-rate problems. The inlet should be high enough above the fuel tank to facilitate good gravity flow of the fuel into the tank. In many instances the inlet is improperly placed, resulting in poor flow rates, fuel line back up and resultant fuel spills. Vessel inlets are generally placed in the same plane as the deck of the vessel. The significance of this is that most nozzles used in marinas were designed for proper operation with angled inlets commonly used with motor vehicles. Using these nozzles at angles they were not designed for presents additional problems during fueling. The size of the inlet is important when considering causes of fuel spills. Fuel inlets and hose sizes have decreased in recent years in contrast to styles in use a number of years ago. These smaller inlets contribute to small kickback type spills during the fueling process.

During fueling, an accidental release of fuel may occur through the vessel's overboard air-vent. The fueling team found a device[37] designed to fit over the air vent during fueling which collects any spilled fuel.

2. Bilge Pump-Out Systems

Generally, excess bilge water accumulating in a vessel will be discharged directly into surface waters. If the engine or fuel system is not properly maintained, the vessel bilge water may contain petroleum. With funding provided by the California Integrated Waste Management Board (CIWMB), the San Mateo County Environmental Health Division has developed a pump-

[36] Hold-Open Latches on Gasoline Dispensing Nozzles and Personal Exposure to Benzene from Vehicle Refueling, California Air Resources Board, June 1998.

[37] No Spill, Davis Instruments Company

out system at Oyster Point Harbor[38] to collect the bilge wastewaters for proper disposal. The pump-out system is the first of its kind in the Bay Area and is provided free to all recreational boaters in the county. This new system is in operation and is being used by boaters. There is an education program in place that will encourage use of the system. An additional bilge pump-out program, also funded by CIWMB, will be started at several marinas around Lake Tahoe.

The issue of proper disposal of old fuel, especially fuel used in two-cycle engines, is one that came up repeatedly during the study process. It is common for boaters to have fuel stored in auxiliary tanks for long periods of time. This is especially problematic in the marine environment where the fuel tends to absorb moisture. Fuel may be stored for long periods in sailboats that have kicker motors used only occasionally for returning to dock when the wind fails. The need to dispose of old fuel from these sources is common. There are very few disposal options available to the recreational boater and as a result the fuel may be improperly disposed of.

EDUCATION

The fueling team located and documented a number of groups that are in pursuit of boating education and that address the issue of petroleum, including methyl tert-butyl ether (MTBE), in their educational materials. Some of these groups already educating the boating public include: the California Coastal Commission's Boating Clean and Green Campaign, U.S. Coast Guard, U.S. Coast Guard Auxiliary, U.S. Power Squadron, California Department of Boating and Waterways, California Department of Fish and Game Office of Oil Spill Prevention & Response, and the California Boating Safety Centers. However, the fueling team discovered that there does not appear to be a central clearinghouse for disseminating educational materials to the inland marina operators. The team did discover that the SWRCB, Nonpoint Source Program is working on a committee[39] that may address this problem.

ISSUES AND RECOMMENDATIONS

1. *Issue*: Inconsistencies may exist in the statutory requirements for hold-open latches for use by recreational vessels. Section 135, Harbors and Navigation Code and Section 41960.6 of the Health and Safety Code appear to be in conflict. The provision in the Harbors and Navigation Code addresses fueling practices unique to water craft and, given the fuel-flow rate commonly encountered at fuel dispensing facilities on or adjacent to the water, hold-open latches should not be required. This will result in less fuel spilled into the waterway, and require more due diligence on those providing fueling services. The requirement for hold-open latches at marinas fueling recreational vessels may result in increased overfills and pollution.

   Recommendation: The SWRCB should continue the fueling team's research and consult with the California Air Resources Board regarding gasoline exposure and the use of hold-open latches. If the fueling team's findings are confirmed, the California Legislature should consider re-evaluating the statutory requirement for hold-open latches at inland marinas.

[38] RGF Marine Environmental Technologies

[39] Marina and Recreational Boating Technical Advisory Committee, established pursuant to the 1990 Coastal Zone Management Act Reauthorization Amendments

2. *Issue*: The design of vessel fuel venting systems may result in direct petroleum discharges into drinking water sources. The State of New York has addressed this problem by legislating the installation of fuel/air separator systems.

   Recommendation: The SWRCB should contact the National Marine Manufacturing Association (NMMA) and U.S. Coast Guard and consult with them regarding possible statutory requirements for vessel fuel/air separator systems.

3. *Issue*: Leakage from fuel dispenser nozzles, installed on marina docks, and portable fuel containers, discharges directly into surface waters. Due to the limited market for specialized dispenser nozzles and portable fuel containers, manufacturers may be unwilling to develop new products which prevent leakage.

   Recommendation: The California Legislature, taking into consideration the importance of protecting our drinking water resources, should provide financial incentives to encourage research and development.

4. *Issue*: Vessel operators discharge wastewater from bilges directly to surface water due to the unavailability of bilge pump-out systems at marinas.

   Recommendation: The SWRCB should contact the California Integrated Waste Management Board and recommend they increase their grant program for bilge pump-out systems on surface waters that serve as drinking water sources.

5. *Issue*: Several organizations are developing educational materials for preventing pollution on California's waterways, however a common clearinghouse has not been established to distribute these materials to marinas located on drinking water sources.

   Recommendation: The manager for the SWRCB, Division of Clean Water Programs, Underground Storage Tank Program should contact the manager of the SWRCB, Division of Water Quality, Nonpoint Source Program and encourage the development of a clearinghouse to gather and distribute educational materials to California's inland marinas.

SECTION 4

VESSEL EMISSIONS

SECTION 4
VESSEL EMISSIONS

SCOPE OF WORK

The scope of work for this team was to gather MTBE contamination occurrence data from drinking water reservoirs that have motorized recreational activity and to develop voluntary management practices for agencies that own drinking water reservoirs, reservoir managers, and boat owners to help minimize motorized water craft emissions that could potentially contaminate reservoir water.

BACKGROUND

Fuel contamination of drinking water supplies has become a point of growing concern in the drinking water community. Specifically, methyl tertiary-butyl ether (MTBE), a water soluble component of gasoline has been found in both ground and surface waters that are used as sources of drinking water. Groundwater supplies can be contaminated by MTBE from leaking underground fuel tanks and pipelines. Surface water supplies are also vulnerable to MTBE contamination. There are several potential routes for MTBE intrusion into surface waters – the use of motorized water craft, accidental fuel spills and runoff being the principal routes.

Much of California's drinking water is stored in surface water reservoirs. Many surface water supplies are open to the public for recreational use. Some reservoirs are completely restricted from public use, and thus have no recreational impacts. Others allow boating for fishing purposes only, with no body contact. The reservoirs most vulnerable to MTBE contamination are those which allow the use of a variety of water craft (e.g., motorized personal water craft, boats). The impacts of recreational activity tend to vary seasonally.

OCCURRENCE OF THE GASOLINE ADDITIVE MTBE IN CALIFORNIA RESERVOIRS

The report by the Association of California Water Agencies (ACWA) entitled "1997 MTBE Summer Survey" [40] was in development at the time of the formation of this panel. The finalized report demonstrates the strong correlation between motorized recreational activity on drinking water reservoirs and the occurrence of MTBE in the reservoir water.

In order to establish the pattern of occurrence of MTBE in drinking water reservoirs, ACWA conducted a demonstration summer survey. This survey began in May 1997 and continued through the summer and fall of 1997. It consisted of an MTBE monitoring program with specific rigorous sampling and quality control protocol and two information forms regarding the reservoir and its recreational uses.

Monthly monitoring of specific drinking water reservoirs for MTBE took place starting in May 1997 and continued into the fall. Additionally, monitoring occurred before and after each of the three big recreational holidays - Memorial Day, Fourth of July, and Labor Day. Wherever possible, boating information was collected that corresponded to recreational use of the reservoirs monitored.

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[40] Association of California Water Agencies, 910 K Street, Sacramento, CA 95814, Nov. 1998.

The analysis of this data showed a strong correlation between motorized recreation on surface water reservoirs and MTBE contamination of the water in the reservoir. This finding is supported by other studies performed on lakes and reservoirs in California. [41,42]

Specifically, the recently released "Health and Environmental Assessment of MTBE" findings state that "the use of gasoline containing MTBE in motor boats, in particular those using older 2-stroke engines, results in the contamination of surface water reservoirs."[43]

MANAGEMENT OF MTBE ON DRINKING WATER RESERVOIRS AND LAKES

In 1998, a group of stakeholders (including members from this team), representatives from key California water agencies, the National Marine Manufacturers Association, and related California State boating and water agencies met to develop guidelines to assist California surface water management authorities in their efforts to deal with MTBE occurrence in drinking water reservoirs. These guidelines, "MTBE Management Practices, A Guide to Assist Reservoir and Lake Managers in the Management of MTBE"[44] (MTBE Management Practices Guide) detail strategies that reservoir/lake managers and owners as well as boaters can take to help reduce the amount of gasoline and gasoline components (including MTBE) discharged into a reservoir on which motorized recreational activity is permitted. Included are recent actions taken by two water districts, East Bay Municipal Utility District and Santa Clara Valley Water District, to reduce or eliminate, to the extent possible, MTBE contamination of their drinking water reservoirs.

Importantly, the California Air Resources Board (CARB) recently adopted a requirement for multi-tiered emissions labeling of all new outboard marine engines to be sold in California[45] by 2001. The labeling, which will clearly identify the emission class of an outboard engine, will enable reservoir/lake managers to more easily identify and manage the types of motorized recreation allowed on their reservoir. At the same time, the CARB also set an accelerated deadline of 2001 for meeting the U.S. Environmental Protection Agency's requirement of reducing water craft emissions by 75% and adopted stringent new emission standards requiring a 90% reduction in 2008.

ISSUE AND RECOMMENDATIONS

1. *Issue*: Gasoline fueled, motorized recreational water craft can contaminate surface waters through emission of gasoline (and MTBE) into the water. Such contamination can degrade the quality of the water resource.

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[41] Reuter, J.E., B.C. Allen, R.C. Richards, J.F. Pankow, C.R. Goldman, R.L. Scholl and J.S. Seyfried, 1998, Concentrations, sources and fate of the gasoline additive methyl tert-butyl ether (MTBE) in a multiple use lake, Environ. Sci. Tech. (in press).

[42] Health and Environment Assessment of MTBE, Report to the Governor and Legislature of the State of California as Sponsored by SB 521, November 12, 1998.

[43] UC Report: MTBE Fact Sheet, Health and Environment Assessment of MTBE, Report to the Governor and Legislature of the State of California as Sponsored by SB 521, November 12, 1998.

[44] MTBE Management Practices, A Guide to Assist Reservoir and Lake Managers in the Management of MTBE, December 1998. A document prepared by representatives from key California water agencies, the National Marine Association, and related California state boating and water agencies.

[45] California Regulations for New 2001 and Later Spark-Ignition Marine Engines, California Air Resources Board, December 1998.

The following recommendations should help reduce or eliminate, to the extent possible, contamination produced by motorized water craft usage. Many of the recommendations can also be found in the MTBE Management Practices Guide.

Recommendation: Promote the management practices for reducing emissions described in the Mobile Source Reduction Component and Engine Maintenance Practices sections of the MTBE Management Practices Guide.[44] The recommended management practices include, but are not limited to, emission reductions through use of more efficient engines as certified by the CARB marine engine environmental emissions labeling program, adopting good housekeeping practices for engine maintenance, limiting high emission water craft usage on the reservoir, and reduced boat speed operation on the reservoir.

Recommendation: Develop and implement a comprehensive education program for boaters and reservoir owners and managers which will encourage the implementation of the recommended MTBE management practices. In many cases boaters and reservoir owners and managers are unaware of the steps which can be taken to reduce emissions. The Information Communication & Distribution section of the MTBE Management Practices Guide describes the type of information that could be distributed and lists various information distribution channels.

Recommendation: Encourage reservoir owners (in conjunction with drinking water agencies that utilize the reservoirs, when appropriate) to establish a water quality goal for MTBE in the reservoir. The goal should be set a level which ensures consumers will have a high degree of confidence in the quality of their drinking water supplies and drinking water standards are met.

Recommendation: Promote implementation of reservoir monitoring programs for MTBE. Ongoing monitoring will facilitate evaluating the effectiveness of management practices, provide measurement of progress in meeting water quality goals, and help ensure drinking water standards are met. See the Water Quality Monitoring Component in the MTBE Management Practices Guide for more information about monitoring for MTBE in surface waters.[44,46]

Recommendation: Ensure that adequate research is undertaken to investigate the multi-media fate and transport of any new oxygenates or reformulated gasoline (RFG) components. The surface water impacts of substitute oxygenates and RFG components (and their decomposition and by-products) need to be well understood before sold and used commercially.[46]

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[46] Monitoring and research should be encouraged for other gasoline components suspected of water quality contamination due to the operation of motorized water craft such as di-isopropyl ether (DIPE), ethyltertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), and tertiary butyl alcohol (TBA). Monitoring will provide an early warning signal of potential water quality impairments and provide an opportunity to prevent water quality degradation. Research will provide an understanding of the fate and transport of any new oxygenates or reformulated gasoline (RFG) components in a reservoir.