

REPORT ON THE EXISTING PROGRAM
FOR REGULATION OF MARINE SANITATION DEVICES
UNDER SECTION 312 OF THE CLEAN WATER ACT

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I. INTRODUCTION

The purpose of this paper is to discuss options for revisions to the existing marine sanitation device (MSD) program (section 312 of the Clean Water Act, 33 U.S.C. §1322).

The Senate Appropriations Committee Report accompanying the FY 1981 Housing and Urban Development (HUD) and Independent Agencies Appropriation Bill contained a request that the Administrator provide the Congress with a justification of the basis for the marine sanitation device program. EPA prepared a preliminary analysis for the Committee, which was discussed at a meeting between senior Agency staff and Mr. Wallace G. Berger, Chief Clerk of the HUD and Independent Agencies Subcommittee on January 9, 1981. At that meeting, it was agreed that the paper should be revised to include options for changing the existing program and an analysis of these options. This paper is the Agency's response to the Committee's request. The Coast Guard, the agency responsible for certification of equipment and enforcement of the MSD program, has participated in the preparation of this paper.

The Agency has analyzed six alternatives ranging from abolition of all Federal requirements for MSD's on vessels to imposing Federal no-discharge requirements on all such vessels in all states. We believe that these alternatives provide Congress with a suitable range of regulatory options in lieu of the current regulatory scheme. We look forward to working with Congress on the development of a particular option. To place the options in context, some background material has been prepared.

The statutory and regulatory history of the present program is described (Appendix A) and a summary of a technical analysis of the effectiveness of the existing recreational boat program (Appendix B), which was prepared for EPA by a contractor, has also been included.^{1/} The contractor was asked to collect and analyze data regarding the effects of sewage discharges from recreational vessels on the aquatic environment. Also examined were the attitudes of a segment of the regulated community (recreational vessel and MSD manufacturers and recreational boaters) and the states towards the existing recreational boat program. Some of the key findings are:

- o The regulated community consists only of owners of vessels with installed toilets, fewer than 10% of the U.S. vessels.
- o The concentration of vessels varies from state to state.
- o Measurable environmental effects from marine discharges are seasonal and localized in nature.

The complete contractor's report is attached.

II. ELEMENTS FOR ANY OPTION

After assessment of the current MSD program and evaluation of possible alternatives, we have developed a number of factors which appear to be central to the program. We believe these factors should be used to evaluate the options, as they allow

^{1/} JRB Associates, Inc. of McLean, Virginia performed work pursuant to EPA Contract No. 68-01-6347; Work Assignment 1.

for consideration of a balance between the competing interests of involved parties while providing for environmental protection:

1. Certainty for the affected parties

- the boating community should be assured that the equipment they purchase meets required standards.
- MSD manufacturers need certainty that their device can meet the requirements of a given state's MSD regulations and that they will be able to market their device nationally without fifty competing sets of standards.
- vessel brokers need a clear understanding of any use and re-sale restrictions that an MSD-equipped vessel may be subject to.

2. States' interests

- States should be able to set their own level of environmental protection based upon their own assessment of the problem from marine discharge.

3. Interstate travel and commerce

- Citizens should be permitted to freely travel from state to state.

4. Enforcement

- There must be effective enforcement at the point of manufacture and at the point of use on the water.

It appears that sewage discharges from vessels do not present a national environmental problem. Environmental impacts from such discharges appear to have only local effects and should therefore, from an environmental perspective, be dealt with on a local or state level. However, as a result of other considerations, such as effects on interstate commerce and travel that would result from state and local control of vessel discharges, a continuing federal presence may be warranted.

III. BACKGROUND

There are approximately 8.2 million pleasure craft presently registered in the United States, according to statistics compiled by the National Marine Manufacturers Association (NMMA) and approximately 75,000 documented commercial vessels.^{2/} These vessels discharge sewage in varying quantities and with varying levels of treatment into water which is used for commercial fishing, recreation, and public water supplies, and is necessary for protection of fish and wildlife.

Human sewage can contain a wide variety of bacteria, viruses, fungi, and worms which can contribute to increased incidence of disease. If inadequately treated sewage is discharged in the vicinity of shellfish beds, the shellfish can be contaminated. In addition, inadequately treated sewage contains material that depletes the amount of oxygen available for aquatic organisms

^{2/} There are also an additional three million small recreational vessels (i.e. canoes, rowboats, etc.) which are not registered and are not considered in this study.

and can contribute to the death of these organisms and the creation of eutrophic bodies of water which are undesirable for recreation or drinking.

At the present time, vessels with installed toilets 3/ must be equipped with MSD's. MSD's are designed to either hold sewage for shore-based disposal or to treat sewage prior to discharge. Three types of MSD's are available. In Type I MSD's, disinfectant chemicals are usually mixed with the raw sewage, which is chopped up with high speed blades and then discharged. Type I MSD's discharge treated effluent having a fecal coliform bacterial count 4/ not greater than 1000 per 100 milliliters and no visible floating solids. 5/

In Type II MSD's, the waste is chopped up and either chemically or biologically treated. In the biological treatment process, naturally occurring microbiological organisms break down the sewage; chemicals are used as disinfectants for fecal coliform

3/ Of the approximately 8.2 million registered recreational vessels in this country, a small number, approximately 750,000 have installed toilets. Of the 75,000 U.S. commercial vessels, the majority are equipped with installed toilets. Of the 7.5 million recreational vessels without installed toilets, some may be equipped with portable toilets. These toilets are either emptied into an appropriate container or dumped overboard, discharging raw sewage into the waters. Raw sewage can also be discharged from vessels that do not have portable toilets. The existing statutory program only covers vessels with installed toilets. Vessels without installed toilets that may discharge raw sewage are not addressed by this program.

4/ Fecal coliform bacteria are indicia of fecal discharges from warm-blooded animals which may contain disease-causing organisms.

5/ 40 C.F.R. §140.3(a)(2).

reduction. A means of removing suspended solid material from the waste, such as sedimentation or filtration, is usually necessary. Type II MSD's discharge treated effluent having a fecal coliform bacterial count of less than 200 per 100 milliliters and suspended solids less than 150 milligrams per liter (mg/l).^{6/} Because of their generally larger size, weight, power consumption, maintenance requirements and initial capital expense as compared to Type I or III systems, Type II systems are not usually considered a viable alternative for vessels under 65 feet in length.

Type III MSD's do not discharge any sewage, either treated or raw. They are devices designed to store the sewage (usually with disinfectants and deodorants added) until it can be pumped out at a shore-based facility or in an unrestricted discharge zone. Incineration and recirculation devices may also qualify as Type III MSD's, but are generally not used on recreational vessels.

IV. THE PROBLEM

Recreational boaters have been very much opposed to the existing program. Recreational boaters argue that sewage from vessels does not pose a significant environmental problem; that any environmental impacts from vessel sewage are localized; and that the problem does not merit Federal regulation. Recreational boaters have also expressed opposition to the specific Federal requirements for MSD's claiming that they are unduly burdensome

^{6/} 40 C.F.R. §140.3(d).

because MSD's take up space, are very expensive, inconvenient to use and operate, and even pose potential safety problems. Consequently, voluntary compliance with the regulations by recreational vessels has been minimal. Furthermore, the Coast Guard has not been able to adequately enforce the Federal requirements for recreational vessels. As a result, it is estimated that only about 25% of all recreational vessels are now in compliance with EPA's requirements.

Opposition to the program by the commercial sector has not been as active as that from the recreational boating community. Operators of smaller commercial vessels have expressed complaints similar to those expressed by recreational boaters. The large commercial vessel operators have complained about the costs and reliability of MSD systems as compared to the benefits derived from their use.

Coast Guard enforcement for U.S. commercial vessels has been adequate to assure the equipment has been installed on the vessel, primarily because it is done in conjunction with routine pollution prevention and safety inspections. It is estimated that 90-95% of U.S. inspected commercial vessels are already in compliance with the federal requirements for installation of the devices. This does not necessarily mean that the equipment is maintained or is functioning properly. The smaller uninspected commercial vessels, such as fishing boats and tugs, do present some enforcement problems. Because they are not subject to routine inspections, their compliance rate may be assumed to parallel that of recreational vessels, about 25%.

The following discussion evaluates the concerns raised by the boaters and the reasons why the existing program has not been particularly successful for recreational vessels. These concerns are addressed in more detail in Appendix B.

1. The Environmental Impacts of Sewage From Vessels

Although relatively few investigators have studied the effect of direct discharges of sewage from vessels on water quality, there is evidence to support a link between sewage discharges from vessels and resulting shellfish contamination, increased pathogens in the water column, and increased contamination of waters frequented by boats, such as marinas.

Human sewage contains a wide variety of bacteria, viruses, fungi, and worms, some of which are pathogenic. Although most human enteric tract pathogens will not grow in the aquatic environment, some will survive long enough to constitute a health hazard. These pathogens, some of which form spores in their reproductive cycle, can remain virulent for relatively long periods of time and may even become enriched in sediments of sewage-contaminated waters; thus, lakes, reservoirs, impoundments, rivers, and even coastal zones where untreated sewage is discharged may be a source of disease organisms.

In addition, the introduction of human sewage into a body of water increases the concentration of oxygen-demanding substances, which deplete the amount of oxygen available for desirable aquatic species. Further, nutrients in the sewage increase the rate of eutrophication in freshwater lakes, reservoirs, and impoundments,

and may result in an eutrophic waterbody that is undesirable for human use or activities. ^{7/}

Nevertheless, while it appears that sewage from vessels may pose environmental problems, these problems are localized. The problems are greatest in enclosed areas such as marinas, enclosed bodies of water such as freshwater lakes, and in shellfish growing waters with heavy vessel traffic. There does not appear to be a problem with pollution from one state affecting another. No state has cited this problem as a reason for Federal regulation of vessel pollution.

The environmental impacts of sewage from vessels covered by the existing program must be placed in perspective. The existing Federal program only addresses boats with installed toilets. (See Appendix A). Regardless of the onboard facility, all vessels have the potential for raw sewage discharge, either by dumping a portable toilet or a standby bucket over the side, or by bypassing an approved system. The vast majority of recreational vessels (7.5 out of 8.2 million boats) do not have installed toilets but some are equipped with portable toilets. (See Table 1). Most commercial vessels have installed toilets. Short of requiring the installation of MSD equipped toilets on vessels and outlawing

^{7/} Some boaters argue that the disinfectants associated with MSD's pose greater environmental problems than does untreated sewage. However, studies of the existing scientific literature do not support this argument. Two disinfectants are generally used in MSD's, formaldehyde and chlorine. The scientific literature demonstrates that formaldehyde breaks down rapidly in the natural environment to innocuous substances; and there is little evidence in the literature that chlorine-based compounds have deleterious effects in the volumes and at the concentrations at which they are discharged from MSD's. These arguments are dealt with in more detail in Appendix B, at B-5 - B-7.

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Table 1

Categorization of Vessels

Vessel length (feet)	less than 16	16-26	26-40	40-65	more than 65	Totals
Number of Vessels	5 million	2.9 million	225,000	30,000	less than 1000	approx. 8.2 million
Number of vessels with installed toilets	very few	less than 600,000	approx. 112,500	approx. 30,000	same as above	approx. 750,000

portable toilets, little can be done to eliminate raw sewage discharges from the vast majority of recreational vessels which do not have installed toilets.

2. Boaters' Objections to Specific Requirements

In addition to arguing that the environmental impacts from vessel sewage do not justify the present regulations, the boating community and marina operators have specific complaints about the particular types of devices required by the regulations. Some boaters believe that Type I MSD's ^{8/} are too expensive, have substantial maintenance problems, are too complex, and can have unduly burdensome power and space requirements. These concerns are evaluated below.

a. Costs

Type I MSD's can cost between \$500 and \$1500 to purchase and install, with annual operating and maintenance costs of approximately \$20. Type II MSD's are even more expensive. A Type III device costs approximately \$350 to purchase and install and has annualized operating and maintenance costs of approximately \$45, including the costs of pumpouts. Over an assumed ten-year functional lifespan, a Type I MSD will have annualized costs that are 50% higher than those for a Type III MSD (\$120 vs. \$80).

Larger commercial vessels will install either Type II or Type III MSD's, which can have purchase and installation or

^{8/} This discussion focuses primarily on Type I and Type III MSD's because either of these is acceptable under the existing regulations and Type II's are generally unavailable for all but the largest vessels.

retrofitting costs up to \$200,000. 9/ The annualized operating and maintenance costs of such devices are approximately \$500.

b. Reliability, Complexity, Space, and Power Constraints

While some earlier models of Type I MSD's were susceptible to breakdowns, the newer models are generally more reliable if the vessel owner follows simple rules of operation. MSD's for recreational vessels have always been relatively simple to operate.

The installation of any MSD requires a certain amount of space on a vessel. Space constraints may be a problem on the smaller vessels, especially those in the 16 to 30 foot range. Sailboats, because of their hull configurations, encounter more difficulty with installations of MSD's than do power boats. While some sailboats have a large enough space to install an MSD, such as an underbunk locker, on smaller boats even this much space may be unavailable. Flexible holding tanks can fit into odd, otherwise unused space but larger holding tanks, and Type I MSD's, may be difficult to install on smaller boats.

Type I and II MSD's require a source of electric power which may be in limited supply onboard a vessel. Powerboats can usually overcome this problem by running the MSD from the engine's generator but sailboats do not have this option when under sail and must rely on batteries. Many of the MSD's will impose an unreasonable drain on a battery if the boat is used for more than a

9/ This figure represents the purchase and installation or retrofit costs for a whole system for a vessel in excess of 400 feet with a normal crew of 30-35 people.

day or weekend cruise. One manufacturer has attempted to overcome this problem by introducing a batch storage and treatment system, avoiding the electrical drain after each use of the head. However, the boaters, especially sailboaters, remain skeptical and continue to complain about potential safety problems if their batteries are used to run an MSD. They fear the loss of electrical power for the radio and running lights.

c. Complaints Regarding Type III MSD's (Holding Tanks)

With regard to Type III MSD's, boaters complain about both safety and aesthetic problems. Boaters complain that the sewage produces methane gas which could cause the holding tanks to explode, that the odors from the tanks are offensive, that the tank could spill and create unsanitary and offensive conditions while the boat is underway, and that pumpout facilities are inadequate.

Neither the Agency nor the Coast Guard is aware of any incidences of holding tanks exploding. Chemical deodorants and biocides can inhibit the production of the small amount of methane produced as a byproduct of microbial activity. Type III MSD's are required to be equipped with a vent on the top of the tank to release any gases produced. These vents must be properly maintained.

Odors can be controlled by using odor-suppressant chemicals and by pumping out the tank at regular intervals. The chemicals should be added to the tank as a part of normal maintenance. Holding tanks, if constructed properly with baffles to reduce

movement, and if installed correctly, have no more potential for spilling than do other installed tanks, such as fuel or water tanks.

The boaters' main objection to holding tanks is that pump-out facilities in most parts of the United States are inadequate. Marina operators do not want to install the facilities, especially if demand is not sufficient to justify the expense. We estimate that if pumpout facilities are installed and fully utilized, they can pay for themselves over approximately five years. This assumes that an automatic pumpout facility costs approximately \$10,000, including capital costs of the facility, interest, and five year operating and maintenance costs, and that to recover the capital investment of the facility fully over five years would require 400 pumpout operations at \$5 each per year, or an average of 40 pumpout operations per weekend during the boating season. Given the widespread antagonism of the boating community towards Type III MSD's, marina owners are concerned that there will not be such a high demand for pumpout facilities. Thus, a stand-off situation is created: marina operators will not voluntarily install pumpout facilities unless they are sure that the facilities will be fully utilized, and boaters will not install holding tanks and use pumpout facilities until adequate facilities are available.

3. Enforcement Problems

Absent widespread public acceptance of the need for regulation, a standard's effectiveness is only as great as the effort made to enforce it. The MSD standards are particularly difficult to enforce

because of the large number of vessels and the ease with which violations of the standards can go undetected. Even if the proper type of MSD is installed it must be in good working condition and operated properly. An onboard inspection is necessary to determine if a device is in good working condition and it is practically impossible to determine if it is being operated properly. It is easy for vessels to bypass the treatment devices or holding tanks and discharge raw sewage into the waters when out of sight from shore and it is very difficult for an enforcement agency to detect such violations.

The Coast Guard does not have a separate enforcement program for MSD's; all enforcement activities are being conducted in conjunction with routine pollution prevention, safety, and other law enforcement boardings and inspections. For U.S. inspected commercial vessels, this has proven adequate to insure installation of MSD's since these vessels are routinely boarded while in port and are also subject to regular inspections prior to issuance of their certificates of inspection. Smaller, uninspected commercial vessels, such as fishing boats and tugs, are not subject to routine inspections. Consequently, enforcement efforts for these vessels occur on a less frequent basis.

Recreational vessels present a particularly difficult enforcement problem because of the overwhelming number of boats. Inspection teams, called Boating Safety Detachments, routinely made on-the-water boardings to check for safety compliance and also check for MSD compliance if the boat has an installed toilet. The Coast Guard averaged approximately 15,000 boardings annually.

Even if all of the vessels boarded annually had installed toilets, an enforcement effort of this type could only reach a small portion of the 750,000 boats subject to the existing MSD requirements. Furthermore, the Coast Guard has had to reduce the number of these inspection teams because of other higher priority activities. An extensive federal enforcement effort for recreational vessels is not possible without a substantial infusion of ships, manpower, and funding for vessel fuel.

V. Impacts on Interstate Commerce and Travel

A major reason for the existing program for MSD's was to minimize the impacts on interstate travel and interstate commerce that were associated with conflicting state design and discharge standards. (See Appendix A for a detailed description of the development of the existing program). The effects on interstate commerce and travel of abolishing the existing federal program are evaluated in the following discussion.

If all federal standards and regulations are abolished, it is possible that design and discharge standards will differ substantially from state to state. One state could adopt a Type I standard; an adjacent state could adopt a variation of the Type I standard that requires a slight modification of a Type I device. One state could allow discharges of sewage without treatment; and another state could require installation of holding tanks. Thus, the situation would be analogous to that prior to 1972, when national federal standards were adopted.

a. Impacts on Interstate Commerce

Interstate commerce may be affected in two ways by differing state design and discharge standards for waterways. First, the interstate sales of MSD equipment and MSD equipped vessels may be adversely affected and second, the interstate movement of commercial and recreational vessels may be restricted. To the extent that commercial and recreational vessels are discouraged from traveling interstate, a burden on interstate commerce will result. 10/ The burden on interstate commerce associated with restrictions of interstate travel will be discussed in the next section entitled "Impacts on Interstate Travel."

In the absence of uniform federal standards and a national certification program, a burden could be placed on interstate sales of MSD equipment and MSD equipped vessels. At present, the statute requires that the Coast Guard promulgate uniform national design standards which preempt state design standards and provide a certification program which insures that particular MSD's meet the federal requirements. In the absence of this program, and if states adopt different design standards, MSD manufacturers could have to design devices that would meet each states' standards. Indeed, if individual localities could impose design standards, the number of different design standards could increase substantially. This could result in an increase in costs to the manu-

10/ Because recreational vessel owners spend money in interstate commerce when they travel interstate, any restriction of movement of these vessels across state lines places a burden on interstate commerce. The restriction of interstate movement by commercial vessels has even more direct impacts on interstate commerce.

facturers to interpret and comply with different state regulations and in a decrease in certainty on the part of the boating community and marine equipment dealers regarding whether a particular device meets the standards of a particular state. It is also possible that if states adopt different design requirements, no particular device would meet the standards of very many states. Because retrofitting of vessels is quite expensive, conflicting state design standards could create difficulties for vessel owners wishing to move to a different state or to sell their vessels to buyers outside of a state. 11/ The existing program reduces the burdens on interstate commerce associated with differing state design standards.

b. Impacts on Interstate Travel

Both commercial and recreational vessels frequently travel interstate. If the states are permitted to adopt and enforce conflicting discharge requirements, interstate travel could be impeded which could, in turn, affect interstate commerce (See note 10, supra). Vessels attempting to travel interstate and to operate their MSD's outside of their home state may be in violation of one or more states' discharge requirements even if their device is in compliance with the law in their home state. For example, vessels with Type I's or II's will violate state discharge standards if they operate these devices in states with no-discharge requirements. Similarly, vessels equipped with no-discharge devices

11/ Retrofitting could also be a problem associated with any change in the existing program. However, existing vessels' compliance with new requirements could be deferred.

will be unable to operate their toilets once their holding tanks are full in states requiring Type I's unless adequate pumpout facilities are available.

Several legislative mechanisms exist to minimize these burdens on interstate travel. These include: 1) have uniform national discharge standards; 2) allow states to promulgate their own discharge standards but allow vessels traveling interstate a grace period during which time no state would be permitted to enforce discharge standards more stringent than a certain type (e.g. Type I); or 3) allow both state and federal discharge standards but allow vessel owners to comply with either the state or federal standards. Under the second mechanism, a state would be prevented from enforcing the state's discharge standards against a vessel from another state until that vessel had been in the state's waters for more than a certain period of time, i.e. seven, fourteen, or twenty-one days. Under mechanism number three, states could only enforce the discharge standard selected by the vessel owner. Presumably, vessel owners that travel frequently interstate would select the federal standard since they would then be in compliance in all states. Vessels that did not travel frequently interstate could select the standard of their home state. Any of these mechanisms would reduce the burden on interstate travel associated with differing state design and discharge standards for MSD's.

In summary, uniform federal design standards and a national certification program eliminate the burdens on interstate sales of MSD equipment and MSD equipped vessels associated with differing

state design standards. Uniform federal discharge standards eliminate the burdens on interstate travel associated with differing state discharge standards. However, the burden on interstate travel can be reduced by mechanisms not now included in the existing program that give states more flexibility to determine the degree of regulation of MSD's appropriate within their borders.

The issue is to develop modifications to the existing program that would eliminate the concerns raised by vessel owners and manufacturers, and the enforcement problems encountered by the Coast Guard, yet still reduce the burdens on interstate commerce and travel.

VI. Options

The Agency has analyzed six alternatives to the existing program ranging from abolition of all federal requirements for MSD's to imposing federal no-discharge requirements on commercial and recreational vessels in all states. The options are ranked according to increasing degree of federal involvement.

A. Abolish All Federal requirements for MSD's

- States could adopt and enforce their own equipment design and effluent discharge standards
- No national design standards for manufacturers of MSD's
- No federal involvement in any aspect of MSD enforcement

Consequences:

- Conflicting state standards would impede interstate commerce and travel 12/

12/ The burden on interstate travel could be eliminated by adopting one of the mechanisms described on page 16, supra. These mechanisms could be adopted under any of these options.

- Eliminates the need for federal management and enforcement of MSD requirements
- Could have localized adverse environmental consequences in those states with large boating populations that choose not to regulate discharges from boats

B. Abolish federal MSD discharge requirements for recreational and small commercial vessels; allow optional state programs for these vessels based upon federal design standards (Type I, II, or III) or no program; retain federal MSD requirements for large (over 65 ft.) commercial vessels

- States could adopt any one of three types of MSD requirements for recreational and small commercial vessels based upon the federal classifications or could decide not to adopt any standards; large commercial vessels remain subject to federal requirements
- Retains national design standards for manufacturers
- No federal enforcement of MSD requirements for recreational and small commercial vessels; federal enforcement for commercial vessels over 65 feet

Consequences:

- Would eliminate burden on interstate commerce because retains nationally uniform design standards but would impede interstate travel because allows conflicting state discharge standards 13/
- Eliminates need for federal enforcement for recreational vessels
- Could have adverse localized environmental consequences in those states with large recreational boating populations that choose not to regulate sewage discharges from recreational vessels

C. Allow optional state programs based upon federal design standards (Type I, II, or III), or no program; also retain existing federal requirements but vessels owners may comply with either state or federal requirements

- Retains national design standards for manufacturers
- No federal enforcement of MSD requirements

13/ See footnote 12.

Consequences:

- Eliminates need for federal enforcement
- Eliminates burden on interstate commerce because retains national design standards but would impede interstate travel because allows conflicting state standards 14/
- Could reduce local environmental quality in areas now designated "no-discharge" because treated effluent could be discharged

D. Establish minimum federal Type I discharge standards for all vessels; states may promulgate more stringent discharge standards based upon federal design standards

- States could adopt more stringent discharge standards
- Retains national design standards for manufacturers
- Federal enforcement of federal standards; states would enforce more stringent state standards

Consequences:

- Would eliminate burden on interstate commerce because retains national design standards but would impede interstate travel 15/
- Imposes federal requirements on states that do not view sewage from vessels as a serious environmental problem
- Provides uniform minimum degree of environmental protection

E. Establish federal Type I discharge standards for all vessels; states may not promulgate more stringent discharge requirements

- States could not adopt more stringent standards
- Retains national design standards for manufacturers
- Retains federal enforcement authority

Consequences:

- Eliminates burden on interstate commerce and travel because of uniform national design and discharge standards

14/ If vessel owners elect to comply with the federal standards, interstate travel would not be impeded. But see footnote 12.

15/ See footnote 12.

- Imposes federal requirements on states that do not view sewage from vessels as a serious environmental problem and preempts states that want more protection
- Provides uniform minimum degree of environmental protection but could reduce local environmental quality in areas now designated "no-discharge" because treated effluent could be discharged

F. Establish Federal Type III standards; mandate the installation of pump-out facilities

- States could not adopt less stringent discharge requirements
- Retains national design standards for manufacturers
- Federal enforcement

Consequences:

- Eliminates burden on interstate commerce and travel because of uniform national standards
- Imposes federal requirements on states that do not view sewage from vessels as a serious environmental problem
- Provides uniform and extensive degree of environmental protection
- If not enforced, or if adequate pumpout facilities are not available, could create a greater environmental problem since raw sewage may be discharged in large quantities from holding tanks
- Would require regulation of an additional class of persons, marina operators

APPENDIX A - STATUTORY AND REGULATORY HISTORY

In the 1960's, states began regulating discharges of sewage from vessels and requiring the installation of MSD's. Interest in the regulation of pollution generated by pleasure boats developed from the local level to the point that in the early 1970's about thirty states regulated the discharge of sewage from vessels. The lack of uniformity among these state laws created situations in which a boater could be in compliance with state discharge standards on one side of a river and out of compliance on the other because a neighboring state had different requirements. Manufacturers of MSD's had to produce devices that met different state design standards. These problems led to a growing interest in national, uniform regulations.

A. Early Legislation

The Clean Water Restoration Act of 1966, 80 Stat. 1246, which amended the Federal Water Pollution Control Act (FWPCA), contained the first expressions of congressional concern regarding sewage pollution from vessels. Section 210 of that Act, 80 Stat. 1252, added a new section 17 to the FWPCA which directed the Secretary of the Interior, in consultation with the Secretaries of the Army, Commerce, and Health, Education and Welfare, and with the Coast Guard, to conduct an investigation to determine the extent of pollution of all navigable waters of the United States from litter and sewage discharged, dumped, or otherwise deposited in such waters from watercraft using such waters, and the methods of abating either in whole or in part such pollution.

Pursuant to that provision, the Secretary submitted a report to Congress in August, 1967. S. Rep. No. 48, 90th Cong., 1st Sess.

(August 7, 1967). The report concluded that legislation was needed and recommended that the legislation direct the Department of Interior to promulgate standards for the discharge of sewage from vessels. Id., at 5.

These recommendations formed the basis for section 13 of the Water Quality Improvement Act of 1970, 84 Stat. 91. Section 13 directed the Federal Water Quality Administration of the Department of Interior (which less than six months later became the Environmental Protection Agency) to promulgate standards of performance for marine sanitation devices which shall be designed

to prevent the discharge of untreated or inadequately treated sewage into or upon the navigable waters of the United States from new and existing vessels, except those vessels not equipped with installed toilet facilities.

States were prohibited from adopting or enforcing any statutes or regulations governing the design, manufacture, installation, or use of any MSD on any vessels subject to the statutory requirements. However, states could apply to the Administrator for issuance of a regulation completely prohibiting any discharges into certain waters of the state.

EPA proposed regulations on May 12, 1971 prohibiting discharges of sewage from vessels with installed toilets which contain visible floating, or settleable, solids, coliform bacteria in excess of 240 per 100 ml, biochemical oxygen demand in excess of 100 mg/l and suspended solids in excess of 150 mg/l. The preamble to the proposed regulations noted that flow-through devices meeting the proposed standards had not yet been developed for certain smaller classes of vessels but stated that development of

such devices before the effective date of the standard was within the limits of available technology. The preamble went on to note that holding tanks were available on the market and could be used to meet the standards.

Over 6,000 comments were received in response to the proposed regulations, and five public meetings were held. During the comment period, many groups opposed the proposed MSD standards. The boating public opposed the standards, which would have required the installation of holding tanks for certain smaller vessels, because of potential offensive odors associated with the tanks, the potential danger of explosion from the contained gases, and the potential for unsanitary conditions resulting from spillage of the contents of the tank, either while underway or during pumpout. In addition, the boaters felt that the requirement for holding tanks only provided an incentive to break the law and dump the contents of the tank overboard, without treatment, because pumpout facilities were generally unavailable and because boaters wanted to avoid the time, inconvenience, and cost of a pumpout. The U.S. Coast Guard, which under section 13(b)(1) of the Water Quality Improvement Act was required to enforce the standards, opposed them because detection of violations of the law was extremely difficult, and manpower was simply not available to fully enforce the law.

Despite the opposition to standards requiring holding tanks, on June 23, 1972, EPA promulgated final standards which provided for no overboard discharge of sewage into the navigable waters of the United States from vessels with installed toilets with

certain limited exceptions. 37 Fed. Reg. 12391. Existing vessels equipped with Type I's within three years from the date of promulgation of Coast Guard implementing regulations were not required to comply with the no-discharge requirements as long as the Type I remained operable.

B. The Existing Program

In 1972, Congress amended the FWPCA and included the present requirements for MSD's. Section 13 of the Water Quality Improvement Act was brought forward with certain amendments as section 312, 33 U.S.C. §1322. Section 312(b)(1) directed EPA to promulgate standards of performance for MSD's which were to take effect for new vessels two years from the date of promulgation and for existing vessels five years from the date of promulgation. 33 U.S.C. §1322(b)(1). The Coast Guard was directed to promulgate regulations governing the design, construction, and installation and operation of MSD's, to certify that particular devices meet the federal design standards, and to enforce EPA's standards of performance. 33 U.S.C. §§1322(b)(1), (g)(2), and (k).

In addition, the 1972 amendments added two new subparts to section 312 of the FWPCA under which EPA and the states could totally prohibit the discharge of vessel sewage into certain specified waters (Sections 312(f)(3) and (f)(4), 33 U.S.C. §§1322 (f)(3) and (f)(4)). Section 312(f)(3) provides that

if any state determines that the protection and enhancement of the quality of some or all of the waters within such state requires

greater environmental protection, such state may completely prohibit the discharge from all vessels of any sewage, whether treated or not, into such waters, except that no such prohibition shall apply until the Administrator determines that adequate facilities for the safe and sanitary removal of sewage from all vessels are reasonably available for such waters to which such prohibition would apply.

As of March, 1981, a total of eighteen petitions had been received by the Agency under section 312(f)(3). Of these, fifteen were approved, 1/ one was denied on procedural grounds, 2/ one was denied on technical grounds, 3/ and one is pending. 4/

Section 312(f)(4) states that if the Administrator determines upon application by a state that the protection and enhancement of the quality of specified waters within such state requires a prohibition on the discharge of any sewage (whether treated or not) he shall by regulation completely prohibit such discharge. The legislative history for this subsection indicates that Congress intended this special protection to be utilized only for limited

1/ California, 44 Fed. Reg. 26963 (May 8, 1979); Texas, 42 Fed. Reg. 59776 (Nov. 21, 1977); California and Nevada, 42 Fed. Reg. 59105 (Nov. 15, 1977); Minnesota, 42 Fed. Reg. 33362 (June 30, 1977); California, 41 Fed. Reg. 34353 (Aug. 13, 1976); New York, 41 Fed. Reg. 17599 (April 27, 1976); New York, 41 Fed. Reg. 2668 (Jan. 19, 1976); Michigan, 41 Fed. Reg. 2274 (Jan. 15, 1976); Wisconsin, 41 Fed. Reg. 11875 (March 22, 1976); Vermont, 40 Fed. Reg. 42240 (Sept. 11, 1975); New Hampshire, 40 Fed. Reg. 36797 (Aug. 22, 1975); Missouri, 40 Fed. Reg. 54462 (Nov. 24, 1975).

2/ Texas, 40 Fed. Reg. 36421 (August 20, 1975).

3/ Minnesota and Wisconsin, jointly, 42 Fed. Reg. 37844 (July 25, 1977).

4/ Virginia, Notice of Receipt of Petition published in 44 Fed. Reg. 67524 (November 26, 1979).

specified areas, such as drinking water supplies, human body contact recreation areas, and shellfish beds. EPA has received three petitions under Section 312(f)(4). Of the three, one has been approved, 5/ and two were denied on procedural grounds. 6/

Following passage of the 1972 FWPCA Amendments, EPA reconsidered its previously promulgated MSD standards of performance. EPA proposed new standards on October 10, 1975, (40 Fed. Reg. 47972) and after consideration of additional comments, revised its final standards of performance for marine sanitation devices on January 29, 1976. (40 C.F.R. Part 140, 41 Fed. Reg. 4453). EPA's new standards provided that existing vessels (those with construction initiated before January 30, 1975) equipped with a Type I device by January 31, 1978 could retain that device for its operable life. If a Type I was not installed by this date, then an existing vessel had to install a Type II or III device by January 30, 1980. New vessels (those on which construction was initiated on or after January 30, 1975) were permitted to install Type I, II, or III systems until January 30, 1980. After this date, they, too, were restricted to installing Type II or III systems. These standards apply in coastal waters and estuaries, the Great Lakes and interconnecting waterways, freshwater lakes and impoundments accessible through locks, and other flowing

5/ Minnesota, 42 Fed. Reg. 43837 (August 31, 1977).

6/ Minnesota, 42 Fed. Reg. 41833 (September 9, 1975); Michigan 40 Fed. Reg. 36797 (August 22, 1975).

waters that are navigable interstate by vessels with installed toilets.

In formulating new standards, EPA also took into account the fact that certain water bodies, those with relatively long detention periods which cannot cleanse themselves easily through natural processes, should be given a higher degree of protection than other waters. The 1976 regulations therefore prohibited the discharge of sewage from vessels in freshwater lakes, reservoirs, or impoundments whose inlets or outlets prevent the ingress or egress by vessels with installed toilets, or in rivers not capable of navigation by interstate vessel traffic.

Existing vessels in waters subject to no-discharge requirements were required to install either Type III devices designed to prevent any discharge, or Type I or II MSD's that had been secured to prevent discharge, by January 30, 1980. New vessels in these waters were required to be so equipped by January 30, 1977. However, even in no-discharge areas, vessels equipped with Type I's as of the date of promulgation of the standards were permitted to retain and use the devices for the life of the device.

Some boaters believed that EPA would not retain the MSD deadline. When it became evident towards the end of 1977 that the Agency intended to retain the deadline, there was a considerable demand for Type I MSD's. As a result, there were not enough devices available at retail dealers for all potential customers. Consequently, the Coast Guard, with EPA's concurrence, issued a waiver pursuant to section 312(c)(2) on November 28, 1977, which

stated that if the owner of an existing vessel made a "firm commitment for the purchase and placement of" a Type I MSD prior to January 30, 1978, he then had until January 30, 1979 to install that device in an operable condition. 42 Fed. Reg. 60619. If the conditions of the waiver were met, the owner would be considered in compliance with both the Coast Guard regulations and the EPA standards.

In addition, it became apparent that there were very few Type II MSD'S available for small vessels. As a result, the Coast Guard issued a second waiver on July 10, 1978, also with the concurrence of EPA, which stated that the Type II MSD requirement for vessels 65 feet in length or less was being waived until adequate Type II MSD's become available for smaller vessels. Consequently, owners of vessels 65 feet in length or less had and still have the option of installing Type I MSD's in lieu of the originally required Type II or III MSD's. 43 Fed. Reg. 29637.

APPENDIX - B - TECHNICAL ANALYSIS

A. Introduction

The agency was asked to evaluate the existing program and alternative methods of regulating discharges of sewage from vessels. In an effort to be responsive to the Committee and to examine as broad a range of information as possible, the Agency used a contractor, JRB Associates, Inc., to collect and perform preliminary analyses on a wide range of data. These analyses included:

- . searching thirteen computer files consisting of over 10,000 entries for relevant information in the existing scientific literature on the effects of sewage discharges from recreational vessels on the aquatic environment;
- . conducting supplemental library research to identify secondary data sources not covered by the automated literature searches;
- . examining the results of a survey conducted in the spring of 1980 by a major manufacturer of MSD's to determine attitudes among boating equipment retailers and the public regarding purchase and installation of MSD's;
- . examining the results of a survey conducted in the summer of 1980 by a contractor for the U.S Coast Guard to determine the concerns of selected elements of the marine industry regarding utilization of MSD's; and
- . expanding that survey by contacting individuals identified from the literature, Federal and State governmental personnel, and other sources especially knowledgeable about specific topics. State officials contacted were involved in some

aspect of vessel management, and included state boating law administrators, chiefs of marine police, and directors of state departments of natural resources and environmental protection.

The results of this analysis are summarized below.

A. Pathogens and Viruses

The role of pathogens in human sewage discharged to the aquatic environment from vessels is crucial in any discussion of the installation and implementation of MSD's for recreational vessels. Many boaters contend that there is no scientific literature that demonstrates that overboard discharge of untreated human sewage results in increased disease transmission or adverse health effects. Some boaters even argue that the discharge of untreated sewage is desirable, since it provides nutrients for aquatic organisms. However, such arguments do not appear to be supported by any corroborating evidence in the scientific literature.

Because of their universal presence in the human enteric tract and because they are easily identified and counted, coliform bacteria have been utilized for much of the twentieth century as an indicator of fecal contamination. Although pathogenic organisms such as Salmonella sp., Shigella sp., Entamoeba sp., and Vibrio sp., are not usually numerically tabulated when fecal analyses are performed, the level of fecal coliform bacteria in sewage is universally assumed to indicate potential levels of pathogens such as the four identified above. Evidence in the scientific literature corroborates a link between the presence of fecal coliform bacteria in the aquatic environment and the discharge of human sewage.

D.E. Kidd ("Bacterial Contamination of Lake Powell Waters: An Assessment of the Problem", NTIS, PB 261-682, 1975), demonstrated an increase in both fecal coliform and fecal streptococci bacteria in areas of Lake Powell, Arizona, frequented by boaters. These increased bacterial levels occurred during the summer months in areas of high boating activity. W.N. Mack et al. ("Pollution of a Marina Area by Watercraft Use as Indicated by Coliform and Chemical Concentrations", NTIS, PB 200-622, 1971), studied the waters surrounding a marina on a small Michigan Lake prior and subsequent to heavy use on major boating weekends. The investigators found significant increases in fecal coliform bacteria in the marina slips that were used most often. Authors of the Rhode Island Water Quality Management Plan (1978) reported many cases of increases in fecal coliform bacteria in shellfish beds which lay beneath areas of heavy boating use. Increases in fecal coliform counts in shellfish tissue and the water column were found, for example, after the Labor Day weekend that were directly proportional to usage of those areas by the boating population. R.D. Barbero et al. ("Bacteriological Water Quality of Several Recreational Areas in the Ross Barnett Reservoir", J.W.P.C.F., 41:1330, 1969), in a study of marina and non-marina waters in a Mississippi reservoir, found significantly higher fecal coliform and fecal streptococci bacterial counts in the marinas than in local areas of the reservoir. Other studies that demonstrate that marine pleasure craft contribute to environmental pollution include:

- (1) Furfari, S.A., Northeast Marine Health Services Laboratory, U.S. Public Health Service, "Boat Waste Survey, Potter Cove, Rhode Island, Summer, 1968," 1969.

- (2) Cassin, J., et al., Environmental Letters, 2(2):59-63, 1971, "Sanitary Implications of Small Boat Pollution in an Atlantic Estuary."
- (3) Bowerman, F.R., and Chen, K.Y., University of California Environmental Engineering Program, Report No. USC-SG-4-71, "Marina del Ray: A Study of Environmental Variables in a Semi-Enclosed Coastal Estuary," 1971.
- (4) Furfari, S.A., Northeast Marine Health Services Laboratory, U.S. Public Health Service, "Problems of Boat Wastes and the National Shellfish Sanitation Program," 1968.

A number of other studies were reviewed but they were inconclusive. In addition, contraction of hepatitis as a result of ingestion of oysters and other shellfish which have been obtained from waters contaminated by human sewage has been well-documented for a number of years. Further, it is well-known that viruses often pass through the human enteric tract in an extremely virulent state, and that diseases such as poliomyelitis and enteric infections caused by Coxsackie and Echo viruses are transmitted via aquatic routes. Both epidemiologic and localized investigations of the discharge of sewage into the aquatic environment demonstrate the increase in pathogens and the resultant potential for increased disease. The conclusion that is reached as a result of this analysis is that environmental and health effects from discharges of sewage from vessels are localized. Each of the scientific studies cited above demonstrated environmental or health effects within a single body of water or a localized area of a larger aquatic ecosystem. While the environmental and health effects may have been adverse in the location of the discharge, the studies did not conclude that there were adverse effects beyond this local area.

2. Chemical Disinfectants

As in nearly all onshore municipal sewage treatment plants, most Type I MSD's employ disinfectant chemicals in their treatment of sewage. The purpose of these disinfectant chemicals is to reduce the pathogen content of the sewage before it is discharged to the aquatic environment. The chemicals are mixed with the waste, which is then macerated by blades turning at high speeds; The disinfectant mixture is then discharged into the aquatic environment. Sometimes the disinfected mixture is stored until a specific tank capacity is reached. A range of chemicals has been employed in Type I MSD's. The most common disinfectants presently employed are chlorine (in the form of sodium hypochlorite tablets or liquid) and formaldehyde (in the form of formalin, which is a 40% solution of formaldehyde).

The boating community has argued that these disinfectant chemicals when discharged cause more harm to the aquatic environment than raw sewage. The boating community argues that the chlorine compounds and formaldehyde utilized in MSD's are well-known systemic toxicants, and that even the small quantities discharged cause adverse effects in larval and juvenile fish and shellfish, as well as in other aquatic species.

The toxic properties of chlorine, its compounds, and formaldehyde have been documented for over one hundred years. It is precisely these toxic properties that are desired when such chemicals are added to sewage for disinfection and public health purposes. Studies have shown that there may be circumstances

under which the concentrations of chlorine residuals in water may reach the acute toxicity range for a number of species in the aquatic environment. However, the studies which demonstrate environmental damage from chlorine residuals were based on large shore-based discharges.

Data available on formaldehyde indicates it may be less of an environmental hazard than previously believed. The disinfectant properties of formaldehyde come from its ability to denature proteins, thus altering the chemical structure of the protein and its previously toxic nature. In addition, formaldehyde reacts in both oxidative and reductive chemical environments. In the oxidative environment of aerated surface waters, formaldehyde oxidizes rapidly to formic acid, which is less toxic than formaldehyde. In the reductive environment of human sewage, where the available oxygen is rapidly consumed by the BOD (biological oxygen demand) of the waste, formaldehyde disinfects the sewage and in the process is converted to methyl alcohol, which is rapidly biodegradable. Further, formaldehyde is fully miscible in water and is photosensitive; thus, any unreacted formaldehyde discharged to the aquatic environment will rapidly mix with surface water and will be degraded by the action of sunlight. Although specific environmental degradation rates for formaldehyde have not been determined, it is known that the potential for bioaccumulation of formaldehyde is low, thus presenting minimal long-term environmental hazards. In addition, it should be noted that formaldehyde is a normal human metabolite; some of its resultant products are amino acids.

Most of the disinfectant chemicals used in MSD's are consumed or changed during the chemical processing of the wastes. As was noted above, both sodium hypochlorite and formalin react chemically with sewage and are changed in the process to relatively harmless substances. Thus, the quantity of the chemical discharged is not equivalent to the amount added to the MSD. It is unlikely that these chemicals will cause any significant adverse effects in the small concentrations in which they are found in the environment when used to disinfect sewage from watercraft.

B. Surveys Conducted by the Coast Guard and JRB Associates

The Office of Merchant Marine Safety of the U.S. Coast Guard has contracted with the David Taylor Naval Ship Research and Development Center (DTNSRDC) to determine the concerns of the marine industry regarding MSD's on recreational vessels of less than 65 feet in length. In the late summer of 1980, the DTNSRDC sent questionnaires to 28 MSD manufacturers, 46 powerboat and 23 sailboat manufacturers, and 10 boating organizations to determine the immediate concerns of these groups regarding the use of MSD's on recreational vessels less than 65 feet in length. While the DTNSRDC study is still continuing, the Coast Guard has provided copies of the responses to the original questionnaires to assist EPA in preparing this paper.

The DTNSRDC questionnaire was sent to a total of 107 potential respondents. High responses were received from the survey: 61 percent of the MSD manufacturers returned completed forms, as did 39 percent of both power and sailboat manufacturers and 30

percent of the boating organizations. The high rate of response eliminated the need for the contractor to seek primary data from similar sources. Instead, efforts were concentrated on discussing various aspects of MSD policies with appropriate officials in each of the fifty states.

The MSD and vessel manufacturers, as might be expected, were well aware of the issues pertaining to MSD's, especially regulatory and enforcement problems. Most of the State personnel were also well informed about the regulatory issues pertaining to MSD's at both the state and Federal level. This was particularly true of those individuals in states where water quality issues have a high priority, such as those states with EPA-certified "no discharge" waters.

The vessel and MSD manufacturers were asked to rate the importance of a number of characteristics of MSD's for both power and sailboat applications. Simplicity of operation was viewed by the largest number as the key factor for powerboats; physical size and power requirements were viewed by the largest number as the key factor for sailboats. Small sailboats might have problems meeting the power requirements of an MSD without an additional power source that adds undesirable weight to the boat. When the state personnel were asked a similar question, to identify the major factors discouraging the use of MSD's, half the state personnel (49%) identified the lack of pumpout facilities for vessels equipped with holding tanks. The next most frequently mentioned reason was the cost of the devices.

It is important to note that none of the reasons cited reflect on the need for MSD's, or the validity of the program in general.

The mechanical and operational characteristics of the devices are the prime concern. Further, it appears that any strengthening of the Federal MSD program to require holding tanks on more vessels would not be welcomed; the pumpout facilities to accept the wastes are not in place in most areas.

When the issue of enforcement was raised, 100% of the MSD manufacturers and 66% of the vessel manufacturers stated that they believed that "moderate" or "strict" enforcement measures are required to ensure the installation and proper use of MSD's. Similarly, nearly half (45%) of the state respondents stated that they favored stricter enforcement of the MSD regulations. Only 16% of the state respondents said they opposed stricter enforcement of the Federal MSD regulations. The reasons identified by the state personnel were that the regulations were not being adequately enforced at the present time by the Coast Guard; and that certain waters, such as shellfish beds and drinking water supplies, need greater protection. Many state personnel indicated that the state should concentrate on enforcing the MSD regulations in the state, and that the Coast Guard should enforce the regulations on the major navigable and surrounding waters of the state.

Finally, it is important to note that when the state personnel were asked about the existence of state MSD laws prior to the implementation of Federal standards and regulations in 1976, 82% of the state respondents said that their state had had their own laws regulating sewage discharges from vessels; further, 63%

of the respondents said their laws had been more stringent than the current Federal MSD standards and regulations.

Thus, what many states are clearly concerned about is efficient MSD's that are acceptable to the boating community, and in certain areas of the United States, stricter enforcement against violators of MSD regulations, whether those regulations are federally or state controlled.