Saxton Bill, H. R. 3673, Opposition White Paper Comments from Ed McKiernan - President, Dometic Corp. - Marine Systems

I was having dinner with my wife, son and two friends in Seattle at a pier-side seafood restaurant offering over two-dozen species of raw oysters, when I finally understood what the Saxton Bill was all about. If the Saxton Bill is passed, either existing shellfishing beds will be greatly reduced in size or boats will lose access to certain waters where shellfish are harvested. There are economic implications for both industries, and on a much larger scale there are implications for the overall health of our environment.

While well intentioned, H.R. 3673, the Saxton Bill, makes claims that I believe have not been upheld by scientific peer review.

May actually introduce into No Discharge Zones (NDZs) chemicals more harmful to the environment than the waste they purportedly are treating.

Analysis and Response to Claims Made by McKiernan
Prepared By Charles B. Husick
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Advocate for The Use of Technology to Enhance the Environment

Comment: Mr. McKiernan's "understanding" of the Saxton Bill is widely at variance with reality. Mr. McKiernan has a strong economic interest in preventing the development and use of advanced waste treatment systems, therefore his statements must be viewed with suspicion unless thoroughly substantiated by FACT. McKiernan's citations dealing with the danger to shellfish beds harvested for human consumption disclose threats from a combination of improperly operated or otherwise defective shore based sewage treatment plants and in some instances the lack of on board flow-through waste treatment systems capable of preventing bacterial and viral contamination on the commercial vessels engaged in harvesting shellfish.

Comment: The performance requirements set forth in H.R. 1027 are met by two presently available systems whose performance has been verified by recognized scientific testing laboratories (Underwriters Laboratories, Terra Lab Engineers and South Jersey Testing Laboratories) in the US and recognized laboratories in Australia and New Zealand. Mr. McKiernan's belief in or doubt about what has been achieved cannot be a valid measure of the worth of the proposed legislation. The facts must carry the day. The tests performed to qualify the treatment systems are "approved" since they were carried out by accredited laboratories staffed by highly qualified personnel and in some of the documented tests a world renowned virologist whose scientific opinion is clearly superior to McKiernan's belief or disbelief.

Comment: The two devices already tested and found to meet the stringent treatment standards required in the bill do not use or discharge any harmful chemicals into the environment. In contrast, when the discharge apparatus used to extract raw sewage from a Type 3 MSD, the only system Mr. McKiernan would allow to be used, is cleansed in *accordance with industry recommendations* substantial amounts of chlorine are introduced into the water. In addition, holding tanks are typically dosed with chemicals

	in an attempt to control offensive odors. The Material Safety Data Sheet for one of these chemicals, Secure Holding Tank Deodorant and Cleaner sold by Dometic, manufacturers of Sealand toilets (Mr. McKiernan's company) lists among its contents Secondary Alcohol Ethoxylate and Sodium Hydroxide. The MSDS states, in part "Sodium hydroxide in this product reacts with magnesium, aluminum, zinc (galvanized), tin, chromium, brass and bronze generating hydrogen which is explosive". The MSDS further states "HAZARDOUS DECOMPOSITION PRODUCTS; Carbon monoxide and carbon dioxide". Section 6-of the product's MSDS, Control and Protective Measures, also recommends the use of specified protective equipment, Chemical deodorants and stabilizers offered by other manufacturers are also used to combat the malodors created from the storage of raw, untreated sewage in vessel holding tanks, most of which must be vented to the atmosphere. It is also appropriate to note that decomposition of sewage in holding tanks generates hazardous gases including methane (explosion hazard) and hydrogen sulfide (toxic).
May be unenforceable, since there are no provisions in the Saxton Bill to require any routine inspection of the installed treatment devices that require varying degrees of service and maintenance.	Comment: There are NO routine inspection provisions for any type of recreational vessel MSD in the current Clean Vessel Act. Ensuring the proper operation of the MSD is the responsibility of the boat owner. This applies equally to Type 1,2 and 3 systems AND to the proper legal use of sewage- macerator-overboard discharge pumps typically fitted to vessels equipped with Type 3, holding tank MSDs. Discharge of stored waste from vessel sewage systems (Type 3 MSDs) that fail to eliminate hazardous bacteria in waste before it is stored pose a greater threat to the environment than systems which decontaminate waste as it is generated (Type 1 & 2 MSDs). Promoting the development and use of advanced waste treatment systems will provide mariners with a valuable option to the requirement to use only a Type 3 MSD and will change the unenforceable command and control environment needed to ensure that Type 3 systems are used properly to one of voluntary compliance. Enactment of H.R. 1027 into law will allow responsible boat owners to choose waste treatment and disposal systems which are better for the environment than today's seriously flawed system. President Bush, in his 2003 State of the Union Address clearly set forth the need to use technology to solve our problems ""Even more, I ask you to take a crucial step and protect our environment in ways that generations before us could not have imagined. In this century, the greatest environmental progress will come about not through endless lawsuits or command-and-control regulations, but through technology and innovation." H.R. 1027 fulfills the President's call for action. Preventing the use of new technology can only be judged a luddite response to the challenge of protecting our environment.
The FDA will not allow the use of Type 1 devices on or near	

currently unrestricted shellfish beds, given the presumption that contamination and chemical pollution may occur	Comment: The National Shellfish Sanitation Program Model Ordinance, VIII, Control of Shellfish Harvesting 02.C presents requirements for disposal of human sewage from vessels engaged in harvesting shellfish for human consumption. No statement or presumption of chemical pollution exists in the ordinance. Tests conducted by recognized independent laboratories have proven the ability of the Type 1A MSD proposed in H.R. 1027 to effectively protect sensitive aquatic environments, including waters at shellfish beds. The model ordinance is clear in its concern for the operation of vessels engaged in harvesting and is mute regarding the activities of the occasional transient vessel.
I believe the best solution is not to dump anything into sensitive waters. Education of boaters, marinas and regulators, along with the installation of properly working "pump-outs" from Type III holding tanks offers a proven, long-term method for cleansing and maintaining clean rivers, bays and offshore waters.	Comment: Discharge of waste from a holding tank into a sewer system connected to a treatment plant does not guarantee that the extracted waste will not subsequently pollute nearby water. The appendix to this report presents the record of a recent spill of 550 million gallons of untreated sewage into a shellfish harvesting area in New Jersey. It is common for moderate to heavy rain to overwhelm shore side sewage treatment plants, causing tens of thousands to hundreds of thousands of gallons of untreated or poorly treated sewage to flow into adjacent waters. The only "proven" way in which the holding tank system can be made failure free is through extensive policing action coupled with totally failure proof on-shore treatment plants and pump-out stations, neither of which are now or will likely be practical in the future. Exclusive reliance on a Type 3 MSD on vessels operating in tidal and offshore waters may create an environmental hazard greater than what would exist if the vessel discharged treated sewage directly into the sea as it was generated. Discharge of the raw, chemical doped sewage from a holding tank is far more abusive to the environment than the discharge from any Type 1 or 2 MSD. The installation of sewage macerator / overboard discharge pumps (many made and sold by Dometic) and the provision of gravity overboard drain systems on many Type 3 MSD installations provides substantial evidence of the necessity for an alternate means for discharging stored waste.

Potty Training

Bathrooms are a basic necessity of life. Home values often are measured according to the number of bathrooms. Most of us grow up never really understanding what happens to the waste when we flush a toilet. On airplanes and recreational vehicles equipped with toilets, waste goes into a holding tank and is emptied into a proper "dumping station" which ultimately in most cases is connected to a municipal waste treatment center.

On a boat, the U.S. Coast Guard has approved several methods for disposing of sewage (1). The Coast Guard defines a Type I Marine Sanitation Device (MSD) as a device, which treats sewage with disinfectant chemicals and by other means before it is discharged into the water. The treated discharge must meet certain health standards for bacteria content and must not show any visible floating solids. A Type II MSD is also a treatment device like the Type I, but it must meet a higher level of sewage treatment.

A Type III device is basically a holding tank. When a boat reaches a marina with a pump-out, the sewage is removed from the holding tank, which ultimately in most cases is connected to a municipal waste treatment facility.

Under the Federal Water Pollution Control Act of 1972 (FWPCA) (2), no raw sewage may be dumped overboard within the three-mile territorial limits of U.S. waters. Also, no sewage, treated or untreated, may be discharged into certain sensitive waters called No Discharge Zones.

A brief survey of various coastal states beach condition reports discloses that many beaches remote from any significant boat population are closed for swimming due to excessive coliform bacteria levels (typically specified by the EPA at more than 200 per 100 ml.). This level is 20 times the maximum specification for the undiluted effluent from the Type 1A MSD specified in H.R. 1027 (a level of treatment already achieved or surpassed by the Raritan Lectrasan MC and the Groco Thermopure 2). In addition the treated effluent of a Type 1, 1A or 2 MSD is immediately and unavoidably diluted by a factor in excess of 10,000:1.

Comment: McKiernan's recitation of the need for, use or economic value of bathrooms or the operation of aircraft sanitary facilities is not germane in a discussion of the merits of H.R. 1027. The existing law, including limitations on use of Type 1 and 2 MSDs is well known and not at issue with regard to the proposed legislation.

The "certain sensitive waters called No Discharge Zones" (NDZs) mentioned by McKiernan are designated as such without presentation of any evidence of (a) existence of pollution of any kind in the area to be designated a no treatment zone (b) that vessels of any kind are contributing to or causing any pollution whatsoever (c) that the waters are in any recognizable way "sensitive". The presumption of pollution from vessels used to justify NDZ designation is at variance with the first hand knowledge of mariners and responsible ecologists and results in an undesirable degree of disrespect for the law and for the agencies promoting the NDZs.

The criteria set by the EPA for determining the adequacy of pump-out stations does not take into account the actual requirements of vessels navigating in the proposed NDZ. Once the NDZ is established the EPA does not address the actual availability or the operational status of the pump-out stations presumed to be available. We are unaware of any EPA surveillance of the discharge of collected waste to assure that it is properly treated.

Comment: The failure of the current law to adequately protect the environment may be seen in massive sewage spill previously noted and in the following two situations in New Jersey's tidal waters.

Shark River, New Jersey;
Less than 1 year after the Shark River in New Jersey was granted No Discharge Status not a single pump-out station was functioning. A call placed to the EPA Region II office by

Vessel sewage discharge is regulated under Section 312 of the FWPCA. A State can have all or portions of their waters designated as a no-discharge zone for vessel sewage to:

1. Protect aquatic habitats where pumpout facilities are available.
2. Protect special aquatic habitats or species.
3. Safeguard human health by protecting drinking water intake zones.

According to the EPA web site on regulatory waste sewage, (http://www.epa.gov/owow/oceans/regulatory/vessel_sewage/) "Currently 6 States have all (or nearly all) of their surface waters designated as NDZs. Those States are: Michigan, Missouri, New Hampshire, New Mexico, Rhode Island, and Wisconsin. In addition, 11 other States have segments of their surface waters designated as NDZs. Those States are: California, Florida, Georgia, Massachusetts, Minnesota, New Jersey, Nevada, New York, South Carolina, Texas, and Vermont. Approximately 50% of the NDZs are in fresh water and the other 50% are in salt or estuarine waters."

The Case Against H.R. 3673.

Saxton Bill supporters make the simplistic argument that Type I technology, as offered by MSD manufacturer Raritan Engineering Co., is equal to and frequently superior to municipal sewage

personnel from Raritan Engineering solicited the following response from EPA's Mr. Jim Olander: "It is not the EPA's responsibility to be sure pump-outs continue to function, that is the States responsibility."

Barnegat Bay, New Jersey;
The EPA's proposed imposition of a no discharge zone on the waters of Barnegat Bay includes a comment that the 66 existing pumpout stations and the two pumpout boats will be "more than sufficient" to service vessels throughout the bay during the summer boating season. This assumption deserves analysis.

According to Staff Writer Don Bennett's article "No discharge in Barnegat Bay" published in the Ocean City Observer newspaper on 2 April 2003 the bay's boat population includes 15,587 boats at private docks, plus 12,487 at marinas during the summer. Mr. Bennett comments that there will therefore be 420 boats for every pumpout station and that this count meets the EPA's self generated criteria of having one pumpout station for every 300 to 660 boats. An examination of the boat population numbers and the number of pumpout stations discloses a major problem if this no discharge zone is to have the desired effect of protecting the bay's waters from pollution from sewage generated on boats.

For the purpose of analysis we will assume that of the 28,087 boats on the bay only 30% (EPA usually uses 40%), 8426 have on board toilets. We will also assume that only half of these boats, 4213 are used over a typical boating season weekend and will need to have pumpout service beginning late on Sunday afternoon. We estimate that the time needed for a boat to approach a pumpout station, tie up, be pumped out, have the deck area around the pumpout fitting properly cleaned and depart is about 12 minutes (assuming good weather and a reasonably proficient crew on both the boat and the pumpout station). The arithmetic shows that each of the 68 pumpout facilities will have to service an average of 62 boats. Assuming that the first boat reaches a pumpout station at 4:00 pm and that servicing each boat takes 12 minutes the last boat in line will head for its home port at about 4:20 the next morning! Add a bit of rain, wind or a typical thunderstorm and some of the weekend boaters will still be floating around, waiting their turn at the pump sometime late Monday.

Comment: McKiernan's reference (4) does not deal with or question the efficacy of Raritan's Type 1 MSD (or the Groco Type 1 MSD). McKiernan's (4) deals with the persistence of virus in seawater, marine sediment and in already infected oysters. This reference, printed in full below does not support McKiernan's assertion that supporters of the Saxton bill are making a "simplistic argument". If a simplistic argument is being made it is

treatment facilities. In regard to Raritan's devices, Mr. Saxton's claim is based on two studies (4):	McKiernan's effort to support his position by misdirecting the reader to a scientific report that does not deal with the performance of sewage treatment systems. However it is interesting to note that one of the researchers quoted in the report, proposed as a reference by McKiernan, Dr. G.S. Grohmann, is the author of the report (see appendix- Australia test) affirming the ability of the Raritan Lectrasan to effectively treat sewage to a degree sufficient to render it harmless to the aquatic environment. The text of McKiernan's (4) states: "There are more than 110 different viruses known to be excreted in human feces, collectively called the "enteric viruses" (Goyal, 1984). Viruses survive better at low temperatures and are inactivated at high temperatures (Lo et al., 1976, as cited in Goyal et al., 1984). As a result, most outbreaks of hepatitis occur during winter and early spring. Viruses can remain viable for long periods of time in seawater and have been shown to survive as long as 17 months in marine sediment (Goyal et al., 1984). Viruses associated with sediment are as infectious to animals as those that are freely suspended. Marine sediment acts as a reservoir of viruses, which may be resuspended by any kind of turbulence, such as boating, storms and dredging (LaBelle et al., 1980). Rainstorms can also increase viral concentration in the water by increasing land runoff (Gerba et al., 1979) and by release of sewage from overburdened treatment plants (Goyal, 1984)." …These researchers concluded that bacterial depuration rates can not accurately predict viral contamination levels. Finally, an Australian study (Grohmann et al., 1981) using naturally infected oysters, indicated that Norwalk virus is not completely depurated after 48 hours. In this study, some of the volunteers, who were fed depurated oysters (which met bacteriological standards), become ill with viral gastroenteritis (60% of illnesses occurred during periods of heavy winter rain). Note: Dr. Grohmann included the Hepatitis A virus in the test of the efficacy of the Raritan Lectrasan precisely because it is a particularly difficult virus to kill.
1.The original certification testing for the Coast Guard conducted in the 1970's.	<u>Comment</u>: The technology referred to in H.R. 1027 is NOT based on the original Coast Guard certification tests done to qualify Type 1 MSDs. The two MSDs now known to meet or exceed the stringent requirements for a Type 1A device specified in H.R. 1027 have been tested by recognized commercial testing laboratories using test procedures capable of measuring the extraordinary degree of treatment achieved, less than 10 coliform per 100 ml, as required by the specification.
2. A 1997 study by the Department of Veterinary and Pathology at the University of Sydney, Australia.	<u>Comment</u>: The study conducted in Australia was done at the behest of the local government in recognition of what they termed the unworkable aspects of the then current Australian law, which they commented was parallel to the US law then and now in force. The tests were done by a fully accredited laboratory and were more

	stringent than those required for certification testing of Type 1 or 2 MSDs under US law. The test included the addition of the hepatitis A virus to the waste, a method used to evaluate the ability of the treatment system to deal with the possible virus content of human waste. A copy of the final report from the Department of Veterinary Anatomy & Pahtology, The University of Sydney, 25 June 1997 is provided in the appendix. The concluding paragraph of the report states; "This system [Raritan Lectrasan] will provide an effective viral barrier protecting any direct users of recreational water as well as shellfish farmers and shellfish consumers. After discharge of Lectrasan treated water into the water body the resultant high dilution factor will further minimize any effect of viruses on the environment and human health. Overall, it is clear that the risk of viral disease being transmitted to the community from Lectrasan treated water is extremely low".
To our knowledge, neither of these documents, nor any other studies have been published in a scientific journal and subjected to peer review – a common and accepted practice in the field of microbiological sciences. Their specific claims are:	Comment: This statement is a repetition of McKiernan's second statement and offers no new information in support of his position. In amplification of our previous statement: It is NOT a common or accepted practice to publish the results of routine processes in peer reviewed journals. Articles reporting the results of such tests would not be accepted for publication since by definition they would not be expected to contain new scientific findings. We believe the extensive tests conducted by recognized independent laboratories in the US, Australia and New Zealand provide ample evidence of the efficacy of the proposed Type 1A MSDs.
"The independent lab test results required for certification documented coliform reduction in the sewage treatment process to less than 20 per 100 ml in 38 of 40 samples" (highest two readings discounted per standard procedure).	Comment: This statement has no application to the tests conducted to verify the performance of the Type 1A devices proposed in H.R. 1027 which were conducted in accordance with EPA and USCG standards. We find this comment irrelevant.
"Results of the lab test resulted in the following comments by the Virologist: this system is effective and will remove 78-98% of viruses from fecal material, as Hepatitis A virus (HAV) is one of the most difficult to destroy by chemical sterilization, a higher rate of removal for other enteric viruses can be expected when using this device."	Comment: We appreciate McKiernan's inclusion of this comment in support of the validity of the stringent tests used to validate the efficacy of the Type 1A MSD.
It appears that Raritan is making the assumption that because of reduction of one species of indicator bacteria and one type of virus the toilet-generated wastes receive sufficient treatment to be safely discharged overboard in any coastal waters.	Comment: McKiernan's comment states that Raritan is making an assumption regarding the value of the tests conducted by Dr. G.S. Grohmann, a recognized virologist quoted in McKiernan's ref, (4). The statement that a waste treatment system capable of dealing effectively with the Hepatitis A virus is an effective method for eliminating risk created by other viruses is made by Dr. Grohmann and other qualified scientists. McKiernan has presented no

Public health officials don't agree and here's why.

Scientists have known with certainty that oysters from waters with acceptable levels of "indicator organisms" (aka fecal coliform bacteria), can still be loaded with disease-causing viral particles (5). "Indicator organisms" are not a reliable way to assure the public's health [statistically 1 in 2,000 servings of raw oysters, clams or mussels may result in an illness (6)]. The result has been expanded condemnation of waters where shellfish are harvested, not because of higher levels of bacteria, but because of the presumption that contamination may occur.

Today, 98% of the 16,000 sewage treatment plants operating in the U.S. are at secondary level of treatment or higher (only about 5% were operating at this level in 1972) (7). Discharges are well within safe limits for shellfishing waters. The Food and Drug Administration (FDA) presumes, however, that accidents and failures occurring with the disinfection system, or unpredicted overflows or other mishaps will occur. So, their guidelines require the closure of waters within a proximity close enough to a treatment plant (or a marina) should a problem occur and affect shellfish beds (such closures usually encompass many acres of surface waters)(8). These control measures work for land-based sewage treatment plants, but what about highly mobile boats? Is an onboard Type I so failsafe that the FDA will accept the discharge from boats over shellfish beds?

credentials that might qualify him to cast doubt on Dr. Grohmann's findings. Further, McKiernan's reference (7) specifically states that the use of an indicator bacteria (coliform) is an accepted technique in aquaculture management.

Comment: McKiernan's reference (5), a magazine article published in Vogue Magazine was not available to us at the time this response was prepared. Having no knowledge of the scientific qualifications, if any, of the author it must be dismissed from consideration. However we note that McKiernan's reference (7) states; "Because monitoring for all human pathogens is not feasible, an indicator group of bacteria is used to assess the likelihood that human pathogens are present." McKiernan's reference (6) - EPA report 833-F-98-003, June 1998 is included in the appendix to this report. This EPA report contains nothing that supports McKiernan's comment but does identify; "Discharges from combined sewer or sanitary sewer overflows as a cause of beach closings, fish and shellfish bans, flooded basements and wide range of public health problems." Discharge of treated waste from Type 1 or 2 MSDs on navigating vessels is not mentioned in this report. We welcome McKiernan's inclusion of this reference in his white paper since its contents support our contention that exclusive reliance on transfer of raw sewage to shoreline sewage treatment plants is fraught with peril for the environment.

Comment: McKiernan's reference (7) contains no comment or information related to the statement preceding the reference. Reference (8) deals with contamination of an oyster bed that the investigators determined was the result of discharge of raw sewage from a commercial oyster harvesting vessel. It is worth noting that the presence of a Type 1 or Type 2 MSD on the vessel would have reduced the chance of contamination of the shellfish. A Type 1A MSD would likely have prevented the contamination altogether.

Ref (8) is presented in its entirety in order to ensure a full understanding of the facts:
"http://jama.amaassn.org/cgi/content/abstract/273/6/466
"An outbreak of Norwalk virus gastroenteritis associated with eating raw oysters. Implications for maintaining safe oyster beds", M. A. Kohn, T. A. Farley, T. Ando, M. Curtis, S. A. Wilson, Q. Jin, S. S. Monroe, R. C. Baron, L. M. McFarland and R. I. Glass , Epidemic Intelligence Service, Centers for Disease Control and Prevention, Atlanta, GA.
OBJECTIVE--To determine the characteristics and the cause of an outbreak of gastroenteritis associated with eating raw

FDA currently says no, for several reasons: First, there is no reliable evidence proving Type I discharges will always be safe; second, there is no current or cost-effective means to ensure Type I devices will always be working properly; third, the introduction of chemicals in shellfish waters by Type I discharges adds another hazard that must be routinely determined by state authorities at state cost; and, last, safer and ecologically sound alternatives already exist for fresh and marine waters.

oysters.

DESIGN--Survey of groups of persons reporting illness to the health department after eating oysters; survey of convenience sample of oyster harvesters; and tracing of implicated oysters.
SETTING--General community.
MAIN OUTCOME MEASURES--Relative risk for illness after oyster consumption, source bed of contaminated oysters, presence of antibodies to Norwalk virus in serum, presence of a Norwalk virus in stool by direct electron microscopy and reverse transcription-polymerase chain reaction (RT-PCR), and DNA sequences of RT-PCR products.
RESULTS--Seventy (83%) of 84 persons who ate raw oysters became ill vs three (7%) of 43 people who did not eat raw oysters (relative risk, 11.9; 95% confidence interval, 4.0 to 34.2). Eleven (79%) of 14 serum pairs had at least a fourfold increase in antibody to Norwalk virus. All 12 stool samples tested were positive by electron microscopy and/or RT-PCR for Norwalk virus. The RT-PCR products from all seven stool samples tested had identical DNA sequences. Implicated oysters were harvested November 9 through 13, 1993, from a remote oyster bed. Crews from 22 (85%) of 26 oyster harvesting boats working in this area reported routine overboard disposal of sewage. One harvester with a high level of antibodies to Norwalk virus reported having gastroenteritis November 7 through 10 and overboard disposal of feces into the oyster bed.
CONCLUSIONS--This outbreak was caused by contamination of oysters in the oyster bed, probably by stool from one or more ill harvesters. Education of oyster harvesters and enforcement of regulations governing waste disposal by oyster harvesting boats might prevent similar outbreaks."

Comment Continued: It is reasonable to assume that had the oyster boats been equipped with existing specification Type 1 or 2 MSDs the likelihood of contamination of the oysters would have been greatly reduced. If the proposed Type 1A MSD were in use the possibility of such contamination would have been vanishingly small.

Comment: No system can be considered "always safe", including Type 3 MSDs which have been known to fail and result in a spill of raw sewage into the bilge of a boat and subsequently into the surrounding water. Pump-out stations have failed and deposited raw sewage into the surrounding area and waters. The best maintained sewage treatment plants and their connecting pipelines have failed, often causing widespread damage to the aquatic environment. (Refer to 550 million gallon sewage spill into Raritan Bay included in the appendix). The intentional dumping of untreated waste from Type 3 MSDs is undoubtably occurring, in large part as a result of the unavailability of

operating pumpout stations.

McKiernan claims that the use of a Type 1A MSD will introduce chemicals into the waters surrounding a shellfish bed. Since neither of the MSDs that currently meet the Type 1A standard use chemicals (other than the use of the salt already present in sea water in the case of the Raritan Lectrasan MC) this claim cannot be sustained. McKiernan overlooks the possibility of damage to the environment that may result from the addition of stabilizing chemicals to waste stored in a Type 3 MSD.

Consider the following facts. Licensed specialists bear personal liability for the proper operation of sewage treatment facilities throughout the U.S., and this still is not totally sufficient under FDA guidelines. There are no Coast Guard or EPA requirements for failsafe operation of Type I's to assure that they are always operating within safe parameters. (More on the engineering and maintenance concerns in a moment.)

Comment: The operating licenses for land based sewage treatment facilities typically require achievement of an average level of treatment success. The actual degree or success of treatment during any one period of time may vary widely and may (and in some areas will frequently) include discharge of barely treated or untreated waste into adjacent waters.

But wait a minute, boats generally only have a few people on board and their discharge is tiny in quantity compared to a land based municipal plant. Aren't the Feds overreacting to such a small amount of discharge? In 1995, an article appeared in the *Journal of the American Medical Association* (9) that described an outbreak of gastroenteritis caused by oyster consumption. In this article, physicians and public health specialists from the Center for Disease Control (CDC) in Atlanta reported that this outbreak was caused by Norwalk virus and affected 70 of 84 people who ate oysters harvested from waters thought to be safe from land-based sources of contamination. The oysters implicated in this particular outbreak were from Louisiana, and they did not have unacceptable levels of indicator organisms.

Comment: McKiernan's reference (9) is essentially a repetition of his reference (8) above. (Note; the reference title is incorrect as given and should have been CDC MMWR Weekly, 20 January 1995 / 44(02);37-39). The source of the contamination was identified as the discharge of raw sewage from the boats harvesting the shellfish. The previous comments about the desirability of using on board waste treatment apply equally to this reference that is printed in full below:
"January 20, 1995 / 44(02);37-39 Epidemiologic Notes and Reports Multistate Outbreak of Viral Gastroenteritis Associated with Consumption of Oysters -- Apalachicola Bay, Florida, December 1994- January 1995"

On January 3, 1995, the Florida Department of Health and Rehabilitative Services (HRS) was notified of an outbreak of acute gastroenteritis associated with eating oysters. The subsequent investigation by HRS has identified 34 separate clusters of cases, many of which were associated with oysters harvested during December 29-31 from 13 Mile Area and Cat Point in Apalachicola Bay. Oysters were shipped to other states, but additional clusters of illness associated with these oysters have been reported only in Georgia. Most of these oysters were served steamed or roasted. This report summarizes the preliminary findings of the ongoing investigation of this outbreak.
On January 4, Apalachicola Bay was closed to harvesting even

though levels of fecal coliforms in the water and in the oyster meat were within acceptable limits. The preliminary investigation identified no gross breaches of sanitation; however, during the holiday season, the bay was used heavily by recreational boaters and commercial fishermen. Clusters of cases identified since the bay was closed prompted concern regarding the continued marketing of these oysters as unshelled and as shucked product both in Florida and other states.
Following the detection of cases associated with oysters from Apalachicola Bay, enhanced surveillance detected three additional clusters of cases in Florida and two in Texas initially linked to oysters harvested in Galveston Bay. As a result, on January 13, GalvestonBay was closed to harvesting. Norwalk-like viruses have been detected by electronmicroscopy in stool specimens from seven of 11 persons who ate oysters from Apalachicola Bay. Reported by: C Aristeguieta, MD, Dept of Family Medicine, Univ of Miami; I Koenders, Districts 1 and 2 Health Office, Tallahassee; D Windham, Districts 3 and 13 Health Office, Ocala; K Ward, MSEH, Districts 4 and 12 Health Office, Daytona Beach; E Gregos, Districts 5 and 6 Health Office, Tampa; L Gorospe, E Ngo-Seidel, MD, Nassau County Public Health Unit, Fernandina Beach; J Walker, MD, District 4 Health Office, Jacksonville; WG Hlady, MD, R Hammond, PhD, RS Hopkins, MD, State Epidemiologist, Florida Dept of Health and Rehabilitative Svcs. DM Simpson, MD, State Epidemiologist, Texas Dept of Health. Viral Gastroenteritis Section, Respiratory and Enteric Viruses Br, Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases; Div of Field Epidemiology, Epidemiology Program Office, CDC.

Editorial Note
Outbreaks of oyster-associated gastroenteritis affect substantially more persons than those identified in the few documented sentinel clusters (1-3). An important feature of these outbreaks is the inherent delays in removing contaminated oysters from the market. Although oyster tags permit traceback to the general harvest areas, they are not sufficiently detailed to allow recall of oysters from a specific site, and they can be lost when oysters are shucked. In this outbreak, the continued occurrence of cases 1 week after the bay was closed and the product was recalled suggests that the contaminated product was still available to consumers. Cooking (i.e., steaming and roasting) did not always render the oysters noninfectious. In addition, enhanced surveillance in Florida prompted by the investigation led to the closing of an oyster bed in Texas. The observation that both the quality of water in the Florida beds and the meat in the implicated oysters met national standards underscores the inherent limitations of the existing methods and the urgent need for improved indicators of viral contamination. In the absence of such indicators, it is difficult to determine when a bed can be safely reopened.

Note: list of references in document deleted from this comment, available in original reference.

Comment Continued: As for the previous references it is necessary to view the entire report and to once again note that the offending vessels

	were engaged in harvesting the shellfish and none were equipped with Type 1 or 2 MSDs. Had Type 1A MSDs been on board contamination would not have occurred.
Similar illness outbreaks attributable to oysters from Florida (Norwalk-like virus) (10) and from Texas (Shigella bacteria) (11) have been studied and reported in medical journals. Each of these outbreaks was caused by waste discharged from watercraft.	Comment: McKiernan's reference (10) and (11) are essentially repetitions of the situations reviewed in references (8) and (9) and end with the same conclusion as (8) and (9), i.e. the contamination of the harvested shellfish was caused by direct discharge of raw sewage into the waters of the shellfish bed from commercial vessels engaged in harvesting the shellfish. References (10) and (11) are available on the web and are not printed in this commentary in the interest of brevity. The above scientific reports support the correctness of incorporating the Hepatitis A virus in the testing program conducted in Australia and validate the findings of those tests. It should be noted that any discharge of untreated sewage from a Type 3 MSD, whether intentional or unintentional has the potential of contaminating, with both fecal coliform and viruses volumes of water far in excess of those threatened by a single use of a marine toilet discharging untreated waste directly into the environment.
Keep in mind that viruses can remain viable in seawater for a long time, and disease-causing viruses have been shown to survive as long as 17 months in the marine sediment (12).	Comment: The survival of viruses in seawater or in marine sediment has no bearing on the ability of the proposed Type 1A MSD to deal effectively with bacteria and viruses present in human waste. In fact, passing contaminated sea water through a marine head connected to one of these MSDs will inevitably result in a decrease in the overall level of contamination present in the water surrounding a boat so equipped.
Moreover, in filter-feeding molluscan shellfish (clams, oysters, mussels, etc.) viruses become concentrated at levels higher than the surrounding water and, though they do not multiply inside shellfish, they do accumulate and are retained in their liver-like digestive gland (13) for weeks.	Comment: In the interest of brevity the text of McKiernan's Ref (13) which is essentially a repetition of ref (8, 9 and 10) is omitted from this commentary. NOTE: McKiernan's references 11, 12 and 13 contain no implication that recreational vessels were in any way involved in the discharge of waste into the waters in question. In fact, the time of year in which the problem related in (13) occurred was one during which there is very little recreational boating in the area. Further, as previously noted the use of even existing Type 1 or 2 MSDs would likely have reduced if not eliminated the reported contamination problem.
Now, consider that doctors from the CDC surmise the waste from a single infected person would yield enough viral particles in one day to contaminate an oyster bed one kilometer long and 100 meters wide (an area over ten football fields) (14).	Comment: Reference (14) is a data sheet from the Raritan Engineering Web site and has no connection with McKiernan's statement. A comment about the water area and depth needed to dilute the total fecal coliform bacteria excreted by a single person in one day is found in McKiernan's reference (7). The comment deals with the discharge of raw sewage and states that uniform dilution into 54 million gallons of seawater (a 300 by 300 foot area with a depth of 5.5 feet) would reduce the fecal coliform density to the NSSP standard value of 14 coliform per 100 ml. This statement emphasizes the remarkable ability of the proposed Type 1A MSD to safely dispose of human waste AT THE SOURCE, eliminating further opportunity for hazard to health.
in light of all these facts, people	Comment: We believe that people have the right to demand that their government allow and encourage the intelligent use of science and

have the right to expect that legislators and regulators will ensure the safety afforded by Type I devices before giving the kind of approval sought in H.R. 3673.

Introduction of Harmful Chemicals?

H.R. 3673 claims no harmful chemicals are discharged with the Type I system since none are added to the waste being processed. Sales brochures from Raritan state, "Generates its own natural disinfectant from salt water" and "Coated electrodes use salt water to kill bacteria and viruses without adding harmful chemicals to the sea" (15).

A brief understanding of the chemical process involved in treating sewage at a municipal plant and through the onboard Type I system developed by Raritan will help to illustrate why this claim may be misleading or at a minimum confusing.
One of the basic principles of processing municipal wastes is that solids must be reduced to a very low level (30 mg/liter or less, about the equivalent of slightly cloudy water) in order to achieve an effective amount of disinfection (16).

This principle is the reason most sewage treatment plants send wastewater slowly through huge settling tanks or ponds, using gravity to settle out much of the solid material. During several steps in the treatment process, solids are either floated to the surface or settled to the bottom. After the solids have been reduced to a minimum, the waste is subjected to chlorination in order to kill many of the remaining microbes. If solids are not removed, chlorination only coats the particles of waste passing through, and the disinfection step is ineffective. The following is from an EPA document on chlorination of combined sewer outfalls: "Because suspended solids can inhibit the disinfecting agent from reacting with the bacteria, disinfection is usually used in conjunction with an additional technology that specifically reduces the suspended solids in solution" (17).

In Type I devices, solids are not removed from the waste stream. They are only reduced in size (but not in weight) so that they pass through a test sieve with a standard pore size of $1/16^{th}$ of an inch, about the size of a pinhead (18). Literally hundreds of thousands of organisms, even millions, can and are encapsulated into one of these $1/16^{th}$ inch particles, and only the organisms on the surface of particles are effectively

technology to protect the health and safety of the population. Imposition of irrational restraint on technological progress is totally counterproductive and can only result in contempt for unreasonable laws and regulations and those who promote and enforce them.
Comment: The referenced Raritan Product Information Sheet (L1030) correctly states the method used in the Lectrasan LST/MC to produce Hypochlorous acid (HOCL the same disinfectant chemical discussed in detail and recommended in the EPA document 832-F-99-034, the document referred to as reference (16). Reference (15) Spellman's Standard Handbook for Wastewater Operators Fundamental Level, Volume 1 contains no commentary related to the operation of the Raritan product and does not deal with the techniques used in on board flow through waste processing systems.

Comment: Reference (16) Combined Sewer Overflow Technology Fact Sheet, Chlorine Disinfection (EPA 832-F 99-034) deals specifically with "Combined sewer overflow (CSOs) that tend to occur during periods of rainfall or snowmelt when total wastewater flows exceed the capacity of the combined sewer system (CSS) and/or treatment facilities. This document has only peripheral application to a sewage treatment system that is required to deal only wit human waste delivered and treated in quantities that rarely exceed one gallon (231cubic inches). The methods for dealing with suspended solids noted in the EPA document do not apply to the violent maceration and agitation proces used in a Type 1A MSD. This critical processing differenc invalidates the comments in (16) regarding the reduction o solids to 30 mg/l and those suggesting the contact time needed for effective inactivation of biological hazards contained in waste. The remainder of McKiernans's statement that deals with settling tanks, separation of solid and the effect of chlorination on combined sewer outflows should be viewed as intentionally misleading since he is well aware of the processes used in both the Raritan Lectrasan and the Groco Thermopure 2 MSDs.
McKiernan's reference (17) is a US Coast Guard documen not an EPA document as he claims it to be and appears to have no connection to his discussion of suspended solids.

Comment: McKierenan's reference (18), the Raritan Engineering Website, is mute regarding solids, other than possible mention that the approved systems meet all Feder standards and should therefore be considered invalid or misleading. The statement following reference (18) is not supported by a presentation or reference to scientific data and must be considered invalid in light of the findings of

killed by the chlorine. Type I devices can not deliver a consistent, controlled disinfection routinely as can a municipal sewage treatment plant because they always contain solid particles.
Raritan currently offers two types of the Type I MSD, the Lectra/San LST/MC and the Purasan (19), and both depend on chlorine to kill microorganisms. The Lectra/San is a microprocessor-controlled unit that creates chlorine by the electrolytic breakdown of saltwater (20). The Purasan uses calcium hypochlorite tablets that yield chlorine when submerged in water (21).

The Lectra/San consumes huge amounts of DC current (50 amps at 12 volts for 2 minutes). The Purasan needs just 10 amps at 12 volts for 2 minutes, and it is intended mainly for boats that either can not meet the power requirements of the Lectra/San model or that travel on freshwater only. Both systems start at the push of a button. The treatment cycle is two minutes. There are three lights to indicate that the treatment is ok, that the system needs service or adjustment, or that the system is shut down due to insufficient current crossing the plates in the treatment tank.

Raritan's Lectra/San will shut down its two-minute treatment cycle if the salt content of the incoming flush water is too low. However, sewage treatment experts tell us that a minimum contact time of at least 30 minutes is necessary to assure that sewage receives the proper level of disinfection (22).

both the US, Australian and New Zealand laboratories. McKiernans's allegation that the disinfection accomplished by a Type 1 MDS is not consistent is wholly unsupported by any factual reference and is therefore nothing more than a personal opinion of clearly questionable worth.
Comment: The Purasan has not being recommended as meeting the proposed specification for a Type 1A MSD. Given McKiernan's claim of intimate knowledge of the technology it would be reasonable to expect him to know that the Purasan MSD is not a subject of this issue. McKiernan's reference (21) yields no information of any value to the evaluation of the worth of an advanced waste treatment system. Use of this reference is irrelevant since it has no bearing on the Raritan MSD proposed as meeting the requirements proposed for a type 1A MSD.

Comment: The energy consumption of a waste treatment system is not at issue as long as the vessel on which it is installed can supply the system's demand. The modest energy demand of the Raritan Lectrasan would allow a unit installed in a canoe with no electrical power other than a BCI Group 27 deep cycle storage battery to be used five times a day for more than 5 1/2 days before it would be desirable to recharge the battery.

The characterization of a 50 ampere current requirement as "huge" is absurd. A current of 50 amperes is hardly huge in light of the ampere flow commonly supplied by the batteries and engine driven alternators on virtually any boat equipped with an electrical system. For example, the starting motors on even the smallest diesel engines (12-18 hp) typically draw as much as 160 amperes (Yanmar Model Number S114-303).
A modest size DC/AC inverter, (Freedom Marine 10, West Marine Catalog Part Number 147996) (1,000 Watt rating @ 93% efficiency) demands currents in excess of 85 amperes while operating. The actual Energy consumption of the Lectrasan is 1.7 ampere-hours per use cycle (reference Raritan Lectra/San MC Installation and Maintenance Instructions, Specification Table, 12 volt operation). A group 27 marine deep cycle battery (nominal 100 AH rating) can support at least 28 Lectrasan use cycles before its stored energy level is reduced to 50%, the maximum energy withdrawal level recommended for deep cycle batteries by battery manufacturers..

Comment: The duration of the Lectrasan's treatment cycle is determined by the unit's control system and will continue until sufficient sanitizing agent is produced and thoroughly mixed with the macerated waste, The monitor / control system will shut the system down and inform the user in the event complete treatment is not achieved. The "sewage treatment experts" mentioned by McKiernan are not identified nor are their qualifications relating to the operation of a Type 1 MSD specified. The statement that 30 minutes are required to reach a proper level of disinfection (Ref 22) may apply to some sewage treatment plants, however it is disputed

The Lectra/San unit operates on a one flush in, one flush out principle. If the people on board are using it at a rate faster than one flush every fifteen minutes or so (as might happen if one of the passengers was ill, or passengers are waking up at the same time in the morning), the discharged waste is likely not getting sufficient treatment. There is no positive control of the amount of time sewage in the Lectra/San unit is in contact with the chlorine generated by the system. And, there are other factors that need to be considered in order to assure proper levels of disinfection, like the pH, water temperature, and concentration of organic wastes (23). Likewise, none of these are controlled in the Lectra/San device.

How does a Lectra/San unit restart once it shuts down due to insufficient chlorine being generated? According to Raritan's service department (24), one throws more salt into the bowl and hits the "reset" button, which then overrides the interruption of the process. The system shuts down again, and then the operators press the reset again, and so on until the salt content reaches operating levels again. Remembering that the Lectra/San device operates on a one in, one out principle, the likelihood that at least one or two under-treated flushes will be discharged is pretty certain.

Another key difference between a Type I device, like the Lectra/San, and a wastewater treatment plant is the discharge of chlorine that is highly toxic to marine life. Many municipal wastewater treatment plants actually dechlorinate before discharging their effluents into receiving waters, by treating with sulfur-based chemicals that neutralize the residual chlorine. One authoritative text on the subject states, "Dechlorination can virtually eliminate toxic effects resulting from wastewater chlorination" (25). There exist no such environment friendly dechlorination steps in Raritan's devices.

by the data in Table 2, Summary of CL_2 Disinfection Data From Study Locations, contained in Mr. McKiernen's reference (16) EPA 832-F-99-034 which shows required chlorine contact times ranging from 1 minute to 6 minutes with a 3 minute contact time reducing the total coliform content by 99.9%.
Comment: This statement is invalid as shown by the content of Table 2 in McKiernan's reference (16) above. Further, the Type 1A MSD is to be used in tidal waters where pH, and the presence of organic wastes should not be of concern. Type 1,2 and Type 1A MSDs are designed to work properly at any water temperature, pH or level or organic waste found in navigable waters. It is interesting to note that should a vessel equipped with a Type 1, 2 or Type 1A MSD operate its marine head and associated MSD in many of the tidal waters of the US the resulting effluent would likely be "cleaner" than the intake water.

Comment: The assertion that multiple cycles will be required to achieve the required salt level is not supported by personal use experience over a period in excess of 25 years. Should a low salt indication appear it is only necessary to add a modest amount of salt to the toilet bowl and flush sufficient water to move the concentrated salt solution into the initial treatment chamber. I have found that transfer of about 2 liters of water is usually sufficient.

Comment: The chlorine discharged from the Raritan Lectrasan is at a level far too low to cause reasonable concern for its effect on the environment. The following test data is contained in Raritan Document KGS:012402 The generation of Chlorine in the Lectra/San:
Test results from two independent labs were taken: Results from water sampled at 20cm below the thru-hull on five consecutive days show the following levels of free chlorine residual: (Seawater chlorine residual was constantly 0.0-0.2 ppm Tests conducted during 5 consecutive days showed the chlorine content of the treated effluent to be between 0.2 and 0.4 ppm. Tests of the chlorine content of the treatment tank showed free chlorine levels of 14 ppm. In contrast, the recommended "best practice" for washing down a deck fitting after being

Raritan's claims about chlorination may be misleading, or at a minimum confusing.

Raritan's products brochure claims, "Generates its own natural disinfectant from salt water" and "Coated electrodes use salt water to kill bacteria and viruses without adding harmful chemicals to the sea". The form of chlorine that is released by their process is not a "natural" or a non-harmful chemical. True, seawater has an abundance of naturally occurring chlorine ions. Raritan's Lectra/San device uses the electrolytic breakdown of salt and water, where: $2NaCl + 2H_2O \rightarrow Cl_2 + 2NaOH + H_2$ (26). The free chlorine (Cl_2) released in their process is man-made, not widely naturally occurring, and it is quite toxic to many aquatic species. One authoritative text on the effect of chlorine on aquatic life concludes, "Chlorine residual levels may need to be as low as 0.002 mg/L to preclude adverse effects" (27). If the discharge level for the Raritan device is greater than 10.0 mg/L, that is 5,000 times greater than the "no adverse effects" level.

Another apparent contradiction exists between Raritan's most recent promotional brochure and the Material Safety Data Sheet (MSDS) for its Purasan model. The Purasan model does not make chlorine from salt water, but instead uses calcium hypochlorite tablets similar to swimming pool chlorine tablets. Raritan's brochure claims that the Purasan unit, "Neutralizes waste, making it sanitary and safe for boaters and marine life", yet the MSDS (28) for the Purasan tablets states, "This product is toxic to fish. Do not discharge into lakes, streams, ponds or public waters unless in accordance with an NPDES permit." The manufacturer should get its story straight.

According to one study reported in the *Journal of Applied and Environmental Microbiology*, it takes a chlorine concentration of 10 or 20 mg/liter and an exposure time of 30 minutes to inactivate Hepatitis A virus completely (29).

pumped out places 1200ppm of chlorine into the water.

Comment: The method used to produce chlorine is not at issue. Chlorine is recognized and recommended by the EPA and virtually all other water / sewage treatment references as a highly desirable treatment method, both to sanitize water and waste and to prevent the presence of harmful organisms in water distribution systems. Reference (27) is devoid of any information regarding residual levels of chlorine considered safe for the environment. The discharge of chlorine from the Lectrasan is as shown above in the range of 0.0 to 0.2 parts per million, at a distance of only 20 cm from the discharge port and prior to the immediate, inevitable and massive dilution that occurs as the typical one gallon effluent stream enters the sea. The Groco Thermopure 2 MSD uses NO chlorine whatever, therefore concern about chlorine content of its discharge is totally unfounded.

Comment: It is McKiernan who is confused, not Raritan. The Purasan model is not proposed as meeting the requirements of the Type 1A MSD as specified in H.R. 1027. McKiernan's reference (28) presents the results of scientific investigation reported in Applied and Environmental Microbiology and has no connection whatever with the statement in which it is used.

The paper published in the Journal of Applied and Environmental Microbiology, Oct. 2002 p 4951-4955 (McKiernan's 28) deals with (emphasis added) the **detection of virus nucleic acid after chlorine disinfection (a) Full-sequence scanning results for virus nucleic acid.** It appears that this level of testing may be inappropriate as a measure of the effectiveness of chlorination in routine day-to-day disinfection of sewage. In addition, Mr. McKiernan's reference (16), Table 2, Summary of Chlorine Disinfection Data From Study Locations presents contact times for effective disinfection ranging from 1 to 6 minutes.

Comment: Ref (29) lists a telephone conversation with a Mr. Irwin Oster, Oster Marine Service, West Palm Beach, Florida, 10 May 2003. We are therefore unable to comment on the statement describing the chlorine concentration and exposure time needed to deactivate the Hepatitis A virus "completely". In contrast, the tests

If the Raritan device produces a concentration of chlorine that assures sufficient killing of viruses, then the resulting discharge is going to require as much as 20,000 gallons of water to dilute each flush to ensure that effluent is not harmful to the environment. By this calculation, in one day four people on a boat could generate enough chlorine to require dilution by as much as 400,000 gallons of water. Obviously, this is simply not feasible. Thus, either MSD treatment systems must dechlorinate effectively before discharging wastewater, must discharge harmful chemicals into the marine environment, or must altogether forego effective treatment to inactivate pathogenic viruses.

No Provisions to Require Routine Inspection or Maintenance

Independent marine contractors who service Type I systems note that in the warm waters of South Florida, the calcium carbonate build-up on the Lectra/San electrode plates is accelerated, thereby gradually reducing the effectiveness of the unit (30). Instead of the six-month maintenance as suggested by Raritan, boat owners may not realize that a cleaning with muriatic acid is required every three months. This can lead to disuse due to the inconvenience of the 45-minute to two-hour ritual required to acid treat the electrolytic mechanism.

Doing the Right Thing

I have the pleasure of being a grandfather twice over. Those of you who share this privilege in life know that you will do just about anything for your grandchildren, and we know we can change our behavior. For me, I am committed to the relationship between what the world will be like and my grandchildren. There are a million reasons why we should change our behavior about dumping sewage into our lakes and oceans.

conducted in Australia and New Zealand and referred to previously in this commentary confirm the ability of the Lectrasan to deal effectively with this virus.

Comment: This statement is based on what appears to be a faulty reading of a technical journal and has no bearing on the ability of a Type 1A MSD to protect the aquatic environment. The amount of chlorine released into the sea from the Lectrasan has been measured and reported upon previously in this commentary. McKiernan's statement is beyond comprehension. We can find no evidence to substantiate this absurd claim.

Comment: The Lectrasan will notify the user of the need for cleaning by indicating a lack of salt in an area where the user already knows the salt content to be sufficient. The time required to accomplish the acid treatment is rarely longer than 45 minutes with most of that time available for accomplishing the multitude of other chores normally required to maintain a boat. Further, the Groco Type 1A MSD has no electrode plates and is therefore not subject to any such problem. It is important to recognize that H.R. 1027 defines a level of waste treatment, not a particular product or method of treatment. Once devices capable of achieving the level of treatment required by H.R. 1027 are permitted to be used we may expect to see additional treatment systems from Raritan, Groco and other manufacturers, systems that may or may not use any of the techniques used in these two pioneering systems.

Comment: Existing US law already prohibits the "dumping" of sewage into our lakes and oceans. From the standpoint of protection of the environment the use of flow-through waste treatment systems is obviously superior to a Type 3 MSD system comprised of a holding tank fitted with either a gravity or pump powered system for discharging large quantities of stored, totally untreated and chemical doped waste into the environment. Yet, this system is precisely what is installed on thousands of vessels operating in the tidal waters of the US and prescribed by McKiernan as the ultimate means for dealing with sewage on boats.

	Type 1, Type 2 or the proposed Type 1A MSD systems are installed in a manner that does not allow bypassing of the treatment device. In rare situations where the discharge of even the most effectively treated waste into the environment might be unwise the operator of a boat equipped with a flow through treatment system is able to divert the treated waste to a holding tank for later discharge in an area where the discharge cannot create a problem. Users of the Type 3 systems who are frequently confronted with full holding tanks and no available pump-out facility are denied this opportunity to respect the environment. H.R. 1027 does not propose use of the flow through waste treatment systems available using already developed technology in fresh water lakes. The Bill proposes use only in tidal waters.
Type 1 devices are unlikely to ever be an acceptable alternative to no discharge zones for sensitive waters. They just will not be effective or ecologically sound. The alternative, holding tanks, dumps nothing directly into the aquatic environment when properly used.	Comment: The term "sensitive waters" is not defined. The provisions of H.R. 1027 apply to the tidal waters of the United States. The EPA biennial national survey of water quality (www.epa.gov/305b/) identifies numerous sources of water pollution and lists municipal point sources (sewage treatment plants) among the primary sources of impairment of the environment. There is NO mention of waste from navigating vessels in this EPA report. Mr. McKiernan's claim that the use of holding tanks does not result in waste being introduced into the aquatic environment is not supported by the facts. There are countless documented instances in which the contents of the holding tank, transferred to a shore side treatment plant wind up in the water in which the boat is floating due to a malfunction of the treatment plant, overwhelming of the plant by heavy rain or a break in a sewer line carrying raw or partially treated sewage. The 550 million gallons of raw sewage dumped into Raritan Bay in New Jersey during the incident reported on previously in this paper exceeds by many orders of magnitude the total amount of sewage generated on every boat operating in US tidal waters for an entire year. In light of the well documented incidents of discharge of raw or partially treated sewage into the tidal waters of the US each year McKiernan's confidence in holding tanks must be viewed as either naive or intentionally misleading.
Installation of more pump out facilities, a concerted effort to educate boat manufacturers and retail dealers, and boaters about clean water has already made a difference on the Great Lakes, and in places like Block Island and Avalon Harbor at Catalina Island. No Discharge Zones and using pump-outs are not even issues to boaters in these locations.	Comment: The fact that pump-out stations can work in some specific areas is not at issue. The existence of a technology should not bar the use of the newer and better technology. It was not necessary to prove the telegraph deficient to allow the use of the telephone. It was not necessary to find a flaw in the use of the FAX machine before widespread use of e-mail became common. We need to offer our most environmentally responsible citizens, those who own boats, a choice of technologies in their pursuit of environmental protection. That said, it is worth noting that many no discharge zones have insufficient, inoperative or inaccessible pumpout stations.
	Comment: We cannot agree with Mr. McKiernan's claim that

Passage of the Saxton Bill will only weaken our clean water laws and create economic challenges to two major industries. Boating is good clean fun. Let's do the right thing; let's keep it that way.

passage of H.R.1027 will weaken our clean water laws any more than the development and widespread use of advanced technology auto emission control systems that work differently from those first envisioned and mandated weakened the clean air act. We applaud the development of combined or hybrid cycle ultra low emission vehicles rather than insisting that all vehicles use only catalytic converters to meet emission standards.

Lastly and on a personal note, Mr. McKiernan expresses his pleasure at being a grandfather twice over and his wish to do what is right to ensure that his grandchildren have a bright future. I share in his wish for his grandchildren as well as for the 11 grandchildren my wife and I share. However I won't claim that my numerical advantage in this area makes me a more concerned citizen. However, I will claim to be a more experienced mariner than Mr. McKiernan, if for no reason other than that I live within a few hundred meters of the Gulf of Mexico, own a boat equipped with two Type 1 MSDs that meet the Type 1A specification and spend as much time as my schedule permits on our tidal and on offshore waters.

Comment: We have researched each of the references listed as "end notes". We have found a number of the references to be incorrect as to the organization that published the information, the title of the article or its date, however each was eventually identified and reviewed. For example, the text referred to in Mr. McKiernan's references (15) and (21) deal with conventional sewage treatment plants in which the overall content of the waste and the treatment mechanism is importantly different from the material and processing used in a flow through MSD.

In this instance we have chosen not to challenge the inclusion of references that have little or no connection with the subject under consideration or McKiernan's commentary on the proposed legislation, however we note that references 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 21 and 22 appear to either contain little or no information in support of McKiernan's position or as noted in the text often present facts in support of the proposed legislation.

In our opinion the intent of the proposed legislation is clear: to employ advances in waste treatment technology for the benefit of our environment. We also believe that McKiernan's goal is equally clear, to prevent the use of

End Notes:

1. U.S. Coast Guard (USCG) Marine Sanitation Device Regulations, Vol. 40, No. 21 (Washington, D.C.: Office of the Federal Register, National Archives and Record Service, January 30, 1975).
2. Federal Water Pollution Control Act, Publication L. 92-500; 33 USC 1322 (1970), Section 312.
3. Monograph, On-Board Waste Treatment, Lectra/San ® EC ™ USCG Approved Waste Treatment Device for Boats, Raritan Engineering Co., undated.
4. University of California, Seafood Network Information Center Website, (http://seafood.ucdavis.edu/Pubs/safety1.htm), General Viruses – Detection & Prevention, downloaded 11/23/02, page 3 of 54.
5. Steingarten, Jeffrey, "Pleasures & Terrors," Vogue Magazine, October 1992.
6. U.S. Environmental Protection Agency, Water Pollution Control, EPA 833-F-98-003, June 1998.
7. Florida Aquaculture, Shellfish Programs Website, (http://www.floridaaquaculture.com/SEAS/SEAS_Intro.htm), Page 2 of 4.
8. Kohn, M, et al., An Outbreak of Norwalk Virus Gastroenteritis Associated with Eating Raw Oysters; Journal of the American Medical Association; Vol 273: 466-471; February 8, 1995, No. 6.
9. Multistate Outbreak of Viral Gastroenteritis Associated With Consumption of Oysters – Apalachicola Bay, Florida, December 1994 – January 1995; New England Journal of Medicine; Vol 273: February 8, 1995, No. 6.
10. Reeve, G, et al., An Outbreak of Shigellosis Associated with the Consumption of Raw Oysters; New England Journal of Medicine; Vol 321: 224-227; July 27, 1989, No. 4.
11. University of California, Seafood Network Information Center Website, (http://seafood.ucdavis.edu/Pubs/safety1.htm), Viruses – Detection & Prevention, downloaded 11/23/02, page 3 of 54.
12. University of California, Seafood Network Information Center Website, (http://seafood.ucdavis.edu/Pubs/safety1.htm), General Viruses – Detection & Prevention, downloaded 11/23/02, page 3 of 54.
13. Kohn, M, et al., An Outbreak of Norwalk Virus Gastroenteritis Associated with Eating Raw Oysters; Journal of the American Medical Association; Vol 273: 466-471; February 8, 1995, No. 6.
14. Raritan Engineering Company Inc Website, (http://www.raritaneng.com), Lectra/San Promo Sheet, L1030, p 1.
15. Spellman, Frank, Spellman's Standard Handbook for Wastewater Operators, Fundamental Level, Volume 1, (Lancaster, Pennsylvania: Technomic Publishing, 1999), page 131.
16. U.S. Environmental Protection Agency, Combined Sewer Overflow Technology Fact Sheet: Chlorine Disinfection, EPA 832-F-99-034, September 1999, page 2.
17. U.S. Coast Guard (USCG) Marine Sanitation Device Regulations, Vol. 40, No. 21 (Washington, D.C.: Office of the Federal Register, National Archives and Record Service, January 30, 1975).

technology that might diminish the sale of equipment produced by the company he manages.

18. Raritan Engineering Company Inc Website, (http://www.raritaneng.com/).
19. Raritan Engineering Company Inc Website, (http://www.raritaneng.com/).
20. Raritan Engineering Company Inc Website, (http://www.raritaneng.com/).
21. Spellman, Frank, Spellman's Standard Handbook for Wastewater Operators, Advanced Level, Volume 3, (Lancaster, Pennsylvania: Technomic Publishing, 2000), page 145.
22. Cheremisinoff, Nicholas et al., Chemical and Nonchemical Disinfection, 1981, page23
23. Telephone conversation with Raritan Engineering Co., Service Technician named Vic, April 11, 2003..
24. Water Environment Federation, Wastewater Disinfection, Manual of Practice FD-10, 1996, p 54.
25. Chlorine Chemistry Council Website, (http://www.c3.org/).
26. Water Environment Federation, Wastewater Disinfection, Manual of Practice FD-10, 1996, p 54.
27. Raritan Engineering Company, Inc.; Material Safety Data Sheet for Purasan Tablets; February 23, 2001.
28. Li, Jun Wen, et al., Mechanisms of Inactivation of Hepatitis A Virus, Applied and Environmental Microbiology, October 2002, p 4951 – 4955, Vol. 68, No. 10.
29. Telephone conversation with Irwin Oster, Oster Marine Service, West Palm Beach, Florida, May 10, 2003.

Ed McKiernan is President of Dometic Corporation – Marine Systems, formerly Sealand Technology, Inc. Dometic Marine is a major supplier to the worldwide marine industry of sanitation systems utilizing holding tank system based on vacuum toilet technology. Mr. McKiernan has been active in the marine industry for over thirty years and is currently a member of the National Marine Manufacturers Association, Marine Accessories Board.

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Charles B. Husick is a U.S. Coast Guard Licensed Merchant Marine Officer, Master of Steam, Motor or Auxiliary Vessel Of Not More Than 100 Gross Tons Upon Near Coastal Waters. He is a graduate engineer and has extensive knowledge and experience in a number of fields including computers, aerospace telemetry (including manned spacecraft), aircraft and marine electronics, manufacturing of aircraft and related products, hydraulics, composite structures and recreational boats.

His career includes serving as President of aircraft and marine electronics companies, Senior Vice President of Cessna Aircraft and Fairchild Industries, and Chairman and President of the Chris Craft Boat Company. He is currently a member of the Boat US Advisory Council, the Technical Board of the American Boat and Yacht Council, Industry Sector Number 4 of the US Department of Commerce, and is a member of the Board of Directors of the Radio Technical Committee Marine. He has also served on an FAA Advisory Committee, as a member of the White House Committee on Aerospace and as Chairman of the General Aviation Manufacturer's Association. A consultant and author he has no financial interest in activity involved in the manufacture or sale of marine sanitation devices, specifically including products that now meet or may eventually meet the requirements specified in H.R. 1027. His activity in support of H.R. 1027 is totally self financed and dedicated to furthering the healthy growth of recreational boating.

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