Marine Environmental Update

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A Message From The Judge Advocate General

Date: 11 February 1997
From: RADM Harold E. Grant, Judge Advocate General
Subj: ENVIRONMENTAL PROTECTION

"Introduction

"1. In the three years that I have served as Judge Advocate General I have developed a much better appreciation of how environmental requirements affect virtually every aspect of Navy operations. In a variety of contexts, environmental laws have significantly influenced when, where and how we do our business, both ashore and at sea. Recent examples include establishment of a national marine sanctuary in Hawaiian waters; environmental analysis in connection with deployment of the SURTASS LFA sonar; decision making regarding West Coast homeports for aircraft carriers; environmental cleanup of the Washington Navy Yard; and protection of the right whale off northern Florida. These and other environmental issues have required attention at the highest levels of the Fleets, OPNAV and the Secretariat.

"2. Although the issues mentioned above are new, the legal requirements that drive them are not. Most of the relevant statutes have been on the books for more than 20 years. Because these long-standing legal drivers continue to generate new issues for us, I believe another look at environmental requirements is in order. In this and in two subsequent EMAILs I will provide a quick sketch of the requirements, and discuss how they impact the Navy. This note will discuss general principles and organization; the next will focus on operations at sea, and the final one will address

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Read me on-line at: **http://environ.nosc.mil/Programs/MESO/Newsltr/newsltr.html**

shore infrastructure impacts.

"Environmental Laws and Regulations.

"3. The Navy is subject to environmental regulation by more than 60 federal environmental statutes, a dozen or so presidential executive orders, and thousands of pages of implementing federal regulations. Several of the federal statutes also require that federal agencies abide by state and local environmental law, which increases by an order of magnitude the total number of legal requirements we face. Although immense, the field of environmental law can be roughly categorized into four areas: environmental planning, pollution prevention and control, conservation, and cleanup. Each area affects us in a different way, as discussed below.

"a. Planning. The foremost planning statute is the National Environmental Policy Act. It requires that we identify and consider the environmental consequences of major actions before carrying them out. The "NEPA process" requires us to address the full panoply of environmental requirements pertinent to a proposed action. Those impacts might include, for example, creation of a discharge which requires a permit under the Clean Water Act, or operations in the vicinity of endangered species, which may require consultation with the U.S. Fish and Wildlife Service. Hence, satisfying NEPA goes a long way toward addressing all of the relevant environmental requirements. Environmental planning for activities that take place outside the United States and the territorial sea is governed by Executive Order 12114, which is similar to NEPA. Asking the question "Is there a NEPA or 12114 requirement here?" is a good idea, early on, in all Navy planning.

"b. Pollution prevention and control. Statutes in this category, such as the Clean Air Act and the Clean Water Act, for the most part address present day pollution elimination or reduction. These statutes operate by requiring permits for pollution discharges, and for hazardous waste handling. Our challenges in this area have mainly occurred when requirements are ratcheted down, or when a regulatory agency's formula for regional pollution reduction creates a disproportionate impact on the Navy. For example, in recent years various proposals have been advanced to minimize vessel-generated air pollution in California by relocating a shipping channel further away from the coast. This relocation, however, would adversely affect the Navy's Outer Sea Test Range off Point Mugu. We are working intensively with federal and state regulators in this case, and others like it, to ensure that our interests are protected.

"c. Conservation. This category of environmental requirements includes statutes designed to protect endangered animal and plant species, marine mammals, designated land and ocean areas, and historic and cultural resources. Some of these requirements are stringent – courts have held that protection of endangered species takes precedence over federal agency missions in cases where the two objectives are mutually exclusive. Of the four categories of environmental law, the conservation area presents the greatest challenge to our operations. Although conservation requirements have caused us to modify our activities in some areas, thus far we have found ways to satisfy these requirements while

still carrying out necessary training and operations. I anticipate that significant new issues will continue to crop up in this area for the foreseeable future.

"d. Cleanup. Current laws require us to clean up environmental contamination caused by historic activities, as well as by current operations. Through the Installation Restoration (IR) program, most of the existing contamination on naval installations has been identified, and plans have been made to remediate it over a period of years. In addition to being a fiscal challenge (the Navy plans to spend $290 million on the IR program in FY 1997), environmental contamination is a high interest item with most adjacent communities.

"Keeping track of all of these requirements is difficult, but doable. The OPNAVINST 5090.1 series, updated regularly by N45, boils down these requirements into comprehensible parts, and specifically lays out the responsibilities of various Navy officials. Another helpful reference is the Commanding Officer's Guide to Environmental Compliance, available from the Naval Facilities Engineering Center, in Port Hueneme. I urge you to keep these references close aboard.

"4. The Players.

"a. The Agencies. Outside the Navy, the principal environmental players are the federal, state and local regulatory agencies. In dealing with them, we must bear in mind that they, like us, have a statutory mandate, and a mission to accomplish. In most cases, representatives of these organizations are supportive of the Navy mission, and prepared to work cooperatively with us. When agreement cannot be reached at lower levels, Navy leadership in Washington is prepared to engage appropriate leadership in the agencies. Where vital Navy interests are at stake in a dispute with a federal agency, Navy is prepared to seek assistance through the Office of Management and Budget to resolve regulatory policy issues or go to the National Security Council to resolve non-regulatory policy matters.

"b. Environmental Groups. Environmental interest groups significantly influence the development, implementation and enforcement of environmental laws in the U.S. Many environmental statutes specifically authorize citizen suit enforcement of their requirements. Other environmental statutes can be enforced through the Administrative Procedure Act, which, among other things, requires federal agencies to operate in accordance with law, and to avoid arbitrary and capricious action. Most citizen suit plaintiffs are environmental interest groups. Navy has found it useful in some contexts to dialogue with responsible environmental interest groups, and to address their concerns to the extent consistent with the Navy mission and our own view of the law.

"c. The Navy Organization. OPNAVINST 5090.1B makes clear that environmental protection is a chain of command responsibility. Over the past five to seven years the various chains of command have developed appropriate environmental organizations, from the field through major claimant levels. In addition, the Navy has developed a highly effective Regional Environmental Coordinator (REC) system, which has enabled us to address issues on a cross-claimant regional basis. Inside the beltway,

major environmental issues are addressed primarily by OPNAV N45, and the Office of the Assistant Secretary of the Navy for Installations and Environment. Other parts of the OPNAV organization, particularly N3/5 and N8, are becoming more directly involved in environmental matters, ensuring that operational-environmental issues receive appropriate operator attention. Within the legal community, in recent years the Navy General Counsel and I, and our organizations, have worked very closely together on emergent environmental issues. With all these various parts working in concert, I believe we have the organization in place to meet present and future challenges.

"5. Enforcement.

"a. Agency enforcement. Environmental enforcement action can take a variety of forms. Because Executive Branch agencies generally cannot bring judicial action against each other, federal agency enforcement against the Navy takes the form of notices of violation, followed by resolution within the administrative processes of the enforcing agency. States and localities, by contrast, can and do sue federal agencies to enforce environmental laws. The effectiveness of the Navy's environmental protection efforts is borne out in a declining enforcement profile. At the end of fiscal years 1994 through 1996, the Navy had 184, 152 and 130 unresolved environmental notices of violation, respectively.

"b. Citizen Suits. As discussed above, private parties can and do sue the Navy to enforce environmental laws. For example, we are presently defending a lawsuit brought by citizens groups seeking to block the homeporting of a nuclear aircraft carrier at NAS North Island. The suit alleges a variety of environmental violations, including failure to do proper environmental analysis under the National Environmental Policy Act, and inappropriate issuance of a dredging permit. A number of other environmental citizen suits have been threatened, including one to block Navy use of San Clemente Island for naval gunfire support, and one involving Navy protection of right whales off northern Florida. While we can never eliminate the threat of citizen suits being filed, we can minimize that probability, and build an effective defense, through continued attention to both the substantive and the procedural requirements of environmental law.

"c. Personal Liability. Most environmental statutes allow enforcement against both the organization and the responsible individuals within it. This personal liability can be either civil or criminal. While personal accountability for official acts is possible, it need not unduly concern Navy officials who are conscientious in the performance of their environmental duties. To date, four Department of the Navy employees have been convicted of environmental crimes for actions taken on the job; the circumstances in each case were egregious. The last conviction took place in 1992, when the NAS Adak civilian fuels director was convicted of Clean Water Act violations. He allowed several hundred thousand gallons of JP-5 to be released into the sea, through knowing continued use of ruptured piping. The best advice I can give to avoid personal liability is to be up front with the chain of command and with environmental regulators concerning known problems, and to document your compliance efforts. Along these lines, I also suggest you review Article 0832, Navy Regulations

1990, which requires reporting to the chain of command whenever environmental requirements cannot be achieved.

"6. I realize that this note is long, but I appreciate your taking the time to read it. Periodic review of these requirements will help us avoid future problems. We must work to preserve the Navy's well-deserved reputation within the environmental community as a responsible steward of the environment. That reputation enables us to negotiate from a position of strength when dealing with the agencies and environmental interest groups. It will also strengthen our case to amend the law, in the event of an irreconcilable conflict between environmental requirements and vital Navy operations. The Navy has had some recent success in amending environmental laws to facilitate Navy operations, as I will discuss in the next EMAIL on operational-environmental requirements at sea. You can expect to receive it in about three weeks."

/s/
H. E. GRANT

E-mail message from RADM Harold E. Grant dtd Tuesday, February 11, 1997.

President Signs National Invasive Species Act

President Clinton recently signed into law the National Invasive Species Act of 1996 (Pub. L. 104-332). According to the President's statement, the law "will help control the unintentional introduction and spread of invasive species, such as zebra mussel, throughout the waters of [the] Nation." The law establishes a national voluntary ballast water management program to reduce the threat of additional pest species entering the waters of the United States. The law also includes provisions for funding research and new technology demonstrations for combating aquatic nuisance species. A copy of the law is available online from MESO at http://environ.nosc.mil/Programs/MESO/newsltrs/fy97_no2.html.

White House Press Release, October 26, 1996.

NPDES Program Regulation Amendments: Round Two

On December 11, 1996, the Environmental Protection Agency (EPA) proposed numerous revisions to the National Pollutant Discharge Elimination System (NPDES) regulations (40 CFR parts 122, 123, 124, and 125). Summaries of some of the major revisions are noted below.

New Sources/New Dischargers (40 CFR 122.4, 124.56).

Section 122.4(i) prohibits the issuance of a permit to a new source or new discharger if the discharge would cause or contribute to a violation of water quality standards. A new source or new discharger may, however, obtain a permit for discharge into a water segment which does not meet applicable water quality standards by submitting information demonstrating that there is sufficient loading capacity remaining in waste load allocations (WLAs) for the stream segment to accommodate the new discharge and that existing dischargers to that segment are subject to compliance schedules designed to bring the segment into compliance with the applicable water quality standards.

The EPA is proposing to revise the information submission requirements to allow the Director to waive the present submittal of information requirements under Sec. 122.4(i) where the permitting authority determines that it already has the required information. In many instances the information required to be submitted by the applicant (such as waste load allocations available or compliance schedules for existing discharges) may already be in the Director's files. Where the information is not available or current, the director may not waive the requirement for the applicant to generate all supporting documentation. The EPA also proposed to include an express requirement in Secs. 122.4(i) and 122.56(b)(1) that information which demonstrates how the criteria for permit issuance in Sec. 122.4(i) are met is included in the fact sheet for the permit.

Group Permit Applications (40 CFR 122.26(c)(2))

The 1987 amendments to the Clean Water Act (CWA) added section 402(p) which established a two phase approach for addressing point source discharges of storm water. Under Section 402(p), Congress identified five classes of point source storm water discharges that would be included in Phase I of the storm water program and required to obtain NPDES permits. In the November 16, 1990, final rule, the EPA provided that storm water discharges associated with industrial activity could pursue one of three permit application options including the submission of:

- An individual permit application;
- A notice of intent to be covered under a general permit; or
- A group permit application.

The EPA proposes to eliminate the group application option at Sec. 122.26(c)(2), since the deadline for submitting group applications for Phase I facilities expired on October 1, 1992, and coverage under storm

water general permits is now widely available. Industrial facilities may readily obtain permit coverage by submitting a NOI to the appropriate permitting authority or through applying for an individual permit.

General Permits (40 CFR 122.28)

The EPA proposes to revise Sec. 122.28 to enable greater permit drafting flexibility. The proposal would allow the EPA to write a general permit covering a categories of permittees whose discharges, sludge-use or disposal practices differ more substantially than previously allowed. The proposal also provides that where dischargers (or treatment works treating domestic sewage) are subject to water quality-based limitations, the sources in that specific category shall be subject to the same water quality-based effluent limitations. Because the proposal would allow issuance of a single general permit to cover multiple categories of facilities, it would facilitate the use of general permits in areas with differing water quality requirements or standards. It may allow the permitting authority to issue general permits on a watershed or geographic basis to facilities with the same water quality requirements. The proposal would allow a permit to cover a single category of dischargers or treatment works treating domestic sewage to cover different subcategories subject to different effluent limitations, standards, or conditions. General permits are still subject to the same reporting and monitoring requirements, limitations, enforcement provisions, penalties, and other substantive requirements as individual permits.

Monitoring (40 CFR 122.41(j), 122.41(l)(4), 122.44(i)(1)(iv), 122.48)

The EPA is combining the provisions currently found at Secs. 122.41(j)(4) and 122.44(i)(1)(iv). Both of these provisions require that monitoring be conducted in accordance with test procedures approved under 40 CFR part 136 unless an alternative test procedure has been approved under part 136. For sludge use or disposal, monitoring must be conducted in accordance with test procedures approved under part 136 unless otherwise specified in 40 CFR part 503. The EPA is also clarifying that where no test procedure has been approved under 40 CFR part 136, the EPA shall specify a test method in the permit.

Effluent Guideline Limits in Permits (40 CFR 122.44(a))

The EPA is proposing to revise Sec. 122.44(a) so that it does not require limits for all guideline-listed pollutants under certain circumstances. Existing paragraph (a) would be redesignated as (a)(1). A new paragraph, (a)(2), would allow permit writers on a case-by-case basis not to include limits for guideline listed pollutants where a permit applicant certifies and provides supporting information that the facility does not discharge and will not discharge certain guideline-listed pollutants. In such cases, permit writers may decide not to include a limit for those parameters in the permit. The permit would not authorize any discharges of those excluded parameters in any amounts. For the exclusion to be valid, the permit would have to contain an express condition which notes that the permit does not authorize the discharge of those excluded pollutants. This exclusion is good only for the term of the permit. To receive an exclusion under proposed paragraph (a)(2), Permittees must submit certifications (along with supporting information) each time a permit is applied for (including permit reissuances). For such an exclusion to be valid, it must be included as an express condition each time a permit is issued.

Termination of Permits (40 CFR 122.64)

The EPA is proposing to revise Sec. 122.64 to allow the director to terminate a permit by giving notice to the permittee and without following part 22 or part 124 procedures where the permittee has permanently terminated its entire discharge (by elimination of its process flow or other discharge components) or has redirected that discharge into a POTW. Where a permittee objects to the termination, this revision would require the Director to follow the existing part 124 procedures to terminate the permit. The EPA is adding language in proposed Sec. 122.64 to state that expedited permit termination procedures are not available to permittees that are subject to pending state and/or Federal enforcement actions including citizen suits brought under state or Federal law. The proposal would enable the EPA to terminate permits when the discharger has eliminated its discharge without waiting for permit expiration.

Actions and RCRA Permit Terminations

The EPA is today proposing substantial revisions to its existing procedural requirements for issuing NPDES permits in those States and territories (and in Indian Country) where the EPA retains the authority to issue NPDES permits. The EPA is proposing to eliminate as unnecessary the existing procedures for conducting formal evidentiary hearings on NPDES permit conditions contained in 40 CFR part 124, subpart E, and is further proposing to eliminate the alternative "Non-Adversary Panel Procedures" in part 124, subpart F. The EPA is also proposing to eliminate Appendix A to part 124 (Guide to Decision-making under part 124) and modifying the procedures for terminating NPDES and RCRA permits. These revisions do not apply to authorized State NPDES Programs.

For further information contact: Thomas Charlton, Permits Division (4203), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460, (202) 260-6960. The complete text of the "Amendments to Streamline the National Pollutant Discharge Elimination System Program Regulations: Round Two; Proposed Rule" can also be obtained in Adobe® PDF format from MESO at http://environ.nosc.mil/Programs/MESO/newsltrs/fy97_no2.html.

Federal Register, Volume 61, Number 239, December 11, 1996, pp. 65267-65296.

Integrated Marine Environmental Compliance Program For Naval Shipyards

The goal of the NAVSEA 00T sponsored Integrated Marine Environmental Compliance Program (IMECP) is to develop a long-term, cost-effective, proactive strategy for marine environmental compliance at Naval Shipyards. The Naval Command, Control and Ocean Surveillance Center Research, Development, Test and Evaluation Division (NRaD) is accomplishing this by integrating regulatory

requirements with ecological science to provide a unified, risk-based monitoring and evaluation approach for environmental managers.

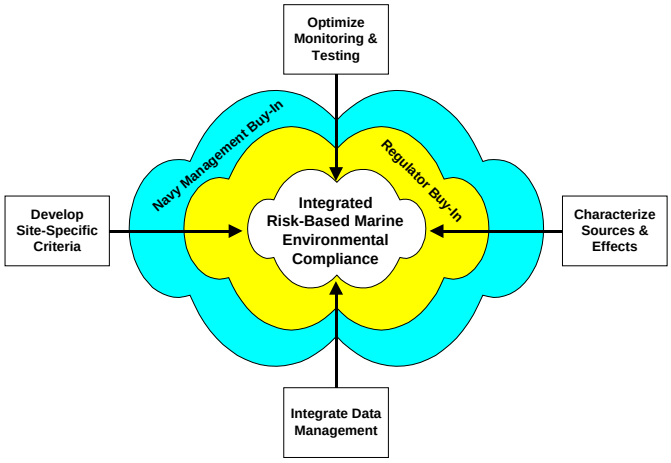
The IMECP is creating a process that will, over time, allow a transition from piecemeal regulatory controls to more effective and integrated compliance, with documentable results. The efficiency of an integrated approach will significantly reduce the cost of compliance. Moreover, it is consistent with recent regulatory trends to use ecological risk, multi-media, and watershed management approaches.

The IMECP provides an opportunity for alternative, performance-based demonstration of environmental excellence and leadership. It will produce superior environmental results that are consistent with the President's strategy for reinventing environmental regulation. Finally, NRaD believes an extra benefit of the program will be to provide regulatory relief in exchange for launching marine environmental compliance into the future.

NRaD's long-term vision for the IMECP has four thrusts:

1. **Integrate Data Management:**

- Data Model - a common generalized environmental data model.
- Data Reporting Specification - explains what data to report and how to report them in digital form in accordance with the data model.
- Database Design - a relational database built to the same data model specifications.
- Data Management Plan - guides the Shipyard environmental managers in implementing integrated data management with an emphasis on how they can share measurement data across their differing programs through a common or compatible database(s).



Elements of the Integrated Marine Environmental Compliance Program.

2. **Characterize Pollutant Sources & their Effects:**

- Thoroughly and accurately characterize all Shipyard discharges/sources.
- Determine all other sources and relative contributions, including point source discharges, nonpoint source discharges, and land and sediment contamination from past industrial practices.

- Develop comprehensive understanding of aquatic ecosystem health through ecological risk assessment.

3. Optimize Monitoring and Testing Schemes:

- Improve sampling designs by ensuring that appropriate parameters are being measured with valid spatial and temporal scales.
- Implement cost-effective sampling strategies through screening methodologies and tiered-sampling approaches.
- Evaluate and use existing data to justify changes in required monitoring to provide regulatory relief.
- Use more ecologically-relevant monitoring methodologies, including a shift from chemical analyses of point-source effluents to receiving waters and sediments, and biological and ecological receptors.

4. Develop Site-Specific Criteria:

- Use EPA-approved methods for shifting regulatory compliance from a "one-size-fits-all" approach that uses laboratory-derived national criteria to one that considers the specific characteristics of each water body and its aquatic ecosystem.
- Conduct smaller scale near-field studies, including mixing zone analyses, recalculation/resident species/water effects ratios, and chemical translators - Participate in or lead larger scale watershed/water body studies, including hydrodynamic mixing and contaminant transport & fate studies & models.
- Calculate accurate Total Maximum Daily Loads (TMDLs) to develop reasonable Wasteload and Load Allocations (WLAs/LAs) and derive realistic water and sediment quality standards, discharge effluent limits, and cleanup criteria for all stakeholders in the water body.

The program is being implemented in four phases (currently in Phase IV):

- Phase I: Conduct survey and data collection at Naval Shipyards, analyze the effectiveness of compliance programs, make recommendations to improve programs.
- Phase II: Initiate plan for Integrated Data Management, initiate implementation of Phase I recommendations by providing Shipyard-specific technical support on individual tasks.
- Phase III: Finalize Integrated Data Management plan, evaluate methodologies used in Ecological Risk Assessment for potential application in long-term compliance programs.
- Phase IV: Engage regulators in implementation, initiate ecological risk assessment approach to compliance at all Shipyards by developing Long-Term Monitoring Plans and implementing Integrated Data Management.

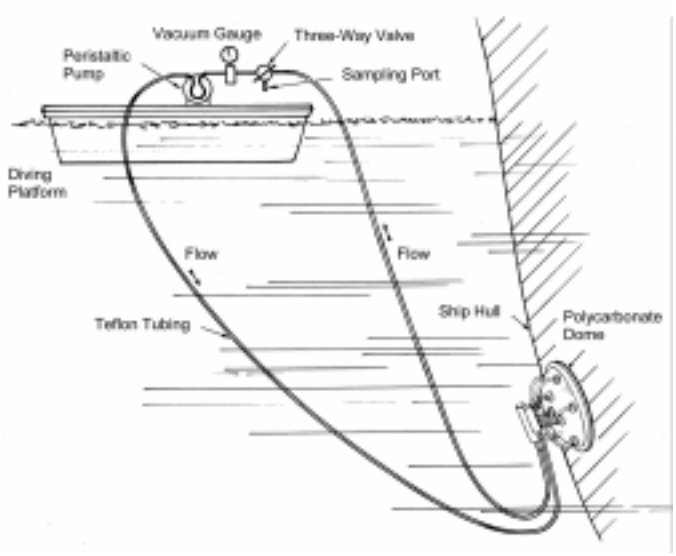
NRaD is currently finalizing the data management structure and developing long-term monitoring plans which are specific for each of the four Shipyards: Norfolk, Virginia; Puget Sound, Washington; Pearl

Harbor, Hawaii; and Portsmouth, New Hampshire. To provide a road map from which to design the monitoring plan, conceptual models for ecological risk assessment were developed for each Shipyard. Environmental personnel from the Shipyards have been involved throughout the process, providing valuable user input and feedback. Puget Sound will probably be the first Shipyard to introduce this innovative approach to their local regulatory agencies who oversee the Shipyard's water programs. Meetings are expected to occur there within the next several months. NRaD expects to work similarly with the other three Shipyards this year to coordinate with their respective regulatory authorities. Eventually, this ecological risk-based approach to compliance will be exportable to other Naval facilities.

For more information contact: Ron Gauthier, NCCOSC RDTE DIV D3621, 53475 Strothe Rd., San Diego, CA, 92152-3625, telephone: (619) 553-5330, e-mail: meso@spawar.navy.mil.

Sonar Dome TBT Release Rate Study Conducted By MESO

Vessel-mounted sonar domes utilize a rubber coating impregnated with tributyltin (TBT) to protect surfaces from biological fouling and permit effective sonar operations. The rubber coatings potentially release TBT to the surrounding environment over time. In support of the Navy's effort to promulgate Uniform National Discharge Standards for Department of Defense vessels (*Marine Environmental Update*, Vol. FY95, No. 2), a study was conducted by MESO at the Naval Station in San Diego, CA to determine TBT release rates from NOFOUL® rubber coatings, existing on the exterior and interior surfaces of surface ship sonar domes.



Schematic of the NRaD-developed in situ *release rate measurement system.*

Release rates were determined *in-situ* using a closed system developed by NRaD for the determination of release rates of ship hull antifouling coatings attached to the exterior dome surface. Direct TBT measurements were made from collected water samples by hydride derivatization and atomic absorption detection. Calculated exterior TBT release rates and interior concentrations were compared to total estimated TBT mass within San Diego Bay and within the confines of NAVSTA San Diego.

The data presented from the calculated exterior sonar dome TBT release rates indicated that release rates and flushing of domes would release very little TBT to the receiving waters of San Diego Bay when compared to existing calculated masses and known sources. The estimated releases of TBT would not result in water concentrations which would exceed the EPA's or the State of California's recommended water quality criteria.

For more information about Uniform National Discharge Standards, see the UNDS home page at http://www.n4.hq.navy.mil/unds.html.

Validation Of FPXRF For Metals In Marine Sediments

"The Validation of Field-Portable X-Ray Fluorescence Spectrometry for the Analysis of Metals in Marine Sediments," V.J. Kirtay, J.H. Kellum and S.E. Apitz.

The primary focus has been the study of FPXRF detection limits of metals, specifically Cu, Zn, and Pb, in marine sediments in the field, and the demonstration of the capabilities of the portable instrument relative to detailed standard chemical analyses. Instrument detection limits have been determined, and these have been compared to the manufacturer-stated detection limits. The lower linear range of the instrument was examined for Cu, Zn, and Pb using serial dilutions of a standard reference material, PACS-1 marine sediment (NRCC, Ottawa, Canada). Results from FPXRF analyses of sediment samples from various locations have been compared with results from standard analyses (Inductively Coupled Plasma Spectrometry, Atomic Absorption Spectrometry, Laboratory X-Ray Fluorescence Spectrometry). The data are used to draw correlations between the different methods, as well as to aid in establishing detection limits. The ability to reliably detect metals in sediments would allow for the generation of data from sediment grabs in a time-frame that could guide on site decision making for mapping strategies and detailed sampling.

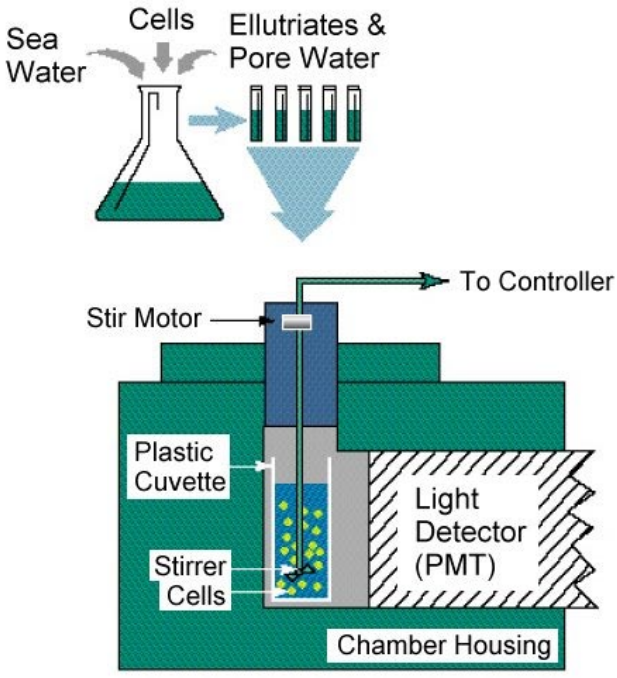
For more information contact: Victoria Kirtay at NCCOSC RDTE DIV D361, 53475 Strothe Rd., San Diego, CA 92152, telephone (619) 553-2794, e-mail: d361@spawar.navy.mil. This document is also available from MESO (see the form at the end of this newsletter).

NRaD Bioassay System Inventors Issued Patent

U.S. Patent Number 5,565,360, *Bioluminescent Bioassay System*, was issued recently to David Lapota, Marine Environmental Quality Branch, Code D362; Gary Mastny, and Hugh Copeland, both of the Materials, Sensors, and Systems Branch, Code D364. This invention relates to detecting bioluminescent emissions, particularly to counting photonic emissions of an aqueous solution of bioluminescent organisms to determine the level of environmental toxicity present in solution.

Ocean Test Equipment, Incorporated, has received a non-exclusive license to practice this invention, and is starting commercial production. Information about the Bioluminescent Bioassay System can be found on the WWW at http://www.spawar.navy.mil/sti/publications/pubs/td/2688/index.html, or by contacting: Dave Lapota at NCCOSC RDTE DIV D362, 53475 Strothe Rd., San Diego, CA 92152, telephone (619) 553-2773, e-mail: d362@spawar.navy.mil.

NRaD Outlook, February 21, 1997



Schematic of the Bioluminescent Bioassay System.

ABOUT THE *MARINE ENVIRONMENTAL UPDATE*

This newsletter is produced quarterly by the Marine Environmental Support Office (MESO), and is dedicated specifically to inform the Navy about marine environmental issues that may influence how the Navy conducts its operations. MESO is located at the Naval Command, Control and Ocean Surveillance Center Research, Development, Test and Evaluation Division (NRaD) in San Diego, California. The mission of MESO is to provide Navy-wide technical and scientific support on marine environmental science, protection and compliance issues. This support covers a broad spectrum of activities, including routine requests for data and information, technical review and consultation, laboratory and field studies, comprehensive environmental assessments, and technology transfer. Significant developments in marine environmental law, policy, and scientific advancements will be included in the newsletter, along with references and points of contact for further information.

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