

**Marine
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**DOD NOW SPENDING MORE ON CLEANUPS
THAN ON STUDIES**

The Department of Defense (DOD) is finally spending more money on cleanups than on studies, according to departmental officials who informed the House Armed Services Subcommittee on Military Installation and Facilities on April 19 and 20, 1994. The DOD is focusing on "three cleanup phases:" remedial design, remedial action, and interim remedial actions. Sherri Wassermann Goodman, Deputy Defense Secretary for Environmental Security, stated that it is the first time since 1984 that the amount of money allocated to environmental restoration and cleanup programs exceeded spending on studies. Currently, the DOD has asked for \$2.68 billion in fiscal 1995 for environmental restoration.

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In 1993, Goodman's office was able to considerably reduce sites thought to be in need of cleanup. Through site assessment and analysis, the original number of 19,694 cleanup sites was reduced to 10,439. The more than 8,000 sites deemed as not-hazardous are the result of studies, interim remedial actions, and cleanups performed during fiscal year 1993. Cleanups of 571 sites were successfully accomplished during that year. Goodman reported that the number of active DOD sites on the superfund National Priorities List had increased between 1987 and 1993 from 29 to 94.

On April 19, Rep. Duncan L. Hunter (R-Calif) pressed Elliot Laws, Environmental Protection Agency Assistant Administrator for Solid Waste and Emergency Response, to justify the increased expenditures that occur when an agency must comply with both state and federal cleanup standards. Laws responded by explaining that the EPA was working closely with state governors to come up with regulations that will satisfy both state and federal guidelines, hoping to adopt one entity to govern cleanups. Laws informed Hunter that in 1993 state legislation or regulations were responsible for increased costs 48% of the time in areas where costs for cleanups exceeded estimates. The remaining 52% was due to federal legislation and regulation.

DOD and EPA Tell Subcommittee About Methods for Improving Compliance

On April 20, officials told the House Subcommittee that the DOD is seeking continued improvement in its compliance with environmental regulations and that the EPA is expanding enforcement efforts to ensure that compliance. Deputy Defense Secretary Goodman told subcommittee members that in Fiscal Year 1993 the Defense Department paid \$8 million in fines for non-compliance. In addition, Goodman mentioned that the DOD is still negotiating another \$5 million in fines and has paid settlements totaling more than \$3 million.

Goodman says the DOD and its suppliers are apparently considering pollution prevention opportunities in the design and engineering of weapons, because almost 80% of the department's hazardous materials is linked to weapons systems production, maintenance, and disposal. She also indicated that the DOD is reforming the defense acquisition system to place higher priority on eliminating military specifications and standards that require the use of hazardous materials.

According to Steven A. Herman, head of the EPA's Office of Enforcement, federal facility compliance with agency regulations has improved in the 1990's, but compliance within the DOD still lags behind the private sector. In order to facilitate the cleanup of solvents, fuels, and wastes from military equipment repair and servicing, the DOD and EPA have created 93 inter-agency agreements under the Comprehensive Environmental

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Response, Compensation, and Liability Act. According to Herman, these agreements will also act to develop a design for sites considered to be of highest priority.

--*Environmental Reporter*, Vol. 24 No. 51, April 22, 1994, p. 2195.

--*Environmental Reporter*, Vol. 24 No. 52, April 29, 1994, p. 2232-2233.

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DOD SEEKS TO STANDARDIZE ENVIRONMENTAL MANAGEMENT

The Department of Defense has taken a major step in establishing Corporate Information Management programs. The goals included within the programs are to standardize business processes for the Department of Defense to move into an open systems environment, "migrate" its information systems to an integrated target system, and standardize data definitions and attributes. The Defense Review Management Decision 920, issued in December 1991, stated that a Defense Environmental Corporate Information Management (DECIM) Program Office needed to be established to support improvements of environmental business processes and consolidate current environmental information systems. DECIM's three goals are to:

- Identify "migratory" information systems for 24 functional environmental areas.
- Reengineer approved "migratory" systems to include data from all components for short-term use.
- Develop target systems to improve interoperability and incorporate future improvements for long-term use.

Other migratory systems are expected to be selected that will support management of data on installation restoration, pollution prevention, hazardous substances and hazardous waste, air emissions tracking, wastewater, underground storage tanks, conservation, occupational safety and health, and similar environmental programs. Version 1.0 of the Defense Environmental Information Network Exchange (DENIX) is a menu-driven bulletin board system that consolidates the service-specific bulletin board systems previously used, and includes environmental reports, EPA updates, daily environmental news, current and pending environmental laws and regulations, electronic mail features, and other options. An updated version of DENIX will be introduced this year. For information on DENIX or to obtain an account call (800) 642-3332.

--*Environmental Update*, Vol. 5 No. 3, April 1994, U.S. Army Environmental Center, p. 8.

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NAVY IS LOOKING FOR MORE THAN ONE "PAT" ANSWER

In an attempt to remain compliant with environmental laws without adversely affecting its operations, the Navy has formed four Process Action Teams (PATs) to develop national design standards for its platforms, weapons systems and facilities. The Environmental Performance Standards Quality Management Board (EPS QMB), managed by the office of the Chief of Naval Operations (N45), held its first meeting in June 1993 and is coordinating the four PATs. The four focus points and their objectives include:

- **Ordnance Design Standards**
Disposal, manufacturing, design, cleanup and environmentally sound ranges.
- **Facilities Design Standards**
Air emissions reduction in operation and maintenance, solid waste disposal, hazardous material storage and use, clean water issues, and natural resources problems.
- **Ship Design Standards**
Shipboard solid waste management, hazardous material use in shipboard operations and maintenance, air emissions reduction, ozone depleting substances reduction, clean water issues, shipboard medical waste, and a process for development of environmentally-sound ships.
- **Aircraft Design Standards**
Hazardous material use in aircraft, air emissions reduction, noise issues, natural resource issues, identification of operations that are in conflict with proposed regulations.

--*XCHANGE Pollution Prevention News*, Vol. 3 No. 1, Spring 1994, Naval Air Systems Command, p. 12.

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PERSON CAN BE POLLUTION "POINT SOURCE," GOVERNMENT TELLS SUPREME COURT

On April 4, 1994, the federal government asked the U.S. Supreme Court to decide whether an individual who knowingly discharges pollutants from the trunk of his car into navigable waters may be held criminally liable under the Clean Water Act (U.S. v. Villegas, US SupCt, No. 93-1512 04/04/94). The intention of the government was to reverse a federal appeal's court ruling, which ruled that such a release was not from a "point source" and therefore not prohibited by the Clean Water Act (CWA).

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A September 1993 ruling by the U.S. Court of Appeals for the Second Circuit contended that a point source of pollution, applying the term written within the CWA, generally refers to industrial and municipal polluters, not individuals (U.S. v. Plaza Health Laboratory Inc., 3 F.3d 643,37 ERC 1265; 24 ER 883). The government's petition argues that the Court of Appeals' ruling drastically erodes the protections of the CWA by concluding that the Act incorporates an industrial or municipal pollution requirement. The petition contends that the decision conflicts with the Act's plain language. The respondent, Geronimo Villegas was convicted in federal district court under the CWA for knowingly dumping vials of human blood from the trunk of his car into the Hudson River. Villegas was vice president and co-owner of Plaza Health Laboratories, a blood testing lab in Brooklyn, New York. The Second Circuit contended that Villegas was not a point source that falls under the CWA's mandates. The Court illustrated that the discharge of pollutants in rainfall runoff, such as chemicals in agricultural fertilizer, cannot be traced to a specific pipe or outfall. Thus, the Act prohibits discharges only from point sources.

The government petition contended that Congress used the term point source to distinguish it from diffuse runoff pollution, which Congress left to the states to regulate. By contrast, the pollution at issue here is readily attributable to a particular source, Villegas, and is therefore subject to federal regulation. The petition then stated that the district court instructed the jury that Villegas' car, not Villegas himself, was the conveyance for the pollution. The Second Circuit cited that intervention of a human being between a conveyance, or point source, and the nation's waters precludes conviction under the CWA. The decision conflicts with other circuits' decisions recognizing that the act prohibits "a broad array of polluting conduct that is logically indistinguishable from respondent's activities," thus meriting review by the nation's highest court.

--*Environmental Reporter*, Vol. 24 No. 51, April 22, 1994, pp. 2193-2194.

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COMMENT PERIOD EXTENDED

According to a spokeswoman from the Department of Commerce, the comment period on a proposed rule on natural resource damage assessment has been extended until July 7, 1994. The extension would allow more individuals additional time to review the measure. The Commerce Department's National Oceanic and Atmospheric Administration (NOAA) proposed the regulation on January 7th under the Oil Pollution Act of 1990.

The measure was expected by NOAA, industrial, and environmental group representatives to generate significant public comment, particularly on the definition



and authorization of the contingent valuation method for determining the value of natural resources. Contingent valuation is a method that attempts to quantify the "non-use" value of a natural resource, including the worth of a resource's availability to future generations.

Public meetings held March 24 and 25 by NOAA addressed regional issues and questions on the six months of research conducted by NOAA. Issues such as pre-spill planning were presented. Written comments on the proposed rule may be submitted to the NOAA Damage Assessment Regulations Team, 1305 East-West Highway, SSMC No. 4, Workstation No. 10218, Silver Spring, MD 20910.

--*Air & Water Pollution Control*, Vol. 7 No. 8, April 13, 1994, p. 6.

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EPA SAYS FARM, URBAN RUNOFF, MUNICIPAL SOURCES CAUSE MOST POLLUTION

The Environmental Protection Agency issued the *National Water Quality Inventory 1992 Report to Congress* on April 29, 1994. The report, which is the ninth in its series, has been and will be prepared every two years under Section 305(b) of the Clean Water Act. The Clean Water Act gives states the responsibility to monitor and assess their waters and report the results to EPA. In turn, the EPA provides guidance, technical assistance, and summarizes the results of the state assessments in a Report to Congress. Although currently unavailable for distribution, this report specifies that the leading sources of water pollution throughout the nation are municipal point sources, agricultural runoff, and urban areas.

The report includes rivers, lakes, estuaries, wetlands, coastal waters, Great Lakes, and ground water. Information on public health and aquatic life concerns, water quality monitoring, and state and federal water pollution control programs are also provided within the report. Water quality is measured within individual waters by determining if waters are clean enough to support uses such as fishing, swimming, and drinking. Water quality standards set by the states undergo approval by the EPA.

Assessment of the two-year report by the states encompasses 18% of the Nation's 3.5 million river miles, 46% of the Nation's 39.0 million lake acres, and 74% of the Nation's 37,000 estuary square miles. Although many waters remained unassessed within the report, comparison of the previous two-year report of 1984 reveals a near doubling of the regions evaluated. Approximately two thirds of assessed waters provide good enough quality to support the uses states set for them, therefore meeting the Clean Water Act goals established by Congress. One third of the evaluated waters with water

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quality problems, have them as the result of agricultural runoff, municipal sewage treatment plant discharges, storm sewers and urban runoff. Agricultural runoff was the most extensive source of pollution. The report estimates that:

- 40% of lakes, rivers, and streams within the United States are too polluted for fishing, swimming, or boating;
- Runoff from farm activity contributes 72% of total pollutants to rivers and 56% to lakes;
- Urban runoff accounts for 43% of the total number of square miles of polluted estuaries and 24% of impaired lake acres;
- Sewage treatment plants and other municipal point sources contribute 53% of total pollutants to estuaries.

The report contends that less than 3% of the Great Lakes' shoreline fully supports their designated uses. A large contributor to the degradation of the Great Lakes is atmospheric deposition and contaminated sediments. Carol M. Browner, the administrator of EPA, stated that the findings underscore the need for reauthorization of the Safe Drinking Water Act (SDWA) and the Clean Water Act (CWA). These findings prompt the passage of both the SDWA and CWA rewrites due in 1994. Additionally, the EPA and the states are implementing future pollution control programs including the National Combined Sewer Overflow Strategy, storm sewer permitting requirements, and water quality standards for wetlands.

--*Environmental Reporter*, Vol. 24 No. 52, April 29, 1994, pp. 228-229.

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WATER, AIR, FORESTS IN MUCH BETTER SHAPE THAN ON FIRST EARTH DAY

According to a report released on April 21, 1994 by the Pacific Research Institute, the quality of the nation's air, water, and forests has substantially improved since the first Earth Day in 1970. The report entitled "Index of Leading Environmental Indicators" maintains that the improvement is not solely due to federal regulatory enforcement. Other factors, such as economic efficiency, and state and local regulatory control have attributed greatly to the environmental amelioration. The report also cites the substantial contribution from the growing consumer preference for a clean environment as an amenity value.

The report cites many examples of improved qualities in the environment. The reduction of sulfur dioxide and lead emissions since the 1970's illustrates the success of air pollution limitation efforts. The introduction of unleaded gasoline and the elimination of lead compounds in paints and coatings contributed a near 97% decrease in



lead emissions. The report contends that forests have been making a rapid recovery in the United States. For example, in 1850, the state of New Hampshire was 50% forested area, currently it is 86% forested. Toxic releases have decreased substantially from 1988 to 1991. Total fuel consumption has declined by 13% from its 1978 peak resulting from automobile fuel efficiency. Copies of the report may be obtained from the Pacific Research Institute at (415) 989-0833.

--*Environmental Reporter*, Vol. 24 No. 52, April 29, 1994, pp. 2231-2232.

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"LAUNDRY LIST" OF ENVIRONMENTAL BILLS MAY BE COUNTERPRODUCTIVE

According to Steve Shimberg, minority staff director of the Senate Environment and Public Works Committee, the Clinton administration failed to set priorities for its recent environmental reform measures. Lack of prioritization has slowed the movement of environmental bills through Congress, according to a Senate Republican aide. Carol Browner, EPA Administrator, told the forum that reform of the Clean Water Act, the Safe Drinking Water Act, the pesticides law, and the superfund statute are all equally important. When asked by reporters to rank them in order of priority, Browner responded, "I need them all."

John Lawrence, majority staff director of the House Committee on Natural Resources commented that environmental issues are seen as less pressing than they were in the past. Lawrence states that an obstacle to congressional passage of environmental legislation lies within the Senate, particularly among Democrats from some Western states. According to Lawrence, these democrats have joined Republicans in opposing key resource reform efforts, such as those on fees for grazing and mining on federal lands.

Lawrence also feels that the large influx of new members in January 1995 and the scores of representatives that joined the chamber in recent years will contribute to the slow passage of the environmental bills. He stated that these new members "never have been through a legislative battle over an environmental law -- such as the 1990 passage of the Clean Air Act amendments." This lack of experience, according to Lawrence, will make major environmental reforms more difficult in the future.

--*Environmental Reporter*, Vol. 24 No. 52, April 29, 1994, pp. 2232.

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STATE REGULATORY HIGHLIGHTS

Refineries Accused of Allegedly Violating Discharge Limits in Bay Area

On March 2, a coalition of environmental groups filed federal suits against two oil refineries, the United States-owned Benicia and Union Oil Co.'s Rodeo, for violating selenium discharge limits into the San Francisco Bay system. The suits under the Clean Water Act claim that the companies violated the act in 1993 by discharging selenium into San Francisco Bay in excess of limits set by the National Pollutant Discharge Elimination System (NPDES). Plaintiffs include Citizens for a Better Environment, San Francisco Bay Keeper, Bay Institute of San Francisco, Santa Clara Valley Audubon Society, and Save San Francisco Bay Association.

The alleged discharges from the two companies specifically violate §505 of the CWA and §17200 of the California Business and Professions Code. The permit limits were set under a 1991 order of the San Francisco Bay Regional Water Quality Control Board stating the daily maximum selenium concentration discharge limits to be 50 parts-per-billion. The plaintiffs allege that both refineries have continually exceeded and will continue to exceed their NPDES permit limits.

The Regional Board's limits were set after EPA Region IX listed particular areas of San Francisco Bay as toxic hot spots under CWA Section 304(1). The section identifies point source dischargers who contribute to impaired waters, and also calls for control strategies to clean up pollution. According to the regional board's order, all San Francisco refineries were identified as substantial point source dischargers of selenium.

--*California Environmental Reporter*, Vol. 4 No. 10, March 25, 1994, p. 190.

Proposed DHS Certification Regulations Need Enforcement Scheme

The Association of California Testing Laboratories (actLABS) urged adoption of certification and enforcement regulations at a Department of Health Services (DHS) workshop on March 16. Proposed regulations set minimum standards and fees for state certification of environmental laboratories. Andy Eaton, the president of actLABS, contends that the proposed regulations are still in need of a well-defined enforcement scheme. Eaton claims that the association, representing 70% of the private and commercial testing business in the state, informed DHS that almost 30% of results generated by California-certified labs on EPA performance evaluation samples were inaccurate. Although many certified labs failed most of the tests in a performance evaluation sample, DHS did not investigate or take any enforcement action.



Eaton recommends that the proposed regulations enlist detailed procedures for enforcement actions based on the degree of violation. He suggested that DHS develop an annual self-certification process specifying that false information would be subject to strict penalties. In spite of actLABS concerns, Eaton urged adoption of the regulations because of the need to create effective laboratory certification regulations. For more information contact Ron C. Wetherall, Chief, Office of Regulations, (916) 657-0692.

--*California Environmental Reporter*, Vol. 4 No. 10, March 25, 1994, p. 186.

Santa Ana Water Board Adopts Update to Plan with Site-Specific Objectives

On March 11, state public notification requirements forced the Santa Ana Regional Water Quality Control Board to rescind its previously adopted site-specific objectives for cadmium, copper, and lead; and then to re-adopt these limits as part of its 1994 basin plan update. Confusion over procedural issues began due to last minute changes required by an October 15 ruling that invalidated the state water board's Inland Surface Waters Plan (ISWP). The modifications allowed less than the required public comment time. Beneficial use designations, omission of references to ISWP, and stricter objectives for un-ionized ammonia are the only other major draft differences between the approved plan and a draft released last summer. To obtain a copy of the plan, contact the California Regional Water Quality Control Board, Santa Ana Region, 2010 Iowa Ave., St. 100, Riverside, CA. 92507-2409; (909) 782-4130.

--*California Environmental Reporter*, Vol. 4 No. 10, March 25, 1994, p. 194.

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NRAD SAFEGUARDING POINT LOMA ENVIRONMENT

NRaD performs a valuable role promoting development, protection, and preservation of the environment for which the Navy is responsible. Occupation of the command encompasses 508 acres of the unique 1500 acre landmass of the Point Loma peninsula. The land was purchased in 1907 by the Navy originally for their first West Coast radio station. Since California's coastline is depleting rapidly, this area is considered critical because of the endangered ecosystem. Fortunately, the area has been relatively unspoiled by developers as a result of Navy ownership. In fact, much of the natural environment has been virtually untouched since Spanish explorer Juan Cabrillo came ashore over 450 years ago.

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Included in the 250 species of birds using the region for migration and residence, six are endangered species and four are listed as threatened. Point Loma's unique environment houses 53 species of birds, reptiles, mammals and bats which are considered sensitive or of special concern by the U.S. Fish and Wildlife Department. There have been sightings of coyotes, foxes, peregrine falcons, migratory bald eagles, and the northern red diamond back rattlesnake. Survival of this wildlife can be threatened by habitat destruction, as well as habitat fragmentation and isolation that leaves populations too small to survive normal population fluctuations.

The Point Loma habitat is composed of over 117 native and 53 introduced species of plants. Important representatives of six natural plant communities include the diegan coast sage scrub, the southern coastal bluff scrub, and southern maritime chaparral. Five species are nearly extinct in Southern California emphasizing the importance of preserving the critical remnants of these plant communities on Point Loma.

NRaD is committed to protecting this fragile ecosystem. In April, 1993, former NRaD Commanding Officer Captain J.D. Fontana joined the command officers of the other four commands on Point Loma in signing a letter of intent to develop a plan for protection of the natural resources. The agreement is to pursue good stewardship of the area's sensitive and unique natural resources. A 640-acre ecological Reserve Area is now in the final stages of development and is expected to be made official in the summer of 1994. The Navy can proceed with planned development to achieve its military mission while preserving the sensitive and unique resources under its jurisdiction.

NRaD, along with the Naval Submarine Base and the Fleet Industrial Supply Center, developed an Installation Restoration Community Relations Plan. The three commands identified a dozen potential cleanup sites on Point Loma and developed appropriate funding for sites that require remedial action. In addition to long-term, large-scale efforts, NRaD has taken the initiative to secure the natural environment in direct ways. Volunteer landscaping crews, mostly members of the Facilities Engineering Office, spend lunch hours pursuing a planting program to reestablish native area vegetation.

--NRaD *Outlook*. Vol. 18 No. 7, April 22, 1994. NCCOSC Research, Development, Test and Evaluation Division.

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BIOMARKERS RESEARCH AT NRAD

The Biomarkers program at the NRaD Marine Sciences Laboratory, has evolved over more than ten years of research on the biochemical responses of marine organisms to environmental pollutants. Back in the late 70's, standard survival/mortality-based dredge spoil bioassays were conducted in parallel with studies measuring the release of lysosomal enzymes resulting from stress related lysosomal destabilization and changes in hemolymph cell populations in mussels. This work revealed that, on a sublethal level, exposure to toxicants was expressed at the molecular/cellular level by changes in the extracellular concentration of lysosomal enzymes, hemolymph cell counts and fluctuations in the proportions of hemolymph cell types. Subsequent investigations examined stress-induced expression of various enzymes and proteins, in particular, the induction of metallothioneins (metal binding proteins) in response to trace metal exposure, and the induction of heat shock proteins or stress proteins, in response to elevated temperatures, trace metals, and tributyltin. Most recently, a number of promising biomarkers (stress proteins, DNA strand breaks and P-glycoprotein) have been evaluated in conjunction with growth, reproduction, and bioaccumulation in an ongoing multi-agency field survey of sites in San Diego Bay.

The goal of the biomarker approach is to develop a hierarchal series of molecular measures that will initially examine an organism's general level of challenge and then progressively establish the character of the toxicant to which the organism is responding. The current suite of molecular biomarkers under study require the processing of a very small number of cells (10^3 - 10^6), therefore determinations of each can be made for multiple tissues from a single organism. In most cases, these small samples can be easily archived to the benefit of investigations in the future. In addition, they are adaptable to new technologies, such as flow cytometry, which will no doubt refine our understanding of toxicity, and establish stronger links between these molecular responses and the potential for higher level, physiological, organismal, and population effects. For more information, contact Scott Steinert at (619) 553-2794.

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FREE QWIKLITE BIOASSAY SAMPLE ANALYSES OFFERED BY NRAD SCIENTIST

Nearshore coastal and harbor DOD and civilian communities are faced with increasingly stringent environmental regulations. The Navy has developed a rapid bioassay system (QwikLite) which is proving to be a valuable asset for conducting bioassay tests on various materials such as metals, storm drain discharge, Toxicity Reduction Evaluation (TRE) effluents, and ship hull coatings. The basis of detection is to measure light reduction from bioluminescent dinoflagellates. These microscopic

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plankton are found along all coastlines in the world. The response is usually measured within 24 hours from the start of the test and can be conducted for acute 48 or 96 hour tests. A substantial savings in operational costs can be achieved by use of this system compared to other standard bioassays.

The present system attracted interest at several conferences, including the First SETAC World Congress on Ecotoxicology and Environmental Chemistry held in Lisbon, Portugal in April 1993, and a description of the system has been published: "The use of stimutable bioluminescence from marine dinoflagellates as a means of detecting toxicity in the marine environment," by Lapota *et al.*, 1993, in Gorsuch, J.W. (Ed.) ASTM Special Technical Publication 1216, *Environmental toxicology and risk assessment*, 2nd vol, pp. 3-18.

The QwikLite system has already been used to test a TRE effluent from a shipyard with results which compared well in sensitivity with more traditional bioassays (LC₅₀) using shrimp and minnows. The new QwikLite system is undergoing final fabrication and we expect delivery in July 1994. In the meantime, we would like to extend an invitation to any of our readers to contact us about having their effluent samples tested with QwikLite, *free of charge*, as a way of introducing the potential use of this system to the environmental community. A brochure is available by request from MESO (see the form at end of this newsletter). For details about this offer, please contact:

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NEW PAPERS AVAILABLE FROM MESO

A Slurry Biocascade for the Enhanced Degradation of Fuels in Soils

A slurry biocascade for the degradation of fuels in highly contaminated, weathered, clay-rich soils has been developed. In this biocascade approach, different bacterial populations are optimized for sequential steps in the petroleum hydrocarbon degradation. In the first step, the simplest fuel components (*e.g.*, *n*-alkanes) are biodegraded. Then, the soil is transferred to the next steps in the cascade, in which different "microbial



soups" degrade the next groups of hydrocarbons (*e.g.*, the more recalcitrant components, such as multi-ring PAHs). Each successive step of the cascade maintains a microbial consortium that is optimized to consume organic components of increasing complexity. This "biological chemostat" has been demonstrated for the degradation of total petroleum hydrocarbons (TPH). Compared to the batch approach, the biocascade was shown to be much more effective both in terms of the rate and degree of degradation.

The Biodegradation of Fuels in Soils and Sediments: Differences as a Function of Mineralogy

Experiments were carried out to determine the effects of substrate mineralogy on the biodegradability of fuel components. Samples of quartz sand (Fischer Sea Sand) and illite clay (API#35) were spiked with DFM, aged, slurried and inoculated, and concentrations of fuel components were monitored over time. While there was chromatographic and biomarker evidence of TPH biodegradation on the sands, illite samples showed no evidence of loss of aliphatic components. PAHs, on the other hand, degraded equally well on both substrates, and in both cases, degraded to a much greater extent than did TPH.

ABOUT THE MARINE ENVIRONMENTAL UPDATE

This newsletter is produced 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's 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 law, policy, and scientific advancements will be included in the newsletter, along with references and points of contact for further information. The Marine Environmental Support Office may be reached at:

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