



Contaminated Sediments News



Sediment Strategy Forums Scheduled

EPA's Office of Water, Risk Assessment and Management Branch, is sponsoring three forums this spring/summer focusing on issues important to the Agency in developing a strategy for contaminated sediments. Each forum will include panel presentations by invited experts and discussion periods, as well as periods of time set aside for comments from the audience. Speakers will include representatives from EPA EMAP, NOAA NS&T, USGS, ACOE, MA Division of Food and Drugs, and others. A document summarizing the three forums will be produced and available in July 1992. The topics for these forums are as follows:

- Forum #1 - *Extent and Severity of Sediment Contamination*
Chicago, IL, April 21-22, 1992
- Forum #2 - *Contaminated Sediments: Building Alliances Among Federal Agencies*, Washington, DC, May 27-28, 1992
- Forum #3 - *Contaminated Sediments: Outreach and Public Awareness*
Washington, DC, June 16, 1992

For more information contact Tim Kestin, EPA-OST, at (202)260-5994.

Sediment Activities Around the Country

EPA Headquarters

Tiered Testing Workgroup Developing Standard Methods

On March 5, 1992, a detailed outline of EPA's sediment management strategy was distributed for public review and comment. Under the strategy, EPA will develop and use a consistent, minimum set of chemical

and biological methods across Agency programs to determine whether sediments are contaminated. These methods will be incorporated into various programs for the prevention, remediation, and management of dredged material disposal. Once a standard set of tests is established, they may be supplemented with EPA program-specific assessment methods. Individual programs may also develop their own guidance detailing the regulatory actions to be taken based on the assessment methods used.

An Agencywide "tiered testing workgroup" is currently working to identify the suite of tests that can be used by all EPA programs to consistently assess environmental problems caused by contaminated sediment. The workgroup met on March 31 to complete a review of EPA regulatory

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CS News is produced by EPA-OST to exchange relevant information on contaminated sediments and to increase communication among interested parties. To obtain copies of this report or to contribute information, contact Beverly Baker, EPA HQ, at (202)260-7037.

Contaminated Sediment Activities Timeline

April 21-22, 1992. EPA Sediment Strategy Forum #1 - Extent and Severity of Sediment Contamination. Chicago, IL. Contact Deborah Kanter at (617) 641-5317.

April 28-30, 1992. 2d ASTM Symposium on Environmental Toxicology and Risk Assessment. Pittsburgh, PA. Contact Chris Ingersoll at (314)875-5399.

May 14-15, 1992. National Conference on Bioavailability of Dioxin, PCBs, and Metals in Aquatic Ecosystems. Washington, DC. Contact Nora Claudias at (301)596-3855.

May 24-30, 1992. Water Quality International '92: 16th Biennial Conference and Exposition. Washington, DC.

May 27-28, 1992. EPA Sediment Strategy Forum #2 - Contaminated Sediments: Building Alliances Among Federal Agencies. Washington, DC. Contact Deborah Kanter at (617)641-5317.

June 16, 1992. EPA Sediment Strategy Forum #3 - Contaminated Sediments: Outreach and Public Awareness. Washington, DC. Contact Deborah Kanter at (617)641-5317.

June 21-24, 1992. Subsurface Restoration Conference. Dallas, TX. Contact Kathy Balshaw-Biddle at (713)527-4951.

September 1-3, 1992. 3rd National Meeting: Water Quality Standards for the 21st Century. Las Vegas, NV. Contact Patti Morris at (202)260-2806.



program sediment testing needs and requirements and the testing guidance that is now available. The workgroup also consulted with EPA's Office of Research and Development to design a program of research that will generate a set of standard sediment testing protocols. The research program, funded by the Office of Water, will be undertaken by EPA's Environmental Research Laboratories in Duluth, MN, and Narragansett, RI. Initial research will focus on the completion of acute sediment toxicity test protocols for appropriately sensitive marine and freshwater species, as well as bioaccumulation test protocols. Work is also planned to develop chronic sediment testing protocols. Quality assurance requirements and guidelines will be developed by the workgroup jointly with EPA's Environmental Research Laboratories and Environmental Monitoring and Systems Laboratories.

In addition to completing work on the test protocols, the workgroup is planning a national workshop on sediment toxicity testing. The workshop will bring scientists and regulators together to discuss a tiered sediment testing framework. For more information contact Tom Armitage, EPA-OST, at (202)260-5388.

Fish Consumption Advisory Special Interest Group Added to BBS

The Risk Assessment and Management Branch has established a Fish Consumption Advisory Special Interest Group (SIG) on the Nonpoint Source Bulletin Board System (BBS). The SIG functions as a discrete, fully functioning BBS. The purpose of the Fish Advisory SIG is to promote the exchange of fish advisory information among Federal agencies, State health departments, State fish and game services, State water pollution control agencies and the public.

The Fish Consumption SIG offers several features. The primary feature is a database that contains a bibliography of fish advisory-related reports, a table of existing fish advisories/bans

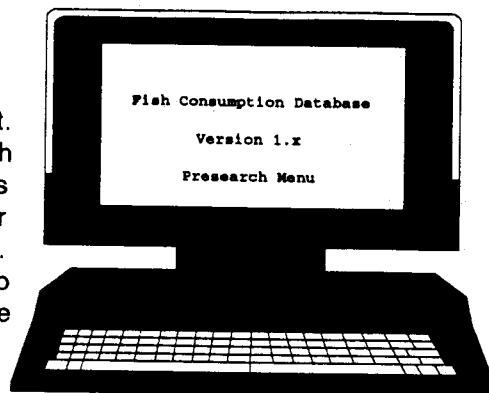
for each State, and the names and phone numbers of contacts who can provide additional information. The table of existing fish advisories contains the following information: the chemical of concern, the nature of the advisory (for the general public, a subpopulation, or commercial), the name of the water body, and the geographical extent. The database of fish advisories and bans can be searched for specific information. One possible way to search the database is to request the number, location and type of fish advisories in a particular state. A second possibility includes the number and location of all the fish advisories that have been issued in the United States for a specific contaminant such as chlordane. The bibliography can also be searched by title, author, and/or key words.

A second feature includes the posting of bulletins/news articles. This feature allows users to share fish advisory-related information and publicize fish advisory-related activities undertaken by the Federal government and the States. Other features enable users to leave messages requesting information from other users, to conduct discussions directly with colleagues, and to exchange computer files, including databases, electronic spreadsheets, word-processing files, and software.

The phone number of the BBS is (301)589-0205. To access the NPS BBS, you will need a personal computer, telecommunications software (such as Crosstalk or ProComm), a modem (1200 or 2400 baud) and a phone line that will handle modem communications. First-time users will be asked to fill out a short registration form and create a password. The Fish Consumption SIG can be accessed by typing **J 2** at the main board command prompt. EPA invites everyone to take a look at the database and welcomes

any suggestions on how to improve its use.

The draft of EPA's Contaminated Sediment Management Strategy is now available in the Fish Consumption SIG. The Office of Water is soliciting input on the draft proposal which has been distributed to over 900 people. The schedule and information on the three public forums are also included in the file.



A copy of the User's Manual can be down-

loaded if you are familiar with the operation of the NPS BBS, or it can be mailed to you. If you would like a copy or have any information to contribute to the Fish Advisory SIG, contact Alison Greene at (202)260-7052.

EPA Science Advisory Board Reviews Green Book

The EPA Science Advisory Board (SAB) provided a number of recommendations for improving the Green Book (see *Contaminated Sediments News*, Issue No. 4, p. 1) in its January 1992 report, EPA-SAB-EPEC-92-014, *Review of a Testing Manual for Evaluation of Dredged Material Proposed for Ocean Disposal*. Aspects of the manual addressed by the SAB include quality assurance/quality control, use of sediment quality criteria, selection of appropriately sensitive organisms for toxicity tests, use of application factors, interpretation of bioaccumulation test results, reference site selection, and interpretative guidance for decision-making. Many of the SAB recommendations will be incorporated into future revisions of the Green Book and into the Inland Testing Manual (under development) for evaluation of dredged material proposed for discharge in inland and near coastal waters (Clean Water Act waters). For more information contact Mike Kravitz, EPA-OST, at (202)260-8085.

Office of Radiation Programs

On October 8, 1991, ORP conducted a sediment workshop for Dr. Viktor N. Egorov, Deputy Director, Institute of Biology of the Southern Seas, in Washington, DC. Members of the EPA Sediment Oversight Technical Committee presented papers showing current U.S. status in sediment cleanup endeavors. Chris Zarba discussed "National Sediment Criteria," Mike Kravitz presented "Sediment Quality Assessment Methods," and Janet Burris discussed "Ecological Risk Assessment and Remedial Design at Superfund Sites." Jim Neiheisel and Bill Curtis discussed the results of the EPA study of the Black Sea investigation conducted in June 1990 for evidence of Chernobyl fallout in the Black Sea sediment and water column, as well as current studies of radioactivity in sediment of the Kieve Reservoir.

ORP has also developed a soil characterization protocol for radioactively contaminated soils at Superfund sites that is also applicable for characterization of radioactive sediments and remedial considerations. The protocol was developed by ORP from hands-on studies at radium-contaminated sites at Montclair and Glen Ridge, New Jersey, and from thorium-contaminated sites at Wayne and Maywood, New Jersey. The protocol is in press as an OSWER Technical Bulletin.

ORD ACTIVITIES

ERL-Newport

Sediment contaminants may pose a human health risk if they are bioaccumulated by clams and other edible sediment-dwelling organisms. A key question is whether ecologically-derived sediment quality criteria are sufficiently stringent to protect human health so that health risks do not have to be explicitly considered. Henry Lee (EPA), Martha Winsor (ASCI), and Robert Randall (EPA) of the ERL-N Newport laboratory are addressing this question by modeling the tissue residues in shellfish at sediment

quality "guideline" values and then predicting the associated health effects.

Cancer risk is estimated by EPA's linearized multistage cancer model, whereas noncarcinogenic effects are predicted from the hazard quotient. The health risks associated with 12 carcinogens and 8 noncarcinogenic metals are calculated for shellfish consumption rates ranging from one meal per day to one meal per lifetime. Bioaccumulation of neutral organics is predicted from the equilibrium partitioning bioaccumulation model and metals from bioaccumulation factors (BAFs). The five ecologically-derived sediment "guidelines" are as follows:

- the interim equilibrium partitioning (EqP) values,
- the median and sensitive apparent effect thresholds (AET) from Region 10, and
- the median and low effects range (ER-M and ER-L) developed by NOAA.

With the exception of the EqP values, the sediment guidelines are not sediment quality "criteria" per se, but they should bracket the range of any ecologically-derived criteria.

For the carcinogens, the lifetime excess cancer risks of 10^{-6} and 10^{-4} were used as cut-offs for unacceptable risks. At one meal per day, the 10^{-6} risk was exceeded for at least one of the ecologically-derived guidelines for all 12 compounds, with the EqP values exceeding the 10^{-6} risk for 8 to 12 of the carcinogens. The number of sediment guidelines resulting in risks exceeding 10^{-6} declined with reduced consumption rates, but at one meal per year one or more of the sediment guidelines resulted in risks exceeding 10^{-6} with 7 of the 12 compounds. Even at the lowest possible consumption rate, one meal in a lifetime, the 10^{-6} risk was exceeded by the AET-M and EqP values for benzo (a) pyrene and by the AET-M for PCBs. The analysis using 10^{-4} risk showed a similar pattern although none of the compounds exceeded 10^{-4} risk with one meal per lifetime.

For the noncarcinogens, only four sediment guidelines are used as EqP does not apply to metals. At a consumption rate of one meal per day, seven of the eight metals have hazard quotients exceeding 1.0 for one or more of the sediment guidelines. The hazard quotient is a threshold value, with a value greater than 1.0 indicating that sensitive individuals would be adversely affected. At one meal per month, only cadmium has a hazard quotient exceeding 1.0 for one of the sediment guidelines, and there are no violations with one meal per year or lifetime.

The main conclusion to draw from this analysis is that ecologically-derived sediment quality criteria do not protect human health for a variety of carcinogenic and noncarcinogenic pollutants. Therefore, human health risks should be considered in the development of sediment quality criteria and the management of contaminated sediment. For more information contact Henry Lee, ERL-Newport, at (503)867-4042.

GREAT LAKES NATIONAL PROGRAM OFFICE

The ARCS program has initiated several pilot-scale demonstration projects to employ innovative technologies in the treatment of contaminated sediments. Three additional projects will be completed this summer. All of the pilot projects are being managed by the local Corps of Engineers office.

Buffalo River, Buffalo, NY

The Buffalo River demonstration was completed in November 1991 at a confined disposal facility (CDF) managed by the U.S. Army Corps of Engineers. Twelve cubic yards (yd^3) of contaminated sediments from the Buffalo River were processed in a low-temperature thermal desorption unit provided by Remediation Technologies, Inc. This unit volatilizes the organics of concern (PAHs, oil and grease) and recondenses them in an oil mixture. The remaining solid

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Focus: New England

ERL-Narragansett Develops "Soft Bottom" Sediment Corer

After a long series of tests and modifications, a sediment corer developed at ERL-Narragansett has been shown to be capable of collecting intact and undisturbed sediment cores from "soft bottom" locales in Narragansett Bay, RI. Present cores are 6 inches in diameter and up to 24 inches in length. The collection method uses a water vacuum, created at the sediment-water interface, that is capable of removing the core from the sediment bottom. The core is then transferred to the water surface and subsequently placed on the deck of the ship, where a removable nose cone containing the core is put into a life support system for transport to laboratory microcosms. Future efforts will be directed toward increasing the diameter of the sediment core from 6 inches to 12 inches. In addition, the degree of "soft bottom" hardness will be quantified (via grain-size analysis) throughout the Bay so that the range of sediments in which the corer can function successfully will be rigorously defined for future users.

This corer is valuable because many aquatic environments are so highly

polluted that the use of divers to collect intact sediment cores for subsequent research studies could represent a serious health threat to the investigators. This corer eliminates such risks to human health. For more information contact Kenneth Perez, ERL-Narragansett, at (401)782-3052.

Casco Bay Critical Habitat Pilot Study

The Casco Bay National Estuary Program has developed a menu-driven GIS application to support the National Estuary Program's need for multimedia information for watershed characterization and protection of shellfish resources in Casco Bay. Data were digitized and integrated for shoreline areas, shellfish beds, biological areas, critical resource areas, hydrography and drainage areas, and NPDES locations. Future efforts will include the addition of soils, contours, land use/land cover, landfills, and an agricultural inventory to assess impacts of nonpoint source pollution on critical habitats and shellfish. In addition to creating the GIS layers, an interface for EPA's PCS data base will be created to allow easy downloading of monitoring data for input into the GIS application. Once the system is fully implemented, users will be able to evaluate potential causes of degradation, assess the potential impact of point and nonpoint source pollution, and target high-risk dischargers for further controls. For more information contact Ray Hall, EPA-OCPD, at (202)260-1998.

Summary of Recent Capping Investigations with Dredged Sediments in New England

Capping of contaminated dredged sediments in mounds at shallow (20-60 m) offshore disposal sites with less contaminated sediments has been used as a management practice in New England since the early 1970s. Evaluation of the success of this technique and extension of its use to deep-water sites (60-100 m) has been the focus of a number of studies over the last several years. These studies have included assessment of physical mound stability, the long-term isolation of contaminants within the mounds, and surveys to determine the feasibility of creating sediment mounds at sites in the 100-m depth range. The passage of Hurricane Gloria in 1985 was found to have limited erosion effects on capped disposal mounds at the central Long Island Sound disposal site at the 15 to 20-m depth. This observation has also been supported by observations of mound stability at several sites for up to 15 years. Chemical profiles measured in cores taken in mounds in 1990, more than 10 years after contaminated sediment and cap sediment placement, showed no detectable contaminant migration. More recently, studies of mound formation with disposed sediments at the Massachusetts Bay disposal site, at a 90-m depth, have begun to support the feasibility of capping sediments at this and other sites with similar depths. For more information contact Tom Fredette, US-ACE, at (617)647-8291.

ENVIRONMENT CANADA

Sediment Database Compiled

The U.S. Geological Survey Office of Energy and Marine Geology has maintained a scientific East Coast (off-shore) sediment database since the 1970s. In an effort to extend coverage to inshore coastal areas and compile a contaminated sediment database that would attempt to include as comprehensive as possible an inventory of chemical, geological/physical, and environmental parameters from all sources (published and unpublished), USGS initiated a pilot program using Boston Harbor-Massachusetts Bay.

In the past, many scientists have regarded working with heterogeneous older data as difficult and have often simply launched new field studies. Working with the Massachusetts Water Resources Authority (MWRA) and EPA Region I, USGS sifted through quantities of older data and documents to demonstrate that special approaches permit large-scale processing (computer entry, validation, and integration) of data from hetero-

geneous sources. For example, recovery of data from some 1300 samples from the area to date revealed a more detailed breakdown of sediments in terms of their toxicity potential for mercury and 7 other metals, when the effects-based sediment toxicity criteria of Long and Morgan (1990) were applied. Different toxicity criteria will alter toxicity ratings, but the new data input transforms the scope of knowledge of environmental parameters used to make management decisions.

Besides continuing data compilation and disseminating the data to users, current and future efforts focus on linking pollutant distribution with bottom sediment maps and creating maps of pollutant concentrations at different time intervals. These may help to evaluate and predict changes caused by major events such as storms or dredging. For more information contact Frank Manheim, USGS, at (508)457-2235.

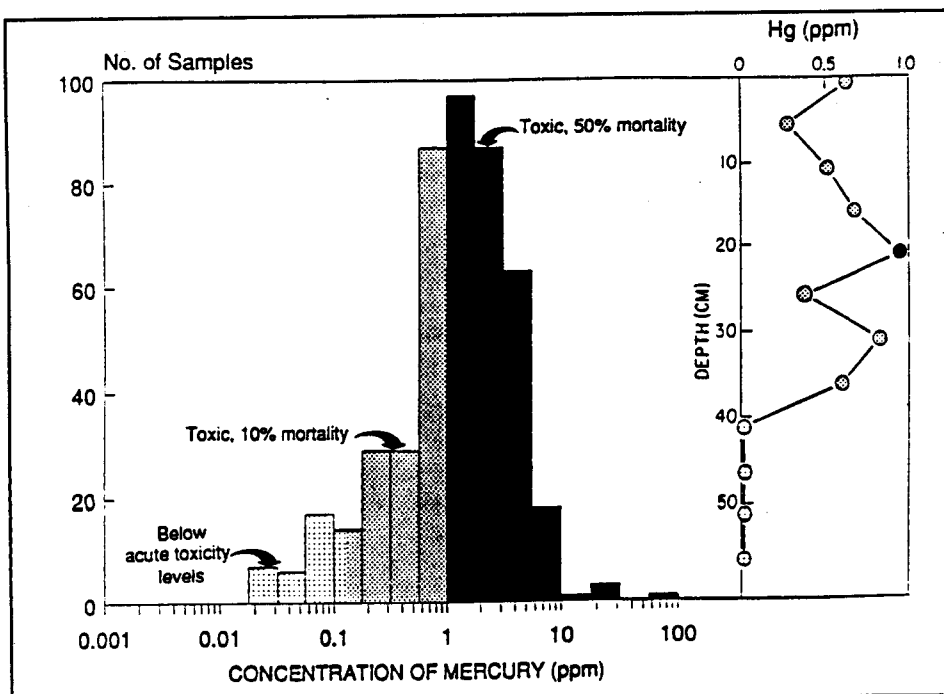
The Environmental Quality Guidelines Division of Environment Canada has the responsibility for developing national sediment quality guidelines. These guidelines are defined as numerical concentrations or narrative statements recommended to support and enhance designated uses of the aquatic environment. These activities are carried out under the auspices of the Canadian Council of Ministers of the Environment (CCME), and all guidelines are reviewed and approved by the provincial and territorial members.

Currently, the protocol for the derivation and use of sediment quality guidelines (for the protection of freshwater and marine aquatic life and their uses) is being finalized. Once the protocol is approved by the CCME, guidelines will be developed for priority substances identified by such clients as provincial and territorial agencies, the National Contaminated Sites Remediation Program, and the Canadian Environmental Protection Act (which includes ocean dumping activities).

Sediment quality guidelines are intended to provide scientifically-based "yardsticks" or reference points for addressing sediment quality issues and concerns. These guidelines will contribute to the consistent development of site-specific objectives" which account for local environmental conditions, as well as socio-economic factors), remediation objectives, and the regulatory requirements of various Canadian programs.

For more information on the development of sediment quality guidelines in Canada, contact Sherri Smith at (819)953-3082 or Amanda Brady at (819)953-3206.

Mercury in Sediments



material was either combined with portland cement to determine the effectiveness of restricting the leaching of heavy metals or disposed of at an appropriate facility.

Saginaw River and Bay, MI

Using particle size separation technologies, Bergmann, USA initiated a demonstration project in Saginaw Bay, MI, in the fall of 1991. The project will be completed this summer. This demonstration project combines soil washing and particle separation technologies to treat PCB-contaminated sediment. Using a barge-mounted unit located at a COE-operated CDF in Saginaw Bay, a total of 300 to 400 yd³ of sediment will be processed through the apparatus to separate the sands from the silts and clays. In a full-scale project, PCBs will bind to the smaller grained silts and clays so that the sand mixture, which is roughly 80 percent of the total volume, will hopefully be clean enough to be used for some beneficial purpose (beach nourishment or construction fill). The remaining 20 percent will be disposed of in a CDF or destroyed using other treatment technologies. A portion of the contaminated silt will be sent to the Risk Reduction Engineering Laboratory in Cincinnati, OH, to be treated using biodegradation techniques.

Grand Calumet River, IN

This demonstration project will take place in May 1992 at the U.S. Steel Gary plant, adjacent to the Grand Calumet River, IN. The Basic Extraction Sludge Technology (BEST), a solvent extraction process, will be used to extract PCBs, PAHs, and oil and grease from 140 gallons of contaminated sediment. The solvent, triethylamine, was developed by the Resource Conservation Company.

Ashtabula, OH

A low thermal desorption technology will be used this summer to treat 15 to 20 yd³ of sediment contaminated with PCBs and other chlorinated hydrocarbons from the Astabula River in Ashtabula, OH.

Sheboygan, WI

Bioremediation technologies will be used to treat 3300 yd³ of contaminated sediments from the Tecumseh Motors

Superfund site. These sediments are currently stored in a confined treatment facility on Tecumseh property. Sediments will be cycled from oxic to anoxic conditions, and/or nutrients will be added to achieve complete PCB degradation. The firm Blasland and Bouck will be working with ERL-Athens to complete this demonstration project.

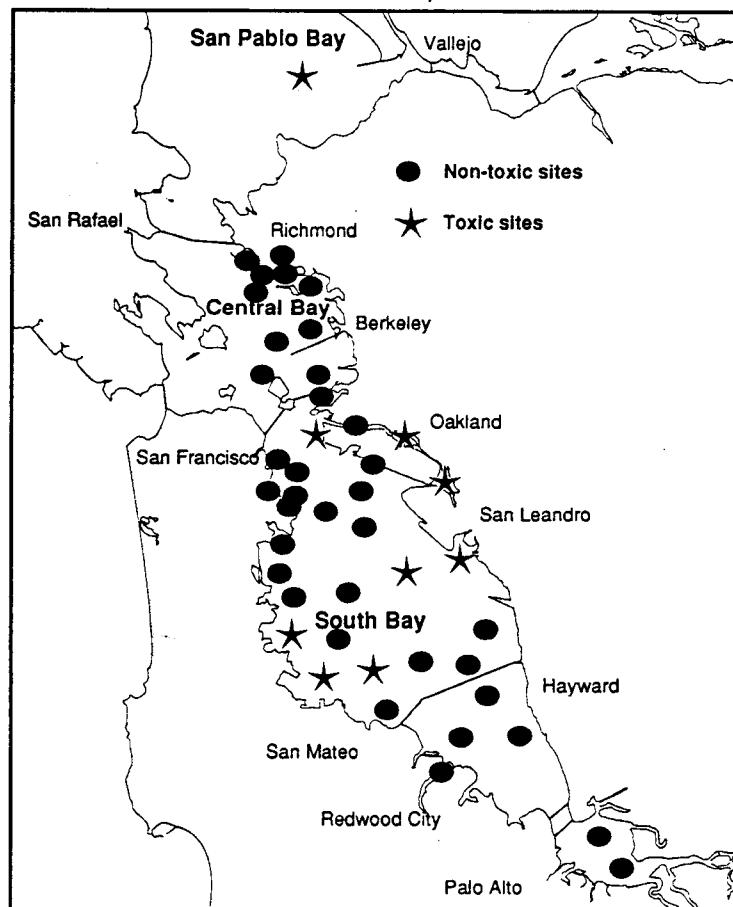
For more information on these demonstration projects, contact Steve Garbaciak, GLNPO, at (312)353-0117.

NOAA

As part of the assessments of the biological effects of toxicants in the marine environment, NOAA's National Status and Trends Program has conducted a series of surveys of sediment toxicity in selected regions. The first of these surveys was conducted in the San Francisco Bay estuary. The survey was intended to determine the spatial extent, spatial pattern, and severity of toxicity throughout the estuary. Toxicity data both from historical surveys and from the testing of sediments from 45 sites were evaluated.

Numerous sites have been sampled for sediment toxicity in historical surveys performed by several laboratories and sponsored by numerous agencies. Sediments from these sites were tested for toxicity with amphipod (*Rhepoxynius abronius*) survival tests and/or bivalve larvae (*Mytilus edulis* or

Crassostrea gigas) normal morphological development tests during the period of 1985-1990. Based upon the cumulative record from these surveys, most of the estuary has been tested for toxicity with one or both of these tests. Out of a total of 111 samples tested with *R. abronius*, 56 (50.4 percent) were significantly toxic. Of 202 samples tested with bivalve larvae, 116 (57.4 percent) were significantly toxic. In some areas tested in the historical surveys, toxicity was very patchy and inconsistent among tests and surveys; in other areas, toxicity was relatively consistent. Highest toxicity was observed mainly in peripheral harbors such as Mare Island Strait near Vallejo, Richmond Harbor, Oakland Harbor, along the San Francisco waterfront, Redwood Creek, and Guadalupe Slough at the extreme southern end of the estuary. The Alcatraz dredged material disposal site was relatively toxic, and some of the sediments from the basins of San Pablo Bay, Central Bay, and South Bay were very toxic. Toxicity continued on p. 7



Locations of 45 sampling sites including 9 that were toxic to bivalve larvae

was relatively highly correlated with the concentrations of aromatic hydrocarbons and, to a lesser extent, certain trace metals and pesticides.

In 1990 NOAA sponsored a synoptic survey of sediment toxicity, performed by ToxScan, Inc. Surficial sediments were collected at 45 sites within the estuary, mainly in the Central and South Bay basins and adjacent peripheral areas. Toxicity was determined with a battery of tests, one of which was the bivalve larvae (*M. edulis*) test of survival and normal development. Sediments from 9 of the 45 (20 percent) sampling sites were significantly toxic to either survival or normal development of the bivalve larvae. The toxic sites were located in San Pablo Bay, South Bay, and Oakland Harbor/San Leandro Bay. Tests of cytogenetic/cytologic endpoints in both mussel larvae and sea urchin larvae indicated significant effects in most or all of the 15 samples tested.

The results of both the historical surveys performed in 1985-1990 and the survey performed for NOAA in 1990 indicated that toxic conditions are widespread throughout the estuary. Toxicity was more frequent and often most severe in peripheral harbors and waterways, but as expected, some basin areas also were toxic in some tests. The results of this work in San Francisco Bay are expected to be published as a NOAA technical memorandum this spring. For more information contact Ed Long, NOAA, at (206)526-6338.

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