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**Proceedings of the Seventeenth
Annual Aquatic Toxicity
Workshop: November 5-7,
1990, Vancouver, B.C. Vol. 1**

**Comptes rendus du dix-septième
colloque annuel sur la toxicologie
aquatique : 5-7 novembre
1990, Vancouver, (C.-B.) vol. 1**

Editors/Éditeurs

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February 1991

Février 1991

**Canadian Technical Report of
Fisheries and Aquatic Sciences
No. 1774 (Vol. 1)**

**Rapport technique canadien
des sciences halieutiques et
aquatiques n° 1774 (vol. 1)**



Fisheries
and Oceans

Pêches
et Océans

Canada

TECHNICAL REPORT DATA		
(Please read Instructions on the reverse before complet.		
1. REPORT NO. EPA/600/A-94/002	2.	3.
4. TITLE AND SUBTITLE AN APPLICATION OF "REAL-TIME MONITORING IN DECISION MAKING:THE NEW BEDFORD HARBOR PILOT DREDGING PROJECT	5. REPORT DATE	
	6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) William G. Nelson	8. PERFORMING ORGANIZATION REPORT NO. ERLN-1197	
	10. PROGRAM ELEMENT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS US EPA Environmental Research Laboratory 27 Tarzwell Drive Narragansett, RI 02882	11. CONTRACT/GRANT NO.	
	13. TYPE OF REPORT AND PERIOD COVERED Peer Reviewed Proceedings	
12. SPONSORING AGENCY NAME AND ADDRESS	14. SPONSORING AGENCY CODE	
	15. SUPPLEMENTARY NOTES Proceedings of the 17th Annual Toxicology Workshop Vancouver, BC. Canadian Technical Report Fisheries and Aquatic Sciences 1991 1(1774):76-69.	
16. ABSTRACT A decision-making framework was established for assessing the impacts of a pilot dredging study at the New Bedford Harbor, MA, Superfund site. Concern over possible environmental impacts due to dredging at this site necessitated that a monitoring program be implemented to ensure that unacceptable water quality impacts did not occur during this project. Consequently, criteria were derived, a management committee assembled, and a "real-time" monitoring plan designed. Because many existing chemical concentrations in the water column and indigenous biota exceeded Federal and state water quality limits, site-specific chemical and biological criteria were established. A committee of environmental managers from Federal and state government was established with the authority to assess and modify the operation on a daily basis. Finally, a "real-time" monitoring plan was implemented in which water samples were collected, analyzed within 16 hours, and the data supplied to the management committee in order to assess the environmental impact of the previous days' operation. The combined use of site-specific criteria and a "real-time" decision making management process allowed for successful completion of this project with a minimal effect on water quality.		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Dredging Project New Bedford Harbor Monitoring Decision Making assessing impacts Super Fund site water samples	indigenous biota	
18. DISTRIBUTION STATEMENT RELEASE TO PUBLIC	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES 4
	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE

AN APPLICATION OF "REAL-TIME" MONITORING IN DECISION MAKING:
THE NEW BEDFORD HARBOR PILOT DREDGING PROJECT

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ABSTRACT

A decision-making framework was established for assessing the impacts of a pilot dredging study at the New Bedford Harbor, MA, Superfund site. Concern over possible environmental impacts due to dredging at this site necessitated that a monitoring program be implemented to ensure that unacceptable water quality impacts did not occur during this project. Consequently, criteria were derived, a management committee assembled, and a "real-time" monitoring plan designed. Because many existing chemical concentrations in the water column and indigenous biota exceeded Federal and state water quality limits, site-specific chemical and biological criteria were established. A committee of environmental managers from Federal and state government was established with the authority to assess and modify the operation on a daily basis. Finally, a "real-time" monitoring plan was implemented in which water samples were collected, analyzed within 16 hours, and the data supplied to the management committee in order to assess the environmental impact of the previous days' operation. The combined use of site-specific criteria and a "real-time" decision making management process allowed for successful completion of this project with a minimal effect on water quality.

EXTENDED SUMMARY

New Bedford Harbor (NBH) is located along Buzzards Bay between the cities of New Bedford and Fairhaven, MA. Since the 1940's, electronics and manufacturing companies in the area have discharged effluents containing polychlorinated biphenyls (PCBs) into the harbor. High PCB concentrations in harbor sediments were first documented in 1974 (Connelly and St. John, 1988), with PCB concentrations as high as 100,000 parts per million (ppm) in some areas of the upper harbor. In 1982, the site was added to the Environmental Protection Agency's (EPA) National Priorities List of hazardous waste sites slated for cleanup under the Superfund Act.

A feasibility study conducted by EPA in 1984 proposed several alternatives for the remediation of NBH. One option common to most remediation alternatives was the dredging of contaminated sediments. Federal, state, and local officials, as well as the public, expressed concern that the resuspension of sediments during dredging may cause the release of contaminants that would affect biota at more distant areas in the harbor and Buzzards Bay. Others cited potential pollution problems from contaminated water (leachate) leaking from the proposed disposal site (Averett and Francigues, 1988).

In order to address these concerns, EPA Region I, in conjunction with the U.S. Army Corps of Engineers (COE), initiated the NBH Pilot Dredging Project to establish the impacts of various dredging and disposal options on a small scale with relatively low (with respect to NBH) contaminated sediments (PCB concentrations approximately 100 ppm). Information derived from this project would be used to determine the most environmentally safe methods for use in a possible large scale remediation of the most contaminated areas of the NBH Superfund Site.

The overall goal of the Pilot Project was to determine the feasibility of various dredging and disposal options for removing and sequestering highly contaminated sediments in NBH. This included assessing whether or not it was practical from an engineering perspective, as well as determining if the operations could be completed without causing unacceptable environmental impacts. The engineering aspect of the project assessed three shallow-water dredges capable of removing sediment with minimal resuspension. In addition, two disposal methods were evaluated: 1) a confined disposal facility (CDF), which required construction of a containment dike partially in-water and partially on land; and 2) a confined aquatic disposal cell (CAD), an in situ underwater disposal method (Otis, 1987). The results of these engineering operations are reported elsewhere (Otis, 1989).

A second objective implicit in the overall goal was to determine whether the engineering operations could be completed in such a manner as not to cause unacceptable damage to the environment. The decision-making process used to assess the environmental acceptability of this project is the topic of this summary.

Because of the high PCB concentrations in the sediments to be dredged during the Pilot Project (100 ppm), it was necessary to make rapid assessments as to the environmental "acceptability" of the operations. The evaluation of possible unacceptable contamination of the water column due to dredging during the Pilot Project was complicated by the fact that Federal and State water quality standards for PCBs (U.S. EPA, 1980) and certain heavy metals (U.S. EPA, 1985) were exceeded in NBH under preoperational baseline conditions. In addition, the U.S. Food and Drug Administration (FDA) action level for PCBs in seafood in NBH was exceeded (Kolek and Ceurvels, 1981).

These special conditions necessitated the development of a distinctive site-specific monitoring/management strategy for the Pilot Project. This framework included several unique aspects: 1) development of a set of site-specific Decision Criteria for assessing water and tissue chemical concentrations and biological effects, 2) establishment of a panel of environmental managers, Decision Criteria Committee, to use those data in a timely manner, and 3) design and implementation of a monitoring program to provide the necessary environmental data to the Committee in a rapid time-frame (12-24 hours). This approach provided an effective feedback loop to evaluate, modify or terminate the dredging operation if the Decision Criteria were exceeded.

Each aspect of this strategy was successfully implemented. First, site-specific Decision Criteria were established at two strategic locations within the harbor. The philosophy adopted for establishing criteria values was that

short-term, near-field elevations in contaminant concentrations or biological effects would be evaluated against long-term improvements in water quality, provided that no far-field effects were observed. Using this rationale, criteria were established for a number of physical, chemical, and biological parameters based on data collected prior to the initiation of dredging (Nelson and Hansen, In press).

Secondly, a Decision Criteria Committee was formed with representatives from each of the major participants involved in the study: EPA Region I, the COE, the Massachusetts Department of Environmental Protection, and EPA's Environmental Research Laboratory, Narragansett, RI (ERL-N). This committee was empowered to make decisions on a daily basis if there were impacts attributable to the operation. Possible corrective actions to limit adverse effects due to the project ranged from altering operational procedures to temporarily halting the operation or termination of the study.

Finally, a monitoring plan was developed and implemented by ERL-N to collect samples during the operational phases of the project, complete sample analysis within 24 hours, and transmit the resultant information to the Committee for comparison with the Decision Criteria values.

The chemical and biological monitoring data indicated that the dredging operation had a minimal effect on existing water quality; the only criterion exceeded was PCB water concentration. On the four occasions when elevated PCB concentrations were detected, they were attributed to a specific causative operational procedure or meteorological event. Operational modifications were implemented effectively, thus limiting elevations in water column PCB concentrations.

It may be unrealistic to expect to complete a Superfund remediation at an aquatic site with absolutely zero short-term impact. However, this program successfully established a set of limits (Decision Criteria) beyond which the impact was considered unacceptable, and a mechanism (real-time monitoring program) which provided the information necessary for environmental managers (Decision Criteria Committee) to effectively oversee this project to completion.

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