



WATER RESOURCES RESEARCH GRANT PROPOSAL

Sonochemical Remediation of PCB Contaminated Sediments

FOCUS CATEGORIES: TRT, SED, TS

KEYWORDS: Contaminated Sediment, Remediation, Surface Water Quality, Oxidation, Toxic Substances

DURATION: 9/1/98 to 8/31/00

FEDERAL FUNDS REQUESTED: \$32,933 year 1, \$33,498 year 2

NON-FEDERAL (MATCHING) FUNDS: \$67,186 year 1, \$70,136 year 2

PRINCIPAL INVESTIGATORS:

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CONGRESSIONAL DISTRICT: Fifteenth

STATEMENT OF CRITICAL REGIONAL OR STATE WATER PROBLEMS:

In December 1997, EPA released the report, "The Incidence and Severity of Sediment Contamination in Surface Waters of the United States" documenting the severity of sediment contamination. Of the 96 Areas of Probable Concern, 39 are located within nine states in the North Central Region, many contaminated with polychlorinated biphenyls (PCBs) (US EPA, 1997b). For example, the Ottawa River in Ohio has a fish consumption advisory in effect due to PCB levels more than 30 times the USFDA health standard for fish filets. Moreover, the EPA estimates that in the United States approximately 10% of the sediment underlying surface waters is sufficiently contaminated to pose risks to fish, humans, and wildlife (Bolattino and Tuchman, 1993). It is difficult to treat sediments or soils because the sorbed hydrophobic contaminants are less accessible. Currently, capping the sediments in place or extraction and removal to a hazardous waste landfill is the most common method of treatment. However, the contaminants are not destroyed and pose a potential future risk. Moreover, episodic events such as storms and ships may compromise the capping material (by re-suspension) which could potentially mobilize the contaminants.

One of the EPA's four goals for managing contaminated sediment is to better understand the fundamental processes involving contaminated sediment and to develop solutions (US EPA, 1998). Ultrasonic irradiation of contaminated sediments may provide an on-site treatment technology which removes the contaminant from the sediment and

subsequently destroys the contaminant through sonochemical oxidation. *Research into the fundamental factors affecting sonochemical remediation of contaminated sediments will increase the understanding of this potential treatment process as well as lend insight into the factors affecting desorption of contaminants from sediments.*

STATEMENT OF RESULTS AND BENEFITS

The development of this treatment technology will provide an alternate solution to existing sediment remediation technologies. Existing treatment technologies such as capping have the limitation that the pollutants are not destroyed and pose a future risk. Incineration is also used, but is prohibitively expensive and labor intensive. Conversely, sonication of sediments can be performed on a ship, does not require dewatering, and since sonication destroys the contaminants, the sediments can be replaced after treatment. The proposed process is potentially more energy efficient and environmentally benign than conventional sediment remediation technologies.

As well as gaining knowledge of parameters affecting sonochemical remediation of contaminated sediments, the results obtained will provide important design variables such as solids concentration necessary to create a pilot scale sonochemical reactor to test on-site for removal of PCB contaminated sediments. In addition, the description of this process by a one-box model will provide a framework for understanding the applicability of this process to other contaminants and systems.