Laboratory scale evaluation of combining AOP with sediment stabilization for beneficial use.

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Focus Area

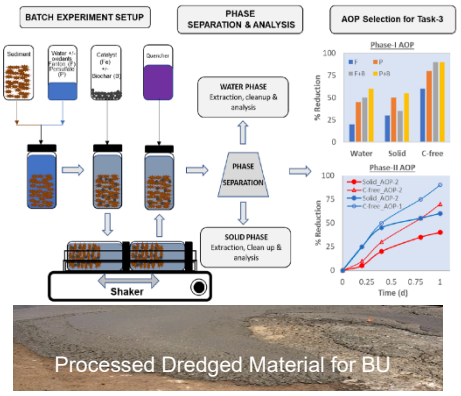
Risk Management: Public Private Partnership - Innovative Technologies for Managing / Treating Contaminated Sediment to Expand Beneficial Use Opportunities.

Problem

There is a growing recognition to find alternative solutions for dredged material that involves beneficial use of sediments. Examples include the use as engineered fill or construction material, habitat restoration, elevation for coastal resiliency and brownfield remediation/restoration projects. However, for this to be a viable option, the dredged material must have favorable environmental characteristics and it is important that the inherent risks due to the presence of contaminants are reduced and managed. Several ex-situ remedial technologies have been shown to reduce organic contaminant (e.g., polycyclic aromatic hydrocarbons (PAH) and polychlorinated biphenyl (PCB)] concentrations in soils and sediments including advanced liquid-solid oxidation/reduction processes (AOP and ARP), electrokinetic, physical liquid-solid separation and sorbent treatment. However, the applicability of these chemical treatment technologies for sediments containing varying levels of natural organic matter and multiple contaminant suites is not well known.

Study Description

A technical evaluation will be undertaken to determine the effectiveness of AOP treatment technology using Fenton's and persulfate reagents with/without sorbent addition (e.g., biochar) to treat sediments for reducing bulk and bioavailable contaminant fractions. The chemically treated sediments shall then undergo ex-situ stabilization through controlled laboratory experiments by mixing the impacted sediment(s) with different types (e.g., Portland cement) and dosage of binders to minimize cracking and strength degradation. The optimal combination of chemical treatment with/without sorbents and stabilization materials shall be evaluated in the bench-scale experiments. Based on the results, a techno-economic analysis will evaluate the balance between treatment costs and stabilized beneficial use product(s) benefits.



Products

The products from this project will include a technical report detailing the effectiveness of different AOP technologies in reducing the risks of hazardous and/or impacted pollutants in dredged materials. In addition, the report will contain the techno-economic feasibility of treating sediment for beneficial use. Results of the experiments will be published in peer reviewed literature for broad dissemination. Furthermore, critical findings and recommendations will be published as a technical note and communicated via technical presentations at national/international conferences such as Society of Environmental Toxicology and Chemistry (SETAC) and Battelle sediment conferences. Dissemination of information will be valuable to industry users of these products as a possible substitution of non-renewable products substituted by treated stabilized dredged material.

Summary

There is a growing need to find solutions that address removal of contaminants from sediments to enable beneficial use. A series of laboratory studies will be conducted to assess the efficacy of AOP based sediment treatment followed by sediment stabilization using binders. The results from this study are expected to provide additional options for *ex-situ*-based sediment management.

Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.

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