US Army Corps of Engineers®
Engineer Research and Development Center

Assessing Toxicity of Contaminated Sediment and Water

Description

ERDC Environmental Laboratory (EL) expertise supports the Corps of Engineers and other agencies in evaluating contaminants present in dredged material as well as in sediments proposed for dredging. ERDC-EL also conducts risk assessment and biological assessments, develops remediation goals, assesses remediation success, delineates aquatic contamination, and determines and identifies contaminants. ERDC-EL uses laboratory-based toxicity bioassays or field studies to assess the biological effects of contaminants in aquatic systems. Laboratory-based studies employ controlled sediment or water bioassays to assess the toxicity of field-collected sediments or chemicals added to uncontaminated sediment or water. Field assessments include community integrity surveys and in situ placement of organisms to evaluate contaminant bioavailability and effects. These studies are often coupled with measures of chemical bioavailability such the biomimetic solid phase micro extraction (SPME) and diffuse gradient in thin films (DGT) devices. In addition, ERDC-EL has expertise in the field application of toxicity reduction and identification evaluations (TRE/TIE) for sediments.

Capabilities

ERDC has the capability to assess the toxicity to aquatic biota of chemicals present in sediment and water. Acute and chronic bioassays are used to examine field-collected media. ERDC-EL has a demonstrated record of testing and test method development using a wide range of marine and freshwater organisms. A wide range of test organisms are cultured at ERDC including freshwater and marine amphipods, oligochaetes, and insects.

Supporting Technology

ERDC-EL has access to over 5,000 sq ft of laboratory space with state-of-the-art chemistry facilities to support associated analysis of water, sediment, and tissue samples. Sediments can be assessed for toxicity using acute and chronic bioassays and elutriate and water column assessments are accomplished using fish and aquatic invertebrates. Body residue analyses of exposed animals are conducted to derive tissue concentrations associated with biological effects.

Field-related expertise includes site characterization, assessment of remediation technologies, and in situ testing. Previous projects involved toxicity assessment of a variety of chemicals including pesticides, explosives, polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and chemical mixtures. Expertise is available to support regulatory decision-making, review and audit data, audit contract laboratory facilities, and develop sampling and analysis plans.

Benefits

Toxicity assessment expertise supports dredged material evaluations, risk assessments, biological assessments, remediation goal development, remediation success assessment, aquatic contamination delineation, and contaminant determination and identification for total maximum daily load (TMDL) development.

Success Stories

The ERDC-EL is an international leader in protocol development for ASTM, EPA, PIANC, International Maritime Organization (IMO), and NATO. Toxicity and bioaccumulation testing methods, including sediment chronic toxicity protocols for marine polychaetes and amphipods, have been developed, validated, and demonstrated for use in the dredging and superfund sediments program. Comprehensive investigation of the toxicity of military unique compounds (e.g. explosives) on aquatic organisms has been conducted with funding from the U.S. Army and Navy. ERDC-EL partners with a wide range of partners including government, industry, and academia to complete diverse challenging studies. Example projects include:

New York Harbor Dredging Program. ERDC-EL has been a technical leader in the development of a region specific guidance and evaluation process for New York Harbor placed in the ocean (Historic Area Remediation Site).

New Orleans Inner Harbor Navigational Canal. ERDC-EL has partnered with New Orleans District and private partners to complete a comprehensive evaluation of pre and post-hurricane sediments for construction of a new canal lock.

Point of Contact

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