



Predicting Outcomes from Tier III Environmental Testing of Dredged Material: A Machine Learning Approach

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG®

Focus Area

Risk Management

Problem

Environmental compliance testing (MPRSA Section 103 and CWA Section 404) is time-intensive and costly to perform, particularly the field collection and bioaccumulation tests required in Tier III, and in many instances such testing is unwarranted or not informative for the final risk management decision.

USACE districts need a fast, reliable, and science-based tool for predicting whether resource-intensive Tier III testing is truly necessary and constructive based on findings from less-intensive Tier I and II evaluations.

This type of predictive tool would also be helpful to districts impacted by storm-derived shoaling. In these situations, a rapid response is required, however, ocean disposal concurrence is not always maintained because the impacted area did not historically require dredging, and the chemical constituents of the displaced material are often unknown. A quick, dependable tool that predicts Tier III outcomes using historical regional data can help expedite emergency response.

Study Description

The desired outcome of this project is to be able to convey to end users that, based on the data they have for Tier I and the results they generated in Tier II, our ML algorithm predicts (within a specified level of confidence) that they will achieve a particular outcome in Tier III. The ML algorithm will be trained and validated by mapping historical Tier I and II data to subsequent Tier III results. A sufficient number of Tier I, II and III data sets will be required to train the algorithm and demonstrate its functionality. The project will utilize the data sets that have already been aggregated as part of other DOER projects (e.g., [DOER RT19-11](#)), as well as evaluation data provided by USACE Divisions and Districts.

Particular focus will be on providing defensible, scientific rationale for reducing the need for analytically expensive bioaccumulation assessments of exposed tissue, which also drives the large sediment volume requirements during field collections and rarely informs the final risk management decision. If successful, this ML algorithm will provide a path to streamline future dredged material evaluations and expedite the risk-informed planning phase of USACE feasibility studies. This project will also seek endorsement from regulatory stakeholders (e.g., US EPA) and highlight any gaps that need to be addressed to support the integration of ML into current operating procedures and DM disposal regulations.

Products

This study will result in an ML algorithm that predicts Tier III outcomes using Tier I & II data, a video demonstration of the concept, a simple pilot software tool (e.g., Excel-based), and submission of a manuscript to a peer-reviewed journal.

Summary

This study will determine whether a robust AI/ML algorithm can provide a faster, cheaper, and more accurate prediction of Tier III testing outcomes than current operating procedures can offer, thereby streamlining dredged material evaluations and expediting the risk-informed planning phase of USACE feasibility studies.



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