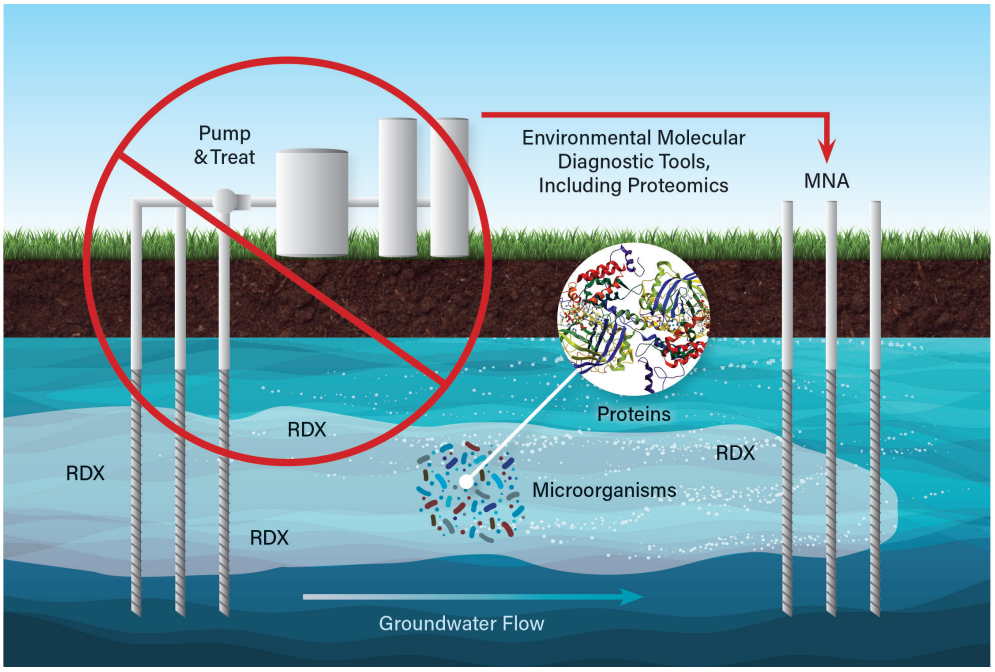
PROJECT ID:
596

Integrated Analytical Approach to Transition from Active to Passive Treatments at Munitions Sites



(Diagram Credit: Tony Danko)

OBJECTIVE

This project is developing a protocol to ease transition from active to passive remediation at Navy sites contaminated with munitions constituents.

PROBLEM STATEMENT

The Navy has over 400 sites in need of remediation due to remnants of munitions (munitions constituents). Approximately 70 of these sites are currently being treated with pump and treat systems, which means that contaminated groundwater is pumped out of the soil and treated aboveground. Remedial program managers (RPM) need a formalized framework to determine when pump and treat activities (active remediation) can be ceased and the next phase (passive remediation) begun.

DESCRIPTION

Isotopic analysis is the identification of the isotopic signature and chemical elements found in a wide variety of organic and inorganic compounds. This project team is combining compound-specific isotopic analysis (CSIA) with molecular biological tools to identify degradation potential of munitions constituents at Naval Base Kitsap – Bangor, which is an active remediation site.

This effort merges practical experience with in situ bioremediation with knowledge on degradation and molecular

biological tool design, including quantitative measurements of key proteins involved in contaminant degradation. Identification of proteins, known as proteomics, has emerged as a robust and sensitive tool for quantifying proteins in a sample. Proteomics provides the most direct measure of activity within a substance, a key indicator for biodegradation.

The protocols developed by the team can be transferred to a variety of environmental contaminants, including RDX. The process will be incorporated into Naval Base Kitsap – Bangor's adaptive management plan which will formalize a versatile cleanup strategy developed in conjunction with regional representatives from the U.S. Environmental Protection Agency. This management plan will guide RPMs to transition from ineffective active treatment to passive and less costly passive remedies, such as biostimulation followed by monitored natural attenuation. (NOTE: Biostimulation refers to the application of nutrients (vegetable oil or fructose), that act as a food source to microorganisms that metabolize or degrade, explosives, fuels or solvents.)

RETURN ON INVESTMENT

Pump and treat systems are more costly to operate and maintain than a monitored natural attenuation program. Thirty-year lifecycle cost reduction estimates are $8.3 million for Site F at Kitsap – Bangor and $2.7 million for Site A at Kitsap – Bangor. The savings are believed representative of other pump and treat sites, because all systems are similar in design and operation and maintenance costs. Based on these estimates, the payback for this project is estimated at five to six years.

NAVY BENEFITS

The application of quantitative proteomics is a novel and innovative approach that requires limited sample processing, and will yield usable biodegradation rates as it has already done for a number of chlorinated solvent sites. It is a less costly alternative to the total analytical cost associated with field-scale CSIA. The combination of CSIA and molecular biological tools, including proteomics, will enable sites to end pump and treat remediation sooner and switch to less costly alternatives.

TRANSITION DESCRIPTION

The final report will be distributed throughout the Department of Defense (DoD) and the technology will be transferred to the federal and commercial sectors through conference presentations, proceeding papers, and peer-reviewed journal articles. A Navy Environmental Restoration (ER) Technology Transfer (T2) email announcement will be released regarding the final cost and performance report and the U.S. Army Corps of Engineers Innovative Technology program will receive the results.

A web tool with an overview of the technology will be distributed to DoD ER T2 contacts and posted on the public side of the Navy ER and Base Realignment and Closure (BRAC) web page.

CONTACT

For more specific information about this project, contact the Principal Investigator at 805-982-4805.

ABOUT THE NESDI PROGRAM

The Navy Environmental Sustainability Development to Integration (NESDI) program is the Navy's environmental research and development, demonstration and validation (6.4) program, sponsored by the Chief of Naval Operations, Energy and Environmental Readiness Division (OPNAV N45) and managed by the Naval Facilities Engineering Systems Command (NAVFAC) out of the Engineering and Expeditionary Warfare Center (EXWC) in Port Hueneme, CA.

The mission of the program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness and lethality. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency and Department of Energy.

For more information, visit the NESDI program web site at www.navfac.navy.mil/nesdi or contact Ken Kaempffe, the NESDI Program Manager at 805-982-4893, DSN: 551-4893 or ken.kaempffe@navy.mil.