# Fact Sheet

## ON-SITE ANALYTICAL METHODS FOR EXPLOSIVES IN SOIL

### PROBLEM

One of the most serious environmental problems at many military installations is the presence of soil contaminated with explosives residues. This contamination has occurred during the last 50 years due to waste discharges from munitions manufacture, the destruction of out-of-date or off-specification material, and utilization at impact ranges throughout the Department of Defense (DoD).

The most common residues contain 2,4,6-trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), and associated impurities and environmental transformation products. Unlike many other pollutants, some of these contaminants have little affinity for soils and rapidly migrate to produce groundwater pollution.

In order to eliminate this pollution, contaminated soils first must be located and characterized. Until recently this was done exclusively by sending soil samples to off-site laboratories for analysis. While the quality of this information was generally acceptable, it often took weeks or months to receive the data, resulting in long project delays. Also, most of the soils tested blank, wasting DoD resources and reducing the ability to accurately delineate the boundaries of contaminated soil.

### SOLUTION

CRREL, in association with the U.S. Army Environmental Center (AEC), developed low-cost on-site analytical methods for TNT, RDX, HMX, dinitrotoluene (DNT), and ammonium picrate in soil. These methods involve solvent extraction followed by simple chemical reactions that produce intensely colored solutions if these munitions chemicals are present. Detection can be made visually, or semi-quantitative results can be obtained with a field-portable spectrophotometer. Analytical results correlate well with those from the standard laboratory method.

These methods have been successfully utilized to characterize many DoD sites. Test results are available to site investigators in near-real time, allowing on-site decisions and judicious selection of samples for more rigorous laboratory analysis.

The TNT method has been adopted by the U.S. EPA as SW-846 Method 8515. The RDX/HMX method has been accepted by the EPA as SW-846 Method 8510. Commercially available kits based on this work are available through Strategic Diagnostics Corporation, Newark, Delaware. A recent evaluation of field screening kits by the EPA determined that these methods were the cheapest, most accurate, and the overall preferred on-site analytical methods for TNT and RDX.

### CONTACT


Dr. Thomas F. Jenkins
603-646-4385
Fax: 603-646-4785
E-mail: tjenkins@crrel.usace.army.mil

Marianne E. Walsh
603-646-4666
Fax: 603-646-4785
E-mail: marianne@crrel.usace.army.mil

Philip G. Thorne
603-646-4494
Fax 603-646-4785
E-mail: pthorne@crrel.usace.army.mil



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Cold Regions Research & Engineering Laboratory

CRREL, 72 Lyme Road, Hanover, NH 03755-1290
http://www.crrel.usace.army.mil