

## MARSSIM and Site Closure Strategies

*The ultimate goal of environmental restoration activities is site closure and release for productive reuse. The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) is an example of an integrated, graded framework for designing and conducting final status surveys at sites contaminated with radionuclides. Argonne National Laboratory's Environmental Science Division (EVS) has extensive and unique experience in assisting federal facilities with developing and implementing effective site closure strategies that include MARSSIM as a component.*

### PROBLEM/OPPORTUNITY

The ultimate goal of environmental restoration activities is site closure and release for productive reuse. Closure strategies for federal facilities can be complex. These strategies must:

- Consider varied state and federal regulatory and licensing requirements;
- Address multiple media types such as soils, sediments, groundwater, surface water, and structures;
- Identify appropriate reuse goals and associated exposure scenarios;
- Develop consistent risk- and/or dose-based compliance standards;
- Integrate with remediation and decommissioning and demolition (D&D) plans;
- Include technically defensible protocols for demonstrating and verifying that closure requirements have been met;
- Satisfy stakeholder concerns and desires; and
- Meet demanding schedule and budgetary constraints.

Very little formal guidance exists for closure strategy development. One exception is MARSSIM, which provides an integrated, graded framework for designing and conducting final status surveys at sites contaminated with radionuclides. EVS has extensive and unique experience in assisting federal facilities with the development and implementation of technically sound and cost-effective site closure strategies that include MARSSIM as a component.

### APPROACH

EVS brings a unique skill set to closure strategy design and implementation. EVS staff expertise includes human-health and ecological risk assessment (radiological and chemical), the National Environmental Policy Act (NEPA), health physics, hydrogeology, civil/environmental

engineering, and statistical sampling program design. The majority of EVS staff members have 15 or more years of experience working on environmental restoration issues across a wide range of federal facility settings. Because of that wide-ranging and unique experience, EVS staff brings insights from other programs and projects to site-specific closure strategy needs. EVS staff members are nationally recognized, supporting U.S. Environmental Protection Agency (EPA) headquarters, U.S. Nuclear Regulatory Commission (NRC), and U.S. Department of Energy (DOE) Environmental Management (EM) program efforts on a national level, as well as the needs of specific facilities. EVS staff members are frequently requested to lead training workshops sponsored by NRC, EPA, Navy, Army, and DOE organizations.

An example of EVS-provided training is MARSSIM-related workshops (<http://web.ead.anl.gov/marssim/>). A key objective of MARSSIM training workshops conducted by Argonne is to tailor courses to the needs of different audiences and give participants practical knowledge that can be immediately applied for planning and implementation at specific sites. Argonne offers three MARSSIM workshops to address the needs of management and operations representatives, program or project managers, and the public.

EVS has been involved with closure strategy development and implementation at many different sites and many different levels, depending on the needs of individual sites and programs. In some cases, EVS has been tasked with developing the overarching closure strategy, working closely with DOE or U.S. Department of Defense (DoD) counterparts and their contractors. In other situations, EVS has produced site-specific documentation required as part of the closure process (e.g., final status survey plans, derived concentration guideline levels, etc.). At other times, EVS has been asked to serve in an advisory and/or independent technical review role to ensure that closure strategies and associated documents and plans are as technically sound as possible. Finally, EVS is frequently called upon to provide MARSSIM and RESidual

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RADioactive (RESRAD) code training for site managers, their contractors, and associated regulators.

## RESULTS

EVS has worked on site closure-related issues at numerous DOE and DoD facilities. The examples below highlight EVS involvement.

EVS played a critical role in integrating NEPA and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documentation requirements as part of the remediation and closure process at DOE's Weldon Spring site. EVS was part of the Weldon Spring technical team from the initiation of the project and selection of the prime management contractor in 1986, to the completion of remedial action and transfer of the site to the Office of Legacy Management in 2002. Weldon Spring was the first major DOE CERCLA restoration site closure.

EVS was also intimately involved in developing portions of the closure strategy for DOE's Fernald site, including buildings, groundwater, and soils. In the case of soils, EVS was part of a team that successfully integrated real-time measurement techniques within the excavation and final status survey process at the site, resulting in cost savings estimated at \$40 million over the original baseline. In the context of the Fernald effort, EVS worked closely with EPA Region 5 and Ohio EPA to gain acceptance for closure protocols that predated MARSSIM.

EVS has been a key player in the Formerly Utilized Sites Remedial Action Program (FUSRAP) since its inception under DOE managerial oversight in 1974. EVS's efforts led to several DOE Pollution Prevention Awards. EVS's involvement continues today with the U.S. Army Corps of Engineers (USACE), the agency that currently manages FUSRAP. Among EVS's contributions to the USACE FUSRAP program is its RESRAD and MARSSIM expertise. EVS conducts periodic RESRAD and MARSSIM training for the USACE and its contractors, develops site-specific MARSSIM-based closure protocols as needed, and provides technical quality assurance oversight for closure data collection at FUSRAP sites. EVS also ensures that remedial designs are tightly integrated with the overall closure strategy for individual sites. EVS was part of the USACE teams working on Ashland 1, Ashland 2, and Rattlesnake Creek (collectively known as the Tonawanda site). With EVS support, the actions identified in the Ashland Record of Decision (ROD) were successfully completed.

EVS's experience has been that the sooner closure strategies are articulated and integrated within overall restoration plans, the better the outcomes.



EVS provides MARSSIM workshops tailored to site-specific needs.



EVS ensures MARSSIM surveys are tightly integrated with remedial activities



Site restoration of Rattlesnake Creek after remediation