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Technology Profiles
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Volume 2
Emerging Technology Program

National Risk Management Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Cincinnati, Ohio 45268

NOTICE

The development of this document was funded by the U.S. Environmental Protection Agency (EPA) under Contract No. 68-W-01-032, Task Order 14, to Computer Sciences Corporation. The document was subjected to the Agency's administrative and peer review and was approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use at any particular hazardous waste site.

FOREWORD

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for preventing and reducing risks from pollution that threatens human health and the environment. The focus of the Laboratory's research program is on methods and their cost-effectiveness for prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites, sediments and ground water; prevention and control of indoor air pollution; and restoration of ecosystems, NRMRL, collaborates with both public and private sector partners to foster technologies that reduce the cost of compliance and to anticipate emerging problems. NRMRL's research provides solutions to environmental problems by developing and promoting technologies that protect and improve the environment; advancing scientific and engineering information to support regulatory and policy decisions, and providing the technical support and information transfer to ensure implementation of environmental regulations and strategies at the national, state, and community levels.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by the EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

Hugh W. McKinnon, Director
National Risk Management Research Laboratory

ABSTRACT

The Superfund Innovative Technology Evaluation (SITE) Program, now in its sixteenth year is an integral part of EPA's research into alternative cleanup methods for hazardous waste sites around the nation. The SITE Program was created to encourage the development and routine use of innovative treatment and monitoring and measurement technologies. Under the program, EPA enters into cooperative agreements with technology developers. These developers research and refine their innovative technologies at bench- or pilot-scale and then, with EPA's support, demonstrate them at hazardous waste sites. As a result, the SITE Program provides environmental decision-makers with data on new, viable treatment technologies that may have performance or cost advantages compared to traditional treatment technologies.

This document is intended as a reference guide for those interested in technologies participating in the SITE Demonstration, Emerging Technology, and Measurement and Monitoring Programs. The two-page profiles are organized into two sections for each program, completed and ongoing projects, and are presented in alphabetical order by developer name. Reference tables for SITE Program participants precede the sections and contain EPA and developer contacts. Inquiries about a SITE technology evaluation or the SITE Program should be directed to the specific EPA project manager; inquiries on the technology process should be directed to the specific technology developer.

Each technology profile contains (1) a technology developer and process name, (2) a technology description, including a schematic diagram or photograph of the process, (3) a discussion of waste applicability, (4) a project status report, and (5) EPA project manager and technology developer contacts. The profiles also include summaries of demonstration results, if available. The technology description and waste applicability sections are written by the developer. EPA prepares the status and demonstration results sections.

A Trade Name Index and Applicability Index are also included in the back of this document. The Applicability Index is organized by 11 media categories, 19 waste categories, and 14 technology categories.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LISTS OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

The project manager responsible for the preparation of this document is Teri Richardson of EPA's National Risk Management Research Laboratory in Cincinnati, Ohio. This document was prepared under the direction of Robert Olexsey, Director of the Land Remediation and Pollution Control Division. Key program area contributors for EPA include Annette Gatchett, and Randy Parker. Special acknowledgment is given to the individual EPA SITE project managers and technology developers who provided guidance and technical support.

Computer Sciences Corporation prepared this document under the direction and coordination of Teri Richardson and Annette Gatchett.

SITE PROGRAM DESCRIPTION

The U.S. Environmental Protection Agency's (EPA) Superfund Innovative Technology Evaluation (SITE) Program, now in its sixteenth year, encourages the development and implementation of (1) innovative treatment technologies for hazardous waste site remediation, and (2) characterization and monitoring technologies for evaluating the nature and extent of hazardous waste site contamination.

The SITE Program was established by EPA's Office of Solid Waste and Emergency Response (OSWER) and the Office of Research and Development (ORD) in response to the 1986 Superfund Amendments and Reauthorization Act (SARA), which recognized a need for an "Alternative or Innovative Treatment Technology Research and Demonstration Program." The SITE Program is administered by ORD's National Risk Management Research Laboratory (NRMRL), headquartered in Cincinnati, Ohio.

The SITE Program includes the following key elements:

- **Demonstration Program** - Conducts and evaluates demonstrations of promising innovative technologies to provide reliable performance, cost, and applicability information for site cleanup decision-making

- **Emerging Technology Program** - Support of the Emerging Technology Program ended in 1998 after completion of all committed projects in the Program

- **Monitoring and Measurement Technologies** - Evaluates technologies that detect, monitor, and measure hazardous and toxic substances to provide better, faster, and more cost-effective methods for producing real-time data during site characterization and remediation

- **Information Transfer Activities** - Disseminates technical information, including engineering, performance, and cost data, on innovative technologies to remove impediments for using innovative technologies

This Technology Profiles document describes completed and ongoing projects in the Demonstration, Emerging Technology, and Characterization and Monitoring Programs. Figure 1 shows the relationship among the programs and depicts the process of technology development from initial concept to commercial use.

In the Demonstration Program, the technology is field-tested on hazardous waste materials. Engineering and cost data are gathered on the innovative technology so that potential users can assess the technology's applicability to a particular site. Data collected during the field demonstration are used to assess the performance of the technology, the potential need for pre- and post-processing of the waste, applicable types of wastes and waste matrices, potential operating problems, and approximate capital and operating costs.

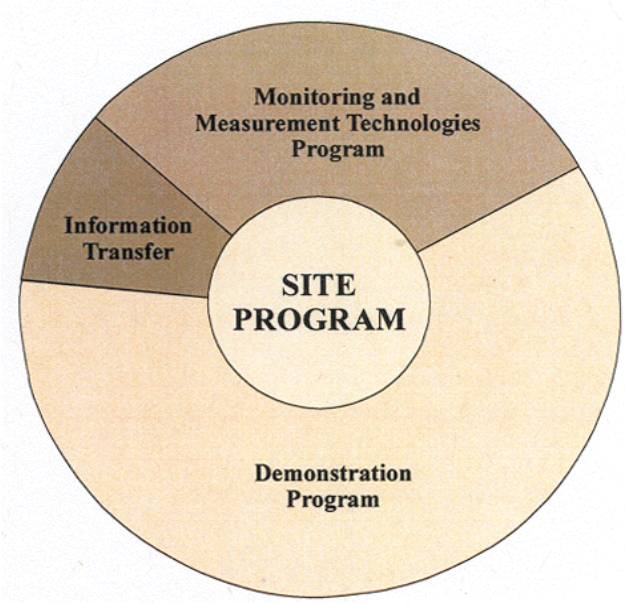

Figure 1 *Development of Innovative Technologies*

At the conclusion of a SITE demonstration, EPA prepares an Innovative Technology Evaluation Report (ITER), Technology Capsule, and Demonstration Bulletin. Often, a videotape of the demonstration is also prepared. These reports evaluate all available information on the technology and analyze its overall applicability to other site characteristics, waste types, and waste matrices. Testing procedures, performance and cost data, and quality assurance and quality control standards are also presented. These demonstration documents are distributed by EPA to provide reliable technical data for environmental decision-making and to promote the technology's commercial use.

The Demonstration Program currently as 147 program participants conducting 141 demonstrations. Of these projects 128 demonstrations are complete and 13 are ongoing. The projects are divided into the following categories: thermal treatment (34), biological degradation (28), physical/chemical treatment (50), solidification/stabilization (13), phytoremediation (5), soil washing (4), materials handling (3), and other (4). Several technologies represent more than one treatment category.

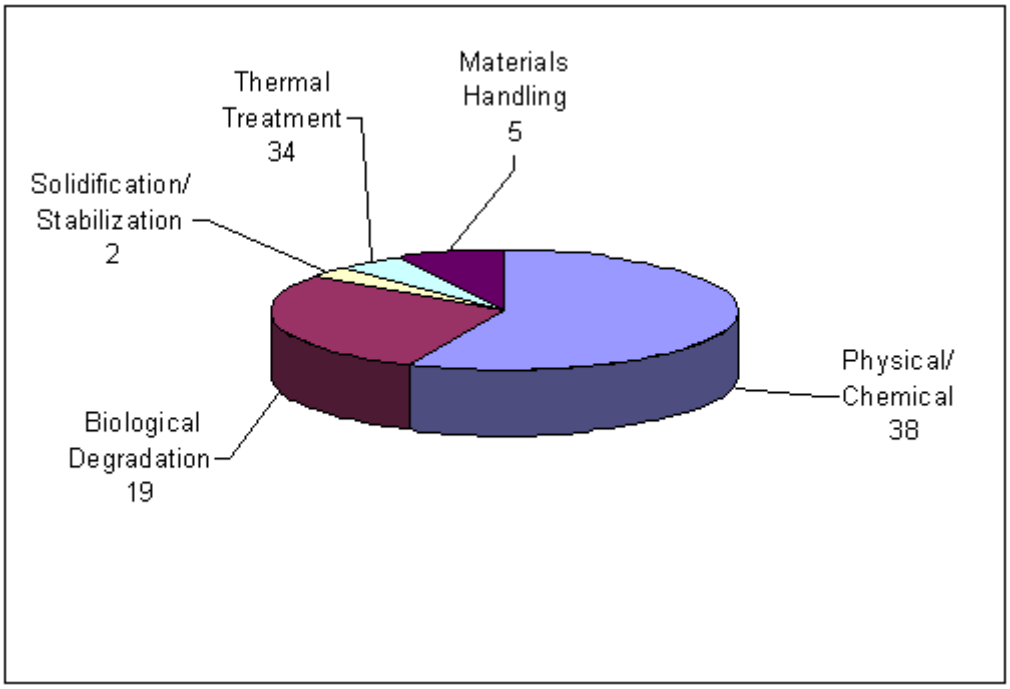

Figure 2: *Innovative Technologies in the Emerging Technology Program*

Figure 2 shows the breakdown of technologies in the Demonstration Program. Profiles for technologies demonstrated under the Demonstration Program are located in Volume I.

EPA has provided technical and financial support to 77 projects in the Emerging Technology Program. Seventy-three are completed and four have exited the program. Eighteen Emerging Technology Program projects participated in the Demonstration Program. The seventh-three active technologies are divided into the following categories: thermal destruction (9), physical/chemical treatment (38), biological degradation (19), solidification/stabilization (2), and materials handling (5). Figure 3 displays the breakdown of technologies in the Emerging Technology Program. Profiles for technologies demonstrated under the Emerging Technology Program are located in Volume II.

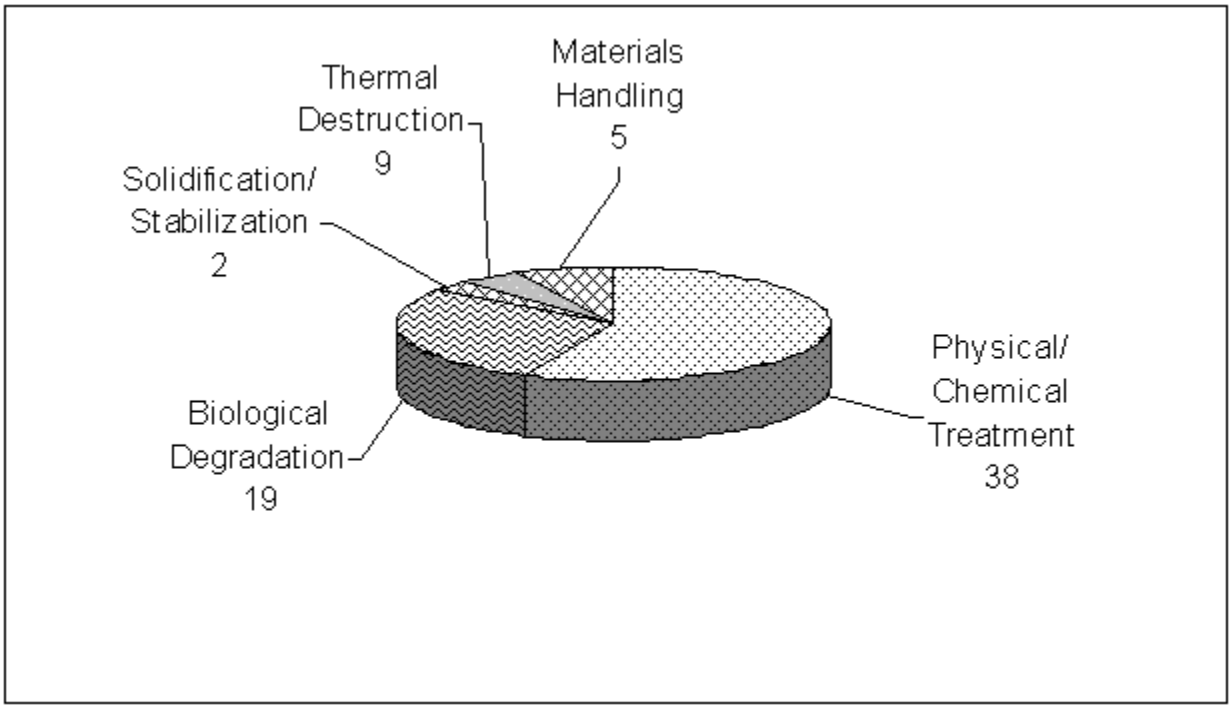

Figure 3: Innovative Technologies in the Demonstration Program

The Monitoring and Measurement Technologies (MMT) Program's goal is to assess innovative and alternative monitoring, measurement, and site characterization technologies. To date, 38 technology demonstrations have occurred under the MMT Program. These demonstrations have included four cone penetrometers, 6 field portable X-ray fluorescence units, 6 portable gas chromatographs, 4 spectrophotometers, 12 field test kits, and 6 soil samplers. Profiles for technologies demonstrated under the MMT Program are located in Volume III.

In the Technology Transfer Program, technical information on innovative technologies in the Demonstration Program, Emerging Technology Program, and MMT Program is disseminated to increase the awareness and promote the use of innovative technologies for assessment and remediation at Superfund sites. The goal of technology transfer activities is to promote communication among individuals requiring current technical information for conducting site investigations and cleanups.

The Technology Transfer Program reaches the environmental community through many media, including:

- Program-specific regional, state, and industry brochures
- On-site Visitors' Days during SITE demonstrations
- Demonstration videotapes
- Project-specific fact sheets to comply with site community relations plans
- ITERs, Demonstration Bulletins, Technology Capsules, and Project Summaries

- The SITE Exhibit, displayed nationwide and internationally at conferences
- Networking through forums, associations, regions, and states
- Technical assistance to regions, states, and remediation cleanup contractors

SITE information including an electronic version of this document, is available through the following on-line information clearinghouses:

SITE Program Home Page: *http://www.epa.gov/ORD/SITE*

Cleanup Information Bulletin Board System (CLU-IN)
Help Desk: 301-589-8368; Internet Access: *http://www.clu-in.org*

Technical reports may be obtained by calling the National Service Center for Environmental Publications in Cincinnati, Ohio. To find out about newly published documents or to be placed on the SITE mailing list, call or write to:

USEPA/NSCEP
P. O. Box 42419
Cincinnati, OH 45242-2419
1-800-490-9198

SITE PROGRAM CONTACTS

The SITE Program is administered by EPA's Office of Research and Development (ORD), specifically the National Risk Management Research Laboratory (NRMRL). For further information on the SITE Program or its component programs contact:

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