State Policy and Regulatory Barriers to *In Situ* Ground Water Remediation

U.S. Environmental Protection Agency

Technology Innovation Office (5102W)

EPA 542-R-96-001
March 1996

Preface

This report is based on a series of interviews with State regulators involved in the review and approval of applications for demonstrations or applications of surfactant technologies for the remediation of contaminated ground water. Treatment of aquifers contaminated by non-aqueous phase liquids (NAPLs) by traditional pump-and-treat systems has proven impracticable in many instances. State regulators, researchers, and engineers are working on innovative solutions to this problem. This report focuses on identifying specific State regulatory and policy barriers to the use of techniques that enhance *in situ* ground water treatment technologies through the use of surfactants, co-solvents, and nutrients. The goal of the study was to identify barriers and describe strategies for success in gaining State regulatory approval to promote the use of these techniques.

The Technology Innovation Office gratefully acknowledges the assistance of those individuals on the attached list of State contacts who gave their time and consideration to this project, as well as the various investigators and researchers in the area of *in situ* technologies who dedicate their considerable resources to the search for innovative solutions to the nation's hazardous waste remediation problems.

Walter W. Kovalick, Jr., Ph.D.
Director
U.S. EPA Technology Innovation Office

The information in this document has been funded by the United States Environmental Protection Agency under contract number 68-W2-0004 to Environmental Management Support, Incorporated. It has been reviewed by the Agency and has been approved as an EPA document. The opinions expressed herein are those of the authors and do not necessarily represent those of the U.S. Environmental Protection Agency. Any mistakes are attributable to the authors and not those interviewed. Mention of trade names does not constitute endorsement nor recommendation for use.

Comments or questions regarding this report should be directed to:

Rich Steimle
Technology Innovation Office (5102W)
U.S. Environmental Protection Agency
401 M Street SW
Washington, DC 20460
703-308-8800

State Policy and Regulatory Barriers to *In Situ* Ground Water Remediation

Introduction

The mission of the U.S. Environmental Protection Agency's Technology Innovation Office (TIO) is to stimulate the development and application of innovative treatment technologies at sites contaminated from hazardous wastes and to identify and remove impediments to the use of such technologies. As part of this effort, TIO is engaged in promoting the development and field application of alternative technologies to increase the options available for implementing effective *in situ* ground-water remediation technologies.

Numerous studies and experiences at contaminated ground-water sites have shown that remediation or containment of contaminated aquifers using conventional pump-and-treat technology is difficult, time-consuming and, in most cases, incomplete. For example, certain contaminants, particularly dense non-aqueous phase liquids (DNAPLs) such as trichloroethylene (TCE), can not be remediated or contained effectively using conventional pump-and-treat systems. DNAPLs have very low solubility in water and can migrate downward into bedrock fractures, where they are difficult to reach. These characteristics lead to very slow rates of removal by pumping. To improve the performance of pump-and-treat systems, new *in situ* technologies are being developed that mobilize or solubilize these contaminants to improve removal efficiency. Other *in situ* technologies under development enhance biodegradation and other natural processes.

The *in situ* ground-water remediation alternatives in this report involve the introduction of treatment agents into contaminated ground water, typically through an underground injection well. These technologies either treat the contaminant directly or increase the solubility and mobility of contaminants, enhancing the efficiency of a pump-and-treat system. An example of the former technology type is nitrate enhancement, which introduces nitrates to increase the rate of biodegradation. The latter type of technology includes the injection of surfactants that enhance the removal efficiency of pump-and-treat systems for DNAPLs.

While these new technologies offer significant benefits, their use may be restricted or prohibited by regulatory or procedural barriers within States. For example, nitrate concentrations in drinking water are restricted by the Safe Drinking Water Act and further restricted by some States. Also, the injection of a common surfactant, sodium dodecyl sulfate, may be subject to State control, since some States restrict the concentration of sodium and sulfate in ground water. Authority for regulating injection wells is split between the States and the Federal government under the national Underground Injection Control (UIC) program, and some delegated States may restrict injection wells or require a permit (see sidebar, p. 2).

Purpose

This report seeks to promote the use of innovative *in situ* technologies for ground-water remediation by identifying barriers to their implementation. During a workshop in June 1992, representatives from universities, industry, and consulting firms reached a consensus on the need for a more favorable regulatory environment for the use of these technologies. Workshop participants identified impediments such as: 1) regulations that prohibit injection; 2) enforcement of water quality standards for injected substances (such as nitrates); 3) "No Degradation" or "Anti-Backsliding" policies, which may prohibit the use of Alternate Concentration Limits (ACLs) for ground-water cleanup; and 4) the use of drinking water standards as applicable or relevant and appropriate requirements (ARARs) under CERCLA.

The purpose of this study is to provide interested parties, particularly technology developers, with a better understanding of the regulatory and policy climate in the States regarding *in situ* ground-water remediation technologies by examining regulations and policies in the States that may restrict or prevent injection of surfactants, co-solvents, nutrients, or other injectants into contaminated aquifers as part of a remedial or corrective action. The study also provides a regulatory contact person in each State.

Procedures

Injection Wells and the UIC Program

Injection wells are regulated by the Underground Injection Control (UIC) program under the Federal Safe Drinking Water Act. Under the UIC program, injection of any fluid into a well is prohibited, except as authorized by permit or rule. State UIC programs may be delegated complete or partial enforcement responsibility (or primacy) by EPA. Twenty-five State UIC programs have been delegated complete primacy, while ten hold primacy over some portion of the State UIC program. If a State does not seek primacy, or its program is not approved, EPA enforces the Federal UIC program for that State. Fifteen State UIC programs are administered by EPA Regional Offices.

Injection wells incidental to aquifer remediation and experimental technologies are distinguished from hazardous waste injection wells and are designated as Class V under the UIC program. Class V wells covered by the Federal UIC program are authorized by rule and do not require a separate UIC permit. A Class V well regulated by a State UIC program may require a permit. While permit requirements are not a direct barrier to *in situ* ground water remediation, States that require UIC permits are noted in the summary table.

The purpose of the UIC program is to protect underground sources of drinking water (USDW) by prohibiting injections that may affect water quality in USDWs. Contaminated aquifers at Superfund sites may not serve as a USDW. For this reason, UIC requirements may not apply to wells at CERCLA sites.

State policies and regulations were obtained using the *Envirotext Retrieval System* (ETRS), a Federal database operated by the U.S. Army Corps of Engineers. The database contains abstracts of Federal, State, Territorial, and Native American environmental regulations. EPA is a co-sponsor of the database. Only State regulations that prohibit the use of *in situ* ground water remediation technologies directly or impose regulations more stringent than Federal regulations are included. State requirements incidental to the operation of *in situ* technologies, such as siting and monitoring requirements, engineering and construction standards, restrictions on transfer of ownership, etc., are not included. To confirm the information in the database, follow-up discussions and interviews with State regulators were conducted. Summary findings were distributed to State regulators for final comments.

Conclusions

- Some States with delegated UIC programs were unsure of the role of the UIC program, especially those which have not received or reviewed applications. Some require a UIC permit, while others may only require a review by the UIC program.

- No State has a direct regulatory prohibition on injection technologies for treating contaminated aquifers. Until recently, a few States prohibited the use of injectants, either through bans on new Class V injection wells or prohibition of injectants that did not meet ground water quality criteria. Currently, exceptions are made for Class V remediation wells, and the States that prohibit injection of fluids that do not meet ground-water quality standards allow the use of site-specific criteria for contaminated aquifers.

- Few States have policies that discourage use of injection technologies, and most of those with such policies have approved individual projects. A small number of States have rejected most or all of the proposals they have received on policy or technical grounds. Reasons given for rejecting proposals include failure to include or adequately demonstrate a monitoring and recovery plan in the proposal, failures of previously-approved injection projects, lack of a clearly defined process for obtaining approval and uncertainty over the identity of authorized agencies, and lack of experience with injection projects.

- About two-thirds of the States have allowed some sort of injection incidental to an *in situ* ground water remediation technology, mostly the injection of nutrients to enhance bioremediation.

- Eleven States have allowed surfactant injection, mostly for the enhancement of existing pump-and-treat systems. Most surfactant approvals were at CERCLA sites.

- The use of co-solvents has not been proposed to any State for direct remediation; one State has approved a co-solvent demonstration in a controlled cell.

- The technical merits of a proposed technology, as reflected in a proposal or application for State approval, are the most important factors considered by a State. Almost all States rely on the terms of the technical proposal, and almost all decisions are made on a case-by-case basis. Few States have a clearly defined process for obtaining final approval for injection. Approvals have been both formal and informal. One surfactant project at a CERCLA site received verbal approval from the State agency after a brief review.

- Several States require closed systems or some other evidence that all injectant will be captured and removed, verified by a comprehensive monitoring system, particularly for surfactant injection. Others States are more open to risk and affect analyses.

- Fifteen States have not received an application or proposal to review. None of them indicated any particular reason why a proposal would not be approved.

Summary

A summary of findings is presented in the following table. “Regulatory Prohibition” means the State has or does not have a strict regulatory ban on injection. “Policy Prohibition” means the State has or does not have policies that prohibit or discourage the use of injection technologies. Policies may be either written or a regulatory agency custom. For example, the State of Nebraska, which approved injection in the past, indicated its unwillingness to approve proposals for injection in the future.

“Proposal Reviewed” means the State agency accepted for review a proposal that includes injection and completed that review. It is meant to indicate whether the agency is willing to receive proposals, and to indicate that the agency has some experience in reviewing such proposals; it does not indicate whether the proposal was approved or rejected. “Injection Allowed” means the State approved (or failed to disapprove) a proposal for injection, or otherwise allowed injection; it does not indicate whether injection was actually completed. Several approved projects did not result in actual injection for a number of reasons (funding, superseding Federal disapproval, *etc*.). Likewise, “Injectant” corresponds to the type of injectant allowed; it does not indicate whether the approval led to actual injection.

“Comments” focus on the results of interviews with State contacts. Approvals at CERCLA sites should be distinguished from other proposals, since potential UIC

barriers are not an issue for contaminated aquifers at CERCLA sites. Agency review requirements should be distinguished from formal permit requirements, which may include significantly greater technical specifications. Finally, States that have not received or reviewed any proposals may have indicated a likely response to a proposal.

STATE REGULATORY AGENCY CONTACTS
IN SITU GROUND WATER REMEDIATION TECHNOLOGY REPORT

ALABAMA:

Robert Barr
Water Quality Branch
Water Division
1751 Congressman Dickinson Dr.
Montgomery, AL 36130
(205) 271-7741

ALASKA:

Ric Davidge
Alaska DNR
P.O. Box 107005
Anchorage, AK 99510
(907) 762-2145

Jonathan Williams
U.S. EPA Region 10
1200 Sixth Ave.
Seattle, WA 98101
(206) 553-1369

ARIZONA:

Chuck Graf
Groundwater Section
Arizona DEQ
2005 N. Central Ave
Phoenix, AZ 85004
(602) 207-4661

ARKANSAS:

Clark Bates
Hazardous Waste Division
Arkansas Dept. of Pollution Control
8001 National Drive
Little Rock, AR 72209
(501) 570-2863

CALIFORNIA:

Susan Timm
Central Valley Regional Water Quality
Control Board
3443 Routier Rd., Suite A
Sacramento, CA 95827
(916) 255-3057

COLORADO:

Dave Walls
Colorado Dept. of Health and Environment
(HMWMD-SWIM-B2)
4300 Cherry Creek Drive S.
Denver, CO 80222-1530
(303) 692-3360

CONNECTICUT:

Mark Lewis
Water Management Bureau
79 Elm Street
Hartford, CT 06106-5127
(203) 566-5486

DELAWARE:

Margie Zhang
Delaware DNR
715 Grantham Lane
New Castle, DE 19720
(302) 323-4540

FLORIDA:

Tim Larson
Florida DEP
Bureau of Waste Cleanup
2600 Blairstone Road
Tallahassee, FL 32399
(904) 488-3935

GEORGIA:

Jennifer Kaduck
Georgia EPD
Floyd Tower East, Suite 1162
205 Butler Street, SE
Atlanta, GA 30334
(404) 657-8600

HAWAII:

Tom Arizumi
Environmental Management
Hawaii Dept. of Health
919 Ala Moana Boulevard, Suite 300
Honolulu, HI 96814
(808) 586-4304

IDAHO:

Al Murrey
Bureau of Water Quality
Idaho Dept. of Health and Welfare
1410 N. Hilton St.
Boise, ID 83706
(208) 334-5860

ILLINOIS:

Ken Liss
Groundwater Unit
2200 Churchill Road
Springfield, IL 62794-9276
(217) 524-3300

INDIANA:

Greta Hawvermale
Indiana DEM
Office of Environmental Response
P.O. Box 6015
Indianapolis, IN 46206-6015
(317) 233-4166

IOWA:

Lavoy Haage
Iowa DNR
Solid Waste Section
Wallace Building
Des Moines, IA 50319
(515) 281-4968

KANSAS:

Mike Cocha
Division of Environment
Kansas Dept. of Health and Environment
Forbes Field, Bldg. 740
Topeka, KS 66620
(913) 296-5560

KENTUCKY:

Tuss Tailor
DOE/Federal Facility Oversite Unit
14 Reilly Road
Frankfort, KY 40601
(502) 564-6716

LOUISIANA:

Steve Chustz
Louisiana DEQ
P.O. Box 82215
Baton Rouge, LA 70884-2213
(504) 765-0487

MAINE:

Bruce Hunter
Maine DEP
Station 17
Augusta, ME 04333
(207) 287-2651

MARYLAND:

John Fairbanks
Maryland Dept. of the Environment
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3497

MASSACHUSETTS:

Jan Nafarsteck
Water Pollution Control Division
1 Winter St., 7th Floor
Boston, MA 02108
(617) 292-5697

MICHIGAN:

Tom Crossman
Michigan DNR
Environmental Response Division
P.O. Box 30426
Lansing, MI 48909
(517) 335-3397

MINNESOTA:

Tim Turnblad
Groundwater & Solid Waste Division
520 Lafayette Road
St. Paul, MN 55155-4194
(612) 296-8582

MISSISSIPPI:

Russell Smith
Mississippi DEQ
P.O. Box 10385
Jackson, MS 39289-0385
(601) 961-5072

MISSOURI:

Evan Kifer
Missouri DNR
P.O. Box 250
Rolla, MO 65401
(314) 368-2168

MONTANA:

John Arrigo
Groundwater Section
Water Quality Bureau
Cogswell Bldg.
Helena, MT 59620
(406) 444-2406

NEBRASKA:

Phil Hargis
Ground Water Section
Water Quality Division
P.O. Box 98922
Lincoln, NE 68509
(402) 471-4230

NEVADA:

Marcia Greybeck
Division Of Env. Protection
333 West Nye Lane
Carson City, NV 89710
(702) 687-4670

NEW HAMPSHIRE:

Carl Baxter
NH Dept. of Environmental Services
6 Hazen Drive
Concord, NH 03301
(603) 271-2909

George Lombardo
NH Dept. of Environment
GW Protection Bureau
P.O. Box 95
Concord, NH 03301
(603) 271-3645

NEW JERSEY:

George Nichols
New Jersey DEP
Div. of Publicly Funded Site Remediation
Bureau of GW Pollution Abatement
401 E. State St. (CN413)
Trenton, NJ 08625
(609) 292-8427

NEW MEXICO:

Dale Doremus
Groundwater Section
New Mexico Dept. of Environment
1190 St. Francis Drive
Santa Fe, NM 87502
(505) 827-4300

NEW YORK:

Jim Harrington
Room 208
New York DEC
50 Wolf Road
Albany, NY 12233-7010
(518) 485-8792

NORTH CAROLINA:

Arthur Mouberry
Ground Water Section
Div. of Environmental Management
P.O. Box 29535
Raleigh, NC 27626
(919) 733-3221

NORTH DAKOTA:

Dave Glatt
North Dakota State Health Department
1200 Missouri Avenue
P.O. Box 5520
Bismark, ND 58502-5520
(701) 221-5233

OHIO:

John Sadzewicz
Division of Drinking & Ground Water
P.O. Box 163669
1800 Watermark Drive
Columbus, OH 43216
(614) 644-3020

OKLAHOMA:

Rod Horton
(6W 41C)
1000 NE 10th Street
Oklahoma City, OK 73117-1299
(405) 271-7899

OREGON:

Rene Dulay
Oregon DEQ
Water Quality Division
811 S.W. Sixth Avenue
Portland, OR 97204
(503) 229-5374

PENNSYLVANIA:

Jim Shaw
Division of Remediation
P.O. Box 847
Harrisburg, PA 17105-8471
(717) 783-9475

RHODE ISLAND:

Mark Dennen
Groundwater Protection Program
Division of Groundwater
291 Promenade St.
Providence, RI 02908
(401) 277-3872

SOUTH CAROLINA:

Rob Devlin
South Carolina DHEC
Ground Water Protection Division
2600 Bull Street
Columbia, SC 29201
(803) 734-4672

SOUTH DAKOTA:

Ron Holm
South Dakota Dept. of Environment
523 East Capitol Avenue
Joe Foss Building
Pierre, SD 57501
(605) 773-3296

TENNESSEE:

Robin Bell
Division of Water Supply
401 Church Street
6th Floor
Nashville, TN 37243-1549
(615) 532-0191

TEXAS:

Gary Beyer
TNRCC (Room 200-18N, Building D)
P.O. Box 13087, Capitol Station
Austin, TX 78711
(512) 239-2361

UTAH:

Larry Mize
Groundwater Section
Water Pollution Control Bureau
288 N. 1460 W.
Salt Lake City, UT 84114
(801) 538-6146

VERMONT:

Richard Spiese
Hazardous Material Management Div.
103 South Main Street
West Building
Waterbury, VT 05671-0404
(802) 241-3880

VIRGINIA:

Howard Freeland
Virginia DEQ
Waste Division
P.O. Box 1009
Richmond, VA 23240
(804) 527-5324

WASHINGTON:

Bert Bowen
Groundwater Unit
Water Quality Program
P.O. Box 47600
Olympia, WA 98504
(206) 407-6423

WEST VIRGINIA

Pete Costello
Division of Env. Protection
Office of Waste Management
1356 Hansford Street
Charleston, WV 25301
(304) 558-2745

Mark Priddy
Division of Env. Protection
Office of Water Resources
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-2108

STATE REGULATORY AGENCY CONTACTS

WISCONSIN:

Terry Evanson
Wisconsin DNR, SW/3
P.O. Box 7921
Madison, WI 53707
(608) 266-0941

WYOMING:

Bob Lucht
Ground Water Operations
Water Quality Division
122 W. 25th St.
Cheyenne, WY 82002
(307) 777-7095