



ITRC PROJECT PROPOSAL

Update the ITRC 2003 “An Introduction to DNAPL Site Characterization” document and expand it to a Technical Regulatory document.

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Proposal Contact:

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Call for Proposals Topical Area

Primary Topic Area: CHAR: Site characterization, sampling, and monitoring

Secondary Topic Areas: CONT: Soil and groundwater contamination

Problem Statement (why is this project necessary and relevant to ITRC’s purpose & mission?)

Dense Non Aqueous Phase Liquids (DNAPLs), particularly chlorinated organics and their co-contaminants, are one of the most widespread and high-risk types of subsurface contamination. Chlorinated organic solvents have been produced on an industrial scale since the 1930s. They have been widely used for cleaning and degreasing in a number of industries, including chemical manufacturing, aerospace, semiconductors, electronics, commercial and retail dry cleaning, and pest control. The same properties that led to their use in industry also led to their widespread use at Department of Defense (DOD) and Department of Energy (DOE) (predecessor) sites and facilities. As a result of the widespread use, chlorinated solvent DNAPL and attendant dissolved phase contamination are found at many sites (industrial facilities, military bases, DOE facilities, dry cleaner sites, and grain elevators). Other DNAPLs such as “coal tar” at manufactured gas facilities are also common throughout industrialized areas of the country. The exact number of DNAPL sites is unknown, but is estimated to be over 10,000, with sites in every state.

The fate and transport of DNAPLs in the subsurface is extremely complicated and affected by many variables. The factors include the physical and chemical properties of the soil or rock matrix and of the DNAPL itself, degradation processes, the prevalence of significant heterogeneities in all aquifers and the interactions between dissimilar fluids attempting to occupy the same pore spaces and cover the same matrix surfaces within the subsurface.

By the 1970s, scientists and regulators began to recognize the exposure risks posed by chlorinated organics. In the decades since, environmental professionals have attempted to characterize the presence, fate, and transport of DNAPLs and the associated subsurface contamination. The standard practice has been to drill numerous monitoring wells during multiple phases of site investigation, a typically slow and expensive process. Unfortunately, the data collected were in many cases, of little practical use or, worse, misleading. Prolonged litigation has resulted at some sites because the characterization did not adequately define the source of the contamination. If an inaccurate characterization was accepted, more money was often spent implementing remedial systems that were focused on the wrong areas or had little chance of fully remediating the site or significantly reducing risks to human health and the environment.

Recent research has discovered that micro and macro-heterogeneities in the subsurface matrix and diffusion into and out of comparatively lower conductivity portions of the aquifer may be major and even dominant factors controlling the subsurface behavior of DNAPLs and the associated dissolved phase contamination.

As a result, researchers and advanced practitioners of site characterization have focused on improving existing and developing new DNAPL site characterization techniques. The emerging characterization techniques more accurately characterize the distribution and transport characteristics of DNAPLs and the associated dissolved phase contamination. This improved characterization allows remediation to be focused on the contamination, particularly the most mobile portion, and to more quickly and effectively reduce contaminant mass as appropriate and protect human health and the environment. When remediation is focused where it will do the “most good” less energy will be used and less waste will be generated, making the remediation more “Green”.

In September 2003, the ITRC DNAPL team published the technology overview document: “An Introduction to Characterizing Sites Contaminated with DNAPLs” (<http://www.itrcweb.org/Documents/DNAPLs-4.pdf>.) This document focused on the DNAPL characterization methodologies under development at that time. In the seven years since it was published, characterization science has grown significantly, and the document no longer represents the characterization science state of the art. The document was also not a technical regulatory document. It did not address regulatory issues or how to incorporate emerging methods into existing processes for many sites.

Though the new site characterization techniques may seem expensive at first glance, the new ITRC Technical Regulatory document will explain how these methods can save available environmental dollars. Improved DNAPL site characterization methodologies enable remediation to be focused where the majority of contaminant mass is actually located due to subsurface heterogeneities increasing both remedial effectiveness and cost-effectiveness of the effort. In these days of reduced remedial budgets, this can be a significant help to both regulators and problem holders. Characterization methods and applications data are rapidly changing, and both regulators and private sector practitioners will benefit from a document that captures the current status of technology.”

These and more reasons to develop this document clearly fit the ITRC Purpose: “**To advance innovative environmental decision making**” and its Mission to: “**Develop information resources and help break down barriers to the acceptance and use of technically sound innovative solutions to environmental challenges through an active network of diverse professionals.**”

Proposed Scope to Address Problem (what is the approach for this project?) Please note that technology research and demonstration project proposals are not valid for this RFP.

The proposed DNAPL Site Characterization team will conduct a comprehensive review of the 2003 ITRC DNAPL site characterization document to determine which sections need to be revised and where to add updated or new material. The team will summarize the basis and the current status of emerging DNAPL site characterization methods. The DNAPL Site Characterization Technical and Regulatory Document will provide objective guidance on the emerging DNAPL site characterization methods and their applicability in various geologic settings. The document will help regulators, project managers, and stakeholders improve their understanding of these techniques prior to major site characterization decisions and to be more open to their use. The team will also develop an internet-based training module or a more innovative training module, if appropriate.

Topics that the DNAPL Characterization team will address include:

- The latest conceptual models of DNAPL and associated dissolved and sorbed phase contamination.
- The impact of geological and anthropogenic heterogeneities on the distribution and migration of DNAPL and the associated dissolved and sorbed phase contamination.
- The effect of mobile and immobile pore spaces, diffusion, and dispersion as significant processes affecting contaminant fate and transport.
- Emerging and, more briefly, existing methods to assess geology, DNAPL and associated dissolved phase distribution, and contaminant fate and transport.
- The role of analytical and digital modeling in DNAPL site characterization.
- What managers should consider when reviewing site characterization plans.
- The relative costs of DNAPL site characterization including the effect of improved site characterization on the cost and effectiveness of remediation at DNAPL sites.
- Characterization tools that can be used in the revised characterization methodology.
- Geophysical techniques most appropriate for DNAPL site characterization

Targeted Users (who will use products generated by this project?)

The primary target will be state and federal regulators, the environmental consulting industry, and the regulated community and other problem holders. The products will help communities and other stakeholders understand DNAPL and related contamination as well as the processes best able to characterize the extent, fate, and transport of contamination at DNAPL sites and how that information can be used to improve site remediation and to more quickly reduce risks to human health and the environment.

This proposal fits a number of the State priorities from the 2010 and 2009 surveys: Site Characterization: Sampling, Modeling, Monitoring (top priority 2010); Environmental Impacts from Remediation Technologies; Groundwater Contamination; DNAPLs; and Brownfields.

Summary of Deliverables (primary project product(s))

Team work will begin when team leaders attend the 2012 Kick-off meeting. The team leaders will hold monthly conference calls with team members. The team will first meet in person at the 2012 spring meeting. As per the direction of the Life Cycle Guidance, the team will start by assessing the existing DNAPL characterization document, collecting information on the latest updates to the DNAPL site characterization paradigm, and collecting case studies that clearly describe emerging characterization methods and their advantages. The team will update the 2003 DNAPL characterization document first and then expand it into a formal ITRC Technical Regulatory document. Case studies will be included in an appendix as needed to demonstrate particular uses or applications of specific techniques. Upon completion of the draft Technical and Regulatory document, the team will go through the formal ITRC review process. Concurrent with the development of the draft Technical Regulatory document, the team will begin development of the Internet Training. If the team determines that there may be an innovative training technique to supplement the Internet Training, the team will consider a proposal to the Board to revise the training methodology.

The final Technical Regulatory document and training will significantly expand and improve the references available to regulators, project managers, and problem holders during evaluation of the use of recently developed DNAPL site Characterization techniques.

Impact (how will this project result in more effective environmental decision making?)

As discussed above, sites contaminated with DNAPLs continue to be a major environmental issue that must be addressed by regulators, environmental consultants, academia, and stakeholders. A Technical Regulatory document written by diverse team members will support the development of a widespread network of diverse environmental professionals supporting the ITRC Mission:

Develop information resources and help break down barriers to the acceptance and use of technically sound innovative solutions to environmental challenges through an active network of diverse professionals

By publicizing emerging innovations and improvements in DNAPL site characterization and educating environmental regulators, consultants, and stakeholders, ITRC will impact the entire field of DNAPL site characterization and remediation, while helping regulators, consultants, problem holders, and stakeholders to significantly improve DNAPL site characterization and remediation. This will help insure that the ever dwindling pool of dollars available for assessment and remediation is spent in the most efficient and proactive manner and that human health and the environment are protected with the least impact on the environment.

Project Schedule

- 1) Begin work at the 2012 ITRC Kick-off and spring meetings with monthly conference calls held between the meetings.
- 2) Complete review of existing document, complete outline, assign writing duties, and identify potential case studies by April 2012
- 3) Identify and describe emerging characterization techniques and complete collection of case studies by Summer Team Meeting 2012 (usually July)
- 4) First Internal Draft completed by October 2012

- 5) Complete internal review December 2012
- 6) Incorporate review January 2013
- 7) Complete second internal draft review April 2013
- 8) Send to POC/peer review June 2013
- 9) Begin development of training June 2013
- 10) Address POC/peer comments and practice training in October 2013
- 11) Finalize of Tech Reg and Internet Training by April 2014.

Proposed Personnel

Potential Team Membership/Needs

Team Leader: Naji Akladiss, Maine

Naji has degrees in Chemistry/ Engineering, and is a licensed professional engineer with the state of Maine. He works for the State of Maine as a project manager in its superfund program. Naji Akladiss has significant experience in ITRC. He was the Point of Contact for Maine, a team member on the former ITRC DNAPL team and the Team Leader for the “Bioremediation of DNAPLs” and “Integrated DNAPL Site Strategy” project teams. Naji has consistently demonstrated leadership skills by bringing together a large and very diverse group of regulators, academics, professionals, and stakeholders to put together case study, overview, resource, and Technical Regulatory documents, Internet-Based Training and Short Courses. The documents and training have been very well received, as evidenced by the selection of the Bioremediation of DNAPLs Team as the 2008 Team of the Year and Naji’s designation as the 2009 ITRC Team Leader of the Year Award.

Co-Team Leader: Michael B. Smith, Vermont

Michael has a BS degree in Geology, an MS in Hydrogeology, and an MA in Climatology. Michael Smith has worked as a geologist and hydrogeologist in both industry and government. He has worked the last 25 years for the State of Vermont in groundwater protection and remediation, and in development of regulations and state policies regarding groundwater. He has focused his work in the field of DNAPL site characterization and remediation. Michael has experience in ITRC as Point of Contact for Vermont, a member of the DNAPL team, and the Bioremediation of DNAPLs and Integrated DNAPL Source Zone Strategy project teams. Michael has also been on the ITRC Board of Advisors since 2005, including the role of Training Program Coordinator on the Board since 2006.

State Agencies:

DNAPL site contamination is a significant issue in all states. State agencies can be involved in site management decisions indirectly, through their regulator function, or directly, through management and restoration of “orphan” sites. State funding available for assessment and remediation of orphan sites is usually minimal, a situation exacerbated by the current economy. State regulators should be as up-to-date as possible with emerging characterization technologies to insure that site characterization is accurate and that remediation reduces contaminant mass and protects human health and the environment as cost-effectively as practical.

Representatives of regulatory agencies at the states listed below are anticipated to participate on the proposed team.

California
Maine
New Jersey
Vermont

Florida
Massachusetts
New York
Virginia

Other organizations that have expressed interest in participating as team members for this project and why.

The proposed DNAPL Site Characterization team includes some of North America’s leading academics, researchers, and consultants in this area and the resulting guidance will draw on their collective experiences and skills. The team will also include numerous regulators from a variety of States and from the Federal Government agencies who bring their varying perspectives on this topic, a diversity critical to any characterization technical regulatory document.

Federal Agencies:

Federal agencies can also be involved in site management directly or indirectly. Federal funding also ranges widely depending on the agency involved. As is true for state agencies, federal agencies should utilize emerging characterization techniques to optimize assessment and remediation, as well as make efficient use of available funding.

Federal agencies that intend to be involved in this project include both regulators (EPA) and problem holders/stakeholders (DOD, DOE, USAF, and USN).

US EPA
US DOE

US DOD
USAF

USN

Private Environmental Consultants:

Sites for which private entities are responsible range from very large industrial sites to “Mom and Pop” dry cleaners. Private parties responsible for site clean-up range from private multi-nationals to single proprietors. Available funding also ranges widely, from well-funded, PRP-lead, “Superfund” sites to minimally funded sites owned by failing enterprises. All entities, whether public, private, or corporate, responsible for a site also are responsible for O&M that can potentially last hundreds of years. It is necessary for private PRPs and their consultants to be familiar with emerging characterization technologies to insure that the site characterization is accurate and remediation is focused so that site restoration is efficient and cost-effective.

Representatives of the following private firms intend to participate in the proposed team.

Arcadis
Aquifer Solutions, Inc.
Battelle
Burns & McDonnell Engineering Co., Inc.
CDM (Camp, Dresser, & McKee, Inc.)
Fishbeck, Thompson, Carr & Huber

Geosyntec Consultants, Inc.
GSI Environmental, Inc.
Geo-Cleanse International, Inc
JRW Bioremediation, LLC
Langan Engineering & Environmental Services
Dajak, LLC

Academia:

The team is a forum in which academics can bring their research and network with practitioners from both the private and public sectors.

Members of the following academic institutions will participate in the new team.

Colorado State University, University of New Mexico Yale University

The skill mix of Team Members required H(e.g. hydrogeology, engineering, risk assessment, etc.):

The required skill mix includes hydrogeology, engineering, computer modeling, site characterization, regulatory, geology, chemistry, bioremediation, and chemistry, among other disciplines.

Sectors of Team Members required:

As the DNAPL Site Characterization issue is so common and wide spread, the team needs all of the above sectors involved.

Proposed In-Kind/Direct Project Funding

Nothing has been identified at this time.

Related Work:

[http://www.clu-in.org/contaminantfocus/Dense Nonaqueous Phase Liquids \(DNAPLs\)/cat/Detection and Site Characterization/](http://www.clu-in.org/contaminantfocus/Dense+Nonaqueous+Phase+Liquids+(DNAPLs)/cat/Detection+and+Site+Characterization/)