# **3.61 Contaminated Sites**

**Project Number & Title**

3.61 - Contaminated Sites

**Project Lead and Deputy Lead**

David Jewett, NRMRL, Project Lead

Dennis Timberlake, NRMRL, Deputy Project Lead

**Project Period**

FY16 – FY19

**Project Summary**

SHC Project 3.61 emphasizes research and technical support activities and products to characterize and clean up contaminated sites. This project supports the Agency by providing the scientific foundation and technical knowledge for those who engage in Office of Solid Waste and Emergency Response (OSWER)-specific site cleanups and community engagement. Technical support activities will focus on assistance the Office of Research and Development (ORD) provides to OSWER and the Regions in order to characterize and clean up contaminated sites. Technology transfer products will be developed to support remedial project managers and other site management personnel, who then engage communities through the specified procedures. Research activities will address how contamination, from single or multiple sources, can be effectively characterized and optimally remediated to protect community public health and their resources and beneficial uses, and for revitalization and reuse of these sites. Results from this research will provide new and improved methods for characterizing and remediating contaminated ground water, vapors, soils, and sediments to improve community public health and their resources and facilitate revitalization. Research will also address community water supply issues, including environmental justice concerns; providing tools to determine the temporal and spatial impacts of contaminated sites on community public health, including impacts to community drinking water quality and quantity from contaminated ground water, soils, and sediments, and the revitalization and reuse of these sites. A more holistic assessment of community water supplies, one that combines elements of the environment, society, and economy, can be completed by linking predictive tools to mapping-assessments, aquifer vulnerability assessments, water well locations, and economic analyses. This effort will build on previous contaminated sites research and will involve the assessment of metrics for remediation, restoration, and revitalization, in a context of potential spatial and temporal changes due to various factors including climate change.

**Project Description**

Problem and Decision Context

Contaminated groundwater is found at 80% of Superfund sites and clean up can take decades to complete. Clean up of contaminated sites is part of EPA’s Fiscal Year 2014-2018 Strategic Plan Goal 3: “Cleaning Up Communities and Advancing Sustainable Development”*[[1]](#footnote-1)*. Because of the reliance on aquifers for drinking water, the Superfund program seeks to prevent human exposure to contaminants and to try to ensure that ground water quality meets federal and state drinking water standards*[[2]](#footnote-2)*. As the need for drinking water increases due to population increase, exacerbated by potential cycles of weather extremes due to climate change, contaminated ground water may directly impact people drinking from private wells, limit water supply in some locations, or it may constrain community choices of water supply. Subsurface contamination can be the source of volatile contaminants that enter residences or businesses, also known as vapor intrusion. People may then be subject to inhalation exposure to hazardous pollutants. Discharge of contaminated ground water to surface water bodies may increase contaminant loadings to sediments and to surface water. Superfund sites with contaminated sediments present a risk to surface water and can be a factor in the degradation of beneficial uses through human and ecosystem impairments (for example, fish-consumption advisories). A few contaminated sediment sites are mega-sites where the sediment remedy cost may exceed $50 million*[[3]](#footnote-3)*. In some cases, ground water/surface water interactions are the mechanism for contaminating surface waters from contaminated sediments. The Federal Brownfields Revitalization Act[[4]](#footnote-4), signed in 2002, was enacted to promote clean up and revitalization of Brownfields. Brownfields are often multimedia challenges with ground water, surface water, soil, and sediment issues.

Health and ecosystem impacts from contaminated ground water, vapor intrusion, and contaminated soils and sediments continue to be reported by the news media. Recently publicized impacts from contaminated sites include negative health impacts from drinking private well water, restrictions on use of ground water for community supplies, vapor intrusion-caused abandonment of office space and legal action over exposure to school children, and contaminated sediments as a cause of fish consumption advisories.

Because of the potential impacts to human health and the environment, the high cost of remediation, the need to support brownfields revitalization, and the impact to community water supplies, this Contaminated Sites research project includes multiple components that 1) provide technical support; 2) conduct research on characterization, remediation and site management; and 3) conduct research on spatial and temporal impacts on community water supplies. Products from these first two areas facilitate Superfund site decision makers through site-specific technical support; and generalized research on hazardous waste site characterization, remediation and site management. The results of this work also supports decision makers at RCRA sites, Brownfields sites, and Great Lakes National Program Office delisting activities with technical products that address assessment and remediation that might be necessary for restoration and revitalization. Products from the third focus area facilitate community decisions on water supplies with respect to Brownfields and Environmental Justice concerns.

Outputs

The Contaminated Sites project is designed to produce products that contribute to five SHC outputs.

* 3.61.1 Lessons learned from ORD’s Technical Support to Superfund and other contaminated sites
* 3.61.2 Incremental report on lessons learned from ORD’s Technical Support to Superfund and other contaminated sites
* 3.61.3 Methods for characterizing and remediating contaminated ground water, vapor, and sediment sites, impacted with single or multiple contaminants, to improve community public health and their resources and facilitate revitalization
* 3.61.4 Strategies for integrated management of contaminated sites
* 3.61.5 Tools for evaluating temporal and spatial impacts of contaminated sites on public health and the environment, for use in site remediation, restoration and revitalization decisions

Focus Areas

With assistance from the SHC National Program Team, the Contaminated Sites Project Team coordinated with designated staff from OSWER in order to better understand the priorities and needs of this key SHC customer. OSWER staff were engaged through a variety of methods (the SHC Communique, meetings with writing team members, conference calls, and opportunities to review and comment on draft documents). This process of engagement has allowed a greater amount of customer input into the planning process and allowed the project team to better align research and technical assistance activities and key products with customer priorities. Project research and technical support activities are described in the following three focus areas:

1. Technical Support for Contaminated Sites
2. Research on Site Characterization, Remediation, and Management, and
3. Research on Temporal and Spatial Impacts of Contaminated Ground Water with an Emphasis on Impacts to Community Water Supplies.

The exchange of information and ideas between OSWER and the Contaminated Sites Project Team will continue through the project charter development phase. Engagement will also continue throughout the life of the project in order to discuss ongoing research and technical support activities, vet new research and assistance ideas and needs, and adjust to changes in customer priorities to the extent possible.

*Focus Area #1: Technical Support for Contaminated Sites -* Clean ups at Superfund sites are complex processes that involve environmental transport phenomena, remedial decisions, technology implementation, community engagement, remedy review, and redevelopment decision-making. Individual EPA site managers do not usually have expertise in all of these areas and ORD provides support in this area to OSWER and the Regions through five technical support centers: Ground Water, Engineering, Monitoring and Site Characterization, Superfund/Human Health and Ecological Risk Assessment Technical Support Centers[[5]](#footnote-5). ORD technical assistance can be requested by EPA remedial site managers in any Region as well as program office staff. Center Directors review requests and identify ORD scientists and engineers with knowledge and expertise commensurate with the requests. These technical support centers provide a valuable link between research and contaminated site problems. Knowledge obtained through these activities provides the basis for designing research projects and likewise research provides improved approaches for characterization and remediation of contaminated sites. For example, one priority research area that has been identified by OSWER is mining site remediation. Mining contaminated sites vary greatly in both extent and types of contamination present. ORD’s Engineering and Ground Water Technical Support Centers have a long history of working with Regional scientists and staff to address issues related to contaminated mining sites and mining-influenced waters (acid-rock drainage and waters laden with large concentrations of metals and metalloids).

One of the OSWER’s primary priorities for the Contaminated Sites project, one that OSWER wants to maintain, is the continued technical support provided by ORD scientists and technical staff to Regional and Program Office staff at Superfund sites across the Nation. Key technical support products will contribute to Outputs 3.61.1 and 3.61.2, which describe technical support activities and compile information on “lessons learned” from this work. These “lessons” capture experience from working on specific sites for site managers and also provide blueprints for future research. In addition, the technical support program greatly enhances state-of-the-science technology transfer between ORD, OSWER, and Regions, providing scientific and technical approaches, methods, technologies, and strategies that are an essential component to cleaning up contaminated sites efficiently and effectively. This technical assistance is highly valued by the EPA Regions and OSWER and it will remain a key component of the Contaminated Sites Project. Other key products related to the technical support component of the Contaminated Sites Project are aligned with OSWER priorities, such as the development of tools and technologies to characterize and clean-up Superfund, RCRA, Great Lakes National Program Office Areas of Concern, and Brownfields sites, including site reuse and revitalization.

The key products for Focus Area 1 include:

* Technical support center annual reports: annual reports from the various technical support centers describing assistance activities provided to site managers across the nation.
* Lessons learned: information on lessons learned compiled from technical support activities, capturing site-specific experiences to share with other project managers and providing blueprints for future research.
* Technical support issue papers: issue papers focusing on site characterization or site remediation technologies and strategies (as is current practice, issue paper topics will be coordinated with EPA’s Ground water, Engineering, and Federal Facilities Forums, who will provide guidance and input into their development).
* Assessment on the application of geophysical methods to contaminated sites: reports and web site update reviewing the successes and failures of using geophysical methods to map and monitor contamination and remediation.
* Long-term monitoring methods, metrics, and protocols to conduct effectiveness assessments following contaminated sediment remediation and restoration activities in a watershed (or area of contamination, AOC): methods, models, and guidance to characterize the spatial and temporal recovery of watershed and contaminated sediment resources; and report on case studies (from SHC Project 2.62 place-based studies) demonstrating use of methods and models to characterize restoration following remediation and restoration activities in a watershed to support sustainable use of a beneficial resource.
* Contaminated mine site remediation, treatment, and reclamation: compilation of ORD research and state-of-the-practice to assess remediation and treatment technologies for contaminated mine sites and mine influenced waters (MIW); to inform and broaden acceptance of innovative technologies for remediating or treating contaminated mine sites and MIW nationally.

*Focus Area #2: Research on Site Characterization, Remediation, and Management -* Research in this focus area will advance the science and engineering needed for proper assessment, remediation, and reuse of contaminated sites. In some areas, technical knowledge gaps are addressed by developing our understanding of site characterization, remediation, and site management. In other areas, new approaches build upon prior ORD work, such as the impacts of diffusion from fine-grained sediments at in-situ chemical oxidation sites. This research will support site redevelopment and reuse. Technical issues at many sites can be complex, even at the stage of redevelopment. Characterization, remediation and site management activities continue to play a role when the transition is made to a Brownfields redevelopment or a Great Lakes Area of Concern delisting and restoration which may be a part of a broader community revitalization effort.

OSWER priorities for ground water research include: improving the application and interpretation of high resolution ground water characterization technologies (such as modeling and geophysical tools); conducting research on site characterization and mitigation involving ground water contamination via back diffusion; and developing and evaluating improvements in ground water treatment delivery and extraction technologies and strategies. This focus area targets contaminated ground water research activities that produce important products to address these priorities. EPA publications and papers in scientific and technical journals will be major products of this focus area. In addition to manuscripts for scientific and technical journals, technology transfer products (reports, manuals, tools, models, etc) will be developed that provide the detail necessary to put these products to work, cleaning up our contaminated sites. Several reports and publications are proposed for contaminated ground water research activities; such as, geophysical assessment of monitored natural attenuation; flux-based site management; impacts of multiple treatment technologies; back-diffusion of contaminants from fine-grained materials to conductive aquifers; dense non-aqueous phase liquid source zone and plume response; uncertainty in pump-and-treat and monitored natural attenuation; and related modeling approaches.

Research on ground water will include the application and interpretation of high resolution groundwater characterization technologies and methodologies. ORD, in collaboration with OSWER and the Regions will develop an issue paper on analysis of existing commercially available approaches for high resolution ground water characterization and interpretation to assist Regions.

ORD modeling work will be incorporated with advanced source term characterization to better understand contaminant behavior which can contribute to better site management. ORD will also conduct research on site characterization and mitigation involving plume persistence due to back diffusion[[6]](#footnote-6). Back diffusion continues to present challenges for the effectiveness of treatment systems and the ability to develop effective exit strategies for site cleanups. Better understanding the diffusion issues as well as developing technologies and high resolution approaches to characterizing sites is essential for effective and protective cleanup of Superfund sites.

Ground water research will continue to develop and evaluate improvements in groundwater treatment delivery and extraction technologies and strategies. As improved source zone and groundwater treatment is contingent on the ability to deliver treatment amendments and extract contamination from the subsurface, this research will support the development of needed data on the effectiveness of available delivery and extraction systems and ways to improve their effectiveness. Ground water research also focuses on improving treatment technologies and strategies to clean up contaminated subsurface environments. Even though many technologies have been developed to help clean up contaminated ground water, more research is needed in order to improve the efficacy and cost-effectiveness of these technologies, as well as provide new, novel combined treatment technology alternatives. ORD is building collaborations with other organizations, such as the U.S. Departments of Defense and Energy, and the Chinese Ministry of Science and Technology, to improve and optimize remediation technologies for contaminated soils and ground water and to better understand remediation and its impacts on bioavailability/bioaccumulation in soils polluted by heavy metals or PAHs.

The development of an environmental leaching assessment framework for organic pollutants also is a priority for the OSWER. A leaching assessment framework has been developed for inorganic pollutants, the Leaching Environmental Assessment Framework, but a similar framework approach has not been developed for organic contaminants. OSWER and ORD need to further discuss this effort

OSWER priorities for contaminated sediments research include: improving our understanding of linkages between contaminant concentrations in sediment and fish tissue concentrations; improving analytical technology for the evaluation of hydrophobic organic contaminants and metals in soil and sediment; and evaluating the effectiveness of contaminated sediment remediation alternatives and their associated impacts. ORD research on sediments will focus on developing methods and approaches to characterize sources, evaluate remediation technologies, evaluations of remediation and restoration activities, and metrics to measure revitalization and redevelopment efforts. These approaches include techniques such as: deriving sediment interstitial water remediation goals to protect benthic organisms from toxicity, and how interstitial water measurement can be integrated into the prediction of residues in fish. Additionally, research will continue on the use of passive sampling for measuring interstitial water concentrations for contaminants at contaminated sediment sites to help standardize passive sampling techniques and develop rapid evaluation techniques for sediment contaminants. This work will improve the analytical technology for the evaluation of hydrophobic organic contaminants and metals in sediment and in sediment pore water and serve in the development of guidance to apply this new data within the site characterization and remedy effectiveness assessment process. Regarding remedy effectiveness of sediments, ORD will work with OSWER and the Great Lakes National Program Office to evaluate the effectiveness of various remediation processes. As an example, evaluating monitored natural recovery, enhanced monitored natural recovery, amendments, capping, and dredging to meet Remedial Action Objectives at Superfund sites and Great Lakes National Program Office Area of Concern sites, and to evaluate the efficacy of remedy and restoration activities. ORD will work with OSWER, the Regions, and the Great Lakes National Program Office in developing a potential inter-agency effort to better understand the linkages between sediment and fish tissue concentrations of PCBs, PAHs, dioxins, Me-Hg and Hg, and metals.

Additional discussions between ORD and Program Offices, including the possibility of a technical workshop that includes academia, may help elucidate linkages between pollutant concentrations in sediments/pore waters and those in fish tissue. Case studies from place-based research sites and other contaminated sediments sites will demonstrate methods and approaches for characterizing sources of contamination to aquatic sediments sites from point, non-point, groundwater, and upstream sources. Additionally, these case studies will provide long term monitoring methods and protocols to characterize restoration following remediation activities in a watershed to support sustainable use of resources and to assess remediation to restoration to revitalization (R2R2R).

ORD is designing its vapor intrusion research activities to address OSWER requests for information on the use of external remedial controls to reduce vapor intrusion and decrease the need for in-structure intrusive sample collection or in-building remediation systems. Research on vapor intrusion will also include a literature review on the influence of building parameters on vapor intrusion (for example, the role of building physics in indoor air concentration, and the influence of building efficiency on vapor intrusion). Addressing this priority also will allow scientists to describe the defining characteristics of vapor intrusion problems to guide site assessments and model development. Further collaborative efforts between ORD and OSWER and the Regions will include assessment of tools to understand worst case exposure conditions to be able to provide answers quickly and efficiently. Other ORD research and technical support activities will address OSWER priorities on developing short-duration screening methods; improving subsurface characterization, including sub-slab sampling, to quantify contaminant concentrations in soil gas; and ensuring health protection from vapor intrusion is based on accurate predictions. ORD and OSWER representatives are discussing research activities related to assessing and mitigating vapor intrusion in large buildings and the role of soil vapor extraction. Ongoing discussions with OSWER will help to better focus ORD vapor intrusion research activities to ensure that they address the highest OSWER priorities.

Note that future reductions in contaminated sediment and vapor intrusion research will likely accompany any future reductions in FTE for this research area.

Products in this focus area contribute to outputs 3.61.3 and 3.61.4. These proposed products address several of the OSWER’s priorities for ground water (site characterization and remediation), sediments (site characterization and remediation, and bioavailability), and vapor intrusion (assessment and remediation efficacy). The work supports management of Superfund, RCRA, and Great Lakes National Program Office Area of Concern sites and additional work which may be needed for Brownfields revitalization.

The key products for Focus Area 2 include:

* Natural attenuation of metalloids: report addressing transport and fate of metalloids and their management through natural attenuation remedies.
* Mobilization of metals - report extending prior work on metals to address conditions under which metals become mobilized, including transformations of organic co-contamination.
* Post-in situ chemical oxidation assessment of VOC rebound, impact of natural attenuation, and changes in aquifer permeability: product evaluating the influence of ISCO on VOC rebound (back diffusion), natural attenuation capacity, and aquifer characteristics following ISCO treatment at a contaminated case study site.
* Critical analysis of pore volume estimation methods for designing ISCO oxidant loading: critical analysis of ISCO design factors used in estimating the delivery of oxidant volume/dosage.
* Flux-based site management: report on aspects of fluxed-based site management (selection of monitoring points, uncertainty in complex aquifers, application) and economic analysis at a contaminated case study site.
* Back-diffusion assessment and management strategies: products focusing on magnitude and significance of back-diffusion for site characterization and management and evaluating strategies for managing risk due to back diffusion.
* Analytical models for two- and three-dimensional contaminant transport in aquifers characterized by low- and high-permeability zones: tool for predicting contaminant distribution at contaminated sites characterized by preferential pathways (high-permeability layers) interacting with surrounding, low-permeability zones.
* Using geophysical methods to map, characterize, and monitor contaminant plume location and movement in the subsurface: guidance documents and reports on geophysical methods for contaminate plume mapping and remedy monitoring; literature review of geophysical methods best practices for characterizing contaminant plumes directly and indirectly through their interaction with natural subsurface conditions, and research on geophysical methods as a proxy for monitoring active and passive remediation efforts.
* Tools to characterize and monitor groundwater-surface water interactions: products testing, developing, and assessing field investigative tools such as fiber optic distributed temperature systems (DTS) and electrical resistivity for this purpose.
* Applications of passive sampling for measuring interstitial water concentrations of contaminants of concern at contaminated sediment sites: research products evaluating: 1-passive sampling methodologies for estimating bioavailable concentrations of contaminants in sediments and the water column, and 2-the efficacy of passive sampler-based interstitial water measurements to improve predictions of contaminant concentrations in fish and shellfish.
* Improving bioaccumulation models for predicting residues at contaminated sediment sites: determination of processes causing the apparent increase in bioaccumulation as concentrations in sediments decrease at Superfund sites with contaminated sediments.
* Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates: revised sediment testing methodologies that are used by testing laboratories (private and governmental) across the country and globally.
* Develop and demonstrate methods along multiple lines of evidence for site characterization used in source identification/apportionment, remedial investigation, and feasibility studies: case studies from place based research sites (e.g. SF and AOC projects) demonstrating the use of multiple lines of evidence (chemical, biological, physical, and modeling) for source and site characterization and effectiveness assessment.
* Calibrated hydrodynamic model simulating sediment and metals mass flux in aquatic systems: an Environmental Fluid Dynamics Code (EFDC)-based model that will work in concert with a previously delivered watershed loading model (SWAT) to simulate fate, transport, and sediment-water interaction of contaminated sediment facilitating remedy evaluation in RI/FS studies.
* Development of a conceptual model for vapor intrusion using the most current state of knowledge: product defining characteristics of vapor intrusion problems to guide site assessments and numerical model development.
* Analytical solutions for subsurface vapor transport incorporating the mass exchange between vadose zone and water table aquifer: SERDP-leveraged model study that simulates the fate and transport of volatile organic compounds in the vadose zone above the water table aquifer.
* Analytical modeling of soil vapor extraction subject to effective diffusion in a water table aquifer: SERDP-leveraged modeling study that couples the soil-vapor extraction process with lateral diffusion in the underlying ground water.

*Focus Area #3: Research on Temporal and Spatial Impacts of Contaminated Ground Water - Site Reuse and Revitalization and Environmental Justice -* With population increases and increased frequency of extreme weather events due to climate change, there are stresses on aquifer-based water supplies, and the impacts of contaminated sites may constrain community decisions on water supplies. At the decision-making level environmental considerations (Focus Areas One and Two) are augmented by social and economic factors. In Focus Area Three, the temporal and spatial changes in ground water, vapor intrusion and contaminated sediments are coupled with social and economic factors related to community water supplies addressing Environmental Justice concerns and Brownfields needs.

Ground water modeling approaches for both detailed and screening of impacts of contaminated sites are proposed, as are mapping-based evaluation of locations and impacts to private drinking water wells in the context of aquifer vulnerability. These efforts address the environmental pillar of sustainability. This research includes a proposed product that focuses on the economic valuation of various water supply alternatives. This economic valuation of water supply alternatives will be applied to select communities (that is, demonstration projects) as determined by project stakeholders. Combining all of these research components into a demonstration project incorporates the social and economic pillars of sustainability.

The research products in this focus area will contribute to output 3.61.5 by combining knowledge and tools generated to assess community decisions on water supply. These include understanding aquifer vulnerability and private water well use; contaminant plume transport and its impact on public and private water supply wells; and social and economic factors which influence water use and water valuation.

The key products for Focus Area 3 include:

* Extension of streamline-based ground water model for management alternatives: extended modeling system that accommodates remedial and site management activity products from Focus Area Two (potential includes reactive barrier walls, monitored natural attenuation, back diffusion, and in-situ chemical treatment).
* Analytical modeling for transport of volatile organic compounds in vadose zone and water table aquifer incorporating mass exchange through air boundary layer near ground: a group of analytical solutions for the equation system describing transport of volatile organic compound in the vadose zone and water table aquifer; the model will specifically accounts for different transport mechanisms in the subsurface domains.
* GIS-based tool for assessment of groundwater contamination to predict spatial and temporal distribution of organic chemicals in groundwater at multiple scales.
* Economic evaluation of water supply alternatives, including an evaluation report addressing impacts of contaminated ground water on choices for community water supplies

**Nature of the Work**

Technical support activities use FTEs for evaluation of site-specific documents and on-site field activities; extramural funds are used to augment in-house expertise in specific areas. ORD and contract personnel will provide support for field work and sample analyses for individual sites.

Contaminated site research is divided among laboratory studies, field studies, model development and application, mapping, and economic analysis. The fundamental knowledge of contaminant behavior is developed from laboratory and field studies, and an emphasis is placed on these activities. Field and laboratory studies can also be expensive given their use of supplies and equipment, and the need to staff sites where research and data collection are occurring; hence more of the expense/extramural resources are devoted to these areas. Field research efforts are leveraged with ongoing characterization and remediation site activities. Modeling consumes less physical materials, but requires labor hours, which we obtain mainly through ORD researchers. Mapping and economic analysis, similarly, require mostly ORD personnel.

**Collaboration**

Collaboration within SHC: Decision-making for Superfund cleanups and other remediation, restoration, and revitalization activities is closely related and in some cases integrated with Project 1.61. Contaminant fate and transport research and technical support, as well as other remediation, restoration, and revitalization activities, provide foundations for work in Project 2.62 (Community Public Health and Well-Being). Work on contaminated sites includes impacts to vulnerable populations (Project 2.63 Assessing Environmental Health Disparities in Vulnerable groups) as they may be more severely affected than others. Private well mapping, field data evaluation and modeling, and GIS evaluation of impacts contributes to objectives of: EnviroAtlas: A Geospatial Analysis Tool (Project 1.62); Community Public Health and Well-Being (bioavailability and C-FERST, 2.62); and Environmental Releases of Oil and Fuels (3.62). Development of ground water indices supports Project 2.64 (Indicators, Indices and Report on the Environment). Ground water transport and contaminated sediments research provides inputs to Project 2.61 for characterizing linkages between Ecosystem Good and Services (FEGS) and public health. Ground water modeling at contaminated sites supports similar needs in Project 3.62 (Environmental Releases of Oil and Fuels). Sediment and ground water restoration research supports Remediation to Restoration to Revitalization (R2R2R) work in Projects 2.61 and 2.63. Tools developed to assess transport and transformation of contaminants provide building blocks for sustainability assessments in Systems-Based Assessment Methods for Community Sustainability research (Project 4.61).

Collaboration with other ORD National Programs: Research on drinking water resources meshes with the SSWR research areas on Watershed Sustainability, Green Infrastructure, and Water Systems. Research on community ground water impacts is applicable to ACE interests on climate change.

Collaboration within EPA: EPA’s OSWER and Regions, the Great Lakes National Program Office (Great Lakes Legacy Act and Great Lakes Restoration Initiative), and the EPA’s Ground Water, Engineering, and Federal Facilities Forums are anticipated collaborators on contaminated site related research. Additionally, OW is interested in the research related to ground water and potential water quality impacts from contaminated sites. Lastly, this research supports the Office of Sustainable Communities, Children’s Health, and Environmental Justice.

External Collaboration: Existing and future external research collaboration will be with other federal agencies (DOD, DOE, NOAA, USFW, USGS); tribal and state regulatory authorities; the Federal Facilities Forum of the Environmental Council of the States; the Federal Remediation Technologies Roundtable; the Interstate Technology Regulatory Commission; the Strategic Environmental Research and Development Program /Environmental Security Technology Certification Program (SERDP/ESTCP); and academic institutions.

International Collaboration: The collaborative research proposed in the work plan to the ORD-Chinese Ministry of Science and Technology Memorandum of Understanding has a strong relationship with SHC Project 3.61 - Contaminated Sites. This relationship is strongest related to Focus Area 2 research (research on site characterization, remediation, and management). ORD and Chinese scientists will work collaboratively to advance the science and engineering needed for proper assessment, remediation, and reuse of contaminated sites.

**Assumptions/Constraints**

Much of the research and technical support is predicated on the assumption that access to suitable sites and data remain available. For our areas of historic focus, no problems are anticipated. For Focus Area Three, the work is extended to communities: selection and participation from appropriate communities is critical to success and will be coordinated with the Regions, States and communities.

**Project Charter Writing Team Members**

Souhail Al-Abed, NRMRL

Steven Acree, NRMRL

Karen Bradham, NHEERL

Barbara Bergen, NHEERL

Michael Brooks, NRMRL

David Burden, NRMRL

Robert Burgess, NHEERL

Lawrence Burkhard, NHEERL

Mark Cantwell, NHEERL

David Carson, NRMRL

Brian Dyson, NRMRL

Robert Ford, NRMRL

Tim Gleason, NHEERL

Mohamed Hantush, NRMRL

Dale Hoff, NHEERL

Scott Huling, NRMRL

David Jewett, NRMRL, Project Lead

Fran Kremer, NPD Representative

Jim Lazorchak, NERL

Todd Luxton, NRMRL

John McKernan, NRMRL

Marc Mills, NRMRL

Dave Mount, NHEERL

Randy Parker, NRMRL, Former MI

Kirk Scheckel, NRMRL

Dennis Timberlake, NRMRL, Deputy Lead

Thabet Tolaymet, NRMRL, Acting MI

Brian Schumacher, NERL

Varma Rajender, NRMRL

Jim Weaver, NRMRL, Former Project Lead

Dale Werkema, NERL

Rick Wilkin, NRMRL

Lynn Wood, NRMRL

Tony Zimmer, NRMRL

John Zimmerman, NERL

1. Fiscal Year 2014-2018 EPA Strategic Plan, April 10, 2014, United States Environmental Protection Agency, Washington, DC. Goal 3: Cleaning Up Communities and Advancing Sustainable Development. Clean up communities, advance sustainable development, and protect disproportionately impacted low-income and minority communities. Prevent releases of harmful substances and clean up and restore contaminated areas. Objective 3.3: Restore Land. Prepare for and respond to accidental or intentional releases of contaminants and clean up and restore polluted sites for reuse. [↑](#footnote-ref-1)
2. http://www.epa.gov/superfund/health/conmedia/gwdocs/brochure.htm. [↑](#footnote-ref-2)
3. http://www.epa.gov/superfund/health/conmedia/sediment/index.htm [↑](#footnote-ref-3)
4. Small Business Liability Relief and Brownfields Revitalization Act, 115 STAT. 2356. [↑](#footnote-ref-4)
5. <http://www.epa.gov/superfund/health/research.htm>. Briefly, the Ground Water Technical Support Center provides support on issues regarding subsurface contaminant fluxes to other media (e.g., surface water or air), and ecosystem restoration. The Engineering Technical Support Center offers short- and long-term assistance to Superfund and RCRA Corrective Action staff. Assistance focuses on treatment technologies and engineering approaches to site management at any phase from problem identification through remedial action. The Monitoring and Site Characterization Technical Support Center supports Superfund and RCRA staff with on- and off-site monitoring and site characterization issues. The Human Health and Ecological Risk Assessment Technical Support Centers provide technical information and address scientific questions of concern or interest on topics relevant to ecological risk assessment at hazardous waste sites. When on-site work is required, the TSCs mobilize specialized teams of field scientists equipped with portable or deployable instruments to aid the Regions with screening and site characterization. Expertise is available for support throughout the various stages of evaluation of a site (from planning and design to analysis and data interpretation). The Engineering, Ground Water, and Monitoring and Site Characterization TSCs are supported through SHC Research Program and the Human health and Ecological Risk Assessment TSCs are supported via the HHRA Research Program. [↑](#footnote-ref-5)
6. Back diffusion is the process where contaminants contained in low permeability aquifer materials diffuse into otherwise remediated aquifers. [↑](#footnote-ref-6)