Presented to:

Minnesota Pollution Control Agency

and

Minnesota Department of Agriculture

Request for Proposal
Professional / Technical Master Contract
Event ID R3201-2000008034
CR 6249 Superfund, Petroleum, Agriculture

West Central Environmental Consultants, Inc. Technical and General Proposal:

Category A – Petroleum, Superfund, MDA, Closed Landfill Program Environmental Services

14 Green River Road
Morris, Minnesota 56267

Telephone: 800.422.8356
Fax: 320.589.2814

April 11, 2018

WCEC
ENVIRONMENTAL CONSULTANTS

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WCEC
ENVIRONMENTAL CONSULTANTS

Morris, Minnesota Office
14 Green River Road | Morris, MN | 56267
800.422.8356 | www.wcec.com | Fax 320.589.2814

Section A Technical Proposal

A.1 Cover Letter

April 6, 2018

Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155

Re: Request for Proposal - Professional / Technical Master Contract - Category A: Petroleum, Superfund, MDA, and Closed Landfill Program Environmental Services

West Central Environmental Consultants, Inc. (WCEC) is pleased to submit the following Technical and General Proposal for Category A Environmental Services, in response to the above-referenced Request for Proposal (RFP).

As an incumbent under the current Superfund, Petroleum Remediation Program and Agriculture Environmental Professional Master Contract (Master Contract) with the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Agriculture (MDA) since 1998, our exceptionally qualified and experienced team understands the environmental concerns presented at Superfund, petroleum and agriculture sites unique to the state, and our commitment to responsiveness, quality and cost-effective results separates us as a top-tier service provider. We greatly value and enjoy being a service provider to the MPCA and MDA and are excited about the opportunity to continue this important partnership. Our recent growth in technical service capabilities and implementation of our new, state-of-the-art project management and accounting system strengthens our ability to service the agencies while achieving our company's mission: *to partner with our customers to create quality, cost-effective solutions for mutual business and individual success*.

COMPANY & CONTACT INFORMATION

Proposer's Designated Contact and Address

Mr. Douglas Stahman, General Manager
14 Green River Road, Morris, MN 56267
Tel: (800) 422-8356 | Fax: (320) 589-2814
Website: www.wcec.com
Email: stahmand@wcec.com

Company Locations Participating Now or in the Future

Corporate and local office:
14 Green River Road, Morris, MN 56267

Satellite Offices:

- Minneapolis / St. Paul Metro Area
  5005 Boone Avenue N., New Hope, MN 55428
- Missoula, MT
  1030 South Avenue W., Missoula, MT 59801

WCEC Overall Capabilities, History and Organizational Structure

WCEC is a multidisciplinary environmental consulting firm which was incorporated in 1990 and employs over 50 persons in three offices. Our comprehensive experience and capabilities meet the requirements of the scope of services requested in the Category A RFP. We are also uniquely qualified to perform many specialized services that are relevant to this opportunity, including high resolution site characterizations using direct-sensing technologies and preparation of 3D integrated site visualizations as part of our development of comprehensive site conceptual models. Use of these tools as part of our focused investigation process significantly enhances our corrective action design and implementation capabilities. Green and sustainable remediation best management practices and principles are considered and used where appropriate in all of our corrective action projects, bringing maximum benefit to all stakeholders.

Beginning in 1990, WCEC provided environmental consulting services to private companies in rural Minnesota and the Dakotas. By 1993, WCEC expanded services to public and private clients throughout Minnesota, Wisconsin and westward to the Pacific Northwest. WCEC now provides environmental services nationally and internationally as a recognized leader in site characterization, remediation and other specialized consulting services. WCEC has built many long-standing business relationships with Minnesota agencies, all of which have been built on trust, reliability and performance. For example, since 1993, WCEC has been providing emergency response services for hazardous/non-hazardous material releases on behalf of the Minnesota Department of Administration, Materials Management Division, and serviced the Minnesota Department of Public Safety as a Hazardous Materials Chemical Assessment Team (CAT) from 1996 to 2014. Since 1998, WCEC has provided environmental services at over 200 hydrocarbon, agricultural, and hazardous materials sites under the MPCA and MDA Master Contract. In November 2006, WCEC was also awarded a contract with the State of Minnesota to provide drilling and monitoring well installation services to State Agencies and their contracted consultants.

WCEC is internally organized by service division categories and subgroups, independent of the geographical location of staff and equipment. These groups include but are not limited to teams for soil and groundwater investigation and remediation at hydrocarbon, agricultural/chemical and hazardous waste sites, regulatory compliance, engineering, information services, spill response and agency training. Each service line has a designated leader and assigned team members that are selected based on specialized areas of expertise. Team leaders participate in weekly strategy and planning meetings and use these opportunities to exchange ideas, cross-train staff, and collaborate to develop solutions to complex project challenges. Our project management tools are used to continuously monitor project progress, anticipated workloads and staffing requirements on all current projects on a company wide basis, enabling us to maximize the efficient use of our human and technological resources, regardless of physical location.

Availability to the Agencies

WCEC is available on a day to day basis to generally discuss, inform, and interact with the Contract users regarding any aspect of our services, including billing and accounting information during regular office hours, 8:00 AM to 5:00 PM, Monday through Friday. Our local Minnesota offices have 15 project managers, 1 professional engineer, 10 scientists, 6 technicians, and other specialized staff meeting the personnel classifications required under Category A. Support from our satellite offices is available to the Agencies as needed at no additional expense associated with geographical location. A Staff Classification Matrix demonstrating our level of experience available to the Agencies is included in Section A.2.3 of this proposal.

Acceptance of Classification Levels, Rate Schedules & Sample Contract Terms

WCEC understands that this proposal will become part of the awarded contract. WCEC accepts the Classification Levels and Rates presented in Schedules 1 and 2, and the Equipment and Supplies List and rates included in the RFP. WCEC also acknowledges the proposed Sample Contract Terms and Conditions included as Attachment C of the RFP and in addition to the Classification Levels and Rate Schedules, accept them as part of a contractual agreement.

On behalf of WCEC, thank you for the opportunity to respond to this RFP.

Sincerely,

Dr. James B. VanAlstine, Ph.D.
Vice President/Senior Consultant

A.2 Qualifications and Capabilities

This section of our proposal presents an overview of WCEC's overall company capabilities, including a description of our key staff, a reference to the resumes contained in Appendix A, our experience with other Federal and State Agencies or Departments, our knowledge of the Guidance and Regulations associated with the work under this contract, and descriptions of two remedial investigations conducted by WCEC within the past three years.

A.2.1 Overall Summary

WCEC is a multidisciplinary environmental consulting firm, which was incorporated in 1990 and employs over 50 persons in three offices, including two regional offices in Minnesota. We provide a full range of environmental consulting services that meet the needs of the Category A Contract, including, but not limited to, property assessments, field investigations, risk assessments, feasibility studies, remedial design, and remediation system construction, operation and maintenance at petroleum, agricultural-chemical, and hazardous waste release sites. Our staff is a unique collaboration of committed professionals that combine their technical expertise, academic knowledge, and more than 27 years of shared company experience to investigate, identify, and remediate releases of contaminants that pose a threat to the state's environment and the public's health and safety. The following descriptions provide an overview of our capabilities relevant to the primary service levels of the RFP.

Petroleum Environmental Services

WCEC's experience at petroleum release sites is extensive and comprehensive and encompasses the full range of services required by the RFP. Projects successfully completed by WCEC include but are not limited to overseeing the removal of underground storage tanks (USTs) at retail petroleum stations, providing emergency response, site investigation and corrective action implementation services at train derailments and petroleum pipeline sites involving large-scale release of hydrocarbons, completion of high resolution site characterization using direct sensing technologies, and preparation of 3D integrated site visualizations as part of our development of comprehensive site conceptual models. Our engineers, scientists and technicians have years of combined experience with corrective action design, construction and remedial system operation and maintenance throughout the state of Minnesota. We have completed over 2500 petroleum release site projects, many of which have been performed directly on behalf of the MPCA as an incumbent under the current Master Contract.

Our engineers, scientists, and technicians possess a unique collaboration of academic skills with practical hands-on experience gained from over 27 years of providing petroleum site investigation, remediation system design and implementation services. We have designed, installed and/or operated over 100 petroleum remediation systems in Minnesota and various other states using a wide range of technologies, including:

- Source area removal through excavation
- Multi-phase extraction
- Soil vapor extraction
- Air sparging

- Ozone sparging
- Oxygen injection, and
- Enhanced bioremediation

The MPCA Green Remediation practices and policies will be followed for all projects performed under this contract, bringing maximum benefit to all stakeholders. More details regarding our experience and capabilities with petroleum environmental services are provided throughout the applicable portions of this proposal.

Minnesota Superfund Environmental Services

WCEC has the experience and capabilities to perform projects for the MPCA, MDA and other Contract users under the Minnesota Environmental Response and Liability Act (MERLA), the Land Recycling Act (LRA), the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) as amended, the Resource Conservation and Recovery Act (RCRA), Minnesota's Voluntary Investigation and Cleanup (VIC) program, and the National Oil and Hazardous Substances Contingency Plan (NOHSCP), and other pertinent state and federal regulations related to remediation of hazardous substances pollutants or contaminants.

Highly responsive, properly trained and properly equipped personnel make up WCEC's technical teams that are available to the MPCA, MDA and other Contract users for Superfund projects. These team members have successfully performed the following tasks at Minnesota Superfund sites:

Potentially Responsible Party (PRP) Search - reviewing documents, performing interviews, using request letters to gather information, title searches, and conduct research using online resources, libraries, courthouses, and state offices.

Preliminary Site Investigations – determination whether a site poses little or no threat to human health and the environment, or, if it does pose a threat, determining whether the threat requires further investigation, emergency actions such as mitigation of contaminants that pose an imminent threat to public health or the environment, and/or investigation and cleanup.

Remedial Investigation / Feasibility Study – an assessment of the treatability of site contamination and evaluation of the potential performance and cost of treatment technologies.

Other tasks performed by WCEC at Minnesota Superfund sites include response action plans and oversight, removal and remedial actions, long-term response actions and risk assessments. More details regarding our experience and capabilities with Minnesota Superfund environmental services are provided throughout the applicable portions of this proposal.

Other Environmental Services

In addition to the above-described services and the other Category A scope items presented in this proposal, WCEC provides other comprehensive environmental services to public and private sector clients throughout Minnesota and other states, including but not limited to:

- Laser-induced fluorescence (LIF) site surveys to identify non-aqueous phase liquids (NAPL)
- 24-hour on-call emergency spill response to all types of hazardous materials – over 200 projects each year for the State of Minnesota, transportation companies, and private business
- United States Coast Guard-certified Oil Spill Removal Organization (OSRO)
- Environmental Assessment Worksheets (EAW) and Wetland Delineations
- Conservation easement monitoring for the Natural Resource Conservation Service in South Dakota, and well head protection plans (WHP) in Minnesota
- Risk Management Plans, Facility Response Plans, Spill Prevention Control and Countermeasure Plans
- National Incident Management System training to counties in Minnesota and South Dakota and directly to MPCA staff

A.2.2 Resumes

Resumes for key staff who will be assigned to the contract are provided in Appendix A. The resumes provide details regarding individual's education, project experience, professional certifications, and assigned classifications for this Master Contract.

A.2.3 Staff Classification Matrix

The following table presents WCEC staff available to the MPCA and the MDA for Category A Environmental Services. WCEC field staff have a minimum of 40-hour OSHA HAZWOPER training, and many have an additional 40 to 80 hours of hazardous materials training. WCEC employs a wide variety of technical specialists, including Professional Geologists, Professional Engineers, Certified Wetland Delineators, Risk Assessors, Biologists, Chemists, Environmental Scientists, Certified Hazardous Materials Managers and Specialists, Asbestos Inspectors, and Licensed Minnesota Monitoring Well Contractors. Selected key staff resumes are provided in Appendix A.

Projects are evaluated on client needs, project location, and level of complexity, and each new project is assigned by matching project manager experience, technical specialty, and existing workload with the project requirements. Our staff commonly works in teams, consisting of a project manager and one or more scientists and/or technicians; engineers or specialists are added as needed. With this approach, the projects are completed in a timely manner by the most appropriate staff.

The following WCEC Staff Matrix table details the capabilities, MPCA Personnel Classification and Qualifications, OSHA certifications, educational experience, professional experience, professional licensing, years of service with WCEC, and office location for all WCEC staff who are available to perform work on this Contract.

WCEC STAFF CLASSIFICATIONS, EDUCATION, TRAINING, AND EXPERIENCE

Name	Applicable Staff Classifications											Highest Degree	Certifications and Licenses	OSHA Certification	Years Experience	Years at WCEC	Work Location	Work Experience
	Level 1				Level 2			Level 3										
	E1	S1	FT	G/C	E2	S2	ERA2	PM	E3	ERA3	OSI							
Steve Carlson		X	X			X		**X**			X	BA Biology	Residential Radon Mitigator	Hazmat Specialist	30	7	Metro	Project manager/scientist performs investigations, corrective actions, and construction monitoring. Has completed NEPA reviews and NRDA documents and negotiations, wetland delineations, and ecological field surveys. Completes permit applications and reports for wetland replacement, construction and industrial stormwater, NPDES, and endangered species takings.
Paul Carter		X	X			X		**X**			X	MS Geology	Professional Geologist	Hazmat Specialist	31	20	Metro	Project manager and Hydrogeologist for all forms of site investigation; also remedial action design, pilot testing, and installation. Reports include investigation reports, O&M, monitoring and RSOM reports. Peer reviewer.
Shawna Conroy		X	X			X		**X**				BA Geology	Ag Chem Incident and Investigation training	Hazmat Specialist	17	17	Morris	Performs investigations of petroleum release sites and agricultural chemical sites. Conducts data quality review, data interpretation, corrective action design and implementation, and reporting. A key WCEC contact with MDA for work under the MultiSite contract.
Joann Dyson		X	X			X		**X**				PhD Physics		Hazmat Specialist	19	19	Morris	Completes petroleum release site investigations, data interpretation, report preparation, and special projects. Director of direct sensing operations involving LIF/UVOST Technologies. ITRC trainer.
Matthew Johnson		X	X			X		**X**			X	BA Geology	Professional Geologist	Hazmat Specialist	30.5	27.5	Morris	Completes environmental investigations and remediation plans. Has served as the key point of MPCA contact for the MultiSite contract for the past several years.
Jeremy Burns		X	X			X		X				BS Biology	WMD Crime Scene & Evidence Collection, HazMat Transport	Hazmat Specialist and Supervisor	10	10	Morris	Soil and groundwater sampling, contaminated site investigations, hazardous waste release site response and investigations, waste management and reports.
Ed Creaden		X				X		X				BGS Environmental Studies	CHMM	Hazmat Technician	29	6	Kansas	Completes investigations and remediation designs for petroleum release and hazardous waste sites. Has completed hundreds of Phase I and Phase II environmental site assessments. Regional Manager.

WCEC STAFF CLASSIFICATIONS, EDUCATION, TRAINING, AND EXPERIENCE

Name	Applicable Staff Classifications											Highest Degree	Certifications and Licenses	OSHA Certification	Years Experience	Years at WCEC	Work Location	Work Experience
	Level 1				Level 2			Level 3										
	E1	S1	FT	G/C	E2	S2	ERA2	PM	E3	ERA3	OSI							
Jesse Frank		X	X			X		X			X	BS Geology	Professional Geologist	Hazmat Technician	16	13	Morris	Provides field oversight and project management, and all aspects of site investigation permitting and field work. Experience operating LIF/UVOST, and report preparation.
Ross Haugen	X				X				X		X	BS Biosystems Engineering	Professional Engineer	Hazmat Specialist	16	16	Morris	Remediation system pilot tests, remediation system design, stormwater inspections and design, reporting.
Jake Holthaus		X	X			X		X				BA Geology	Professional Geologist	Hazmat Specialist	12	10	Metro	Project manager and geologist for site investigations, corrective actions, data review and report preparation.
Sarah Kuhn	X	X	X			X					X	BS Bioproducts and Biosystems	Engineer in Training (MT)	Hazmat Technician	6	6	Montana	GIS/GPS data acquisition and geospatial data management. Prepares Facility Response Plans and SPCC documentation, and remediation system design, installation oversight, and maintenance.
Christopher Lesmeister		X	X	X		X		X				BS Ecology, Field Biology	MN Wetland Delineator	Hazmat Technician	18	10	Morris	Desktop review of ecological receptors, wetland field delineation and permits, site investigations and reports.
Jeff McCoy		X				X		X				BA Mathematics	Asbestos Inspector	- -	28	24	Morris	Has completed hundreds of Phase I / Phase II site assessments. Provides VIC project management.
Shawn Miller		X	X			X		X			X	BS Environmental Science	CBNRE Suspicious Chemical Sample Collection (MDH)	Hazmat Specialist, Construction Supervisor	13	6	Morris	Conducts soil and groundwater investigations. Performs vapor intrusion investigations, mitigation installation, and oversight/monitoring for vapor mitigation systems.
Myles Morris		X	X	X		X					X	BA Geology	AutoCAD, ArcGIS, and Entervol w/EVS & MVS	Hazmat Specialist	13	13	Montana	Conducts contaminated site investigations and performs groundwater modelling. 3D modeler.
Bryan Murdock		X				X		X			X	BS Biology, Chemistry minor	MN Construction Erosion Site Manger, Asbestos Inspector	Hazmat Specialist, Supervisor	30	1	Metro	Completes property transfer due diligence and condition inspections, contamination investigations, waste surveys and industrial hygiene surveys, and provides remedial action design services. Provides peer / principal review.
Nathan Olson			X					X				BS Economics		Hazmat Specialist	13.5	13.5	Montana	Performs property assessments, manages contaminated site investigations, and in-situ treatment technologies.
Jim Rolle		X				X		X			X	BA Biology		Hazmat Technician	18	18	Montana	Director of WCEC Environmental Services, performs release site and hazardous waste site investigations and corrective actions. Principal of hazwaste landfill design.

WCEC STAFF CLASSIFICATIONS, EDUCATION, TRAINING, AND EXPERIENCE

Name	Applicable Staff Classifications											Highest Degree	Certifications and Licenses	OSHA Certification	Years Experience	Years at WCEC	Work Location	Work Experience
	Level 1				Level 2			Level 3										
	E1	S1	FT	G/C	E2	S2	ERA2	PM	E3	ERA3	OSI							
Douglas Stahman		X				X		X				MS Geology	Professional Geologist	Hazmat Specialist	35	28	Morris	Conducts variety of investigations, Corrective Action Design, and trainings. 27 years as General Manager.
James VanAlstine		X				X		X				PhD Geology	Professional Geologist	- -	35 +	28	Morris	Conducts groundwater resource and contaminant investigations, RI and CAD preparation, Principal review.
Kevin Boike		X	X			X						BS Environmental Science		Hazmat Technician	6	6	Morris	Conducts Phase I Environmental Site Assessments, and field sampling during Phase II ESA's and Remedial Investigations. Prepares reports as required.
Brett Edlund		X	X			X						BA Chemistry		Hazmat Specialist	12	12	Morris	Corrective action excavation oversight, profiling and disposal of wastes, land application of impacted soil.
Greg Frank		X	X			X						BS Chemistry	Residential Radon Mitigator	Hazmat Technician	10	6	Metro	Conducts field work for site investigations and cleanups, excavation oversight, receptor risk and elevation surveys, sub-slab depressurization system diagnostics and performance monitoring, and well installation oversight. Conducts data review and reduction, report preparation.
Melissa Hamling		X	X	X		X						BA Geology	FTIR Operation	Hazmat Specialist	10	10	Morris	Soil and groundwater sampling for petroleum and agricultural chemical release sites, coordination and oversight of corrective action excavations, health/safety training coordination. Drafting using AutoCAD.
Kayla Hovde		X	X	X		X						BA Environmental Studies	MDH Suspicious Substance Sampling, Registered EMT	Hazmat Technician	6.5	6.5	Morris	Conducts all forms of field sampling and elevation survey field work. Performs data reduction for reports, completes receptor notifications, reviews subcontractor invoices.
Ryan Moehn		X	X			X						BA Natural Sciences	Asbestos Inspector	Hazmat Technician	17	5	Metro	Has completed hundreds of Phase I / Phase II ESA's, field oversight of drilling, excavations, and corrective actions.
Bailey Zeiher		X	X				X					MS Biology Ecotoxicology focus		Hazmat Technician	4	< 1	Morris	Recent work includes sampling for WCEC field investigations at contaminant release sites. Past work included environmental fate and receptor impact assessment, ecotoxicity assays, and ecological risk assessment for an adjunct found in herbicides.

WCEC STAFF CLASSIFICATIONS, EDUCATION, TRAINING, AND EXPERIENCE

Name	Applicable Staff Classifications											Highest Degree	Certifications and Licenses	OSHA Certification	Years Experience	Years at WCEC	Work Location	Work Experience
	Level 1				Level 2			Level 3										
	E1	S1	FT	G/C	E2	S2	ERA2	PM	E3	ERA3	OSI							
Ethan DeWitte		X	X	X								BS Reclamation, Environment, and Conservation; Env. Sci. minor	SWPPP Administrator; TERNORM Cert., and Remote (drone) Pilot	Hazmat Technician	4.5	3.5	Metro	Has completed response actions, excavation oversight, elevation (level-loop) and aerial photometry surveys. Conducts field sampling of soil, water, and air and non-hazardous waste transportation. Conducts data queries and drafting using ESI ArcGIS, and geospatial data collection / reduction using Trimble submeter global positioning system (GPS) equipment.
Jakin Flynn		X	X									BA Environmental Studies	Geology minor, confined space rescue.	Hazmat Technician	1.5	1.5	Metro	Conducts treatment system maintenance. Completes field sampling of soil, water, and air. Provides excavation oversight, and waste profiling.
Wes Lueck		X	X									BS Geology		Hazmat Specialist and Supervisor	3	< 1	Morris	Performs field sampling at contaminant release sites. Conducts remediation system installation oversight and maintenance. Completes excavation oversight, aquifer testing and drill/well logs for exploration activities.
Jordan Miller			X									BA Biology		Hazmat Technician	1	1	Morris	Performs field sampling for waste and petroleum release site investigations, conducts elevation survey fieldwork.
Ben Rosburg		X	X									BA Environmental Studies		Hazmat Technician	2.5	0.5	Metro	Elevation surveys, field sampling (soil, water, air) and excavation oversight, public contact to schedule water well sampling, and data reduction for reports.
Sayge Wooldridge			X									BA Geology		Hazmat Technician	2	2	Morris	Field investigation sampling of soil, water, and vapor. Provides excavation oversight and data reduction.

Notes:

Level 1	Level 2	Level 3
E1 - Engineer 1	E2 - Engineer 2	PM - Project Manager
S1 - Scientist 1	S2 - Scientist 2	E3 - Engineer 3
FT - Field Technician	ERA2 - Ecological Risk Assessor 2	ERA3 - Ecological Risk Assessor 3
G/C - GIS/CADD		OSI - On-Site Inspector

Primary contract PM names are shaded.

A.2.4 Locations Participating in Contract now or in the future

Since 1993, WCEC has completed an extensive variety of environmental projects on behalf of numerous state and federal agencies. WCEC maintains three office locations to serve our clients across the Upper Midwest, Dakotas, and Northwest United States.

WCEC Corporate Headquarters:
WCEC
14 Green River Rd.
PO Box 594
Morris, MN 56267

WCEC Metro Regional Office:
WCEC
5005 Boone Avenue North
New Hope, MN 55428

WCEC Montana Regional Office:
WCEC
1030 South Avenue W.
Missoula, MT 59801

A.2.5 Experience with other Agencies

Since 1993, WCEC has completed an extensive variety of environmental projects on behalf of numerous state and federal agencies. As a Contractor under the existing MPCA and MDA Master Contract for Environmental Services and under other State of Minnesota contracts, we understand the importance of comprehensive and cost-effective project and program management. Table 2 presents a summary of other agencies for which we have directly provided environmental services and describes the nature of the services provided to each.

EXPERIENCE WITH FEDERAL AND STATE AGENCIES/DEPARTMENTS	
Agency / Client	**Experience, Project and Contract Types**
Minnesota Pollution Control Agency and Minnesota Department of Agriculture	Superfund, Petroleum and Agriculture Professional Environmental Multi Site Contract. Investigation and remediation response action contract from 1998 to present.
MN Department of Administration	Spill Contract for petroleum and hazardous waste cleanup- 1993 to present with hundreds of completed projects. Environmental drilling contract since 2006.
MN Department of Military Affairs	Petroleum tank removals, spill cleanups, and hazardous materials projects including lead abatement management and unknown wastes.
US Army Corps of Engineers (USACOE)	Petroleum tank removal and remedial soil excavation projects.
U. S. Fish & Wildlife Service	Tank removal and environmental investigations.
Western Area Power Administration (WAPA)	Spill cleanup, tank removal projects, and remedial excavation of soils.

EXPERIENCE WITH FEDERAL AND STATE AGENCIES/DEPARTMENTS	
SD Department of Natural Resources	Inventory unregistered USTs in the eastern half of South Dakota. Emergency spill contract/work since 2001.
University of MN and MNSCU	Petroleum tank removals and release site investigations. Prepare HASP and supervise removal of vessel containing oil with PCBs.
United States Department of Agriculture/Natural Resource Conservation Service	Contract to complete conservation easement monitoring services in eastern South Dakota. Completed hundreds of project sites under 12 separate Task Orders for this contract.
MN Department of Natural Resources	Well abandonment, groundwater injection permitting, and water appropriation permitting.
United States Department of Agriculture	Petroleum release investigation project.
MN Department of Public Safety/Homeland Security & Emergency Management	Contract to provide emergency response services as a Hazardous Materials Chemical Assessment Team (CAT) from 1996 through 2014.
Montana State Procurement Bureau, General Services Division – Environmental Services Contract SPB12-2177V	Environmental Remediation, Reclamation and Restoration Design; Waste Management; Waste Disposal; Environmental Evaluation; Inspection and Monitoring; Sampling and Sampling Design; Waste Characterization Services.

A.2.6 Knowledge of Applicable State Guidance Documents

The following sections describe WCEC's knowledge of the MPCA Risk Based Site Evaluation Manual, Underground Storage Tank (UST) and Aboveground Storage Tank (AST) Release Cleanup Guidance Documents and Fact Sheets, VIC Guidance Documents, and MDA Guidance Documents.

A.2.6.1 MPCA Risk Based Site Evaluation Manual

The MPCA has developed a risk-based site evaluation (RBSE) "toolkit" (https://www.pca.state.mn.us/waste/risk-based-site-evaluation-guidance) that provides a foundation for making cost-effective site decisions and remedy selections based on projected risks to the public and the environment. This toolkit includes fact sheets, guidance documents, and spreadsheet-based calculators for determining clean-up goals and ensuring that decisions are made in a manner that is based on best professional practices supported by sound scientific principles.

In the past 27 years, WCEC has provided professional consulting and contracting services at Superfund sites and sites with contamination regulated under MERLA, RCRA, TSCA and other regulatory programs. Some of these projects were managed through the MPCA and MDA Superfund and Petroleum Storage Tank Investigation and Remediation Master Contract when the Superfund program was added to the contract users in 2003. Where appropriate, the MPCA risk-based site evaluation process was followed by WCEC to characterize the site, inform the community, and evaluate the risks to human health and the environment. Sites where we have applied this approach include, but are not limited to, commercial dry cleaning sites impacted with perchloroethylene (PCE) and trichloroethylene (TCE), agricultural sites

impacted by nitrates, pesticides and/or herbicides, and sites impacted by vinyl chloride, solidified paint, RCRA metals and lindane waste.

In tiered evaluations, each exposure area (EA) and the related receptor's pathway is evaluated separately. This evaluation process is used to prepare a site-specific work plan, which includes such items as a sampling and analysis plan (SAP), a set of standard operating procedures (SOPs) for all project activities and site-specific cleanup goals. The current and projected land use affecting the site (and surrounding impacted areas) is incorporated in the evaluation process based on a combination of public input and the results of technical assessment of the RBSE data. The RBSE calculation tools are based on toxicological studies, and assumed doses associated with the various exposure types.

Additions to the MPCA's RBSE guidance is monitored through the MPCA website; WCEC remains current with changes and proposed changes to the guidance. Some recent form updates include the *Surface Water Toxic Impacts Assessment Request* form (March 2016), the *Environmental Covenant and Easement* template (July 2016), and the *Affadavit Concerning Real Property Contaminated with Hazardous Substances* model form (October 2016). Examples of guidance changes or draft guidance changes include Stakeholder Input on Draft SRV Documents (October 2016), MDH revised cPAH Guidance (September 2014), and Lead Blood Level interim policy (September 2014).

As summarized best by the MPCA, "The Risk-Based Site Evaluation Manual is composed of individual documents describing the process of site characterization, community involvement, evaluating the risk to human health and the environment posed at a site, and how to address that risk."

A.2.6.2 UST/AST Release Cleanup Guidance Documents & Fact Sheets

The mission of the MPCA's Petroleum Remediation Program (PRP) is to "investigate and evaluate risks from petroleum tank releases, with the goal of protecting human health and the environment" (c-prp1-01, 2017).To accomplish this goal, the PRP has developed a set of cleanup guidance documents for responsible parties and consultants to use when a petroleum release has occurred, called G*uidance documents for underground storage tank and aboveground storage tank release cleanup* (https://www.pca.state.mn.us/waste/cleanup-guidance). The MPCA PRP publications are comprised of a set of approximately 55 documents and worksheets that specify program requirements, which are organized in the following categories:

- General guidance
- Release reporting
- Soil excavation and treatment
- Site investigation and risk evaluation, and
- Corrective action.

Other MPCA cleanup guidance found at the same website also provides information useful on AST and UST projects subject to certain planned activities. These include guidance such as *Vapor Intrusion Best*

Management Practices and *Guidance for brownfield redevelopment projects*. WCEC also incorporates Green and Sustainable Remediation (GSR) practices and principles into our remediation design, installation and site management decision making when possible.

WCEC has over 27 years of experience working on petroleum-related projects such as UST and AST removals, leak investigations and remediation. Our successful completion of hundreds of these projects has been the result of our thorough understanding and consistent application of these UST/AST guidance documents' methods and principles. Our technical staff maintain proficiency with the most current version of the documents via the MPCA website and through our internal staff training and development programs. In addition, WCEC has developed internal documents that contain key MPCA guidance document tables as a means of ensuring that the tables are used appropriately and efficiently for tracking statistics and chart preparation.

Our employees are tasked to review and become familiar with these documents and demonstrate their proficiency during their first few weeks of employment at WCEC. In addition, WCEC staff regularly review and discuss the guidance documents to enhance our understanding and familiarity with the program methods and requirements. This includes discussing updates/revisions during regular company-wide meetings and with MPCA staff. Further training opportunities relevant to LNAPL investigation and remediation are provided to WCEC staff through the Interstate Technology & Regulatory Council (ITRC) online and classroom training courses. Many of WCEC's staff assigned to PRP projects have attended the following ITRC training events:

- ITRC LNAPL Internet-based Training (3-part series)
- ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology - 2 Day Classroom Training
- Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management

WCEC recognizes the value of this training and has been a sponsor for ITRC LNAPL classroom trainings across the country. WCEC further sponsors ITRC's efforts as an Industry Affiliate Program (IAP) member, with a Project Manager on the ITRC *LNAPL Update* and *Implementing Advanced Site Characterization Tools (ASCT)* teams, involved in preparation of new guidance such as the updated LNAPL-3 document (2018). WCEC's Project Manager received the 2017 IAP award for contributions to the LNAPL Update team and continues to be involved as a trainer for the newly revised LNAPL internet-based training program.

Another manner in which WCEC stays current with the PRP program is through receipt of electronic mail notifications from the MPCA outlining any program changes. WCEC team members also attend and assist in MPCA Consultant's Day presentations, such as in May 2017, when the MPCA introduced updates or changes to the PRP publications or policies, including the groundwater policy, soil excavation and surface soil guidance, vapor Best Management Practices and interim ISV guidance, EQuIS participation, and brownfields updates. WCEC also routinely attends MPCA seminars and other

informational meetings to gain first-hand knowledge of changes, additions, and updates to the Guidance Documents.

SUPPLEMENTAL INFORMATION

Minnesota Statute 115C.01-115C.13 – Petroleum Tank Release Cleanup

For over 25 years, WCEC has been completing soil and groundwater sampling and site documentation for petroleum storage tank removals. We have also completed hundreds of soil and groundwater investigations and designed, pilot tested, installed and operated and maintained various types of remediation technologies at petroleum release sites in Minnesota.

WCEC staff are very familiar with the terminology and definitions in this chapter ("Petroleum Tank Release Cleanup Act") and how they are applied. WCEC has assisted many clients with the definition and interpretation of a responsible person and how it will affect that individual or entity. Whenever we are retained to provide services for a project that has not yet been identified as a leak site, we very clearly inform the client (usually in writing) that it will be our obligation to report the presence of any contamination (that is in excess of the established guidelines) to the MPCA PRP.

WCEC is a registered Petrofund Consultant/Contractor and maintains the required insurance and other compliance criteria. We have a thorough understanding of the petroleum release compensation program and have worked closely with the Petrofund staff since 1990 to stay abreast of program changes. We attend the Petrofund Board meetings and prepare reimbursement applications for many of our clients. We also inform clients/potential clients as to which phases of the work must be competitively bid in order to maximize their financial reimbursement.

A.2.6.3 Knowledge of VIC Guidance Documents

The MPCA Voluntary Investigation and Cleanup (VIC) program was developed by the MPCA in response to amendments to the Minnesota Environmental Response and Liability Act (MERLA) and a 1995 Memorandum of Agreement with US Environmental Protection Agency, in which MPCA was designated the lead agency for VIC program sites. These developments provided incentives and an orderly program to promote the transfer and development of contaminated property, including liability assurances and regulatory approval for proposed actions.

The VIC program provides guidance for use by parties with a *bona fide* interest in a property, including property owners, buyers, and/or the Responsible Party (RP) involved in superfund site actions that include cleanup actions, redevelopment actions, and obtaining limitation of liability documents. VIC Guidance Documents (developed in the early 2000s include Guidance Document 1 (Introduction to the VIC Program) through 21 (Summary of Available Financial Incentives) that provide a foundation for program involvement. They are informational in nature, providing a basis for the technical and regulatory aspects of the program. Some topics include handling of asbestos containing materials, selecting a consultant, and preparing Phase I Site Assessments, Phase II Work Plans, and reports.

The more recent VIC program publications include both informational guidance and working documents (https://www.pca.state.mn.us/waste/brownfields); one example of an informational document is c-brwnfld4-01 which outlines the services available through the MPCA Brownfields program. The program enrollment application (c-vic3-01) was a working document (editable format) template used to enroll in the program; this has been replaced by the *Remediation Program Enrollment Application* on the MPCA eServices web portal, an additional development in VIC program improvements that support the efficient redevelopment and beneficial use of contaminated properties.

Other MPCA guidance such as *Program Management Decision on Regulated Fill* (Feb. 2012) is expressed in VIC guidance documents, such as *Offsite Reuse of Fill Materials* (c-rem2-02) and *Regulated Fill Application* (c-rem4-05) which applies the Soil Reference Values (SRVs) in the MPCA's Risk Based Site Evaluation (RBSE) toolbox, an illustration how VIC guidance has shifted from an information-only set of documents to usable documents that promote consistency of assessment and efficient redevelopment of contaminated property. Current guidance incorporates agency-wide media-specific regulatory limits.

A significant addition to VIC guidance documents includes Best Management Practices for vapor investigation and building mitigation decisions (c-rem3-06e) and the vapor intrusion map templates that MPCA has developed. The guidance document details a 5-step process to determine soil gas impacts, evaluate the vapor intrusion risk to receptors, and ultimately determine the need for vapor mitigation. This set of operating principles and working documents provides an extensive toolkit for the vapor intrusion receptor pathway. They provide a clear means of communicating investigation findings and the resulting corrective action decision, and the consistent map format provides an efficient way to document site findings.

VIC corrective action is based on the risks posed by contamination and the planned uses associated with the contaminated property as evaluated through this guidance. If plans include redevelopment of the property, the "Volunteer" navigates through the process following applicable program procedures. Where work is conducted on site to maintain status quo property uses or when the voluntary party is a Responsible Party, a *Cooperative Cleanup Memorandum of Agreement* (c-rem4-42) is prepared jointly between the Applicant and MPCA to arrive at a defined course of action in a clear and mutually agreed-to binding document.

The efficient long-term management of contamination on real property is vital to reduce the attendant risks and promote the beneficial use of affected land. Limitation of landowner Superfund liability and protection of the environment and the public requires robust administrative controls so that approved response actions continue to meet their objectives. The MPCA Brownfields program developed legally enforceable, consistent, and readily-adapted working documents (forms) to meet this need; this includes the following documents:

- *Affidavit Concerning Real Property Contaminated with Hazardous Substances* (c-rem4-02),
- *Environmental Covenant and Easement* (c-rem4-03); and

- *Consent of Mortgagee* (c-rem4-04).

Prior to the promulgation of these consistent forms, Volunteers and others seeking to implement administrative controls may have encountered a cumbersome, iterative process to develop the legal documentation required to meet Superfund requirements. This illustrates how the VIC guidance documents have evolved over time from information-only guidance to include practical tools useful in the efficient assessment and reporting and management of contaminated property in Minnesota.

REPRESENTATIVE EXPERIENCE: SCRAP RECYCLING FACILITY

Property Transfer for a Detroit Lakes, Minnesota Recycler

WCEC was retained by a recycling facility in Detroit Lakes that wished to sell the property to a new operator. WCEC completed a Phase I Site Assessment to comply with VIC procedural requirements and Guidance Document 8 (Phase I Investigation, April 2004) as applicable to the updated ASTM Standard E1527-13 and the EPA's "All Appropriate Inquiries" rule; this identified Recognized Environmental Conditions which included a waste oil UST, battery storage area, and open ground in the scrap receiving/sorting area. The Phase I ESA was used to identify the scope of work for an initial Phase II ESA; this identified elevated heavy (RCRA) metals near the scrap sorting area and a burn pile. WCEC assisted the owner with an application to enter the VIC program.

WCEC completed test pits on the property to better investigate the areas of concern. Investigation revealed the presence of hazardous materials to be present at concentrations above the industrial Soil Reference Value, including lead, arsenic, mercury, PCBs, and benzo-a-pyrene. These were discussed in a supplemental investigation report. WCEC also assisted the owner with a cooperative cleanup memorandum using the VIC template document.

The supplemental report included a proposed work plan for additional actions; this was approved by the VIC program for implementation. WCEC compiled the site information in a progress report with Investigation Work Plan and Remedial Action Plan (RAP) that included a provision for vapor intrusion investigation, based on the additional findings that would be developed. MPCA approved the RAP, and the owner modified facility operation for RAP implementation. This included the need to clear the scrap sorting area for soil excavation, excavation backfilling (cover), and asphalt paving (cap) completion. These activities removed impacted soils of concern and installed an engineering control to remove the risks associated with residual soil impacts in the Area of Concern.

Project challenges included negotiations between the buyer and the owner and additional property transfer proceedings between the owner and a railroad which holds easement to the facility property for a rail spur. These involved parties needed to review the site documentation for recording via their own procedures. Vacated easements for city streets were also documented.

WCEC prepared the Environmental Covenant and Easement (EC) form that was reviewed and approved by the owners' legal counsel and the State. The EC was legally recorded by the County January 28, 2015; MPCA issued a determination to take no action (NAD) February 15, 2015.

A.2.6.4 Knowledge of MDA Guidance Documents

WCEC's working knowledge of the MDA Guidance Documents (http://www.mda.state.mn.us/chemicals/spills/incidentresponse/guidelist.aspx) has been gained through comprehensive and on-going review of the Guidance Documents and by working closely with MDA Incident Response Unit (IRU) staff to understand and implement Guidance Document requirements during each agricultural chemical investigation or incident. Since 1991, WCEC has performed investigations and necessary corrective actions at approximately 200 pesticide and fertilizer release sites in Minnesota. Several WCEC staff members are experienced in managing MDA investigations; two of our project managers have over 35 years of combined experience performing investigations and corrective actions following the MDA Guidance Documents.

The MDA Guidance Documents were developed by MDA IRU staff to regulate and enforce the following Minnesota laws:

- 115B (MERLA [the Minnesota "Superfund"])
- 18B (Pesticide Control Law)
- 18C (Fertilizer Law)
- 18D (Agricultural Chemical Liability, Incident, and Enforcement Law)
- 18E (ACCRA [Agricultural Chemical Response and Reimbursement Account])

The Guidance Documents provide goals and step-by-step procedures along with reporting formats for completing agricultural chemical investigations and corrective actions. Correct use of the Guidance Documents helps to streamline the investigation and cleanup process, reduce overall project cost, and maintain the appropriate level of environmental protection. Each phase of an agricultural chemical investigation is completed in accordance with the Guidance Documents. WCEC understands that all sampling and remedial activities must be proposed to and approved by MDA IRU staff prior to implementation.

WCEC has a team of people specializing in agricultural chemical projects. Each team member periodically reviews the most recent version of the Guidance Documents (GD1 through GD29) to remain cognizant of MDA policies, procedures, and reporting formats. New WCEC Environmental Services staff read the Guidance Documents and discuss them with a knowledgeable WCEC mentor. The Guidance Documents, related insight, and updates/revisions are discussed during bi-weekly meetings in an effort to maintain a consistent level of proficiency among the entire WCEC Environmental Services staff. Any uncertainties regarding the Guidance Documents and/or unique circumstances encountered at any time during a site investigation are clarified and discussed with MDA IRU staff.

WCEC monitors revisions to the Guidance Documents on the MDA website. Guidance Document revisions are noted by the listed revision date. Any revisions are discussed internally and with clients, if applicable. If revisions apply to or affect subcontractors such as laboratories and land spreaders, WCEC

notifies the subcontractor of the changes and verifies that the changes have been adapted or are in the process of being adapted.

When offered, WCEC staff attend the MDA IRU Consultants Day events. Consultants Day offers an opportunity for WCEC staff to meet with IRU staff regarding current or anticipated changes and additions to the Guidance Documents. WCEC staff also regularly attend the Agricultural Chemical Response and Reimbursement Account (ACRRA) Board meetings on behalf of our clients to assist in the reimbursement application process.

REPRESENTATIVE EXPERIENCE

Eastern Farmers Coop Parcel, Luverne, Minnesota

After agronomy operations ceased and the site property was sold, WCEC assisted its client, the responsible party/property seller, in preparing and submitting an AgVIC Application, as described in Guidance Document 5 *Introduction to the Agricultural Voluntary Investigation & Cleanup Program.* Prior to the sale of the property, a *Phase I Environmental Site Assessment* (*Phase I ESA*) had been completed by another consultant on behalf of the property buyer. Although compliant with American Society for Testing and Materials (ASTM) standards, the *Phase I ESA* did not meet the additional requirements set forth in Guidance Document 14 *Agricultural Environmental Site Assessment (AgESA).* WCEC prepared an update to the *Phase I ESA*, which included the following additional information, as required by Guidance Document 14:

- Identification and description of High Risk Areas (HRAs);
- Compilation of current and past chemical inventory stored or handled at the site, including quantities and active ingredients;
- An extended search radius for MDA data associated with the site (1/2 mile);
- Interviews with those knowledgeable of current and historic site operations, including past reported and unreported incidents, HRAs, etc.;
- A review of MDA-specific data sources including the *What's in my Neighborhood-Agricultural Interactive Mapping* webpage, the *County Spill Report* and a *Company Summary Report* (requested from the MDA Data Practices and Records Management Coordinator);
- Completion of the checklist in Attachment 2 of the *AgESA Guidance Document.*

A site walkover was completed by MDA IRU, WCEC, the responsible party and the current property owner, and a *Remedial Investigation Work Plan* (*RIWP*) was prepared in accordance with Guidance Document 9 *Remedial Investigation Work Plan*. Following MDA approval of the *RIWP,* WCEC collected composite and discrete soil samples in accordance with Guidance Document 11 *Soil Sampling Guidance*, of which a duplicate sample was collected for one in every ten samples or less. Non-disposable sampling equipment was decontaminated, and samples were documented, packaged, and shipped as required in Guidance Document 11. Soil samples were submitted to a laboratory listed in Guidance Document 23 *Pre-approved Commercial Laboratories: Fixed Base and Mobile.* The laboratory data was reviewed by WCEC in accordance with Guidance Document 29 *Laboratory Data Review Guidance*. Analytical data was compiled and submitted to the MDA along with the Guidance Document 29 attachment *Laboratory Data Review Checklist* and recommendations for additional analytical analyses.

REPRESENTATIVE EXPERIENCE

C-W Valley Co-op, Wegdahl, Minnesota

Following MDA approval of the AgESA, a *Remedial Investigation Work Plan (RI Work Plan)* was prepared in accordance with Guidance Document 9 *Remedial Investigation Work Plan.* The *RI Work Plan* outlined the proposed remedial investigation parameters and documented site history investigation findings. During the remedial investigation, WCEC collected composite and discrete soil samples following Guidance Document 11 *Soil Sampling Guidance*.

Upon receipt of all requested laboratory analytical reports, WCEC submitted a *Remedial Investigation Report/Corrective Action Plan (RI/CAP)* based on MDA Guidance Document 10 *Agricultural Chemical Incident Remedial Investigation Report and Corrective Action Plan*. WCEC's *RI/CAP* included site history and background information, site investigation results, and recommendations for corrective actions. The *RI/CAP* also discussed site contamination impacts on public health and the environment *(Contamination Impacts Survey*, Guidance Document 9, Attachment 2).

Following MDA approval of the RI/CAP, WCEC implemented the corrective action plan, which consisted of a remedial soil excavation using a combination of field testing for nitrate as nitrogen in the soil and previous analytical data to guide the excavation dimensions. Duplicate field samples were collected for a minimum of 10% of the field samples and submitted to the laboratory for confirmatory analyses. In total, 5,787 cubic yards of contaminated soil were removed from the site. Following MDA approval of the *Proposal to Land Apply Soil from Agricultural Chemical Incidents,* prepared in accordance with Guidance Document 13 *Instructions for Proposal to Land Apply Soil from Agricultural Chemical Incidents*, contaminated soil was land applied on 677 acres. WCEC submitted a *Corrective Action Report* (*CAR*) based on Guidance Document 15 *Corrective Action Report*. The *CAR* summarized corrective actions taken at the site. The site received a No Further Action designation from MDA IRU.

A.2.7 Knowledge of MN ERLA, Land Recycling Act, CERCLA, RCRA, NOHSCP, State and Federal regulations

WCEC has been involved in environmental consulting for over 25 years, providing technical consulting services to hundreds of private and public-sector clients in numerous states. The nature of this work is governed by various Federal and State of Minnesota regulations that formed in response to concerns for deteriorating environmental quality and human safety. For example, the Minnesota Legislature formed the Minnesota Water Pollution Commission (WPC) in 1945 in response to unsafe water conditions, including reaches of the Mississippi River that were virtually devoid of life and unsafe for swimming or most other uses. The WPC focused on protection of surface waters. The WPC was replaced by Minnesota Pollution Control Agency (MPCA) in 1967, and the newly formed MPCA was also given jurisdiction over air pollution and solid waste.

The Federal Water Pollution Control Act of 1948 also established a framework for conservation of surface waters. This was extensively re-written in 1972, and the resulting Clean Water Act (CWA) was re-authorized in 1977. The CWA and the associated Water Quality Act (1987) formed a national framework for protection of "Waters of The State" which has generally been applied to surface waters, but

implications to groundwater have been claimed using the “significant nexus” or connection to surface water-groundwater interaction. This body of Federal regulations include provisions for wetland protection (Section 404, Dredge and Fil) and water quality certification for planned activities (In Minnesota, MPCA has Section 401 jurisdiction) and point source discharge permitting under the National Pollutant Discharge Elimination System (NPDES) via Section 402.

In 1968, The National Oil and Hazardous Substances Contingency Plan (NOHSCP, usually known as the NCP) was formulated. The NCP is the federal government's plan for responding to oil spills and hazardous substance releases. Originally developed in response to large-scale oil releases, the NCP was revised as required by the Clean Water Act of 1972 to include a framework for responding to hazardous substance spills as well as oil discharges. Following the passage of Superfund (CERCLA) legislation in 1980, the NCP was broadened to include releases at hazardous waste sites requiring emergency removal actions. Further revisions to the NCP were finalized in 1990 to include changes due to the Superfund Amendments and Reauthorization Act (SARA) and in 1994 to reflect the oil spill provisions of the Oil Pollution Act (OPA) of 1990.

Under OPA, certain facilities that store and use oil are required to maintain Facility Response Plans (FRPs) that demonstrate a facility's preparedness to respond to a worst-case discharge (WCD). WCEC is experienced with assisting our clients in preparing and complying with their FRPs. WCEC is also US Coast Guard-classified Oil Spill Removal Organization (OSRO) and routinely participates with, and on behalf of, our clients in voluntary and mandatory emergency response exercises ranging from table top exercise to full-scale equipment and personnel deployments.

The Resource Conservation and Recovery Act (RCRA) of 1976 gave the EPA the authority to control hazardous waste from the "cradle-to-grave", including the generation, transportation, treatment, storage, and disposal of hazardous waste. The 1984 and 1986 amendments (Title I) to RCRA enabled the EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances.

The U.S. Congress enacted the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in 1980 to deal with federal and priority (“Superfund”) sites that needed investigation and cleanup. Under CERCLA, states that accept federal Superfund dollars are required to contribute 10 percent of the cost of investigation and cleanup. To fulfill its commitment and deal with sites not enrolled in the federal program, the Minnesota Legislature passed the Minnesota Environmental Response and Liability Act (MERLA) of 1983, a law that provides the State regulatory framework required for compliance with CERCLA. MERLA also offers liability limitation for a property owner who bought a facility with CERCLA liability after the regulated release occurred. This limitation of (Responsible Party, “RP”) liability requires that the purchaser does not use the chemical of concern, contribute to the release or its risks, and is not materially connected to the RP.

CERCLA includes a Hazard Ranking System (HRS) to develop a risk ranking based on site parameters; a ranking above 28.5 results in a site being placed on the National List of Priorities (NPL) for corrective action. Under CERCLA, this can include Removal Actions and/or Remedial Actions. Removal Actions tend to be short-term responses and can be determined for a site on an emergency response, time-critical, and non-time critical basis. Remedial Actions may be more long-term activities, as required to address the impacts and correct damage to the environment. Significant amendments to CERCLA include programmatic inclusion of lender liability protection (1996) and provisions in 2002 for Brownfield redevelopment.

WCEC personnel have gained valuable working experience and knowledge by completing projects regulated by MPCA's Site Remediation and Redevelopment Section. Examples of these projects include:

- Minnesota Slip, Duluth – investigation of lake-bottom sediments
- Former City Dump #1, Duluth – performed long-term ground water, surface water, and residential well water monitoring
- Schumacher Dump, Leavenworth – managed the excavation, temporary storage, transportation and disposal of over 80 drums of hazardous waste
- Former Adams Coal Plant, Adams – evaluated the extent of known and potential contaminant impacts to soil and ground water at the former Adams coal gasification plant
- Gopher Oil, Minneapolis – completed an investigation to evaluate the extent of LNAPL using our Ultra Violet Optical Screening Tool (UVOST), collected ground water and storm sewer water samples for laboratory analyses, and completed a vapor survey of the storm sewer
- Lehillier Superfund Site, Mankato – removed, recycled, and disposed of the ground water treatment system, abandoned six pump-out wells, and abandoned and replaced monitoring wells
- Soil Gas Assessment, Dawson and Granite Falls – completed soil gas investigations for dichlorodifluoromethane at former petroleum leak sites
- Former Pilgrim Cleaners, Brooklyn Center – acted as a subcontractor to MPCA's Contractor to perform permanganate injection
- Former Ace Sign, Willmar – collected soil samples to evaluate the extent and magnitude of mercury impacts to soil after completing removal actions under our Minnesota Emergency Response contract
- PCI Superfund Site, Shakopee – stabilized lead-impacted soil and managed its disposal as a non-hazardous waste. Completed soil, ground water, and water sampling for perfluorochemicals (PFCs)
- Fish Hatchery Dump Superfund Site, St. Paul – completed a remedial investigation including sediment, ground water, surface water, and water well sampling
- PFC Waste Sites, Washington County – sediment, soil, ground water, and water well sampling related to the Woodbury and Oakdale Dumps and potential dumps
- Highway 96 Dump Superfund Site, North Oaks – assisted with water well abandonment
- West Broadway Ground Water Contamination Superfund Site, Owatonna – collected soil and ground water samples for VOCs and completed both a door-to-door receptor survey and a passive soil gas survey for VOCs in the downtown area

- WAFTA/Nike Missile Base, Carver County – WCEC completed sampling for VOCs and PFCs from monitoring wells and residential wells at this former VIC site

The Land Recycling Act (LRA) of 1992 encouraged the reuse and redevelopment of existing industrial and commercial land as part of a sound land use management policy to "prevent the needless development of prime farmland, open space, and natural and recreation areas, and to prevent the expansion of urban sprawl." Persons who undertake and complete voluntary cleanup actions approved by the MPCA Commissioner, who are not otherwise legally responsible for the contamination, are protected from MERLA liability for cleanup. Protection from cleanup liability takes effect when the MPCA Commissioner issues a Certificate of Completion. The Voluntary Investigation and Cleanup (VIC) program of MPCA provides this as a service to parties involved in sites that fall within the Superfund program. Examples of WCEC's land recycling project experience are discussed below:

- Former Manufacturing Facility, Kimball - WCEC assisted the property owner in obtaining a No Action Determination letter from the MPCA and the buyer in obtaining a No Association Determination letter from the MPCA. The owner also received a non-tank petroleum release closure letter from the MPCA Petroleum Brownfields Program and a tank leak site closure letter from MPCA PRP
- Breckenridge Site - WCEC assisted the owner in obtaining a No Action Determination letter and the buyer in obtaining a No Association Determination letter from the MPCA
- Wisconsin Sites – WCEC completed site assessments, wrote remedial action plans, and implemented the proposed remedial actions for two properties where historical contamination was identified. Actions resulted in the issuance of a *Certificate of Completion* for each site

WCEC has also performed assessments, investigations, and remedial activities at numerous agricultural chemical and industrial chemical sites throughout Minnesota. These projects would have been conducted under MERLA if the responsible parties had not been willing to perform the assessments and cleanups. Examples of these projects include: Kahlstorf Lumber (PCP remediation); Hiawatha Rubber (TCE remediation); and Reese Welding (investigation and monitoring of multiple contaminants).

Based on our understanding of the above regulations, WCEC undertakes proper management and storage of wastes pending transportation for disposal. Wastes that can be positively identified are recycled or reused whenever practicable and allowable. In most cases, the waste can be managed, stored, transported, and disposed of as a non-hazardous waste. Listed or characteristic RCRA hazardous wastes are handled only by contractors that are legally licensed and adequately insured to transport, store, and/or dispose of these waste streams.

In many cases, particularly when the waste streams are mixed or are of unknown origin, the waste must be properly containerized and securely stored to ensure the safety of the public. WCEC has experience managing the temporary storage of solid and liquid waste in tanks, commercial steel lock boxes, tanker trailers, drums, and a variety of other containers until the waste can be identified, profiled, and

transported. Some waste streams require secondary containment, security fencing, or even 24-hour security. In cases of bulging drums or unstable wastes, WCEC partners with local public safety officials and industry experts, as needed, to stabilize site conditions and ensure that the wastes will not further threaten human health or the environment.

Examples of waste streams that WCEC has managed and profiled for transportation and disposal include: petroleum and non-petroleum contaminated solid and liquid waste; RCRA hazardous wastes (listed waste, characteristic waste, universal waste, and mixed waste); and compressed gas waste. Wastes that WCEC has managed have been generated from a variety of industries and processes including licensed waste generators, fires, transportation accidents, clandestine drug labs, and illegal dumping.

WCEC employees are knowledgeable with a variety of pertinent state and federal regulations which may extend jurisdiction to specific activities related to remediation of hazardous substances, pollutants or contaminants including the following:

- Federal Clean Water Act and National Pollutant Discharge Elimination System (NPDES) permits (wetland protection, contamination discharges)
- Federal Clean Air Act (Risk Management Plans)
- MDH Well Code and Wellhead Protection Rules
- MDA rules pertaining to Agricultural Chemicals (Liability, Incidents, and Enforcement)
- National Environmental Policy Act (NEPA) and amendments
- Minnesota Environmental Policy Act of 1973 (EAW, EIS)
- Minnesota Wetland Conservation Act (WCA) and related Shoreland protection
- Federal and Minnesota regulations under the Safe Drinking Water Act
- The 1989 Minnesota Comprehensive Groundwater Protection Act
- MDNR Water Appropriation Rules and Shoreline Protection Rules
- MPCA UST and AST Compliance Rules
- MPCA NPDES Rules, MPCA Industrial Stormwater Program, and MS4 Permit Program
- MnDOT rules pertaining to hazardous waste labeling and transportation

Many of these regulations establish procedures and limits for the permitted discharge of environmental contaminants such as treated effluent from ground water pump-and-treat or multi-phase extraction remediation systems, vapor effluent from remediation systems or fugitive emissions, and various discharges to surface waters. Additionally, WCEC identifies the applicable codes, laws, and rules, when planning a remedial action which may generate a regulated waste stream or treated discharge.

A.2.8 Remedial Investigations Completed in Past 3 Years

WCEC is providing the following project summaries for Remedial Investigations (RIs) completed in the past 3 years. Section A.2.8.1 describes a project completed by WCEC to address petroleum impacts at a gas station/convenience store in St. Stephen, Minnesota, and Section A.2.8.2 describes adjacent

properties with petroleum impacts in Luverne, Minnesota. The project approach and scope of work for each of these sites demonstrates some of our firm's experience as it pertains to the qualifications and capabilities described in the RFP.

A.2.8.1 RI Example Project 1 – Cono Mart, St. Stephen

The Former Cono Mart site is a gas station and convenience store located in St. Stephen, Minnesota. St. Stephen is a small community located in Stearns County that does not have municipal water or sewer. The gas station at this site has operated since 1989 when the current petroleum tank system, consisting of five underground storage tanks, associated product lines, and three fuel dispensers, was installed. Petroleum impacts were identified in the soil and groundwater at the site during a Phase II Environmental Site Assessment (ESA) in March 2014. The findings of the Phase II ESA were reported to the Minnesota State Duty Officer. The Cono Mart site was assigned MPCA leak site number LS00019430. WCEC was initially hired to complete a standard scope limited site investigation (LSI).

The following is a summary of pertinent project roles and responsible staff:

PROJECT ROLES AND RESPONSIBILITIES		
Project Contacts	**Name**	**Key Roles, Responsibilities**
Client	Tom Schmidt 320-259-0054	Owner and Responsible Party
MPCA Project Management	Roberta Wirth-Freeney (Project Manager) 651-757-2830, Rose Tusa (Hydrologist) 218-316-3924	Petroleum Remediation Project Manager and Petroleum Remediation Hydrologist
WCEC Project Management	Shawn Miller – Project manager Jeff McCoy – Senior Project Manager	Primary author of all WCEC submittals to MPCA, project coordination, and fiscal reporting
WCEC Field Technicians	Shawn Miller, Ross Haugen, Kevin Boike, Wyatt Nolan, Jordan Miller, Sayge Wooldridge, Ryan Moehn	Field documentation, sample collection, report assistance
WCEC Drafter	Marina Cord, Melisa Hamling	All WCEC drawings for reports
Subcontracted Laboratory	Pace Analytical	Sample analysis – certified lab
Subcontracted Driller	Dakota Technologies, Traut Wells	Site investigation borings and monitoring wells per MDH codes
Subcontractor	Culligan Ultrapure (Tom Schepley)	Installation of residential GAC system

Phase II Environmental Site Assessment

WCEC completed a Phase II ESA on the subject property in March 2014. The purpose of the Phase II ESA was to determine the presence or absence of petroleum and volatile organic compound (VOC) impacts

associated with the current and historical use of bulk petroleum storage tanks and pump islands on the subject site. WCEC oversaw the completion of two soil borings and the collection of soil and/or groundwater samples from each boring. Laboratory analysis of the soil and groundwater samples identified petroleum impacts in the soil and groundwater above the established health risk-based standards. WCEC informed the property owner of the results of the Phase II ESA, who then authorized WCEC to report the release to the Minnesota Duty Officer. The property owner was told that additional investigation would likely be required by the MPCA.

Limited Site Investigation

WCEC completed a limited site investigation (LSI) in accordance with the MPCA *Petroleum Remediation Program General Policy* and associated specific guidance documents found in the MPCA's *Petroleum Remediation Program: Guidance documents for underground storage tank and aboveground storage tank release cleanup*. The LSI included the completion of soil borings, receptor-specific soil gas samples, and receptor surveys. Petroleum impacts were identified in four of the initial five boring locations, including the presence of light non-aqueous phase liquid (LNAPL) in the worst-case boring.

Laboratory analysis of soil and groundwater samples confirmed the presence of petroleum contamination in the resource aquifer below the site. Additional soil borings were completed to delineate the extent of petroleum impacts in the resource aquifer. Soil conditions and the depth of the contamination limited the effectiveness of push-probe technology for defining horizontal and vertical extent of soil contamination. The MPCA agreed with WCEC's recommendation of developing a focused investigation using a screen-point sampling method for further investigative drilling activities to define the extent of dissolved-phase groundwater contamination. This not only expedited the investigation process, but also reduced project costs for the RP. The findings of the LSI indicated that a remedial investigation (RI) was necessary for the following reasons:

- A sole source aquifer was contaminated by petroleum compounds at concentrations above drinking water standards, and
- LNAPL was encountered.

Remedial Investigation

WCEC continued the investigation at the site to identify the extent of contamination in the resource aquifer and determine hydrogeologic conditions. The additional investigation included the installation of three monitoring wells: one in the worst-case location (source area); one lateral well to define plume width; and one downgradient well. Seven additional soil borings were completed using the screen point sampling method to further delineate the extent of the dissolved plume. As the scope of the investigation expanded, gasoline range organics (GRO) was detected in a downgradient, private water supply well. The MPCA was notified, a residential granular active carbon (GAC) system was immediately installed on an emergency basis, and the supply well was added to the quarterly sampling protocol. WCEC submitted Guidance Document 4-06 *Investigation Report Form* after four quarters of groundwater sampling from the monitoring wells.

After the initial investigation report was submitted, WCEC worked with the MPCA and the RP on continuing the site investigation. Five additional monitoring wells, including three deeper wells, were installed using rotosonic drilling technology. The deeper wells were installed at the depth of the surrounding water supply wells. Groundwater sampling of the monitoring wells, site well, and two additional residential wells continued on a quarterly basis, along with sampling of the associated GAC systems to ensure the integrity of the water being supplied to the residents.

Conceptual Corrective Action Design

The results of the investigation revealed that a sole source aquifer was impacted by dissolved-phase petroleum contamination, which necessitated corrective actions because of the elevated risk to nearby residential supply wells. WCEC submitted Guidance Document 7-02 *Conceptual Corrective Action Design Report* (CCAD), which proposed corrective action. WCEC proposed air sparge and soil vapor extraction as the most feasible corrective action based on the site conditions: coarse-grained soils, light-phase contaminants, and depths of unsaturated/saturated zones.

A.2.8.2 RI Example Project 2 – CHS Eastern Farmers Co-op; Former Luverne Gas Station & South Station, Luverne

A Phase II investigation for a car dealership was conducted on a property along Minnesota Trunk Highway 75 in Luverne, Minnesota. This property was owned by CHS Eastern Farmers Co-op and had three parcels; the northern parcel was the site of the Former Luverne Gas Station, the middle parcel had a car wash, and the CHS Eastern Farmers Co-op South Station was located on the south parcel. The Phase II investigation detected petroleum contamination on the north and south parcels. The Minnesota State Duty Officer was notified, and two leak sites were assigned - the Former Luverne Gas Station (LS00019371) and the CHS Farmers Co-op South Station (LS00019372). The CHS Eastern Farmers Co-op is the responsible party (RP) for both releases.

The Former Luverne Gas Station had been inactive since approximately 1991. The CHS Eastern Farmers Co-op South Station was an active retail gas station at the time of the Phase II, with underground storage tanks containing diesel, gasoline, and an ethanol fuel blend of 85% ethanol (E85). The CHS Eastern Farmers Co-op contracted with WCEC to complete investigations at each site, as well as excavation oversight during underground storage tank removal at the South Station. While the investigations were being conducted by WCEC at the two leak sites, the car dealership took ownership of the property and began construction of a new building.

The following is a summary of pertinent project roles and responsible staff:

PROJECT ROLES AND RESPONSIBILITIES		
Project Contacts	**Name**	**Key Roles, Responsibilities**
Client - CHS Eastern Farmers Co-op	Gary Perowitz, (Senior Project Specialist, Key Contact) 320-287-3109	Responsible Party
MPCA Project Management	Gary Zarling, 651-757-2838 Rebecca Higgins, 651-757-2240	Petroleum Remediation Project Manager Petroleum Remediation Hydrologist
WCEC Project Management	Jesse Frank Project Manager, 320-589-2039	Primary author of all WCEC submittals to MPCA, project coordination, and fiscal reporting
WCEC Field Technicians	Jesse Frank, Josh Hollen, Kayla Hovde, Shawn Miller, Wyatt Nolan	Onsite investigation, field documentation, sample collection, report assistance
WCEC Drafter	Marina Cord, Melissa Hamling	WCEC drawings for reports
Subcontracted Laboratory	Pace Analytical	Sample analysis – MN certified laboratory
Subcontracted Driller	Dakota Technologies	Site investigation borings and monitoring wells per MDH codes

Limited Site Investigation

WCEC completed limited site investigations (LSIs) at both sites in accordance with the MPCA *Petroleum Remediation Program General Policy* and associated specific guidance documents. Although the LSIs were conducted independently at both sites, the completion of soil borings, receptor-specific soil gas samples, and receptor surveys were completed jointly. The LSIs identified adsorbed-phase, dissolved-phase, and vapor-phase petroleum contamination in soil borings adjacent to UST basins and former dispenser locations for both sites. Several additional on- and off-site soil borings were completed to define the extent of the different phases of contamination. The adsorbed-phase and dissolved-phase contamination plume of the impacted aquifer extended downgradient towards a perennial stream. In addition, off-site contamination was identified to the north of the Former Luverne Gas Station site with evidence of co-mingling plumes. For both sites, the field and analytical results from the LSIs indicated that a remedial investigation (RI) was necessary for the following reasons:

- Based on the soil descriptions, sieve analysis, and estimated hydraulic conductivity values, the impacted unit could be considered an aquifer. The concentrations of petroleum compounds found in the aquifer were above drinking water standards.

- Surface water within a quarter mile of the site was potentially at risk of contamination by petroleum compounds.

Remedial Investigation

WCEC completed full RIs at both sites to conduct risk assessments, evaluate groundwater concentrations over time, delineate the extent of the groundwater plume, and establish groundwater flow direction. Due to the proximity of these sites, installation of monitoring wells, surveying, and groundwater monitoring events could be completed concurrently. As part of the RIs, four monitoring wells were installed at each site (eight total) in the following locations: one in the worst-case area; one to delineate lateral extent; one downgradient; and one located between the identified dissolved phase plume and the perennial stream. The surveyed water elevations in the eight wells were used to determine groundwater flow direction. WCEC continued quarterly groundwater monitoring for both sites over six quarters, as directed by the MPCA project hydrologist. Results from the quarterly monitoring events were discussed using the MPCAs *Monitoring Report Form,* Guidance Document 4-08.

Outcome Achieved

Former Luverne Gas Station site: After the completion of the RI (based on six rounds of quarterly monitoring), it was determined that concentrations of the dissolved phase contaminants were less than the chronic standards for *Specific Water Quality Standards for Class 2 Waters of the State; Aquatic Life and Recreation*. However, the dissolved phase plume did not appear to be stable. (Groundwater flow direction remained consistent over the monitoring period.) Although the worst-case area monitoring well appeared to show a decreasing trend, the monitoring well that was installed to define the lateral extent showed an increasing contamination trend. The monitoring results from all site wells offered evidentiary support that an off-site source from a previously investigated leak site was contributing to the contamination in the monitoring wells. This investigation led to the re-opening of a previously closed leak site. WCEC has continued site monitoring on a semi-annual basis at the Former Luverne Gas Station site as requested by the MPCA Project Hydrologist. Although the impacted unit is considered an aquifer based on soil type and estimated hydraulic conductivity, this site is outside any designated wellhead protection area and is not considered a sensitive groundwater condition.

Eastern Farmers Co-op South Station site: After the completion of the RI (based on six rounds of quarterly monitoring), it was determined that the dissolved phase plume associated with this site was stable and that no completed pathways existed to identified receptors. Although the impacted unit is considered an aquifer based on soil type and estimated hydraulic conductivity, this site is outside any designated wellhead protection area and is not considered a sensitive groundwater condition. MPCA staff approved WCEC's recommendation of site file closure in January 2018.

A.3 Scope of Services

The following sections provide a detailed description of WCEC's company experience as it relates to the Category A scope of services outlined in the RFP.

A.3.1 Prepare Engineering Evaluation Costs Analysis (EE/CA)

WCEC will prepare an engineering evaluation/cost analysis (EE/CA) for all non-time-critical removal actions under CERCLA as required by section 300.415(b)(4)(i) of the National Contingency Plan (NCP) or upon the request of the MPCA, MDA or other Contract users to evaluate potential removal alternatives for non-time-critical actions. WCEC will perform analyses with the intent to:

- Satisfy environmental review requirements for removal actions
- Satisfy administrative record requirements for unproven documentation of removal action selection
- Provide a framework for evaluating and selecting alternative technologies.

The EE/CA will identify the objectives of the removal action and analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. The EE/CA effectively results in a more streamlined remedial investigation/feasibility study (RI/FS) for removal actions. The EE/CA will be prepared in general accordance with the USEPA Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA, dated August 1993. The general components of the EE/CA will typically include:

- Executive Summary – to describe background information, including previous investigations, identification of the purpose, identification of stakeholders, and an overview of the report's organization
- Site Characterization – to describes the site, previous removal actions, the source nature and extent of contamination, analytical data, and a streamlined risk evaluation
- Identification of Removal Action Objectives – to present the Statutory limits on removal actions, a determination of the removal scope, a determination of the removal schedule, and planned remedial activities
- Identification and Analysis of Removal Action Alternatives – to describe the effectiveness, implementability and cost of the removal actions
- Comparative Analysis of Removal Action Alternatives – to evaluate the relative performance of each alternative
- Recommended Removal Action Alternative – to describe the reasons for selection of the recommended action.

Feasibility Study/Cost Estimates

The MPCA Petroleum Remediation Program requires a similar evaluation and selection of final corrective actions with the Conceptual Corrective Action Design (CCAD) report. During preparation of a CCAD, WCEC follows MPCA Guidance Documents 7-01 and 7-02, which include the completion of life-

cycle cost estimates, a cost-effectiveness evaluation for several corrective action alternatives, and a recommendation for a preferred correction action alternative. Some alternatives may require an updated cost estimate(s) after a pilot test or during preparation of a Detailed Corrective Action Design (DCAD) report. In some cases, it may be necessary to update cost estimates for all initial alternatives proposed to re-evaluate the preferred alternative. WCEC has completed numerous CCADs/DCADs with cost estimates on behalf of the Petroleum Remediation Program under the MPCA and MDA Master Contract and on behalf of numerous private sector clients throughout Minnesota. Whether we are recommending a simple corrective action or a complex corrective action with recommendations for a focused investigation or pilot testing, use of the CCAD process by our scientists and engineers with extensive remediation experience in Minnesota results in a comprehensive evaluation, selection and recommendation that considers cost-effectiveness and applicability to site-specific conditions.

A.3.2 Oversee and Conduct Pilot Testing of Remediation Systems

WCEC has designed, overseen, and implemented pilot testing of various remediation technologies, working as a consultant and as a contractor using one of our mobile pilot test trailers. As part of the remedial alternatives analysis, a pilot study is performed prior to selecting a remedial alternative. The benefit of performing a pilot study is that it enables a more thorough evaluation of the applicability of the selected technology to the site and allows for identification of site-specific limitations that may not be readily apparent during the preliminary remedial evaluation process. These data are then utilized in combination with a robust site conceptual model to design and implement the most appropriate remediation system. WCEC personnel have experience in the design and implementation of the following types of pilot studies:

- Aquifer Pump Tests
- Soil Vapor Extraction
- Multi-Phase Extraction
- Air Sparging and Ozone
- LNAPL Recovery

A successful pilot test design requires a robust site conceptual model, which typically includes data from a focused investigation (e.g. LIF investigation). The focused investigation derived data strengthen the site conceptual model, which allows the remediation design Engineer to select the most appropriate (feasible, implementable, cost effective) remedial technology to be pilot tested. Additionally, the focused investigation determines critical data to allow proper design of the pilot test. For example, LIF data can be used to define the three-dimensional distribution of subsurface contaminants, which allows for precise placement of remediation points (recovery well or vapor extraction well screens) and provides targeted treatment of these zones.

When working on MPCA PRP projects, WCEC prepares a Pilot Test Work Plan using Guidance Document 7-05. The goal of the pilot test is to determine technical feasibility of a remedial technology, and if technically feasible, to collect the correct data to determine full-scale system design criteria and

economic feasibility. Data to be collected during the pilot test often include the physical and chemical conditions of the target zone and associated subsurface response(s). Additionally, process monitoring and sampling to calculate contaminant removal or in-situ destruction for each step and stage of a pilot test are also collected. The data are evaluated to determine site-specific full-scale system design parameters such as equipment sizing, piping size, well depth, well spacing, waste generation and treatment requirements, emission controls, electrical demand, etc. Following completion of the pilot test, the subsequent reports are submitted using MPCA Guidance Document 7-06.

SUPPLEMENTAL INFORMATION
Guidance Document Technical Support
WCEC provided technical review services to the MPCA during MPCA's preparation of the 2011 updates to the CAD Guidance Documents.

Aquifer tests

Aquifer tests are conducted with WCEC's mobile, automated pump and treat system to provide data regarding aquifer parameters as applicable to the specific test being conducted and the appropriate solution for estimating the following aquifer properties: vertical and horizontal hydraulic conductivity; transmissivity; storativity; specific yield; specific capacity; and boundary conditions if present. It may be necessary to perform a step drawdown test to determine the optimum pumping rate for an aquifer test. Detailed aquifer test parameters are presented to the MPCA, MDA or other Contract user in site-specific work plans based on the project objectives and site conditions. In situations where the pilot test objective is to influence groundwater hydraulics (e.g., aquifer pump tests, MPE, etc.), WCEC uses the ASTM standard for aquifer test durations for confined and unconfined aquifers as the theoretical timeframe to achieve steady state conditions. Where appropriate, slug tests are performed on one or more monitoring wells to obtain data on the hydraulic conductivity of the deposits screened by the wells. Slug test data will be collected utilizing transducers and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976) or other methods as appropriate.

Soil vapor extraction (SVE) and Multi-Phase Extraction (MPE)

SVE and MPE pilot tests are an essential part of the corrective action design phase, allowing for a multitude of full-scale system design data to be obtained and evaluated (subsurface physical and chemical data, monitoring and sampling data of recovery and treatment processes, emissions/waste stream production chemical and physical data, etc.). Soil vapor extraction and multi-phase extraction pilot tests are completed by WCEC using our state-of-the-art mobile, automated, multi-phase contaminant recovery system, equipped with the essential gauges, sample ports, valves and other appurtenances necessary to collect appropriate data for performance evaluation. Some challenges associated with conducting pilot tests for these systems include: electricity supply; waste disposal (e.g. recovered groundwater); potential nuisances of noise and emissions; space limitations; and traffic.

Air sparging and ozone

Air sparging and ozone pilot tests are performed using WCEC's mobile, ozone/air sparging unit. WCEC always evaluates the potential for explosive hazards prior to conducting an air sparging pilot test. Pilot

tests are not conducted if WCEC determines that a significant potential for fugitive vapor migration into confined spaces, sewers, or buildings may exist, or if the contaminant source is in a confined aquifer. Sparging pilot tests are usually conducted in conjunction with soil vapor extraction, to control vapor migration. Air and ozone sparging pilot tests can be designed to focus on source mass removal (addressing LNAPL directly), stripping aqueous phase contaminants from groundwater, and stimulating biodegradation via increased electron acceptors dissolved in groundwater. The pilot test design must be carefully planned in order to determine the focus of the pilot test and to collect the proper baseline, testing, and post-test data.

SUPPLEMENTAL INFORMATION

Continuing Education for LNAPL Management

In addition to ensuring that WCEC staff understand and incorporate the concepts and methodologies outlined in relevant MPCA Guidance Documents for LNAPL projects, WCEC invests in continuing education for our Project Managers and Scientists to ensure that we are applying the most updated, science-based solutions for management of LNAPL sites. LNAPL training completed by our staff on an on-going basis includes:

- ITRC LNAPL Internet-based Training (3-part series)
- ITRC Vapor Intrusion: Fundamentals of Screening, Investigation, and Management

LNAPL Recovery Tests

WCEC has completed LNAPL Recovery Tests to serve as an Interim Corrective Action, as a means to demonstrate LNAPL removal to the maximum extent practical, as a pilot test to determine recovery/recharge rates for design of full scale saturation-based remediation technologies, and to use the data as a performance metric or remediation endpoint during full scale system monitoring. LNAPL recovery testing can be conducted in two areas with similar in-well LNAPL thicknesses but different viscosities to verify and refine parameters such as transmissivity and hydraulic conductivity. The testing also assists the Engineer with predicting LNAPL recovery using *LNAPL Distribution and Recovery Model* (LDRM) (American Petroleum Institute, www.api.org), and using calculation/evaluation procedures outlined in the MPCA's *Light Non-Aqueous Phase Liquid Management Strategy* (MPCA Guidance 2-02) and to determine most efficient technology to meet the remediation goals. Saturation-based LNAPL recovery technologies evaluated by WCEC are LNAPL skimming, enhanced fluid recovery, dual pump liquid extraction, and multi-phase extraction (dual pump).

Examples of WCEC pilot testing experience performed at sites on behalf of public and private sector clients are presented in the table below:

REPRESENTATIVE WCEC PILOT TESTING EXPERIENCE		
Technology	**Contaminants of Concern**	**Example Project**
Air Sparging/ Soil Vapor Extraction (AS/SVE)	Gasoline Constituents	At a site in Condon, MT, thorough pilot testing resulted in extremely effective remedial system placement and design. Over 800 gallons of gasoline (as TPH) was removed by the full scale AS/SVE system in the first quarter of operation.
Multi-phase Extraction (MPE)	Gasoline Constituents	WCEC completed MPE pilot tests utilizing our mobile, automated, multi-phase contaminant recovery system. Following LIF investigation at a site in Walker, MN to determine the location of the NAPL in the subsurface, WCEC demonstrated MPE as an effective remediation technology at the site by achieving targeted outcome goals for site dewatering and NAPL removal including recovery of 1000 kg of hydrocarbons over a 4-day pilot test. For this phase of work, WCEC completed a conceptual corrective action design, pilot test work plan, and pilot test results report, including cost proposals, to the client and the MPCA Petrofund. This pilot test served as a field training for MPCA staff.
Multi-phase Extraction (MPE)	Gasoline Constituents	WCEC oversaw and assisted in an MPE pilot test at a location in Alexandria, MN where gasoline leaked from USTs. LIF investigation results indicated a large NAPL plume in the fine-grained sediments. Mass balance calculations indicated pilot testing resulted in removal of over 970 kg of hydrocarbons, including over 180 gallons of gasoline LNAPL, over several days of operation. WCEC assisted in preparation of the Feasibility Study and Pilot Test Report.
Multi-phase Extraction (MPE)	Diesel Fuel	WCEC designed and implemented a pilot test at a site in Willmar, MN to address an LNAPL saturation concern. In this particular case, the pilot test determined that MPE was not a suitable remediation technology for the site, resulting in re-evaluation of the previously selected remedial technology.
Free Product Recovery	Gasoline Constituents	WCEC performed a feasibility study on behalf of the MPCA involving an LNAPL recovery system utilizing an alternative type of skimmer. Results of the feasibility study concluded that the alternate type of skimmer was not capable of operating under site conditions. Pilot testing of the skimmer prior to purchasing saved over $20,000 in equipment and installation expenses. For this project, WCEC prepared a pilot test work plan, interim pilot test operation report, and final pilot test operation report outlining results and conclusions.
Ozone Sparging	Petroleum Constituents	At a site in Cut Bank, MT, WCEC conducted a six-month pilot scale ozone injection series to remediate dissolved and sorbed phase contaminants in the shallow aquifer and fractured sandstone subsurface. Dissolved contaminant levels were reduced by several orders of magnitude. Dissolved oxygen concentrations were greatly enhanced within and surrounding the zone of direct pneumatic influence.

Ground Water Pump and Treat	Trichloroethylene (TCE)	At a site in Minneapolis, MN, TCE was released to subsurface, which then leached to the groundwater. WCEC designed and performed a drawdown study, followed by pump and treat feasibility study. Results of the study indicated that a vacuum-enhanced total fluids recovery system would be the most effective method for achieving site cleanup. WCEC submitted a CAD outlining (proposed) full-scale system design, and then implemented and operated the system according to the CAD.

A.3.3 Operate and Maintain Remediation Systems

WCEC has performed operation and maintenance (O&M) of over 100 remediation systems across the upper Midwest and northwest US, with more than half of these located in Minnesota. We have experience providing complete remediation system services including pilot testing, design, construction, installation, and O&M. WCEC remediation system O&M standard operating procedures follow MPCA guidance for system performance monitoring including the generation of Remediation System Operation Monitoring Reports (RSOMs). WCEC submits RSOMs within 30 days of system start-up and then quarterly thereafter as dictated in MPCA Guidance Document 7-01. Field staff follow the operation monitoring plan for O&M contained in the remediation Detailed Corrective Action Design (DCAD) report. O&M events consist of monitoring and/or sampling the appropriate remediation and monitoring points for sub-surface response, contaminant removal, and operational status. Remediation system equipment is checked, and controls are adjusted as necessary. Operational data collection and monitoring point sampling are conducted prior to making any system adjustments or performing any maintenance.

Our team organizational structure and cross training philosophy facilitates an “active project management” approach, where each team member from project manager, to design engineer, to field technician is familiar with the operational strategy, performance objectives, and operation monitoring plan of each individual remediation system. Additionally, our routine company-wide safety meetings include detailed discussions of QA/QC procedures specifically related to remediation system field meter operation. Operational issues, required repairs, or upgrades to our meter equipment are identified to ensure that we maintain our high-quality remediation system monitoring protocols.

Telemetric controls and data acquisition are incorporated into most remediation systems operated and maintained by WCEC to allow real time interaction with the system and determine when an O&M event is necessary (e.g. if telemetry data indicates that pump pressures are gradually increasing, this may indicate that particulate filters should be replaced, etc.). Using this type of active telemetry monitoring supports our development of the necessary O&M schedule and the remote diagnosis of unanticipated system shutdowns. Remote diagnostics enable us to mobilize the necessary equipment, tools, and personnel to quickly restart the system, increasing our efficiency and reducing overall project costs.

WCEC field staff maintain an event log detailing the current operational status of the system and the process followed during the O&M event for inclusion in the RSOM. WCEC technical lead staff and project managers review and analyze O&M data promptly to ensure that necessary adjustments can be made prior to the next field event. Ultimately, WCEC technical lead staff use O&M data over a given time interval to evaluate system performance based on strategic and compliance objectives and present any conclusions regarding ongoing system operation in the subsequent RSOM.

REPRESENTATIVE EXPERIENCE

East Bay Flathead Lake, Montana

WCEC designed and constructed a 500 gallon per minute water treatment facility to remediate a gasoline-impacted fractured bedrock aquifer on the East Bay of Flathead Lake, Montana. Components of the water treatment facility include a groundwater interceptor trench with automated variable frequency drive sumps, a 2,400 ft2 steel frame warehouse building, ozone injection equipment capable of 24 g/hr, a shallow-tray air stripper with 25 hp blower, four 300-gallon sand particulate filtration vessels, three 4,000-gallon granular activated carbon (GAC) vessels, and various automated controls and alarm systems. The water treatment system effluent is regulated by a National Pollutant Discharge Elimination System (NPDES) permit and WCEC submits Discharge Monitoring Reports (DMRs) to the United States Environmental Protection Agency (USEPA) on a monthly basis.

As part of an Administrative Order issued by USEPA, WCEC was required to produce a detailed O&M manual containing design as-built schematics, process and instrumentation diagrams, optimal operation parameters, and regularly-scheduled maintenance procedures. WCEC has been performing the following weekly or monthly tasks as outlined in the O&M manual since January 2009:

- Sample water for BTEX and GRO at influent and effluent locations for NPDES compliance
- Record discharge water parameters: pH; salinity; temperature; dissolved oxygen; and ORP
- Back flush sand filtration vessels and replace 50-micron bag filters in filter skid
- Check and record the hertz of each VFD transfer pump
- Check and record the flow gauge on the 25 hp blower
- Record system pressures (ozone, transfer pump, filter skid, and valve tree)
- Check and record the total system flow meter reading
- Measure dissolved ozone concentration post air stripper
- Review influent and effluent analytical data and back flush carbon vessels if necessary
- Inspect stripper trays and either perform cursory cleaning or schedule acid bath
- Check propane level and confirm the tank gauge matches the digital reading in the building
- Check alarm system components: propane detection, blower failure, stripper high water
- Replace the intake filter on the oxygen generator

WCEC completes semiannual groundwater monitoring of a monitoring well network with various locations upgradient and downgradient of the interceptor trench. These data along with the weekly influent analytical results and system operational parameters are used to evaluate system effectiveness based on strategic and compliance objectives. WCEC calculates first-order decay rates for source area and downgradient monitoring points and the total system influent. A 90% confidence interval is developed on the mean regression rate to estimate groundwater (cont.)

REPRESENTATIVE EXPERIENCE

East Bay Flathead Lake, Montana (continued)

restoration timeframes and to predict system life-cycle operation. Current estimates for continued system operation are 1 to 2 years and WCEC is in the process of modifying the system operation plan to incorporate component phase-out and post-shutdown monitoring.

REPRESENTATIVE EXPERIENCE

Farm Credit Services, Alexandria, Minnesota

WCEC performed operation and maintenance of a multi-phase extraction (MPE) system equipped with a thermal oxidizer unit for air emission controls. Process water underwent treatment via a treatment train consisting of oil water separation, air stripping, particulate bag filtration, and granular activated carbon (GAC) filtration prior to discharge to the local sanitary sewer. WCEC used an active project management system of performing frequent (e.g. several times per week) telemetry checks and data reduction to track system operation and predict maintenance schedules. Based on our extensive experience operating other MPE systems in similar environments, WCEC designed a site-specific telemetry unit that facilitated monitoring of operational process data (air flows, water treatment flows, product tank volume, etc.) and data used to anticipate O&M schedules (pressures, vacuums, flow rates) and to diagnose the cause of unexpected shutdowns (transfer pump ceased, level float stuck).

Development of the site conceptual model revealed that local geologic and groundwater chemical conditions present at this facility would promote calcification and biofouling on equipment and piping within system treatment processes. The WCEC design Engineer considered these factors and incorporated the appropriate system components, including a specialized air stripper, which resulted in greatly reduced maintenance and system downtime.

On site monitoring and sampling was completed on a monthly basis as follows: collection of subsurface response data (hydraulic and pneumatic); collection of liquid treatment samples to evaluate treatment efficiencies and ensure discharge compliance to the local wastewater utility; collection of contaminant mass recovery data (to calculate air flow rates according to standard temperature and pressure conditions, collect process samples for laboratory analyses, etc.); recording of liquid levels in the product tank; and recording and adjusting system configurations as necessary.

Typical maintenance activities included exchanging particulate filters, cleaning accumulated precipitates and silts from treatment equipment, replacing pump seals, cleaning solenoid valves, float switches, and gate valves, and maintaining the thermal oxidizer. These routine maintenance actions served to maintain the operational integrity of the system and ensure continual compliance with discharge requirements for treated water and air until system operation was discontinued.

A.3.4 Prepare Corrective Action Design Documents

Corrective actions are conducted to permanently reduce unacceptable risk to human health and the environment at petroleum, agricultural chemical, and other chemical release sites in Minnesota. WCEC has prepared many corrective action documents for releases such as these for the MPCA and the MDA.

WCEC routinely monitors the MPCA and MDA websites for new guidance publications. Once published, WCEC incorporates the new guidance into ongoing and future work.

For MPCA release sites, WCEC has prepared hundreds of reports and other supporting documents in accordance with applicable MPCA Guidance Document formats as appropriate to the MPCA's review and evaluation process. These include the Superfund VIC RCRA CAD Guidance Policy (*c-rem3-02*); the RBSE manual; and MPCA Guidance Document 7-01 for all Corrective Action Design (CAD) program elements at petroleum release sites and eligible (small and/or 'simple') responses at sites in the Superfund/RCRA and VIC cleanup programs. GD 7-01 describes the process for obtaining MPCA CAD approval at petroleum release sites and provides technical information to support the approval process, from design through implementation. WCEC is also familiar with and has completed numerous documents in accordance with the following MPCA formats:

The following guidance documents (and their previous versions) have been used by WCEC on multiple completed and ongoing projects:

- *Superfund VIC RCRA Corrective Action Design Guidance Policy* (c-rem3-02) and referenced documents therein
- *Conceptual Corrective Action Design Report* (CCAD) (MPCA Guidance Document 7-02)
- *Focused Investigation Work Plan (MPCA Guidance Document 7-03)*
- *Focused Investigation Report* (MPCA Guidance Document 7-04) (WCEC provided a technical review for MPCA during development of this document)
- *Pilot Test Work Plan* (MPCA Guidance Document 7-05)
- *Pilot Test Report* (MPCA Guidance Document 7-06) (WCEC provided a technical review for MPCA during development of this document)
- *Remediation System Detailed Corrective Action Design Report* (SDCAD) (MPCA Guidance Document 7-07a)
- *Excavation Detailed Corrective Action Design Report* (EDCAD) (MPCA Guidance Document 7-07b)
- *Corrective Action Excavation Report* (MPCA Guidance Document 3-02a)
- *Remediation System Operation Monitoring Report* (RSOM) (MPCA Guidance Document 7-08)

REPRESENTATIVE EXPERIENCE

Farm Credit Services, Alexandria, MN (PRP)

WCEC has prepared multiple Remediation System Operation Monitoring (RSOM) Reports for the Farm Credit Services site located in Alexandria, where a multiphase extraction system operated. The RSOM report format provides a functional structure that enables large amounts of site information to be outlined in a clear, logical manner. For example, the RSOMs contain information related to subsurface response monitoring, recovery and treatment process monitoring and sampling, waste generation and disposal, emissions evaluation, site history and background information, contaminant mass recovery, receptor evaluation, site conceptual model updates, and more.

When site-specific circumstances require report form modification or use of non-standard reporting requirements, WCEC prepares the documentation in a concise manner, comparable to the same general approach as the most relevant MPCA Guidance Document.

While progressing through the CAD stages on MPCA fund financed site, WCEC follows the current MPCA Contractor and Subcontracting Purchasing Manual. Large scale projects are typically over $50,000, which requires preparation of plans and specifications following the MN Department of Administration procurement requirements. WCEC has extensive experience working on bid solicitation projects ranging in costs from less than $5,000 to over $200,000.

REPRESENTATIVE EXPERIENCE

Harvest States Coop, Elkton, MN (AgVIC)

WCEC prepared a Corrective Action Plan for a site located in Elkton, MN to excavate 3,500 yards of soil under the Minnesota Department of Agriculture AgVIC Program.

Superior Wood Systems, Superior, WI (VIC)

WCEC compiled past consultants' information and completed a Remedial Investigation/Response Action Plan (RI/RAP) for a former wood treatment facility located on railroad property in an industrialized area of Superior, Wisconsin. WCEC prepared the RAP consistent with Wisconsin NR 722 (Standard for Selecting Remedial Actions) and the selected remedy was implemented by WCEC. The completed actions were documented in a RAP implementation report. Remedial actions addressed the concerns in all six operational areas, and the Wisconsin Department of Natural Resources issued the associated Certificates of Completion to the responsible parties.

A.3.5 Prepare Health and Safety Plans

It is the policy and primary concern of WCEC to develop and maintain safe and healthy worksite conditions for all employees, subcontractors, and the general public. This is accomplished through the application of the WCEC Hazard Communication Program, Medical Surveillance Program, safety training courses and programs, and through procedures and policies as outlined in the WCEC Employee Health and Safety Policy Manual. WCEC requires strict compliance with the Health and Safety Policy Manual and established work procedures. One element of the Health and Safety Policy is preparation of site-specific Health and Safety Plans (HASPs). A HASP is required for field activities subject to OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and WCEC has completed thousands of HASPs for environmental and emergency response projects. These field activities are generally associated with site characterization and remedial activities at contaminated sites under the jurisdiction of a local, state or federal agency.

The HASP has required elements that must be addressed, including conducting a hazard assessment of the site. The hazard assessment identifies hazards for each specific task being performed and how these hazards will be controlled. Another component of the HASP development process may include development or review of a Job Safety Analysis (JSA). The JSA includes a step by step description of how to perform a task, identifies potential hazards associated with a task, and presents controls to mitigate the identified hazards. JSAs are also used to educate employees on safe practices prior to using equipment. JSAs are developed for all equipment and specific operations that present safety hazards and/or concerns.

Prior to initiating the first phase of work at a site, WCEC prepares the site-specific HASP, which includes but is not limited to the following information:

- General Site Information (1910.120(c)(4)) – Site location, site contacts, WCEC staff associated with the project, emergency telephone numbers, the nearest hospital location, and emergency escape plans
- Site Description (1910.120(c)(4)) – Facility information, type of hazards anticipated to be present on site, amount of hazardous materials present, work objectives, project organization
- Project Objectives (1910.120(b)(3)) – Description of planned work area activities, including beginning and ending dates of work activities
- Project Organization (1910.120(b)(2)) – Identification of team members and responsibilities.
- Chemical Hazard Analysis (1910.120(b)(4)) – Identification of site contaminants and associated physical properties, including routes of exposure and OSHA exposure limits
- Other Potential Hazards – Identification of hazards such as heat or cold stress, excavation, noise, heavy equipment operation, slips, trips, falls, overhead or underground utilities, etc.
- Site Control (1910.120(d)) – Identification of established work zones and how they will be designated (barriers, caution tape, security fencing, etc.)
- Personal Protective Equipment (1910.120(b)(4)) – Based on evaluation of potential hazards, the levels of personal protection are designated for the applicable work zones
- Decontamination Procedures (1910.120(k)) – Description of personnel and equipment decontamination procedures and site locations for conducting decontamination
- Ambient and Personnel Air Monitoring (1910.120(b)(4**))** – Description of activity, instrumentation, action levels, frequency of monitoring, and other relevant information specific to the site
- Contingency Plan (1910.120(l)) – Established emergency communication protocols, escape routes

Once on site (and each day of the project), the HASPs are reviewed, signed, and dated by all on-site personnel, including State Contractors and subcontractors. Site HASPs are reviewed periodically and updated as site conditions or work tasks change. First aid kits and fire extinguishers are kept on site for emergency use.

A.3.6 Oversee Site Investigation Services: Soil Borings and Monitoring Wells

WCEC has performed oversight services on hundreds of site investigations involving soil boring advancement and monitoring well installation using standard drilling methods, push probes, and sonic drilling at sites throughout Minnesota. These services have been performed on behalf of our public and private sector clients. In our roles as oversight contractor, WCEC has supervised the installation of thousands of monitoring and recovery wells. Soil, ground water, and vapor intrusion assessment oversight activities performed by WCEC at petroleum release sites are completed in accordance with the protocols and procedures outlined in the MPCA Guidance Document 4-01 *Soil and Ground Water Assessments Performed During Site Investigations* and Guidance Document 4-01a *Vapor Intrusion Assessments Performed during Site Investigations*, published by the MPCA Petroleum Remediation Program. Additionally, WCEC uses our internal Standard Operating Procedures to train staff and continuously improve the quality of our site investigation services.

Soil Borings

WCEC staff typically assigned to oversee installation of soil borings and monitoring wells using standard or push-probe drilling methods are degreed geologists, many of whom have personally overseen the installation of hundreds of soil borings and wells. WCEC staff have a high level of expertise pertaining to drilling oversight due to WCEC's previous arrangement as a drilling provider. WCEC was one of the first consultants in Minnesota to own and operate Geoprobe™ push probe soil and groundwater sampling technology. WCEC directly provided drilling services from 1992 through 2014, which included soil vapor sampling, electrical conductivity assessment, and laser-induced fluorescence (LIF) assessments. WCEC was a leading national and international service provider for LIF technology and other direct sensing technologies advanced into the subsurface to identify non-aqueous phase liquids (NAPL) at hydrocarbon release sites using push probe technology. Although the drilling services are now run through a sister company of WCEC, this comprehensive experience has resulted in a high level of staff expertise due to cross-training from the contract services division to our professional environmental services division.

The following paragraphs generally describe the duties of WCEC oversight personnel for site investigation services:

Driller Oversight - Prior to performing any subsurface activities, WCEC verifies that the contracted drillers have contacted a public underground utility locating service to locate areas where utilities enter and transect property or, if drilling offsite, locate offsite utilities. Where subsurface work is required inside a critical area (e.g., the vicinity of known underground hazards such as USTs and related equipment), WCEC will recommend contracting a private underground utility locating service. In addition, WCEC verifies that decontamination procedures are followed by the drillers and that all contaminated products are handled and disposed in accordance with the requirements of the site-specific health and safety plan and the investigation derived waste (IDW) handling procedures. This may include using steam cleaning, high-pressure washing, or a wash and rinse program (non-phosphate wash solution followed by a two-step rinse), as appropriate for the equipment or tools being decontaminated. More stringent decontamination procedures may be required, depending on the chemistry of the contaminant, analysis to be performed, or waste sampled.

Soil Sampling - WCEC records stratigraphic data for all soil samples collected and documents changing drilling conditions that provide relevant geologic and stratigraphic information. Subsurface soil samples are typically collected for chemical and grain size analysis at all sites using WCEC Standard Operating Procedures. WCEC collects soil samples for laboratory analysis at the zone of maximum organic vapor concentration and the water table interface or, if ground water is not encountered, at the terminus of the boring, unless MPCA staff approve other sampling guidelines. WCEC uses its internal Standard Operating Procedures for laboratory sampling to ensure the quality of data meets established project objectives.

Field Screening Sampling - WCEC collects and evaluates soil samples for organic vapors at least every 5 feet in uncontaminated horizons, at changes in material, and at least every 2.5 feet in contaminated

horizons using standard drilling or push probe technologies. Petroleum sheen testing is completed for the presence of LNAPL on soils that are visually petroleum stained or exhibit high organic vapor concentrations (as measured with a field instrument). The samples are screened in accordance with MPCA Guidance Document 4-04, *Soil Sample Collection and Analysis Procedures*.

Groundwater Sampling from Soil Borings - For soil borings that intersect the groundwater table, screens are set within the bore hole that straddles the apparent water table so that groundwater elevation can be measured, and groundwater samples can be collected. Groundwater sampling is done in accordance with MPCA Guidance Document 4-05, *Groundwater Sample Collection and Analysis Procedures.* At times an investigation will require discrete water sampling in select depths within an aquifer. WCEC works with the driller to determine the target depth for the sample and the driller deploys the appropriate tooling to collect the discrete water sample from that specific horizon.

Soil Gas Sampling - WCEC advances soil gas sampling points to the required depths that are determined by depth to groundwater and building construction (i.e. buildings with basements, slab-on-grade, or crawl spaces). WCEC also follows the MPCA recommended sampling methodology described in Guidance Document 4-01a *Vapor Intrusion Assessments Performed during Site Investigations* and where applicable, the MPCA Vapor Intrusion Best Management Practices.

Monitoring Well Installation and Development

Following completion of selected borings, monitoring wells may be installed through the center of the hollow stem auger, drive casing, or open boring advanced with standard drilling or push probe technology. WCEC ensures that all monitoring wells are installed in accordance with the Minnesota Department of Health water well construction codes. Completion diagrams are prepared for each well, documenting major features of the well including depth from ground surface to all major well features, well screen slot size, sand pack size, inner diameters of riser casing, screen, protective casing, and borehole (inches), well development information, well construction materials, a unique well number and project identification number, the date the well was begun and completed, the driller and consultant names, and the elevation of ground surface and measurement point.

Following the curing of the grout (approximately 24 - 48 hours), each monitoring well is developed. Prior to development activities, the depth to static water level and total casing depth is measured in each well. Also prior to well development, if applicable, the water interface of each monitoring well is checked for the presence of LNAPL. WCEC uses an oil/water probe, clear bailer, or color indicator paste for this inspection. The objective of monitoring well development is the removal of silt and/or clay size particles from the water bearing unit and the filter pack of the well. Removal of the silt and clay will produce ground water samples with low turbidity and more accurate ground water quality data.

A.3.7 Conduct Ground Water, Soil, Surface Water, Sediment, and Air Sampling & Monitoring

WCEC has collected and analyzed a variety of samples at thousands of sites including, but not limited to, petroleum, agricultural chemical, methamphetamine, mercury, asbestos, PFC, and RCRA metal sites.

Groundwater Sampling

WCEC's environmental technicians that conduct ground water sampling receive extensive (supervised) training in MPCA and MDA procedures, as well as in MDH rules and regulations. Projects involving groundwater sampling include sites at which one or more of the following are conducted: tank or remedial excavations, Phase II environmental site assessments, remedial or limited site investigations, monitoring well installation, vapor extraction system installation, or spill and emergency response clean-up activities. WCEC staff document field data, site conditions, and sampling methods and complete a chain of custody for each sampling event. Personnel collecting samples follow all state, laboratory, and WCEC written procedures closely to ensure the accuracy of sampling results. Any deviations from these procedures necessitated by site conditions are recorded and reported to the hydrogeologist or project manager.

WCEC has vehicles dedicated to monitoring well sampling that are stocked with a variety of equipment and supplies needed to sample a wide variety of wells. WCEC utilizes many different types of sampling equipment, such as disposable bailers (polyethylene EcoBailers with stainless steel weights), low-flow pumps, submersible pumps, multi-parameter devices, and various Geoprobe® tooling designed for groundwater sampling.

Soil Sampling

Surficial and subsurface soil samples have been collected, documented, and analyzed by WCEC at thousands of sites including petroleum, agricultural chemical, Phase II investigations, industrial, and spill response projects. Soil samples have been collected using various methods including: Geoprobe™ large bore, macro core, and dual tube sampling; split spoon sampling; hand auger sampling; and surficial sampling. We are knowledgeable and experienced in the current collection and analysis procedures in the MPCA and MDA Guidance Documents, including collecting soil samples for analysis of MDA List 1 and List 2 pesticides, nitrates, organochlorines, toxaphene, clomazone, fluorodifen, volatile organic compounds (VOCs), DRO/GRO, RCRA metals, PCBs, PAHs, and PFCs. In addition, we have completed field screening (XRF technology) of metals compounds in soils for two remedial excavation projects.

Surface Water Sampling

WCEC has completed point and non-point source pollution monitoring for surface water including naturally-occurring surface waters (i.e., rivers, lakes, and wetlands) and man-made surface waters (i.e., run-off ditches and holding ponds). Surface water monitoring projects have included long-term monitoring of surface waters adjacent to source contamination points and sampling and analysis of surface water to determine real or potential impacts associated with spills or other sudden releases. Surface water monitoring is conducted using procedures described in the MPCA and MDA Guidance.

REPRESENTATIVE EXPERIENCE

Cleveland, North Dakota

As part of the cleanup at a train derailment in a wetland area, it was necessary to assess possible impacts from rail cars containing sodium carbonate (soda ash) and molten sulfur. A site walkover with the railroad representative established the areas of concern and priorities for documenting the extent of elevated pH levels and background concentrations. Background levels were determined for the wetland, and elevated levels were found only in the immediate area of the cars containing sodium carbonate. These levels were mapped and documented. As part of the cleanup, the highly impacted area within the wetland was separately contained, and the surface water was pumped and applied on nearby land owned by the railroad. WCEC conducted a follow up assessment of pH levels in surface water throughout the wetland area and confirmed there were no changes in pH levels after the transloading and cleanup of all the derailed cars.

Sediment Sampling

Sediment samples have been collected, documented, and analyzed at several sites, including petroleum, agricultural chemical, Phase II, industrial, and spill response projects. Sediment samples have been collected from various areas including: man holes, sewers, scale basins, sumps, and tiles. Sediment samples are collected by hand if possible; however, WCEC has various tools to use for hard-to-access areas. Most commonly, WCEC uses an extendable "scoop-type" device that can be decontaminated to collect sediment samples in hard-to-access areas.

REPRESENTATIVE EXPERIENCE

Hennepin County, Minnesota

WCEC was retained to determine if hazardous materials had been flushed into the storm pond on the Hennepin County Public Works Department shop in Hopkins, Minnesota. This investigation included the collection of a combination of sediment and water samples to determine the extent of the contamination. Soil borings were advanced through the sediment in the pond to determine the thickness of the sediment and to collect samples for analyzing contaminant levels. Water samples were also collected from the pond outfall. Samples were analyzed for VOCs, RCRA 8 metals, and DRO. The results of the analytical testing determined that the pond sediment was contaminated with petroleum hydrocarbons. WCEC then developed and implemented a remediation plan.

Lake Elmo, Minnesota

As part of WCEC's investigation of potential PFC contamination at a former dumping site, surface water and sediment samples were collected at Eagle Point Lake in Washington County, Minnesota. Sampling events were completed in the winter through the ice and in the spring following the ice-melt. Sediment and water samples were collected from a feeder creek and the lake itself to determine if PFC contamination was present.

REPRESENTATIVE EXPERIENCE

Lac Qui Parle Lake Watershed Project, Minnesota

WCEC was retained to establish base line water and environmental quality data on Lac Qui Parle Lake, its tributaries, and watershed to enable the Lake Association to be competitive in its requests for corrective action funding. In addition to routinely collecting water quality data samples from several points in the watershed, WCEC collected sediment cores from six locations on the lake. Cores were collected with a two-meter piston-type coring apparatus with a 35-mm aperture. All sample analyses, WCEC lake study information, and researched historical information from other sources were presented in a report (with supporting table and graphs) to the Association.

Air Sampling and Monitoring

WCEC is one of the most experienced firms in Minnesota using various field instruments to monitor hazardous air and vapor conditions. Our 17 years of experience as a Hazardous Materials Chemical Assessment Team and over 20 years as a State Spill Contractor have given us extensive experience in using state of the art monitoring equipment.

REPRESENTATIVE EXPERIENCE

Wolverton, Minnesota

After tracing the presence of petroleum in a sanitary sewer system and lift station to a residence, WCEC conducted minor cleanup in the residence basement. Because of possible concern for human health, including very small children, WCEC deployed summa canisters in the basement and in an upstairs bedroom to document the presence or absence of remaining petroleum vapors. Laboratory analysis was completed for volatile organic compounds (VOCs) and naphthalene, confirming the absence of measurable vapors.

WCEC has installed and operated dozens of soil and groundwater remediation systems at petroleum leak sites. Air sample collection and analysis has been a requirement at many of these sites, such as those with vapor extraction systems. We have collected air samples from many petroleum spill sites where basements or other similar confined space situations exist. Routinely we use a portable gas analyzer (GEM 5000) to collect air samples, and in some instances, to measure for methane.

During vapor intrusion assessments where a completed pathway evaluation is necessary, paired sampling of sub-slab, indoor and outdoor ambient air sampling is necessary. A minimum of two semi-annual seasonal sampling events are conducted to evaluate whether vapor intrusion is occurring. WCEC follows the MPCA's Best Management Practices for Vapor Investigation and Building Mitigation Decisions document during these investigations.

A.3.8 Conduct Vapor/Air Monitoring: Health and Safety and Air Quality Criteria

The primary goals of vapor surveys are to evaluate environmental, hazardous and/or explosive conditions and to investigate existing or potential health risks due to vapors. WCEC routinely conducts vapor surveys in structures, sanitary sewers, and storm sewers as part of petroleum leak site investigations and emergency response actions. Vapor surveys are completed in the field using instruments such as a photoionization detector (volatile organic compounds), four-gas meter (combustibles/lower explosive limit [LEL], oxygen, hydrogen sulfide, and carbon monoxide), ToxiRAE meter (ammonia), GEM 2000 meter (methane, carbon dioxide, oxygen) and Lumex meter (mercury). Air samples for monitoring vapor intrusion (soil gas, sub-slab and 24-hour) are collected in laboratory-supplied summa canisters and sent to the laboratory for analysis. Direct-push sampling can also be used to collect soil vapor samples in utility corridors.

As described in Section A.3.5 of this proposal, WCEC prepares site specific HASPs which include conducting a hazard assessment of the site and performing ambient and personnel air monitoring in accordance with 29 CFR 1910.120(b)(4). Monitoring the breathing zone during site operations is one manner that we employ to ensure that the health and safety of all onsite personnel is protected for the duration of a project.

Because of our extensive experience as an emergency contractor, WCEC is frequently called to assess and remediate vapor situations in critical health or environmental response situations. Vapor mitigation equipment that can be temporarily or permanently installed and used in conjunction with on-going monitoring is kept in inventory at WCEC. WCEC currently has projects that require regularly scheduled vapor monitoring of site and/or nearby business or residential basements and storm/sanitary sewers.

REPRESENTATIVE EXPERIENCE

Sodium Hydroxide and Nitric Acid Spill, Evansville, Minnesota

An overturned truck on U.S. Interstate 94 near Evansville, Minnesota caused the release of sodium hydroxide and nitric acid, resulting in vapors that impacted several third-party first responders. As part of WCEC's response, air monitoring for pH and LEL (lower explosive limit) was conducted with wet pH paper and a four-gas meter near the incident as well as at one-, two-, and three-mile perimeter points around the incident. These results, along with Draeger tube sampling for nitrous fumes and acid vapors, were used to establish hot/cold work zones and to make the decision whether to evacuate the town, located one mile away. Post-incident monitoring by WCEC of nearby downgradient wetlands, ditches and a river included conducting field pH sampling and data logging from eight pre-designated sampling points.

REPRESENTATIVE EXPERIENCE

Manufacturer Fire, Newport, Minnesota

WCEC completed air monitoring and air sampling activities to determine the extent of an evacuation area and to evaluate air quality impacts resulting from a chemical manufacturer fire. The chemical facility fire created a contaminated smoke plume that, due to the prevailing wind, impacted a residential neighborhood and forced an evacuation. WCEC coordinated with local and state officials in monitoring the evacuated area and collected air quality samples utilizing summa canisters.

REPRESENTATIVE EXPERIENCE

Air Quality Monitoring, Trucking Facility, Minnesota

WCEC responded to concerns about exposure to contaminant emissions from a nearby battery recycler. WCEC completed air quality monitoring inside the trucking facility and on the facility loading docks. Personal monitoring devices were worn by personnel to sample and analyze air quality in the work environment.

Residential Fuel Spill, Alexandria, Minnesota

Home heating oil was spilled in a residential basement, impacting the basement walls, floor and residents' personal belongings. A resident had been overcome by fumes while cleaning and required medical assistance. WCEC arrived at the site and installed a blower system to ventilate vapors. Air monitoring was completed with a photoionization detector to confirm that hazardous conditions were effectively remediated, allowing for commencement of spill cleanup activities. Impacted materials were cleaned, sealed, and/or removed from the residence. Summa canisters were used to collect air samples in three locations within the residence. Analytical analyses verified that concentrations were below the MPCA's residential Intrusion Screening Values (ISVs).

A.3.9 Conduct and Oversee Site Assessments, LSIs and RIs

Since 1990, WCEC has conducted thousands of site assessment activities including Phase I and Phase II Environmental Site Assessments (ESAs), Agricultural Environmental Site Assessments (AgESAs), limited site investigations (LSIs) and remedial investigations (RIs) at petroleum, agricultural chemical, hazardous waste, industrial, commercial and emergency response sites on behalf of our public and private sector clients throughout the state of Minnesota. The type of assessment or investigation activity performed at each site depends on numerous factors including regulatory requirements, technical objectives of the project, potential contaminants of concern identified at the site, the time-critical nature of the potential or identified hazard(s) and/or the business purpose of the assessment. Site assessment can include desktop review of data and historical documents, on-site exploration via direct-sensing methods, and intrusive investigation that involves subsurface penetration with sample collection for off-site analysis. Some investigations require a combination of these techniques.

Environmental Site Assessments (ESAs)

Phase I ESA

WCEC has over 25 years of experience in completing Phase I ESAs in accordance with the guidelines established by the American Standards of Testing and Materials (ASTM), as described in ASTM E1527-13: Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The purpose of the ASTM practice (E 1527-13) is to define good commercial and customary practice for conducting an ESA of a parcel of commercial real estate with respect to the range of contaminants within the scope of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. This practice is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner or bonafide prospective purchaser limitations on CERCLA liability. The Small Business Liability Relief and Brownfields Revitalization Act sets forth as law specific eligibility conditions for achieving CERCLA liability protections known as "All Appropriate Inquiries" (AAIs). The EPA has determined that ASTM Standard E 1527-13 is in full compliance with the requirements for conducting AAIs specified in the published EPA rule, "Standards and Practices for All Appropriate Inquiries."

The goal of the processes established by this practice (Standard E 1527-13) is to identify Recognized Environmental Conditions (RECs) associated with the subject property. ASTM defines RECs "as the presence or likely presence of any hazardous substances or petroleum products on the subject property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into the structures on the subject property or ground, ground water, or surface water of the subject property."

A 2013 revision to the ASTM Standard E 1527-13 included changed definitions for various *Recognized Environmental Conditions* (RECs) including revised definitions applicable to contaminant migration. The current standard therefore incorporates potential vapor intrusion as a REC requiring further inquiry/actions.

AgESA

Additional requirements, beyond those outlined in ASTM Standard E 1527-13, apply when conducting a Phase I ESA at a site associated with an active MDA Incident Response Unit (IRU) (non-preconstruction) investigation. ESAs at active IRU investigation sites are completed in accordance with MDA Guidance Document 14, *Agricultural Environmental Site Assessment* (AgESA). AgESA requirements include:

- Completion of a thorough site walkover to document the existing use of the property;
- Compilation of current and past chemical inventory stored or handled at the site, including quantities and active ingredients;
- An extended (1/2 mile) search radius for MDA data associated with the site;
- Interviews with those knowledgeable of current and historic site operations, including past reported and unreported incidents, HRAs, etc.;

- A review of MDA-specific data sources including the What's in my Neighborhood-Agricultural Interactive Mapping webpage, the County Spill Report and a Company Summary Report (requested from the MDA Data Practices and Records Management Coordinator);
- Completion of the checklist in Attachment 2 of the Agricultural Environmental Site Assessment (AgESA) Guidance Document.
- Identification and description of High Risk Areas (HRAs).

Phase II ESA

A Phase II ESA may be used to evaluate Recognized Environmental Conditions identified in a Phase I ESA or AgESA**.** Phase II ESAs are typically completed to determine the presence or absence of contaminant impacts on the subject property. Phase II ESAs are often completed on a voluntary basis for legal or business risk decisions. The scope of work is unique for each property, depending on the needs of the client, the site layout, and the identified Recognized Environmental Conditions or High Risk Areas. Phase II ESAs are completed in accordance with guidelines established by ASTM E1903-11, *Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process***.**

Limited Site Investigations/Remedial Investigations (MPCA)-

One of WCEC's areas of specialized expertise is completing contaminated site investigations. WCEC has completed LSIs and/or RIs for many different types of contamination including: petroleum, heavy metals, and other hazardous chemicals. These investigations are conducted by a WCEC team, typically including a Project Manager, Scientist, and Field Technician, with assistance from Engineers and modelers as needed. Our LSI and RI experience includes releases from fuel storage at homes and schools, retail petroleum stations, and bulk petroleum storage tank facilities. Sites include releases of petroleum or hazardous chemicals at industrial facilities, dry cleaners, and a variety of commercial settings. Direct-sensing technology is utilized on many projects managed by WCEC, as it often provides a high return of data for the costs involved. Direct-sensing methods overseen by WCEC include laser-induced fluorescence (LIF), the membrane interface probe (MIP), electrical conductivity (EC) arrays and the hydraulic profiling tool (HPT). WCEC's experience in overseeing these direct sensing methods accentuates the capabilities of WCEC to perform a wide array of site investigations.

WCEC performs MPCA limited site investigation (LSI) and remedial investigation (RI) activities in accordance with applicable industry, state and federal standards and guidance documents, including but not limited to the following:

- ASTM E2531: Standard Guide for Development of Conceptual Site Models and Remediation Strategies for Light Non-Aqueous Phase Liquids Released to the Subsurface – Describes development of the general conceptual model of subsurface contamination, which provides the basis for completing a subsurface investigation, evaluating risks, and developing a corrective action strategy, if necessary. This general conceptual model is used in developing the overall conceptual site model (CSM).

- ASTM E2600-10: Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions – Voluntary standard provides a framework for estimating subsurface vapor intrusion (Vapor Encroachment Concern – VEC) on a target property based on specified criteria.
- MPCA Guidance Document 4-01: Soil and Ground Water Assessments Performed During Site Investigations – WCEC performs LSI and RI activities at petroleum release sites following this guidance.
- MPCA Guidance Document 4-01a: Vapor Intrusion Assessments Performed During Site Investigations – Presents the Petroleum Remediation Program procedures for collection and evaluation of soil gas composition data, for use in evaluating site risks from subsurface vapor.
- MPCA Guidance Document 4-06: Investigation Report Form – Structured to assist in the development of the CSM, which is utilized as the basis for selecting an appropriate site management strategy.
- MPCA Guidance Document 4-09: Ground Water Investigations in Karst Areas – Addresses the requirements for collection of additional hydrogeological data in karst areas during the remedial investigation phase at petroleum release sites.

MPCA limited site investigations (LSI) and remedial investigations (RI) determine the extent and magnitude of soil and groundwater contaminant impacts, assess the risks to the environment and human health impacts, and ultimately determine the need for corrective action. An LSI provides a snapshot of site conditions, while the RI measures contaminant concentrations over time to determine trends and more carefully evaluate the site-specific risk pathways. The MPCA has developed a standard LSI/RI process for use on petroleum release sites and a standard reporting format; however, the MPCA Superfund program defines the elements of the investigation without an established reporting format due to the wide variability in the contaminants of concern and often the site complexity.

The essential components of the LSI include determination of the horizontal and vertical extent of soil and groundwater contamination through installation and sampling of soil borings. If contaminated groundwater is identified, it is compared to applicable Minnesota Department of Health's health risk limits (HRLs). If groundwater impacts are not identified, a determination of the potential for soil contamination to leach into groundwater is made. The LSI also includes evaluation of the hydrogeologic unit's aquifer characteristics, an assessment for the presence of LNAPL and assessment of the extent of subsurface vapor migration.

REPRESENTATIVE EXPERIENCE

Remedial Investigations of Multiple UST Sites, Bigelow, Minnesota

WCEC conducted concurrent remedial investigations at three underground storage tank (UST) leak sites concentrated within a three-city block area. Two of the leak site investigations were conducted as part of the existing MPCA and MDA Master Contract; the third was a competitively-bid responsible party (RP) site. The three investigations included the installation of and sampling 40 soil borings and 14 vapor sampling probes, completion of a receptor survey and risk evaluation, completion of a utility vapor survey with 13 survey points, and the installation and sampling of 13 monitoring wells. (cont.)

REPRESENTATIVE EXPERIENCE

Remedial Investigations of Multiple UST Sites, Bigelow, Minnesota (continued)

During the investigations, WCEC delineated soil and dissolved-phase contaminant impacts from source areas at each site. Investigation findings suggested that impacted soil and groundwater was present off site and commingled with other source areas. Light non-aqueous phase liquid (LNAPL) was observed in a localized area on each site. Several buildings were identified to be at risk for vapor accumulation. Indoor air sampling was conducted at one of the site buildings and at an adjacent residence. The receptor survey identified 14 undocumented residential wells within 500 feet of the commingled dissolved-phase contamination plume. The city utilizes rural water supply, so most of these wells were being used as irrigation wells. Twelve (12) of the residential wells were sampled, and no impacts to the wells were identified. An impacted well was identified adjacent to one of the leak sites and had been sealed several years earlier due to petroleum impacts. To learn more about the underlying geologic layers and potential resource aquifers, an EC probe was advanced at one of the sites. Groundwater monitoring was completed on a quarterly basis at each of the sites. Groundwater data from the sites was evaluated jointly for a comprehensive assessment of groundwater impacts.

The initial conceptual site model for the three sites suggested that buried public utilities were likely in contact with the soil and dissolved-phase contamination plumes and were likely within a few feet of the documented LNAPL. To define impacts to the utilities, a utility backfill investigation with 26 hand auger borings was performed. The utility backfill investigation data was used to update the conceptual site model, and risks associated with the leak sites were re-evaluated by WCEC. Several receptors were identified as high risk for impacts from contamination including three residential wells, the public sanitary sewer and water utilities. The three at-risk residential wells were sealed by a Minnesota Department of Health (MDH)-licensed well driller in accordance with the Well Code.

An LIF/EC investigation was performed to update the CSM and obtain a detailed picture of the vertical and horizontal extent of the LNAPL and to obtain detailed site stratigraphy from the EC data. A conceptual corrective action design (CCAD) was developed to mitigate risks associated with the impacted backfill material around the sanitary sewer and water utilities. Excavation was determined to be the most feasible, cost effective corrective action and was planned based on the updated LNAPL CSM. An excavation of 2175 cubic yards of soil was completed during the winter to reduce dewatering requirements, and the MPCA closed the three leak sites.

As demonstrated in the project summary presented above, the RI expands on the findings of the LSI by collecting additional hydrogeologic information, including groundwater contaminant concentrations measured in monitoring wells over time. Other components of the RI include the following: determination of the vertical and lateral extent and magnitude of groundwater contamination and LNAPL with monitoring wells; determination of groundwater flow direction and velocity based on hydraulic conductivity measurements within the plume; and determination of plume stability. The RI provides a detailed evaluation of projected risks to groundwater receptors based on these data, other field-collected information, and readily available public sources of information, such as the Minnesota Well Index (MWI).

The MPCA enhanced investigation procedures to include investigation of the vapor intrusion pathway by following Best Management Practices (BMPs) in a five-step process. This involves the evaluation of vapor sources and nearby receptors (buildings in use) and conducting a focused soil gas investigation involving soil gas probes and/or sub-slab sampling locations. The results of this are compared to established criteria, Intrusion Screening Values (ISVs), appropriate for the site. The criteria include ISVs for Residential or Industrial settings, "Expedited ISVs", the so-called "33x ISV" concentration (ISV divided by 0.03), or the "33x Expedited ISV". Comparing the sampling results to the appropriate criteria defines the vapor intrusion Area of Concern (AoC) that provides the basis for investigation and remedial decisions. The results establish the Vapor Mitigation Area, and determine actions required for each affected building. The MPCA has developed map templates for each of the five steps involved, for ease of communicating the findings and building/area-specific actions involved.

Remedial Investigations (MDA)-

The objectives of the MDA RI are similar to those of the MPCA LSI and RI and include:

- Identification of the likely sources of contamination;
- Determination of the extent and magnitude of contamination in soil, groundwater and/or other media;
- Determination of actual and potential impacts and risks relating to the contamination; and
- Collection of information needed to design and implement corrective actions, if necessary.

WCEC has completed RIs under the MDA's Agricultural Voluntary Investigation Cleanup (AgVIC) and Comprehensive Facility Investigation Program at a wide variety of facilities including: agronomy storage and distribution centers, wood treatment facilities, aerial applicator facilities, manufacturing facilities, golf courses and seed/lawn care facilities. The RI is typically initiated following MDA approval of the AgESA. RI activities are executed in accordance with applicable MDA standards and guidance documents, including but not limited to the following:

- MDA Guidance Document 9: Remedial Investigation Work Plan –Outlines the approach to remedial investigations and provides guidelines for the key steps including: development of the *Remedial Investigation Work Plan* (*RI Work Plan*), investigation of likely contaminated areas (HRAs) and reporting of the remedial investigation (detailed guidelines for the former are provided in Guidance Document 10: Agricultural Chemical Incident Remedial Investigation Report and Corrective Action Plan).
- MDA Guidance Document 11: Soil Sampling Guidance – Provides procedures and requirements for soil sample collection, equipment decontamination, documentation, and sample storage, packaging and shipping.
- MDA Guidance Document 12: Groundwater Sampling Guidance – Provides groundwater sampling procedures and describes required hydraulic conductivity testing, water level determination, quality assurance parameters, sample packaging and shipping requirements and reporting procedures.

Prior to submittal of the *RI Work Plan*, an on-site meeting is typically held between representatives of the MDA, WCEC and the responsible party to inspect and discuss HRAs and to determine appropriate sampling locations, depths and parameters. Following the on-site meeting, the *RI Work Plan* is prepared. The main objectives of the *RI Work Plan* are to identify and document the HRAs and chemicals of concern, present proposed methods and procedures that will be employed to investigate HRAs, and specify how potential receptors and migration pathways will be identified and assessed.

HRAs and chemicals of concern are discussed within the *RI Work Plan* and are illustrated on a site map, along with proposed sampling locations within each HRA. The proposed sampling approach is discussed including: the sample collection method, the sample type (groundwater, composite soil, discrete soil or sediment), the sampling depth and the frequency of duplicate samples (one in ten). It is WCEC's experience that information regarding HRAs, chemicals of concern, sampling parameters and sampling depths, is most concisely summarized in the form of a table.

Soil analytical parameters are proposed in the *RI Work Plan*. Samples collected from areas in which fertilizer has been or is currently being stored or handled are analyzed for nitrate as nitrogen and total Kjeldahl nitrogen (TKN); samples that are collected from areas in which pesticides have been or are currently being stored or handled are typically analyzed for MDA List 1 Pesticides. Samples collected from pesticide handling or storage areas may also be analyzed for MDA List 2 or for additional unique chemicals, based on chemical inventory information gathered during the AgESA. RIs at sites that are not ag retailers and applicators, such as greenhouses, exterminators, aerial applicators, golf courses, etc., will likely require analyses of MDA List 3 Pesticides, organochlorine pesticides, fungicides, dinoseb, organophosphorus and/or heavy metals. If analyses of unique chemicals are recommended, WCEC discusses the recommended analyses with the MDA. Prior to completing the unique chemical analyses, the laboratory is required to submit additional information, including its Quality Assurance/Quality Control Plan, to the MDA as described in Guidance Document GD24, *Fixed Base Laboratory Quality Assurance/Quality Control Plans*. MDA approval is required prior to analyses at laboratories that are not pre-approved.

The MDA requires collection of composite soil samples from areas not overlain by concrete or asphalt in order to more broadly characterize near-surface soil impacts within an HRA. Composite soil samples are created from equal volumes of subsamples from a common six-inch thick vertical depth interval collected at three to six equally-spaced locations within a 15-foot diameter sampling area. Composite sample are collected from interval depths of 0-6 inches and 2-2.5 feet below surface grade or below a loose gravel base (if present). In areas overlain by concrete or asphalt, shallow soil is collected as discrete, rather than composite, samples. Discrete samples are collected from the 4.5-5-foot sampling interval from one of the centrally-located borings within each sampling location. Deeper soil sampling is generally required during an RI to evaluate the vertical extent of contamination, the threat of contamination reaching the groundwater and/or subsurface stratigraphic formations at the site. Deeper soil sampling is required around a scale pit, if present. Deeper soil samples are collected from six-inch intervals every two feet, at changes in lithology, and at the water table. Sampling depths are provided in the *RI Work Plan*. If it is necessary to modify sampling depths or locations based on field conditions, the MDA is contacted for approval.

Samples are submitted for analytical analyses incrementally. Generally, the 2-2.5-foot sample interval is submitted for initial analyses. Samples not submitted for immediate analyses may be stored frozen under the chain-of-custody for up to six months. When initial analytical data are received, contaminant levels

are compared to MDA's high-, moderate- or low-risk to groundwater cleanup goals. The cleanup goal is determined based on geologic, contamination and receptor characteristics, as described in Guidance Document 19, *Soil Cleanup Goals*. Initial analytical data are compared to the selected cleanup goal to evaluate which samples should be submitted for subsequent laboratory analyses. In most cases, if contaminant levels exceed the selected clean-up goal, the deeper sample will be analyzed. Conversely, if contaminant levels are below the clean-up goal, the shallow sample will be analyzed.

Recommendations for additional analyses are submitted to the MDA for review along with the analytical report, tables summarizing samples collected and analytical results, the MDA *Laboratory Data Review Checklist*, boring logs, and a map showing sampling locations. Additional samples are submitted following MDA approval.

If full horizontal and vertical delineation of soil impacts is not achieved during the initial sampling event, a work plan for additional soil sampling is prepared. As with the *RI Work Plan,* the additional soil sampling work plan outlines proposed sample locations, depths, types and analytical parameters. The proposed work is not executed without MDA approval.

It may be necessary to collect groundwater samples during an RI. This determination may be made during the initial sampling phase based on site history, previous investigation/sampling data and vulnerability/potential risks to receptors. This determination may also be made after the initial sampling phase, based on soil contaminant distribution, the depth to groundwater at the site, and subsurface stratigraphic formations at the site. Groundwater may be sampled from monitoring wells, temporary monitoring wells (borings), and/or private wells. If monitoring wells are required, a minimum of three wells will be proposed to allow for determination of the groundwater flow direction. Monitoring well locations and construction specifications will be proposed to the MDA. Slug or plug testing on select monitoring wells is required to estimate the horizontal hydraulic conductivity.

Procedures used during an RI such as soil and groundwater sample collection, equipment decontamination, quality assurance/quality control parameters, sample transportation and handling, drilling, monitoring well development and slug/plug testing are submitted to the MDA prior to the proposed work being completed. Investigation activities, including sampling and laboratory analyses, are not completed without MDA approval.

A Contamination Impact Survey is completed to assess exposure pathway risks to human health, groundwater, surface water, and other potential receptors. The Contamination Impact Survey is submitted to the MDA in the *Remedial Investigation Report and Corrective Action Plan* (*RI/CAP*). The *RI/CAP* presents site history and background information, site investigation results and a plan for addressing documented impacts associated with the site.

REPRESENTATIVE EXPERIENCE

AgESA and RI, Agronomy Facility, Grove City, Minnesota

A Phase I ESA of the site was completed in association with a property transfer. Because the site had been entered into the MDA Comprehensive Facility Investigation program, additional information was required beyond the scope of a standard Phase I ESA. WCEC completed an update to the Phase I ESA, bringing it into compliance with MDA Guidance Document 14 *Agricultural Environmental Site Assessment* (AgESA). Representatives of WCEC, the MDA and the responsible parties conducted a site walkover at the facility to inspect High Risk Areas and discuss sampling locations. Based on site observations and information gathered during the AgESA, WCEC recommended remedial investigation sampling locations and parameters in a *Remedial Investigation Work Plan (RI Work Plan)*. Upon MDA approval of the *RI Work Plan*, RI sampling activities, including soil and groundwater sampling, were completed. WCEC reviewed guidelines set forth in MDA Guidance Document 19, *Soil Cleanup Goals* to recommend appropriate soil cleanup goals for the site. Soil data was compared to the selected cleanup goals and recommendations for additional analysis were made to the MDA. Upon receipt of all analytical data, WCEC submitted a *Remedial Investigation Report/Corrective Action Plan (RI/CAP)* recommending no corrective actions. WCEC's *RI/CAP* included site history and background information, site investigation results and a *Contamination Impacts Survey* which evaluated and discussed site contamination impacts on public health and the environment. WCEC recommended that the case file be closed. The MDA approved the RI/CAP and issued a No Further Action determination for the site.

A.3.10 Conduct Surface Water, Ground Water, Air and Vapor Receptor Surveys

WCEC has completed thousands of spill cleanups and site investigations that have required ground water, surface water, and vapor receptor surveys to help protect the public and the environment. WCEC completes receptor surveys for scheduled investigations and emergency spill response sites on a weekly basis. When performing these receptor surveys and screenings, WCEC follows the MPCA Petroleum Remediation Program guidance documents such as c-prp1-01, c-prp4-01, c-prp4-01a, and c-prp4-02; MDA guidance documents such as the *Contamination Impacts Survey;* and Superfund guidance documents such as the risk-based fact sheets.

In some cases, identifying receptors in the field may be critical to protect the public from hazardous situations such as combustible vapors in subsurface structures that can lead to explosions such as at the former Hillcrest 66 leak site (Leak #12649, Rochester). In addition to field surveys, WCEC identifies receptors by accessing internet databases. There are currently numerous searchable sites that exist, such as the MPCA's "What's in My Neighborhood"; the MDA's "What's in my Neighborhood-Agricultural", the PRP's GIS site; the Minnesota Department of Health Well Index; and the EPA's "My Environment". WCEC also utilizes new and developing technologies such as the Environmental Quality Information System (EQuIS), which WCEC was one of the contractors used in the pilot project by utilizing the field data collection tool EDGE (EQuIS Data Gathering Engine). WCEC also uses county and municipal

GIS sites for underground utility construction details and wetland inventories, and contacting local drillers, utility companies or individual municipal departments.

WCEC has collected hundreds of drinking water well samples from residential, municipal, public water supply, and non-community wells to analyze for a variety of contaminants. Project sites have ranged from PRP, MDA, and Superfund to Emergency Response sites in Minnesota, including:

- Multiple PRP sites in the City of Foley, City of Pelican Rapids, and City of Alexandria
- WAFTA/Nike Missile Superfund site in Carver County
- PCI Superfund site in Shakopee
- Widespread PFC contamination in Washington County
- Fish Hatchery Dump Superfund site in St. Paul
- WWTP lagoon contamination in the karst terrain of Askov
- Various Emergency Response sites where residential wells were potentially at risk (Peickert, Anoka; Larkin, Kenyon; Transport spill, Twig)

Field vapor surveys of subsurface structures using PID and multi-gas meters at petroleum release sites is commonplace for WCEC Scientists, Field Technicians, and responders. The MPCA has detailed processes for conducting vapor investigations which are included in their document, “Best Management Practices for Vapor Investigation and Building Mitigation Decisions”. Vapor receptor surveys are an integral part of the process and WCEC accomplishes these using the MPCA’s Vapor Intrusion Building Survey Form (c-rem3-01a). WCEC has collected numerous sub-slab vapor samples and installed and monitored permanent soil gas monitoring points as part of vapor investigations and subsequent building mitigation decisions for PRP, Superfund, and Emergency Response sites. WCEC has also installed dozens of sub-slab depressurization systems (SSDs) and soil vapor extraction (SVE) systems in residential and commercial settings to prevent human exposure to vapors from heating oils, gasoline, and solvents. WCEC routinely conducts vapor surveys in storm/sanitary sewer and other utilities. WCEC has also screened for methane in buildings, borings, and landfill gas monitoring points, and conducted real-time monitoring of a variety of airborne chemicals during Emergency Response work.

WCEC has completed many surface water receptor surveys and Level 1 screening assessments to evaluate the potential risk to surface water including lakes, streams, and associated wetlands. Initial assessments are completed with worst-case site ground water concentrations being compared to Tier 1 standards, criteria, or screening numbers. One example of a Level 1 screening assessment is the comparison of worst-case perchloroethylene, vinyl chloride, and benzene concentrations in shallow groundwater monitoring wells upgradient of the Straight River in Owatonna to Tier 1 surface water chronic standards. WCEC has also completed Tier 2 evaluations on a site-specific basis such as the comparison of the concentrations of polynuclear aromatic hydrocarbons, pesticides, metals, and perfluorochemicals in groundwater and surface water to surface water chronic standards for Class 2B waters (Fish Hatchery Dump, St. Paul) per Minnesota Rules, Chapter 7050. WCEC has also estimated the potential for exceedance of Tier 2 surface water standards for specific classes of waters using the

highest concentration of a given site contaminant in ground water, the maximum volume of ground water discharge, and the least amount of surface water dilution.

A.3.11 Oversee Vapor Mitigation Construction / Conduct Non-Construction Mitigation

For vapor mitigation construction oversight, WCEC may prepare mitigation system designs or supervise the design of a mitigation system by a specialty Contractor. Field oversight includes observing the construction of vapor barriers to mitigate vapors, and/or conducting independent measurement of pressure field extension (PFE) for a sub-slab depressurization system. WCEC also oversees the proper placement of vapor barriers, including fastening to the foundation walls for a crawl space; PFE measurement; and design/oversight of construction for pathway interrupting techniques such as excavations and soil replacement to act as a barrier for vapor migration, placement of bentonite slurry walls, or concrete caps to prevent further migration of vapors. WCEC may also oversee the installation of active venting systems, including sub-slab depressurization systems, heated-air exchangers, and other HVAC system appurtenances used for building mitigation or remediation in/around the affected structure.

Non-construction vapor mitigation techniques overseen and/or conducted by WCEC include: foundation joint and slab crack sealing, placement of slotted PVC in corrective action excavations alongside or under the foundation of buildings to prevent vapors from migrating into the building; sealing of the concrete of a basement to prevent the contaminant vapors from entering the building; installation of an explosion-proof fan to draw air from the soil and discharge to outside air if the contaminant is flammable; or use of the fan to ventilate a building space to provide a safe working environment and/or reverse potential vapor migration into occupied spaces. Non-construction mitigation techniques can include HVAC system tuning, especially in commercial buildings where pressure gradients can be corrected in a way that removes the vapor intrusion driving force.

REPRESENTATIVE EXPERIENCE

Hillcrest 66, Rochester, Minnesota

WCEC was contacted by the MPCA to respond to an explosion and gasoline vapors near Hillcrest 66 in Rochester, Minnesota. WCEC met with the Incident Commander, MPCA staff, and other officials. WCEC responders split into two groups to complete site activities.

Group 1 installed an intrinsically safe fan in a manhole located at the intersection of Elton Hills Drive and 19th Street NW, and a second fan was installed in the manhole in front of a restaurant located approximately 400 feet south of the intersection. Air monitoring was conducted with a PID and a four-gas meter.

Group 2 completed direct-push soil borings on the Hillcrest 66 property and adjacent streets to identify the source of the vapors. WCEC installed a vapor extraction system (VES) and sumps in an area that was excavated to remove highly impacted soils. The manhole fans were operated continuously for three weeks except when the manholes were monitored for vapor (cont.)

REPRESENTATIVE EXPERIENCE

Hillcrest 66, Rochester, Minnesota (continued)

accumulation under static conditions. During the excavation and VES installation work, WCEC continued to monitor the manhole ventilation fans. The VES was installed to help prevent the advancement of vapors in the Qwest conduit.

REPRESENTATIVE EXPERIENCE

West 66th and Vincent Ave. Site in Richfield, Minnesota

WCEC is assisting the MPCA with the investigation of a perchloroethylene release(s) that created impacts to the groundwater and soil gas. The site is also the subject of core area sampling by the US EPA. The MPCA Emergency Management Unit installed nine mitigation (active sub-slab depressurization) systems prior to the current Best Management Practices. The affected properties were identified, in part from results of initial vapor investigations in 2012 and 2013 by other firms.

Homes with active SSD systems were observed by WCEC, and a building survey form completed. Non-construction activities included use of a hammer drill to install sub-slab soil gas sampling (Cox-Colvin) points and pressure measurement ports. System measurements and PFE results varied; some homes had SSD systems that met current MPCA guidelines, while others did not meet PFE criteria. One property had a non-functional SSD blower. One home had a crawl space that was not part of the mitigation system. Deficient systems were upgraded as required to meet MPCA specifications, following the current vapor mitigation BMPs and established purchasing procedures.

WCEC prepared documentation that includes building survey forms, active mitigation system checklists, sampling notes, post-mitigation diagnostic checklists, post-mitigation confirmation sampling, and compiling the Property Summary Report for each successfully completed/upgraded system. Continued work includes mitigation decisions based on ongoing investigation results.

REPRESENTATIVE EXPERIENCE

Mercury Spills, School and Residential Property, Minnesota

A mercury spill in an Eden Prairie, Minnesota, classroom at a middle school resulted in wide spread mercury vapors in the school buildings. The ambient air concentrations remained above the acceptable levels even after the removal of the source material, requiring additional remediation techniques. WCEC installed blowers to provide positive pressure, as well as blowers and duct work for extraction which effectively reduced mercury vapors in ambient air within a 24-hour period.

Multiple homes in a mobile home community were contaminated with mercury when vandals stole a large quantity of mercury from an abandoned industrial facility. Based on vapor monitoring results and spot-checking of the trailers, WCEC determined that residents who (cont.)

REPRESENTATIVE EXPERIENCE

Mercury Spills, School and Residential Property, Minnesota (continued)

were in contact with the mercury on a neighborhood playground had cross-contaminated their mobile homes. Multiple Lumex meters were used to monitor indoor mercury vapor concentrations to determine which trailers required remediation. WCEC used heat to volatilize residual mercury which was subsequently captured using a system of blowers. In instances where the vapor source could not be mitigated, the carpet, floor, or drywall was removed or sealed to prevent additional vapors from accumulating.

A.3.12 Install Stainless Steel Soil Gas Sampling Ports

WCEC has completed numerous vapor intrusion assessments for different types of properties and for various chemicals of concern. In conducting these assessments, it is necessary to install stainless steel soil gas sampling ports using an electric drill to penetrate through floor slabs. WCEC prefers using manufactured vapor pins (i.e. Cox-Colvin Vapor Pin™ Kits) for typical installations. Depending on the location of the vapor pin, it may require a flush mount style that can be installed with a flush mount cover.

Before any drilling through the sub-slab is initiated, utilities (pipes, electrical lines, etc.) are located. A wet/dry vacuum is used to collect the cuttings and keep the area neat. Typically, a 5/8-inch diameter hole is drilled with a hammer drill and appropriate concrete bit to a depth of approximately 1 inch into the soil beneath the slab. If flush mounted installation is needed, then a 1 ½-inch hole to a depth of 1 ¾-inches is completed. The hole is cleaned out and vacuumed with the wet/dry vac. Following the manufacturer's directions, the vapor pin is assembled into the drilled hole (the Cox-Colvin Vapor Pin™ has a silicone sleeve to insure an adequate seal) then tapped into place with a dead blow hammer and the extraction/installation tool. The sub-slab soil-gas conditions are allowed to equilibrate, then the sample train assembly is attached to the pin. The MPCA Vapor Intrusion Best Management Practices (VI-BMP) are then followed to collect the sample: sample train setup; water dam leak testing of the sub-slab point; conducting a shut-in test; purging the sample train and sub-slab point; sub-slab sample collection; and, field screening the sub-slab point. Once the point is no longer needed, the sub-slab point is permanently sealed to prevent sub-slab vapor from entering the building.

REPRESENTATIVE EXPERIENCE

Residential Properties, Minnesota

Site assessment work indicated a risk for perchloroethene (PCE) vapor intrusion to residences immediately east of an active dry cleaner. The Minnesota Pollution Control Agency (MPCA) Emergency Management Unit issued a work order to WCEC to collect a limited number of soil gas samples, assist with access agreements, and coordinate the installation of sub-slab depressurization (SSD) systems. SSD systems were eventually installed by a professional radon mitigation contractor at 9 residences over a 13-month period.
(cont.)

REPRESENTATIVE EXPERIENCE

Residential Properties, Minnesota (continued)

Two semi-permanent sub-slab vapor sampling pins were installed at each residence. WCEC installed the pins following the MPCA's Vapor Intrusion Best Management Practices (VI-BMP) and the vapor pin manufacturer's standard operating procedure (SOP). Vapor pin locations were plotted on the building floor plans with other pertinent features.

Sampling was conducted in accordance with MPCA's VI-BMPs using individually certified 6L summa canisters with 200 mL/minute flow regulators, a sample train with particulate filters, and vacuum gauges. A water dam was used, the points were purged using a syringe with three-way valve, and field screening of the points was conducted using a PID. The samples were analyzed for volatile organic compounds (VOCs) by EPA Method TO-15.

A.3.13 Oversee Sediment Sampling Construction and Conduct Non-Construction Sediment Samplings

WCEC has provided contaminated soil remediation and emergency response services for over 25 years. Throughout that time, WCEC has completed contaminated sediment remediation and restoration in a variety of aquatic environments from lakes and wetlands to rivers and ditches. Contaminated sediment remediation strategies are designed to be effective and practical. Strategies are evaluated based on feasibility of implementation, probability of success, and cost effectiveness. Evaluation, monitoring, and design elements include identification and control of the source and pathway of contamination and focused data gathering.

Construction-related sampling includes dredge oversight and work conducted inside caissons. Sample collection in these situations requires a comprehensive understanding of the safety hazards and potential for sample disturbance. Non-construction sampling conducted by WCEC is generally based on hand-held devices that either grab a discreet sample or provide a means to cut a continuous core of sediment for stratigraphic investigation.

WCEC is an industry leader in geophysical direct sensing technologies (EC, HPT, UVOST, MIP, etc.) to obtain hydrogeologic and contaminant parameters in the field without having to physically collect and disturb the sediment. If physical samples are required to further define the characteristics of the sediment contamination, samples are collected using, for example Dutch mud augers, dredge (Ponar) samplers, piston core samplers, vibracores, and push probes. Sediment sampling has been completed on land, from barges and boats, and through the ice.

WCEC staff are knowledgeable in the U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and MPCA requirements of excavation, treatment, and disposal of recovered sediment. WCEC typically follows the EPA's Contaminated Sediment Remediation Guidance for Hazardous Waste Sites unless another regulatory agency's guideline takes precedence. Results of data gathering

determine the remediation strategy, which typically includes monitored natural attenuation, in-situ capping, and dredging or a combination of the three. Best Management Practices to control turbidity include multi-depth turbidity monitoring, and contaminant discharge mitigation with sediment curtains, silt fences, grass mats, bubble curtains and bank stabilization.

A.3.14 Conduct or Oversee Operation and Maintenance on Remedial Systems

WCEC has performed operation and maintenance (O&M) of over 100 remediation systems across the upper Midwest and northwest US, with more than half of these located in Minnesota. We have experience providing complete remediation system services including pilot testing, design, construction, installation, and O&M, thus WCEC has the experience to perform or oversee O&M on remedial systems for state funded projects.

WCEC's remediation system O&M standard operating procedures follow MPCA guidance for system performance monitoring O&M events consist of monitoring and/or sampling the appropriate remediation and monitoring points for sub-surface response, contaminant removal, and operational status. Field staff follow the operation monitoring plan for O&M contained in the remediation system Detailed Corrective Action Design (SDCAD) report. Remediation system equipment is checked, and controls are adjusted as necessary. Operational data collection and monitoring point sampling are conducted prior to making any system adjustments or performing any maintenance.

Our team organizational structure and cross training philosophy facilitates an "active project management" approach, where each team member from project manager, to design engineer, to field technician is familiar with the operational strategy, performance objectives, and operation monitoring plan of each individual remediation system. Additionally, our routine company-wide safety meetings include detailed discussions of QA/QC procedures specifically related to remediation system field meter operation. Operational issues, required repairs, or upgrades to our meter equipment are identified to ensure that we maintain our high-quality remediation system monitoring protocols.

Telemetric controls and data acquisition are incorporated into most remediation systems operated and maintained by WCEC to allow real time interaction with the system and determine when an O&M event is necessary (e.g. if telemetry data indicates that pump pressures are gradually increasing, this may indicate that particulate filters should be replaced, etc.). Using this type of active telemetry monitoring supports our development of the necessary O&M schedule and the remote diagnosis of unanticipated system shutdowns. Remote diagnostics enable us to mobilize the necessary equipment, tools, and personnel to quickly restart the system, increasing our efficiency and reducing overall project costs.

WCEC field staff maintain an event log detailing the current operational status of the system and the process followed during the O&M event. WCEC technical lead staff and project managers review and analyze O&M data promptly to ensure that necessary adjustments can be made prior to the next field event. O&M data (field and laboratory) is submitted to the MPCA in a Remediation System Operation

Monitoring Report (RSOM). WCEC submits the initial RSOM within 30 days of system start-up and then quarterly thereafter as dictated in MPCA Guidance Document 7-01. Ultimately, WCEC technical lead staff use O&M data over a given time interval to evaluate system performance based on strategic and compliance objectives and present any conclusions regarding ongoing system operation in the subsequent RSOM.

REPRESENTATIVE EXPERIENCE

Farm Credit Services, Alexandria, Minnesota

WCEC performed operation and maintenance of a multi-phase extraction (MPE) system equipped with a thermal oxidizer unit for air emission controls. Process water underwent treatment via a treatment train consisting of oil water separation, air stripping, particulate bag filtration, and granular activated carbon (GAC) filtration prior to discharge to the local sanitary sewer. WCEC used an active project management system of performing frequent (e.g. several times per week) telemetry checks and data reduction to track system operation and predict maintenance schedules. Based on our extensive experience operating other MPE systems in similar environments, WCEC designed a site-specific telemetry unit that facilitated monitoring of operational process data (air flows, water treatment flows, product tank volume, etc.) and data used to anticipate O&M schedules (pressures, vacuums, flow rates) and to diagnose the cause of unexpected shutdowns (transfer pump ceased, level float stuck).

Development of the site conceptual model revealed that local geologic and groundwater chemical conditions present at this facility would promote calcification and biofouling on equipment and piping within system treatment processes. The WCEC design Engineer considered these factors and incorporated the appropriate system components, including a specialized air stripper, which resulted in greatly reduced maintenance and system downtime.

On site monitoring and sampling was completed on a monthly basis as follows: collection of subsurface response data (hydraulic and pneumatic); collection of liquid treatment samples to evaluate treatment efficiencies and ensure discharge compliance to the local wastewater utility; collection of contaminant mass recovery data (to calculate air flow rates according to standard temperature and pressure conditions, collect process samples for laboratory analyses, etc.); recording of liquid levels in the product tank; and recording and adjusting system configurations as necessary.

Typical maintenance activities included exchanging particulate filters, cleaning accumulated precipitates and silts from treatment equipment, replacing pump seals, cleaning solenoid valves, float switches, and gate valves, and maintaining the thermal oxidizer. These routine maintenance actions served to maintain the operational integrity of the system and ensure continual compliance with discharge requirements for treated water and air until system operation was discontinued.

REPRESENTATIVE EXPERIENCE

Minneapolis, Minnesota

Emergency cleanup (soil excavation and stockpiling) of a trichloroethylene (TCE) release was completed by WCEC under the direction of the MPCA at the Hiawatha Rubber facility. WCEC constructed an MPCA approved on-site treatment cell for the contaminated soil and conducted a soil and groundwater site assessment.

The soil treatment system was a contained ventilated stockpile with strict parameters for which WCEC monitored the emission rates for ventilation. The results of the soil and groundwater extent-of-contamination study indicated that groundwater had been affected by the release. WCEC installed monitoring wells to determine groundwater flow direction and measure the extent of contamination. To determine the feasibility of different options for groundwater remediation, WCEC installed vapor points, piezometers, and test holes. A drawdown and pump test pilot study and a groundwater pump-and-treat pilot study were conducted. After MPCA's approval of WCEC's remedial action plan, WCEC installed three additional monitoring wells, three recovery wells, one sparge point, and seven vapor extraction wells.

The vacuum enhanced total fluids recovery wells were constructed to contain off-site plume migration, as well as to allow vapors in the vicinity of the wells to be captured and removed. The vapor extraction system and fluid recovery systems performed as they were designed. Gradient control was established, preventing off-site plume migration, and approximately 25 gallons of TCE were recovered. The air stripper system removed 99.1% to 99.8% of the TCE pumped into the stripper, and discharged effluent concentrations continuously achieved NPDES permit requirements.

Throughout the project, WCEC operated and monitored the system and conducted the required permitting, sampling, monitoring, and analysis of the systems and wells. After several years of successful system operation and reduction of contaminant concentrations in monitoring wells, the site was considered adequately remediated and granted closure by the MPCA.

A.3.15 Arrange for Transportation, Storage and Proper Management of Wastes

WCEC has managed a variety of waste streams for hundreds of clients and understands the need for the proper management of wastes from generation through the final transportation for disposal. Examples of wastes that WCEC has managed include liquid and solid wastes such as petroleum and petroleum-contaminated wastes; hazardous waste including listed wastes, characteristic wastes, universal wastes, and mixed wastes; and compressed gases. Wastes managed by WCEC have been generated from many different situations including legal production operations, fires, transportation accidents, clandestine drug lab operations, and illegal dumping.

Wastes need to be accurately identified to insure proper storage and disposal. In most cases, the waste can be managed, stored, transported and disposed of as a nonhazardous waste. When practicable and allowable, wastes are recycled or reused. Those that are known to be or test to be RCRA hazardous

wastes are handled only by contractors that are legally licensed and adequately insured to transport, store, and/or dispose of the waste. In cases of bulging drums or unstable wastes, WCEC works with public safety officials and partners with or subcontracts special experts as needed to stabilize site conditions.

WCEC has managed temporary storage of a variety of wastes, including solid and liquid wastes in tanks, commercial steel lock boxes, tanker trailers, drums, and a variety of other containers pending waste identification, profiling and transportation. Some wastes require secondary containment, security fencing, or even 24-hour security. In many cases, especially with unknowns or mixed waste, the waste must be stored securely, and precautions must be taken to ensure the safety of the public. Unknown wastes are sampled for waste characterization by staff utilizing robust personnel protective equipment based on available information that includes field test results. When available, Generator knowledge is a useful source of information to formulate an appropriate sampling and analysis strategy for waste characterization.

For state-funded projects, WCEC uses State contractors (Section A.3.20) for disposal of hazardous waste, which includes transportation of the waste from the site. When this is required, WCEC characterizes the waste with use of a State contract laboratory, and we work with the MPCA to profile and manifest the waste involved. A critical element of this coordination is properly identifying the Generator for a given waste activity. This could be a site/owner or the State depending on the nature of the work and waste generation process involved. The State contractors for waste disposal then complete a relatively routine waste pick-up and document the final disposition of the waste.

A.3.16 Alternative Drinking Water and Point-of-Use Treatment

WCEC evaluates potential receptors of impacted groundwater as part of every remedial investigation. Monitoring well sampling results are reviewed to determine if contaminants exceed the MDH health risk limits (HRLs). The use of monitoring well data, especially from purposely installed “sentinel” wells, can provide an early warning that the contaminant plume is migrating into a supply well area of influence. When applicable, WCEC evaluates the water quality in samples collected from drinking water wells to ensure that drinking water quality is maintained, and contaminants do not exceed HRLs. We have provided alternate water supply sources to address impacts to drinking water supplies when needed.

A result of groundwater evaluation has been the determination that new potable wells were necessary in some cases because of a contaminated well, or an immediate or potential threat to the well existed. In one rural community, WCEC removed underground storage tanks next to a contaminated well, and immediately drilled a deeper well to provide a new supply. Other residence/business wells in the community were tested for levels of petroleum contamination. In another case, WCEC had to coordinate the extension of a water supply line to serve affected residents with impacted private supply wells.

REPRESENTATIVE EXPERIENCE

Saint Francis, Minnesota

A heating oil leak impacted the soil and groundwater next to a residence in a rural part of Saint Francis, and WCEC provided emergency spill response services. This included monitoring of the residential water supply well, which was completed less than 20 feet below ground surface at a location within 15 feet of LNAPL. A fuel recovery (skimming) well was installed in the LNAPL, and alternatives were reviewed for a replacement water supply. The only practicable alternative was connection of the residence to municipal utilities, which were available at the property location. WCEC solicited bids per MPCA Purchasing Manual requirements and provided oversight during water supply connection, sewer connection and septic tank abandonment, and former supply well (3 sand points) sealing.

To ensure rapid response to drinking water impacts, WCEC maintains an inventory of 1-gallon containers of distilled and bottled drinking water and a supply of fiberglass reinforced plastic (FRP) carbon vessels to filter drinking water. WCEC has vendors available that can rapidly install point-of use treatment such as granular activated carbon (GAC) vessels. These suppliers also maintain an inventory of fittings for connecting filter arrays. For State projects, WCEC secures a State Contractor through the MPCA Purchasing Manual and coordinates and oversees GAC filter installation and vessel change-out.

REPRESENTATIVE EXPERIENCE

Audubon and Cottage Grove, Minnesota

As a result of a tanker rollover in Audubon, Minnesota, approximately 1,500 gallons of gasoline was released into a ditch. The product subsequently infiltrated into the soil and migrated through a culvert beneath the road. WCEC performed emergency cleanup activities and a complete remedial investigation with several monitoring wells. After several quarterly monitoring events, the contaminant trends showed migration towards a nearby private well. WCEC recommended the abandonment of this well, which was accepted by the property owner. WCEC installed a new potable well 200 feet away on the opposite side of the property, and then sealed the at-risk well.

Elevated levels of perfluorinated chemicals (PfCs) in private drinking water wells at residents' homes in several communities in Washington County, Minnesota prompted the installation of GAC filters for all wells that exceeded the MDH established levels. WCEC provided follow-up sampling to confirm that the filters were removing the PfCs from the potable water. Other work included the installation of a large-scale GAC treatment plant to treat the water pumped from two municipal wells operated by City of Cottage Grove.

REPRESENTATIVE EXPERIENCE

Detroit Lakes and Erhard, Minnesota

As part of the site investigation and potential concern by residents, WCEC installed carbon filtration systems on potable water systems at two petroleum leak sites. These systems were set up for sampling and subsequent analysis from three points: pre-treatment, post-treatment, and a point between the two carbon filters. This allowed for monitoring of the effectiveness of the treatment system. Carbon in these systems was exchanged as necessary, based on analytical results.

A.3.17 Contaminated Sediment Remediation and Restoration

WCEC evaluates alternative remedies following established Risk Based Site Evaluation (RBSE) practices promulgated by the MPCA and the sediment setting involved. Evaluation of contaminated sediment risk is gauged through identification of the contaminant concentrations within the elutriate, porewater and whole-sediment and their direct effects to aquatic ecology and less direct fate and transport mechanisms. Direct negative effects include the physical and toxic effects to benthic organisms in the sediment and potential for re-suspension of impacted sediment into the water column. Less direct effects include the leaching of contaminants into surface water and downstream effects. Restorative actions consider the cumulative impacts and impact pathway on an individual or trophic-level receptor basis. For example, the removal of sediments impacted by heavy metals followed by replacement with media of similar physical and mineral/organic composition would remediate the RCRA impacts and provide benthic habitat for restoration of site ecological functions and values.

A.3.18 Coordinate Remedy, Restoration and End Use Planning

WCEC evaluates alternative remedies following established Risk Based Site Evaluation (RBSE) practices promulgated by the MPCA. This requires consideration of the projected/proposed end use of the affected lands. For example, the Soil Reference Values and other risk-based criteria used to establish (Tier 1) generic or used for determination of (Tier 2 and higher) site-specific cleanup goals are based on exposure assumptions that are affected by land use.

A proposed end use often involves public involvement to review proposed development scenarios and/or zoning changes, and WCEC staff have experience with land developers involved in these proposed developments. In many cases, a mitigation plan is prepared according to a negotiated agreement among the stakeholders involved. The mitigation may take the form of wetland creation, prairie land cover restoration, or providing new functional habitat to replace habitat impacted by past actions. WCEC has experience in these types of site-specific restoration plans.

Development of Brownfields (contaminated) properties requires an understanding of land use planning and zoning and the permitted uses associated with them. This understanding can predict potential human exposure pathways associated with residual contamination. If an end use involves the creation of new roadways and industrial buildings, it may be possible to leave higher concentrations of

contaminant in place (beneath pavement and/or clean surface soil cover) than in cases where general development or specific residential land use is expected.

The land-altering response actions required to remediate an impacted property influence the scope and sequence of restoration efforts associated with restoring the land to its original use, for a limited use or for a new purpose. For example, contaminated soil excavation is best conducted prior to paving roads and general surface grading for a development, whereas in-situ chemical oxidation via injection can often take place effectively in cases where roads already exist.

REPRESENTATIVE EXPERIENCE

Princeton Dump Site

WCEC reviewed the cumulative data gathered by past consultants and current and projected land use for this area of the community when preparing the Environmental Covenant and Easement (EC&E - a deed record) to support a No Further Action decision at the Princeton Dump Site.

The former dumping extent is outlined in yellow, the tan rectangle outlines the controlled use area, and red outlines the "limited use" area where the property owner can park vehicles for viewing by visitors to his auction. The limited-traffic road corridor to this outlot limits the use of the dump site, and surrounding zoning is a low risk scenario. Future road improvement for a truck service center has been considered, but this use is not currently feasible.

A.3.19 Bathymetry Data Search and Gathering

WCEC uses bathymetry data for various project types to predict water and bottom substrate sampling depths, verify dredging depths, evaluate and monitor sedimentation rates, classify wetlands and monitor post-mitigation replacement basins, calculate area/volume of water bodies and measure post-remediation/restoration water depths.

WCEC's approach to search and gather bathymetry data is determined by the scale, complexity and purpose of the project. Many projects can utilize existing information from the wealth of GIS data available for Minnesota surface waters. Bathymetry data are available from the Minnesota Department

of Natural Resources, (digitized lake contour maps) without post-processing. These are not geo-referenced, so they are not suitable for large-scale or high-resolution purposes.

Minnesota Geospatial Information commons (MnGeo) hosts the access to various geo-referenced data sets. This includes that National Hydrology Dataset (NHD) for base data, and DNR developed lake bathymetric outlines, contours, and vegetation. These data sets, combined with a high-resolution Digital Elevation Model (DEM) allows our GIS operators to develop maps and model queries that can be used for a variety of outputs. Some of the available data was developed by Natural Resource Research Institute (NRRI-Lake Superior), National Oceanic and Atmospheric Administration (Lake Superior coastal), and the U.S. Geological Survey (Great Lakes DEM). Recent contributions include the DNR Ditch (and buffer) mapping projects, certain watershed and county-led GIS mapping efforts, and the Statewide Altered Watercourse Project by MPCA. The latter can be used to identify surface water features and flow patterns that may include buried stream segments (e.g. box culverts and pipe flows) and impounded streams, useful for fate and transport studies and remediation planning. Data received from these sources are incorporated into project datasets using contemporary computer programs including AutoCAD Civil 3D 2018, ArcGIS 10.6 (with Spatial and 3D Analyst), and Ctech's Mining Visualization System (MVS) and Earth Volumetric Studio (EVS). WCEC has implemented planned system upgrades in 2018, and as projects require.

WCEC collects site specific bathymetry data for projects where data are not available or where a higher level of detail is required. Bathymetry data are collected on small scale projects by completing survey transects of water depth (physically measured from a boat) and plotted to create water depth contour maps and cross sections. High-resolution soundings are conducted by linking a depth sounder to a GPS receiver. The resulting data are post processed in ArcGIS, AutoCAD, or MVS and generates depth contour maps, area/volume calculations, flow and flux models, and 2D/3D visualizations. WCEC utilized a GPS unit and depth sounder to manage data collection, record water depth and infer sediment characteristics; the bathymetry data was collected to guide Laser Induced Fluorescence (LIF) screening of sediments for historic hydrocarbon contamination in the Duluth Harbor. When more detailed assessments are necessary, WCEC would subcontract the performance of a multi-beam or side-scan hydrographic surveys.

A.3.20 Coordinate and Cooperate with Other State-Contracted Services

WCEC works regularly with state agencies, contractors, and other consultants to investigate and remediate sites. WCEC, through its various State of Minnesota contracts previously described in this proposal (emergency spill response, petroleum/agricultural chemical/Superfund site services, and drilling services), has worked extensively with the MPCA, the MDA, and several other state-contracted consultants and agencies.

During the floods of 1997, WCEC worked closely with MPCA representatives and contractors that were hired on a temporary basis for flood ravaged locations such as Ada, Breckenridge, East Grand Forks, and Moorhead. In addition to conducting actual release cleanups, we assessed the nature of releases, and

provided residents with information and supplies to clean up releases. On several occasions, investigation projects at state-funded sites had to be halted for emergencies which required coordination with state-contract emergency response contractors.

WCEC investigations rely on the specialized services of state contract-holding analytical laboratories and drilling contractors to complete necessary tasks. WCEC contracts as needed for other services, such as electrical services and granular activated carbon (GAC) filter installation, which are also provided by state contractors. This is conducted in conformance to the MPCA Purchasing Manual for MPCA-led sites and in cooperation with MDA for work directly contracted by that Department.

Similar to coordinating with MDA for contracted services, WCEC has assisted the MPCA in securing state contracted services for MultiSite projects when required, such as for SSD system installation. This includes tasks such as preparation of site-specific bid specifications, preparation of bid pricing sheets and reviewing price quotes from state contractors. For example, WCEC assisted with soliciting price quotes from SSD installers for upgrades to active sub-slab depressurization systems in the West 66th and Vincent Ave. neighborhood.

Proper management of hazardous waste requires specially-licensed firms, and State contracts exist for this, which are available for projects completed by MultiSite contractors. When this is required, WCEC characterizes the waste with use of a State contract laboratory, and we work with the MPCA to profile and manifest the waste involved. A critical element of this coordination is properly identifying the Generator for a given waste activity. This could be a site/owner or the State depending on the nature of the work and waste generation process involved. The State contractors for waste disposal then complete a relatively routine waste pick-up and document the final disposition of the waste.

A.3.21 Geophysical Services Management

WCEC has coordinated, supervised and directly performed electrical conductivity (EC) and laser-induced fluorescence (LIF) investigations at hundreds of project sites. WCEC's sister company, Dakota Technologies, owns multiple EC and UVOST LIF units, standard and low-level membrane-interface probes (MIP) and hydraulic profiling tools (HPT). This relationship has allowed for cross-training on some of these High-Resolution Site Characterization (HRSC) tools, giving WCEC staff the knowledge to manage these services when needed on State projects. In addition, WCEC has used other subcontractors for geophysical activities such as performing seismic (reflection/refraction) and gravity surveys. Our staff have performed or directed these surveys to find bedrock cavities, ground water vadose zone interface and/or the depth to bedrock. WCEC has overseen the use of downhole video cameras to identify leaky well casings at multiple locations in Minnesota. If projects arise that require additional geophysical investigation, we will contract with geophysical specialty firms to perform the necessary testing and data analysis.

REPRESENTATIVE EXPERIENCE

Askov, Minnesota

WCEC coordinated the use of Ground Penetrating Radar (GPR) to find and evaluate the extent of sink holes in the City's solid waste lagoons. These sink holes were allowing the waste to leach in to the underlying fractured bedrock aquifer.

A.3.22 Subcontractor and State Contractor Management

WCEC utilizes subcontractors for specialized services needed during investigations, cleanups and tank removals, which may include the use of State Contractors. WCEC oversight begins with task planning and contractor bid solicitation. WCEC develops a scope of work and project goals for the subcontractor to complete. The low, responsible bidder is selected for the work. For work under this Master Contract, we have the applicable experience in retaining the required documentation of the entire process, including the cost limitations and thresholds in the MPCA Purchasing Manual. When the subcontractor is a State Contractor, a State Contract Order Form is issued detailing the authorized items and work scope involved.

Oversight continues through task execution by the subcontracted firm(s) involved. This includes review of submittals required for the work, such as Certificate of Insurance, Site Specific Health and Safety Plan (and related items such as confined space permit) and the applicable regulatory permits and agency notifications. WCEC tracks Subcontractor performance and activities, including time of work crew and equipment arrival/departure, time intervals spent on each component task, and level of effort/scope of work directed toward each pay item involved in the subcontract. The latter provides a means to determine reasonableness of cost when reviewing pay requests from the subcontractor. In cases where additional compensation is sought by the subcontractor, the documentation provided by the WCEC field (On-Site Inspector or other) oversight staff is used to review the reasonableness of such claimed costs.

Post-construction oversight includes review of invoices and other pay requests, supporting information such as local agency inspection records, WCEC On-Site Inspector documents, and submittals for documentation of human resources practices which include withholding and prevailing wage records. In applicable cases, WCEC has initiated performance reporting so that Department of Administration can track contractor (non-) performance on State Contracts.

REPRESENTATIVE EXPERIENCE

Sampling of Subcontract Work Managed by WCEC

Perham, Minnesota

WCEC has been the awarded bidder for arsenic removal water treatment media change-out in Perham as part of the remedy for a State Assessment site. This can involve a high level of subcontractor management. The recent changeout in 2018 involved separate vendors for the new treatment media, waste handling boxes, boom lift, waste transportation, waste disposal, and analytical work. Media change out work involved WCEC staff, a subcontracted Industrial Services firm, equipment/operator from a local crane provider, and another construction company. Despite adverse weather conditions, the project completion (final waste disposal) occurred within the timelines established for the project by the MPCA.

Backus, Minnesota

WCEC provided emergency response corrective actions following identified impacts to a private water supply well. After initial investigation results identified the area of heightened receptor risk, WCEC retained a civil design firm to provide plans and specifications and bidding support for a municipal water line extension into the at-risk portion of the community. Bidder solicitation and contractor selection for the water main construction work was handled by Minnesota Department of Administration (Admin) in conformance with the Emergency Response contract and MPCA Purchasing Manual. The project was successful in removing water well risks in the at-risk neighborhood.

WCEC is familiar with the safe operating practices and procedures that are required for various construction-related activities, which is useful when planning and observing field activities. WCEC is aware that subcontracted firms are considered by outside parties to be part of the overall WCEC project work force, and their performance reflects on our overall performance on each project assigned to us. The ability to utilize our in-house expertise to plan, implement, and review the subcontracted work has resulted in positive client feedback and satisfaction with WCEC performance.

For tank removal projects, we have prepared tank removal specifications for customers to use in obtaining competitive contractor bids. In addition, we have certified UST Closure supervisor staff in-house. This allows WCEC to direct a qualified Contractor during tank removal.

REPRESENTATIVE EXPERIENCE

Tank Removal Projects Managed by WCEC

St. Cloud, Minnesota

In 2012, WCEC oversaw UST removal at a site which was determined to be the source for wide-spread vapor intrusion impacts into multiple businesses and residences. WCEC also provided construction oversight and documented replacement UST installation to ensure the work complied with regulatory requirements.

(cont.)

REPRESENTATIVE EXPERIENCE

Tank Removal Projects Managed by WCEC (continued)

Odin, Minnesota
WCEC provided oversight for a farm, diesel spill from a leaking aboveground storage tank (AST) that included tank removal and soil excavation for emergency corrective action. The excavation contractor was retained directly by the Responsible Party. WCEC also performed a water well receptor survey and risk assessment for the release. The rapid response of WCEC allowed the site to be closed with no further investigation.

Fergus Falls, Minnesota
WCEC provided oversight for UST removals on a site being redeveloped for a police services facility. During construction, two USTs were removed entirely, as they were determined to be insufficiently filled during past closure-in-place work. In addition, a previously unreported UST was encountered during earthwork. WCEC characterized the tank contents for product recycling, provided field oversight, and provided a Closure Supervisor during tank removal.

Vikings Center UST Closure
WCEC provided the Closure Supervisor and field sampling oversight for a UST removal during redevelopment of an airline headquarters into part of the new Minnesota Vikings Training Complex in Eagan, MN. This required adherence to access/egress and safe working practice procedures.

A.3.23 Report Preparation and Evaluation

During the past 28 years, WCEC has completed well over 1,000 environmental investigation and remediation projects, which always followed the most current regulatory requirements, including the established reporting practices and formats. As requirements have changed over the years, WCEC has continually and promptly adapted to these changes, including to technological advances. In the last 5 years, WCEC has prepared hundreds of investigation, monitoring, LNAPL recovery, and remediation reports, including over approximately 250 RI and LSI reports.

Preparation of quality, technically accurate reports is a key aspect of every environmental project for WCEC. Thorough documentation is a crucial part of the process to ensure that proper procedures, investigation requirements, and cleanup objectives have been met. WCEC's standard practice for all programs (MPCA, Superfund, and MDA) is to utilize a team approach; a project is assigned to a team, which includes field staff and scientists/geologists overseen by a project manager. The team is responsible for field work, data analysis, and report preparation. This approach ensures that all the staff working on the project are knowledgeable of the project and allows for seamless transition throughout the various phases of the investigation. This practice has proven to be beneficial when preparing reports because information has been shared within the team throughout the project.

WCEC is very knowledgeable of the cleanup guidance and required reports for the Petroleum Remediation and Superfund programs. WCEC incorporates the methods and requirements from this guidance when preparing investigation, monitoring, LNAPL recovery, and remediation reports, as well as

other reports requested by the MPCA. WCEC is equally knowledgeable with respect to MDA guidance and required reports. For all three programs, results of investigations, sampling events, or tasks are outlined in the appropriate agency report format, including a thorough description and rationale of all work performed, a comparison of analytical results to site goals or regulatory standards, and results of the risk assessments. Evaluations and recommendations made by WCEC are based on results clearly presented and documented in maps, graphs, figures, tables, and/or appendices. Often, WCEC includes more supporting documentation than minimally required in the standard report in order to thoroughly support site evaluations and recommendations.

During the last phase of WCEC's report preparation, the entire document is internally reviewed for accuracy and quality of content. At times, WCEC must evaluate site reports from other consultants in order to determine the next phase of an investigation. During this type of background review, attention is again given to quality and accuracy of work performed in order to identify potential data gaps and "at-risk" subject matter areas for further investigation and/or evaluation.

A.3.24 Evaluate Invoices

Project managers at WCEC review all invoices related to their projects. Our invoice preparation and review process is supported by our state-of-the art project management and accounting system software. These tools enable project managers to access project budget and invoice data in real-time and can instantaneously produce weekly, monthly, year-to-date, and project-to-date budget status, task completion reports and invoices. In general, time and equipment/expenses are posted to the project management and accounting system daily, and invoice previews can be monitored as needed by the Project Manager. Invoiced amounts are verified by comparing tasks and the correct staff/rates to those on previously-approved bid specifications, proposals or work plans, which are electronically incorporated into our project management software. Project Managers verify that the work order or purchase order number is listed and that approved change orders or amendments are incorporated into the invoice. The Project Manager also reviews all subcontractor billings in detail. If necessary, subcontractors are contacted to discuss revisions to their invoice such that they are in line with purchasing documents such as the *State Contract Order Form* or the *Subcontractor Goods and/or Services Purchase Order Form*.

WCEC is highly experienced in evaluating a variety of subcontractor invoices to ensure compliance with agreed upon rates, quantities and other invoicing requirements of the client or contract. Examples of subcontractors that WCEC has hired includes State Contractors (drillers, laboratories, hazardous waste haulers and disposal facilities), plumbers, electricians and excavating contractors.

WCEC is experienced in reviewing a wide range of data reports including laboratory reports, well construction reports, shipping manifests, geophysical data reports and survey data. The review process includes tasks such as verifying that the requested work was performed, reviewing the data for completeness and accuracy in accordance with the project Quality Assurance/Quality Control requirements, and reviewing control data for indicators of quality issues. When a data report or part of a

data report is questionable, the subcontractor is contacted to remedy the concern. When necessary, the subcontractor is requested to submit a written explanation of the discrepancy(s) and, in some cases, repeat the task(s). The regulatory agency and the client are informed of all discrepancy(s) in the reported data.

A.3.25 Collect and Manage Field and Laboratory Data for Electronic Submittal in MPCA Specified Format

WCEC was formed out of the recognition that individuals and industries need defensible, high quality environmental data to formulate sound site decisions. Our 25+ years of company experience, has reinforced the importance of uniformly high-quality data, managed in a way that can be readily incorporated in reports and other documents for distribution to the affected stakeholders. The MPCA has recently committed considerable resources to adoption of the Environmental Quality Information System (EQuIS) database solutions provided by Earthsoft, Inc. to drive the agency's current groundwater contamination mapping project and for long-term improvements to agency service quality and program data transparency.

WCEC has coordinated site work with the MPCA EQuiS team and the laboratories involved to facilitate data flow in the format specified by the MPCA. Field-collected data is provided so the MPCA-tailored EQuIS Data Gathering Engine (EDGE_MN) can manage these data for loading into EQuIS, providing the proper work flow in support of the MPCA programs involved. A part of the process includes WCEC use of the compatible sample tracking form, which provides the traditional Chain of Custody documentation in a format that supports laboratory data set-up required to meet the MPCA-specified data reporting (MN_EDD) formats. During the initial months of software implementation, WCEC made an effort to assist the MPCA by using the MPCA Chain of Custody in place of the lab-supplied form and submitting field data in the requested format to identify problems with the process.

In addition to the use of specific forms and formats to support the EQuIS enterprise, WCEC provides facility-specific information and metadata as requested by the agency. This includes geospatial information on site features and qualifier codes for data quality and data origin as used in the program.

A.3.26 Evaluate Data Quality and Data Verification Reports

WCEC performs data quality evaluations for each project as required by the Agency/program overseeing the project to ensure sufficient precision and accuracy of samples collected at a site. For example, environmental data for MDA projects is reviewed according to various MDA guidance documents (discussed below) to verify that criteria for precision have been met. For PRP projects, data quality guidelines for soil and groundwater sample collection can be found in MPCA Guidance Documents 4-04 and 4-05. For other MPCA-managed investigations, WCEC has prepared QAPP documents following the structure and content guidelines provided in the *MPCA Quality Assurance Project Plan Guidance* document dated February 2012 as revised by the Site Assessment Program *Quality Assurance Project Plan* of September 2014.

Laboratory analysis is performed by a Minnesota Department of Health-certified laboratory. Analytical reports are reviewed by a WCEC scientist and/or project manager to confirm that laboratory quality assurance/quality control (QA/QC) parameters have been met including: duplicate sample RPD, surrogate recovery, continuing calibration verification, laboratory control sample analyses and matrix spike analyses. In addition, WCEC confirms that analytical samples have been cross referenced correctly by the laboratory and that sample holding time, preservation and chain of custody requirements have been met. Field and trip blank results are compared with sample results for indication of cross contamination.

Samples collected during agricultural chemical investigations are submitted to a laboratory that has been approved by the MDA for the requested analysis, in accordance with MDA Guidance Document 24. If there is no MDA-approved laboratory for the requested analysis, the laboratory is required to submit a *Fixed Base-Laboratory Quality Assurance/Quality Control Plan* to the MDA, as outlined in MDA Guidance Document 24. Laboratory analysis is not completed until the MDA has approved the laboratory's *Fixed Base-Laboratory Quality Assurance/Quality Control Plan*.

Agricultural chemical data collected using field screening methods are generally confirmed by analyzing a subset of the samples in the laboratory. Duplicates are collected for a minimum of 10% of laboratory samples, in accordance with MDA Guidance Document 11, *Soil Sampling Guidance,* and MDA Guidance Document 12, *Ground Water Sampling Guidance*. Laboratory results of the duplicate sample pair are compared to verify that the relative percentage difference (RPD) is within 20%. Laboratory data is reviewed in accordance with MDA Guidance Document 29, *Laboratory Data Review Guidance.* The *Laboratory Data Review Checklist* attachment to Guidance Document 29 is completed and submitted along with each laboratory report. QA/QC parameters outside of laboratory limits and unusual or non-compliant sample conditions are noted by WCEC on the *Laboratory Data Review* Checklist, along with data impact implications. Certain QA/QC failures require that the samples be re-analyzed by the laboratory; re-analyses is completed at no cost to the client.

For the MPCA PRP program, QA/QC methods for soil and groundwater sample collection are found in MPCA Guidance Documents 4-04 and 4-05. Sample blanks are collected to detect background or method contamination and duplicate samples are collected to evaluate variability in analytical methods. For example, during a groundwater monitoring event, WCEC collects at least one duplicate set of groundwater samples per analysis to be performed from a well with at least a moderate level of contamination. If more than ten wells are being sampled, it is required that one duplicate be taken per every ten samples. Laboratory results of the duplicate sample pair are compared to verify that the relative percentage difference (RPD) is within 20%.

WCEC prepares a *Quality Assurance Project Plan* (*QAPP*) for sites where this is a programmatic requirement, generally larger RCRA or MERLA regulated sites. The QAPP establishes the quality assurance/quality control and data quality objectives that must be met for the project. Data quality issues are reported to the MPCA Quality Assurance Coordinator, who may take further actions to

resolve the matter. In cases where the data are deemed unusable, associated analytical costs are not invoiced to the client.

A.3.27 Arrange for Site Access

WCEC confirms property ownership and obtains access to properties as necessary to accomplish work assigned under this Master Contract unless otherwise notified by the contracting agency's Project Manager. Access to a third-party property may be needed for project tasks such as to complete delineation of a contaminant plume, evaluate off-site impacts, sample private wells, excavate contaminated soil, and/or complete other remedial activities. In such cases, WCEC first determines which properties must be accessed and then identifies the owners of those properties. WCEC has experience obtaining site access from a variety of property owners such as residential property owners, county governments, city governments, Minnesota Department of Transportation (MnDOT), and private business owners.

WCEC initially contacts the property owner to discuss the proposed work, answer questions the owner may present and requests permission to access the property. For fund-financed PRP projects, the appropriate MPCA Access Agreement form is used to obtain written permission from property owners or MnDOT. A similar document is used for access to properties in the Superfund program. WCEC coordinates with the property owner and the agency contact to communicate the process and to obtain the appropriate signatures from all parties. However, if after making reasonable efforts WCEC cannot obtain access to the site, we seek assistance from the contracting agency's Project Manager in accordance with the Master Contract requirements. While the contracting agency will not pay for access to a property, it makes other reasonable efforts to gain access to the site.

If requested, investigation results related to the property will be forwarded to the owner. WCEC adheres to the receptor notification requirements per MS. §116.482 when performing work on private properties. Other required licenses and permits are obtained to secure access to the property according to individual agency requirements.

A.3.28 Coordinate Utility Locates and Traffic Control

Safety is the highest priority during any field event for on-site workers and the public in the vicinity of a site. Identification of utility locations and use of effective traffic control are crucial to maintaining this safety. In addition, identification of underground utility corridors is important for assessment of potential preferential contaminant pathways at a site, including during planning stages.

Prior to any sub-surface activity, utilities must be marked via the public location service to ensure the safety of workers and property owners and to minimize risks of damaging utilities. WCEC has coordinated many public and private locates for projects ranging from emergency response, to day-long projects on one property, to week-long projects covering several city blocks. However, for projects such as state projects, where a Contractor is responsible for the utility locate, WCEC provides the Contractor with the necessary information such as drilling locations and property owner information. In Minnesota,

a public locate is requested through the Gopher State One-Call service at least 48 hours prior to scheduled work or immediately via an "emergency locate" during an emergency response incident. Other states have similar systems, although the required lead time varies from state to state. If there are any marking concerns or questions while on site, WCEC contacts the utility provider directly to resolve the issue. If the site work area is complicated or is known to have complex utilities, an onsite meeting with utility representatives is coordinated to discuss the project parameters. If private utilities are involved or are in question, a private locater is subcontracted in conjunction with the public utility location service.

When utilities are installed, the backfill material may have a greater hydraulic conductivity than the surrounding native soil. Having an accurate location of utilities is essential in determining whether the utility corridor intersects a contaminant plume. Even if the utility has not been impacted, the backfill has the potential to act as a preferential pathway for contaminant transport, thereby warranting further investigation.

For projects requiring work in or near roadways or other high traffic areas, WCEC coordinates traffic control following procedures and safety protocol for the specific property owner (MnDOT, county, city, etc.). WCEC sees that applicable regulations and policies are followed and that access approval is obtained prior to initiating work. This includes determining an appropriate traffic control plan and securing a subcontractor for traffic control equipment and/or flagger duties. Where the project goals and objectives are not compromised, WCEC avoids planning work that requires lane closures or detours, utilizing unpaved shoulders, turn lanes, or parking lanes as alternatives.

REPRESENTATIVE EXPERIENCE

Vehicular Traffic Control, Brooklyn Center and Bloomington, Minnesota

WCEC coordinated vehicular traffic control, including flaggers, to close one lane of Logan Avenue North in Brooklyn Center, Minnesota to allow for safe traffic flow during temporary completion of borings and chemical injection along Logan Avenue North as part of a Superfund remedial action. WCEC also used fencing to prevent pedestrian and vehicular traffic from entering the construction zone. The corrective action and site restoration work was completed safely and successfully to the satisfaction of the MPCA, and the City of Brooklyn Center.

WCEC requested and received permission from the Minnesota Department of Transportation (MnDOT) for weekday overnight lane closures of the eastbound and westbound inside lanes of I-494 in Bloomington to allow for the excavation of diesel-contaminated soil and for backfilling and surface restoration of the median of I-494. WCEC contracted and coordinated with a local highway safety contractor to furnish, install and maintain all required traffic control devices according to the MnDOT *Minnesota Field Manual on Temporary Traffic Control Field Manual*. The corrective action and site restoration work was completed safely and successfully to the satisfaction of the MPCA and MnDOT.

REPRESENTATIVE EXPERIENCE

Additional Traffic Control Coordination Examples

- Closure of one lane of westbound I-94 near Evansville, Minnesota to allow WCEC access to a petroleum spill located in the median of I-94.
- Closure of one lane of US Highway 2 in Fosston, Minnesota for an LIF investigation which included data collection locations in the highway.
- Multiple closures of US Highway 14 in Springfield, Minnesota, including closing the center portion of the roadway to conduct a utility backfill investigation and a one-lane closure for an LIF investigation.
- Alternate closure of one lane of 15th Street North and parking lot control of several businesses in St. Cloud, Minnesota to allow for an LIF investigation, well installation, and corrective action system installation which included locations in the street, parking lots and multiple properties.

A.3.29 Bid Specification Preparation and Evaluation

With 20 years of experience as an MPCA Master Contract holder, WCEC has a broad range of experience in preparing, submitting, reviewing and implementing bid requirements for a diverse range of State-funded projects. WCEC has prepared bid specifications for subcontracted work such as tank removals, water supply well replacement, drilling, installation of monitoring and recovery wells, complete remediation systems, purchase of specific system components, and corrective action excavations. Our bid specifications are prepared in a conventional manner that ensures that the contractor, estimator, contracting Agency or other reviewers find information easily and that the comprehensive information required to complete the project is clearly presented. WCEC is experienced with the process of preparing appropriate bid specifications for implementing the remedial actions. We are experienced with sealed bid advertising, notification, and selection of contractors.

WCEC understands that clear, well-written and technically accurate bid specifications improve the quality and efficiency of projects and are imperative to upholding fair transactions between project owners (both public and private) and the selected contractors. Specifications accompany the bid/proposal solicitation and describe the general scope of the project, special site conditions, project schedule/substantially complete date, pre-bid meeting requirements and any additional detailed specifications. Project specifications document templates are provided by the MPCA in the MPCA Contractor & Subcontracting Purchasing Manual and for MDA projects, detailed specifications for contracted tasks are included in the Work Plan.

The requirements set forth in the MPCA Contractor & Subcontractor Purchasing Manual are dependent on the anticipated dollar amount of the work being contracted (less than $5000, $5000 to $10,000, $10,000 to $50,000). For projects anticipated to be $50,000 and over, detailed bid specifications are prepared by WCEC and incorporated into the Department of Administration's front-end documents. The solicitation is posted on the Department of Administration's website. The winning vendor is selected and contracted directly by the Department of Administration.

WCEC understands the MPCA's Contractor & Subcontractor Purchasing Manual and variations in the Minnesota Department of Administration's procedures for hiring of state contractors (laboratories, drillers, couriers, etc.). An agreement is in place between the Minnesota Department of Administration and the MPCA which allows the MPCA Master Contract holders to enter into a binding contract with a State Contractor. The MDA and the Minnesota Department of Administration do not have such an agreement in place.

For all MDA contracting and some state contracts used by the MPCA, WCEC prepares or assists in preparing the bid specifications, but the MDA or MPCA secures the contractor directly via a Purchase Order. Examples would be when drilling or laboratory services are required for an MDA project or when installation of a sub-slab depressurization (SSD) system (SSD state contract) is required for an MPCA project.

Bids received by WCEC are scrutinized for vendor qualifications, insurance credentials, pricing bid sheet discrepancies, and times of bid submittal. After bids have been examined, the MPCA's *Bid Tabulation Sheet* is completed and recommendations are made to the MPCA project leader of which vendor should be awarded the contract. Upon the MPCA Project Leader review and approval of the *Bid Tabulation Sheet*, the contract is awarded to the vendor.

REPRESENTATIVE EXPERIENCE

Construction Project, Former Masonic Temple, MPCA Multi Site Project, Ortonville, Minnesota

WCEC prepared bid specifications for a construction project in the $10,000 to $50,000 range. WCEC prepared the required forms including the *Request for Quotation, Specifications for Construction Form, Pricing Bid Sheet, Responder's Qualifications Forms, and Solicitations Posting Form* for solicitation of qualified construction vendors. Included with the bid package was a copy of current prevailing wages for Big Stone County, the county in which the site is located. Along with posting the construction project on the Department of Administration web site, WCEC solicited bids from other vendors including Targeted Group/Economically Disadvantaged (TG/ED) vendors. Due to the complexity of the construction project, WCEC required that a pre-bid meeting be attended by potential vendors. This was stated on the *Solicitations Posting Forms, Specifications for Construction Form* and cover letter prepared by WCEC that was sent to vendors. The contract was awarded to the selected vendor in the amount of $20,566.

A.3.30 Conduct and Review Human Health and Ecological Risk Assessments

Ecological risk assessment generally employs a tiered approach, which varies dependent on regulatory-specific applications. The process begins with planning and scoping and moves through the essential steps of hazard identification, dose-response assessment, exposure assessment and risk characterization. Each successive tier generally involves a more in-depth site evaluation, incorporating more site-specific data and a more detailed, less conservative analysis of such conditions.

With the tiered approach, data or observations from one tier determine whether further studies are needed to meet the assessment's objectives and, if so, what these studies are. At some sites, the tiered approach might result in a low level of effort adequately characterizing risks. At other sites, the tiered approach might indicate that the assessment should be expanded to include studies of specific habitats impacted with contaminants in order to evaluate the risks. At even more complex or severely impacted sites, the tiered approach may identify areas originally not considered at risk.

WCEC has staff experienced in performing ecological risk assessment, as well as several biologists with skills and experience required to collect field data in support of the risk assessments. WCEC currently does not have experienced human health risk assessors meeting the RFP criteria, as this is a very distinctive field that requires considerable highly specialized professional experience. When appropriate, WCEC employs this tiered approach when assisting the MPCA (and partner agencies) in their development of human-health and ecological risk assessments. When required this involves following appropriate USEPA guidance documents, including the *Risk Assessment Guidance for Superfund (RAGS), Volume I - Human Health Evaluation Manual* (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments) Final December 2001.

The data generated from prior studies are reviewed by WCEC to identify data gaps and/or to perform the additional data gathering required to support the risk assessments. Unless specified otherwise by the MPCA or MDA, the human health and ecological risk assessments will consist of the following four primary components:

1) Contaminant identification
2) Exposure assessment
3) Toxicity or ecological effects assessment
4) Risk characterization

Human Health Risk Assessment

The Human Health Risk Assessment is a process used to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. The basic components of a human health risk assessment address the following issues:

- Types of health problems that may be caused by environmental stressors such as chemicals and radiation
- Likelihood that people will experience health problems when exposed to different levels of environmental stressors
- Identification of levels below which some chemicals do not pose an observed human health effect
- Environmental stressors that people are exposed to, including concentrations and duration
- Potential that some people are more likely to be susceptible to environmental stressors due to factors such as age, genetics, pre-existing health conditions, ethnic practices, gender, etc.
- Potential that some people are more likely to be exposed to environmental stressors because of factors such as where they work, where they play, what they eat, etc.

Ecological Risk Assessment

An ecological risk assessment is a process used to evaluate the adverse effects that human activities and pollutants have on the plants and animals that make up our ecosystems. WCEC uses the information gathered to help make environmental decisions, including corrective action, restoration plans, and damage assessments. WCEC evaluates the findings of preliminary studies, including a site visit and collection of screening-level data, to identify and specify the objective of the ecological assessment. The ecological assessment objective can have several components, and each study that the work scope specifies is aimed at meeting an objective, such as filling a data gap or testing a hypothesis about the effects of a site's contaminants on resident organisms. Studies performed by WCEC staff have included damage assessment of aquatic habitats impacted by petroleum or herbicide compounds. WCEC also routinely completes botanical studies for classification of wetlands, including functions and values assessments. Our staff have worked on numerous environmental reviews under the National Environmental Protection Act (NEPA) including desktop data reviews and field surveys for the assessment and enumeration of species (population and diversity assessments) and assays of adverse effects (impact studies) involving the survey of both specific communities and the habitats of plants, insects and other invertebrates, fish, amphibians, reptiles, and listed rare species of mammals.

WCEC staff have completed fate and transport studies to assess the contaminant exposure pathways involved in the release of a chemical(s) of concern. Current WCEC staff have also completed impacts assessment and negotiations for settlement of Natural Resource Damage Assessments, including amortization of lost values and for the proposed mitigation/compensation provided by restoration. Restoration plans in these cases were based on reducing the ecological risks posed by contamination that would remain in place, and corrective action was targeted at providing a substrate amenable for creation of replacement habitat.

A.3.31 Prepare and Review Site-Specific HASPs, QAPPs, and SAPs

Health and Safety Plans

It is the policy and primary concern of WCEC to develop and maintain safe and healthy worksite conditions for all employees, subcontractors, and the general public. This is accomplished through the application of the WCEC Hazard Communication Program, Medical Surveillance Program, safety training courses and programs, and through procedures and policies as outlined in the WCEC Employee Health and Safety Policy Manual. WCEC requires strict compliance with the Health and Safety Policy Manual and established work procedures. One element of the Health and Safety Policy is the preparation of a Health and Safety Plan (HASP). A HASP is required for field activities subject to OSHA 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response projects. These field activities are generally associated with site characterization and response actions at contaminated sites under the jurisdiction of a local, state or federal agency.

The HASP has required elements that must be addressed, including conducting a hazard assessment of the site, and job hazard analysis for the specific tasks to be performed. The hazard assessment identifies

hazards for each specific task being performed and how these hazards will be controlled. This can be formalized in a written Job Safety Analysis (JSA). The JSA includes a step by step description of how to perform a task, identifies potential hazards associated with a task, and presents controls to mitigate the identified hazards. JSAs are used to educate employees on safe practices prior to utilizing equipment. JSAs are developed for all equipment and specific operations that present safety hazards and/or concerns. These concerns may also trigger the preparation of plans to remove the hazards, such as confined space entry permits, rescue plans, and lock-out/ tag-out (LOTO) procedures to be implemented.

WCEC has prepared thousands of HASPs for projects including petroleum release, hazardous waste, agricultural chemical and PCB site investigations and remediation and emergency response activities. Prior to initiating the first phase of work at a site, WCEC prepares a site-specific HASP, to include the following minimum information:

- General Site Information (1910.120(c)(4)) – Site location, site contacts, WCEC staff associated with the project, emergency telephone numbers, the nearest hospital location, and emergency escape plans
- Site Description (1910.120(c)(4)) – Facility information, type of hazards anticipated to be present on site, amount of hazardous materials present, work objectives, project organization
- Project Objectives (1910.120(b)(3)) **–** Description of planned work area activities, including beginning and ending dates of work activities
- Project Organization (1910.120(b)(2)) – Identification of team members and responsibilities
- Chemical Hazard Analysis (1910.120(b)(4)) – Identification of site contaminants and associated physical properties, including routes of exposure and OSHA exposure limits
- Other Potential Hazards – Identification of hazards such as heat or cold stress, excavation, noise, heavy equipment operation, slips, trips falls, overhead or underground utilities, etc.
- Site Control (1910.120(d)) – Identification of established work zones and how they will be designated (barriers, caution tape, security fencing, etc.)
- Personal Protective Equipment (1910.120(b)(4)) – Based on evaluation of potential hazards, the levels of personal protection are designated for the applicable work zones
- Decontamination Procedures (1910.120(k)) – Description of personnel and equipment decontamination procedures and site locations for conducting decontamination
- Ambient and Personnel Air Monitoring (1910.120(b)(4)) – Description of activity, instrumentation, action levels, frequency of monitoring, and other relevant information specific to the site
- Contingency Plan (1910.120(l)) – Established emergency communication protocols, escape routes

Once on site, the HASPs are reviewed by all on-site personnel, including State Contractors and subcontractors. If multiple parties operate under different plans, potential conflicts are communicated and addressed. The HASPs are reviewed, signed and dated each day of the project. First aid kits and fire extinguishers are maintained in WCEC vehicles and job trailers for emergency use. Site HASPs are reviewed periodically and updated as site conditions or work tasks change.

WCEC routinely performs "tailgate" safety briefs while on site. These briefs are held at the beginning of each operational period and when any of the following occurs:

- A change in the staff present on a team or working group
- A change in site conditions
- A change in tactics or equipment used
- Following each break; e.g. after lunch

WCEC clients include transportation firms and fixed-based industries which often have their own specific safety training and hazard communications protocols. WCEC is experienced in navigating the myriad of specialized worker safety procedures, safety briefing practices, and controls used to protect the broader public.

Quality Assurance Project Plan (QAPP)

At the request of the MPCA or other Contract users, WCEC has prepared QAPP documents following the structure and content guidelines provided in the *MPCA Quality Assurance Project Plan Guidance* document dated February 2012 as revised by the Site Assessment Program Quality Assurance Project Plan of September 2014. The QAPP serves as an agreement between the Agency, the responsible party (RP) as applicable, the consultant, the laboratory and other interested parties concerning what work will be performed, how and why it will be performed and what analytical methods will be used. The QAPP establishes the quality assurance/quality control (QA/QC) and data quality objectives that must be met for the project.

Sampling and Analysis Plan (SAP)

Depending on project-specific circumstances such as smaller scale RCRA sites, Leaking UST site reports or Voluntary Investigation projects, the MPCA may prefer that a SAP be prepared in lieu of the QAPP. Following consultation with the MPCA Project Manager or Quality Assurance Coordinator (QAC), WCEC will prepare a SAP using the *MPCA Sampling and Analysis Plan (SAP) Development Guidance* dated September 2005, which is based upon USEPA Quality Assurance Project Plan (QAPP) requirements, USEPA QA/R-5, and the EPA Region 5 model QAPP guidance. The objective of the SAP is to ensure that project sampling and analytical methods are adequately documented and are appropriate for the project scope and purpose. The signed SAP is a legally binding document for all involved parties.

REPRESENTATIVE EXPERIENCE

Minnesota Slip and Duluth Former City Dump #1 Sites

WCEC has developed site-specific SAPs and QAPPs for MPCA and other projects with environmental sampling and analysis, including the Minnesota Slip and Duluth Former City Dump #1 sites. The Duluth Former City Dump #1 SAP addressed the sampling and analysis requirements associated with 11 groundwater monitoring wells, 10 surface water sampling locations, and five residential drinking water wells used to measure water quality. The contaminants of concern included vinyl chloride, aluminum, arsenic, iron, lead, manganese, and low-level mercury. Adherence to the requirements of the SAP ensured that the data quality objects were met, and the results of the project greatly reduced the risk to human health and the environment.

A.3.32 Perform Feasibility and Treatability Studies

WCEC has completed numerous feasibility and treatability studies at contaminated sites that included various petroleum compounds, chlorinated solvents, PCBs, and agricultural chemicals. WCEC has gained a thorough understanding of the processes applied when preparing Focused Feasibility Studies (FFS), including the evaluation of alternative Response Actions (RAs), and development of Response Action Plans (RAPs). The purpose of the FFS is to identify, screen, develop, and assess proposed RA alternatives. If necessary, design and completion of treatability studies is conducted to comprehensively evaluate each viable RA. The primary objective of a completed FFS is to provide project stakeholders and the MPCA with the information necessary to make confident decisions regarding the appropriateness and effectiveness of the RA and allow for subsequent development of the RAP.

REPRESENTATIVE EXPERIENCE

Polson, Montana

WCEC completed an in-depth feasibility and treatability study at a large-scale gasoline release site in Montana where over 4,000 gallons of product infiltrated a complex fractured bedrock system that ultimately discharged to Flathead Lake, a highly sensitive surface water receptor. Remedial alternatives (RAs) were evaluated to comply with the US EPA Administrative Order which required eliminating discharge of contaminants to surface waters and intrusion of vapor phase constituents into five residences. The feasibility study considered the numerous permitting requirements, weighed benefits of each outcome against necessary impacts to public and private properties to implement the RA, and evaluated costs of implementation to ensure the response was economically viable.

Following initial screening of alternatives and completion of thorough feasibility/treatability testing, WCEC developed a comprehensive remedial action plan which included remedial excavation, installation of 600 linear feet of gradient controlled interceptor/groundwater capture trench, construction of a 500 gallon per minute (GPM) water treatment system, and individual subsurface vapor removal systems in each impacted residence. WCEC provided support in obtaining a National Pollutant Discharge Elimination System (NPDES) permit, completed a certified wetland delineation, and assisted in preparing and obtaining the required USACE, local, and tribal permits pertaining to shoreline protection, wetland mitigation, and re-vegetation. Following the remediation phase of the project, WCEC worked with all project stakeholders to develop, design, and manage restoration of the impacted properties and lakeshore for long term beneficial end uses including residential, recreational, and habitat enhancement.

System operation greatly reduced contaminant concentrations and the lateral extent of the plume contracted significantly. However, the US EPA required more complete reduction of contaminants, in part due to exiting regulation and complex arrangements between the State and Tribal stakeholders. WCEC designed and implemented an ethanol co-solvent flushing of the impacted bedrock, using the existing groundwater capture network to prevent a release of solution or COCs to the lake. Contaminant reduction and natural attenuation monitoring continues, per US EPA Order.

REPRESENTATIVE EXPERIENCE

Alternatives Assessment for Historic Railroad Lease Property

WCEC prepared an assessment of remedial alternatives for a Conceptual Corrective Action Design (CCAD) report associated with work completed on an historic bulk oil facility in Austin, Minnesota. The CCAD was focused on remediation of impacted groundwater that could infiltrate into a sewer. Alternatives included active remedial system installation, soil excavation, and either a replacement or in-situ lining of an at-risk buried utility (deep storm sewer) conduit. In addition, the monitoring and indirect costs associated with implementation of institutional controls were estimated.

The lowest-cost alternative was implementation of formalized institutional controls. Soil excavation was required to remove contaminated surface soil exposure risks. This was completed, and the reduction in source area contamination and projected land use is such that *de facto* institutional control conditions were met. The most recent WCEC report recommended closure.

A.3.33 Design Comprehensive Remedial Action Remedies and Remediation Systems

As part of a remedial investigation process, WCEC staff review the results of risk assessments with the client and/or state agency to determine whether an unacceptable risk exists and whether a corrective action is necessary to achieve permanent risk reduction. WCEC reviews the remedial investigation results and conducts a gap analysis to ensure adequate site data is available to formulate a site decision. Corrective action is based on the permanent removal of an unacceptable risk to a receptor, as posed by the applicable contaminants of concern (COC) and risk pathway(s) involved. Various remedial options are considered and each one analyzed to determine its feasibility, probability of success, and an overall lifetime cost evaluation. Strategies that incorporate Green and Sustainable Remediation are employed whenever possible to reduce environmental, social, and economic impacts.

The Remedy Selection process used by WCEC follows the RBSE guidance, and *c-rem3-02* guidelines. A comprehensive remedial action plan concept emerges from this analysis, which may be an iterative process. Once the selected remedial option (or combination of remedial technologies) appears to fit the objectives of COC reduction, considering goals of each EA in each AOC, a feasibility study (FS) is prepared. The FS may include bench or pilot-scale treatability studies, public meetings to explore potential land use/zoning changes that influence regulatory cleanup goals, and technological suitability to the stated goal(s). Each candidate response action (RA) considered must emerge from the process meeting the criteria of a viable remedy; it must protect the public health, welfare, and the environment.

Selection of the RA is based on striking a balance among the following goals:

- Long-Term Effectiveness
- Implement ability
- Short-term risks
- Total costs
- Community acceptance

WCEC has designed over 100 engineered corrective action systems at multiple locations utilizing a wide range of technologies. WCEC has used standard remedial technologies such as excavation, water supply well replacement, point-of-use treatment of contaminated water, vapor extraction, air sparging, in-well aeration, and groundwater pump and treat. WCEC has also implemented new and innovative approaches such as composting pesticide and hazardous waste impacted soil and installing and operating in-situ vacuum vaporizer wells to address soil and groundwater simultaneously. WCEC has successfully implemented a broad spectrum of system designs from small-scale temporary vapor extraction systems constructed onsite as part of emergency response actions, to a NPDES permitted water treatment system capable of treating 500 gpm of impacted groundwater to drinking water standards.

WCEC prepares system operation and maintenance plans, and sets the operational strategy and remedial goals for proposed systems, so that Agency acceptance of the proposed remedial actions can consider how the CAD implementation and remedial objectives provide an “exit strategy” for determining when the system shut-down can/should occur.

WCEC’s unique operational model, in place until 2014, merged industry leading in-house contract services (laser-induced fluorescence and membrane interface probe scientists and licensed well drillers) and scientists (Engineers, Geologists) to provide a broad range of expertise and experience that provides a synergistic remediation system design approach. The benefits of this arrangement are still reaped today as we strive for ingenuity in developing new system designs and in using the most appropriate system to solve each unique project challenge. WCEC constantly pursues emerging remediation technologies to improve our knowledge base and advance the innovation and cost-effectiveness of our remediation services. These advancements are accomplished through providing training opportunities for our technical staff and sponsoring industry leading technical groups such as the Interstate Technology & Regulatory Council (ITRC), whose team of scientists collaborate to develop and present new technologies to the consulting and regulatory communities.

WCEC has also engineered and constructed several innovative mobile remediation system designs including: design and implementation of solar-powered LNAPL skimmer systems; custom-built ozone air sparge/soil vapor extraction enclosed trailers for contract clients; flatbed trailer-mounted pump and treat systems utilizing zeolite based oil/water separation, micro-point sparge bubblers, and granulated activated carbon (GAC) vessels; and a state-of-the art, automated, multiphase contaminant recovery and treatment trailer. WCEC was one of the first consultants in Minnesota to design and construct a multiphase extraction (MPE) pilot test trailer which incorporates all of the necessary process monitoring and sampling equipment to conduct meaningful MPE pilot tests or longer term MPE remediation programs.

Our project managers work within MPCA and MDA regulatory guidelines throughout the design process. As outlined in MPCA Guidance Document 7-01, WCEC prepares Conceptual Corrective Action Design Reports (CCAD) to ensure that all project stakeholders are kept informed of the correction action

objectives, proposed remediation strategies, and anticipated life-cycle costs associated with the proposed system from installation and operation until corrective action goals are met.

Remediation system designs require many critical components in order to provide the framework for a successful system installation and successful system operation. The MPCA CAD Guidance Documents provide a clear road map to address many of the critical components. In WCEC's experience, a common theme of successful remediation system designs incorporates the items highlighted below:

- Working closely with stakeholders and regulatory staff during the design process to provide a solution that best fits the needs of the collective group
- Development of a thorough and robust site conceptual model solidified by Focused Investigation data, including clearly defined target areas, corrective action reasons, and identified data gaps/limitations. All of these factors are carefully evaluated to provide the most appropriate design and prepare a realistic life cycle cost estimate
- Clearly stated corrective action goals and objectives
- Pilot test data from a well-designed and carefully conducted pilot test by knowledgeable and experienced professionals. Pilot test equipment must be designed with specific monitoring and sampling capabilities in order to collect the appropriate data
- Creativity and design experience with the selected remediation system to provide the foresight to predict and plan contingencies for potential failures/shortcomings that aren't addressed in textbooks or publications
- Clearly defined performance metrics, timelines, and endpoints

Once the selected RA (or combination of RAs) has been identified in this process, additional decision documents can be prepared and a Response Action Plan (RAP) can be completed. The RAP would include details concerning the remedial steps, methods, and the Cleanup or Action Levels for each aspect of risk reduction and environmental media/waste type involved in the associated removal action, administrative control, or another selected presumptive or innovative remedy.

REPRESENTATIVE EXPERIENCE

Alexandria, Minnesota

Leak site #5072 is part of the MPCA Petroleum Remediation Program (PRP). During the focused investigation, WCEC used innovative, LIF direct sensing technology to map the LNAPL plume in order to concentrate remediation efforts. Prior to completing a pilot test and feasibility study, WCEC submitted a CCAD to the MPCA, which outlined corrective action goals and objectives. Based on the information obtained during the pilot test and feasibility study, WCEC developed an SDCAD and plan for a multiphase extraction (MPE) system to address LNAPL and petroleum vapor risks. During the MPE system development process, WCEC completed two 24-hour LNAPL recovery events to collect recovery and recharge data to tailor the MPE system to achieve site specific goals and objectives. Once approval was obtained from the MPCA, WCEC solicited and obtained bids from subcontractors for multiple tasks. As the complexity of a task increased, an increased level of cooperation was required between WCEC, state agencies, and subcontractors. Bid specifications were developed with lowest cost/highest benefit considerations and were pre-approved by the MPCA.

REPRESENTATIVE EXPERIENCE

East Bay Flathead Lake, Montana

WCEC constructed a water treatment facility to dewater a fractured bedrock aquifer contaminated by a gasoline release on the shoreline of the East Bay of Flathead Lake near Polson, Montana. WCEC was responsible for all aspects of the engineering design, permitting, and construction of the 500 gpm system which includes the following components:

- >500 lineal feet of groundwater interceptor trench
- Automated pump basins equipped with transducer-controlled variable frequency drives (VFDs)
- 24 g/hr ozone injection for direct chemical oxidation and to control microbial fouling
- 25 horsepower regenerative blower connected to a shallow-tray air stripper
- 300-gallon silica sand filtration vessels
- 50-micron particulate bag filters
- 4,000-gallon GAC vessels
- Rock-armored outfall in lakebed for effluent discharge subject to NPDES regulations
- 2,400 ft^2 steel warehouse building
- Multiple automated electronic alarm devices, backup controls, pressure gauges, and flow meters

This water treatment system was constructed in an ecologically sensitive area, on a steep, timbered slope in the midst of several wetland ponds near the lake shoreline. WCEC successfully navigated all permitting hurdles associated with this challenging construction site which included obtaining approval from overlapping county, state, federal, and tribal government agencies. In addition, the building site is located on a neighborhood commons parcel owned by adjacent landowners who were impacted by the gasoline release and were required to temporarily evacuate their homes due to vapor intrusion concerns. WCEC implemented design considerations for an unobtrusive building profile, noise abatement, and VOC emissions controls based on landowner input.

WCEC's straightforward and open approach to system design allowed for a collaborative process in which WCEC gained the trust of all interested parties, both public and private. WCEC performs ongoing operation and maintenance and NPDES compliance monitoring of the system on a weekly basis. The system design successfully meets all NPDES requirements, is reducing groundwater contaminant concentrations, and satisfies the nuisance concerns of adjacent impacted landowners. Following the remediation system design phase of the project, WCEC worked with all project stakeholders to develop, design, and manage restoration of the impacted properties and lakeshore for long term beneficial end uses including residential, recreational, and habitat enhancement.

REPRESENTATIVE EXPERIENCE

Emergency Response, Hiawatha Rubber Facility, Minneapolis Minnesota

Emergency cleanup (soil excavation and stockpiling) of a trichloroethylene (TCE) release was completed by WCEC under the direction of the MPCA at the Hiawatha Rubber facility. The next two steps of the project were to construct a MPCA approved on-site treatment cell for the contaminated soil and to conduct a soil and groundwater site assessment.

The soil treatment system was a contained ventilated stockpile with strict parameters and emission rates for ventilation. The results of the soil and groundwater extent-of-contamination study indicated that groundwater had been affected by the release. WCEC installed monitoring wells to determine groundwater flow direction and the extent of contamination. To determine the feasibility of different options for groundwater remediation, WCEC installed vapor points, piezometers, and test holes. A drawdown and pump test pilot study and a groundwater pump-and-treat pilot study were conducted. After MPCA's approval of WCEC's remedial action plan, WCEC installed three additional monitoring wells, three recovery wells, one air sparge point, and seven vapor extraction wells.

The vacuum enhanced total fluids recovery wells were constructed to contain off-site plume migration, as well as to allow vapors in the vicinity of the wells to be captured and removed. The vapor extraction system and fluid recovery systems performed as they were designed, removing 25 gallons of TCE. The air stripper system removed 99.1% to 99.8% of the TCE pumped into the stripper and the discharge effluent concentrations were always less than the NPDES permit limits. Throughout the project, WCEC conducted the required permitting, sampling, monitoring, and analysis of the systems and wells. After successful system operation (no unanticipated wear or damage replacements were encountered), the reduced contamination led the MPCA to conclude that this site was considered adequately remediated and was granted closure.

A.3.34 Conduct and Oversee Investigations

WCEC is experienced with completing remedial investigation for contaminant release sites; we have tailored our professional experience to fully investigate sites in several states, under the applicable environmental regulations and agency programs. For petroleum release sites in Minnesota, the MPCA has provided a series of logical and readily-used guidance documents to help the user complete the work properly and report the findings in an efficient and consistent format. Petroleum constituents, in general are amenable to a well-designed report template due to the volume of research on the associated risks, and routine nature of most investigations that can provide regulatory efficiencies associated with petroleum release sites.

Non-petroleum sites under review by the MPCA Superfund program follow guidance documents prepared by the program, and the RI reporting would utilize the risk-based site evaluation (RBSE) and risk-based corrective action (RBCA) tools provided by MPCA. These sites may have contamination associated with RCRA heavy metals, TCSCA regulated PCBs, and EPA-listed halogenated solvents that in combination do not fit well into a rigidly formatted report template. The Superfund guidance documents provide clearly written outlines of the report scope required, and other tools. Recent additions include

vapor intrusion guidance for making site (e.g. mitigation need) decisions based on data developed during site investigation. In all cases, WCEC follows the applicable procedures and work scope, including work plan submittal for MPCA acceptance.

Completing a full remedial investigation under Minnesota Department of Agriculture (MDA) review can often require a comprehensive investigation of sources, development of site-specific risk values one or more chemicals of concern, and reporting that includes the items provided in a structural outline described in Guidance Document 10. WCEC provides a proposed investigation Work Plan for MDA review, and the RI will follow the approved Work Plan. Due to the complexity in multi-service agricultural chemical facilities and potentially complex sequence of site use, intensive cooperation between WCEC and the Department can be required to address all site characteristics with potential for environmental concern.

In most cases, WCEC can directly subcontract for the required drilling or excavation services. For MPCA MultiSite projects, we follow the Purchasing Manual procedures for procuring subcontracted services. The MDA projects relying on this contract involve contractors hired directly by the State, and WCEC does not have direct contractual authority over their activities. For oversight during remedial investigation, WCEC field staff document subcontractor/state contractor activities that have an investigation component. For example, the time spent on site and for specific tasks is tracked. WCEC documents the footage drilled or excavated, and logs of exploration borings and test pits are prepared by our technicians and scientists. Temporary well installation oversight includes documentation of well construction methods, screen (intake) interval, and conditions that can affect sampling and data quality such as formation collapse, drilling fluid use, or physical damage. Permanent well installation oversight includes detailed measurements of the well construction materials (and dimensions) involved, for a higher level of precision in identifying intake (screen and sandpack) interval, location of joints, completion date/time, and well development activities.

Related oversight for State program business practice compliance includes gathering documentation form the contractor, such as the certificate of insurance, prevailing wage and withholding reports, and backup documents to demonstrate reasonableness of costs for supplies and per diem that were applied.

REPRESENTATIVE EXPERIENCE

RI for Grub and Pub site in Minnesota

Leak site #7635 is a Fund-Financed site in the MPCA Petroleum Remediation Program (PRP). Initial investigation was completed by another firm prior to the involvement of WCEC. This identified a dissolved contaminant plume that has impacted a sole-source glacial aquifer above the HRL for 1,2 Dichloroethane (DCA) and benzene over ¼ mile away from the source area, and the extent of the DCA plume was not yet defined.

Remedial Investigation can be an iterative process, to expand the investigation sufficiently to fully define an extensive plume. For the most recent round of supplemental remedial (cont.)

REPRESENTATIVE EXPERIENCE

RI for Grub and Pub site in Minnesota (continued)

investigation, WCEC obtained the additional permissions required to construct monitoring wells beyond the previous monitoring network, and for a focused investigation (FI) that required lane closure for a county highway. WCEC obtained cost quotes from the available state contract exploration firms, and retained the services required for well installation and FI soil borings.

RI work conducted by WCEC included documentation of soil boring logs and elevation determination, and field-screening of soils via headspace screening and the petroleum sheen test. Quarterly groundwater monitoring continued, per MPCA guidance and PRP policies. The RI work included soil borings via sonic drilling and logging the soil cores using direct-sensing techniques based on laser induced fluorescence using a proprietary Ultra Violet Optical Screening Tool (UVOST) to generate a continuous log of data from the discreet cores provided by the driller.

Oversight of the investigation contractors included tracking of time and tasks described in this section, and oversight of the traffic control and investigation procedures. This required close WCEC-led coordination between the sonic drilling firm, the UVOST provider; and support staff required for traffic control changes and drill cutting management. These activities were also completed with the consent and input of the affected private property owners.

A.3.35 Oversee Installation of Remedial Actions and Remedial Systems

WCEC is experienced with the implementation of Remedial Action Plans (RAPs) and has completed a variety of remedial activities in conformance to the RAP requirements. Our firm has professionals with experience in the technical aspects of remedial action and has performed sampling, site monitoring, remediation system and institutional control Operation & Maintenance (O&M) on several sites. Many WCEC staff can operate the equipment used for remediation and O&M on sites; this includes drilling equipment, loaders and transport trucks, vacuum trucks, and hydro-excavation and related vacuum recovery systems. This practical experience provides an expanded knowledge base that WCEC applies toward the best performance of remedial activities, and informed oversight of system installation.

WCEC's staff of geologists, hydrogeologists, and engineers have designed and installed over 100 engineered corrective action systems. As part of our current Master Contract with the MPCA, WCEC has prepared bid specifications for subcontracted work such as tank removals, water supply well replacement, drilling, installation of monitoring and recovery wells, complete remediation systems, purchase of specific system components, and corrective action excavations. Our bid specifications are prepared in a professional manner that ensures that the contractor, estimator, contracting Agency or other reviewers find information easily and that the comprehensive information required to complete the project is clearly presented. WCEC is experienced with the process of preparing appropriate bid specifications for implementing the remedial actions. We are experienced with sealed bid advertising,

notification, and selection of contractors; WCEC has specific experience in following the MPCA Purchasing manual to secure the require remedial action construction work on MultiSite projects.

WCEC has also implemented new and innovative approaches such as composting pesticide and hazardous waste impacted soil and installing and operating in-situ vacuum vaporizer wells to address soil and groundwater simultaneously. WCEC prepares system operation and maintenance plans and sets the operational strategy and remedial goals for proposed systems, so that Agency acceptance of the proposed remedial actions can consider how the CAD implementation and remedial objectives provide an "exit strategy" for determining when the system shut-down can/should occur.

Recent activities include oversight of sub-slab depressurization system installations to mitigate vapor intrusion in homes. For these projects, WCEC documented the contractor's compliance with MPCA's current chemical vapor mitigation BMP's and performed independent tests to document adequate pressure field extension (PFE) was obtained.

For oversight during remedial activities, WCEC tracks the Contractor time on site and documents the methods followed and activities completed. Departures from the approve RAP / CAD are swiftly communicated, and the WCEC documentation used to address conflicts with remedial objectives and potential disputes. Post-installation activities may include completion of an "Engineer's Checklist" by the On-Site Inspector (OSI) provided by WCEC, and documentation of local approvals by e.g. city Inspection departments. Important documentation managed by us include handling the various contractor submittals for certificate of insurance, permits, health and safety plans, prevailing wage, change orders and request for payment that are part of the record documents for construction activities. Although some professionals consider these of a non-technical nature, each can have a measurable performance indicator, and all are vital records for documentation to remain clear, complete, and provide excellent transparency in event of audit, lawsuit, or incident investigation.

REPRESENTATIVE EXPERIENCE

Alexandria, Minnesota

Leak site #5072 is part of the MPCA Petroleum Remediation Program (PRP). During the focused investigation, WCEC used innovative, LIF direct sensing technology to map the LNAPL plume to concentrate remediation efforts. Prior to completing a pilot test and feasibility study, WCEC submitted a CCAD to the MPCA, which outlined corrective action goals and objectives. Based on the information obtained during the pilot test and feasibility study, WCEC developed a SDCAD and plan for a multiphase extraction (MPE) system to address LNAPL and petroleum vapor risks.

During the MPE system development process, WCEC completed two 24-hour LNAPL recovery events to collect recovery and recharge data to tailor the MPE system to achieve site specific goals and objectives. Once approval was obtained from the MPCA, WCEC solicited and obtained bids from subcontractors for multiple tasks. As the complexity of a task increased, an increased level of cooperation was required between WCEC, state agencies, and subcontractors. Bid (cont.)

REPRESENTATIVE EXPERIENCE

Alexandria, Minnesota (continued)

specifications were developed with lowest cost/highest benefit considerations and were pre-approved by the MPCA. WCEC provided oversight during the system installation.

Follow-up activities included separate solicitations for catalytic oxidation treatment of system effluent, and sequences of purchasing that followed Purchasing Manual procedures for system decommissioning, sale of State assets that retained value, and restoration actions.

A.3.36 Conduct Surface Water, Ground Water and Hydrodynamic Modeling

WCEC staff has significant experience collecting and using environmental data from various project types in preparation of groundwater and surface water models. These models are ultimately used by a variety of project stakeholders to make informed decisions regarding the probable long-term impacts of environmental contaminants, cleanup actions, or construction activities which alter natural systems.

WCEC's approach to surface and groundwater modeling fosters an environment of openness, transparency, and accuracy to provide a quality product that meets the needs of all project stakeholders, from interested laypersons to final product design engineers. The first step in creating a valuable and useable model is to compile a precise and thorough dataset which accurately represents site conditions. In addition to environmental data collection, the accuracy of any site model is highly dependent on the quality of the corresponding spatial data for the sample points, ground surface, and surrounding features.

WCEC's staff are skilled in various environmental survey methodologies and are equipped with state-of-art survey and mapping-grade tools including sub-decimeter handheld GPS units (Trimble GeoXH) and sub-centimeter electronic total stations (Leica TPS400). The onsite survey data are coupled with online GIS data such as 0.3-meter pixel satellite imagery and LIDAR derived DEMs (where available) to generate a high-resolution geospatially correlated dataset. The dataset is passed to WCEC's data analysis team for input into various freeware (HEC-HMS, ArcFlow, MODFLOW, Bioscreen, etc.) and commercial software modeling programs. WCEC utilizes industry standard and cutting-edge computer programs including AutoCAD Civil 3D 2017, Autodesk Storm & Sanitary Analysis 2013, ArcGIS 10.6 (Spatial and 3D Analyst), and C Tech's Environmental Visualization System (EVS-Pro). Two-dimensional and three-dimensional model outputs are created which include intuitive and easy to understand visualizations as well as hard datasets which are utilized as input values for the next phase of the design process.

Surface Water Modeling

WCEC has completed surface water modeling projects at varying scales for the purpose of complying with applicable stormwater management, retention, and discharge regulations. These projects range

from designing single oil/water separator catchment basins at retail fueling stations (many locations, upper Midwest & Northwest US) to a multiple detention pond storm water management system at a 40-acre Class II solid waste landfill (oil exploration and production waste, MT). In eastern Washington, WCEC modeled surface water runoff at a bulk petroleum distribution facility located within the city limits of Moses Lake, an area with a high groundwater table, variable surface water inputs, and strict regulations for surface water discharge. Model outputs were used for design and sizing of catchment basins and detention facilities capable of accommodating a 25-year storm event.

As part of wetland delineation projects in the state of Minnesota, WCEC has conducted surface water modeling to map floodplain channel systems and wetland restoration areas, model micro-watershed runoff contributions, and determine regional surface water elevations. In western Montana, WCEC modeled surface water drainage at a multi-parcel subdivision located on a steep mountain-side slope to develop a storm water management plan necessary to establish and maintain compliance with state regulations throughout ensuing phases of development.

Groundwater Modeling

Groundwater modeling projects completed by WCEC range from routine groundwater flow direction and hydraulic gradient calculations to more complex modeling for municipal wellhead protection plans and solute transport and first-order decay rate restoration timeframe calculations at contaminant release sites (multiple locations, upper Midwest and Northwest US).

REPRESENTATIVE EXPERIENCE

Polson, Montana

WCEC completed an in-depth feasibility and treatability study at a large scale gasoline release site in Montana where over 4,000 gallons of product infiltrated a complex fractured bedrock system that ultimately discharged to a highly sensitive surface water receptor. Remedial alternatives (RAs) were evaluated to comply with the US EPA Administrative Order which required eliminating discharge of contaminants to surface waters and intrusion of vapor phase constituents into five residences. The feasibility study considered the numerous permitting requirements, weighed benefits of each outcome against necessary impacts to public and private properties to implement the RA, and evaluated costs of implementation to ensure the response was economically viable.

WCEC used groundwater modeling outputs to design a groundwater interceptor trench for gradient control and dewatering along the shoreline of a pristine mountain lake at a gasoline-impacted, fractured bedrock aquifer in western Montana. The multi-partitioned trench was sized based on model results to supply a water treatment facility capable of handling 500 gpm. Modeling output supported development of best management practices (BPMs) for water quality monitoring of the treatment system effluent to comply with NPDES regulations.

Other project examples include groundwater modeling for solute transport to reduce pump and treat events at a petroleum release facility (Dealers Manufacturing, Minneapolis). At a municipal airport in Benson, Minnesota, two-dimensional fate and transport modeling of a dissolved alachlor plume

indicated a maximum downgradient plume extent would not exceed the property boundaries. In Polson, Montana, groundwater fluctuations as a result of surface water inputs from an artificially controlled lake were modeled alongside a three-dimensional visualization of an LNAPL body derived from an LIF investigation. Insights gained from this process included the discovery that the high and low pool elevations of surface water in the lake were controlling the downgradient horizontal and vertical extent of LNAPL migration. Isolated LNAPL lenses were also identified in the model visualizations at great depth, 10 to 15 feet below the average groundwater table, a phenomenon that had not previously been documented during the past 20+ years of remediation activities using traditional techniques.

A.3.37 Asbestos Identification and Oversee Abatement and Removal

WCEC has employed licensed asbestos inspectors for approximately 25 years. WCEC conducts asbestos inspections following the Minnesota Department of Health guidelines, which follow the Asbestos Hazard Emergency Response Act (AHERA). WCEC has conducted asbestos inspections as part of Phase I Environmental Site Assessments or prior to building renovation, intentional burns or demolition. When asbestos has been identified and abatement required, WCEC has provided project management for the abatement project. WCEC's project management experience assures our clients that the project follows strict safety protocols and state and local rules, often resulting in expedited project turnaround and a reduction of overall project costs. WCEC understands that there is a state contract for asbestos abatement and related activities available for use by the Department of Administration. For abatement projects under this Master Contract, WCEC will coordinate with property owners, coordinate with local governments regarding requirements, assist the Department of Administration in securing a state contractor as requested (such as preparing specifications), and overseeing abatement activities.

A.3.38 Third-Party Review and Analysis of Technical Information

WCEC has the skills and expertise to perform third-party reviews for the MPCA. WCEC has performed many third-party reviews when requested by clients. We understand the potential sensitivity and complexity of projects with multiple interested parties. Our first step of a third-party review opportunity for the MPCA would be to discuss the project details with the MPCA Project Manager and perform an internal conflict of interest check by reviewing our customer information database and inquiring with our senior management and legal staff. Upon identifying no conflicts, we would meet with the MPCA Project Manager to understand fully the project information and agree upon a scope of work. Our technical staff would then thoroughly organize the available information and identify if data gaps exist, organizing the data such that it can be easily understood by multiple interested parties. If a third-party review included the development of recommendations, we would perform an unbiased alternative analysis and provide the MPCA with at least two recommendations for future action.

WCEC is also qualified to provide analysis of technical information for the MPCA and the MDA. WCEC routinely reviews and summarizes the available information for MPCA and MDA sites to prepare a set of recommendations for further action. Many of these projects enter the PRP/Superfund Multi-Site program after initial work was performed, but insufficient data are available to formulate a site decision. In these cases, WCEC prepares a Work Plan at no cost to the agency; our work plan outlines the scope of work, rationale for each work item, and the anticipated schedule and cost for the additional work.

In other areas of expertise, WCEC senior staff has been involved in the development and preparation of Comprehensive Local Water Resource Management Plans for 14 west central Minnesota counties, a Pollution Control Plan for the Eagle Lake Watershed in central Minnesota, and a Watershed Management Plan for the Lac que Parle, Yellow Bank River Watershed. All 16 of these projects required WCEC to compile, review, and interpret data from a wide variety of sources, to provide recommendations to the local units of government involved in the studies (counties, cities, watershed districts, and lake associations), as well as state of Minnesota Regulatory Agencies (MPCA, BWSR, DNR MDH, among others). WCEC staff involvement was that of facilitator and coordinator, as well as the source for technical review of data and development of implementation strategies. Technical work included developing and interpreting baseline information for understanding water and land resources within the jurisdiction and presenting this information to the stakeholders within each project, as well as the state agencies involved.

A.3.39 Provide support for the analysis and development of program policy and guidance, including developing health or ecological risk criteria/standards (including technical report preparation)

WCEC has contributed to the forward progression of the environmental consulting industry for over 20 years and has been closely involved with the development of program policies for the MPCA, MDA, and Montana Department of Environmental Quality (MTDEQ). WCEC's involvement in developing program policy ranges from providing technical insight and support to agency regulators, to testing and implementing new remediation, mitigation, and investigation technologies or methods which ultimately define the direction of program policy.

WCEC has staff experienced in performing ecological risk assessment, as well as several biologists with skills and experience required to collect field data in support of the risk assessments. Studies performed by WCEC staff have included damage assessment of aquatic habitats impacted by petroleum or herbicide compounds. WCEC also routinely completes botanical studies for classification of wetlands, including functions and values assessments.

Examples of specialty subject matter areas where WCEC has provided technical assistance to the Agency include land zoning and development plan review, interpretation of local codes as they apply to Agency projects, evaluation of data for surface water feature classification as part of surface water receptor risk evaluation, Health and Safety questions, and review of MPCA petroleum corrective action updates.

WCEC is a leader in the application and understanding of laser-induced fluorescence (LIF) technology for environmental investigation and has provided technical and field data support which has assisted the MPCA in the development of guidance related to LNAPL investigations. Our involvement includes promoting these investigation methods at training events such as the Interstate Technology and Regulatory Council (ITRC) Light Non-Aqueous Phase Liquids: Science, Management, and Technology - 2 Day Classroom Training, which has been sponsored by WCEC in Minnesota, Michigan, Massachusetts and Pennsylvania, and is attended by state and federal environmental agency representatives nationwide. These training events introduce regulators to new technologies and methods and initiate the process of program policy development.

In Montana, WCEC assisted the MTDEQ in the development of risk-based vapor intrusion guidance for petroleum release sites. WCEC provided technical and practical insight to agency staff during development of sampling protocols, human health exposure criteria, and risk calculation methods that were ultimately included in the MTDEQ Montana Vapor Intrusion Guide (April, 2011). WCEC's experience with vapor intrusion sampling, mitigation, and risk assessment proved to be a valuable resource to agency staff, who utilized data from WCEC's historic projects in the development of the guidance document.

Additionally in 2011, WCEC conducted on-site training for members of the MTDEQ Vapor Intrusion regulatory board related to proper design and installation of vapor abatement and mitigation measures. WCEC's method for designing, installation, performance testing, and assessing vapor intrusion risks was presented to the consulting and regulatory communities in the Spring 2011 MUST News published by the MTDEQ. WCEC's methods are now considered "standard" practice for vapor mitigation by the MTDEQ.

A.3.40 Perform Five-Year and Site Reviews

WCEC has completed five-year reviews with the MPCA on sites subject to response actions in the Superfund program, and routinely conducts site reviews for projects within various MPCA programs. The scope of site reviews can vary with regulatory agency, program guidelines, and the objectives of the agency lead. WCEC has completed numerous site reviews for projects where our firm was the Consultant responsible for the work performed, and also for sites where other firms had been the lead consultant throughout a review period. This includes sites where current MPCA remediation policies require review of the Operational Strategy and system performance, as well as adherence to life cycle cost estimates for a given remediation system.

Five-year reviews are required for sites where hazardous substances remain at concentrations above the regulatory thresholds associated with unlimited site use. These reviews consider the performance of the remedy in meeting the goals established in the decision documents and administrative controls, and the additional information developed during the review period. The review is used to determine if the original remedy is still the appropriate alternative, or if other alternatives should be considered for implementation in the next review period.

WCEC can provide excellent technical writing, data reduction, analysis, mapping, GIS presentation of data, engineering and problem solving related to creative remedy alternatives, which are all necessary when providing this service. In addition, WCEC has the expertise to provide efficiency in preparing five-year reviews, which is likely one of the goals of the EPA's new template released in 2016, which standardizes these reports and eliminates redundant submittal of information.

REPRESENTATIVE EXPERIENCE

Five Year Review for Duluth Dump #1

The Former Duluth Dump #1 Superfund Site (Site) is located in the northwestern corner of the City of Duluth (City) boundary in St. Louis County, Minnesota. The Site operated as a Dump from 1954 through the early 1960s and accepted industrial, commercial, medical, and municipal waste from the Duluth area. Official closure of the dump was completed in 1962.

The Minnesota Decisions Document (MDD) for the Site included selected response actions and cleanup levels intended to protect human health and the environment. Remedial activities completed in 1999 and 2006 were completed by the City in two phases. The activities included consolidation of mixed solid waste fill and capping of waste with a native soil cover, relocation of the on-site residence, removal of on-site buildings, and installation of methane venting system. The Minnesota Pollution Control Agency conducted a monitoring program which includes monitoring of groundwater, surface water, and nearby residential wells.

WCEC participated in a five-year review with MPCA in June 2011.This remedy review found that the response actions had not been fully implemented and that water quality at the Site was still exceeding the cleanup levels that were established in the MDD. In order to meet the response action objectives in the long term, the following actions were identified: 1) Excavate and consolidate the remaining waste and construct a proper cap to eliminate leachate seeps; 2) restrict future land use of the property by establishing an environmental restrictive covenant and proper zoning on the property; and 3) complete operation and maintenance (O&M) activities at the Site. WCEC has continued the O&M activities on this site as requested by the MPCA.

A.3.41 Preparation of Draft Decision and Other Documents

WCEC applies a collaborative work ethic to all aspects of client service. Work performed for state and local governmental agencies has included draft document preparation by WCEC for use by the agency. In providing this assistance in the structuring and authorship of these documents, WCEC understands that our work must be fully compliant with programmatic criteria, and we have been entrusted to provide a document for which our agency clients will ultimately be held responsible.

This high level of trust inspires our staff to provide a high level of performance; this ensures that the draft document is concise, clearly stated, technically sound, and internally consistent (without contradictory clauses) so that minimal edits are needed for the document to be implemented by the Agency lead.

Some examples of draft documents that WCEC authored and/or edited on behalf of clients include:

- Preparation of waste profile documents for waste generated in conjunction with MPCA and other client projects, for disposal facility acceptance
- Access agreement preparation and other access requests to the property owner for our client
- Bid document preparation, including past MPCA project purchases between $10,000 and $50,000 where WCEC is acting on behalf of the state to solicit bids, advise on selection, and retain the selected vendor. WCEC has also prepared final bid documents, processed Addenda, and handled request for payment submittals for purchasing led by Minnesota Department of Administration (ADMIN) for large (>$50,000) and often complex purchasing requirements
- Review of draft Remediation Policy Guidance Document updates prior to implementation in 2011 by the MPCA remediation program
- Preparation of initial applications for utility service (e.g. electrical utility and publicly-owned sewer connection) needed for MPCA remediation projects
- Right-of-way and related work permits for investigation and remediation projects in public easements and rights of way
- Review of MPCA Vapor Intrusion Guidance Document prior to implementation in 2006
- Review of updates to MPCA guidance for management of petroleum contaminated soil from utility and right-of-way projects in 2004
- Review of UST/AST Guidance Documents being updated in 2003
- Grant application preparation for Traverse County, Minnesota. The WCEC application was successful in funding their Flood Mitigation Plan
- Preparation of waste disposal manifests for State-led projects, including sites where the State has the role of Generator, and sites where another party is the Generator but MPCA is managing the waste.
- WCEC staff have prepared draft Ordinances for codification by the Local Governmental Unit; this has included a water well restriction on a Minnesota community for a MPCA multi-site project
- Environmental Covenant and Consent of Mortgagee documents for review by the State, Client, legal counsel, and ultimate filing by the County Recorder
- WCEC compiles the information and prepares reimbursement program applications for many of our clients seeking funds from ACCRA, DERRA, and Petrofund programs in multiple states
- WCEC has prepared presentations on behalf of MPCA for use in public meetings, including presentations pertaining to investigation results from projects in the Multi-Site program
- NPDES Permit applications for discharge of remediation system effluent
- Minnesota Department of Natural Resources Water Appropriation Permits for groundwater withdrawal (above regulatory thresholds) associated with remediation systems
- Draft Environmental Assessment Worksheet (EAW), Environmental Assessment (EA) and Environmental Impact Study (EIS) report preparation, such as the EA for Western Area Power Administration (WAPA), the Responsible Governmental Unit for the environmental review of a proposed wind-to-energy project in eastern South Dakota
- WCEC has prepared site specific cleanup goal statistical work for use by MDA
- We prepare Waters & Wetlands permit documents for development and remediation projects
- DNR Waters crossing permits for transportation and telecommunication projects
- WCEC completes Industrial Stormwater Applications and electronic reports on quarterly and annual schedules for our Clientele
- WCEC staff has experience with drafting Institutional Controls for sites in the VIC program, for use in Stipulation Agreements and the Environmental Covenant records

- Purchase Orders using client-provided letterhead to purchase services; this includes the MPCA State Contractor Order Forms used on the Multi-Site projects
- WCEC has authored watershed-level management plans for multiple local units of government; these have been promulgated with no further modifications after local and State review
- Request for Proposal documents written by WCEC for clients to use on their letterhead to solicit "apples to apples" bids for services on their projects
- Meth lab remediation often requires a certification section for signatures by WCEC, other contractors, the Property Owner, and the Responsible Governmental Unit that is often a public health agency. The completed and fully-signed documents prepared by WCEC have been used in legal recordings for the property files, and for petition to the US Dept. Justice, Drug Enforcement Administration (DEA) for successful removal from the National Clandestine Laboratory Register

In every case, WCEC follows the applicable format and procedure to meet the objectives of document preparation and use. The documents are prepared as though the WCEC preparer would be bound by them, which in many cases is literally true.

A.3.42 Perform Operation and Maintenance System Review and Optimization

WCEC has reviewed and optimized the operation and monitoring plans and maintenance schedules of over 100 remediation systems across the upper Midwest and northwest United States, with more than half of these located in Minnesota. WCEC currently performs operation, maintenance, and system optimization for numerous remediation projects with the MPCA and other state and federal regulatory agencies.

For a system to operate effectively and efficiently, there must be clearly stated corrective action objectives, remediation strategies, performance metrics, operational periods, and remediation endpoints. WCEC relies on experience and training to work with clients and regulators when developing realistic and effective corrective action objectives. Our team organizational structure and cross training philosophy facilitates an "active project management" approach where each team member from technical lead, to Project Manager, to Field Technician is familiar with the operation strategy, performance objectives, and operation monitoring plan of each individual remediation system design. This team approach provides continuous review and optimization of system operation and maintenance, because systems are evaluated from a variety of different perspectives.

System Effectiveness

System effectiveness is one of the two critical performance objectives. System effectiveness evaluates progress toward achieving the compliance and strategic objectives. WCEC maximizes system effectiveness by quickly reviewing and evaluating field and laboratory analytical data to ensure the system is progressing toward remediation endpoints, by using telemetric controls to collect real-time system monitoring data (beyond just a "snap shot" observed during on-site monitoring events) to support (or oppose) field and analytical data, and by using the data to predict when reconfigurations or control adjustments should be made, rather than prolonging the length of a given operation period.

System Uptime Efficiency

System uptime efficiency is the other key performance objective. WCEC maximizes system uptime efficiency by implementing the following approaches:

- Designing appropriate telemetry units and actively (e.g. daily) monitoring telemetry data to predict maintenance, and to be prepared to quickly respond to unanticipated shutdowns
- Training Field Technicians on site-specific equipment and processes to allow optimized equipment operation and accurate diagnoses in the event of equipment failures. Training is conducted in-house and externally
- WCEC technical staff are dedicated to the success of the remediation strategy. Project staff regularly monitor telemetry and are prepared to mobilize to the site to quickly restart a system on evenings, weekends, or holidays as needed
- Conducting preventative maintenance (e.g. replace filters and pump seals, change gear oil, clean scaling from air strippers, etc.) and updating the maintenance schedule based on performance
- Using past experience and training to develop contingency plans, to be able to quickly and effectively address unanticipated system shutdowns. WCEC maintains an inventory of spare parts for elements that are most likely to need replacement (e.g. replacement pump motors, solenoid valves, etc.)

Remedial Progress

Remedial progress is another key indicator of system operational efficiency. As more information becomes available during system operation, WCEC revisits earlier assumptions within the remediation strategy and site conceptual model (SCM) and updates them as necessary. The MPCA is notified immediately of any substantive changes irrespective of the timing of reporting intervals. For example, if a particular remediation point is not inducing the intended changes to the subsurface, it may be necessary to reconfigure operation of other remediation points in order to provide more control to adjacent remediation points, or it may be necessary to install additional remediation points. Rapid data review and evaluation allow for identification of these types of circumstances and serve to expedite implementation of actions which optimize system effectiveness.

Cost Tracking

Cost tracking by WCEC project managers includes evaluation of project costs each month as compared with the costs projected within the given operational period and within the life cycle of the system. Frequent cost evaluations provide additional lines of evidence as to whether a given process or configuration should be reviewed and potentially optimized for more efficient and effective operation.

Operational Life

Operational life is a critical parameter for the design and implementation of a remedial system. One of the highest costs associated with remediation systems are prolonged operation times beyond the useful life. This can often be attributed to poorly defined/poorly planned remediation endpoints and operation periods. WCEC works closely with clients and regulators to define remediation endpoints and operation periods during the design stage. Operational periods typically include a startup/optimization period, where baseline system performance and capabilities are evaluated. Remediation points are tested

under full scale operation during system startup to determine if they are performing as designed. If the remediation system does not induce the intended subsurface responses, preparations and contingencies (i.e., adjusting operational periods or configurations) can be developed at the beginning of the system life cycle to optimize system effectiveness and eliminate unnecessary operational expense.

Once the primary removal or treatment operational periods are completed (as determined by clearly defined endpoints), a pulsing operational period is typically planned, to maximize cost effectiveness. Pulsing of system operational periods can be achieved through incorporation of automated solenoid valves that operate on adjustable timers or scaling system motor loads to achieve the desired operational rates (e.g. using variable frequency drives, or in the case of multiple blower configurations, by taking one of the blowers offline). Upon reaching pre-defined remediation endpoints in conjunction with other lines of evidence indicating that the site specific corrective action objectives have been achieved, WCEC contacts the regulatory agency to make preparations for system shutdown and post-shutdown monitoring.

A.3.43 Research, Evaluate and Implement Innovative Technologies

WCEC is an industry leader in researching, evaluating, and implementing innovative technologies at environmental sites. WCEC's corporate philosophy is to continuously pursue innovative technologies which enhance our ability to complete projects in the most effective and efficient manner possible. WCEC's team of multi-disciplinary scientists are experienced in the process of developing and delivering new technologies to the consulting and regulatory communities, which begins with research and progresses through bench-scale testing/feasibility studies, pilot testing/ground proofing, data validation and evaluation, and ultimately, full-scale implementation or production.

As part of WCEC's continuing efforts to research innovative technologies, WCEC had a staff member on ITRC's LNAPL Update team, which researched technologies for LNAPL remediation, and has a member on the new (2018) Implementing Advanced Site Characterization Tools (ASCT) team, which will be researching tools that provide real-time site characterization data.

WCEC's close relationship with our sister company, Dakota Technologies, provides our technical staff with unique access to an array of cutting edge investigation and assessment technologies. Many of these technologies are utilized by WCEC as they are developed and first emerge in the environmental marketplace.

The following examples display WCEC's experience with the process of implementing a variety of innovative technologies.

High Resolution Subsurface LNAPL Investigation Technologies

In 2005, WCEC completed an evaluation of two different direct sensing tools which utilize ultra violet light to fluoresce petroleum hydrocarbons in the subsurface. The tools were the fuel fluorescence detector (FFD) and the ultra violet optical screening tool (UVOST), also known as a laser-induced

fluorescence (LIF) technology. WCEC advanced the FFD at three sites that were previously investigated using LIF technology. Sites with different soil textures, contaminant types, and magnitude of impacts were strategically selected for comparative analysis. The FFD borings were completed approximately 1 foot away from the previously completed LIF borings. WCEC found that both of these technologies did define LNAPL, provide real-time data, have a similar production rate, and provide geological information. However, WCEC concluded that the UVOST held many advantages over the FFD, including push-probe delivery, a more intuitive output to quickly "fingerprint" the LNAPL, and product definition. In addition, much narrower occurrences of LNAPL could be observed with the UVOST. WCEC presented the findings of the comparative analysis at the Railroad Environmental Conference in Urbana, Illinois.

After the completion of the FFD/LIF comparative analysis, WCEC became a leader in the application and understanding of LIF technology for environmental investigation. This included promoting the technology at conferences and training events such as ITRC's *Light Non-Aqueous Phase Liquids: Science, Management, and Technology* - 2 Day Classroom Training events, which were sponsored and attended by WCEC in Minnesota, Michigan, Massachusetts and Pennsylvania. These conferences were also attended by state and federal environmental agency representatives nationwide. In addition, WCEC mobilized a UVOST unit to Australia for 3-4 months to provide the first LIF services in that country, taking the opportunity to educate regulators and environmental professionals through field demonstrations. WCEC has been an integral part of bringing the LIF technology to the mainstream consulting community.

Soil Color Optical Screening Tool

In 2008, Dakota Technologies Inc. (DTI) developed a soil color optical screening tool (SCOST), which uses a white-light source to distinguish between different soil horizons based upon their color. The SCOST is delivered with push-probe technology, and the results are generated on site in real-time. The operator is provided with an output showing RGB and Munsell color information, with the capability of displaying the specific hue, value, and chroma of each data point.

After WCEC learned of the development of the SCOST instrument, we evaluated whether the SCOST would be able to distinguish between sodium permanganate, which has a bright violet color, and the native soils in Minnesota. Based on our research, we believed that the SCOST instrument could be used for this purpose and quickly coordinated a one-day field test at a site where a sodium permanganate in-situ chemical oxidation (ISCO) injection program had recently been completed. We collected SCOST data in the injection area, as well as at various distances (perimeter, 10 feet, 25 feet and 50 feet) along a transect from the injection area. The SCOST was able to distinguish the violet color of the sodium permanganate from the gray color of the native soil. As expected, the thickness of the sodium permanganate was observed to decrease as distance increased from the perimeter of the injection area. The results of the field test were submitted to the MPCA. During subsequent discussions with the MPCA, an unexpected observation was made regarding the vertical distribution of the sodium permanganate; the sodium permanganate was only observed at depths equal to the maximum vertical extent of the injection borings despite injection of the permanganate at several different depths in each boring. Thus,

application of the SCOST technology provided information about the ISCO distribution that was not previously attainable. WCEC included these results as part of a conference presentation of optical screening tools.

Low-Level Membrane Interface Probe Application

WCEC was the first consulting firm to purchase and utilize the Low-Level Membrane Interface Probe (LLMIP) developed by GeoProbe in 2012. WCEC used this innovative technology to investigate the origin, fate, and transport of aqueous-phase MTBE at a site in northwest Montana. WCEC researched potential investigative tools which would provide in-situ detection of the dissolved MTBE plume at low parts per billion (ppb) concentrations. Following identification of the LLMIP and its applicability, WCEC worked with the Montana Department of Environmental Quality (MTDEQ) and state reimbursement fund in development of a work plan which incorporated this innovative technology. WCEC completed the investigation using the LLMIP in October 2012, which successfully defined the origin, extent, and magnitude of the MTBE impacts to groundwater.

Multi-Phase Extraction Technology

Multi-Phase Extraction (MPE) technology is an effective remediation strategy in a variety of contamination and geologic conditions. WCEC determined that implementation of the MPE technology would allow us to effectively remediate complex environmental cleanup sites. To optimize our use of this technology, WCEC hired Mr. Jarda Solc, the industry leader in MPE and remediation system design and implementation, as our Senior Advisor. Mr. Solc advised WCEC on proper remediation system pilot testing, design, and operation, and he and WCEC's engineering team designed and constructed a mobile MPE trailer equipped with automated controls and remote data acquisition systems, enabling successful completion of pilot testing and short-term remediation. WCEC has implemented this innovative, mobile technology to complete MPE pilot tests and targeted remediation programs for our own projects as well as other consultants' projects as a contracted service.

Solar-Powered Free Product Recovery System

WCEC's recognition of the challenges related to remediation at sites with no electrical power supply led to research, evaluation, design, construction, and implementation of a solar-powered free product recovery system which uses passive skimmers. WCEC had to address unique challenges in the design phase, including sizing system elements to match the power supply from solar panels, while maintaining safety and control features. The system was sized to fit into a site job box which provides both protection from the elements and security. Upon installation and operation, the client requested that WCEC design, build, and install similar systems at additional sites. Furthermore, these solar-powered free product recovery systems serve to establish "green practices" and maintain a small remediation carbon footprint at sites where this innovative technology can be applied to achieve remediation goals.

Electrical Resistance Heating

WCEC recently evaluated and submitted a cost proposal to use electrical resistance heating (ERH) to remediate a site with a relatively large volume of No. 6 fuel oil NAPL existing beneath buildings. Due to

the high viscosity of the No. 6 fuel oil and its location beneath buildings, many traditional remediation alternatives were not applicable. WCEC researched and evaluated various remediation technologies and selected ERH as the most potentially viable option for NAPL cleanup at the site.

Ozone Injection

WCEC's Montana office has researched and developed a method for using ozone (0_3) injection to achieve various remedial goals at hydrocarbon contaminated sites, including pre-treatment of groundwater in a large-scale water treatment system to reduce biological fouling of system components and reduce system maintenance frequency. WCEC has successfully completed numerous pilot studies and implementation of full-scale ozone sparge remediation systems and has received high acclaim from the MTDEQ for pursing this innovative technology.

A.3.44 Presentations

WCEC has experience preparing content for and giving technical presentations to technical and non-technical stakeholders associated with environmental site investigations and cleanups. WCEC understands the importance of presenting technical information in a clear and concise manner so that stakeholders that may not be familiar with the technical details of our work can still grasp the important aspects of a project. Use of our three-dimensional Integrated Site Visualization™ tool allows complex information to be easily evaluated and understood by both technical and non-technical interested parties. Our ISV diagrams and figures prevent misconceptions that often result when using two dimensional plots to represent the three-dimensional subsurface environment.

WCEC staff that are responsible for preparing multimedia presentations, conducting the meetings, and interpreting the data and objectives of the plans will dry-run the presentations to other WCEC technical staff to ensure that the material is clear and achieves the objective of the presentation. Providing technical presentations is important, not only to compile information and address local concerns with water and resource issues, but to also provide interpretations of the data to the attendees. Numerous public presentations have been given by WCEC staff over the last 20 years concerning the importance and implications of local resource management and other environmental concerns.

WCEC is involved with local watershed planning organizations, and our staff has provided presentations to these groups periodically. These meetings were important to not only compile information and understand local concerns with water and resource issues, but to provide interpretations of the data to all attendees.

As a technology leader in the use of LIF and related optical screening tools, WCEC has provided numerous presentations for state agencies, for individuals, and at national conferences on the use of these technologies. The focus of many of these presentations has been providing site characterization at sites requiring cost-effective evaluation of contamination, post-injection reagent distribution, and the presence of buried soil horizons for geophysical and cultural resource applications.

A.3.45 Stormwater Program Management During Construction

WCEC's professional engineers and project scientists have experience overseeing the implementation and maintenance of Storm Water Pollution Prevention Plans (SWPPP) during construction activities to maintain compliance with state and federal storm water management regulations and site specific best management practices (BMPs). Oversight activities include ensuring proper installation of temporary erosion/sediment control measures during the construction phase of projects through establishment of final vegetative cover for permanent site stabilization. WCEC's storm water program oversight project experience ranges from designing, installing, and maintaining erosion and sediment control at various remediation sites, to performing contractor oversight and long-term storm water permit compliance monitoring at subdivisions.

WCEC has prepared, implemented, and provided contractor oversight during installation of erosion control measures and BMPs at numerous sites to comply with state and federal requirements administered under the Clean Water Act (CWA). The purpose of an erosion control plan is to prevent impacts to natural resources resulting from hydraulic sediment transport and overland sheet flow during or following construction activities which disturb the natural vegetation or ground cover. Specifications for erosion control measures are included as components of the site specific SWPPP and are implemented during construction activities in accordance with the applicable stormwater management permits. WCEC has experience designing, implementing, and overseeing deployment of erosion control measures which are compliant with National Pollutant Discharge Elimination System (NPDES) permit requirements.

A.3.46 Provide Technical Assistance to the State

WCEC work under current professional/technical and emergency response contracts with the Minnesota Agencies includes the evaluation of data and the interpretation and presentation of the data in submittals to the Agency contacts. This aspect of our work is a daily occurrence.

When requested, WCEC reviews the data provided by the Agency and provides a technical interpretation of the information, often with evaluation of additional information from public domain sources. A common example of this is in the preparation of a Work Plan under the current MPCA/MDA Professional/Technical Master Contract. WCEC reviews the information made available by the Agency and conducts a file review at the agency office when appropriate. Additional information available to WCEC is reviewed, and the cumulative information is interpreted for the formulation of appropriate additional actions based on the current applicable agency policies.

Examples of specialty subject matter areas where WCEC has provided technical assistance to the Agency include land zoning and development plan review, interpretation of local codes as they apply to Agency projects, evaluation of data for surface water feature classification as part of surface water receptor risk evaluation, Health and Safety questions, review of MPCA petroleum corrective action updates, and fiscal projections for budget planning purposes. As a technology leader in direct-sensing and high-resolution

site characterization services, WCEC also assists other firms with the interpretation of site data collected using laser-induced fluorescence (LIF) investigation methods.

WCEC believes in providing service to the overall community of environmental professionals. Our firm has contributed to the Interstate Technology and Regulatory Council (ITRC) in various ways for several years. Joann Dyson, PhD, of WCEC has served on the LNAPL Update Team since 2016 and was selected for a 2017 Award in the Industry Affiliates Program. Dr. Dyson continues to serve ITRC as a content trainer for the ITRC web-based training program and as a member of the Implementing Advanced Site Characterization Tools (ASCT) team.

A.3.47 Oversight of RP and VP Contractors

WCEC has the technical experience and program-specific knowledge pertaining to the MPCA Superfund Program, the MDA Remedial Investigation Program, the MPCA Petroleum Remediation Program and other regulatory programs in Minnesota to provide efficient and effective Responsible Party (RP) and Voluntary Party (VP) contractor oversight during remedial investigations and corrective action implementation. Our many years of experience directly performing contractor duties in these programs has established a strong competency base from which we can reliably perform oversight on behalf of the governing Agencies.

For the work we complete on behalf of the RP or VP, oversight is a vital element in documenting that approved plans (e.g. RAP, Construction Contingency Plans) are followed. In some cases, WCEC is asked by another party (typically an Agency or affected stakeholder) to observe the Contractor activities and document that the approved plans are followed. In addition, oversight provides an opportunity to formulate a solution to unanticipated site conditions that may arise during work on a site.

Oversight of RP and VP contractors may include, but are not be limited to, the following:

- Provide technical support to the involved Agency's Remedial Project Manager (RPM) in monitoring RP or VP compliance with applicable Settlements, Stipulation Agreements and work plans
- Assist in reviewing the professional qualifications of Remedial Design Professional, Remedial Action Constructors, and independent Quality Assurance Teams
    - Review Remedial Design and Remedial Action Work Plans
    - Review design support data including field investigations and treatability study results
- Review Remedial Design submittals to determine if they are protective of the public health and the environment, comply with governing documents such as Records of Decision (ROD), and will attain the performance criteria specified in the Settlement Agreements and work plans
- Monitor compliance with the Construction Quality Assurance Plans, schedule, and the approved plans and specifications
- Collect split samples in the field, following the established quality assurance/quality control protocols provided in the project QAPP and/or SAP

REPRESENTATIVE EXPERIENCE

Woodbury, Minnesota

WCEC provided MPCA with oversight of work being completed by a VP environmental consultant at a landfill in Woodbury, Minnesota over a four-day period in 2008 and in 2017. WCEC observed and confirmed work being completed by the VP's consultant and periodically collected water level measurements alongside the VP's consultant to confirm the accuracy of the data. The work was completed as part of a hydraulic evaluation study designed and completed by the VP's consultant to evaluate the effect that four barrier pumping wells have on ground water at a site with contaminated bedrock aquifers in southern Washington County, Minnesota.

WCEC further assisted the MPCA in 2012 by collecting split ground water samples from monitoring wells and residential wells at and down gradient of the landfill. WCEC coordinated the purging and sampling of the residential wells, while the VP's environmental consultant coordinated the purging and sampling of the monitoring wells. WCEC provided oversight and documentation of the work and delivered the samples to the state's laboratory for eventual comparison to the VP's own laboratory data.

WCEC recognizes that during oversight projects, only the governing Agency is authorized to approve changes to previously approved work scope items. It is the responsibility of WCEC in the role of oversight contractor to communicate with the governing Agency and the RP and VP contractors in a manner that facilitates efficiency and timely responsiveness by all stakeholders to issues or concerns that may arise during implementation of work.

Where RP and VP contractors have shown themselves to be reliable and technically competent, WCEC may recommend use of sporadic inspections rather than continuous oversight to result in significant oversight cost savings to the Agency. Using unscheduled inspections is most appropriate where a construction project is fairly routine, and/or a particular process is to be repeated multiple times.

REPRESENTATIVE EXPERIENCE

Cottage Grove, Minnesota

WCEC provided assistance to the Emergency Management Unit (EMU) of MPCA in 2017 to secure design of a granular activated carbon (GAC) drinking water treatment system compatible with existing community infrastructure associated with source water from municipal wells 3 and 10. The construction oversight by WCEC involved documentation of facility construction and vessel installation in conformance to the City-approved plans, MPCA contracting procedures, and the MDH-approved designs and procedures.

City of Lake Elmo, Minnesota

WCEC assisted MPCA in 2011 and 2012 by coordinating and overseeing the splitting of ground water samples from an unused municipal well with a VP's environmental sampling technician. WCEC coordinated purging and sampling, provided oversight and documentation of splitting of the samples with the VP's technician, delivered the samples to the state's laboratory for eventual comparison to the VP's own laboratory data.

REPRESENTATIVE EXPERIENCE

Brooklyn Center and Richfield, Minnesota

WCEC assisted MPCA in 2009 by providing oversight of the installation of sub-slab depressurization (SSD) systems at several homes in Brooklyn Center, Minnesota in response to trichloroethylene (TCE) vapors from a former dry cleaner site. Similar work is ongoing in Richfield, Minnesota and has involved the first nine homes to be mitigated. In addition to providing oversight of the state contractor to install the vapor recovery systems, WCEC assisted MPCA by returning to the sites to collect 24-hour indoor air samples, collect additional sub-slab vacuum measurements, and to oversee the work by the state contractor to modify some of the SSD systems with additional suction pits and/or a larger blower.

A.3.48 Oversee and Perform Bench-Scale Lab Treatability Studies, Pilot Testing and Field Demo

WCEC has completed treatability studies at contaminated sites that have included various petroleum compounds, chlorinated solvents, PCBs, and agricultural chemicals. Treatability/feasibility studies related to soil remediation performed by WCEC include soil excavation, on- and off-site treatment, soil vapor extraction, and vacuum vaporizer systems. In addition, we have managed and completed several in-situ and ex-situ bioremediation projects. WCEC has extensive experience with soil composting and bio-piles and has constructed dozens of compost piles to remediate petroleum, agricultural chemical, and solvent contaminated soil.

REPRESENTATIVE EXPERIENCE

Biodegradation Remedy Treatability Study and Implementation, Norwood, Minnesota

WCEC was requested by the client to provide an alternative to land farm treatment for alachlor impacted soils. Land treatment and other remedial options were explored and deemed not feasible because of the high contaminant levels and the large amount of soil. WCEC proposed a bench-scale treatability study to biodegrade the contaminated soils, which was approved by the MDA. USEPA protocols for biodegradation remedies (under CERCLA) were applied to the study, with six portions of soil being equally divided into control and treatability groups. Calculations for the total volume of nitrogen source and bulking agent were necessary to determine the amounts of these to be added to the soil lifts. Piping was incorporated into the soil test piles to facilitate the ventilation / bioremediation process of the pile.

WCEC established a sampling schedule and protocol to measure the effectiveness of the bioremediation process in the soils and the air emissions. Upon completion of the successful bench-scale study, WCEC completed bioremediation of the 1,500 yards of soil with this process. The reductions in contaminant levels that were achieved allowed the soil to be economically land farmed, with substantial overall cost savings for the treatment process.

WCEC has also completed pilot testing / field demonstrations for several innovative site characterization tools, as well as remediation systems. For example, WCEC pilot tests remediation option alternatives by using a multi-phase extraction (MPE) system mounted in a mobile trailer. WCEC's professional experience completing this type to work, combined with our experience overseeing contactors, makes

WCEC highly qualified to oversee the completion this type of work under the MPCA and MDA Master Contract.

REPRESENTATIVE EXPERIENCE

PCE Compost Pile, Frederick, Wisconsin

An example of WCEC's innovation and cost-effective project implementation is our construction of a compost pile to treat perchloroethylene-contaminated soil on a site in Wisconsin. Before our involvement, it was proposed that soil be excavated and hauled off site for disposal in a hazardous waste landfill at a cost of over $500,000.

The responsible party indicated a less-costly alternative was desired, even if it took considerably longer to implement. WCEC excavated the soil and constructed a compost pile on site under a RCRA permit. After 23 months of treatment, the soil was no longer considered hazardous and was spread on site. Treatment was completed for less than one-third of the cost to landfill the soil, and we eliminated the potential for future liability associated with hazardous waste landfills.

Working Study: High Resolution Subsurface LNAPL Investigation Technologies

In 2005, WCEC completed an evaluation of two different direct sensing tools which utilize ultra violet light to fluoresce petroleum hydrocarbons in the subsurface. The tools were the fuel fluorescence detector (FFD) and the ultraviolet optical screening tool (UVOST), also known as the laser-induced fluorescence (LIF) detector. WCEC advanced the FFD at three sites that were previously investigated using LIF technology. Sites with different soil textures, contaminant types, and magnitude of impacts were strategically selected for comparative analysis. The FFD borings were completed approximately 1 foot away from the previously completed LIF borings. WCEC determined that each of these technologies defined LNAPL, provide real-time data, have a similar production rate, and provide geological information. However, WCEC concluded that the UVOST held many advantages over the FFD, including push probe delivery, a more intuitive output to quickly “fingerprint” the LNAPL, and product definition. In addition, much narrower occurrences of LNAPL could be observed with the UVOST. WCEC presented the findings of the comparative analysis at the Railroad Environmental Conference in Urbana, Illinois.

Since the completion of the FFD/LIF comparative analysis, WCEC has become a leader in the application and understanding of LIF technology for environmental investigation. This experience includes promoting the technology at conferences and training events, including the ITRC Light Non-Aqueous Phase Liquids: Science, Management, and Technology - 2 Day Classroom Training events which has been sponsored and attended by WCEC in Minnesota, Michigan, Massachusetts and Pennsylvania, and is also attended by state and federal environmental agency representatives nationwide. WCEC has been an integral part of bringing the LIF technology to the mainstream consulting community.

Soil Color Optical Screening Tool

In 2008, Dakota Technologies Inc. (DTI) developed a soil color optical screening tool (SCOST) which uses a white-light source to distinguish between different soil horizons based upon their color. The SCOST is

delivered with push-probe technology, and the results are generated on site in real-time. The operator is provided with an output showing RGB and Munsell color information, with the capability of displaying the specific hue, value, and chroma of each data point. After WCEC learned of the development of the SCOST instrument, we evaluated whether the SCOST would be able to distinguish between sodium permanganate, which has a bright violet color, and the native soils in Minnesota.

Based on our research, we believed that the SCOST instrument could be used for this purpose and quickly coordinated a one-day field test at a site where a sodium permanganate in-situ chemical oxidation (ISCO) injection program had recently been completed. We collected SCOST data in the injection area, as well as at various distances (perimeter, 10 feet, 25 feet and 50 feet) along a transect from the injection area. The SCOST was able to distinguish the violet color of the sodium permanganate from the gray color of the native soil. As expected, the thickness of the sodium permanganate was observed to decrease as distance from the perimeter of the injection area increased. The results of the field test were submitted to the MPCA. During subsequent discussions with the MPCA, an unexpected observation was made regarding the vertical distribution of the sodium permanganate; the sodium permanganate was only observed at depths equal to the maximum vertical extent of the injection borings despite injection of the permanganate at several different depths in each boring. Thus, application of the SCOST technology provided information about the ISCO distribution that was not previously attainable.

A.3.49 Assist and Provide Training as Requested by the MPCA or MDA

WCEC is highly qualified to provide training to the MPCA and MDA or to assist others who are providing training. In addition to previously coordinating and providing requested training courses to the MPCA and MDA, WCEC has also provided extensive training for private clients in Minnesota, South Dakota, Montana and the Bahamas. Training topics related to this contract have included ambient and personnel air monitoring, laser-induced fluorescence, multiphase extraction and remediation. In addition, WCEC has a staff member that is part of the LNAPL-3 internet-based training team.

Past experience with applicable training also includes the following:

- WCEC participated in on-site field training for the MPCA while conducting a multiphase extraction pilot test at a petroleum release site in Walker, Minnesota.
- WCEC coordinated and ran MPCA Terror Incident Debris Management seminars and workshops for the MPCA Spill Response Unit.
- WCEC provided foam application training to the MDA as a means of depopulating diseased poultry to prevent further outbreak and spreading of disease. Training was provided as part of the MDA Animal Disposal Plan.
- WCEC has presented on-site training during LIF investigations to regulatory personnel, stakeholders, and other consultants, as well as provided LIF workshops at environmental field conferences.

- WCEC coordinated and provided National Incident Management System (NIMS) training for the MPCA staff on multiple occasions from 2006-2009. NIMS training was also provided to city of Sioux Falls, South Dakota by request, and to Minnehaha County and Air National Guard personnel; approximately 17 classes were offered over a period of two years.

Additional training proved by WCEC has included chemical assessment, spill response, containment booming and diking techniques, NIMS, and tank compliance.

A.3.50 Follow MPCA Green Practices and Procedures for Remediation Project

Green and Sustainable Remediation (GSR) are site-specific methods and technologies used to reduce the negative environmental, social and economic impacts of remediation and investigation projects - without impairing the reduction in risk to receptors or reducing the thoroughness or effectiveness of the investigation / remediation objectives. GSR methods and techniques are most beneficial when incorporated as early as possible in a project but may be implemented at any time during a project.

GSR planning and implementation of Best Management Practices (BMPs) is conducted by WCEC on every project. As opportunities emerge, we apply a second level of GSR evaluation to identify affected stakeholders (local individuals, municipalities, other involved agencies and stewards) to enhance the economic, social, and environmental benefits of our activities. The MPCA has considerable resources and "toolkits" to go beyond these first two tiers of GSR, which involves greater stakeholder involvement and communication. Such projects would typically invoke a Life Cycle Assessment (LCA) to quantify the functions and values associated with remedial alternatives. Social acceptance of a planned response action becomes more critical with especially large or complex projects. A negative social response can lead to greatly increased consumption of agency resources, reducing the staff time available to work directly on environmental problems. Examples of the communication tools used by MPCA with a sustainable remediation benefit include the Vapor Intrusion site summaries, and project-specific online content pages hosted through the MPCA web site.

WCEC strives to incorporate green aspects into investigation and remediation projects. Where practicable, WCEC incorporates guidance from MPCA Guidance Document *Green and Sustainable Remediation, Petroleum Remediation Program*, the Interstate Technology and Regulatory Council (ITRC) overview document: *Green and Sustainable Remediation: State of Science and Practice*, GSR-1, 2011, and technical and regulatory guidance: *Green and Sustainable Remediation: A Practical Framework,* GSR-2, 2011. ITRC is one stakeholder coalition devoted to the advancement of remediation technology, and optimized stakeholder value.

REPRESENTATIVE EXPERIENCE

Mac's Inn, Detroit Lakes, Minnesota

WCEC incorporated multiple green practices in the completion of this project. During the early stages of work, a solar skimmer was used to recover subsurface LNAPL at the site. Solar panels powered the compressors which operated the LNAPL skimmers. Not only did this process save energy (costs of connection and costs of supply) and minimize the unnecessary environmental impacts of excessive groundwater recovery and disposal, it also saved the client considerable expense.

The LNAPL that was collected from the solar skimmer was transported to a nearby facility where it was blended with other fuels and recycled, preventing disposal as a waste and reducing overall project costs. Dedicated pumps and tubing were used at the site for sampling the wells, to eliminate excessive waste tubing and decontamination water waste.

By reducing the negative "project footprint" invading the lives of stakeholders, a more sustainable remediation approach can be implemented. This can reduce the anxiety over the work being performed, and reduce the cost of restoring infrastructure impacted by the remedial actions. Some sites are more amenable to a low profile, distributed form of response action that can minimize disturbance and public anxiety.

REPRESENTATIVE EXPERIENCE

Speedstop Northway, St. Cloud, Minnesota

GSR methods and techniques were employed early in the planning stages of the Speedstop Northway project. The vapor extraction system at the site is separated into three separate systems, which operate on multiple small blowers. All four of the system motors were selected for optimum efficiency, based on their performance curves and available site data for system designs.

Separating the system into multiple systems has both short and long-term advantages. Less underground piping was initially installed because of the proximity of one of the systems to the areas that need to be remediated. Also, minimal soil was disturbed and taken for disposal during installation. Separating the system into multiple systems allowed for greater flexibility as the project progressed. As vapor contamination levels decrease or the contaminant plume moves, remediation systems are easily adjusted and taken off line with minimal changes to the system.

Each system is housed in an insulated, non-heated building. Low-consumption tracer cable is around instruments that need to be protected from freezing, and this is controlled to operate only when freezing conditions could occur. Underground piping is also insulated to lower the chance of breakage/replacement.

Rather than using high carbon-footprint technologies such as granular activated carbon filters (which require repeated thermal regeneration once spent) or thermal oxidizers (which are energy and fuel intensive) to reduce vapor emission levels, WCEC installed vertically extended discharge stacks that disperse vapors to safe levels before reaching the breathing zone. This approach (cont.)

REPRESENTATIVE EXPERIENCE

Speedstop Northway, St. Cloud, Minnesota (continued)

was modeled using applicable MPCA calculation tools.

A telemetry system has been installed for remote monitoring of site equipment. Monitoring the system remotely greatly reduces the vehicle miles traveled to the site because data are collected in real time, and mechanical problems can be detected and quickly addressed to eliminate additional damage and repair that consume resources; this also avoided multiple site trips and ultimately reduced the cleanup timeframe.

A.3.51 Oversee Hydrogeologic Investigations and Fate and Transport Modeling

WCEC's team of geologists and engineers have designed and supervised numerous hydrogeologic investigations over the past 20+ years from small scale LNAPL recovery slug tests at individual free product recovery wells to urban watershed analysis for public water supply well head protection plans and Comprehensive Local Water Management Plans for the Minnesota Board of Water & Soil Resources (BWSR). WCEC staff are knowledgeable in current applications of advanced hydrogeologic modeling programs such as AutoCAD Civil 3D, ArcGIS, and Ctech's Environmental Visualization System (EVS-Pro), as well as the fundamental geostatistical principals they are based upon.

WCEC was one of the first consultants in Minnesota to own and operate Geoprobe™ push probe soil and groundwater sampling technology. WCEC grew its drilling capabilities into an industry leader in geophysical direct sensing technologies and employed downhole probes (electrical conductivity (EC), hydraulic profiling tool (HPT), ultra-violet optical screening tool (UVOST), membrane interface probe (MIP), etc.) to obtain hydrogeologic and contaminant parameters in the field. Although the drilling services are now run through a sister company, Dakota Technologies, this comprehensive experience has resulted in a high level of staff expertise. These parameters are processed in real-time to produce two-dimensional and three-dimensional visualizations to aid the field geologist in interpreting subsurface information throughout the investigation. The result is that better informed decisions are made in the field, rather than after the fact in the office, which reduces overall project costs and accelerates clean-up processes at contaminant release sites. Use of 3D visualization tools also allows complex information to be easily evaluated and understood by both technical and non-technical interested parties. Our Integrated Site VisualizationTM (ISV) deliverables prevent misconceptions that often result when using two-dimensional plots to represent the three-dimensional subsurface environment.

REPRESENTATIVE EXPERIENCE

East Bay Flathead Lake, Montana

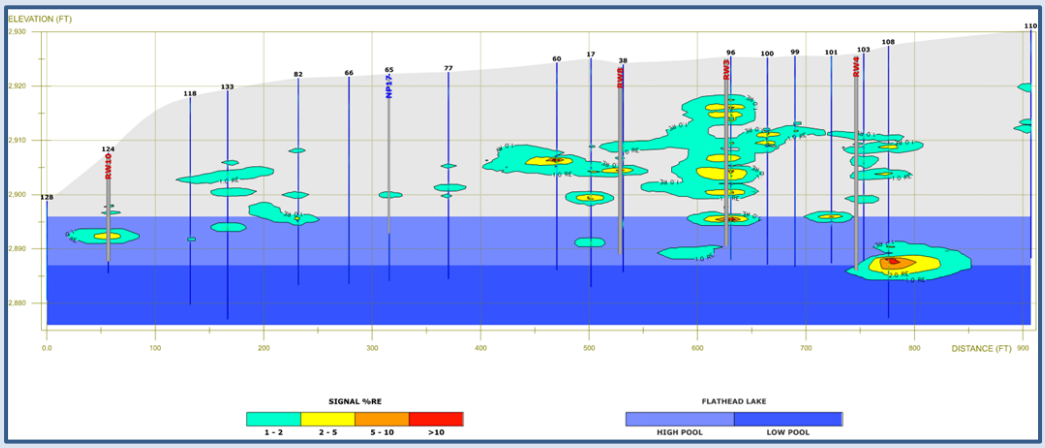
WCEC modeled groundwater discharge and contaminant fate and transport at a gasoline release in a fractured bedrock aquifer adjacent to a large, pristine mountain lake in western Montana. Hydraulic gradient values of up to 0.2 ft/ft were measured in the steep mountain-side slope and secondary porosity values measured in the Precambrian dolomite bedrock groundwater consisted of velocities of up to 100 ft/day. A zero tolerance policy for benzene impacts in the lake set by the regulatory agency (USEPA) required a swift and effective response.

WCEC used direct sensing technologies to map the bedrock surface and calculate the volume of impacted material in the overlying fine-grained glaciolacustrine sediments. Pump tests were performed using monitoring wells to obtain hydrogeologic parameters for design and sizing of a groundwater interceptor trench. WCEC oversaw the construction of over 500 lineal feet of trench along the lakeshore, which feeds a 500 gpm water treatment system with effluent limitations subject to NPDES permit limits. Ongoing water quality monitoring demonstrated that the trench was appropriately designed, and the trench capture zone effectively encompasses the downgradient extent of the dissolved phase plume.

REPRESENTATIVE EXPERIENCE

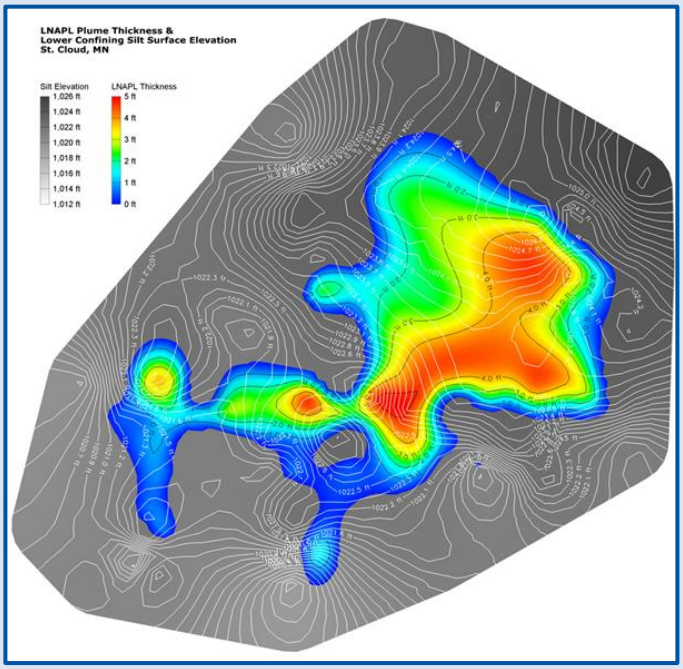
Polson, Montana

WCEC performed a hydrogeologic investigation in a fine-grained glaciolacustrine varved silt medium containing an extensive LNAPL body underneath the downtown area of Polson, Montana. Data from an LIF investigation performed by WCEC were coupled with post-processed sub-decimeter GPS data and surface topography LIDAR elevation data with 2-foot point spacing to generate detailed 2D and 3D visualizations of the LNAPL plume. Surface water and groundwater interactions were evaluated using cumulative groundwater monitoring well data and USGS gaging stations in adjacent Flathead Lake. Sub-surface lithology consisting of varved lakebed sediments resulted in a complex, stratified plume morphology which was evident in the visualizations prepared by WCEC. Isolated LNAPL lenses were identified at great depth, approximately 10 to 15 feet below the average groundwater table, a phenomenon that had not previously been documented during the past 20+ years of remediation activities performed by various responsible parties at the site. Fence diagrams were cut through the 3D LNAPL body to identify the most significant LNAPL bearing units. The fence diagrams were compared with LNAPL residual saturation and transmissivity value estimates from existing LNAPL well pump test data to site additional LNAPL recovery wells.



REPRESENTATIVE EXPERIENCE

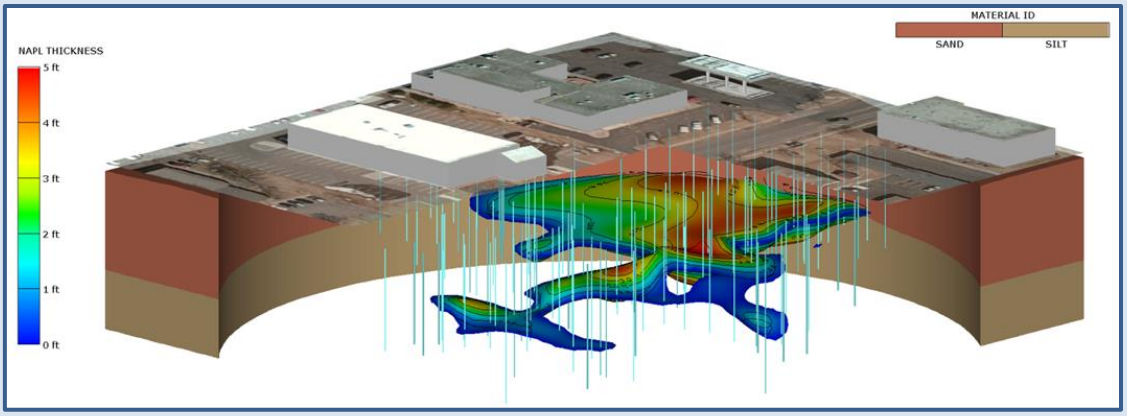
St. Cloud, Minnesota



Under the direction of the MPCA, WCEC completed a hydrogeologic investigation including contaminant fate and transport modeling as part of an emergency response/accelerated site investigation at a retail petroleum distribution facility in St. Cloud, Minnesota which had experienced a catastrophic petroleum release from a UST system.

Data from approximately 150 laser-induced fluorescence (LIF) boreholes distributed over approximately 4 large city blocks (approximately 6 acres) were used to develop 3D visualizations of the extent and magnitude of the actively migrating LNAPL body. Borehole locations were surveyed using an electronic total station to obtain tight horizontal and vertical control with sub-centimeter precision, enabling the creation of a high-resolution conceptual site model. Direct-sensing downhole electrical conductivity (EC) data were used to incorporate lithologic information. ISVs were developed based on the amalgamation of the LIF response data, EC lithology data, and the highly accurate surface topography data.

The 2D and 3D visualizations generated by WCEC using MVS software revealed a lower confining silt aquitard unit with a gently dipping gradient that appeared to be controlling horizontal and vertical migration of the LNAPL. Flow path analysis of the silt surface performed in AutoCAD Civil 3D confirmed that the axis of LNAPL plume migration was coincident with the calculated silt surface flow vectors. This information was crucial for project team leaders as the project transitioned from the emergency response into the remediation and cleanup phase.



WCEC personnel have the requisite education, training, and experience to perform capture zone analysis for the purposes of pump and treat system optimization and municipal wellhead protection. WCEC's capabilities for data analysis and representation range from traditional two-dimensional kriging interpolation of groundwater elevation contours to three-dimensional time domain animations using computer modeling software to visualize fluctuations in groundwater surface elevations and flow vectors over time. An example project is the aquifer pump test study conducted by WCEC for the city of Foley, Minnesota. The purpose of this study was to determine the susceptibility of municipal supply wells to intercepting dissolved phase contaminant plumes from known source areas and what influence supply well pumping rate might have on contaminant plume migration.

Historical data provided by the city were analyzed prior to initiating the pump tests to predict drawdown in adjacent observation wells for comparison with actual drawdown rates measured during the test. WCEC generated two-dimensional capture zone flow lines for each supply well based on groundwater elevation contours from the pump test data and calculated effective radial distances for each pumping cone. Contemporaneous analytical data from proximal and distal monitoring wells were assessed along with the hydrogeologic pump test data to determine whether the direction of dissolved phase plume migration was altered by pumping rate. Results from the study informed City Managers on recommended pumping rates and intervals for individual supply wells to minimize susceptibility of intercepting dissolved phase contamination.

WCEC staff geologists and engineers are proficient in the fundamental hydrogeologic principles required for designing and implementing aquifer pump tests. Aquifer tests are conducted with WCEC's mobile, automated pump and treat system to provide data regarding aquifer parameters as applicable to the specific test being conducted and the appropriate solution for estimating the following aquifer properties: vertical and horizontal hydraulic conductivity, transmissivity, storativity, specific yield, specific capacity, and boundary conditions if present. It is sometimes necessary to perform a step drawdown test to determine the optimum pumping rate for an aquifer test. Detailed aquifer test parameters are presented to the MPCA, MDA or other Contract user in site-specific work plans based on the project objectives and site conditions.

In situations where the pilot test is attempting to influence groundwater hydraulics (e.g. aquifer pump tests, MPE, etc.), WCEC uses the standard rules of thumb for aquifer test durations of 72 hours for an unconfined aquifer, and 24 hours for a confined aquifer, as the theoretical timeframe to achieve steady state conditions. Where appropriate, slug tests are performed on one or more monitoring wells to obtain data on the hydraulic conductivity of the deposits screened by the wells. Slug test data is collected utilizing transducers and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976) or other methods as appropriate.

WCEC has completed aquifer pump tests to gather data for a variety projects including, among others, the following examples: 1) calculating hydraulic conductivity values for septic system permitting and design in residential developments; 2) obtaining LNAPL transmissivity values and recovery rates for free

product removal at petroleum release sites; 3) estimating discharge rates in a fractured bedrock system for design and sizing of a large scale water treatment system groundwater interceptor trench; and, 4) analyzing depression cone radial distances for municipal well head protection. A specific example project is the aquifer pump test performed for the city of Foley, Minnesota presented above.

A.3.52 Prepare and Oversee SWPPP Implementation

WCEC's engineers are experienced with the preparation of Storm Water Pollution Prevention Plans (SWPPP) as a component of the overall permitting requirements for various remediation and construction projects. This experience includes knowledge, application, selection, and design of best management practices (BMPs), which are administered under the MPCA General Stormwater Permit for Construction or equivalent state and federal regulations. WCEC's general project experience includes SWPPP preparation for use in obtaining the required construction permits at various remediation projects involving significant construction elements.

WCEC has prepared, implemented, and provided contractor oversight during installation of erosion control measures and BMPs at numerous sites to comply with state and federal requirements administered under the Clean Water Act (CWA). The purpose of an erosion control plan is to prevent impacts to natural resources resulting from hydraulic sediment transport and overland sheet flow during or following construction activities which disturb the natural vegetation or ground cover. Specifications for erosion control measures are included as components of the site specific SWPPP and are implemented during construction activities in accordance with the applicable stormwater management permits. WCEC has experience designing, implementing, and overseeing deployment of erosion control measures which are compliant with National Pollutant Discharge Elimination System (NPDES) permit requirements. An example of our experience was the preparation WCEC of an erosion control plan as a component of an NPDES permit for a large-scale remediation project adjacent to a sensitive surface water receptor involving federal, state, and tribal regulatory oversight.

A.4 Project Descriptions

The following sections summarize three projects managed WCEC within the past five years. The project descriptions include one hazardous waste profiling and disposal project, one agricultural chemical investigation, and one hazardous vapor mitigation project. The project described in Section 1.4.3 is an example of where WCEC conducted the investigation and completed the approved response action.

A.4.1 Hazardous Waste Site – Riverside Sanitation

Riverside Sanitation (RVS) contacted WCEC in February 2018 when a garbage truck driver noticed mercury leaking from his garbage truck onto a residential alleyway after picking up a demolition dumpster at a private residence in New Ulm, MN. Approximately 2 gallons of elemental mercury had been placed into a demolition dumpster which impacted approximately 380 feet of alleyway, a garbage truck, a roll-off dumpster, and the subject property house and garage.

WCEC provided the following services to Riverside Sanitation and MPCA:

- Project management for recovering mercury impacted debris, including decontamination of private and public property.
- Stabilization and over-packing of leaking chemical containers.
- Inventory of all impacted materials for disposal.
- Oversight of hazardous waste profiling, labeling, sorting and packaging.
- Oversight and management of hazardous waste disposal.

A summary of pertinent project roles and persons responsible for them is as follows:

ROLES AND RESPONSIBILITIES OF PROJECT PERSONNEL		
Project Contacts	**Name**	**Key Roles, Tasks, Responsibilities**
Client	Riverview Sanitation, MPCA ER Team	Project Lead – Key Contact for Riverside Sanitation, MPCA ER Team
Emergency response Coordinator and Project Management	Jeremy Burns	Primary author of all WCEC reports, project coordination, and fiscal reporting
Scientists and Field Technicians	Kayla Hovde Jakin Flynn Joann Dyson	Hazardous Waste Recovery, Decontamination, Inventory, Documentation, Waste Sorting and Packaging Oversight
Subcontractors	Veolia Environmental Services	Waste Profiling, Waste Transport, Waste Disposal

Upon arrival at the site, WCEC screened fire department and police department personnel and vehicles using a Lumex™ Portable Mercury Analyzer (model RA915+) to ensure none of the initial response personnel or vehicles had been contaminated with mercury. WCEC began waste management activities by coordinating with the local police to control the access to the impacted alleyway. WCEC then began recovering puddles of pooled mercury in the alleyway to reduce the spread of mercury into the 12

adjacent residences along the alleyway. A storm drain located at the low point in the alleyway was also protected. CEC personnel used modified level B Personal Protective Equipment (PPE) including chemical resistant coveralls, inner and outer chemical resistant gloves, outer chemical resistant boot covers, and respirators equipped with mercury vapor cartridges. The Lumex™ was used to throughout the cleanup and recovery activities to assess and monitor the risk of vapor exposure during the stabilization and cleanup efforts. The Lumex™ was also used to screen responders when doffing PPE during shift breaks and at the end of each day to ensure residual mercury was not tracked/spread outside of the exclusion zone and ensure responders were not contaminated.

Alleyway Cleanup and Decontamination- WCEC utilized two large capacity mercury salvage vacuums equipped with high efficiency purified air (HEPA) filters (Minute Man® model #255155) to recover mercury beads and contaminated dirt/sand from the entire length of the alleyway. Once all visible beads were recovered, a dry amalgam powder (HgX™) was spread over the alley and then recovered with the mercury salvage vacuums. Following the dry application and recovery, another dry application was placed on the road surface which was then hydrated with water making a solution to increase effectiveness of the material to bond to the mercury. The removal sequence was then repeated and when the road surface dried. A post-remediation Lumex™ survey was conducted along the alley to ensure mercury vapors were reduced to acceptable levels. Precautions were taken prior to the wet application to protect the storm water inlet in the middle of the alley.

Garbage Truck Cleaning/Dumpster Decontamination – During the cleaning of the alleyway, the mercury impacted dumpster was emptied prior to being removed from the site. All visible mercury and debris was removed and placed into 55-gallon poly drums for eventual disposal. After the impacted items were removed, the dumpster was wrapped with 10 mil poly sheeting followed by secondary wrapping with 2-foot-wide packaging plastic. This ensured a tight and leak proof seal prior to transport of the dumpster from the site to RVS for further evaluation and cleaning. Once the dumpster had been relocated, and the plastic wrap removed, readings with the Lumex were collected and mercury vapors were within the acceptable range.

Following the initial identification of mercury in the garbage truck, the truck was secured at RVS where WCEC tarped it with 10 mil poly sheeting to prevent animals from entering and becoming contaminated/poisoned. The sheeting also protected the contents in the event of a precipitation event which could create impacted water and possible additional environmental issues if the garbage truck were to overflow with water. WCEC set up a 10-mil poly “drop cloth” beneath the garbage truck with elevated sides prior removing the impacted materials from the garbage truck and cleaning it to ensure that mercury would not cause impacts. WCEC personnel again used modified level B Personal Protective Equipment (PPE) while removing the impacted materials from the garbage truck and placing into poly drums, overpack drums, or poly lined cubic yard boxes for disposal. After all the rubbish was removed from the truck, WCEC performed a confined space entry to clean out all the small beads of mercury from the interior of the rear compartments of the garbage truck. An amalgam solution (HgX™) was applied to the walls, roof, floor, and mechanical components, and then removed with the Minute Man mercury

vacuum. This process was repeated several times until the mercury vapor readings inside the compactor compartment and rear collection area were below industrial standards for mercury vapors. Responders were screened when doffing PPE to ensure that there had been no breakthrough and no contamination was inadvertently transported from the site.

Subject Property Investigation/Remediation

After an initial survey with the Lumex™ meter indicated mercury impacts to the subject property home, WCEC dedicated a separate team of responders to begin remediation of the house while cleanup operations in the alley continued simultaneously. Three responders in modified Level B PPE began re-screening and removing impacted carpet from the stairs of the residence and began active ventilation to reduce mercury vapor concentrations. Impacts were primarily limited to the entry way, adjacent stairs going to the basement, and kitchen floor on the main level. A solution of hydrated amalgam powder was applied to the kitchen hardwood floors, allowed to sit and then removed with the Minute Man® mercury vacuum. This process was repeated until vapor survey results were within acceptable levels. Impacted carpet from the stairs was removed in strips and placed into 55-gallon poly drums for disposal.

Elemental mercury recovered throughout the duration of the project was placed into plastic bottles with lids, then placed in poly overpack drums. The original containers of mercury were also placed into poly overpack drums. All Hg impacted materials recovered throughout the project were placed into poly overpack drums, 55-gallon poly drums, and/or poly lined cubic yard boxes which were inventoried, weighed and segregated by cleanup location prior to pick up for disposal by Veolia ES Technical Solutions.

Over 4,650 pounds of hazardous waste including approximately 1.45 gallons of elemental mercury was recovered and inventoried during the cleanup. Waste was profiled and transported by Veolia ES Technical Solutions to Veolia ES Technical Solutions in Port Washington, Wisconsin for final disposal.

Outcome Achieved

WCEC assisted RVS and the MPCA in cleaning up the impacted alley, garbage truck, dumpster and private residence while ensuring no further expansion of the impacted areas occurred. The chemical recovery, decontamination, and inventory services provided by WCEC assured that the hazardous waste was properly handled, containerized, and transported for disposal, limiting impacts to the environment. The segregation and sorting of waste ensured that the wastes were managed safely, including segregation of costs to multiple parties for the project.

A.4.2 Agricultural Chemical Investigation – Former Farmers Coop Association, Jackson

The site is an agronomy facility consisting of four parcels including: a fertilizer plant and office (Parcel 1); a chemical and liquid fertilizer building (Parcel 2); a former fertilizer plant (Parcel 3); and a former oil warehouse and ammonia plant (Parcel 4). A remedial investigation was initiated when the site was enrolled into the MDA's Comprehensive Facility Investigation Program. In addition to the remedial

investigation, facility upgrades on Parcel 1 required completion of an expedited preconstruction assessment. Preconstruction and/or remedial investigation sampling identified fertilizer and pesticide impacts requiring soil corrective actions and additional groundwater monitoring on Parcel #1 and fertilizer impacts requiring soil corrective actions on Parcel #3.

The following is a summary of pertinent project roles and responsible staff:

PROJECT ROLES AND RESPONSIBILITIES		
Project Contacts	**Name**	**Key Roles, Responsibilities**
Client	Paul Lange 507-726-4438	Compliance and Safety Director
MDA Management	Deborah Madsen (Project Manager) 651-201-6632, Rich Rippley (Hydrologist) 651-201-6370	Incident Response Unit Project Manager, Incident Response Unit Hydrologist
WCEC Project Management	Shawna Conroy – Project manager Jeff McCoy – Senior Project Manager	Primary author of all WCEC submittals to MPCA, project coordination, and fiscal reporting
WCEC Field Technicians	Marina Cord, Mel Hamling, Ben James, Christopher Lesmeister	Field documentation, sample collection, report assistance
WCEC Drafter	Marina Cord, Melisa Hamling, Char Norlien	All WCEC drawings for reports
Subcontracted Laboratory	Pace Analytical, ECCS (former)	Sample analysis – certified lab
Subcontracted Driller	Dakota Technologies, Matrix Environmental	Site investigation borings and monitoring wells per MDH codes
Subcontractors	Svboda Excavating, Henning Rental J&J Spreading	Excavating/trucking, equipment rental, soil spreading

Remedial Investigation / Preconstruction Assessment

Twenty-two (22) High Risk Areas (HRAs) were assessed on Parcels 1-4 during the remedial investigation. WCEC recommended soil borings in 70 sampling locations within HRAs. A cost benefit analysis was completed, and it was determined that an on-site mobile laboratory should be used to analyze soil samples during the subsurface investigation. The use of the mobile laboratory was cost effective in that it allowed for full delineation of soil impacts during one mobilization. In total, soil borings were advanced in 55 additional sampling locations based on mobile laboratory data.

Nitrogen (nitrate as nitrogen and/or total Kjeldahl nitrogen) was documented in soil at levels above the MDA moderate risk to groundwater clean-up goals (clean-up goals) on Parcel 1 and Parcel 3. Pesticides, including acetochlor, dimethenamid and metolachlor, were also documented in soil at levels above clean-up goals.

During the remedial investigation phase, FCA Coop notified WCEC of plans to replace a concrete pad within an identified HRA and to construct a fertilizer building addition, both on Parcel 1. An expedited preconstruction assessment was completed to assess soil impacts beneath the proposed construction areas. Assessment sampling documented nitrogen and pesticide impacts above clean-up goals, indicating that corrective actions were necessary.

Soil Excavation

Based on remedial investigation and preconstruction sampling data, soil was excavated on Parcel 1 at the rail load-in and beneath the proposed construction areas. Soil excavations were also completed on Parcel 3 at the dry fertilizer load-out, eastern doorway of the dry fertilizer warehouse and equipment parking area. Corrective actions removed a total of 2,665 cubic yards nitrogen and pesticide impacted from Parcel 1 and Parcel 3.

Additional soil totaling 3,000 cubic yards was excavated from beneath the fertilizer building addition footprint for construction purposes. This soil was segregated from soil excavated for corrective action purposes.

Soil Disposal

Soil excavated as part of corrective actions (approximately 2,665 cubic yards) was land applied on 125 tillable acres at the approved application rate.

Soil that was excavated for construction purposes contained low levels of metolachlor, trifluralin, and nitrogen. Although concentrations were below clean-up goals, it was necessary to manage the soil under MDA guidance. The MDA requires that excavated soil found to contain detectable levels of pesticides or nitrogen must be removed from the site and land spread on tillable acreage. Because of the high soil volume (3,000 cubic yards), costs associated with loading, screening trucking, reloading and spreading the soil would have been significant with little benefit.

Alternatively, WCEC proposed a cost-effective option of using the soil as controlled fill and seeding the fill area with alfalfa. The MDA approved WCEC's recommendations and the soil was spread over 2.24 acres of FCA Coop property. The fill area was seeded with alfalfa, a wide-rooted plant, which provided the benefit of nitrogen consumption, limiting direct soil contact and preventing erosion. Erosion control fencing was placed around the fill area and the area was monitored bi-weekly for signs of erosion, particularly after rain events. Where required, areas were reseeded. Once the vegetative cover was fully established and it was clear that erosion was no longer a concern, the MDA discontinued site monitoring requirements.

Beneficial Use of Impacted Soils

Application Area following Alfalfa Seeding

Application Area following Alfalfa Germination

Groundwater Investigation

Three shallow monitoring wells were installed at Parcel 1 to evaluate nitrate/nitrite as nitrogen and MDA List 1 Pesticide impacts documented during the remedial investigation. Nitrate/nitrite as N levels were above the Minnesota Department of Health (MDH) Health Risk Limit (HRL) in groundwater collected from all three monitoring wells. Three additional shallow monitoring wells were installed down gradient of groundwater flow from the site. Groundwater monitoring was completed at the site over a total of fourteen consecutive quarters. Nitrate/nitrite as N levels remain above the HRL in groundwater at the site, but levels decrease significantly down and side gradient of groundwater flow from the site.

Throughout the groundwater investigation, risks associated with the groundwater exposure pathway were assessed and to be considered low based on the following:

- The site is not located within a Drinking Water Supply Management area;
- There are no resource wells located directly down gradient of groundwater flow from the site;
- Accessible surficial soil with nitrate/nitrite as N impacts above MDA soil clean-up values was removed from the site; and,
- The geologic unit underlying the site consists of low-permeability glacial till.

Based on the low groundwater exposure pathway risks, WCEC recommended the discontinuation of groundwater sampling and abandonment of the monitoring wells. The MDA approved WCEC's recommendations in February 2018. The monitoring wells will be sealed in accordance with the MDH Well Code when the ground thaws in late Spring 2018.

A.4.3 Hazardous Vapor Mitigation Site – St. Anthony Park Home

St. Anthony Park Home is an 84-bed privately owned and operated nursing facility. This facility is located on Commonwealth Avenue, west of Como Avenue, in a mixed residential/commercial neighborhood of St. Anthony Park in St. Paul. The facility had an accidental release of approximately 230 gallons of number two fuel oil from two 265-gallon heating oil above ground storage tanks in the basement. An undetermined amount of the released fuel migrated to underlying soil between concrete pavers that comprised the floor of the tank room.

The following is a summary of pertinent project roles and responsible staff:

PROJECT ROLES AND RESPONSIBILITIES		
Project Contacts	**Name**	**Key Roles, Responsibilities**
Client - Diesel Dogs Fuel Services, Inc.	Kevin Harvey 651-448-4321	Responsible Party of Release
Property Owner – St. Anthony Park Home	John Barker 651-632-3503	Responsible Party/Tank Owner
MPCA Project Management	Allen Dotson 651-757-2315 Rose Tusa 651-757-2490	Petroleum Remediation Project Manager Petroleum Remediation Hydrologist
WCEC Project Management	Paul Carter – Project manager	Primary author of all WCEC submittals to MPCA, project coordination, and fiscal reporting
WCEC Field Technicians	Greg Frank	Field documentation, sample collection, report assistance
Subcontracted Laboratory	Pace Analytical	Sample analysis – certified lab
Subcontractor	Vulcan	AST removal & replacement
Subcontractor	McDonough Sewer Services, Inc.	Hydro-excavation of contaminated soils
Subcontractor	Adler Tank Rental/River City Disposal	Contaminated soil storage/hauling
Subcontractor	Dem-Con Companies, LLC	Contaminated soil disposal
Subcontractor	Home Safety Solutions, Inc.	Partially subcontracted for VOC mitigation/SVE system installation

Project Description

The project started in January 2014 as an emergency response cleanup of a fuel oil release that occurred during the filling of the two 265-gallon above ground storage tanks. The initial response for the responsible party, Diesel Dogs Fuel Services, Inc. (Diesel Dogs), was contracted to Wenck Response Services, Inc..WCEC was contracted a few days later and worked with Diesel Dogs and St. Anthony Park Home, who was the tank owner and the responsible party for the leak, to complete the response actions, limited site investigation, system installation, reporting, and closure. WCEC completed the initial fuel recovery and reduced vapors by painting the floor and lower portions of the tank room walls that had been in contact with fuel. Vapors were vented continuously from the tank room and WCEC temporarily sealed the door from the tank room to the adjacent beauty shop/salon to mitigate offsite vapor migration.

A site investigation was completed and an Investigation Report with Conceptual Corrective Action Design (CCAD) was submitted. The CCAD recommended that corrective action should be completed as

soon as reasonably possible given that the residents of St. Anthony Park Home are a sensitive population with respect to potential exposure to petroleum vapors. The corrective action goal was to reduce the potential for petroleum vapors to enter the structure by, 1) excavating petroleum-saturated soils to the extent practicable and, 2) installing a sub-slab depressurization (SSD) system that would maintain a sufficient sub-slab vacuum. The system was eventually installed as a soil vapor extraction (SVE) system with vertical extraction points installed into the underlying petroleum-contaminated sand and gravel. The system operated continuously to remediate the source and maintain a high vacuum beneath the new concrete slab.

January - February 2014

In addition to fuel cleanup, vapor ventilation, and tank removal/replacement, vapor monitoring of the tank room and adjacent salon was routinely conducted throughout the project.

March - August 2014

Vapor monitoring of the home continued and an indoor building survey was completed concurrently with the completion of the limited site investigation. In addition to the standard scope of work for the limited site investigation, four hand-augered soil borings were completed through the concrete pavers of the AST room floor to evaluate the magnitude and depth of sub-slab contamination. Given the spill location and potential for exposure to residents of the home, MPCA requested that the source soil-gas sample be completed as a sub-slab sample rather than a standard soil gas sample. Analytical results showed high concentrations of petroleum compounds 33 times residential intrusion screening values. Instead of indoor air sampling, MPCA requested that corrective action be taken including excavation of contaminated soil to the extent practicable and installation of a SSD system to mitigate the subsurface vapor source to indoor air pathway. A CCAD was prepared and submitted with the Investigation Report form in August of 2014.

September-October 2014

The corrective actions approved by the MPCA were implemented by WCEC. Concrete pavers were removed and approximately 7 cubic yards (9.38 tons) of fuel oil contaminated soil was hydro-excavated from the top 1.25 feet of soil beneath the pavers (limited to the top 1.25 feet of soil as to not undermine footings). The hydro-excavator was used to pot-hole 3 locations for installation of vertical vent pipes consisting of perforated 4-inch diameter schedule 40 PVC approximately 5 feet below the base of the excavation, or approximately 6.5 feet below the base of the former pavers. The excavation was backfilled with pea rock and compacted with an electric vibratory compactor. The vertical vent pipes were connected to a horizontal 4-inch diameter schedule 40 PVC pipe, covered with additional pea rock and poly sheeting, and stubbed up in a corner of the tank room. A 3.5-inch thick slab of concrete was poured across the entire floor. WCEC subcontracted installation of system piping from the tank room over the salon and through the boiler room to the back side of the building. The above ground storage tanks and associated piping were reinstalled in the tank room by a vendor of St. Anthony Park Home. WCEC placed a regenerative blower on the roof of the kitchen, away from air intakes, and started vapor extraction. Two sub-slab vacuum measurement points were installed in the northeast and southwest

corners of the tank room (orthogonal to the orientation of the line of vapor extraction points), and sub-slab vacuum readings were collected with a manometer.

October - December 2014

System operational data (discharge air flow, system and sub-slab vacuum, PID readings), and vapor readings were collected in the tank room and salon (and nearly every month until submittal of the final Remediation System Operation Monitoring (RSOM) Report in May 2017).

January 2015

Submitted first RSOM Report.

February 2015

The regenerative blower was replaced with a RadonAwayTM SF180 mitigation fan.

April 2015

Submitted second RSOM Report.

August 2015

MPCA requested that one round of post-mitigation confirmation sampling be completed during the heating season and that the results of the work be reported with recommendations supporting site closure, additional investigation, or additional corrective actions. MPCA stated that “Given the need for continuous operation of the sub-slab depressurization system to achieve acceptable risk reduction for this site, an Environmental Covenant will be required prior to site closure.”

January 2016

WCEC drafted an Environmental Covenant and submitted it electronically to MPCA.

February 2016

Completed heating season sub-slab sampling. The results indicated that acceptable risk reduction had been achieved. Submitted third RSOM Report. The Environmental Covenant was not finalized.

February 2017

Collected a sub-slab vapor sample after the system had been off for 2 weeks, and PID readings from the tank room and salon. Restarted the system.

May 2017

Collected a sub-slab vapor sample after the system had been off for 2 weeks. Collected sub-slab vacuum readings, system discharge PID readings, and ambient air PID readings after the system was restarted. Submitted fourth and final RSOM Report.
VOC mitigation/SVE system (partially subcontracted to Home Safety Solutions, Inc.)

Outcome achieved

To confirm that acceptable risk reduction had been achieved, seasonal sub-slab sampling was completed after the system had been non-operational for 2 weeks prior to each sampling event following the MPCA's Vapor Intrusion Best Management Practices. Additional sampling confirmed the soil vapor extraction system remediated the source and that residual contamination does not pose a vapor intrusion risk. WCEC recommended leak site closure and discontinuation of system operation with no Environmental Covenant. MPCA issued a Petroleum Tank Release Site File Closure letter on November 29, 2017.

A.5 Scenario A

WCEC has prepared a response to the Example Scenario presented in the RFP. The scenario response has been prepared using the Example Scenario Work Plan Attachment A and Example Scenario Project Spreadsheet Attachment B provided with the RFP.

Attachments A and B for the Remedial Investigation and Attachments A and B for the Remedial design/Remedial Action have been uploaded as separate attachments in Swift as requested in the RFP.

APPENDIX A
KEY STAFF RESUMES

Kevin Boike

Environmental Scientist

Education

B.S. Environmental Science; Geography, University of Minnesota Mankato, 2011

Additional Training/Certifications

Hazardous Waste Operations and Response Certification (OSHA 1910.120)
E-rail Safe/BNSF Responder Training
BNSF Contractor Orientation, CN On-Track Safety and Roadway Worker Protection
National Incident Management System (NIMS) - ICS-100.b, 200.b, 300, 700.a courses
Center for Domestic Preparedness- Hazardous Material Technician for CBRNE Incidents Training
Inland Waterways Spill Responder Training
Confined Space Entry Training
Confined Space Rescue Training
Extreme Cold Weather Oil Spill Response Training
Wetland Delineation Training
TEEX/ProBoard- Hazardous Materials Transportation Specialist Training (NFPA 472)
State of Minnesota – 700/800 MHz Radio Training
CPR and First Aid
Fire Brigade Advanced Exterior- Illinois Fire Service Institute

Memberships/Affiliations

Wetland Professional Association

Technical Specializations

Hydrocarbon Investigations and Remediation
Phase I and Phase II Environmental Site Investigations
Minnesota MPCA UST Program
Emergency Spill Response

Professional Summary

Mr. Boike has 6 years of experience in environmental consulting and environmental services. As an environmental scientist at WCEC, Mr. Boike works on a wide variety of projects for WCEC including hydrocarbon investigations and remediation, MPCA Leak Site investigations and Phase I and II Environmental Site Assessment projects. He actively works on remediation of petroleum-contaminated soil and groundwater. He is proficient in collecting soil and

groundwater samples, evaluating site data, completing site health and safety plans, generating reports, facilitating client-agency representative dialogue, and implementing agency recommendations. Mr. Boike contributes and authors Environmental Assessments in compliance with ASTM Standard E 1527-05.

As a member of WCEC's spill response program, Mr. Boike has gained experience in establishing site response zones, incident communication, air monitoring (using photoionization detectors, multi gas, single gas and toxic gas monitors), monitoring equipment calibration, and decontamination. He serves as a general on- site supervisor.

Project Experience

Petroleum Remediation Program Management; Site Characterizations; Corrective Action/Remedial Action Plan Development; Remedial Installation, Operation and Maintenance; Ground Water Monitoring; Various Local and National Retail Petroleum Companies, Railroads, and State Agencies in Minnesota, South Dakota, and North Dakota.

Technician for many projects in Minnesota, South Dakota, North Dakota, and Wisconsin on behalf of major petroleum retailers, railroads, and state agencies. Performed Limited Site Investigations, Remedial Investigations, Monitoring and Remediation in Minnesota and is Multi-site approved at the Field Technician I and Scientist I level for duties performed. Responsibilities included completion of soil boring logs, well construction diagrams, geologic stratigraphy descriptions, sieve analysis, geologic cross sections, and contaminant concentration classification of soils during push probe investigations and monitor well installations. Oversee excavations of contaminated soils.

Emergency Response; Hazardous Materials Cleanup Oversight; Waste Management and Disposal; Emergency Management Health and Safety; Various Hazardous Materials Transport and Retailers, Railroads, and State Agencies in Minnesota, South Dakota, North Dakota.

A site supervisor for Emergency Response projects in Minnesota, South Dakota, and North Dakota. Contributes to and manages emergency response operations for petroleum and hazardous waste facilities and the transportation industry including site cleanup activities, waste storage, and disposal. Drafts and implements site Health and Safety Plans. Maintained emergency response equipment and environmental monitoring meter calibration.

Jeremy Burns

Project Manager & Trainer

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.S. Biological Science, South Dakota State University, 2006

Additional Training/Certifications

40-Hour Hazwoper
WMD Crime Scene Management for Emergency Responders
WMD HAZMAT Evidence Collection
AWR-160 Terrorism Awareness for Emergency First Responders
IS-700 National Incident Management System (NIMS)
IS-800b National Response Framework
IS-810 Emergency Support Function #10 Oil and Hazardous Materials Response
IS-100a Introduction to Incident Command System (ICS)
IS-200a ICS for Single Resources and Initial Action Incidents
IS-242.b Effective Communication
ICS 300 Intermediate ISC for Expanding Incidents
ICS-400 Advanced ICS Command and General Staff-Complex Incidents.
40-Hour Hazardous Materials Technician for CBRNE Incidents
50-Hour Hazardous Material Transportation Specialist (NFPA 472)
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
CPR and First Aid
eRail Safe Training (BNSF, UPRR, CPRR, CNRR)
BNSF Safety (Contractor Orientation Course)
Road Way Worker Protection
3 day Inland Waterways Spill Responder Training
Confined Space Entry Training
8-hour OSHA Supervisor Training
Drug and Alcohol Reasonable Suspicion Training

Memberships/Affiliations

West Central Chemical Assessment Team (CAT) 2007-2014
Minnesota Army Reserve National Guard- 1st Battalion, 151st Field Artillery, C (-) Battery, Ortonville, MN 1997-2018, Gunnery Sergeant, Sergeant First Class/E-7 (Retired)

Technical Specializations

Hazardous Material Technician
Hazardous Material Transportation Specialist (NFPA 472)
Hydrocarbon Investigation and Remediation

Professional Summary

Mr. Burns has a degree in Biological Science. He has developed his technical and consulting skills over the past 10 years working as an environmental consultant and emergency spill responder. Mr. Burns' responsibilities most recently have shifted into a Project Manager role for the Morris office location as well as working towards becoming an OSHA Outreach Certified Trainer for General Industry.

As Project Manager, Mr. Burns' responsibilities include receiving incoming spill/release calls from private individuals and businesses as well as the Minnesota Pollution Control Agency Emergency Response (MPCA ER) team. He deploys response staff to clean up and mitigate releases of hazardous materials to land, water and air to minimize environmental impacts and identify potential exposure routes and risks to the general public. Mr. Burns coordinates with other Team Leaders and spill response staff members in the Morris, Maple Grove, and Fridley offices to provide timely and professional emergency spill response and clean-up efforts while working along with state agencies. Mr. Burns is also responsible for managing non-emergency projects such Limited Site Investigations and long-term management of sites that originate from spills/releases including reporting to private and public entities.

As an OSHA Outreach Trainer (in Training), Mr. Burns is responsible for ensuring that training programs are implemented and conducted according to state and federal guidelines. Mr. Burns reviews and updates corporate programs and develops new programs in accordance with state and federal regulations as well as client specific programs and training. Training on select programs occurs monthly throughout the year. Course completion tentative June 2018.

Project Experience

Site Investigations, Various Locations in Minnesota, South Dakota and North Dakota. Mr. Burns hydrocarbon investigation project experience includes involvement at all levels from beginning bidding of projects, writing work plans/cost proposals, initial and follow-up field fieldwork sample collection, data interpretation, compiling project information, writing and submittal of project reports and fiscal management of projects. Previous work completed as a project manager/assistant project manager also included field work oversight for Limited Site Investigations/Remedial Investigations (LSI/RI), monitoring well installation/oversight, monitoring well development/oversight, monitoring well sampling and documentation, vapor survey sampling

and documentation and state agency report writing and submittal. Mr. Burns also has experience operating Geoprobe® system drilling equipment to collect soil and water samples utilizing macro core, dual tube, large bore and SP-15 sampling methods, as well as conducting utility backfill investigations with hand auger equipment.

Emergency Response, Various Locations in Minnesota, South Dakota, North Dakota. Mr. Burns' emergency/spill response experience includes projects of various sizes and duration. Examples of recent short-term projects: Several state right-of-way cleanup projects to remediate petroleum and non-petroleum impacted materials as the result of vehicle accidents for both private clients as well as State agencies. A written corrective action work plan was submitted to the Minnesota Department of Transportation (MnDOT) due to the accident occurring in the right of way (ROW) of a state highway; proposing the corrective action excavation to take place as outlined in MnDOT and MPCA guidance documents for soil clean-up; sampling requirements; site restoration and follow-up reporting.

Home Heating Oil Releases; response coordination with state partners as well as property owners to clean up impacted materials associated with fuel oil releases including removal of impacted household items, air monitoring, remedial excavations, vapor extraction system installation and monitoring, as well as follow up reporting and documentation with the property owners and state agency.

Large Quantity Mercury Release; response included segregating, inventorying, documenting, repackaging/securing and removal of mercury contaminated items resulting from the improper disposal of an estimated 2 gallons of elemental mercury from a residence in southern Minnesota. Emphasis was placed on protecting private and public entities and preventing additional impacts to private property while ensuring proper protective measures being taken by responders including respiratory and personal protective clothing ensembles. Tasks included mercury recovery and decontamination of a residential alley, cleaning and decontaminating a dumpster and garbage truck, and removal of impacted materials from a private residence. All of the impacted materials were screened, segregated and disposed of in accordance state and federal rules and in accordance with the MPCA State ER contract. Project resulted in the removal and disposal of over 4,500 pounds of mercury impacted materials including approximately 1.45 gallons of elemental mercury being recovered.

Recent long-term project: currently ongoing Remedial Investigation- project began as a remedial excavation in a county ditch as the result of a semi-truck saddle tank diesel fuel release. During the excavation, impacts to surface water were identified and site limitations inhibited the removal of all impacted soil from the area. Following the excavation, a workplan was submitted to the MPCA to complete a full Remedial Investigation including installation of monitoring wells and monitoring well

sampling. Expected project duration is estimated to be 1 to 1.5 years from the initiation of project to final closure of the site based on current known conditions.

Steve Carlson

Senior Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, On-Site Inspector, Field Technician

Education

B.A. Biology and Philosophy, University of Minnesota, 1985

Additional Training/Certifications

Residential Mitigation – National Radon Proficiency Program (NRPP) ID: 108127 RMT
Supplemental Radon Mitigation courses
Chemical Vapor Intrusion Mitigation – U of MN: 2016 and 2018, MURC-207 (2018 included MPCA BMP's)
40-Hour Health and Safety Training
8-Hour Site Supervisor Training
CPR and First Aid
Confined Space Training
FEMA-directed training for Incident Command System: ICS 100, ISC 200, ICS 300, ICS 400, ICS 700, and ICS 800. Involved in annual drill deployments for OSRO certification compliance
ITRC webinars including Light Non-aqueous Phase Liquids: Science, Management, and Technology, Phytoremediation, and Reactive Barrier Remediation, and Vapor Intrusion; with Completion of hundreds of technical and workplace safety electronic training modules
Twin Cities GECCo Workshop, USDHS 2011
49 CFR 391.41-391.49 Medical Examiner's Certificate
eRailsafe certified for BNSF, CN, CP, and UP Railroads; RR Worker Safety & Substance Abuse Certs.
Numerous client-specific safety training programs
Project management leadership training, Lake Forest Graduate School of Management

Memberships/Affiliations

American Association of Radon Scientists and Technologists (AARST)

Technical Specializations

Contamination Investigations & Remediation

- Hydrocarbons
- Halogenated hydrocarbons
- Subsurface chemical vapor intrusion
- Bio-fuel releases

- RCRA Metals
- PCBs
- Clandestine Drug Lab sites

Environmental Due Diligence
Environmental Permitting
Emergency Spill Response Project Management

Professional Summary

Mr. Carlson has more than 30 years of environmental science and consulting experience. As Senior Project Manager, Mr. Carlson directs environmental projects in the investigation and remediation of contamination for emergency response and long-term environmental management projects. In other firms, he has served as a Regional Workplace Safety Chairman, as Environmental Services Manager, and as technology improvement Trainer for other professionals. His clients have included individuals, Fortune 100 Corporations, small business enterprises, school districts, and units of state, Tribal, county, and local community government.

Mr. Carlson currently serves in the Environmental Services Division at WCEC where he manages projects for a variety of clients; this includes various private entities, non-profit organizations, and the State of Minnesota under their State Spills contract, and in the Petroleum-Agricultural Chemical-Superfund "Multi-Site" program.

Project Experience

A significant focus of projects currently and recently managed by Mr. Carlson are for the MPCA Petroleum Remediation Program, under the "Multi-Site" contract. Many Multi-Site projects have a high public profile, and/or involve working closely with affected residents and local authorities. Examples of projects from the past five years that had multiple stakeholders and a significant public impact footprint are provided below, by general project type.

Redevelopment Projects

Mr. Carlson assisted the city of Fergus Falls, MN with the brownfields redevelopment of property affected by a former dry cleaner and filling station, and construction of a law enforcement center. The resulting amenity is consistent with land use planning, has public acceptance, and the MPCA issued LUST closure and NFAD letters in October 2013.

Mr. Carlson completed work for a private landowner prior to a property sale at Princeton Dump. A cap/cover and passive vent system were in place, subject to land use restrictions established by WCEC and MPCA in the Environmental Covenant and Affidavit for the site. The NFAD was issued in December 2013, and WCEC authored the

annual report (letter from Affiant) for the Buyer's use in the following year.

Mr. Carlson conducted the work required by the Voluntary Investigation and Cleanup program prior to the prospective sale of a scrap recycling plant in Detroit Lakes, MN. The site was impacted by PCBs, heavy metals, and PAHs above risk-based criteria. Mr. Carlson completed supplemental investigation, a Remedial Investigation, and the Response Action Plan. The RAP included soil removal and installation of a cap/cover. VIC issued the NFAD in January, 2014.

Mr. Carlson was the Project Manager serving City of Princeton EDA to complete a NEPA review, Phase II Site Assessment, and pre-demolition hazmat survey (including asbestos inspection) at an abandoned filling station. Demolition work involved asbestos and other waste abatement and well sealing. WCEC responded when two unreported USTs were unearthed during the work, providing the UST closure Supervisor on an urgent basis so the City's work could be completed without project delays. Closure was granted by the MPCA in April, 2014.

WCEC completed various tasks for City of Fridley under the management of Mr. Carlson. This included RAP implementation for Q Stop, a former service station with three recorded releases. RAP acceptance/closure was issued in May, 2014. WCEC also performed pre-demolition surveys at a former Public Works building, and a blighted residence. The latter site was also the subject of meth residue assessment by Mr. Carlson, due to past drug-related activities on the property.

Mr. Carlson managed the Brownfields development and property transfer due diligence for six convenience store markets in the Twin Ports area. This included Phase I environmental assessment and Phase II site investigation, water supply quality assessment, NEPA review, geotechnical investigation, and the preparation of a store development RAP with construction contingency plan. The RAP and contingency plans were implemented for the client by WCEC, and the applicable RAP Implementation acceptance/site closure letters were granted in 2015. Impacted soil management was required at all locations. Unique site conditions that required a construction contingency response included an abandoned underground tank and sump at one store, impacted water management at two stores, protective measures to prevent water line permeation at one store, and the management of abandoned dump material and an urgent response to seal a two-foot diameter dug well at a third site. Longer-term environmental management included an access agreement between the property owner and an adjacent, active petroleum release site, and maintenance of the soil vapor cover at one Superior Wisconsin location.

Large Petroleum Releases

Mr. Carlson was the Project Manager for three large pipeline spills over the past five

years. A gasoline release in Savage, MN travelled via subsurface routes and entered a buried stream conduit (storm sewer) creating a sheen on the surface water exiting the culvert. WCEC excavated severely impacted soil and performed emergency response corrective actions. The industrial property owner at the spill location required significant stream channel and bank restoration, including the removal of impacted materials, rip rap replacement, and incidental landscaping to return conditions to an aesthetically pleasing condition. The stream passes through federally-protected wetlands after leaving the site, which required additional boom placements, site monitoring, and surface water sampling to ensure the impacts were contained on-site. The release was closed in 2014.

A loss of over 60,000 gallons of gasoline occurred at a large AST facility in Apple Valley, Minnesota; WCEC performed the emergency response actions. Standing pools of product were collected, and soil excavation performed. WCEC completed a direct-sensing investigation using laser-induced fluorescence technology, and an initial receptor/impacts assessment. The summary report documented these actions, and the MPCA agreed that the site had been stabilized sufficiently to remove the public exposure risks, and allow non-emergency cleanup to be conducted via longer-term soil venting under the large facilities remediation program.

Mr. Carlson managed the emergency response corrective actions for a release of over 50,000 gallons of gasoline from a large AST in Wrenshall, MN. Emergency response actions included collection of fuel puddles using vacuum trucks, scraping of the affected snow for temporary storage and eventual disposal, and air monitoring for worker protection and assessment of possible vapor plume migration into the adjacent State Park. Site stabilization was achieved overnight. WCEC completed the incident summary report, which included a receptor survey/risk evaluation for direct exposure and attendant vapor, and the potential receptors associated with surface water and groundwater at this location.

Residential Pesticide Releases

Mr. Carlson assisted the Property Owner following the contamination of residential interiors from illicit chemical applications by third parties. This included the assessment and remediation of a public housing authority apartment impacted by Malathion; WCEC sampled surfaces and the breathing zone within the unit and nearby common areas. The work was completed under the review of Minnesota Department of Agriculture, Incident Response Unit.

Mr. Carlson assisted a New Brighton, MN homeowner with property sampling, corrective action plan, and remediation oversight for a severe Chlordane application under MDA review. The home was remediated, the determination for no further action

was issued in January 2015.

WCEC responded to the illegal application of Termador® (Fipronil) inside a home in Elk River, Minnesota with Mr. Carlson as Project Manager. Surface wipe samples were collected, and a remediation plan prepared under MDA oversight. WCEC coordinated with the remediation (structural cleaning) firm involved and handled wastewater characterization and disposal for the wash water and rinsate generated by cleaning the home. In August 2016 the MDA agreed that no further cleanup was required.

Hazardous chemical cleanup at clandestine drug manufacturing sites

Mr. Carlson completed the initial assessment and surface wipe sampling for a methamphetamine production operation (meth lab) inside a mini storage unit in Saint Paul, MN. The results were presented in a remediation work plan, which was approved by the local authority with jurisdiction. After the removal of suspect items and "special wastes" WCEC performed structural cleaning and wash water disposal. The post-remediation sampling indicated that surfaces were non-detect for meth residue, so the unit could be re-occupied.

Mr. Carlson performed the initial assessment, and background review for a 20-acre bank-foreclosed farm property near Princeton, Minnesota that was suspected to have been the location of drug use. The initial findings revealed that a meth lab was formally declared to have been present in part of a barn, and meth impacts requiring remediation were present in the barn and one large room in the nearby house. WCEC obtained remediation Work Plan approval from the local public health authority; the approved plan was implemented, including structural cleaning of the affected areas, post-remediation sampling, abandoned supply well search and sealing, and the removal of approximately 60 cubic yards of hazardous and non-hazardous materials that included electronic waste, solid waste, waste paint and solvents, scrap, old tires, and other items. The WCEC clearance report has been entered in the property records by the County, lifting the meth lab/chemical site declaration so the property may be sold.

Mr. Carlson assisted various Minnesota homeowners (often a perpetrator and/or family of the perpetrator) with the assessment and remediation of meth labs on their property. This included homes in Houston and Brooklyn Park, a farmstead near Spring Valley, and tribal housing in White Earth. In some cases, large-scale projects would involve multiple trades to complete once-through cleanup and subsequent property repair/remodeling work to prepare a property for sale. In these cases, WCEC prepared the remediation work plan, conducted the post-remediation sampling, and submitted the final report with a certifications page per the guidance published jointly by MPCA and Minnesota Dept. of Health. Examples include a declared meth lab in Saint Cloud, and a large-volume meth oil finishing operation in Brooklyn Park.

Recent projects include assessment and house remediation consultation for county Child Protection offices responding to the presence of meth in a home with dependent minors. In all meth lab projects, Mr. Carlson conducts the work with discretion and professionalism, to preserve the dignity of the persons involved while adhering to the regulation and disclosure requirements associated with this type of work.

Ethanol-based Fuel Releases

Steve has worked on projects involving the release of bio-fuels from train derailments in Minnesota. These included a commingled ethanol/soy oil release at the Balaton derailment (see below) a 60,000-gallon food-grade soybean oil release near Minnesota city, and a release of canola oil at a train derailment site in Mahnomen. Bio-fuel releases can result in hazardous methane generation; each site had challenges for response, including multiple agency jurisdictions, cost-effective removal of product and impacted soil, and logistics associated with investigation and cleanup along active transportation corridors.

Mr. Carlson managed field investigation and sampling conducted for initial MPCA investigation work under the MPCA multi-site contract, and then coordinated efforts conducted for the responsible party (DM&E Railroad) while at another firm. He has since assisted the MPCA further, providing service under the State Drilling Services contract and MultiSite contract while at WCEC. The work conducted by MPCA has improved the understanding of biofuel fate and transport conditions associated with large-scale ethanol-based fuel releases.

An underground storage tank leaked up to 1500 gallons of E-85 fuel at a Hastings filling station, in a shallow bedrock setting that prompted concern for the acute toxicity effects to groundwater receptors and potential for severe soil gas impacts associated with degradation of ethanol-based fuels. The site was in a residential/commercial area within the city of Hastings, Minnesota which raised the potential risk that nearby properties could be receptors of the soil gas impacts. While at another firm, Mr. Carlson managed initial site responses (UST removal, Remedial Investigation fieldwork, and soil vent installation) and site monitoring. The work was conducted in cooperation with MPCA policy/research staff to advance understanding of the associated fate/transport mechanisms, and to calibrate developing policies related to biofuel releases. The site remained with the firm, and results of quarterly groundwater monitoring conducted after the initial work led by Mr. Carlson eventually resulted in site closure in 2016.

E-85 was spilled by a fuel tanker rupture in New Market, and a nearby stream was impacted. Mr. Carlson prepared the reports associated with initial spill response and soil excavation, and the RI that followed these activities. Fortunately, the release was recovered sufficiently to remove the surface water impacts, and the groundwater

impacts and associated risks were limited enough to result in site closure in October, 2013.

A release of E-85 was identified by WCEC work conducted on a leaking fuel line at a convenience store in LeCenter, soil excavation and a remedial investigation was completed. Follow up work included product skimming, and groundwater monitoring with a soil vapor and methane investigation. The site was closed in May, 2015.

E-85 was among the released petroleum at the former Budget Oil station in Austin. WCEC assisted the City of Austin (Volunteer who purchased the property) with site investigation (RI) which included vapor impacts survey and the additional analytical parameters associated with this fuel type. Despite difficulties in accessing some areas and changing hydrologic conditions, the work led to site closure in August 2015.

Home Heating Oil Releases

WCEC performed emergency responses to numerous home fuel oil leaks/spills in recent years. Mr. Carlson managed several of these, recently closed sites are mentioned below. This included a State-Contract spill response at Bogen Residence in Morrill Township. Tasks completed by WCEC included the excavation of severely impacted soil around the building foundation, subcontracted installation of a drain tile/sub-building depressurization system, and initial receptor survey. Another firm completed site investigation, resulting in closure in 2017.

WCEC completed emergency response actions under the State Spills contract at a residence in Saint Francis. Upon stabilizing the spill, the site transitioned to the PRP "Fund-Financed" program. Mr. Carlson completed the RI, and sealed the shallow sand point supply well in conjunction with Water Line (and mandated sewer) connection for the residence.

WCEC conducted emergency response water sampling from a residence basement sump in Garfield, under the State Spill Contract. Steve managed the subsequent phases of work on this complex site that included background reviews' investigation via soil borings, vapor probe, and monitoring well completion; focused investigation using laser-induced fluorescence technology, and a sequenced program of water line sampling to explore for potential hydrocarbon permeation. During the work, WCEC conducted a Vapor Intrusion Investigation for the closed "Quinn Residence" leak site, consistent with the work scope followed by MPCA for the review of closed LUST sites throughout the state. The applicable originally opened (basement sump water complaint) release site was closed, and other closed leak sites in the investigation area were not reopened by the Agency.

WCEC was retained to perform MPCA (Spill Contract) emergency responses to a release

of fuel from abandoned USTs located adjacent to the basement, and beneath a basement floor of a home in Dellwood. After initial responses, Steve managed follow-up work under the MultiSite contract which included in-situ chemical oxidant application into the subsurface beneath the basement, ground water monitoring, waste water management and final solution for the basement sump discharge, and documentation. The site was closed in April 2016.

Stormwater and NPDES Projects

Steve has worked on various aspects of erosion control and stormwater management and permitting projects over the past few decades. Examples include Industrial Stormwater (General) permit work on an interim basis for the WCEC Industrial Services facility in Fridley, and ISW permit compliance at multiple facilities for a large transportation firm. These included Stormwater Pollution Prevention Plan preparation and periodic revisions.

Construction Stormwater experience includes inspections, restoration, and regulatory compliance for a State-wide corridor construction project in Wisconsin, and handling the MPCA Construction Stormwater permit requirements for restoration work following a large derailment remediation project in Dresbach (La Crescent area) on the banks of the Mississippi River. Other projects include wetland mitigation projects as part of development mitigation and Stormwater design, and Spill Prevention, Countermeasure Contingency (and Spill Response) planning for a regional telecommunication infrastructure construction firm.

At another frim, Steve contributed to the Bridal Veil Open Space project; he consulted on the construction Stormwater permit and site restoration for the stream and wetland construction associated with the remediation of Bridal Veil Pond. He also provided the vegetation restoration plans and specifications, and the post-construction monitoring plan for Stakeholder approval.

NPDES related work prior to WCEC included facility and remediation system special discharge permitting, and the design of a non-contact cooling water thermal remediation feature to meet warm winter weather thermal discharge limits for discharge to a non-flow stream at a fuel ethanol production facility in southern Indiana. The completed channel is based on Mr. Carlson's original plans and "proof of concept" modeling.

WCEC
ENVIRONMENTAL CONSULTANTS

Paul Carter

Senior Project Manager/Hydrogeologist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, On-Site Inspector, Field Technician

Education

B.A., Geology, Lawrence University, Appleton, WI, 1984
M.S., Geology, Michigan State University, East Lansing, MI, 1989

Licenses/Certifications/Memberships/Training

Licenses

- Wisconsin Licensed Professional Geologist No. 471 (1995-present)
- Minnesota Licensed Professional Geologist No. 30216 (1998-present)

Certifications

- AARST - National Radon Proficiency Program Certification No. 108128 RMT
- American Heart Association Heartsaver® First Aid CPR AED Certified through September 2018
- 40-Hour HazWOPER Certification and Annual Refreshers

Memberships

- MGWA
- AARST

Training

Environmental and Remediation Seminars

- NGWA - Analysis and Design of Aquifer Pumping Tests (1993)
- MGWA - Spring or Fall Conf. (2000, 2002, 2003, 2004, 2008, 2010, 2012, 2014, 2016, 2017)
- E-Flux – Hydrocarbon Natural Attenuation Rates using Passive CO_2 Flux Traps (2014)
- ITRC - LNAPLs: Science, Management, and Technology (2014)
- CLU-IN/ITRC – LNAPL Behavior, Char. and Recoverability, Remedial Technologies (2016)
- Vapor Intrusion Forum, Minnesota Brownfields (2014/2015)
- CLU-IN/ITRC - Integrated DNAPL Site Strategy (2016)

Hazmat and Spill Response Seminars/Conferences/Training

- IAFC - HAZMAT Response Teams Conference (1998)
- MNBCA Methamphetamine Drug Investigation Course (2000)

Spill Drills - Petroleum Tankers, Terminals, Pipelines, and HAZMAT Releases

- Elk River, MN (1998 & 2001)
- Roseville, MN (1999 & 2011)
- Moorhead, MN (2000)
- St. Paul, MN (2002)

- Rogers, MN (2003)
- Minneapolis, MN (2004 & 2006)
- Duluth, MN (2007)

Boom Deployment

- WCEC - Rum River, Anoka, MN (2007)
- USCG - St. Louis River, Duluth MN (2007)
- WAKOTA CAER - Mississippi River, Hastings, MN (2008)
- MPCA - Mississippi River, St. Paul, MN (2011)
- UPRR - St. Croix River, Hudson, WI (2012)
- USCG - Superior Bay, Superior, WI (2013)
- BNSF - Crude Oil Spill Drill and Boom Deployment Training, La Crosse, WI (2014)
- BNSF - Boom Deployment Training/Demonstration, Red Wing, MN (2015)
- FRP Boom Deployment Drill, Fridley, MN (2015)

Railroad

- BNSF Contractor Safety Orientation (2018)
- BNSF Contractor Symposium (2011, 2012, 2015, 2017)
- BNSF/TRANSCAER/Chlorine Institute Chlorine Emergency Response Training, (2014)
- e-RAILSAFE Contractor Safety Orientation, Railroad Security Awareness, Drug & Alcohol Awareness, Roadway Worker Protection (2018)
- Tank Car Training Seminars (2000, 2005, & 2012)

MPCA/WDNR

- MPCA Karst Workshop (2002)
- MPCA Remediation Conference (2004)
- MPCA NAPL Recovery Seminar (2008)
- MPCA PRP Consultant's Day (2011 and 2017)
- MPCA Portable Gas Chromatography for VOCs (2014)
- MPCA SRV Stakeholder Meeting (2015)
- WDNR RR Consultant's Day (2015 and 2017)

EPA, FEMA, and DHS

- DHS AWR-130 Incident Response to Terrorist Bombings – Awareness (2003)
- EPA Radiation Detection Equipment (2008)
- FEMA IS 5.a Introduction to Hazardous Materials (2008/2009)
- FEMA IS 100.a Introduction of Incident Command System (2008/2009)
- FEMA IS 200.a ICS for Single Resources and Initial Action Incidents (2008/2009)
- FEMA IS 700 NIMS an Introduction (2008/2009)
- FEMA IS 800.b National Response Framework (2008/2009)
- FEMA IS 810 Emergency Support Function #10 - Oil and HAZMAT Response (2008/2009)
- FEMA ICS 300 Intermediate ICS for Expanding Incidents (2010)

- FEMA ICS 400 Advanced ICS Command and General Staff - Complex Incidents (2010)

Midwest Universities Radon Consortium

- Radon Measurement Course, NRPP #MURC-9 (2015)
- Radon Mitigation Course, NRPP #MURC-8 (2015)
- Chemical Vapor Intrusion Mitigation, NRPP #MURC-207 (2016)
- Advanced Chemical Vapor Intrusion Mitigation, NRPP #MURC-207 (2018)

Technical Specializations

Site characterization using traditional and specialized techniques in a variety of conditions
24-Hour emergency spill response
Emergency hazard mitigation
Hazardous material characterization, segregation, packing, transportation and disposal
Hazardous waste characterization, profiling, and management
Interim corrective action implementation
Soil and rock classification; soil boring and well installation oversight
Evaluation of bioremediation and natural attenuation potential
Geophysical well log interpretation
Remedial system pilot testing, installation, and operation and maintenance
Aquifer pumping and packer tests

Professional Summary

Mr. Carter has more than 30 years of experience as a professional environmental project manager and hydrogeologist with experience and expertise in the following:

Voluntary Party Investigations & Cleanups
Chemical Vapor Intrusion Assessment and Mitigation
Management/Oversight of Surface and Borehole Geophysical Surveys (GPR, DC resistivity, EM, gamma)
Ultraviolet Optical Screening Tool/Laser-Induced Fluorescence (UVOST/LIF) Investigations
Investigations for Extent of Metals, PCBs, Fuels, Solvents, Coal Tar, and Persistent Bio-Accumulative Toxins
Soil and Ground Water Remediation Including Pump & Treat, Air Sparging, Vapor Extraction, Multi-Phase Extraction, Bio-Enhancement, Lead Stabilization, and Soil Excavation
Industrial Wastewater Lagoon Closures
Management/Oversight of Dye Tracer Studies
Sub-Slab Depressurization Systems
RCRA Hazardous Waste Cleanups
Methamphetamine Lab Cleanups
Expert Witness Testimony on Environmental Hazards

Investigations for Perfluorochemicals
Industrial Decontamination
Residential Well Filtration Systems
Mercury Cleanups
Permanganate Injection
24-Hour Emergency Spill Response and Hazardous Materials Cleanup

Mr. Carter's responsibilities have encompassed all aspects of operations management, including business development, contract administration, human resources, financial planning, quality control, and risk management. As a project manager for various private and governmental clients, he has also directly performed and managed a wide range of technical projects throughout the Midwest and the United States. Mr. Carter's experience includes development and review of technical work plans and reports, regulatory negotiation, development and tracking of project budgets and competitive-bid proposals, quality assurance and quality control of work products, and oversight of technical staff and field activities for a wide variety of site characterizations, remedial investigations, emergency response, and corrective action plan implementation projects.

Mr. Carter's project experience includes project management of numerous site investigation and remediation projects throughout the Midwest for private industry and while under various environmental services contracts with the Minnesota Department of Administration. Clients have included state agencies, school districts, cities, counties, transportation companies, petroleum marketers, insurance companies, cooperatives, retailers, law firms, and manufacturing companies.

Project Experience

PCE Vapors, Cloquet, MN

High concentrations of PCE were detected in soil gas and sub-slab vapor samples collected during a preliminary site assessment at a former dry-cleaning business. Vapor intrusion interior building surveys were completed for nearby residences, sub-slab vapor and indoor/outdoor air samples were collected, and assessment activities were completed.

PCE Vapors, Richfield, MN

High concentrations of PCE were detected in soil gas and sub-slab vapor samples collected during a preliminary site assessment near active and former dry-cleaning businesses. Vapor intrusion

assessments were completed for residences and apartment buildings, sub-slab depressurization systems were installed, and the initial phase of a site inspection/remedial investigation has been completed.

PCE Vapors, Strip Mall, Minneapolis, MN

High concentrations of PCE were detected in sub-slab vapor samples collected during a Phase II ESA of an active dry-cleaning business. Vapor intrusion interior building surveys were completed for all 15 tenant spaces of the strip mall. Nine permanent sub-slab vapor points were installed in selected tenant units to verify the results of the previous sub-slab sampling, and to broaden the assessment area. Three rounds of sub-slab vapor samples and four rounds of 24-hour indoor air samples were collected from selected tenant spaces. A sub-slab depressurization system was installed at the dry cleaners and operational data were collected and evaluated. Continued fugitive vapors from dry cleaning machines led to phasing out of the use of PCE at the facility.

PCE Vapors, Commercial Facility, Spring Lake Park, MN

Low concentrations of PCE were detected in sub-slab vapor samples collected during a Phase II ESA of a commercial building. Within 9 months of starting the project, WCEC completed a vapor intrusion survey of the building, installed vapor pins, collected seasonal sub-slab vapor samples, and the property owner received a No Action Determination letter from MPCA.

PCE Vapors, Former Dry-Cleaning Facility, St. Paul, MN

High concentrations of PCE were detected in sub-slab vapor samples collected from single-family homes and apartment buildings during a state Site Assessment in 2018. WCEC was contracted by MPCA-EMU to collect, and analyze on a rush basis, sub-slab vapor and indoor/outdoor air samples at 3 apartment buildings; oversee emergency mitigation of 3 single-family homes and complete building mitigation BMP attachments and property summary reports; and completed post-mitigation confirmation sampling.

Sanitary Sewer and WWTP Contaminated with Fuel Oil

A release of fuel oil no. 6 occurred at a facility's power plant, entered a floor drain, traveled approximately one-half mile through a sanitary sewer, which ran at depths up to 30 feet below ground, and contaminated a municipal wastewater treatment plant (WWTP). A cleanup planned was developed between the responsible party, MPCA's Emergency Response Team and municipal wastewater staff, city WWTP staff, and subcontractors to avoid WWTP shutdown. A plan was agreed upon to bypass a portion of the WWTP by plugging the 30-inch diameter sewer to allow for cleaning of the pretreatment building, grit tank and waste activated sludge (WAS) tank. This was followed by cleaning of the sanitary sewer between the power plant and the WWTP by creating a half-mile long bypass of the sanitary sewer from the power plant to the WWTP; sewage was pumped over the ground 24/7 from the sanitary sewer manhole at the power plant to the

return activated sludge (RAS) tank at the WWTP. Over a dozen contractors were subcontracted to complete the work that ran for 5 days a week for over 12 weeks. The work generally consisted of high pressure hot water jetting to loosen the fuel oil, and recovery with vacuum trucks capable of recovering both liquids and solids. Water was stored on site pending disposal under terms of Met Council Environmental Services special discharge approval. A total of approximately 325,000 gallons of water were discharged to the Metropolitan Council sewer system, and 200 gallons of sludge were disposed of through a subcontractor. Recovered fuel oil was mixed on site with sand, straw, and lime in roll-off boxes; 569 tons of the fuel oil/sand/straw/lime mixture were disposed of at an industrial landfill. Shutdown of the WWTP was avoided and no further action was required.

Expert Witness Testimony in Defense of a Class Action Lawsuit, La Crosse, WI

High water table caused diesel fuel to enter basements of residential homes located down gradient of an industrial facility. Initial recovery efforts lasted for approximately 10 years; regulators requested additional work. Due to impacted residences, and the potential for reduced property values, a class action lawsuit was filed and certified. A high capacity bioremediation system operated for approximately 3 years followed by approximately 4 years of post-remediation monitoring. Leading up to and during the post-remediation period, significant data were collected to demonstrate remedial objectives had been met, and that natural attenuation by intrinsic bioremediation was occurring and would continue to occur In addition to routine post-remediation ground water monitoring, which assisted to confirm previous findings and opinions, a significant amount of additional work was completed in defense of the class action lawsuit. The results of the work were defended in court testimony. Work included completion of an off-site push-probe investigation to reaffirm previous findings and opinions and to demonstrate the majority of the class-action area was not impacted; demonstrating that aerobic and anaerobic biodegradation of the source and down gradient areas was occurring; estimation of natural biodegradation hydrocarbon removal rates from on-site field testing; fuel molecular weight determination for partitioning calculations to assess the potential of diesel fuel in soil to impact ground water; soil porosity and bulk density analyses; atmospheric air exchange rate estimations; respiration monitoring tests; and estimation of gas transport rates. The remediation system and wells were eventually decommissioned, the site was closed, and the lawsuit settled.

Sole-Source Aquifer Contaminated with VOCs, Foley, MN

A sole-source aquifer and city well were contaminated by VOCs from a petroleum leak site; another city well was considered potentially at risk. A remedial investigation was completed and included installation of 17 shallow and deep monitoring wells; soil and soil gas samples were also collected, and a Phase I Environmental Site Assessment report was prepared. Ground water monitoring was performed quarterly. Aquifer tests were performed by individually pumping the contaminated and at-risk city water supply wells and monitoring shallow and deep monitoring wells with pressure transducers over an extended period. Corrective action alternatives were

evaluated, and costs estimated. A replacement city supply well was installed and the contaminated well abandoned. The results of the remedial investigation and aquifer pumping tests indicated a low potential for contamination of the at-risk city supply well.

Aquifer Contaminated with VOCs, Solway, MN

A remedial investigation, and two site assessments, were completed following the discovery of VOCs in numerous water supply wells. Remedial actions included multiple well replacements.

Aquifer Contaminated with VOCs, Mora, MN

Completed additional ground water investigation/monitoring to evaluate risk to a down gradient municipal well; coordinated installation of parallel GAC systems to treat impacted on-site well; completed pilot testing and CCAD for potential corrective actions.

Private Well Contamination Investigation, Backus, MN

WCEC was contracted to complete confirmation sampling of a private well impacted above HRLs by VOCs, and to collect city well samples for VOCs. An emergency investigation was completed in less than a month, identifying the likely source area and impacted and non-impacted private wells, and resulting in a leak site assignment to a former retail fueling facility. The preliminary Site Conceptual Model indicated that LNAPL exists at the source property and is acting as a long-term source of ground water contamination detected in two shallow downgradient domestic wells. Dissolved-phase petroleum hydrocarbons appeared to have migrated downgradient and downward through preferential pathways in the sandy aquifer. WCEC has been contracted by MPCA's PRP to complete a remedial investigation including additional potential source evaluation, UVOST/LIF investigation of LNAPL, and VIA.

Fuel Oil Investigation and Soil Vapor Extraction System Installation, St. Paul, MN

Completed a remedial investigation in response to a fuel oil spill in a basement that drained into the subsurface. Excavated accessible contaminated soil from the basement, installed a sub-slab depressurization/soil vapor extraction system, and drafted an Environmental Covenant to protect a sensitive population at an extended care facility. The vapor extraction system remediated fuel oil impacts so that sub-slab vapors were below residential intrusion screening values and the Environmental Covenant was not required.

Fuel Oil Investigation and System Installation, Baxter, MN

Completed a remedial investigation in response to a fuel oil release from a home heating oil tank into a basement via a drain-tile system. Advised and provided oversight of work by restoration contractor to remove the drain-tile system, recover fuel, excavate contaminated soil, and install a sub-slab depressurization system. Documented the work and monitored the system to receive leak site closure.

Former Sign Company, Willmar, MN
Managed the excavation of mercury contaminated soil, mercury waste removal, and completed 8-hour indoor air sampling for mercury to clear the site building for occupancy.

Former Railroad Property, Superior, WI
Project manager for the investigation and excavation of lead- and PAH-contaminated soil to meet WI Brownfields Program for Certificate of Completion.

Toluene Dumping, Champlin, MN
Project manager for the limited sampling for VOCs in soil and water. Managed and provided on-site oversight of the excavation of 60 tons of toluene contaminated soil that was manifested, transported, and disposed of as hazardous waste.

Askov Wastewater Lagoon, Askov, MN
Managed and provided field support for the investigation of wastewater release to karst terrain which included dye-tracer study and surface geophysics.

PCI, Shakopee, MN
Managed soil sampling/excavation and lead-stabilization for disposal of soil as a non-hazardous waste.

Bridge Project, Winona, MN
Managed soil excavation and lead-stabilization for disposal of soil as a non-hazardous waste.

Crookston, MN
Managed and oversaw the characterization, packing, and disposal of hazardous and non-hazardous waste at this former feed elevator/seed treatment facility.

Schumacher Dump, Leavenworth, MN
Managed the removal of approximately 80 drums of hazardous waste from a former dump site.

LeHillier Superfund Site, Mankato, MN
Managed the demolition of a Superfund ground water remediation system for TCE, abandonment of pumping and monitoring wells, and monitoring well installation oversight.

Well Sampling and GAC System Installations for PFCs, South Washington County, MN
Managed the collection of thousands of well samples for PFCs from 2007 to 2018. Managed granular activated carbon system installations and change outs at hundreds of residences from 2008 to 2018.

Temporary Carbon Treatment System Installation for Municipal Wells, Cottage Grove, MN
Managed the installation of large-scale temporary carbon systems at two city wells to treat municipal water for PFCs.

PFC Investigations, Washington, Ramsey and Dakota Counties, MN
Project manager for numerous limited investigations into the extent of PFCs in soil, groundwater, sediment, and surface water.

Fuel Oil Release at Manufacturing Facility, Minneapolis, MN
Completed a remedial investigation to define the extent of LNAPL in the Platteville Limestone.

Former Railroad Property, East Grand Forks, MN
Completed a limited site investigation of a 20-acre parcel to allow for development on higher ground after severe flooding in the 1990s.

Active Railyard, Minneapolis, MN
Managed UST removals and remedial investigations of multiple leak sites. Managed the installation, operation and maintenance of a ground water gradient control and LNAPL recovery systems.

Transport Spill, Newport, MN
Managed a remedial investigation into the extent of gasoline impacts to limestone; completed a remedial system pilot test.

Former Service Station, Fergus Falls, MN
Managed a remedial investigation into the extent of LNAPL near the Ottertail River.

Former Industrial Wastewater Lagoon, Superior, WI
Managed the excavation of approximately 3,000 yards of non-hazardous petroleum sludge from an industrial lagoon and received lagoon closure approval.

Service Station, Ontonagon, MI
Managed AS/SVE pilot testing and upgraded an existing ground water pump and treat system with an AS/SVE system.

Railyard, Willmar, MN
Managed a remedial investigation into the extent of fuel oil impacts; installation and maintenance of an LNAPL recovery system; and completion of MPE pilot testing.

PCBs, Newton, MA
Managed a third-party PCB investigation that included soil excavation, incineration, and disposal.

Rock County Landfill, Luverne, MN
Managed methane sampling at closed landfill.

Plating Facility, Fridley, MN
Managed an emergency response cleanup of various plating chemical solutions released due to a fire. Soil corrective actions were completed to allow for no further action.

Former Plating Facilities, Fridley and Minneapolis, MN
Managed the first phase of a remedial investigation into the extent of TCE contaminated soil and ground water. Managed an investigation into the extent of contamination from the release of various plating chemical solutions. Managed an emergency response to the release of various plating chemical solutions.

Shawna Conroy

Agricultural Chemical Program Manager/Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.A. Geology, University of Minnesota, 2000

Additional Training/Certifications

Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
Hazardous Materials Technician for CBRNE Incidents 4.0 Continuing Education Credits
Hazardous Materials Specialist, Various Courses
Agricultural Emergency Response Training Course, 3.0 Continuing Education Credits
Intermediate Incident Command System (ICS) for Expanding Incidents (ICS-300), 1.8 Continuing Education Units
Weapons of Mass Destruction Radiological/Nuclear Hazardous Materials Technicians Course, 3.2 Continuing Education Units
Groundwater Pollution and Hydrology Course, 3.8 Continuing Education Credits
Incident Response to Terrorist Bombings, 3.0 Continuing Education Units
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
Completion of over 50 health and safety training modules
BNSF Railway Contractor Orientation and Roadway Worker Protection
eRailsafe (BNSF Railway, Canadian Pacific Railway, Union Pacific Railroad, Canadian National Railway)
CPR and First Aid

Technical Specializations

Agricultural Chemical Assessments, Investigations & Remediation
Hydrocarbon Investigations & Remediation
UST Program Management
Hazardous Materials Emergency Response

Professional Summary

Mrs. Conroy has more than 16 years of experience as an environmental scientist and project manager. Mrs. Conroy leads the agricultural chemical investigation team. Mrs. Conroy's responsibilities have encompassed all aspects of environmental projects including working with various state agencies, private clients, landowners and contractors to plan and complete a wide variety of agricultural chemical and hydrocarbon

investigations and spill response incident projects. She is experienced in collection, interpretation and application of data gathered during site investigations. Site investigations have included definition and characterization of various phases of contamination plumes; assessment of risks associated with soil, ground water and surface water contamination; research and assessment of aquifer characteristics and land application of agricultural chemical- and petroleum-impacted soil. She is experienced in compilation of detailed scientific reports with site action recommendations, often including comprehensive groundwater monitoring and soil remediation.

As project manager for various private and governmental clients, Mrs. Conroy has prepared technical work plans and cost proposals as well as tracked project activities and budgets. Mrs. Conroy is experienced in the preparation of detailed bidding, design and construction specifications for various contracted tasks and in hiring and oversight of contractors.

Mrs. Conroy's project experience includes project management of numerous site assessment, investigation and remediation projects under several regulatory agencies including the Minnesota Department of Agriculture, the Minnesota Pollution Control Agency, the North Dakota Department of Health and the Kansas Department of Health and Environment.

Project Experience

Minnesota Department of Agriculture (MDA) Agricultural Voluntary Investigation and Cleanup (AgVIC) and Comprehensive Facility Investigation (Comprehensive) Programs, Various Locations, Minnesota. Environmental Scientist and Project Manager of numerous agricultural AgVIC and Comprehensive sites across the state of Minnesota. Worked closely with property owner(s) and MDA to identify and assess potential risk areas, develop investigation parameters, complete remedial investigation and contamination impact surveys and provide site recommendations based on investigation data. Developed and executed soil remediation plans, land application or disposal proposals and follow-up groundwater monitoring plans.

Minnesota Department of Agriculture (MDA) Abandoned Site Inventory Program, Abandoned Agriculture Sites Projects, 2007, 2008, 2012, 2013, 2014 and 2018, Various Locations, Minnesota. Environmental Scientist and Project Manager on 28 sites across Minnesota. Worked under the State of Minnesota Superfund, Petroleum and Agriculture Professional Environmental Multi Site contract to investigate and assess high

risk areas, delineate soil and groundwater contamination, design and oversee remedial activities and prepare data assessment reports at various abandoned agronomy facilities. Projects included preparing detailed work plans and cost proposals for investigations and working closely with the MDA to execute approved investigation and remediation activities.

Minnesota Department of Agriculture (MDA) Preconstruction Assessments, Various Locations, Minnesota. Project Manager of several preconstruction assessments at active agronomy facilities for various private clients. Assessment activities included identification, quantification and remediation of soil impacts beneath proposed construction sites. Aggressive project scheduling and execution were necessary to assure that facility construction activities remained on schedule.

Minnesota Department of Agriculture (MDA) Agriculture Chemical Emergency Response, Glyphosate Release, Minnesota. Technician, Environmental Scientist and Project Manager of emergency response and follow-up investigation activities associated with the release of Roundup WeatherMAX® (active ingredient glyphosate) from a railcar. The release impacted the responsible party's loading facility, the adjacent rail spur line and the main rail line. Coordinated access with the railroad and responsible party to delineate the extent of impacts. Partnered with the MDA and railroad engineers to design corrective actions that met both the railroad's specifications and the MDA's requirements.

Minnesota Department of Agriculture (MDA) Comprehensive Facility Investigation (Comprehensive) Program, Minnesota. Completed a remedial investigation at a former fertilizer plant, during which evidence of petroleum contamination was observed. Worked with the client to ensure that the required notification and reporting protocol were met. Subsequently coordinated activities associated with both the MDA Comprehensive Facility remedial investigation and the Minnesota Pollution Control Agency (MPCA) Petroleum Remediation Program (PRP) remedial investigation. Petroleum, fertilizer and pesticide impacts were identified and delineated under both programs. Corrective actions at the site included the excavation of agricultural-impacted soil. During corrective actions, field screening with a photoionization detector (PID) was completed to segregate petroleum-impacted soils from non-petroleum impacted soils, meeting unique disposal requirements for each.

Kansas Department of Health and Environment (KDHE) Voluntary Cleanup and Property Redevelopment Program (VCPRP), Various Locations. Environmental Scientist and Project Manager of VCPRP sites located in Kansas, one of which involved several on- and off-site property owners and responsible parties. Developed and coordinated investigation activities and corrective actions. Coordinated and oversaw large-scale remedial soil excavation utilizing an on-site mobile laboratory to quantify soil impacts and determine excavation extent and dimensions. Worked with the KDHE, land owner and subcontractors to coordinate land application of excavated soil. Completed on- and off-site groundwater monitoring and risk assessments of potential down-gradient receptors. Worked closely with the KDHE to assure that project objectives were met. Prepared a risk management plan to transition the site from the VCPRP to the Risk Management Program, under which periodic monitoring will demonstrate whether long-term risks are associated with the site.

Joann Dyson, Ph.D.

Senior Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

Ph.D. Physics, University of Georgia, 1994
B.S. Physics, Wake Forest University, 1988

Additional Training/Certifications

Dakota Technology UVOST Training
Hazardous Waste Operations and Emergency Responder (OSHA 1910.120) (40-Hr HAZWOPER)
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology Training
FEMA Debris Management Training
National Incident Management System (NIMS) – ICS 700, 800, 100, 200, 300, 400 courses
North American Environmental Field Conference (Attendee/Presenter 2008, 2010, 2011, 2012)
Battelle Remediation of Contaminated Sediments Conference (Attendee/Presenter)
NGWA Petroleum Hydrocarbons and Organic Chemicals in Ground Water (Attendee/Presenter)
MPCA Air, Water, Waste Conference (Attendee/Presenter)
Cold Zone Regional Hazmat Conference (Attendee/Presenter)
eVerifile compliant; eRail safe certified; RR Worker Safety & Substance Abuse certificates
CAMEO, ALOHA, MARPLOT Training (NCBRT)

Memberships/Affiliations

ITRC LNAPL Update Team 2016-2018
2017 ITRC Industry Affiliated Program (IAP) Team Award for LNAPL Update Team
ITRC LNAPL Update Team Internet Class Trainer 2018
ITRC Implementing Advanced Site Characterization Tools Team 2018

Technical Specializations

Contaminated Site Investigation & Remediation

- Hydrocarbons
- Soil, groundwater, vapors
- Vapor intrusion

Laser-Induced Fluorescence Investigations
Adult Education

Professional Summary

Dr. Dyson has over 18 years of experience in the environmental consulting field and four years as an assistant professor (Gettysburg and Beloit Colleges). Her responsibilities as a Senior Project Manager at WCEC include management of hydrocarbon releases; contaminated site investigations and remediation; laser-induced fluorescence (LIF) investigations; proposal preparation; and special projects. She has extensive experience working with state agencies, as well as individuals, laboratories, other consulting firms, refineries and railroads. Her project management duties include work plan and budget preparation, overseeing field staff, subcontracting, coordinating field work, evaluating site data and reporting. Dr. Dyson has also been involved with special projects such as international LIF investigations; state terrorism preparedness - determining environmental and logistical issues associated with potential WMD event debris for Minnesota's largest cities; providing emergency response ICS training for cities, counties, and government agencies such as the Air National Guard and the Minnesota Pollution Control Agency (MPCA); and assisting the MPCA with Ebola response preparation. Dr. Dyson has presented at a variety of environmental and physics conferences. She has been active in the ITRC since 2016 as a member of the LNAPL Update team, the Implementing Advanced Site Characterization Tools team, and the training team for the LNAPL Update web-based class. She received the 2017 Industry Affiliates Program Award for contributions to the LNAPL Update team. As director of the LIF program at WCEC, Dr. Dyson is responsible for assisting others with project planning, data analysis, and reporting. She was previously a science officer on the State of Minnesota Chemical Assessment Team.

Project Experience

Petroleum Remediation sites

Many of the projects Dr. Dyson manages are fund-financed sites for the MPCA Petroleum Remediation Program under the "Multi-Site" contract. In addition to working closely with the MPCA, these projects often involve working with a property owner that is not a responsible party or owners of offsite properties. Work performed at these sites typically includes investigation of soil, groundwater, vapor intrusion and receptors, but have also involved LNAPL delineation, city/county coordination, permitting, and subcontracting. LNAPL remediation has included MPE system operation, excavation and SSD installation.

As the project manager of a petroleum release site in McIntosh with impacts to soil, groundwater and a sanitary sewer, Dr. Dyson developed and tracked multiple project work plans and budgets. She performed groundwater monitoring, vapor monitoring and an LIF investigation conducted as a pre-remediation site assessment to determine the

extent of LNAPL for excavation. She developed excavation bid specifications and obtained bids from construction contractors following MPCA procedures. She coordinated the excavation and supervised the field staff that oversaw the excavation, which lead to site closure.

Dr. Dyson also managed a petroleum release site in Springfield at an active filling station with petroleum impacts to soil and groundwater, mobile LNAPL, potential risks to utilities, and potential vapor intrusion to an adjacent apartment building and nearby residences. Work performed for this project included site investigation, monitoring well and soil boring installation; groundwater monitoring, vapor monitoring; LNAPL recovery; utility backfill investigation; multiple laser-induced fluorescence (LIF) investigations; and vapor intrusion assessment (sub-slab and indoor). After delineating the extent of LNAPL through the LIF investigations and determining that LNAPL was migrating off-site, Dr. Dyson proposed and conducted multi-phase extraction as corrective action to obtain site closure. NPDES permitting was required for MPE operation for the discharge water since there was no access to the sanitary sewer.

Laser-Induced Fluorescence Investigations (Various Sites)
Dr. Dyson has managed LIF investigations throughout the United States, southeast Australia, and Columbia, South America. This has included workplan development, budget development and tracking, contract negotiations, and mobilizing equipment within United States and internationally. She was on site in Australia to set up the UVOST (LIF) equipment and collect LIF data for another consulting firm for 5 weeks. Dr. Dyson also analyzes LIF data, reviews 2D and 3D site visualizations, and writes LIF investigation reports for WCEC and other consultants.

Special Projects

MPCA Debris Management, St. Paul, MN (MPCA Spill Response Program)
While managing WCEC's MPCA Terrorism Grant, dr. Dyson participated in an MPCA committee to determine preparedness levels of MN's largest cities for dealing with disaster debris. This included developing a Temporary Debris Storage and Reduction (TDSR) Site Assessment Checklist, an associated spreadsheet for evaluating potential sites, and performing site assessments throughout Minnesota with the MPCA and city/county officials. She worked closely with the MPCA to prepare the final report for the MPCA's grant: *Outcomes of the Terror Debris Grant*. She was invited to present the TDSR site assessment checklist and other outcomes of the grant at several conferences. The TDSR Site Assessment Checklist was distributed to all emergency managers throughout Minnesota and is also being used by other state agencies.

MPCA Ebola Response Preparation

Dr. Dyson was part of a team from WCEC that assisted the MPCA in response planning related to the Ebola virus. This included the following activities: review of current information on Ebola, assistance with the establishment of a guidance document, preparing a comprehensive health and safety plan (HASP), assistance with disposal planning and development/implementation of a training program.

WCEC
ENVIRONMENTAL CONSULTANTS

Brett A. Edlund, Chemist

Spill Response Supervisor

MPCA / MDA Master Contract Classifications

Scientist II, Scientist I, Field Technician

Education

B.A. Chemistry, Biochemistry, University of Minnesota, Morris

Additional Training/Certifications

U.S. EPA Oil Response Training Fastwater Course
Emergency Responder, Technician Level 40 Training
-South Pacific Railroad Emergency Response Training Program
Hazardous Materials Technician Operations Course
BNSF Contractor Orientation
Roadway Worker Protection
eRailsafe Contractor Safety (BNSF RR, UP RR, CN RR, CP RR)
Ahura FD-Chemical Identification
Powdered Industrial Truck Training
CPR and First Aid
HazMat Transportation Security Awareness
DOT Hazardous Materials Transportation
Hazwoper Supervisor Training
OSHA Hazardous Waste Operations
IS-700 National Incident Management System (NIMS)
IS-800b National Response Framework
ICS-100a Introduction to Incident Command System (ICS)
ICS-200a ICS for Single Resources and Initial Action Incidents
ICS 300 Intermediate ISC for Expanding Incidents
Confined Space Entry Training
Cold Weather Oil Recovery Training

Technical Specializations

Hydrocarbon Investigations and Remediation
Agricultural Site Management
Avian Influenza Control Management
Emergency spill Response

Professional Summary

Mr. Edlund attended the University of Minnesota, Morris (UMM) where he earned a B.A. in Chemistry. He has gained considerable chemical experience while employed by the University of Minnesota, Morris chemistry laboratory/undergraduate research. His responsibilities included the following: research, setup and conduct complex atmospheric sensitive chemical reactions; inspect equipment used for cleanliness, and fatigue flaws. Complete detailed reaction logs, maintain journal, and present and publish chemical findings.

Mr. Edlund has more than 11 years of environmental consulting experience. As an assistant project manager at WCEC, Mr. Edlund uses his skills to manage projects and assist other project managers in completion of their projects. He oversees and documents remedial excavations following work plan requirements, collects soil and groundwater samples, analyzes samples for pH, eH, temp and identification, and generates reports. Mr. Edlund operates and maintains chemical identification equipment used on projects. Mr. Edlund is a participant in WCEC's spill response program.

Project Experience

Avian Influenza and Bird Euthanasia Program Leader

Project Manager responsible for the ongoing preparation and completion of the euthanasia program in the State of Minnesota. Responsibilities included over 11 years of contract administration, quality assurance/quality control and technical project support on sites under investigation by the MDA/BAH. Additional responsibilities included the preparation and review of technical work plans, coordination of field activities, evaluation of field and analytical data and preparation and review of technical reports.

Site Investigations, State of Minnesota Department of Agriculture

Assistant Project Manager and agricultural site investigations at various abandoned and orphaned locations throughout the state of Minnesota. Contaminants of concern included volatile organic compounds, chlorinated compounds, metals, pesticides and herbicides, PCBs, nitrates, and other hazardous substances. Responsibilities included over 11 years of quality assurance/quality control and technical project support on sites under investigation by the MDA. Additional responsibilities included the preparation and review of technical work plans, coordination of field activities; oversee excavations, evaluation of field and analytical data and preparation and review of technical reports.

Pollution Control Agency in the State of Minnesota in Commercial and Industrial Properties Emergency Response. Staff Scientist and Assistant Project Manager. Performed assessments to identify potential areas of contamination. The scope of services typically included management of hazardous waste disposal, implementation of work plans, and installation of wells and collection of soil and air samples. Prepared written reports summarizing findings and providing corrective measure recommendations.

Gregory Frank

Environmental Scientist, Spill Response Technician

MPCA / MDA Master Contract Classifications

Scientist II, Scientist I, Field Technician

Education

B.A. Chemistry, Southwest Minnesota State University, 2008

Additional Training/Certifications

Residential Mitigation Certified by National Radon Proficiency Program: ID 108129 RMT
40-Hour HAZWOPER Training
Confined Space Entry and Rescue Training
MSHA Surface Mining Training
Inland Waterways Spill Responder Training
Tactical Air Monitoring ("TacTox") Training
E-Rail Safe Training
FEMA ICS Courses 800, 700, 100, 200, 300
MN Class B Drivers License, with DOT Medical Examiner's Endorsement
CPR and First Aid

Memberships/Affiliations

American Association of Radon Scientists and Technologists

Technical Specializations

Hydrocarbon Investigations & Remediation
Chemical Vapor Intrusion Assessment & Remediation
Hazardous Material Spill Response

Professional Summary

Mr. Frank has 9 years of environmental work experience. Mr. Frank's responsibilities for the past 6 years have encompassed all aspects of leak site investigations and monitoring, as well as emergency hazardous material spill response. As an environmental scientist Mr. Frank is responsible for petroleum leak site investigation field activities and report preparation. The field activities that Mr. Frank performs include but are not limited to classifying soils, identifying zones of contamination, collecting soil and groundwater samples, overseeing monitoring well installation, remediation system monitoring and maintenance, overseeing contaminated soil

excavations, collecting indoor and sub-slab air samples and overseeing vapor intrusion mitigation system installation and diagnostics.

Mr. Frank's responsibilities as a senior spill response technician are to coordinate site activities, communicate with clients and regulatory agencies, and contain and recover hazardous materials. These responsibilities draw upon various skills from site air monitoring to equipment operation, and many others. After initial response activities are concluded, Mr. Frank has coordinated waste disposal, environmental restoration, and report preparation associated with the spill. Mr. Frank performs a variety of field assessments in conjunction with the investigatory work. He documents his reconnaissance of site surroundings with respect to land use, occupancy, and the presence of risk-elevating features such as water wells, basements, sumps, and surface water features. He directs junior staff in these functions, including the use of public databases to develop site data using GIS-enabled map systems. His experience in field assessments provides valuable information for completing environmental site assessments (ESAs), remedial investigations (RIs) and for planning site corrective actions.

Other responsibilities include the routine maintenance of the Tac-Tox set, and array of field monitoring instruments used for atmospheric monitoring of large releases such as spills of flammable materials or toxic gases. He maintains this set and other field instrumentation on a regular basis, ensuring that WCEC is prepared to respond swiftly to HazMat incidents.

Project Experience

MPCA Multi-Site Field Operations Coordination

Mr. Frank coordinates the field activities required for Minnesota Pollution Control Agency (MPCA) directed petroleum release sites in the "fund-financed" program. He schedules the required work items for multiple sites in a given city or region, so that multiple projects assignments can capitalize on the costs savings provided by the combined mobilization. He coordinates WCEC project schedules for metro office projects throughout Minnesota. He has conducted remediation system operation monitoring, maintenance, and troubleshooting for multiphase extraction (MPE) systems at the Farm Credit Services (Alexandria) and Trestle Stop (Inver Grove Heights) sites under remediation by MPCA. Previous site operations included the O&M and monitoring for a groundwater sparging and soil vapor extraction system in Cass Lake, Minnesota; this site was successfully closed as planned. He is also the chief field scientist for all vapor intrusion projects in the metro region office.

In addition to coordinating the local activities that he is responsible for, Mr. Frank is a key contact between the metro region office and field assignments being conducted form other regional offices that may benefit from his inter-regional cooperation.

Minnesota Pollution Control Agency, W. 66th St. & Vincent Ave Richfield (SR0001400) PCE. As the primary scientist for the project, Mr. Frank has been involved in all phases of the project. The ongoing phases of the project are vapor/groundwater plume determination and residential vapor intrusion assessments and mitigation. Mr. Franks role in vapor/groundwater plume determination include but are limited to oversee soil borings, monitoring well installations, hydraulic profiling (HPT), and collect soil gas samples. These tasks required Mr. Frank to obtain city and county permits for working in the right of ways, coordinate state contract drillers, determine boring locations to best meet plume definitional needs while avoiding public/private buried utilities and staying in the right of ways. During monitoring well installation Mr. Frank worked closely with the MPCA as soil and groundwater samples were split with the EPA Contract Laboratory Program. Mr. Frank's role in vapor intrusion assessments and mitigation include completing vapor intrusion building surveys, installing Cox-Colvin vapor pins to collect sub-slab samples, collect indoor air samples, oversee mitigating contractors in pre-diagnostics, system installation and post diagnostics checks on the mitigation systems, system evaluation by collecting pressure field extension measurements. Mr. Franks role in this project is not limited to field activities but has also included tabulating and interrupting air sample result to determine mitigation needs, completing boring/well construction diagrams, figure drafting using the MPCA vapor intrusion map templates, and property summary reports.

Minnesota Pollution Control Agency, Trestle Stop (L13062) Multi Phase Extraction. As the lead scientist Mr. Frank is responsible for scheduling and performing monthly and quarterly system monitoring, which includes recording system process data, well head vacuum measurements, system exhaust sample collection, ground water level measurements, and ground water sampling. Mr. Frank is also responsible for scheduled system maintenance and trouble shooting and basic repairs for unexpected system shut downs. This has included system sensor malfunctions, blower and transfer pump replacement. Mr. Frank is responsible for writing and managing the remediation system operation and monitoring reports, and keeping all data tables up to date.

Minnesota Pollution Control Agency, Tom's Resort (L16416) Air Sparge and Soil Vapor Extraction system. Mr. Frank was responsible for scheduling and performing monthly and quarterly system monitoring, which includes recording system process data, well head vacuum measurements, system exhaust sample collection, ground water level measurements, and ground water sampling. Mr. Frank also performed the scheduled system maintenance and troubleshooting; he also handled the repairs for unexpected system shut downs. Mr. Frank also contributed to remediation system operation and monitoring reports, and data tables.

Minnesota Pollution Control Agency, Alexandria Well Field (L114) Contamination Investigation. As an environmental scientist for the project, Mr. Frank is responsible for coordination of quarterly sampling of municipal and domestic supply wells around the city of Alexandria. Investigation results spurred the opening of several remedial investigation sites in the city. Mr. Frank conducted numerous soil borings, oversaw the installation of over a dozen monitoring wells, coordinated/performed quarterly groundwater sampling, and performs periodic free product recovery. He updates the database of analytical results and provides these to the project stakeholders as required for "receptor notifications" under Minnesota Statutes.

Minnesota Pollution Control Agency, Parkway Plaza PCE Investigation and Remediation, Minneapolis, MN. Mr. Frank was the lead scientist for the investigation to define the extent of impacts to the site and determine the PCE vapor intrusion risk. Tasks included conducting vapor intrusion surveys, installing and sampling sub-slab soil gas sampling points, collecting ambient air samples, scheduling field activities with building tenants, and monitoring sub-slab depressurizing system performance.

Investigation of Unknown Contamination Source (L18540) in Garfield, MN.
Greg performed all site investigations for this MPCA fund-financed after joining WCEC. Tasks included water line permeation assessment sampling work, monitoring well sampling, hydrologic monitoring, surface water and sump drain line sampling, and completion of a Focused Investigation using Laser Induced Fluorescence (LIF) technology to define the extent of severe impacts at a petroleum release site in the study area. He provided report preparation work for the Focused Investigation Report and other Investigation Report documents prepared for the site, and he maintained productive relationships with local individuals and City representatives involved in the study area.

Minnesota Pollution Control Agency, Clearwater Ground Water Investigation, Lynden Township As the lead scientist Mr. Frank was responsible for obtaining property owner permission for collection of samples from private supply wells from a region with potential heavy metal and nitrate contamination in a sole source aquifer. Mr. Frank coordinated sampling with residents. The 24 properties that required sampling were sampled within a week due to large part of Mr. Frank's outreach to the residents.

Minnesota Pollution Control Agency, SA 4521 Contamination Investigation.
Mr. Frank coordinated interaction with affected parties to obtain property owner consent for access, and the completion of WCEC site characterization via the installation, monitoring, and sampling of sub-slab sampling points at a site with impacts due to Perchloroethylene (PCE). The investigation included work on a property with two historic petroleum releases at an active auto service facility within a significant historical building nominated for listing in the National Register. Successful completion of field activities by Mr. Frank and the field crew involved the involvement of multiple stakeholders, property owner involvement for construction of sampling elements within the historic building, and a variety of both technical and health/safety considerations.

Nelson Century Farm Diesel Fuel Spill, L19403
Mr. Frank was involved with this petroleum release from the initial emergency spill response work completed to stabilize the site, to the final stage of investigation and reporting required to close the leak file. Throughout the process, he assisted the Responsible Party to remain in compliance with regulatory programs; this involved maintaining the schedule for project activities, periodic updates to the MPCA, and timely report preparation. Project success attributable to the WCEC involvement on this project was due in large part to Greg's excellent work and continuity throughout all site activities.

Mobile Home Park Phase II ESA Contract Services
Mr. Frank was the lead scientist responsible for subcontracted drilling firm management and site assessment field work for the Environmental Site Assessment at this site in Lakeville, Minnesota. WCEC received high praise from the national real estate brokerage firm's Environmental Consultant conducting the Phase II ESA, due to the excellent technical service and Client communication provided by Mr. Frank.

WCEC
ENVIRONMENTAL CONSULTANTS

Jesse D. Frank

Project Manager/Geologist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Supervisor, Field Technician

Education

B.S. Geology, North Dakota State University, Fargo, ND 2002

Additional Training/Certifications

Hazardous Waste Operations and Emergency Responder Certification (OSHA 1910.120)
Hazardous Waste Operations and Emergency Responder Supervisor (OSHA 1910.120(e)(4))
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
Midwest Universities Radon Consortium: Chemical Vapor Intrusion Mitigation
Confined Space Entry
WMD Hazardous Materials Technician – Center for Domestic Preparedness, Anniston, AL
National Incident Management System (NIMS) – ICS 700, 100b, 200b
HAZMAT IQ
AhuraFD Chemical Identification System
Cold Zone 2011 Hazardous Materials Conference – Leak Control for Gas Cylinders, Street Smart Hazmat, Chlorine,
Cameo/Aloha/Marplot
Certified State (ND) Oil and Gas Field Inspector
BNSF Contractor Orientation and Roadway Worker Protection
BNSF eRailsafe
Roadway Worker Protection
CAMEO
CPR and First Aid

Memberships/Affiliations

Licensed Professional Geologist, Minnesota, Lic. #48278
Licensed Professional Geologist, Kansas, Lic. #889

Technical Specializations

Hydrocarbon Investigations, Remediation, and Mitigation
Environmental Spill Response
Hazardous Material Technician
Laser Induced Fluorescence

Professional Summary

Mr. Frank has more than 16 years of environmental Science experience. Mr. Frank has been a project manager, assistant project manager, geologist, and technician at WCEC for 13 years. He had been involved with the Ultra-Violet Optical Screen Tool (UVOST®) Electrical Conductivity (EC) for advance site characterization for 6 years.

Project Manager/Assistant Project Manager

As a project Manager and assistant project manager, Mr. Frank uses his skills to help project managers complete their assignments as well as manage his own projects. He coordinates, oversees and documents drilling projects, prepares scopes of work, hires and oversees subcontractors, collects soil and groundwater samples, evaluates site data, prepares reports, facilities client-agency representative dialogue, and implements agency recommendations. In addition, Mr. Frank assistants in preparing project work plans and cost proposals, monthly project status updates, and project invoicing.

Emergency Spill Response and Chemical Assessment Team

Mr. Frank is a participant in WCEC's spill response program and the Minnesota Department of Public Safety's regional chemical assessment response program in the position of Science Officer. Responsibilities include responding to, assessing and mitigating dangerous hazmat incidents, and managing ongoing site activities and invoices. Additional responsibilities include corresponding with local and state government, communicating with clients, handling contract arrangements, coordinating waste disposal, and producing spill reports that outline WCEC's activities during Hazmat responses.

UVOST® Operator/Equipment Manager

Mr. Frank had operated and maintained the UVOST® direct sensing system for LIF advance site characterization of hydrocarbon contaminated sites. Duties included LIF and EC data interpretation, assisting clients with real time field decisions, and LIF report preparation. As equipment manager responsibility included laser system maintenance, ordering and maintaining system supplies. Mr. Frank had performed several LIF investigations throughout the Midwest (Minnesota, South Dakota, North Dakota, Iowa, Illinois, Nebraska, Kansas, and Montana), Utah and Delaware. Mr. Franks had performed LIF investigation at various facilities including corner gas stations, rail road yards, former refineries, bulk distribution plants, harbor slips, residential, and US Military base.

Previous Professional Summary

Prior to coming to WCEC, Mr. Frank was employed as a petroleum engineer by the North Dakota Industrial Commission (NDIC) Oil and Gas Division. As a field inspector for the NDIC, Mr.

Frank's experiences included the following: determining if drilling and production operations were in compliance with current laws and regulations; inspecting drilling rigs used to secure geologic and engineering information; monitoring cleanup and remediation of oil and salt water releases; contacting violators about appropriate corrective actions and reporting uncooperative operators to the NDIC; giving plugging orders and witnessing plugging of wells to insure proper isolation of oil and water reservoirs; witnessing well integrity tests; investigating public complaints involving oil and gas sites; and completing necessary documentation associated with the above tasks.

Project Experience

Petroleum Leak Investigation & Corrective Actions

Coordinated and conducted multiple petroleum leak investigations throughout the state involving former gas stations, active gas stations, and residential heating oil. Coordinated with WCEC staff, MPCA staff, property/home owners, and contractors to complete site investigation and corrective actives; prepare site health and safety plan; conduct field investigation, oversee soil borings, overseeing monitoring well installations, oversee/document/interrupt LIF site characterization, installing sub-slab sampling ports, and collect soil/groundwater/vapor samples; implement corrective actions involving LNAPL recovery, oversee impacted soil removal/disposal; and oversee/document installation of sub-slab depressurization systems.

Various Mercury Responses

Respond, coordinate, and project management of mercury releases at residential and schools. Project activities included: Coordinated with WCEC response staff, MPCA Staff, and occupants of site incident; prepare site health and safety plan; vapor monitoring; identify and removal of mercury impacted items; isolated and ventilate vapor impacted rooms; mercury recovery; and waste coordination.

Home Heating Oil Spills, Various Sites across Minnesota

Coordinated and responded to multiple home heating oil releases throughout the state. Coordinated with WCEC response staff, MPCA staff, home owners, and contractors to complete; prepare site health and safety plan; evacuation of fuel oil vapors, recovery of free product, removal/disposal of impacted household materials, impacted soil removal/disposal, installation/sampling of monitoring wells, installation and monitoring of temporary vapor extraction/ventilation systems; and oversee/document installation of sub-slab depressurization system for chronic vapor mitigation.

Removal of Hazardous Household Products from Grocery Store Fire, Maynard
Manage/coordinate/respond to incident involving various household chemical cleaning products compromised from a structure fire. Project activities included; Prepare site health and safety plan; segregate and inventory of the known household chemical; identify and segregate unknown household chemicals by pH; contain and prepare waste for disposal; secure waste; and coordinate waste disposal.

Melissa M. Hamling

Drafter/Project Scientist

MPCA / MDA Master Contract Classifications

Drafter, Scientist II, Scientist I, Field Technician

Education

B.A. Geology, University of Minnesota, Morris

Additional Training/Certifications

BNSF Contractor Orientation and Roadway Worker Protection
BNSF eRailsafe
20th Annual Midwest Hazardous Materials Response Conference, Northbrook, IL
TAC TOX
Hazardous Materials Technician of CBRNE Incidents, Anniston, AL
Introduction to the Computer-Aided Management of Emergency Operations (CAMEO) Suite
Advanced CAMEO Applications for All Hazards Management and Planning Level
Cold Zone 2010 Hazardous Materials Conference-Street Smart Hazmat Refresher, Ethanol and Biodiesel, TIH Releases and Toxic Threat Zones, Rapid Radiological Assessment Procedures, Identification Monitoring of Unknown Hazmat, Identification Monitoring of Unknown.
AhuraFD Chemical Identification System
AutoCAD Essentials I- CAD Technology Center, Inc.
HazMatID TM 360 Portable FT-IR Instrument Operation and Application Training Course
Public Safety WMD Response-Sampling Techniques and Guidelines, St. Paul, MN
HazMat IQ
55th CST/HSEM Full Scale Exercise
MDH Suspicious Substance Sample Collection and Hazards Screening Training
Hazwoper 40-Hour Training
8-Hour Site Supervisor Training
IS-00700 National Incident Management System (NIMS), an Introduction
IS-00100-Introduction to the Incident Command System (ICS100)
IS-00200-ICS for Single Resources and Initial Action Incidents

Professional Summary

Ms. Hamling has 10 years of environmental consulting experience. As a project scientist at WCEC, Ms. Hamling uses her skills to manage projects and assist other project managers in the completion of their projects. She oversees and documents drilling projects, collects soil and groundwater samples, oversees slug testing and pump testing, evaluates site data, generates

reports, facilitates client-agency representative dialogue, and implements agency recommendations. Ms Hamling has experience with both petroleum and agricultural projects.

For the past 6 years, Ms. Hamling has used AutoCAD to create site maps, import aerial photographs and generate cross sections and groundwater flow maps. She has also used Surfer to process groundwater flow data and to import data into AutoCAD. Ms. Hamling has used ArcGIS to create site location, receptor survey maps and imported GPS (Trimble) data into. She has also used GPS (Trimble) in plotting boring/well locations, utilities and excavation basins.

While at WCEC, Ms. Hamling created company-wide Green Practices. She contributed to updating the Corporate Health and Safety Plan and created and presented numerous safety power point presentations at monthly Health and Safety meetings. Ms. Hamling organized and led multiple individual and small group equipment training sessions. For over 4 years she assisted with the overseeing of the meter calibration, maintenance, and purchasing program.

Ms. Hamling is a participant in WCEC's spill response program and the Minnesota Department of Public Safety's regional chemical assessment response program.

While a student in the geology program at the University of Minnesota, Morris (UMM), Ms. Hamling participated in geologic mapping, writing and lab opportunities. She mapped major rock units and wrote about the geologic environment of the Black Hills in southwest South Dakota. She collected varves near Itu, in the state of Sao Paulo, Brazil to study microfossils to determine the depositional environment of the area.

Ms. Hamling's lab and writing experience extends beyond her collegiate training. She worked in a previous position which involved conducting lab tests and writing rock identifications for aggregates used in concrete. While working at the Science Museum of Minnesota, Ms. Hamling designed and wrote volunteer activities as well as organizing and leading training sessions. This experience emphasized communication and human relations as well as organizational and task management.

Project Experience

Agricultural Investigations for various private and state clients, Midwest Locations. Completed many investigations of former and current agricultural properties across the Midwest. Performed site walkovers with client and state agency representatives to identify suspected areas of concern, site conditions and/or property usage that have the potential for environmental impacts. Required specific knowledge of regulatory concerns pertaining to agricultural environmental issues. Prepared and implemented Work Plans, evaluated and collected investigation data, and prepared technical reports describing the methods and results of site activities. Conducted and oversaw excavations, monitoring well installation, and other

corrective actions activities at the sites. Completed reports detailing corrective action activities, monitoring well installation and quarterly and annual monitoring reports.

Ross Haugen, PE

Project Manager/Senior Project Engineer

MPCA / MDA Master Contract Classifications

Project Manager, Engineer III, Engineer II, Engineer I, Scientist II, Scientist I, Field Technician

Education

B.S. Biosystems Engineering, University of Minnesota-Institute of Technology, Minneapolis, MN
Honors Graduate

Additional Training/Certifications

Licensed Professional Engineer (MN #48002, MT#30786)
Licensed Petroleum Release Remediator (SD #11304)
Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
RCRA Haz Waste Generator Training
Erosion and Stormwater Management Certified (University of Minnesota)
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
IS-00700, IS-00800, ICS-100, ICS-200, ICS-300
NFPA 1001
BNSF Contractor Orientation and Roadway Protection Worker
Hazmat Safety Officer and Hazmat Branch Officer 16-hour course Hennepin Technical College
Electrical Troubleshooting and Preventative Maintenance-Level 1;
Maintenance Training Association of the Americas
BNSF eRailsafe
CPR and First Aid

Technical Specializations

Remediation system design, installation and operation
Remediation system pilot testing
Emergency response cleanup
Regulatory compliance

Professional Summary

Mr. Haugen has 15 years of experience in environmental investigation and cleanup projects; primarily focused on projects using mechanical systems to remediate hydrocarbon sites.

Project experience includes lead engineer for design, installation, operation, evaluation and pilot testing of air sparging, soil vapor extraction, multi-phase extraction and in-situ chemical oxidation technologies. In addition to managing projects and providing technical support for

other projects, Mr. Haugen has experience in regulatory compliance work including preparation and certification of SPCC plans.

Project Experience

Senior Project Engineer for Mechanical Remediation Projects

Responsibilities have included design, management and implementation of all phases of remediation system life cycles, from conceptual design through decommissioning. Specific responsibilities include life cycle cost evaluation, preparation of work plans and cost proposals, preparing technical design reports, working with state and local stakeholders on both state-funded and privately-funded projects, preparing specifications and soliciting bids, all aspects of field oversight of installation activities, as well as all aspects of remediation system monitoring, sampling and maintenance. Recent projects have included removing LNAPL from beneath an active financial institution utilizing multiphase extraction; mitigating gasoline vapor impacts from large LNAPL plume beneath two commercial properties and two apartment complexes utilizing soil vapor extraction; mitigating LNAPL impacts to surface water via air sparging/soil vapor extraction; and mitigating dissolved phase contaminant impacts to a surface water body utilizing multiphase extraction.

Project Manager

Manager of hydrocarbon projects ranging from investigation to corrective action design, and manager of regulatory compliance projects. Project manager responsibilities included directing field staff, coordinating fieldwork, communicating with regulatory agencies, private stakeholders and local and state government agencies; bid solicitation, preparing cost proposals and technical reports among other tasks. Project types include Limited Site Investigations, Remedial Investigations, Groundwater Monitoring and Corrective Action Design Projects involving excavations, water supply well replacement, and extension of municipal water mains. Recent projects include investigating and monitoring a dissolved phase contaminant plume with a complex mitigation pattern which is threatening a municipal water supply over a 100 acre area consisting of over 70 monitoring wells; and connect a private rural resident to a Rural Water Supply Network following a diesel fuel release which leaked into a aquifer and threatened the water supply well.

Team Leader for Emergency Response Projects

Five years of experience as Team Leader on WCEC's Emergency Response and MN Chemical Assessment Team. Responsibilities include point of contact for client during emergency response projects; securing contracts; directing field staff and subcontractors; and waste disposal management. Projects have included a mercury release from a private individual that contaminated a hotel; petroleum vapors emanating from an unknown source at a private residence on Tribal Lands; agricultural chemical hazardous waste disposal management; and a train-truck collision involving a large-scale release of anhydrous ammonia.

Minnesota Highly Pathogenic Avian Influenza (HPAI) Outbreak 2015

Mr. Haugen managed barn disinfecting crews for 20+ facilities to meet USDA requirements as the final step prior to granting growers approval to restock birds. The work required diligent attention to proper PPE and decontamination to ensure successful elimination of the virus. Mr. Haugen also served various roles in the depopulation and barn cleaning phases of the HPAI outbreak, which required strict attention to PPE and decontamination, and required the ability to effectively communicate with state and federal staff as well as with the bereaved farmers.

Jacob J. Holthaus, PG

Project Manager

Education

B.A. Geology, University of Minnesota-Morris, Morris, MN

Additional Training/Certifications

Professional Geologist, Minnesota, License # 51349
Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120) (40-Hr HAZWOPER); 2008-2018 Annual 8 Hour OSHA Refresher Certification 1910.120
Ridgewater College 2008, 2009, 2010 Hazmat Operations Review
ITRC LNAPL Science, Management, and Technology Conference, Kansas City, MO (2014)
8 Hour HAZWOPER Supervisor Training
Confined Space Entry
Hazardous Waste Generator Training
US Department of Homeland Security/FEMA – ICS-700, -100, -200, -800, -300, -400 courses
An additional 500+ hrs of continuing education, refresher, safety, and hazmat courses
Commercial Driver's License (Class A)
BNSF Contractor Orientation (2006-2018, current)
BNSF, Union Pacific, Canadian National, and Canadian Pacific eRailsafe (2007-2018, current)
Certified Forklift Operator
CPR and First Aid (2007-2018, current)

Memberships/Affiliations

Minnesota Water Well Association
Minnesota Groundwater Association
Wakota CAER

Technical Specializations

Environmental Spill Response & Boom Deployment
Hydrocarbon Investigations
Environmental Drilling

Professional Summary

Mr. Holthaus has 14 years of environmental technician, emergency response, drilling, and project management experience. Mr. Holthaus' responsibilities have included managing, coordinating, scheduling, and implementing emergency response and planned field activities such as providing technical and oversight support for WCEC's emergency response and consulting projects. During the last 8 years, Mr. Holthaus has also managed numerous private

and state-funded hydrocarbon investigation and emergency response projects through completion. Site activities have included soil boring and monitoring well installation, management of small and large-scale excavations, and management of small and large-scale emergency response projects. Between March 2016 and January 2018, Mr. Holthaus gained additional experience working with Bay West, LLC in a project manager capacity. These responsibilities included managing and coordinating emergency response projects, as well as a vapor intrusion and mitigation project within the MPCA Site Assessment Program. Since returning to WCEC in January 2018, Mr. Holthaus' responsibilities have included project management and coordination of WCEC's Emergency Response program in the Minneapolis/St. Paul area. Specifically, his responsibilities have included managing and coordinating personnel, equipment, and subcontractors during private and state-funded emergency response projects, and working with state government agencies, compliance, and reporting.

Project Experience

Field Technician and Site Supervisor. Mr. Holthaus has conducted soil, groundwater, soil gas, and vapor sampling activities at various spill and chemical release sites, including petroleum pipelines, bulk storage terminals, agricultural/chemical storage and manufacturing facilities, rail yards, and train derailment sites. His responsibilities included field documentation and oversight, health and safety, sample collection, decontamination, soil classification, drilling oversight, and emergency response management.

Drilling Manager. Mr. Holthaus has managed drilling activities of nearly 200 environmental drilling investigation projects from 2010-2014. His responsibilities included utility clearances through multiple state one-call systems and private utility contractors, equipment maintenance, staff coordination and training, client communication, inventory management of expendable materials, budget preparation and tracking, and project invoicing.

Project Manager. In the last 8 years (at WCEC and Bay West), Mr. Holthaus has been the project manager for 150+ emergency response projects and 50+ investigation and remediation projects. Responsibilities throughout these projects included project coordination and oversight, emergency response management, drilling-excavation-site investigation management, professional correspondence with clients, regulatory agencies, and stakeholders. Mr. Holthaus' responsibilities also include interpreting site geology, hydrogeology, contaminant mitigation patterns, site conceptual model development, regulatory agency report submissions, site field work and personnel tracking, invoicing, and maintaining client relationships.

Kayla Hovde

Emergency Response Specialist

Education

B.A. Environmental Studies, University of Minnesota, Morris, 2011

Additional Training/Certifications

40 Hour Hazardous Waste Operations and Emergency Response Training (OSHA 1910.120)
8 Hour HAZWOPER Supervisor (OSHA 1910.120(e)(4))
E-rail Safe Contractor Training (BNSF, UP RR, CP RR, CN RR)
BNSF Contractor Orientation Training
BNSF Tac Tox
Tank Car Specialist
CN On-Track Safety
Roadway Worker Protection
MN Department of Health Suspicious Substance Sample Collection & Hazards Screening Training
Center for Domestic Preparedness- Hazardous Material Technician for CBRNE Incidents Training (13-04 HT)
State of Minnesota – 700/800 MHz Radio Training
Nationally Registered Emergency Medical Technician (EMT)
AHA-Certified BLS CPR Instructor
National Incident Management System (NIMS): ICS 100.b, 200.b, 300, 700.a, 800.b courses
Protected Critical Infrastructure Information Program Authorized User
Confined Space Entry
Confined Space Rescue
Cold Weather Oil Spill Containment and Recovery
Inland Waterways Spill Responder Training

Memberships/Affiliations

Stevens County Protected Critical Infrastructure Information Assessment Team Member
West Central Chemical Assessment Team (CAT) 2011-2014

Technical Specializations

Emergency Spill Response
Hydrocarbon Investigations and Remediation
Agricultural Chemical Investigations and Remediation
Mercury Response
AutoCAD
Foreign Animal Disease Response

Professional Summary

Ms. Hovde attended the University of Minnesota, Morris (UMM) where she earned a B.A. in environmental studies. She has gained most of her experience from working as an environmental technician at WCEC for the past six years. Ms. Hovde works on a wide variety of projects for WCEC including hydrocarbon investigations and remediation, MPCA Leak Site investigations and Agricultural Chemical Investigation and Remediation. She actively works on remediation of petroleum-contaminated soil and groundwater, drilling projects, collects soil and groundwater samples, evaluates site data, completes site health and safety plans, generates reports, facilitates client-agency representative dialogue, and implements agency recommendations.

As a member of WCEC's spill response program, Ms. Hovde has gained experience in establishing site response zones, incident communication, air monitoring (using photoionization detectors, multi gas, single gas and toxic gas monitors), monitoring equipment calibration, and decontamination. She serves as a general on-site supervisor. She has also been certified for confined space entry and confined space rescue.

Ms. Hovde is also currently employed at Stevens County Ambulance Service (SCAS) as an Emergency Medical Technician (EMT). She has been employed at SCAS for over six years. She has assisted the community by responding to medical emergencies in Stevens County. She is also a registered DOT instructor and American Heart Association certified BLS instructor for CPR and first aid. Ms. Hovde assists with teaching the EMT course provided by SCAS.

Project Experience

Leak Site Investigations; Various Local and Retail Petroleum Companies, Railroads, and State Agencies in Minnesota, South Dakota, and North Dakota. Responsibilities include conducting spill and leak investigations and site characterizations for hydrocarbon and agricultural chemical release sites. Performed Limited Site Investigations, Remedial Investigations, Monitoring and Remediation in Minnesota and is Multi-site approved at the Field Technician I and Scientist I level for duties performed. Responsibilities included completion of soil boring logs, geologic stratigraphy descriptions, collection of soil and groundwater samples, sieve analysis, geologic cross sections, and contaminant concentration classification of soils during push probe investigations. Oversee excavations of contaminated soils. Conducts site walkovers for SPCC plans as well as preparing the plans themselves.

Emergency Response; Hazardous Materials Cleanup Oversight; Waste Management and Disposal; Emergency Management Health and Safety; Various Hazardous Materials Transport and Retailers, Railroads, and State Agencies in Minnesota, South Dakota, North Dakota. A specialist for Emergency Response projects in Minnesota, South Dakota, and North Dakota. Contributes to and manages emergency response operations for petroleum and hazardous waste facilities and the transportation industry including site cleanup activities, implementation of work plans, collection of soil and air samples, waste storage, and disposal. Drafts and implements site Health and Safety Plans. Prepared written reports summarizing findings and providing corrective measure recommendations. Maintained emergency response equipment and environmental monitoring meter calibration.

Mercury Responses
Respond to mercury releases. Project activities included: Coordinated with WCEC response staff, MPCA Staff, and occupants of site incident; prepare site health and safety plan; vapor monitoring; identify and removal of mercury impacted items; isolated and ventilate vapor impacted rooms; mercury recovery; and waste coordination.

Home Heating Oil Spills, Various Sites across Minnesota
Coordinated and responded to multiple home heating oil releases throughout the state. Coordinated with WCEC response staff, MPCA staff, home owners, and contractors to complete; prepare site health and safety plan; evacuation of fuel oil vapors, recovery of free product, removal/disposal of impacted household materials, impacted soil removal/disposal.

Matthew Johnson

Senior Project Manager/Geologist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.A. Geology, University of Minnesota Morris, 1991

Additional Training/Certifications

40-Hour Health and Safety Training
Industrial Hazmat Technician
Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
E-rail Safe/BNSF Responder Training
National Incident Management System (NIMS)

- MIMS
- Bridge
- IS-100
- IS-300
- IS-700
- IS-800

CPR and First Aid

Memberships/Affiliations

Licensed Professional Geologist, Minnesota, Lic. #30672
Member, MGWA
Member, NGWA

Technical Specializations

Hydrocarbon Investigations & Remediation
Bio-fuel Release Investigation & Remediation
Environmental Due Diligence
UST Program Management
Emergency Spill Response Project Management

Professional Summary

Mr. Johnson has more than 28 years of environmental consulting experience managing hundreds of environmental projects. As Senior Project Manager, Mr. Johnson directs environmental projects in the investigation and remediation of contamination for emergency response and long-term environmental management in Minnesota, Montana, Iowa, and North and South Dakota. He also advises and oversees engineers, scientists, and other technical staff as they conduct environmental assessments and investigations, UST and AST removals, and remediation of contaminated soil and groundwater.

Mr. Johnson currently serves in the Hydrocarbon Services Division at WCEC where he manages projects for a variety of clients; this includes various private entities, non-profit organizations, and the State of Minnesota under their State Spills contract and in the Petroleum-Agricultural Chemical-Superfund "Multi-Site" program. He develops and tracks project budgets and competitive-bid proposals, is responsible for quality assurance and quality control of work products and oversees technical staff and field activities for a wide variety of projects including site characterizations, remedial investigations, emergency responses, and implementation of corrective action plans.

Mr. Johnson's knowledge of federal, state and local regulations regarding site assessments, investigations, and remedial options has enabled him to develop and maintain strong relations with clients/state agencies. He provides full technical support, advice, and regulatory agency negotiations when needed.

Project Experience

Aquifer Contaminated with VOCs, Minnesota

Project manager of a remediation site with an impact to a drinking water aquifer. Bottled water was supplied to two residences until carbon treatment systems were implemented. A new water supply well was installed. Rotosonic drilling was utilized to conduct the subsurface investigation. Oversaw the installation of 35 monitoring wells and five recovery wells completed within three different zones of contamination. Also developed the monitoring plan for these monitoring wells and seven drinking water supply wells. Because no power source was available, a solar-powered free product skimmer system was built and tied in to the on-site recovery wells to remove LNAPL.

Pipeline Leak, North Dakota
Mr. Johnson managed the response to a petroleum pipeline release within the city limits of West Fargo, North Dakota. Provided oversight of air monitoring for protection of the workers and nearby residential development during excavation activities. Advised and provided oversight of the removal of 1994 cubic yards of contaminated soil. Worked with the North Dakota Department of Health in approving a land treatment site for the impacted soil. Coordinated the manifesting and provided oversight of the loading, hauling and spreading of the impacted soil.

Petroleum Vapors in Apartment Building, Minnesota
Mr. Johnson managed an emergency response/accelerated site investigation of a catastrophic gasoline UST release which impacted an area of approximately four city blocks. Vapors from the released gasoline impacted two apartment buildings, a medical complex, and a commercial complex. Immediate emergency response actions addressed the vapor impacts. A laser induced fluorescence investigation was conducted to identify the extent of the spilled product. A corrective action design consisting of three separate vapor extraction systems was designed and installed following MPCA approval.

Gasoline Spill & Investigation and Multiphase Extraction, North Dakota
Mr. Johnson completed an accelerated remedial investigation in response to a catastrophic gasoline release of an estimated 12,000 gallons due to a structural failure of an underground storage tank. After the subsurface extent of the release was investigated and delineated, a multiphase extraction remediation system was used to recover the gasoline. The mobile system was operated and maintained to remove LNAPL, dissolved-phase and vapor-phase product from the subsurface. Mr. Johnson worked with the North Dakota Department of Health to approve an NPDES permit for disposal of the treated groundwater.

Third-Party Audit of Ethanol Plant NPDES/SDS Permit Sampling, Minnesota
Provided oversight and management of a third-party audit for an ethanol production plant in Minnesota. Managed the oversight, verification, and documentation of the procedures followed by the ethanol plant operations personnel. Provided the MPCA with certification of the adherence to their NPDES/SDS permit.

Aquifer Contaminated with VOCs, Minnesota
A remedial investigation discovered that a drinking water aquifer was impacted due to a release from an underground storage tank system at a gas station. A GAC system was connected to the site water supply system until a replacement well could be installed.

Aquifer testing was conducted to estimate the capture zone and to identify a new permanent site well location. Managed carbon filter system monitoring and change outs, as well as sealing of other site wells.

Flood Response, Minnesota, North Dakota, South Dakota
Responded or coordinated the response to multiple flood responses along the Red, Minnesota, Bois de Sioux, and Little Minnesota Rivers. Assisted with fuel oil and/or tank removal, hazardous waste removal, and segregation of waste products from homes and businesses.

Statewide Sampling Projects, Various Sites, Minnesota
Project manager for three separate fund-financed projects to assist the State of Minnesota with a federal initiative for determining the effectiveness of various methods of treating petroleum contaminated soil. Managed personnel in sampling of "treated" petroleum contaminated soils from locations across the state. Reported treatment effectiveness of petroleum contaminated soils that were treated by different methods including; land application on farmland, post-incineration, and composting.

Service Station, Minnesota
Project manager of service station site with LNAPL and vapor impacts to a business. Oversaw the installation of a vapor enhanced, total fluid extraction remediation system with telemetry. With telemetry, site visits and maintenance was optimized to ensure maximum system up-time for system operation which led to expedited site closure.

Transport Spill, Minnesota
A transport truck rolled over into a ditch losing approximately 1,500 gallons of gasoline. Managed the immediate excavation of impacted soils and subsequently managed the installation, operation and maintenance of a vapor extraction system to recover product which could not be addressed through excavation.

Spill Response, Minnesota
Project manager of spill site where asphalt cement entered into a storm sewer system which flowed into a lake. Managed the excavation and product recovery efforts in three distinctly different impacted areas; including a lake, a beach, a sewer system, and the source area.

Sarah Kuhn, EIT

Environmental Engineer

Education

B.S. Bioproducts and Biosystems Engineering, University of Minnesota, Minneapolis, MN

Additional Training/Certifications

40-Hour HAZWOPER Health and Safety Training (OSHA 29 CFR 1910.120)
eRailsafe certified for BNSF, CN, CP, and UP Railroads
BNSF Contractor Orientation and Roadway Worker Protection
GIS for Natural Resources – University of Minnesota
NWETC Fundamentals of Contaminant Chemistry & Applications in Subsurface Contaminant Transportation & Remediation

Memberships/Affiliations

Licensed Engineer Intern, Montana PEL-EI-LIC-39385

Technical Specializations

Environmental Due Diligence and Compliance
Remediation System Procurement & Monitoring
Data Analysis and Report Preparation
Emergency Spill Response
GIS/GPS Geospatial Data Management – ArcGIS and AutoCAD software
Phase I / II Environmental Site Assessments

Professional Summary

Ms. Kuhn has four years of environmental science and consulting experience. She is knowledgeable in the principals of environmental due diligence and compliance, remediation, and monitoring for groundwater, soil, and air which has been impacted by petroleum and agricultural chemicals. Her primary area of expertise is environmental compliance in the form of Spill Prevention, Control and Countermeasure and Facility Response Plans. As an Environmental Engineer, EIT at WCEC, Ms. Kuhn assists Project Managers with environmental projects in the investigation and remediation of contamination for emergency response and long-term environmental management projects. Ms. Kuhn works alongside Project Managers and other Scientist/Engineers to sample soil, ground water, surface water, sediment, and air media as well as perform maintenance on various environmental systems. She is experienced with the use of multiple types of field meters including a Landtec GEM 5000, photoionization detectors, water level and conductive interface probes, volt meters, and manometers.

Ms. Kuhn currently serves in the Engineering Division at WCEC where she works on projects for a variety of clients. Some of these projects include Spill Prevention, Control, and Countermeasure Plans, Storm Water Pollution Prevention Plans, Facility Response Plans, and Response Action Plans.

Project Experience

Environmental Due Diligence and Compliance through SPCC Plans, Facility Response Plans, and Storm Water Pollution Plans. Staff Engineer conducting facility walkovers to determine compliance with applicable EPA oil pollution prevention standards (Title 40, Chapter 1, Subchapter D, Part 112 of the Code of Federal Regulations) and writing reports that show facility's plan to remain in compliance. Identified probable release locations and scenarios, areas sensitive to oil pollution, procedures to follow during a release, and proper oil storage and containment. Applied geospatial information from databases using ArcGIS and AutoCAD to develop maps showing sensitive environments, surface flow directions, probable release locations and behaviors, and facility layouts. Compiled data into a report which summarizes plans for preventing and responding to oil releases.

Environmental Remediation System Design, Installation and Feasibility Studies, Construction, Monitoring, Operation, and Maintenance of Various In-Situ Remediation Systems, Multiple Sites in Montana and Minnesota. Staff Engineer involved in the design, construction, operation, and maintenance of various in-situ remediation systems including soil vapor extraction, air sparge, and multiphase extraction. Systems ranged from small-scale systems housed in permanent shed style building, to mobile systems enclosed in a utility trailer, to large-scale systems housed in a permanent warehouse style building. Completed pilot test studies to obtain site-specific parameters for the final system design. Conducted monitoring and maintenance of the final systems to optimize system performance and efficiency. Completed compliance sampling of system intermediates and effluents as necessary for regulatory compliance.

Soil, Groundwater, and Air, Monitoring, Sampling, Data Management, and Report Preparation, Multiple Hydrocarbon Sites in Montana, Minnesota, and Washington. Staff Engineer conducting environmental media monitoring, sampling, data management, and report preparation for various petroleum release sites under the jurisdiction of the MTDEQ, MPCA, and Department of Ecology. Responsibilities included operation and maintenance of groundwater sampling pumps and multi-parameter field meters, collecting soil samples using techniques which conform to regulatory guidelines, and obtaining air samples with summa canisters for volatile organic compounds (VOCs) analysis. Organized analytical data into tables

and graphs for analysis and display, and applied geospatial information using GPS, ArcGIS, and AutoCAD software. Formatted data was put into formal reports containing text which summarized the sampling and monitoring event and the current status of the remediation process, as required by the MTDEQ, MPCA and Department of Ecology.

Spill Response and Cleanup, WCEC Spill Response Team, Various Release Sites.
Spill response technician at multiple release sites in Montana, Idaho, North Dakota, and Minnesota. Spill response scenarios included truck and train wrecks, tanker spills, surface water spills, and UST/AST releases. Released substances included various agricultural and petroleum chemicals, paint, paper, railroad ties, and unknown chemicals, etc. Spill response activities consisted of maintaining site control and performing an initial assessment followed by expedited cleanup. Assisted team in spill containment using the applicable method based on the scenario such as deploying a boom and sorbent pads for a surface water hydrocarbon spill. Removed impacted materials via soil excavation, free-phase recovery, debris cleanup, etc.

Phase I / II Environmental Site Assessment, Various Commercial and Industrial Clients.
Completion of multiple Phase I Environmental Site Assessments of commercial and industrial properties in Montana. Phase I Environmental Site Assessment responsibilities included identification and differentiation of recognized environmental liabilities, historically recognized environmental liabilities, controlled environmental liabilities, and de minimis conditions that do not present an environmental liability to a property parcel. This includes understanding and conducting Phase I EASs in conformance with the American Standards of Testing and Materials (ASTM) “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process” set forth in the ASTM Standard E 1527-13. Ms. Kuhn has prepared and implemented Phase II Work Plans to evaluate recognized environmental liabilities and quantify the scope of environmental impacts to allow buyers or sellers to understand the environmental liabilities present on a parcel and make informed decisions on the purchase or sale of a property parcel.

Christopher T. Lesmeister

Project Manager/Project Scientist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.S. Ecology and Field Biology: Wildlife Emphasis, St. Cloud University, St. Cloud, MN
A.A.S. Sales and Management, St. Cloud Technical College, St. Cloud, MN

Additional Training/Certifications

Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
ITRC Light Nonaqueous-Phase Liquids: Science, Management, and Technology
Wetland Delineator Certificate Program - Certified Wetland Delineator #1242
Industrial Fire Brigade Training
Mold Remediation Training
Hazardous Waste Technician
Inland Waterways Spill Responder Training
Suspicious Substance Sample Collection and Hazards Screening Training
HAZMAT Branch Officer
HAZMAT Safety Officer
HAZMAT Technician Operations
Annual Midwest Hazardous Materials Response Conference (2008)
Cold Zone 2009 Regional Hazardous Materials Conference
Dale Carnegie Course
WMD Hazardous Materials Technician
Introduction to the Computer-Aided Management of Emergency Operations (CAMEO)
Incident Response to Terrorist Bombing
Confined Space Entry
DOT Hazardous Materials Transportation
Hazmat Transportation Security Awareness
National Incident Management System

- IS-100
- IS-200
- IS-300
- IS-400
- IS-700

BNSF Contractor Orientation, CN On-Track Safety and Roadway Worker Protection
E-rail Safe/BNSF Responder Training
CPR and First Aid

Technical Specializations

Hydrocarbon Investigations & Remediation
Phase I and Phase II Environmental Site Assessments
Agricultural Investigations and Remediation
GIS Mapping and Cartography
Computer Aided Design (CAD) Software
Wetland Delineations and Mitigation
Wetland Banking
FEMA HAZUS Software

Professional Summary

Mr. Lesmeister has experience working with city, county, and government agencies such as; highway departments, fire departments, police and sheriff departments, the Department of Transportation, the Minnesota Pollution Control Agency, the Minnesota Department of Agriculture, and the Minnesota Department of Health. He also utilizes his experience with a technical understanding of mechanics and various equipment operations, from an agricultural and construction background.

Mr. Lesmeister's management and sales experience extends beyond his collegiate training. He has worked in previous positions involved in personal and operational management. This experience emphasized communication and human relations as well as organizational task management.

Since May 2007, Mr. Lesmeister utilizes his skills at WCEC to assist with project management, and to implement various aspects of remediation field work and reporting. Mr. Lesmeister conducts wetland delineations, NRCS conservation easement monitoring site inspections, groundwater monitoring well abandonments, collects soil and groundwater samples, evaluates site data, utilizes laser induced fluorescence (LIF), collects soil and water samples with a hydraulic push probe, generates reports, conducts Phase I and Phase II Environmental Site Assessments, and is trained with ArcGIS and AutoCAD software.

Mr. Lesmeister is a participant in WCEC's spill response program. More information regarding this experience is provided below.

Project Experience

Minnesota Pollution Control Agency-Petroleum Remediation Program

Project Manager/Project Scientist. Responsibilities included emergency response, UST closure and reporting, site characterizations, development of corrective action plans, installation and operation of remediation systems, recovery of LNAPL, and groundwater monitoring. Utilized direct sensing techniques to characterize LNAPL in subsurface prior to excavation of petroleum saturated soils. Negotiated directly with third parties regarding access to private property for the purpose of conducting site investigations and remediation. Support clients in the evaluation of data and allocation of remedial responsibilities at sites for which remediation agreements were executed with new property owners that experience new release(s).

Agriculture Investigations and Remediation

Project Manager/Assistant Project Manger/Scientist. Responsibilities included emergency response, reporting, site characterizations, development/implementation of corrective action plans, and groundwater monitoring. Perform remedial and pre-construction investigations at locations in Minnesota, North Dakota, and South Dakota. Oversee excavations and coordinate land farming of the contaminated soil.

Wetland Delineation

Project Manager/Certified Wetland Delineator # 1242/Scientist. Responsibilities include soil characterization, flora and fauna identification, review of historical imagery, topography review, LiDAR, GPS mapping, reporting, wetland mitigation documentation and implementation, and wetland bank creation. Wetland mitigation responsibilities include development of a replacement plan, coordination with local and regional government units, documentation preparation, and implementation of the replacement plan. Wetland bank creation responsibilities include development of a bank creation plan, coordination with local and regional government units, documentation preparation, and implementation of the bank creation plan. Member of the MN Wetlands Professionals Association.

Phase I and Phase II Environmental Site Assessment, Various Commercial and Industrial Clients

Assistant Project Manager/Scientist. Performed building and site inspections to identify suspect site conditions and/or property usage that may create potential environmental liabilities. Phase I ESA responsibilities included evaluations of existing environmental problems and potential environmental liabilities. Interaction with diverse professional groups including governmental agencies, various institutions and technical specialists. Required specific knowledge of technical, legal and regulatory concerns pertaining to a wide range of environmental issues. Prepared and implements Phase II Work Plans, evaluated Phase II investigation data, and prepared technical reports describing the methods and results of Phase II activities.

Jeffrey McCoy

Senior Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I

Education

B.A. Mathematics, University of Minnesota, 1992

Additional Training/Certifications

Additional Year of Coursework in Geology, Chemistry, Physics, & Engineering, University of Minnesota
40-Hour Health and Safety Training
Certified Hazardous Material Specialist
Due Diligence at Dawn
Lead Inspector Training
MPCA Air Permitting Conference
Spill Prevention, Control, and Countermeasure Plans, Environmental Protection Agency
Certified Asbestos Inspector, Minnesota Department of Health

Technical Specializations

Hydrocarbon Investigations & Remediation
Environmental Due Diligence
Property Transfers
Voluntary Investigation and Cleanup Programs
Agricultural Chemical Assessments, Investigations, & Remediation

Professional Summary

Mr. McCoy has 24 years of environmental consulting experience. Mr. McCoy's present and past responsibilities have included all aspects of operations management, including business development, human resources, financial planning, quality control, and risk management. As project manager for various private and governmental clients, he has also directly performed and managed a wide range of technical projects throughout the Midwestern United States. Mr. McCoy's experience includes development and review of technical work plans and reports, regulatory negotiation, development and tracking of project budgets and competitive-bid proposals, quality assurance and quality control of work products, and oversight of technical staff and field activities for a wide variety of site characterizations, remedial investigations, emergency response, and corrective action plan implementation projects.

Mr. McCoy's experience includes project management of numerous site investigation and remediation projects throughout the Midwest at properties impacted with a variety of contaminants, including volatile organic compounds, chlorinated compounds, metals, petroleum compounds, pesticides, and fertilizers. Mr. McCoy's broad base of environmental knowledge provides WCEC clientele and their financial lending institution with an excellent resource during property transfer projects. WCEC clients utilize Mr. McCoy's experience for environmental risk assessment, technical review and editing of property purchase or lease agreements and financing, including investigation and remediation cost projections and escrow agreements. More information regarding this experience is provided below.

Project Experience

Environmental Property Assessments & Compliance Assessments, Remediation, Agricultural Implement and Equipment Dealerships, National and International Locations. Project Manager and Senior Project Manager on more than 100 Environmental Assessments of agricultural implement and equipment dealerships located throughout the Midwest and Western United States, in addition to multiple international locations. Contaminants of concern included volatile organic compounds, chlorinated compounds, metals, and petroleum compounds. Responsibilities included the review and editing of lease and purchase agreements, evaluation of existing environmental problems and potential environmental liabilities. Job duties required interaction with property managers, corporate managers, attorneys, governmental agencies, and various institutions and technical specialists. Required specific knowledge of technical, legal, and regulatory concerns pertaining to a wide range of environmental issues. Prepared and implemented Phase II Work Plans, evaluated Phase II investigation data, and prepared technical reports describing the methods and results of Phase II activities. Completed UST closures, prepared and reviewed remedial work plans, coordination of field activities, contractor procurement, evaluation of field and analytical data and preparation and review of technical reports for regulatory agencies and financial institutions.

UST Closure; Site Characterizations; Corrective Action/Remedial Action Plan Development; Remediation System Installation, Operation, and Maintenance; Ground Water Monitoring; Various Retail Petroleum Companies, Railroads, Commercial Property Owners, Industrial Facilities, Midwestern States. Staff Scientist, Assistant Project Manager, and Project Manager, on several UST sites in the Midwest on behalf of petroleum retailers, commercial property owners, and industrial manufacturing facilities. Responsibilities included emergency response, UST closure and reporting, site characterizations, development

of corrective action plans, installation and operation of remediation systems, recovery of LNAPL, excavation of petroleum saturated soils, and periodic ground water monitoring. Disposal activities of contaminated soils generated from cleanup activities included options such as composting, land spreading, incineration, and landfilling. Project duties included sub-contractor procurement and management and successfully accessing state reimbursement programs on behalf of WCEC clientele.

Minnesota Department of Agriculture (MDA) Agricultural Voluntary Investigation and Cleanup (AgVIC) and Comprehensive Facility Investigation (Comprehensive) Programs, Various Locations, Minnesota. Environmental Scientist, Project Manager, and Senior Project Manager of numerous agricultural AgVIC and Comprehensive sites across the state of Minnesota. Worked closely with property owner(s) and MDA to identify and assess potential risk areas, develop investigation parameters, complete remedial investigation and contamination impact surveys and provide site recommendations based on investigation data. Developed and executed soil remediation plans, land application or bioremediation composting, and follow-up ground water monitoring plans.

Emergency Spill Response Projects, Various Locations in South Dakota, North Dakota, and Minnesota. Staff Scientist, Assistant Project Manager, and Project Manager of multiple spill response projects relating to major railroads, fuel and chemical transport companies, manufacturing plants, and residential homeowners. Responsibilities included emergency response, site characterizations, development of corrective action plans, product recovery, excavation of contaminated soils, and disposal.

Development Response Action Plans, Various Clients throughout Minnesota, Iowa, South Dakota, and North Dakota. Assistant Project Manager and Senior Project Manager responsible for performing site inspections, historical review, and technical document review prior to the redevelopment of contaminated properties. Assessment activities included identification, quantification and remediation of soil impacts beneath proposed construction sites. Response Action Plans include retrofitting existing structures with passive and active vapor intrusion counter control measures. Aggressive project scheduling and execution were necessary to assure that facility construction activities or property transfer timelines remained on schedule.

Environmental Property Assessments & Compliance Assessments, Christensen Farms, Sites located in Illinois, Iowa, Nebraska, Colorado, South Dakota, and Minnesota.
Completion of more than 150 Phase I Environmental Site Assessments at existing Concentrated Animal Feeding Operations throughout the Midwestern United States. Performed building and site inspections to identify suspect asbestos containing building materials, site conditions and/or property usage that may create potential environmental liabilities. Responsibilities included evaluation of existing environmental problems and potential environmental liabilities. Interaction with property managers, corporate managers, and governmental agencies, various institutions and technical specialists. Required specific knowledge of technical, legal and regulatory concerns pertaining to rural environmental issues.

Minnesota Highly Pathogenic Avian Influenza (HPAI) Outbreak 2015.
Following bird depopulation, Mr. McCoy managed compost crews at more than 30 farm facilities during the HPAI 2015 Outbreak. Duties included providing cost estimates, liaison with farm managers/owners and government officials, sub-contractor management, and completion of compost construction to USDA requirements. Managed barn cleaning crews and barn disinfecting crews for 20+ facilities to meet USDA requirements as the final step prior to granting growers approval to restock birds. The work required diligent attention to proper PPE and decontamination to ensure successful elimination of the virus.

Jordan Miller

Environmental Technician

Education

B.A. Biology, University of Minnesota Morris, 2017

Additional Training/Certifications

40-Hour Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
DOT Hazardous Materials Transportation (Title 49 CFR 172.704)
BNSF Contractor Orientation
eRailSafe Railroad Safety Training
SertC Tank Car Specialist Training
National Incident Management System (NIMS) – ICS 100.b, 200.b, 700.a

Technical Specializations

Hydrocarbon Investigations & Remediation
Emergency Spill Response

Professional Summary

Mr. Miller attended the University of Minnesota, Morris (UMM) where he earned a B.A. in Biology. Mr. Miller has 10 months of environmental science and consulting experience. As an Environmental Technician at WCEC, Mr. Miller assists Project Managers with investigation and remediation of contamination for emergency response and long-term environmental management projects. Mr. Miller has gained experience in soil identification and description, water and soil sampling, and report writing. Mr. Miller currently serves in the Environmental Services Division at WCEC where he works on projects for a variety of clients.

Project Experience

Subsurface Soil and Groundwater Investigations – Multiple Clients and Locations

Provided technical oversight for multiple environmental soil and groundwater investigations. Project responsibilities have included: field sampling activities; site documentation; soil and groundwater monitoring oversight; data evaluation; and report preparation.

Emergency Response; Hazardous Materials Cleanup Oversight; Waste Management and Disposal; Emergency Management Health and Safety; Various Hazardous Materials Transport and Retailers, Railroads, and State Agencies in Minnesota, South Dakota, North Dakota.

A technician for Emergency Response projects in Minnesota, South Dakota, and North Dakota. Contributes to emergency response operations for petroleum and hazardous waste facilities and the transportation industry including site cleanup activities, waste storage, and disposal. Completed and implemented site Health and Safety Plans. Maintained emergency response equipment and environmental monitoring meter calibration.

Shawn Miller

Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.S. Environmental Studies, Saint Cloud State University, 2004

Additional Training/Certifications

40-Hour Hazardous Waste Operations and Emergency Management Response: OSHA 1910.120
8-Hour OSHA Construction Supervisor Training
8-Hour Safety and Health Refresher Training, 2005-2018
eRailsafe System (BNSF, Union Pacific, CN & Canada Pacific)
Annual BNSF Contractor Orientation and Roadway Worker Protection
Hazardous Materials Technician for CBRNE Incidents
Emergency Management Institute IS-00100.b, IS-00200.b & IS-00700.a
Construction QA/QC for Geosynthetic, Compacted Clay Liner and GCL Installations
Chevron Loss Prevention System Training
US HAZCOM
CPR and First Aid
Confined Space Entry and Confined Space Rescue

Technical Specializations

Hydrocarbon Investigations & Remediation
Soil Vapor Extraction System Installations and Operations
Environmental Spill Response
Construction Quality Assurance Officer for Geomembrane Cover Systems
Topographic and Construction Surveys

Professional Summary

Mr. Miller has 14 years of environmental science and consulting experience. As a project manager, Mr. Miller oversees investigation and remediation projects throughout the Midwest. His current duties include project management, client communication, project reporting, and oversight of technical staff and field activities for subsurface soil, groundwater, and vapor investigations. Much of Mr. Miller's experience was gained while working on a large-scale PCB clean up in southern Indiana. His responsibilities while working on the cleanup included all aspects of environmental sampling, contractor oversight, project management and construction

quality assurance. Mr. Miller has also worked with and provided oversight for numerous vapor extraction systems ranging from in-home vapor mitigation systems to large scale multi-phase extraction systems. Mr. Miller also has experience as a land surveyor and has completed many detailed pre-engineering surveys for various environmental cover and remediation systems as well as topographic and construction surveys. Mr. Miller is also knowledgeable of various health and safety initiatives and programs utilized by companies throughout the environmental and petroleum industries. More information regarding this experience is provided below.

Project Experience

PCB Cleanup, GM Powertrain Facility, Bedford, Indiana

Staff Scientist, Construction Oversight & Construction Quality Assurance Officer for a large-scale PCB remediation project in Bedford, Indiana. PCB containing hydraulic oils and PCB impacted materials had contaminated on-site areas as well as the sediment and floodplain soil within Bailey's Branch and the Pleasant Run Creek watershed. This area included approximately 5 miles of creek that runs from the GM Bedford Facility Outfall. Responsibilities included construction and contractor oversight for numerous aspects of remediation including the removal and hauling of 40,000 cubic yards of contaminated soil, construction of a 30-acre geomembrane cover system and restoration of multiple land parcels within the watershed. Mr. Miller was also the third-party construction quality assurance officer responsible for the implementation of the CQA plan while placing geomembrane, geotextile and geocomposite materials during the construction of the 30-acre cover system. He performed numerous topographic and construction surveys including detailed pre-engineering surveys, location surveys for soil and water samples in order to delineate contamination plumes and construction surveys for site grading and construction quantities. Additional responsibilities included collection of characterization and confirmation soil, water and air samples as well as storm water treatment plant operations.

Environmental Phase I and Phase II Site Assessments – Multiple Clients and Locations

Project manager and field representative for the completion of Phase I and Phase II environmental site assessments in Minnesota, North Dakota, and South Dakota. Projects completed for various clients including municipalities, financial institutions, and industrial facilities.

Subsurface Soil and Groundwater Investigations – Multiple Clients and Locations
Staff Scientist, Assistant Project Manager and Project Manager for numerous environmental soil and groundwater investigations. Responsibilities have included site characterization and investigations, UST closure and reporting, development of corrective action plans, excavation and disposal of petroleum saturated soils, soil and groundwater monitoring oversight, data evaluation and report preparation for both state and private clientele

Soil Vapor and Multi Phase Extraction Systems - Multiple Clients and Locations
Staff Scientist, Construction Oversight and Assistant Project Manager involved in the design, implementation and monitoring of numerous soil vapor and multi-phase extraction systems in the states of Indiana and Minnesota. Mr. Miller provided construction oversight as well as routine monitoring and sample collection for over 100 passive and active vapor mitigation systems in Attica, Indiana. These mitigation systems were part of a remediation effort where vinyl chloride ("VC"), trichloroethylene ("TCE") and tetrachloroethylene ("PCE") was present in the groundwater. Mr. Miller has also been actively involved the installation, startup and optimization, routine monitoring and maintenance of a single and multi-phase extraction systems throughout the Minnesota.

Construction Quality Assurance Officer, Indiana, Minnesota
Lead Construction Quality Assurance (CQA) Officer for a 30-acre cover system in Bedford, Indiana as well as the Lead CQA Officer for the construction and installation of an additional liner cell in southern Minnesota. Responsibilities included compaction testing and surface preparation approval of the clay layers prior to the geosysnthetic installations, general construction oversight, geomembrane peel and shear seam testing using field tensiometer and construction quality assurance documentation of all geosynthetic installations.

Topographic and Construction Surveys, Indiana, Illinois, Michigan, Ohio, Kansas
Field Technician and Lead Surveyor involved in multiple projects in the Midwest. Responsibilities have included the establishment of initial site control, general topographic and construction surveys, detailed pre-engineering surveys for various environmental cover and remediation systems, location surveys for soil and water sampling points for delineation of possible contamination plumes, surveys of wellhead locations to monitor groundwater for hydrogeologic investigations and hydraulic containment, topographic surveys for site grading

and construction quantity calculations and establishment of horizontal and vertical control points to orient aerial photography for mapping.

Ryan Moehn

Project Manager/Project Scientist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.A. Natural Science/Mathematics, Thomas Edison State College, 2003

Additional Training/Certifications

OSHA 40-hour HAZWOPER Certification
OSHA 8-hour HAZWOPER Refresher Training (Annual)
OSHA 29 CFR 1910.120 Hazmat Training
OSHA 29 CFR 1910.132 Personal Protective Equipment Training
OSHA 29 CFR 1910.134 Respiratory Protection Training
OSHA 29 CFR 1910.146 Confined Space Entry Training
Asbestos Inspector – Minnesota # AI10924
MN Rules Chapter 7105 Underground Storage Tank Certification
ISO 14001 eMS Implementation Training Course & Workshop

Technical Specializations

Property Transfers/Environmental Due Diligence
Petroleum Investigations & Remediation
Voluntary Investigation and Cleanup Programs
Hazardous Building Material Surveys

Professional Summary

Mr. Moehn has more than seventeen years experience in the environmental compliance and consulting industry. His primary areas of concentration have included: environmental due diligence; subsurface soil and groundwater investigations; industrial hygiene and indoor air quality; hazardous building material inspections and removal oversight; internal/external environmental compliance auditing; and industrial stormwater and wastewater permitting. His current duties include project management and reporting, client communication, researching regulatory activities, and conducting field studies per clients needs.

Mr. Moehn's previous environmental consulting work experience includes project management related to property transfers/environmental due diligence, subsurface soil and groundwater investigations, underground storage tank removal assessments, and hazardous building material management. Mr. Moehn's project management experience has also consisted of routine client

and regulator interaction, as well as contractor oversight to ensure compliance with applicable laws and regulations.

Mr. Moehn's previous environmental compliance work experience includes: emergency spill response investigations/oversight and regulatory compliance while working for the United States Coast Guard; hazardous waste and aboveground/underground storage tank regulatory compliance while working for the Minnesota Pollution Control Agency; and internal environmental compliance auditing while working for the State of Minnesota Department of Military Affairs.

Project Experience

Environmental Phase I and Phase II Site Assessments – Multiple Clients and Locations
Project manager and field representative for the completion of more than 300 Phase I and Phase II environmental site assessments in Minnesota, Iowa, North Dakota, South Dakota, Wisconsin, Nebraska, Colorado, and California. Projects completed for various clients including municipalities, financial institutions, and industrial facilities.

Subsurface Soil and Groundwater Investigations – Multiple Clients and Locations
Provided project and field-level management and technical oversight for multiple environmental soil and groundwater investigations. Project responsibilities have included: site characterization and evaluation of remediation options; soil and groundwater monitoring oversight in a variety of subsurface environments; data evaluation and report preparation; and coordination of investigation-derived waste (IDW) disposal activities.

Leaking Underground Storage Tank (LUST) Assessments – Multiple Clients and Locations. Field and Project Manager for the completion of numerous LUST investigations. Responsible for all phases of investigation activities including historical document review, development of soil and groundwater sampling programs, report preparation, and coordination of benefits through State-operated reimbursement funds.

Hazardous Material Removal Oversight in Educational Facilities – Des Moines, Iowa
Project and task manager for Des Moines Independent Community School District projects that included: review of historical construction documentation; collection of bulk asbestos samples; preparation of inspection reports; development of project specifications and contract documents; reviewing and maintaining progress schedules; construction observation;

communications with contractors and client; and reviewing work for compliance with project specifications, drawings, and plans.

Indoor Air Quality Assessment Services – Multiple Clients and Locations
Field representative for multiple projects involving the assessment and remediation of indoor air quality concerns associated with mold, lead, and dust contamination. Project tasks consist of sample collection, data review and interpretation, client consultation, and report preparation. Indoor air quality services were provided to a variety of public sector clients.

Stormwater Compliance Assistance Services for Auto Salvage Facilities – Multiple Locations. Project and field level management of stormwater compliance issues at several automotive parts salvage and refurbishment facilities in Minnesota, Nebraska, Illinois, and Missouri. Routine project tasks consisted of annual compliance assistance assessments/reporting, quarterly stormwater monitoring oversight/reporting, client consultation, and regulatory correspondence.

Myles H. Morris, P.G.

Senior Project Manager

Education

B.A. Classics, B.S. Geology, University of Montana, Missoula, MT

Additional Training/Certifications

Hazardous Waste Operations and Emergency Response Certificate (OSHA 1910.120)
NWETC Fundamentals of Contaminant Chemistry & Applications in Subsurface Contaminant Transportation & Remediation
Oil Field Wastes-Characteristics, Impact, and Management-MTDEQ Solid Waste Division
AutoCAD Technician-Missoula County Public Schools Continuing Education
GIS for Forest Management-University of Montana, College of Forestry and Conservation
CTech EVS, MVS, and Entervol Training Class
Dakota Technologies Ultra Violet Optical Screening Tool (UVOST) Training
BNSF Contractor Orientation and Roadway Worker Protection
BNSF eRailsafe
CPR and First Aid

Memberships/Affiliations

Licensed Professional Geologist, Idaho PGL-1473
Licensed Professional Geologist, Kansas PGL-882

Technical Specializations

GIS/GPS Geospatial Data Management – AcrGIS, EVS, AutoCAD Civil 3D, and Trimble software
LNAPL Site Characterization, Remediation and Monitoring
2D/3D Modeling of Direct Sensing Data (LIF/MIP/EC/HPT)
Interpretation of UVOST/LIF Signal Response and Waveforms
Data Analysis and Report Preparation
Risk Assessment and Regulatory Compliance

Professional Summary

Mr. Morris has 13 years of experience in the environmental consulting field. He is knowledgeable in the principles of site characterization, remediation, and monitoring for groundwater, soil, and air which have been impacted by petroleum and agricultural chemicals. His primary areas of expertise include the application of GPS/GIS technologies and three-dimensional (3D) visualization software to analyze environmental chemistry and geological data. Mr. Morris has advanced training in the use of Ctech's EVS software which provides 3D visualization tools for modeling subsurface contaminants and geology. He is proficient in

leveraging GPS/GIS data and 3D visualizations along with traditional surveyed AutoCAD base map features to provide an integrated site conceptual model throughout the site characterization process. Mr. Morris works in tandem with the field investigation team to provide 3D images of the extent and magnitude of the contaminant plume in real-time, leading to a more complete understanding of subsurface contaminant fate and transport as the investigation progresses.

Mr. Morris' responsibilities include file research and management of complex environmental remediation sites. He conducts risk assessments and regulatory compliance cleanup level calculations for soil, groundwater, and air. He has performed several vapor intrusion risk assessments for commercial and private localities including the development of site-specific screening levels and attenuation ratios for human health exposure pathways. Mr. Morris provides advanced data analysis, using contaminant fate and transport principals along with natural attenuation parameters, to perform mass balance and assimilative capacity calculations to estimate restoration timeframes based on applicable regulatory compliance protocols.

Mr. Morris has extensive field experience with in-situ hydrocarbon remediation systems and has been involved with the installation, operation, and maintenance of various remediation systems including soil vapor extraction, air sparge, chemical oxidation, pump and treat, free-phase recovery, and bio-attenuation. He is knowledgeable in the sample collection and preservation methodologies for various environmental media and subsequent data management and reporting for regulatory compliance. Mr. Morris is also a member of WCEC's spill response team and has been onsite for dozens of spill scenarios such as truck wrecks, tanker spills, surface water spills, and UST/AST releases.

Project Experience

Site Characterization, 3D Modeling, Various LNAPL Sites Characterized by UVOST/LIF and MIP throughout the US and Canada. Staff Geologist and data analyst for numerous direct sensing (LIF/MIP) LNAPL investigations across US and Canada. Worked remotely on over 100 LIF projects in Alabama, Arkansas, California, Colorado, Florida, Georgia, Idaho, Indiana, Illinois, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Utah, Wisconsin, Wyoming, and the Northwest Territories. Provided direct oversight as a field geologist for 20 LIF projects located in Montana. Responsibilities included import/export of GPS/GIS data and generating 2D/3D imagery in real-time using ArcGIS and EVS software. Provided uncertainty plots to help guide the investigation and strategically locate boreholes, increasing efficiency and reducing overall project costs. Conducted statistical analysis of LIF waveform channels to segment the plume into fractions based on LNAPL mobility. Final deliverables included fully interactive 3D models of the LNAPL plume and still images such as

cross sections and horizontal slices to augment advanced analysis of the plume body at key locations.

Risk Assessment, Site-Specific Screening Level and Cleanup Calculation, Ag-Chem and Hydrocarbon Sites in Northwest US. Staff Geologist and data analyst for various ag-chem and hydrocarbon sites in northwest US. Duties included performing site-specific screening level calculations, such as the Washington Department of Ecology Model Toxics Control Act (MTCA) Modified Method B soil leaching to groundwater pathway, to derive preliminary cleanup levels for regulatory compliance. Calculated cleanup levels for each constituent of concern using the three-phase model with site-specific inputs. Contaminants of concern included various pesticides, herbicides, metals, and petroleum constituents. Project objectives were met in a timely and cost-effective manner as a byproduct of the upfront screening level calculation process.

Risk Assessment, Screening Level Risk Evaluation, Gasoline Release in Wild and Scenic River, Idaho. Staff Geologist and data analyst for a gasoline tanker spill near a designated Wild and Scenic River in a remote area of north-central Idaho. Duties included performing a screening level risk evaluation to quantify the potential risks posed to human health and the environment by residual gasoline constituents. Completed dilution calculations which incorporated individual chemical constituent percent by weight concentrations and surface water flow parameters to estimate potential contaminant release rates. Two hypothetical release scenarios were formulated which encompassed worst case and probable impacts to the river based on the results of the dilution calculations. This information enhanced the development of the conceptual site model and provided quantifiable and reproducible data upon which evaluations of future remedial options could be based.

Risk Assessment, Analysis of Vapor Intrusion Pathway and Site-Specific Screening Level Calculation, Multiple Hydrocarbon Sites in Montana. Staff Geologist and data analyst for multiple hydrocarbon sites with vapor intrusion issues under the jurisdiction of the Montana Department of Environmental Quality (MTDEQ). Responsibilities included conducting building assessments to identify likely vapor migration routes and establishing initial boundaries for the vapor intrusion investigation using a multiple lines of evidence approach. Developed sampling methodologies which adequately quantified vapor constituent concentrations at each step along the intrusion pathway, including soil gas, sub-slab vapor, and indoor air. Established site-specific attenuation ratios and performed screening level calculations using United States Environmental Protection Agency (USEPA) guidelines and the MTDEQ Air-Phase Hydrocarbon (APH) vapor intrusion screening level process. Remediation and mitigation systems were designed and implemented based on the information obtained from the initial investigation and screening level calculations.

Permitting and Compliance, Alternative Liner Demonstration, Class II Landfill for Oil Exploration and Production Waste, Montana. Staff Geologist for a Class II Landfill permit application at an Oil Exploration and Production waste facility in eastern Montana. Duties included completing an Alternative Liner Demonstration to document the equivalency of the proposed geosynthetic clay liner to the prescriptive standard liner according to regulatory requirements. Reviewed borehole data and geologic maps to generate cross sections of the subsurface underneath the proposed landfill. Performed statistical evaluations of hydraulic conductivity measurements to estimate native material hydrogeologic properties. Completed breakthrough and time of travel calculations for leachate to move through the liner and into the subsurface. A Class II solid waste management system license was approved for the facility in December 2014.

System Installation and Feasibility Studies, Construction, Monitoring, Operation, and Maintenance of Various In-Situ Remediation Systems, Multiple Sites in Montana. Staff Geologist involved in the construction, operation, and maintenance of various in-situ remediation systems including soil vapor extraction, air sparge, chemical oxidation, pump and treat, free-phase recovery, and bio-attenuation. Systems ranged from small-scale temporary installations at a spill site, to mobile systems enclosed in a utility trailer, to large-scale systems housed in a permanent warehouse style building. Completed pilot testing and feasibility studies to obtain site-specific parameters for the final system design. Conducted monitoring and maintenance of the final systems to optimize system performance and efficiency. Completed compliance sampling of system effluent as necessary for regulatory compliance. Overall, intelligent in-situ system design based on the pilot testing phase and thorough operation and maintenance of the final system installation enhanced remediation of impacted media and moved the sites towards closure in a timelier fashion.

Soil, Groundwater, and Air, Monitoring, Sampling, Data Management, and Report Preparation, Multiple Hydrocarbon Sites in Montana. Staff Geologist conducting environmental media monitoring, sampling, data management, and report preparation for various petroleum release sites under the jurisdiction of the MTDEQ. Responsibilities included developing a sampling regimen for long term monitoring which satisfied work plan objectives and met budget constraints, operation and maintenance of groundwater sampling pumps and multi-parameter field meters, collecting soil samples using techniques which conform to regulatory guidelines, and obtaining 24-hour samples with summa canisters for volatile organic compounds (VOCs) analysis. Corresponded with the analytical laboratory to select the most appropriate analytical methods based on the impacted matrix, contaminant type, and regulatory requirements. Organized analytical data into tables and graphs for analysis and

display, and applied geospatial information using GPS, ArcGIS, and AutoCAD software. Formatted data was put into formal reports containing text which summarized the sampling and monitoring event and the current status of the remediation process, as required by the MTDEQ.

Spill Response and Cleanup, WCEC Spill Response Team, Various Release Sites in Northwest US. Spill response technician at multiple release sites in Montana, Idaho, and Washington. Spill response scenarios included truck wrecks, tanker spills, surface water spills, and UST/AST releases. Released substances included various agricultural and petroleum chemicals, battery acid, hog oil, paint, glue, plastic bags, unknown chemicals, etc. Spill response activities consisted of maintaining site control and performing an initial assessment followed by expedited cleanup. Assisted team in spill containment using the applicable method based on the scenario such as deploying a boom and sorbent pads for a surface water hydrocarbon spill. Constructed onsite temporary mitigation systems, such as water pump and treat and soil vapor extraction, as needed. Removed impacted materials via soil excavation, free-phase recovery, debris cleanup, etc.

Bryan Murdock

Senior Scientist/Project Manager

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, On-Site Inspector, Field Technician

Education

B.S. Biology, Chemistry Minor, Minnesota State, Mankato, Minnesota, 1988

Additional Training/Certifications

40-Hour HAZWOPER Training
8-Hour Site Supervisor Training
FEMA-directed training for Incident Command System: ICS 100, ICS 300, ICS 400.
Minnesota Asbestos Inspector Certification
Minnesota Construction Erosion Site Manager
Transportation Worker Identification Credential (TWIC)
FEMA Chemical, biological, radiological, nuclear, and explosive (CBRNE) hazards Awareness Trained

Memberships/Affiliations

Minnesota Environmental Quality Board Citizen Member Representing the 8th Congressional District

Technical Specializations

Contamination Investigations & Remediation

- Hydrocarbons
- Legacy Contaminants – Sediment Assessment & Capping
- Halogenated hydrocarbons
- RCRA Metals
- PCBs
- Clandestine Drug Lab sites
- Indoor Air Quality – Methamphetamine, Mold, Asbestos

Environmental Due Diligence
Environmental Permitting, 404/401, Feedlots, Storm water, Water Appropriation
Environmental Review Documents, EAWs, EAs,
State of Minnesota Emergency Spill Response Program Management
State of Minnesota Multi-Site Program Management
Pre-Demolition Hazardous Materials Surveys
Methamphetamine Assessment, Testing and Cleanup

Professional Summary

Mr. Murdock has 30 years of environmental engineering and consulting experience. He is a trusted advisor to both private industry and government agencies. His diverse environmental background makes him a great strategic partner for environmental assessment, public review documents and consultations, remediation and compliance challenges. His technical experience includes real estate due diligence, industrial, agricultural, and petroleum chemical assessment and remediation projects, Brownfield redevelopments, hazardous waste surveys, industrial hygiene surveys, permitting, and emergency response. Mr. Murdock has worked on very large real estate due diligence portfolios of commercial and agricultural properties. He is very familiar with assessing environmental risk and providing risk-reducing solutions to buyers and lenders.

Mr. Murdock is a part-time Senior Scientist/Project Manager at WCEC where he will assist with a variety of project types and contracts on an as-needed basis.

Project Experience

Pier B/Slip 2 Development and Remedial Capping, Waterfront Properties, Duluth, Minnesota

As part of a complex $30,000,000 redevelopment of a waterfront Brownfield site in Duluth, Minnesota, Mr. Murdock managed and prepared environmental permitting (USACE/DNR 404/401), public review documents (EAW), soil assessment and remediation (RAP implementation and reporting), capping of legacy contaminants in Slip 2 using 45,000 cubic yards of clean sediment, design and implementation of a habitat mitigation plan, performing an EPA Self-Implementing PCB cleanup project, construction storm water management, Section 106 consultation, pre-demolition hazardous materials assessment and disposal.

Notable environmental challenges included multi-agency coordination, encountering unknown arsenic and asbestos contamination during an expedited project schedule, managing the 24/7 placement of clean dredge sediments over legacy contaminants, and substantial volumes of trench-water management during utility construction.

The Pier B Resort project could not happen without the stabilization of the 100+ year old dock walls. Mr. Murdock was responsible for identifying a contaminant pathway not previously considered in the harbor. The historic wooden crib and Wakefield wall style dock walls were allowing contaminated soil from the adjacent pier to leak out into the slip area. This finding was managed through the construction improvement made to the landwards side of the dock and the placement of a “super cap” consisting of 45,000

cubic yards of clean soil which pinned contaminated soils behind the dock wall. Contaminated soil placement was monitored by performing bathymetric surveys before, during and after placement. Post cap placement sampling and analysis was performed to confirm a clean cap surface.

When asbestos and arsenic contamination were encountered in soil during construction, Mr. Murdock designed assessment and remediation plans that provided substantial costs savings. Careful assessment of arsenic contaminated soils confirmed they were non-hazardous which permitted local landfilling and substantial cost savings. Mr. Murdock designed a cost saving approach to managing the asbestos contaminated soil by using a rotary screen to remove 90% of the contaminated roofing material. Soil screening was performed in accordance with an Asbestos Emission and Soil Screening Plan approved by the MPCA. Asbestos screening reduced landfill disposal from over 1,000 cubic yards to 270 cubic yards. In addition to reducing hauling and landfill tipping fees, this creative approach kept the much needed construction fill on-site. Contaminated soils (arsenic, PAHs and asbestos) that remained on site were managed in accordance with the MPCA Risk Based Site Evaluation Manual.

A programmatic agreement was in place to manage the Section 106 consultation. Mr. Murdock was responsible for coordinating Section 106 consultation efforts which included the preparation of a historical assessment and photographic documentation, the preparation of an adverse effect mitigation plan, and archeological observations during construction.

This project was partially funded by two $1,000,000 Department of Employment and Economic Development (DEED) grants. Grant revisions, management, and pay applications required Mr. Murdock to work closely with the project proposers, contractors, and the City of Duluth Economic Development Agency and DEED.

Pre-Development Assessment and Remediation Services – Lot D, City of Duluth

In advance of future development, Mr. Murdock assisted the City of Duluth Economic Development Authority with the pre-development assessment and remediation of a waterfront property located in Duluth, Minnesota. Services managed and performed included a geophysical survey, SHPO consultation, community outreach, structural assessment, the preparation of an EPA Analysis of Brownfield Cleanup Alternatives document, remediation workplan preparation and implementation. Remediation consisted of the excavation of legacy contaminants and the placement of a clean fill cap over heavy metals and PAH contamination. This project was partially funded by a $200,000 EPA Brownfield Remediation Grant.

Agricultural Phase I/IIs - Ferrellgas Crop Production Centers throughout US

Brownfield Inventories - City of Duluth, Duluth, Minnesota

Pre-Construction Phase II Assessment – DECC/City of Duluth, Minnesota

Recent Phase I ESAs – Industrial, Commercial, and Vacant Properties

Methamphetamine Assessment and Remediation – LCO Housing Authority, Hayward, WI

396 Home Mold Assessment – LCO Housing Authority, Hayward, WI

Construction Oversight of Mold Remediation – LCO Housing Authority, Hayward, WI

Environmental Assessment Worksheet – Pier B Hotel and Resort, Slip 2 Capping, Duluth, Minnesota

Phase I/II ESA - Minneapolis Institute of Arts, Minneapolis, Minnesota

Environmental Assessments - Land O' Lakes Crop Production Facilities, Texas, Arkansas, Louisiana

Noise Assessment - Manufacturing Facility, Stillwater, Minnesota

Remedial Investigation and Cleanup - Seed Treatment Facility, Marienthal, KS

Remedial Investigation and Cleanup - Crop Production Facility Farmers Coop, Rushford, Minnesota

Remedial Investigation and Cleanup - I-29, Sioux Falls, SD, South Dakota DENR

Petroleum Remedial Investigation – Refinery, St. Paul Park, Minnesota,

Complicated Below-Footing Remedial Investigation and Cleanup of Pesticides - Local Cooperative, Charles City, Iowa

Hazardous Materials Building Surveys- Throughout US

Pipeline ROW Restoration Environmental Inspection - Great Lakes Gas, Michigan

Property Development Services - Target Corporation, throughout US

National Historic Preservation Act, Section 106 Consultation - Minnesota

Permitting of 2 Million Egg Layer Facility - Golden Oval Eggs, Churchill Coop, Renville, Minnesota

Clean Water Act Section 404/401 Certifications – Minnesota, Wisconsin, and Illinois

Industrial and Storm Water SWPPS and Inspections - Minnesota

Compliance Audit – Continental Hydraulics, Shakopee, Minnesota

Fish Sampling and Preparation for Dioxin Analysis – Pine River, Alma, Michigan

Expert Witness on Keystone Pipeline Public Hearing - South Dakota Public Utilities Commission

Emergency Response Mercury Cleanups – U of M and numerous other institutions, Minnesota and Wisconsin

Numerous Mercury and Petroleum Emergency Responses - Minnesota and Wisconsin

Emergency Response and Cleanup - Brown County Ag, Sleepy Eye, Minnesota

Nathan G. Olson

Senior Project Manager

Education

B.S. Economics, Montana State University, Bozeman, MT

Additional Training / Certifications

Hazardous Waste Operations & Emergency Response Certification (OSHA 1910.120)
Emergency Response Tank Car Specialist I
NWETC Fundamentals of Contaminant Chemistry & Applications in Subsurface Contaminant Transportation & Remediation
BNSF Contractor Orientation and Roadway Worker Protection
BSNF eRailsafe
CPR and First Aid

Technical Specializations

Petroleum Hydrocarbon Site Investigations and Remedial Technology Application
Subsurface Contaminant Fate and Transport
Emergency Spill Response Management
Phase I / II Environmental Site Assessments
Regulatory Compliance

Professional Summary

Mr. Olson has over 14 years of experience in the environmental field managing remedial investigations, spill response, operating remediation systems, and monitoring hydrocarbon, agricultural chemical and chlorinated hydrocarbon releases. Mr. Olson has prepared and implemented remedial investigation work plans for facilities with hydrocarbon and agricultural chemical impacts in Montana and Washington. Work plans have included laser induced florescence (LIF), direct push, and hollow stem auger soil investigations; in-situ remediation using SVE/AS system, ozone sparge, and oxygen release compounds; groundwater, surface water, and air monitoring. In the process of implementing these work plans Mr. Olson has conducted air, water, and soil field and laboratory analytical sample collection per company standard operating procedures. Mr. Olson has worked with WCEC's professional engineers on field surveying using auto levels, total stations, and GPS equipment for the purpose of AutoCAD and GIS mapping.

Mr. Olson's project experience includes conducting multiple Phase I/II Environmental Site Assessments, remedial soil and groundwater investigation, and generation of site cleanup plans to meet the regulatory requirements of local, state, federal, and tribal regulatory agency in the process of bringing facilities into compliance with applicable environmental standards. Mr.

Olson manages spill response activities, coordinates WCEC employees, subcontractors, develops site health and safety plans, and implements traffic control plans with state and local agencies.

Project Experience

Site Investigations, Montana Department of Quality, Washington Department of Ecology, Agricultural Chemical and Wood Treatment Sites. Staff Scientist, Project Manager on multiple facilities with impacts from gasoline, diesel, hydraulic fluid, waste oil, agricultural pesticides, herbicides, fertilizer, RCRA Metals, and chlorinated hydrocarbon in Montana and Washington. Responsibilities included conducting Phase I / II assessment of contaminants of concern. Direction of excavation of contaminated soils, soil and groundwater sample collection, analysis, and reporting.

Emergency Spill Response
Project Manager on transportation related spills in Washington, Idaho, and Montana. Spills have included agricultural chemicals, petroleum products, industrial chemicals, batteries, and numerous other products. Responsibilities included management of emergency response including interaction with federal, state, local, and Tribal regulatory agencies, design and implement traffic control plans, oversite of traffic control, excavation, and other subcontractors, waste disposal manifesting and permitting, direction of soil excavation, boom deployment, and river/stream product recovery and remediation.

UST / AST Site Characterization; Corrective Action / Remedial Action Plan Development; Remedial System Design, Construction, Implementation, Operation, and Maintenance; Groundwater Monitoring, Site Surveying, AutoCAD and GIS Map Generation; for National and Local Independent Petroleum Companies in Washington, Idaho, and Montana. Staff Scientist, Project Manager, on over 50 UST / AST releases, and tanker truck spills in Washington, Idaho, and Montana. Responsibilities included interaction with federal, state, local, and tribal regulatory agencies to meet applicable regulatory standards. Mr. Olson has been a staff scientist and project manager during site investigations using direct sensing technologies and traditional soil and groundwater sampling techniques; developed corrective action plans for contaminant excavation, institute treatment through the use of oxygen release compounds, and design, construction, implementation and operation of remedial systems including soil vapor extraction, air sparge, ozone air sparge, and groundwater pump and treat systems utilizing stripper tray, sand bed particulate filtration, and granular carbon absorption medium for contaminant removal on large and small pump and treat systems. Mr. Olson has conducted water, soil, and air sampling; preformed analytical sample

result analysis and reporting for numerous sites in the states of Washington, Idaho, and Montana.

Phase I / II Environmental Site Assessment, Various Commercial and Industrial Clients
Completion of more than 30 Phase I Environmental Site Assessments of commercial and industrial properties in Montana and Washington including petroleum storage, agricultural chemical storage, and wood manufacturing and treatment facilities. Phase I Environmental Site Assessment responsibilities included identification and differentiation of recognized environmental liabilities, historically recognized environmental liabilities, controlled environmental liabilities, and de minimis conditions that do not present an environmental liability to a property parcel. This includes understanding and conducting Phase I EASs in conformance with the American Standards of Testing and Materials (ASTM) "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" set forth in the ASTM Standard E 1527-13 to ensure that good and customary practice for conducting an Environmental Site Assessment of a parcel of commercial real estate with respect to the range of contaminants within the scope of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products are satisfied. Mr. Olson has prepared and implemented Phase II Work Plans to evaluate recognized environmental liabilities and quantify the scope of environmental impacts to allow buyers or sellers to understand the environmental liabilities present on a parcel and make informed decisions on the purchase or sale of a property parcel.

James E. Rolle

Director, Environmental Services

Education

B.A., Biology, University of Montana, Missoula, MT

Additional Training/Certifications

ITRC LNAPLs Science, Management, and Technology
USEPA / CERCLA Groundwater High-Resolution Site Characterization
Contaminant Chemistry and Transport
Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
Emergency Response Tank Car Specialist Training
ARC GIS Environmental Applications
AutoCAD Technician
BNSF Contractor Orientation and Roadway Worker Protection
BSNF eRailsafe
CPR and First Aid

Technical Specializations

Petroleum Hydrocarbon Investigation and Remediation
Vapor Intrusion Pathway Assessment and Indoor Air Sampling Protocols
Subsurface Contaminant Fate and Transport
Emergency Response Management

Professional Summary

Mr. Rolle has 18 years of experience managing and conducting all aspects of environmental investigation and remediation projects ranging from petroleum leak site investigations to complex fractured bedrock plume modeling and remediation. Mr. Rolle has managed over 300 environmental projects across Montana, Idaho, and Washington and has contributed as a senior consultant and technical lead on numerous WCEC led projects in Montana, North Dakota, and Minnesota. As Corporate Director, he oversees and manages the company-wide technical and financial aspects of all WCEC's environmental and emergency response operations. In this role, he advises and oversees project managers, engineers, and other technical staff as they conduct environmental site assessments and investigations, UST and AST removals, remediation of impacted environmental media, and emergency response services. He has an excellent working relationship with state, federal, and Tribal regulatory agencies, and the Montana Petroleum Release Compensation Board. Mr. Rolle is responsible for the development and implementation of soil, groundwater, indoor air, and surface water investigation, remediation, and monitoring work plans. He has completed numerous technical designs and installations of

remediation systems using soil vapor extraction, air sparging, groundwater pump and treat, ozone injection, oxygen enhanced bioremediation, cosolvent flushing, and various accelerated bioattenuation technologies.

Mr. Rolle's project experience includes serving as the technical lead for various MT DEQ, and US EPA projects involving impacts to residential drinking water supply wells and vapor intrusion into residences. Mr. Rolle oversees the collection of legally defensible data and has provided data analysis, interpretation, and professional opinions in support of environmental litigation for a variety of projects.

In addition to managing WCEC's corporate Emergency Response division, Mr. Rolle, leads the Montana based WCEC Emergency Response team serving as the technical lead and site supervisor on complex releases which pose threats to human health, drinking water, and service water resources. The following selected projects are examples which illustrate Mr. Rolle's experience.

Project Experience

Gasoline Tanker Truck Release Adjacent to Wild and Scenic River.

WCEC was retained by a regional petroleum distribution company to provide emergency response and environmental consulting/management services to mitigate impacts to a tanker truck release on a road adjacent to a wild and scenic River in Idaho. WCEC deployed an emergency response team to the incident and performed initial site assessment and environmental cleanup activities. Emergency cleanup actions at the site included deployment and collection of absorbent materials in the roadside ditch, offloading of all accessible product from the trailer, deploying 200' of absorbent boom along the riverbank adjacent and downstream of the release site, and accessing the riverbank for any residual evidence of hydrocarbon sheen or product. WCEC completed all characterization, profiling, and disposal coordination activities related to wastes generated during site remedial activities.

Once the emergency phase of the project was completed, WCEC fast-tracked the preparation of a Work Plan which included scope items of excavation of impacted subsurface soils from the roadside ditch, soil sampling and analysis, continued surface water assessment, surface water sampling, and preparation of an Initial Cleanup Action and Investigation Report. Preparation of the work plan included completion of an associated Quality Assurance Project Plan/Site Specific Sampling Plan, and Site-Specific Health and Safety Plan. The work plan was prepared, submitted, revised, and approved within 5 days of the incident.

WCEC completed the scope of work outlined in the site plan following the review, comment, revision, and approved process conducted by the United States Environmental Protection Agency (EPA) and the Idaho Department of Environmental Quality (IDEQ). Work was

coordinated with various additional agencies including the Idaho Transportation Department (ITD), the United States Forest Service (USFS), and the Nez Perce Tribe. The field work portion of the scope of work included in the work plan was completed within 10 days of the incident, with the report documenting the work submitted in less than 45 days from receipt of laboratory results.

Chemical Warehouse Fire Response, Remediation, Management.

The project originated as a result of an accidental fire at a chemical warehouse in which numerous liquid and solid agricultural and chemical were stored. WCEC was contacted to manage and perform all aspects of environmental management, cleanup, investigation, and reporting related to the release of chemicals associated with the fire. WCEC initially performed emergency response services which included site/risk assessment, receptor survey, hazardous waste characterization, waste handling, site cleanup (excavation), waste segregation, waste profiling, and waste disposal.

WCEC coordinated the disposal of 105.60 tons of demo debris waste from the site which was profiled and transferred under manifest for disposal using microencapsulation. WCEC also recovered 88,840 pounds of chemical rinsate during the responsive action. WCEC completed waste profiling of the rinsate and coordinated hauling and disposal via destruction incineration. Following the emergency response phase of the project, WCEC coordinated and completed a remedial site investigation which included a subsurface soil investigation, soil sampling, groundwater monitoring well installation, and groundwater monitoring/sampling. Additionally, WCEC provided litigation support services in support of the cleanup and investigation actions.

Tanker Truck Rollover Gasoline Release to Fractured Aquifer.

Tasks completed during this project included remedial investigation, construction, regulatory compliance, solid waste identification and disposal, consultation, remedial design, remedial system installation, source water protection, project reporting, and litigation support services. WCEC initially operated as a sub consultant before assuming the lead role on this large scale remediation project resulting from a catastrophic gasoline release into a fractured bedrock aquifer system. Drinking water and water resources were threatened and impacted as the separate and dissolved phase plume mitigated through the aquifer.

Identification of and impacted soils and groundwater plume mapping was conducted during the site investigation. Remedial excavation soil profiling, manifest generation and disposal were completed during the construction phase of the project. A large scale groundwater treatment system was designed and installed to mitigate the threat to surface and drinking water in the area. Individual vapor abatement systems were installed at impacted residences, allowing evacuees to reoccupy their homes. The project is administrated by the United States Environmental Protection Agency (US EPA) and involved coordination with numerous local,

state, Tribal, and federal agencies. Some phases of the project necessitated obtaining a Montana Department of Transportation (MDT) Encroachment Permit which includes an approved traffic control plan.

During the design and construction phase of the project, Mr. Rolle directed and provided oversight of rememedial system design, installation and startup of a 500 gallon per minute (GPM) water treatment system (WTS) to dewater the impacted shallow aquifer and protect groundwater and surface water resources. The WTS includes over 500 feet of groundwater interceptor trench construction, four automated pumping basins, shallow-tray air stripping, ozone injection, and GAC filtration prior to discharge to surface water. WCEC provided support in obtaining a National Pollutant Discharge Elimination System (NPDES) permit, completed certified wetland delineation, and provided support in preparing and obtaining the required Army Corps of Engineers, local, and Tribal permits pertaining to shoreline protection, wetland mitigation, and re-vegetation. In 2015, WCEC designed and implemented two ethanol cosolvent bedrock flushing remediation and performance monitoring events.

Currently, WCEC operates and maintains the WTS, complies with all the requirements of the NPDES permit, and provides ongoing long term groundwater monitoring and indoor air sampling in compliance with an EPA Administrative Order.

Douglas Stahman

General Manager / Senior Geologist

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I, Field Technician

Education

B.A. Geology, University of Minnesota, 1986

M.S. Geology, Lehigh University, 1990

Additional Training/Certifications

40-Hour Health and Safety Training
Industrial Hazardous Materials Technician
Hazardous Materials Specialist Training
Hazardous Waste Operations and Emergency Response Certification, Specialist Level
Homeland Security and Emergency Management training: G250.1,G247,G242,G651, G386, G191, G650 G202
2009, 2010 Cold Zone Conferences
Bio-Terrorism Mobilization Conference
Incident Response to Terrorist Bombings
Cobra
Domestic Preparedness HazMat Technician
Debris Management Course
Center of Domestic Preparedness Homeland Security, WMD instructor
NFPA 472 Hazardous Materials: Incident Commander
NBC Domestic Preparedness Training
CPR and First Aid

Memberships/Affiliations

Region IV Regional Review Committee, Homeland Security and Emergency Management
Team Leader, Chemical Assessment Team, MN Department of Public Safety
Association of Minnesota Emergency Managers

Technical Specializations

Hydrocarbon Investigations & Remediation
Emergency Spill Response
Emergency Management

Professional Summary

Mr. Stahman has more than 29 years of experience conducting investigations on the interactions between the atmosphere, soil, and groundwater systems. He directs Division Managers and Team Leaders as they conduct environmental site assessments and investigations, UST and AST removals, and remediation of petroleum-contaminated soil and groundwater. Mr. Stahman has an excellent working relationship with state regulatory and reimbursement funding agencies, and he has experience with and knowledge of rules and regulations for states in WCEC's service area. He has designed, implemented, and completed research projects in the fields of soil mechanics, surface water chemistry, and groundwater chemistry and flow. Mr. Stahman has experience in a wide range of environmental projects including UST and AST removals, asbestos sampling and analysis, site investigations and closures, phase I and II environmental assessments, and agricultural chemical abatement projects.

Mr. Stahman is a participant of WCEC's spill response program and the Minnesota Department of Public Safety's regional chemical assessment response program. As a member of the State of Minnesota's Chemical Assessment Team, Mr. Stahman serves as a team leader and safety officer. He also served as a volunteer on state committees regarding HazMat response and resources/equipment available to fire services and serves on the Department of Public Safety's regional review committee for region IV as a emergency responder. This committee meets annually with county emergency managers to review emergency response plans.

Mr. Stahman is an Office for Domestic Preparedness (ODP) certified training instructor specializing in response to Weapons of Mass Destruction. He has trainied at the Department of Homeland Security's live agent vacility in Anniston, Alabama and the Energetic Materials Research and Testing Center at New Mexico tech in Soccoro, New Mexico. Most recently he has taught Basic Concepts courses and training in the use of Personal Protective Equipment to law enforcement agencies.

Mr. Stahman worked for the Minnesota Pollution Control Agency to prepare for management of WMD contaminated debris and worked with Minnesota Department of Agriculture to design a cleaning and disinfecting plan for FMD sites.

In addition, Mr. Stahman is the contact for the state of Minnesota's Materials Management Contract and MPCA Multi-Site Contract.

Project Experience

Cenex Truck Site, Fergus Falls, MN (Petroleum Site) Project manager of Investigation of truck stop property. Test holes and monitor wells were installed to determine horizontal and vertical extent of property. Three sources of contamination were present on the extensive property. Excavation of the source areas was implemented to reduce risk.

Johnson Tire Dump, Belle Plain, MN (Fund Financed Project) Developed and implemented remediation plan and erosion control plan. Subcontractors were used to remove and recycle tires from ravine near Minnesota River Valley. WCEC employees constructed and installed rip rap erosion control devices.

Hancock Coop, Hancock, MN (Petroleum Site) Project manager of Leak site. Petroleum vapors were first noticed in homes and businesses along main street. A quick survey of the sewer system and area businesses pinpointed a likely suspect. An inspection of the overfill devices on the tanks indicated a leaking line was the cause of the release. A standard investigation was conducted concurrently with vapor mitigation tactics for the city sewer system. Investigation determined that a concrete form stake was improperly placed.

Debris Management Conference, St. Paul, MN (MPCA Spill Response Program) Project manager/Organizer of national conference on debris management contaminated with WMD chemicals. Organized/Planned event activities, guest lists, national and international speakers from incidents in Oklahoma, New York and England. Managed event location, food service and transportation issues.

Hilton Property, New Providence, Bahamas (Property Assessment) Project manager of Investigation of ocean front property to be developed as part of Marina. Sampled on shore and off shore for heavy metals, VOCs and AG/Chem. Collected samples using sediment core, drill rig and underwater dives. Completed report in conjunction with Bahamanian government.

Tutor Estate, Henning, MN (Meth Lab Investigation) Project manager of Investigation of property/abandoned cabin where Meth was produced. Investigation focused on septic system, drinking water well and lab site. Meth making chemicals/waste products were

present in septic tank and much of cabin. Implemented sampling and remediation plan. Oversaw removal of septic system and lab.

Clipper Oil, Jasper, MN (Petroleum Site) Project manager of remediation site with pumping well interceptor network, vapor extraction and air sparge systems in the source area as well as river impact area (site formerly had a UST petroleum release which had migrated to the neighboring river). Additional sources were suspected. Oversaw installation of seven monitoring wells on city and railroad property.

WMD Training, Buffalo, MN (Homeland Security First Responder Training) Weapons of Mass Destruction training provided to over 200 first responders including fire fighters, law enforcement, emergency medical personnel and public works employees.

Harrold Road Landfill, Nassau, Bahamas (Landfill redevelopment) Project manager of landfill re-development project. Organized project meetings between 6 Bahamian government organizations and landfill staff. Developed fire extinguishing plan and planned de-construction of C&D Landfill. Analyzed contaminant hazards for down wind residents.

Lincoln County Emergency Operations Plan, Ivanhoe, MN (Homeland Security Planning) Managed development of Emergency Operations Plan components.

Dr. James B. Van Alstine

Vice President, Senior Consultant

MPCA / MDA Master Contract Classifications

Project Manager, Scientist II, Scientist I

Education

Ph.D., Geology, Stratigraphy, Sedimentology, University of North Dakota
M.S., Geology, Paleontology, Mineralogy, Petrology, University of North Dakota
B.A., Geology, Winona State University

Additional Training/Certifications

Licensed Professional Geologist, MN, WI

Memberships/Affiliations

Fresh Water Foundation Lake Watch Advisory Board, Board Member
Geology Society of American, SEPM, Member
Minnesota and North Dakota Academies of Science, Member
Steering Committee to Establish Regional Water Quality Workshops in Greater Minnesota, Member
Minnesota Pollution Control Agency Surface Water Outreach Assistance Project, Member
National Ground Water Association, AGWSE Division, Member

Technical Specializations

N/A

Professional Summary

Dr. Van Alstine has more than 30 years experience conducting a wide variety of groundwater resource and environmental investigations. He has designed and directed water quality assessments for surface and groundwater projects and investigations of point and non-point source pollution. He is a leader in assessing the impact changing land use has on water resources.

His environmental investigations in Minnesota, South Dakota, and North Dakota have employed a wide variety of technologies to determine changes in water quality over time, the impact of these changes on ecosystems, and the causes of these changes.

Dr. Van Alstine has been the project director and principal author of land and water resource assessment and management strategies prepared for 14 counties in western Minnesota and assisted in the development of plans for eight counties, about one-fourth of the non-metropolitan counties in the state, to inventory, assess, and understand the nature of their resources and to develop management strategies to protect their resource base. Dr. Van Alstine has also written a Comprehensive Watershed Management Plan for the Lac Qui Parle Yellow Bank Watershed District.

Dr. Van Alstine's experience with hazardous and regulated materials includes preparation of site audits, design and implementation of comprehensive site investigations, and health risk assessments. He has experience in the preparation of remedial investigation reports, corrective action design plans, and other required state agency reports for Minnesota, North and South Dakota, Wisconsin, and Iowa. He has conducted soil and groundwater investigations and has experience with Phase I & II Environmental Site Assessments as part of real estate appraisals and transactions.

Project Experience

Petroleum Site Investigations; Various Petroleum Sites throughout Minnesota. Senior Consultant, for a complex petroleum site where two municipal wells have been impacted and several others are at risk. The source area investigation identified a complex NAPL plume resulting from a 10,000 gallon release of gasoline. Over 50 monitoring wells have been installed to track multifaceted groundwater flow and contaminant transport as influenced by water supply well pumping. Detailed LIF and geologic data obtained for this site are currently being utilized to develop a CCAP and pilot test work plan for addressing the source area.

On another project, WCEC was contracted after the previous consultant failed to understand the dynamics of the NAPL plume. With direction from agency staff, WCEC completed a Laser Induced Assessment of the site and identified a large NAPL plume that was mostly submerged beneath the water table. With the definition of the source area, WCEC partnered with agency staff to complete a Multi-Phase Extraction (MPE) pilot test to lower the water table and expose the submerged NAPL to pneumatic influence. Based on results of the pilot test, WCEC has recommended that the site move to full scale implementation to address the massive NAPL plume at this site.

Special Projects; sedimentation rates in river impoundments; water management strategies; field mapping/interpretation of geologic terrains in SD, WY, MT and MN.

Publications, Conference Papers and Presentations

Van Alstine, J.B., 1996, Big Stone County Comprehensive Local Water and Resource Management Plan. Five year update of the water and resource management plan prepared for Big Stone County and the State of Minnesota. (Four additional publications in 1996 for other counties.)

Van Alstine, J.B., 1992, Executive Management Plan: Executive Summary of the Pope County Comprehensive Local Water and Natural Resources Management Plan.

Van Alstine, J.B., 1991, A Plan for Action: Executive Summary of the Douglas County Comprehensive Local Water and Natural Resources Management Plan.

Van Alstine, J.B., 1990, Big Stone County Comprehensive Local Water Management Plan. A water management strategy prepared for Big Stone County and the State of Minnesota. (Thirteen additional publications in 1989-1990 for other counties.)

Van Alstine, J.B., 1987, Sedimentation Rates and Changing Water Quality, Pomme de Terre River Watershed, West Central Minnesota. A report to the Freshwater Foundation and the Pomme de Terre River Association.

Trisko, A., Van Alstine, J.B., 1995, Variations in Water Chemistry in the Pomme de Terre River, Western Minnesota. (Abstract and Paper) Proceedings of the Minnesota Academy of Science.

Christensen, A., Van Alstine, J.B., 1995, Distribution and Abundance of Molluscan Species, Pomme de Terre River, Western Minnesota. (Abstract and Paper) Proceedings of the Minnesota Academy of Science.

Reppe, T., Van Alstine, J.B., 1994, Water Quality and Non-point Source Pollution Analysis of a Small Watershed, Lac Qui Parle County, Minnesota. (Abstract and Paper) Proceedings of the 9th National Conference on Undergraduate Research.

Sayge Wooldridge

Environmental Scientist

Education

B.A., Geology, University of Minnesota, Morris, MN

Additional Training/Certifications

40-Hour Hazardous Waste Operations and Emergency Response Certification (OSHA 1910.120)
BNSF Contractor Orientation
E-Rail Safe Contractor Training
Roadway Worker Protection
National Incident Management System (NIMS): ICS-100.b, 200.b, 700.b
CPR and First Aid

Technical Specializations

Hydrocarbon Investigations & Remediation
Emergency Spill Response

Professional Summary

Ms. Wooldridge attended the University of Minnesota, Morris (UMM) where she earned a B.A. in Geology and a minor in History. Ms. Wooldridge has 2-years of environmental science and consulting experience. As an Environmental Scientist at WCEC, Ms. Wooldridge assists Project Managers with investigation and remediation of contamination for emergency response and long-term environmental management projects. Ms. Wooldridge has gained experience in soil identification and description, water and soil sampling, and report writing. Ms. Wooldridge currently serves in the Environmental Services Division at WCEC where she works on projects for a variety of clients.

Project Experience

Environmental Phase I and Phase II Site Assessments – Multiple Clients and Locations
Field representative for the completion of Phase I and Phase II Environmental Site Assessments in Minnesota, North Dakota, and South Dakota. Projects completed for various clients including municipalities, financial institutions, and industrial facilities.

Subsurface Soil and Groundwater Investigations – Multiple Clients and Locations
Provided technical oversight for multiple environmental soil and groundwater investigations. Project responsibilities have included: field sampling activities; site documentation; soil and groundwater monitoring oversight; data evaluation; and report preparation.

Emergency Response; Hazardous Materials Cleanup Oversight; Waste Management and Disposal; Emergency Management Health and Safety; Various Hazardous Materials Transport and Retailers, Railroads, and State Agencies in Minnesota, South Dakota, North Dakota.
A technician for Emergency Response projects in Minnesota, South Dakota, and North Dakota. Contributes to emergency response operations for petroleum and hazardous waste facilities and the transportation industry including site cleanup activities, waste storage, and disposal. Completed and implemented site Health and Safety Plans. Maintained emergency response equipment and environmental monitoring meter calibration.

Bailey Zeiher, M.S.

Environmental Technician

Emergency Response Full Service Classifications

Scientist I, Field Technician

Education

M.S. Biological Sciences, University of Manitoba, 2016
B.S. Biology and Earth Science, Vancouver Island University, 2011
Chemical and Bioscience Technology Program, Red River College, 2004

Additional Training/Certifications

OSHA 40 Hr HAZWOPER Training
BNSF Contractor Orientation, CN On-Track Safety and Roadway Worker Protection
National Incident Management System: IS-100.b, IS-200.b, IS-700
E-Railsafe Contractor Training, ISN 2017 EH&S Work Permit Training
CP Oil Spill Ice Response Training
NSC Defensive Driving 9th Ed. MN, 2017
PADI Open Water

Memberships/Affiliations

The Nature Conservancy

Technical Specializations

Tier 1 Environmental Risk Assessments and Environmental Impact Assessments
Water Quality and Nutrient Sampling and Analysis
Stream and Watershed Surveys
Fish and Wildlife Surveys
Data Analysis and Technical Writing

Professional Summary

As an Environmental Technician at WCEC, Ms. Zeiher assists Project Managers with investigation and remediation of contamination for emergency response and long-term environmental management projects. In addition, Ms. Zeiher, collects soil and groundwater samples, evaluates site data, and generates reports. Ms. Zeiher currently serves in the AgChem Environmental Services Division at WCEC where she works on projects for a variety of clients.

Ms. Zeiher has a Master of Science degree with focus in aquatic toxicology and over 4 years of experience in biological science and environmental studies. Ms. Zeiher has gained considerable environmental knowledge through field schools, internships, and professional experience.

Ms. Zeiher's academic background in geology includes field schools which provided working experience in geological mapping, bedrock assessment and soil classification, and aerial photo interpretation. As an Agricultural Research Technician with University of Manitoba, Ms. Zeiher organized and executed oat breeding research trials. Relevant duties included collected environmental and geotechnical soil samples using hand-held augers and corers, and Giddings soil sampler drill rig.

Ms. Zeihers's experience in aquatic science is concentrated around her graduate research which focused on the environmental fate and effects of polyethoxylated tallow amine (POEA; surfactant found in Roundup™ herbicide) in shallow freshwater ecosystems. Ms. Zeiher collected water and aquatic sediment core samples for contaminant analysis. She analyzed complex technical data and performed statistical analysis to determine the dissipation time of POEA in the environment. Other duties included water parameter sampling with the use of YSI meter, collection and analysis of nutrient data, and zooplankton and emergent insect sampling. Addition aquatic science experience, gained through field schools, internships, and as a Research Assistant with the Department of Fisheries and Oceans Canada (DFO), includes: the collection and analysis hydrological and limnological data, stream and watershed survey techniques, habitat assessments, and fish population surveys. As a Volunteer with US Fish and Wildlife, Ms. Zeiher has monitored water quality, and collected water samples for neonicotinoid analysis.

Ms. Zeiher has conducted Impact Assessments for the Conservancy of Southwest Florida on Mangrove forests threatened by development along coastal areas and associated alterations to hydrology. She has also conducted an Environmental Risk Assessment for the Contaminants Advisory (DFO) on POEA in aquatic environments.

Project Experience

Agricultural Investigations for various private and state clients, Midwest Locations

Involved in many investigations of former and current agricultural properties across the Midwest. Prepared and implemented Work Plans, evaluated and collected investigation data, and prepared technical reports describing the methods and results of site activities. Completed

reports detailing corrective action activities, monitoring well installation and quarterly and annual monitoring reports.