MINNESOTA POLLUTION CONTROL AGENCY

amec foster wheeler

Minnesota Pollution Control Agency

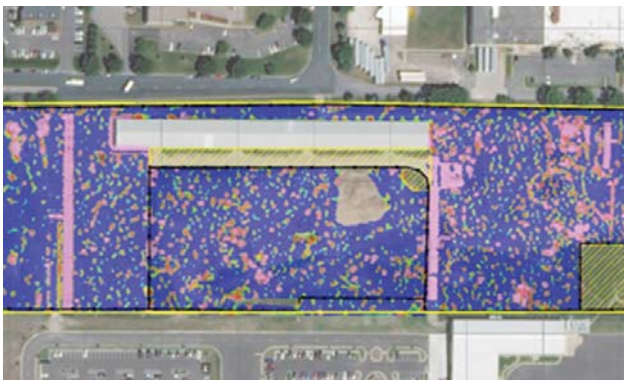
Remediation Master Contract

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

Submitted to:
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Submitted by:
Amec Foster Wheeler
Environment & Infrastructure, Inc.
800 Marquette Avenue, Suite 1200
Minneapolis, MN 55402

April 11, 2018



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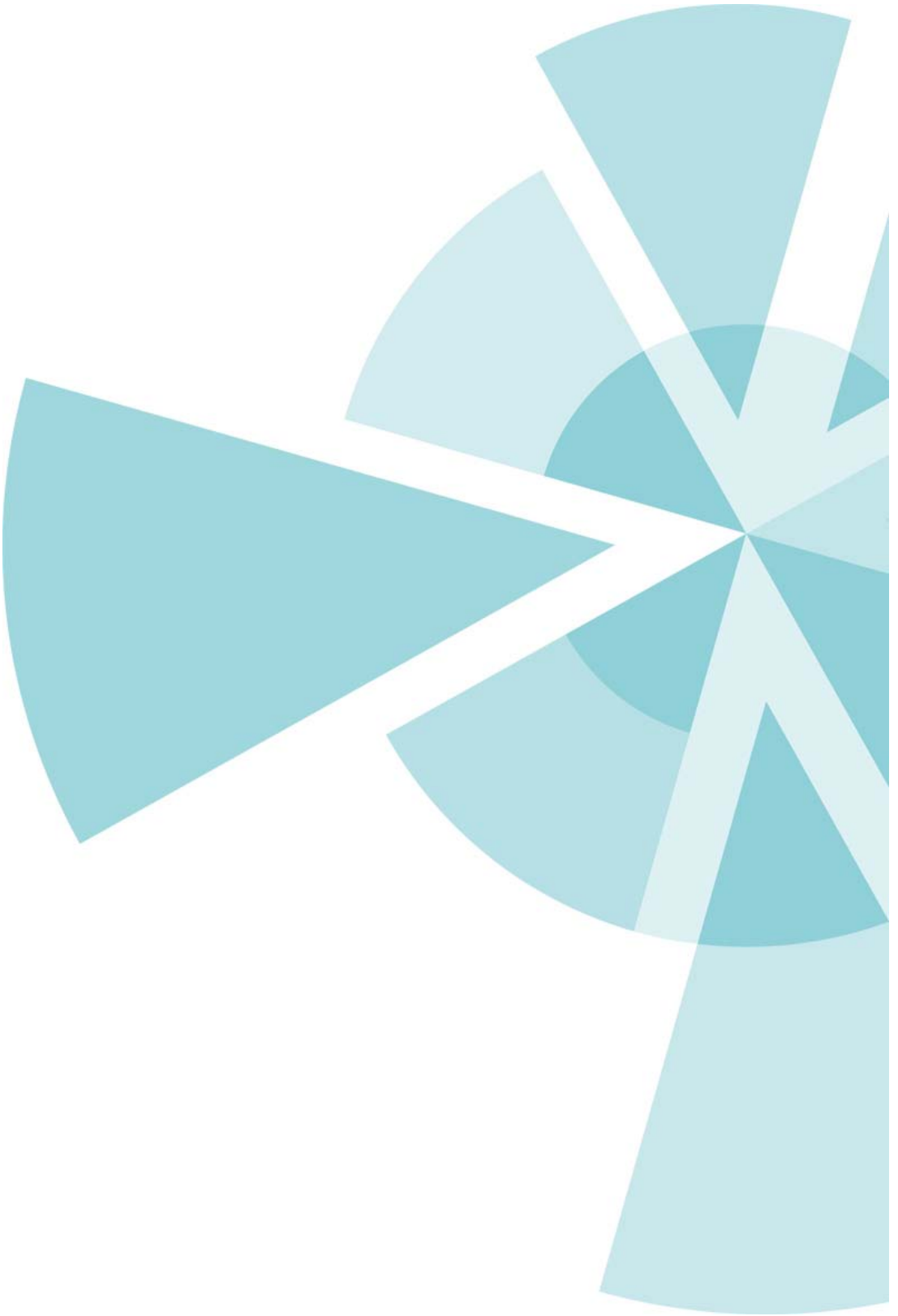

A.1 Cover Letter

April 11, 2018

Mary Heininger
Pollution Control Agency
520 Lafayette Road N
St. Paul, MN 55155-4194

Dear Ms. Heininger:

Subject: Category A: Petroleum, Superfund, MDA, Closed Landfill Program Environmental Services Proposal

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) appreciates the opportunity to provide the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Agriculture (MDA) with this response to the Request for Proposal for Remediation Master Contract (RFP) dated February 28, 2018. This response, for Category A: Petroleum, Superfund, MDA, Closed Landfill Program Environmental Services, addresses the original RFP and incorporates Addendum 1, dated March 19, 2018. Addendum 1 acknowledgement is provided in Appendix A. All references to RFP hereafter include the original RFP and all Addenda.

Amec Foster Wheeler has reviewed Section 5 of the RFP, Classification Levels and Rates and accepts the classifications and hourly rates as identified in Rate Schedule 1 (July 1, 2018 – June 30, 2020) and Rate Schedule 2 (July 1, 2020 – June 30, 2023).

Amec Foster Wheeler has reviewed Section 6 of the RFP, Supplies and Equipment Pricing and accepts the costs as identified. Amec Foster Wheeler understands that the costs shown in Section 6 of the RFP are inclusive of applicable taxes, fees, insurance costs, direct costs, overhead and profit.

As of October 2017, Amec Foster Wheeler was acquired by John Wood Group, plc. and established the new company, Wood plc. (LSE: WG.L), a global leader in the delivery of project management, engineering and technical services to its customers in the world's oil and gas, mining, clean energy, environment and infrastructure markets. With annual revenues of over $10 billion, we design, deliver and maintain strategic and complex assets and employ over 55,000 people in more than 60 countries worldwide. Amec Foster Wheeler currently operates as a wholly owned subsidiary of Wood and will legally change its operating name to Wood Environment & Infrastructure Solutions during the second quarter of 2018.

Amec Foster Wheeler's Environment & Infrastructure division is a leading environment and infrastructure, engineering, consulting and project management organization with more than 175 offices and over 6,500 employees worldwide. Our team of professionals provides a full range of services to clients in a wide range of sectors, including government, industrial & commercial, water, transportation, minerals & metals, oil & gas and clean energy.

Amec Foster Wheeler's Environment & Infrastructure division is headquartered in Alpharetta, GA and is led by our President, Ms. Anne Massey. Two US Regional (Eastern and Western) and two Canadian Regional (Eastern and Western) Managers report directly to Ms. Massey. The Amec Foster Wheeler Minneapolis office resides in the Eastern Group under the direction of Senior Vice President, Mr. Lytle Troutt. The addresses of the Headquarters and local office are as follows:

US Headquarters
1105 Lakewood Parkway, Suite 300
Alpharetta, GA 30009
Tel: 770-360-0600
Fax: 770-360-0540

Local Office
800 Marquette Avenue, Suite 1200
Minneapolis, MN 55402
Tel: 612-332-8326
Fax: 612-332-2423

We intend to primarily draw on our environmental staff of the Minneapolis office to serve the contract with secondary support from our employees across the EPA Region 5 states in Illinois, Indiana, Michigan, Ohio, and Wisconsin as well as our nationally-recognized subject matter experts around the US to support the contract in special cases.

Ms. Emma Driver will continue to serve as the contract manager and designated point of contact for all MPCA and MDA related work. Amec Foster Wheeler employees have worked from 2008 through 2018 on the existing MPCA/MDA Multi-Site Contract and have expertise preparing technical reports, agency invoicing documents, and other contract required deliverables (e.g., Equipment and Usage Summary Reports) directly for the MPCA/MDA. Ms. Driver will assign appropriate project staff, including project managers and technical staff, to bring together the skills and experience required on each project.

The Amec Foster Wheeler local office is within 20 minutes of the MPCA and MDA St. Paul locations and the entire local Amec Foster Wheeler Team can be available in a moment's notice by telephone or for face-to-face meetings to address all contractual and project-specific concerns. In the event communication is required after regular business hours, all Amec Foster Wheeler Project Managers are available via cell phone. We pride ourselves on our customer service and prompt replies. We are dedicated to rapid resolution of potential issues so that our projects can move forward on schedule, within budget, in the most technically proficient manner. Local resources include project managers, scientists, geologists, engineers, QA/QC officers, risk assessors, groundwater modelers, on-site inspectors and field technicians.

Amec Foster Wheeler has reviewed the proposed Sample Contract Terms and Conditions supplied in Attachment 1 of the RFP. We do not have any exceptions to the contract as presented in Attachment C.

Please contact Ms. Emma Driver or the Minneapolis office manager, Mr. Curtis Hudak should you have any additional questions or require any additional information. Amec Foster Wheeler is excited to continue to work the MPCA and MDA on environmental solutions to benefit individual communities and the citizens of Minnesota.

Additional information regarding Amec Foster Wheeler is available on our website www.woodplc.com.

Sincerely yours,

Amec Foster Wheeler Environment & Infrastructure, Inc.

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A.2 Qualifications and Capabilities

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A.2.1 Summary of Overall Capabilities

Amec Foster Wheeler Environment & Infrastructure, Inc., herein referred to as Amec Foster Wheeler, is an environmental consulting, engineering and design, and construction company operating with over 6,500 professionals in 175 locations. Serving the government, clean energy, industrial/commercial, mining, oil & gas, transportation, and water sectors, we provide services to both public and private clients worldwide. The *Engineering News-Record*'s 2017 listing ranked Amec Foster Wheeler 7th of the "Top 500 Design Firms" and 10th of the "Top 200 Environmental Firms".

Amec Foster Wheeler draws upon over 40 years of experience in environmental science and engineering to provide a comprehensive range of environmental services. Our service offerings fall into eight main categories, including:

- **Civil / Site**: planning, site design, grading/drainage plans, storm water management, utilities;
- **Construction:** construction management, construction monitoring, new build, decontamination/decommissioning/demolition, remedial construction, nuclear construction management;
- **Environmental Engineering:** assessment, remediation, hazardous/toxic materials, sediments;
- **Environmental Sciences:** environmental impact assessment and permitting (including NEPA); natural resources management (terrestrial, aquatic, and marine); cultural resources management; environmental health and safety management, compliance, and due diligence; air quality, acoustics, and climate change / greenhouse gases; occupation health and safety;
- **Geosciences:** geotechnical, geology seismology, hydrology, hydrogeology, meteorology;
- **Materials Engineering:** soils, concrete, Non-destruction evaluation (NDE) for metals, welding engineering, forensics;
- **Pure Sustainability Services:** program consulting, stakeholder engagement, climate change, resource conservation, operational efficiency, social responsibility and human environment factors;
- **Water Resources:** watershed management, groundwater modelling, TMDL studies, and stream restoration.

Locally in Minnesota, our firm is represented by more than 120 employees. Our regional resources also include more than 250 employees across the United States Environmental Protection Agency (EPA) Region 5 States, comprised of more employees in Illinois, (Chicago and Peoria), Indiana (Indianapolis), Michigan (Novi and Traverse City), Ohio (Dayton), Wisconsin (Madison).

Our firm is exceptionally qualified to support the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Agriculture (MDA) because we offer:

- **Level 3 Environmental Services Contractor Experience**. Amec Foster Wheeler has held the MPCA/MDA Level 3 Environmental Services contract since July 2008 and has had the opportunity to work with nearly 20 different MPCA project managers to support more than 180 different Work Orders over the last 10 years. As a result, we are intimately knowledgeable about the policies, procedures, and protocols that govern project initiation, planning, execution,

Amec Foster Wheeler has held the MPCA/MDA Level 3 Contract for 10 years, supporting over 180 projects across Petroleum Remediation Program, Site Assessment and Superfund.

monitoring and controlling, and closing of state projects. We have had the opportunity over the last 10 years to meet annually with the MPCA to discuss our performance and continue to strive for opportunities for continual improvement in executing the contract. This is a benefit to both the MPCA and MDA as we immediately have the ability to effectively tackle new project work with little to no learning curve.

- **Robust Local Presence with Global Reach**. Amec Foster Wheeler's local office offers a group of talented professional staff that includes environmental, civil, mechanical and electrical engineers, geologists, hydrogeologists, risk assessors, groundwater modelers, biologists, geophysicists, field technicians, on-site inspectors, and GIS and CAD designers. Our exceptional ability to serve our clients locally is evidenced in the diversity of our group. This, coupled with the ability to draw from specialty resources from around the company, allows us to meet any needs that MPCA or MDA may have. Amec Foster Wheeler has been able to illustrate this under the current and previous contract when we teamed with MPCA to perform special projects for a Perfluorochemical Information Clearinghouse and support of the Soil Reference Value (SRV) Work Group Guidance. This ability is a benefit to MPCA and MDA as we can offer Project teams that provide both strong State regulatory knowledge and experience as well as international experts to supplement as and where needed.
- **Extensive Regulatory Knowledge**. With several individuals on our project team having more than 30 years of environmental experience in the state of Minnesota, Amec Foster Wheeler is able provide the MPCA and MDA with extensive regulatory knowledge. Our staff are thoroughly knowledgeable about MPCA Risk Based Site Evaluation (RBSE) Manual, Underground Storage Tank (UST) and Aboveground Storage Tank (AST) Release Cleanup Guidance Documents and Fact Sheets, Voluntary Investigation and Cleanup (VIC) Guidance Documents, and MDA Guidance Documents. We are extremely knowledgeable about 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), and the National Oil and Hazardous Substances Contingency Plan (more commonly called the National Contingency Plan [NCP]).
- **Proven Track Record with Technology Innovation**. Amec Foster Wheeler strives to be at the leading edge of technology and innovation and as such has been and continues to be involved in research and development efforts via the Department of Defense's Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP). In the last year, our staff have secured more than $2 million in funding through ESTCP and SERDP for research and development as well as demonstration and validation for PFAS remediation technologies. Amec Foster Wheeler is also an Industry Affiliate Member of the ITRC and has active membership on several Teams in addition to the PFAS Team mentioned above. Other teams include but not limited to the Contaminated Sediments Team, Remediation Team, the dense non-aqueous phase liquid (DNAPL) Site Characterization Team, the Geophysical Classification Team, the Petroleum Vapor Intrusion Team and the Fractured Bedrock Team. This is a benefit to both MPCA and MDA as we have the ability to not only efficiently support the Petroleum, Superfund, MDA and Closed Landfill programs but we are able to bring unique and innovative out-of the-box solutions to any project.

Amec Foster Wheeler understands that the key challenges faced by the MPCA and MDA are constantly evolving. The development of new products and chemicals, combined with an increased understanding of contaminant behavior can create unique challenges to the way remedial strategies are evaluated, designed and implemented. Amec Foster Wheeler understands the current challenges in the state of Minnesota and understands that key challenges through the duration of this contract include:

i. Emerging contaminants, specifically per- and polyfluoroalkyl substances (PFAS). Activities will include site investigation (SI), remedial investigation (RI), remedial design/remedial action (RD/RA), including drinking water treatment, and restoration activities at sites either directly (i.e., source sites) or indirectly (i.e., landfills) impacted by the contaminants.

ii. Vapor Intrusion (VI), including continued re-evaluation of sites where VI may be a potential concern associated with historical activities and previously not evaluated, design and implementation of remedial systems, and expanding current best management practices (BMPs) focused on single-family residential buildings to consider commercial and industrial developments.

iii. Restoration, including the identification, evaluation and monitoring; remedial design and implementation; and ecological restoration of potential impacts to human health and the health of the biological community that pose a threat to the Areas of Concern (AOC) on the Great Lakes.

Our project team is uniquely qualified to support the MPCA and MDA in addressing these challenges through demonstrated project experience and expertise in each of the areas as summarized below.

- **Global leader in Emerging Contaminants and specifically Per- and Polyfluoroalkyl Substances (PFASs).** Amec Foster Wheeler not only understands the challenges MPCA faces with PFASs but has been supporting the MPCA since 2008 with these issues. Our team developed a protocol to evaluate potential PFAS sources across the state of Minnesota, we have supported other states with PFASs (i.e., NY, MI, and VT), and we have supported clients globally with PFAS site investigation, remedial investigation and clean-up at more than 100 locations across the United States, Canada, Germany, UK, and Australia. Additionally, our team continues to be a leader in the developing science and policy surrounding PFASs. For example, our Emerging Contaminants Program Manager, Shalene Thomas, developed a proposal, along with representatives from the States of New York and Vermont to initiate a PFAS Team with the Interstate Technical Regulatory Council (ITRC). The proposal was accepted and the PFAS Team is now the largest ITRC Team in the history of ITRC. Amec Foster Wheeler has eight members on the Team, including the co-chair position of the Aqueous Film-Forming Foam (AFFF) sub-Team.

  Our expertise at more than 100 locations performing PFAS site investigation and remedial design, combined with our extensive portfolio of landfill design engineering makes Amec Foster Wheeler uniquely qualified to address the PFAS problem affecting closed landfill sites throughout Minnesota.

- **Expertise in Landfill Engineering Design and Construction Oversight**. Amec Foster Wheeler provides a full range of services for complex, multi-faceted solid waste projects, from integrated waste management to landfill design, closure and remediation. Our landfill experience ranges from small projects to closure of landfills of more than 500 acres in size, from simple to complex closure systems including leachate and landfill gas collection systems. Our systems have been designed to meet RCRA, CERCLA and state solid waste disposal regulations and have ranged from municipal trash landfills or ashfills, to RCRA hazardous waste landfills and cover systems for radiological burial areas. Amec Foster Wheeler personnel have designed over 30 different types of multi-layer landfill cover systems, ranging from simple 'single-layer' covers to covers requiring nine or more separate layers; these cover systems have used combinations of more than 25 different types of natural or synthetic materials selected to meet site-specific, regulatory, quality, waste integration, hydrologic, geologic and climatological requirements.

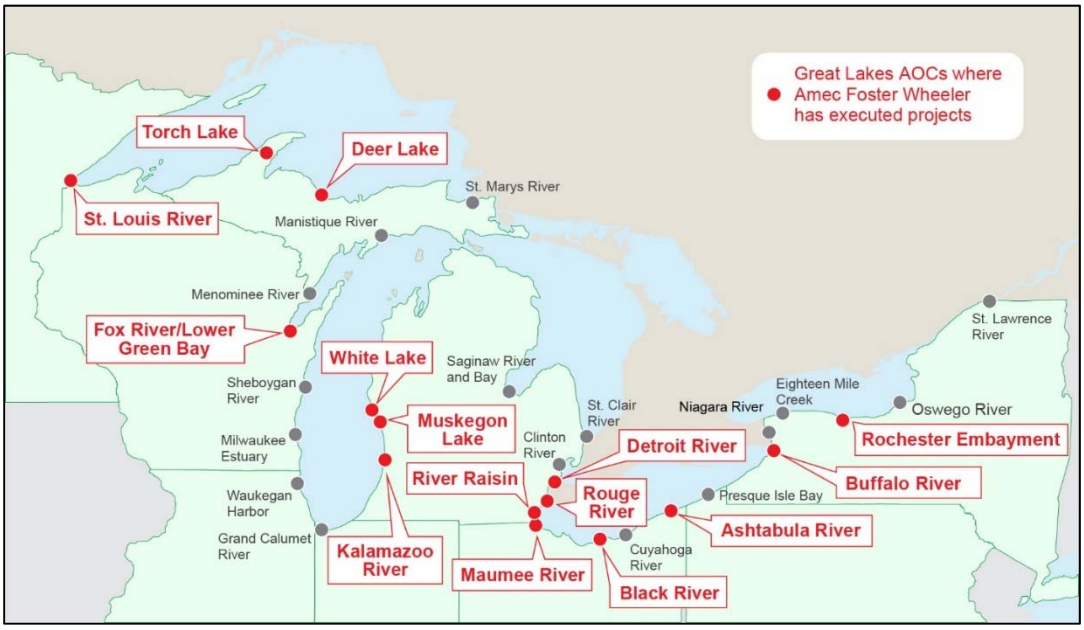
- **Expertise in Vapor Intrusion**. Amec Foster Wheeler's toxicologists, risk assessors, and environmental engineers have been at the forefront of evaluating and remediation of indoor air quality issues from vapor intrusion (VI) at numerous sites across the nation. Using a tiered approach and an understanding of the conceptual site exposure model, including subsurface and building conditions, Amec Foster Wheeler has successfully worked cooperatively with regulators to eliminate concerns for the subsurface to indoor air pathway. In doing so, the establishment of background ambient air quality is critical. Coupled with our knowledge of the toxicology and regulatory status of volatile organic compounds (VOCs), Amec Foster Wheeler has assisted clients in avoiding additional costs and liabilities associated with indoor air issues. Where appropriate we have also developed and implemented monitoring and engineered control programs. Our experience has included evaluation of entire residential and

commercial developments to address VI issues from underlying groundwater contaminant plumes, landfill methane, and other vapor sources.

- **Technical Leader in Sediment Assessment and Remediation**. Amec Foster Wheeler is a leader in sediment assessment and remediation with extensive experience completing remedial construction for numerous large sediment remediation projects at sites regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and other federal and state regulatory programs. Our team of experts have designed some of the most complex multimedia sampling and analysis programs for sediments, marine tissue, surface water and porewater at cleanup sites throughout North America. The team brings experience designing and implementing multimedia characterization for remedial investigation/feasibility studies (RI/FS), design, and long-term monitoring. We have integrated design considerations into baseline sampling plans for projects where we have completed characterization, design, and construction at high-profile sites nationwide, including the Duwamish River, Thea Foss Waterway, Hylebos Waterway, Fox River, Kalamazoo River, and Hudson River. Exhibit 1 identifies the Great Lakes AOCs where Amec Foster Wheeler has executed sediments focused projects.

  Amec Foster Wheeler brings unprecedented experience on sediment projects under the Great Lakes Legacy Act (GLLA) and we hold long standing relationships with the USEPA Great Lakes National Program Office (GLNPO). Our firm and staff bring experience from over 20 Great Lakes sediments projects at 15 of the Great Lakes Areas of Concern (AOCs), developing favorable remedial approaches.

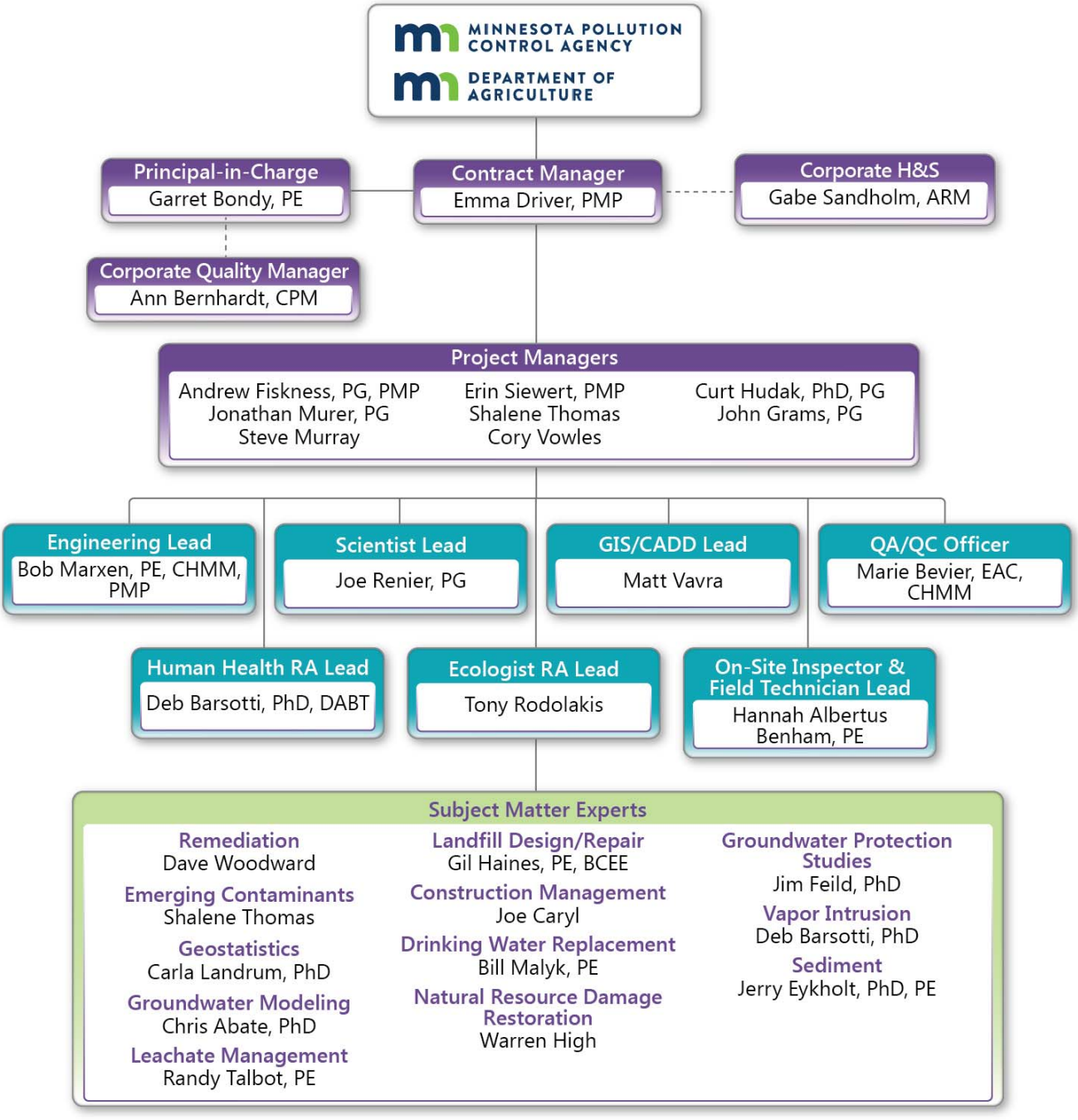
Exhibit 1. Great Lakes AOCs where Amec Foster Wheeler Has Executed Sediment-focused Projects



A.2.2 Resumes of Key Staff

The key staff assigned to the contract are presented in **Exhibit 2**.

Exhibit 2. Organizational Chart



The following roles and responsibilities are defined for key staff:

Contract Manager, Emma Driver, PMP

Ms. Emma Driver will serve as the program manager. In this role, she will ensure that Amec Foster Wheeler is meeting and exceeding the expectations of the MPCA, including Petroleum Remediation Program, Site

Assessment/Superfund and Closed Landfill contract managers and project leads and MDA project managers. Ms. Driver will also ensure that Amec Foster Wheeler is performing effectively within the program. Ms. Driver will continue to utilize a program framework that identifies metrics for project managers to adhere to ensure that consistent and high-quality work products are delivered to MPCA and MDA on every project. Ms. Driver will initiate bi-annual meetings with the MPCA and MDA to discuss overall program performance, project delivery and project managers; she will incorporate the feedback back into the program to ensure continual improvement. Ms. Driver is currently serving as the contract manager for the existing Technical and Master Services contract.

Principal-in-Charge, Garret Bondy, PE

Mr. Bondy is a Regional Manager and Senior Principal Engineer at Amec Foster Wheeler, with over 30 years of environmental experience across EPA Region 5. Mr. Bondy, has extensive environmental and engineering experience in support of brownfield redevelopment projects; site and remedial investigations; remedial design and remedial action; construction management and oversight; landfill engineering; sediment sampling design and remediation; and, regulatory negotiations. Mr. Bondy also serves as Program Manager for multiple state contracts, including an Environmental Remediation contract with the Michigan Department of Environmental Quality. Prior to his career at Amec Foster Wheeler, Mr. Bondy also served as a Superfund Enforcement Section Chief in EPA Region 6.

In the role of Principal-In-Charge, Mr. Bondy will act as the key link between the contract manager and the organization's executive management, including quality manager. Mr. Bondy will help the contract manager facilitate the necessary organizational support needed to make strategic decisions and create successful projects. He will also facilitate problem solving by ensuring that any issues outside of the contract manager's authority are escalated and solved quickly and effectively at the organizational level.

Corporate Quality Manager, Ann Bernhardt, CMQ/OE, CPM

Ms. Bernhardt is the Director of Quality Assurance for Amec Foster Wheeler, Environment & Infrastructure, Inc. She oversees the development, improvement, and implementation of our company's quality program. Our quality program is based on ISO principles and provides the basis for consistent, reliable project delivery. The effectiveness of our program is measured through Customer Satisfaction surveys, audits, and management reviews. We continuously integrate improvements to our program that increase the value of our project delivery to our Customers. Ms. Bernhardt has over 25 years of experience and has served as a QA/QC Manager on multiple government contracts overseeing the quality of our team's delivery primarily executing site characterizations, site investigation, feasibility study, remediation, and construction projects. She has successfully led the quality program for the EPA, Air Force, Navy, Coast Guard, and multiple commercial clients and she has served on the PFAS Work Group leading the development of the PFAS analytical laboratory quality assurance and audit program for Amec Foster Wheeler. Ms. Bernhardt will ensure the overall quality of work conducted for the MPCA/MDA and will conduct quality audits throughout the duration of the contract. Ms. Bernhardt, will also independently evaluate any quality concerns with the MPCA/MDA should they arise.

Corporate Health & Safety, Gabe Sandholm, ARM

Mr. Gabe Sandholm will serve as the Health and Safety Manager for the MPCA and MDA contract. Mr. Sandholm will meet quarterly with the contract manager, Ms. Driver, to ensure Amec Foster Wheeler health & safety policies are consistently adhered to; he will also ensure project health and safety audits are being performed and if warranted, corrective measures be completed. Mr. Sandholm will ensure that Health and Safety Plan templates are adequate and respond to any health and safety questions or comments that the project team members may have. Amec Foster Wheeler will share any lessons learned with the MPCA and MDA project leads to promote our shared safety goals.

Project Managers, Multiple

Our team of selected project managers have been managing projects in the state of Minnesota for over 100 years combined, and includes staff that have been managing projects directly for the MPCA and MDA since 2008. Our project managers have diverse project experience and backgrounds and will be selected to manage projects based on the project objectives. All project managers within our organization are required to complete internal project manager training through our Amec Foster Wheeler Academy, which holds accreditation through the Association for Project Management (APM). In addition, several of our project managers have completed external certification (i.e., Project Management Professional [PMP®]) through the Project Management Institute.

The project manager's role is the overall responsibility for the successful planning, execution, monitoring, control and closure of a project and Work Order. In this role, the project manager will ensure the project meets scope, schedule, and budget constraints and exceeds the MPCA or MDA's expectations. The project manager will also ensure that the project team is adhering to all contractual terms and conditions for the duration of the project and all information is appropriately and effectively communicated to stakeholders in a timely manner.

Engineering Lead, Bob Marxen, PE, CHMM, PMP

Mr. Bob Marxen will serve as the Engineering Lead. In this role, he will serve as the lead for all engineering resources defined for the contract and listed on the matrix of staff. Mr. Marxen has over 30 years of experience working in the environmental industry in Minnesota as an engineer, construction manager and project manager. Mr. Marxen holds current Minnesota Erosion/Sedimentation Control Certification and is a Minnesota certified asbestos inspector. Mr. Marxen has extensive experience working with Minnesota Guidance and Policy. In the role of engineering lead, Mr. Marxen will define best practices for engineering services and ensure they are implemented on every project. He will also serve as peer review for all project work products that involve remedial investigation, remediation design, implementation, and operation. He will mentor mid- and junior staff as needed.

Scientist Lead, Joe Renier, PG

Mr. Renier will serve as the Scientist Lead. In this role, he will serve as the Lead for the Scientist resources defined for the contract and listed on the matrix of staff. He will define best practices for geology and hydrogeology services and ensure they are implemented on every project. He will also serve as peer review for all project work products that involve conceptual site development; groundwater, soil, surface water, and air sampling; and site investigation. He will mentor mid- and junior staff as needed.

GIS/CADD Specialist Lead, Matt Vavra

Mr. Matt Vavra will serve as the GIS/CADD Specialist Lead. In this role, Mr. Vavra will ensure that adequate and consistent standards are developed for all GIS and CAD work products. He will develop MPCA and MDA map templates and oversee other GIS/CADD specialists in map production. He will also ensure all data submitted to MPCA/MDA meets the minimum data deliverable requirements and State spatial data standards.

QA/QC Officer, Marie Bevier, EAC, CHMM

Ms. Bevier will serve as the lead QA/QC Officer. In this role, she will be the primary person responsible for data verification and validation, preparation of quality assurance documentation. She has an in-depth working knowledge of United States Environmental Protection Agency (EPA) environmental analytical methods and EPA contract Laboratory Program (CLP) National Functional Guidelines for Data Review. Ms. Bevier has provided data quality assurance and quality control (QA/QC) for the Minneapolis office for over 15 years and has a thorough working knowledge of the MPCA quality management plan.

Human Health Risk Assessor, Deb Barsotti, PhD

Dr. Barsotti has focused on risk-based solutions for environmental problems for more than 30 years across the US and globally, including risk assessment in Minnesota. As a Diplomate of the American Board of Toxicology,

Dr. Barsotti promotes the use of sound science when conducting human health and ecological risk assessments for use making risk management decisions. She has extensive experience dealing with the toxicological and risk assessment issues surrounding a variety of relevant issues and substances, including PFASs, manufactured gas plants (MGP), polychlorinated biphenyls (PCBs), polychlorinated dioxins and furans, polyaromatic hydrocarbons (PAHs), petroleum hydrocarbons, chlorinated solvents, e.g., TCE, PCE, 1,4-dioxane, arsenic, lead, hexavalent chromium and other metals. In addition, Dr. Barsotti is a recognized published expert on numerous substances, including PCBs and dioxin/furan toxicity and risk assessment. She serves as the subject matter expert for vapor intrusion, including toxicology and risk assessment of potential indoor air impacts.

Ecological Risk Assessor, Tony Rodolakis

Mr. Rodolakis will serve as the lead Ecological Risk Assessor. Mr. Rodolakis has 24 years of experience directing, managing and executing ecological risk assessments and other hazardous waste and environmental permitting projects. He has performed risk assessments and impact studies following MPCA guidance, national USEPA, Environment Canada, Australian EPA, and other internationally recognized programs across North America, South America, and the Caribbean, including CERCLA, RCRA, and more than 25 states and provincial programs. Mr. Rodolakis has also conducted ecological risk assessments at a wide variety of project sites include landfills, mining, petroleum, port, manufacturing, and commercial sites. Mr. Rodolakis applies site-specific weight of evidence approaches to ecological risk assessment based on state-of-the art science to help clients eliminate negligible exposure pathways and chemicals from costly investigation, and to reduce mitigation efforts by developing risk-based clean-up goals. Mr. Rodolakis also specializes in habitat assessment and emerging contaminants such as PFASs.

Onsite Inspector, Hannah Albertus-Benham, PE

Ms. Hannah Albertus-Benham will serve as an On-Site Inspector and field technician lead. In this role, Hannah will ensure that standard operating procedures and MPCA guidelines are being strictly adhered to for all field efforts. Ms. Albertus-Benham will lead the field crews in evaluating various field methodologies and ensuring Amec Foster Wheeler are following all field protocols. Ms. Albertus-Benham has worked with the MPCA for the past five years on the existing MPCA technical services contract and is familiar with all aspects of the MPCA risk based site evaluation documents and the MPCA quality assurance program.

Subject Matter Experts (SME)

Nationally-recognized subject matter experts have been identified to support the contract. Each SME identified herein has been thoughtfully selected in anticipation of MPCA/MDA project needs on the contract. The SMEs are mapped to contract rates as shown in Exhibit 3.

Remediation, David Woodward

Mr. Woodward has more than 32 years of experience in environmental investigation and remediation. He currently serves as the Remediation Practice Leader for Amec Foster Wheeler. He is responsible for contract research and development (R&D) for industry and governmental authorities. He has authored or co-authored over 100 publications, given over 50 platform conference presentations, served as an invited expert panelist, led the development of numerous industry and government guidance and standards covering all aspects of soil and groundwater investigation and remediation. He also serves as Amec Foster Wheeler's Per- and Polyfluoroalkyl Substances (PFAS) Technical Leader, responsible for advancing our understanding of PFAS investigation, fate and transport, and remediation. He has over 10 years of experience conducting PFAS investigations and remediation in the U.S., Canada, Europe, and Australia on projects associated with PFAS Mfg., Manufacturers using PFAS, and on sites involving AFFF. His experience includes R&D projects for private industry, American Petroleum Institute, Swedish Government, Canadian Government, Australian DOD, U.S. DOD/SERDP, and the U.S. Air Force. He has also applied advanced PFAS analytical techniques in support of PFAS R&D, including: Total Oxidizable Precursor Assay (TOP), Particle Induced Gamma Ray Emissions (PIGE) Test, and Total Organic Fluorine (TOF) testing.

Emerging Contaminants, Shalene Thomas

Shalene Thomas is the Emerging Contaminant Program Manager for Amec Foster Wheeler. She has more than 19 years of experience in environmental consulting that includes 10 years of experience supporting PFASs evaluations. She has extensive program and project management, human health risk assessment, data management, GIS and 3D visualization and animation, and site investigation experience and has supported state, federal and industrial clients with PFAS evaluations, including leading the development of an information clearinghouse on the emerging contaminant class for the MPCA. Ms. Thomas currently serves as the PFAS Work Group Manager for Amec Foster Wheeler and has supported PFAS projects in 32 different states in 9 of the 10 USEPA regions as well as projects in Australia and Canada. Ms. Thomas also led the ITRC PFAS Team Proposal and serves on the regulatory/risk task force for the ITRC PFAS Team as well as the co-lead for AFFF Fact Sheet. Ms. Thomas was also a contributing author for the regulatory section of the National Groundwater Association (NGWA) PFAS State of Knowledge and Practice document.

Geostatistics and Data Management, Carla Landrum, PhD

Dr. Landrum has more than 5 years of experience and an applied background in sampling and monitoring design, Phase I and Phase II site characterization, data analyses and interpretation, and environmental risk assessment. Ms. Landrum specializes in minimally invasive site investigative technologies to rapidly characterize shallow subsurface environments with reduced risk, liability, and cost. These technologies include environmental geophysics, LiDAR, portable X-ray fluorescence spectroscopy, and global positioning systems. She fuses these high resolution technologies with sparse direct environmental sampling approaches, including soil coring and geologic borings, using space-time analytical platforms to: optimize sampling and monitoring designs (establish where, when, and number of observations needed); pinpoint source(s), spatial extent(s), and potential migration pathway(s) of constituents of potential concern; establish background concentrations; map risk point exposure concentrations; provide accurate remediation costs by mapping probable concentrations, boundaries, surface areas, volumes and masses of contaminated material with measured confidence; negate risk and liability by measuring and reducing uncertainty in spatial and temporal estimates; and prove remediation endpoints and regulatory compliance.

Groundwater Modeling, Chris Abate, PhD

Dr. Abate has 26 years of experience in environmental geology, hydrogeology, modelling of water resources, project management, and litigation support. He has provided technical and management support for site investigations and remedial design efforts under the RCRA/CERCLA/MCP programs for a range of federal and private clients. Dr. Abate has specific expertise in the application of quantitative methods to water resource problems, including wellhead protection, groundwater remediation system design, stormwater management, and non-point source pollution. He has developed and calibrated groundwater flow models for the purposes of risk assessment, wastewater permitting, water supply management, mine dewatering, and assessing contaminant fate and transport. He has also performed and analyzed aquifer tests and sited water supply wells for clients in coastal plain, glaciated, and hard rock terrains. In addition, he has experience in assessment of Munitions and Explosives of Concern (MEC) distribution and environmental impacts at DOD sites with military training ranges. Dr. Abate has provided expert testimony and made numerous presentations at stakeholder meetings and technical conferences on quantitative methods for site assessment and remedial design as well as other aspects of applied hydrogeology and environmental geology.

Leachate Management, Randy Talbot, PE

Mr. Talbot has more than 30 years of experience. He is a Principal Engineer with environmental technical expertise ranging from municipal and industrial wastewater treatment to feasibility studies and remedial investigations at RCRA sites. Through more than two decades of experience, Mr. Talbot has developed practical engineering and construction experience and developed a reputation for expeditiously addressing design and construction issues and for maintaining a true partnership between the engineer, owner, and contractor. His

project experience and personal attributes have been invaluable in conducting successful remedial system optimization (RSO) evaluations, involving participation by owners, regulatory agencies, operators, consultants, and property owners.

Landfill Design/Repair, Gil Haines, PE, BCEE

Mr. Haines is a civil and environmental engineer with more than 30 years of experience specializing in solid waste and facilities design and planning. His experience includes landfill design and construction and landfill facilities design, site selection, assessments for municipal and private solid waste developments and for collection and recycling systems. His work has included the design and management of site studies, hydrogeologic assessments, alternative liner and leachate collection system design, landfill gas collection and control systems, operational plans, environmental monitoring plans, closure and post-closure care plans, stormwater control systems, solid waste master plans, solid waste management plans and recycling and collection systems. For municipalities throughout the country and Puerto Rico, Mr. Haines has successfully managed all aspects of solid waste programs by reducing costs, initiating innovative technologies, and procuring state funding from solid waste programs. He has also worked closely with municipal governments and concerned citizens to implement successful design and management strategies for project development.

Construction Management, Joe Caryl

Mr. Caryl has more than 30 years of experience as a construction specialist and has participated in more than 100 projects for public and private sector clients involving environmental remediation and restoration. These projects have ranged in value from $50,000 to over $10 million, in longevity from 5 days to 1 year and in geographic coverage from 1/2-acre to approximately 50 acres. His experience includes all aspects of engineered construction/construction management, including brownfield projects, with expertise in inspection, scheduling, budgeting and cost control, permitting, public relations, surveying (boundary and topographic), temporary construction easements and permitting, lead-based paint abatement, UST investigation and removal, collection systems, treatment systems, storm-water erosion and sedimentation, industrial water/wastewater treatment and SPCC, and Phase II assessments.

Drinking Water Replacement, Bill Malyk

Mr. Malyk is a Principal Engineer with over 20 years of experience in managing projects dealing with municipal, industrial water and wastewater treatment. His areas of expertise include in-plant water audit investigations and preliminary and detailed designs of water and wastewater treatment systems. Mr. Malyk has led several treatability studies, including but not limited to treatability studies for PFAS, comparing granular activated carbon (GAC) to regenerable and non-regenerable ion-exchange media. Mr. Malyk is also experienced in wastewater treatment plant modeling using the computer simulation tools for treatment system evaluation and design, and has extensive knowledge of waste treatment reactor design and operation. His experience has been developed working on projects in Canada, the United States, Europe, the UK, India, and China.

Natural Resource Damage Restoration, Warren High

Mr. High is a senior associate scientist and project manager with over 30 years of experience in natural resources damage restoration and specifically ecological restoration. His duties include the design, management, permitting, installation, and monitoring of wetland and stream restoration projects. Mr. High has received advanced training in all aspects of stream restoration, including fluvial geomorphology and bioengineering from national and international experts. Mr. High's specific experience includes watershed assessment, public funding, public education, resource agency permitting, design, preparation of cost estimates, specifications, vegetation lists, bid packages, construction inspection, monitoring, and all other aspects of restoration. Mr. High is a guest lecturer at numerous universities teaching various aspects of stream restoration.

Groundwater protection studies/hydrogeology, Jim Feild, PhD

Dr. Feild has more than 20 years of experience providing hydrogeological technical review for projects. His experience includes many phases and types of environmental and hydrogeologic assessments, in both the vadose zone and saturated zones. Dr. Feild has experience with technology selection, numerous groundwater and soil feasibility testing such as aquifer pumping tests, bail/slug tests, vapor extraction pilot tests, air sparge tests, and bioremediation/bioventing tests. Dr. Feild also has experience designing remediation systems. His strengths include analytical and numerical computer modeling of both saturated and unsaturated zone flow and contaminant transport. Dr. Feild has experience using a variety of natural tracers such as chloride, deuterium, oxygen-18, carbon-13; radiogenic tracers such as carbon-14, tritium, radium-226 and other naturally occurring isotopes of Uranium and Thorium; and anthropogenic tracers such as bromide, fluorescein dye, krypton gas, and sulphur hexafluoride. Dr. Field has conducted aquifer studies to determine alternatives for groundwater source supply where PFAS contamination exists.

Sediment Remediation, Jerry Eykholt, PhD

Dr. Jerry Eykholt is an environmental/geotechnical engineer providing innovative solutions to complex environmental site problems. Taking an interdisciplinary and often fundamental approach to problems, he is an expert-level engineer in the areas of contaminated sediments, surface water quality modeling, and groundwater fate and transport modeling. With over 21 years of experience in consulting, academia, and industrial R&D, Jerry has a broad set of technical, communication, and team skills to manage complex environmental problems in ways that lead to consistently responsive, high quality designs and other services to the client. Dr. Eykholt has project experience in the contaminated sediments area as an engineering/design leader in preparing complex sampling plans, remedial investigations, feasibility reports, remedial designs, and post-remediation evaluations.

The resumes for key project personnel are included in Appendix **B.**

A.2.2.1 Contractor Staff Matrix

Exhibit 3 presents a matrix of project staff offered for the contract. The matrix includes name, primary classification, OSHA certification, summary of educational experience, years of service with the company (and total years of experience), work experience, licenses and certifications held, and the location of those individuals (i.e., local [L], regional [R] or outside the region [O]). The table is organized by personnel classification category and all key staff are identified clearly with a key symbol (🗝). More than 6500 additional staff are available to serve the contract as/if needed.

Exhibit 3. Matrix of all Project Staff

CATEGORY A										
Name	Classification	OSHA Training	Educational Experience (Highest Degree Shown)	Work Experience				Years of Service	Licenses / Certifications	Location
				A	B	C	D			
Key Project Personnel and Subject Matter Experts										
🗝 C. Abate	Scientist 2 (SME – Groundwater Modeling)	●	PhD/Geosciences	●			●	17 (27)	--	O
🗝 H. Albertus-Benham	On-Site Inspector (Field Technician Lead)	●	MS/2009/Civil Engineering	●	●	●	●	1 (3)	PE - MN Asbestos Inspector (State of MN), Stormwater Construction Site Management	L
🗝 D. Barsotti	Human Health Risk Assessor 3 (SME – Vapor Intrusion)	●	PhD/1980/Pathology		●	●		22 (25)	--	O
🗝 A. Bernhardt	QA/QC Officer (Corporate Quality Manager)	●	BS/1991/ Env. Science		●	●	●	23 (25)	CMQ/OE, CPM	O
🗝 M. Bevier	QA/QC Officer	●	BS/1992/Chemistry	●	●	●	●	21 (26)	EAC, CHMM	O
🗝 G. Bondy	Project Manager (Principal-in-Charge)	●	BS/1979/ Env. Science & Engineering	●	●	●	●	26 (34)	PE	R
🗝 J. Caryl	Project Manager (SME – Construction Management)	●	MS/2002/Construction Management		●	●	●	13 (30)	--	R
🗝 E. Driver	Project Manager (Contract Manager)	●	BS/2000/Geography	●	●	●	●	16 (18)	PMP	L
🗝 J. Eykholt	Engineer 4 (SME – Sediment)	●	PhD Civil Engineering		●	●	●	7 (26)	PE-MN Registered Engineer/Surveyor	R

Exhibit 3. Matrix of all Project Staff										
CATEGORY A										
Name	Classification	OSHA Training	Educational Experience (Highest Degree Shown)	Work Experience				Years of Service	Licenses / Certifications	Location
				A	B	C	D			
J. Field	Scientist 2 (SME – Groundwater Protection Studies)	●	PhD/2000/Hydrogeology	●	●	●	●	17 (20)	RG Certified Ground Source Heat Pump (GSHP) Installer	O
A. Fiskness	Project Manager	●	BS/1998/Geology	●	●	●	●	8 (19)	PG, PMP	L
J. Gal	Engineer 2	●	BSE/2004/Civil Engineering		●	●	●	5 (13)	PE-MN	R
J. Grams	Project Manager	●	MS/1987/Geochemistry	●	●	●	●	4 (26)	PG, CPG	L
G. Haines	Engineer 4 (SME – Landfill Design/Repair)	●	MS/2009/Civil Engineering		●	●		3 (31)	BCEE	O
W. High	Scientist 2 (SME – Restoration)	●	MS/Env. Management				●	15 (30)	--	O
C. Hudak	Project Manager	●	PhD/1987/Geology	●	●	●	●	2 (32)	PG - MN	L
C. Landrum	Scientist 2 (SME – Geostatistics and Data Management)	●	PhD/2013/Soil Science/Geostatistics	●	●	●	●	3 (10)	--	L
B. Malyk	Engineer 4 (SME – Drinking Water Replacement)	●	M Eng./1992/Chemical				●	10 (20)	PE	O
B. Marxen	Project Manager/Engineer 3 (Engineering Lead)	●	BS/1986/Chemical Engineering BS/1987/Mathematics	●	●	●	●	14 (30)	PE, PMP, CHMM, Asbestos Inspector (State of MN), Stormwater Construction Site Management	L
J. Murer	Project Manager	●	MS/1989/Water Resources	●	●	●	●	3 (29)	PG	L
S. Murray	Project Manager	●	BS/1985/Geology		●	●	●	21 (25)	CPG	R
J. Renier	Scientist 2 (Scientist Lead)	●	MS/1982/Geology	●	●	●	●	16 (30)	PG	L
T. Rodolakis	Ecological Risk Assessor 3		MS/2000/Ecology	●	●	●	●	13 (24)	--	O

Exhibit 3. Matrix of all Project Staff										
CATEGORY A										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
🗝 G. Sandholm	Scientist 2 (Corporate Health & Safety)		MBA/2008	●				16 (18)	ARM	L
🗝 E. Siewert	Scientist 2	●	BS/2005/Env Studies	●	●	●	●	9 (12)	PMP	L
🗝 R. Talbot	Engineer 4 (SME – Leachate Management)	●	BS/1974 Civil and Env. Engineering			●	●	(17) 35	PE-ME	O
🗝 S. Thomas	Project Manager (SME – Emerging Contaminants)	●	MS/1998/Environmental Science & Mgmt.	●	●	●	●	16 (19)	PMP	L
🗝 M. Vavra	GIS/CADD Specialist	●	MGIS	●	●	●	●	13 (15)	--	L
🗝 C. Vowles	Project Manager	●	BS/2006/Biochemistry	●	●	●	●	12 (12)	--	L
🗝 D. Woodward	Scientist 2 (SME – Remediation)	●	BS/1984/Earth Sciences		●	●	●	2 (32)	--	O
Engineers										
Z. Al-Yassiri	Engineer 1/Technician	●	BS/2013/Environmental Engineering				●	1 (2.5)	EIT	R
S. Bashir	Engineer 2	●	MS/2003/Civil Engineering		●	●		4 (13)	PE - MI	R
A. Gagne	Engineer 3	●	MS/1999/Environmental Eng.	●	●	●	●	8 (7)	PE	R
J. Hansen	Engineer 3	●	MS/2000/Env. Engineering	●	●	●	●	8 (18)	PE - MI	R
S. Hansen	Engineer 3		BS/Chemical Engineering		●	●		6 (9)	PE-MN	L
G. Hauck	Engineer 3		B.Ch.E.				●	15 (35)	PE-MN	L
K. Krol	Engineer 2		BS/2004/Civil Engineering		●		●	14 (16)	PE-MN	L
J. Moran	Engineer 2		BS/1997/Civil Engineering		●			6 (14)	PE-MN	L
D. O'Connell	Engineer 3		BS/Chemical Engineering				●	23 (25)	PE-MN	L
D. Ott	Engineer 4	●	MS/2005/Civil Eng.	●	●	●	●	22 (27)	PE - MN	L
E. Palomino	Engineer 2		BS/1989/Electrical Engineering				●	2 (27)	PE-MN	L
J. Paul	Engineer 1/Technician		MS/2012/Civil Engineering		●			5 (6)	PE-MN	L

Exhibit 3. Matrix of all Project Staff										
CATEGORY A										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
C. Starkell	Engineer 1	●	BS/2001/Mechanical Engineering				●	10 (17)	PE-MN	L
D. O'Connell	Engineer 3		BS/Chemical Engineering				●	23 (25)	PE-MN	L
T. Rasmussen	Engineer 4	●	MS/1992/Civil Engineering	●	●	●	●	16 (22)	PE, PG	L
T. Shannon	Engineer 1/Technician	●	BS/2012/Mechanical Engineering			●	●	3 (3)	PE-MN	L
Scientists/Technicians										
J. Abid	Scientist 2	●	BS/2005/Biology		●	●		13 (13)	--	R
B. Barnes	Scientist 1	●	BS/Env. Science		●	●		3 (10)		L
C. Buckman	Scientist 2	●	MS/2004/Geology	●	●	●	●	3 (11)	PG	L
D. Costamagna	Scientist 2	●	BS/2003/Geology		●	●	●	15 (17)	PG	L
R. Crawford	Scientist 1/Technician	●	BS Geology		●	●	●	2 (2)	--	R
S. Cronin	Scientist 2	●	MS/2007/ Rangeland Ecosystem Science-Restoration Ecology	●	●	●	●	5 (18)	--	L
D. Costamagna	Scientist 2	●	BS/2003/Geology		●	●	●	15 (17)	PG	L
P. Goudreault	Scientist 2		MS/1985 Hydrogeology	●	●	●	●	5 (24)	--	L
S. Henson	Scientist 1/Technician	●	BS/2016/Geology and Geophysics	●	●	●	●	2 (2)	--	L
E. Heytens	Scientist 2	●	BS/Geology		●	●	●	3 (30)	--	L
G. Horstmeier	Scientist 1/Technician	●	BS/2017/Geology				●	1 (1)	--	R
A. Klaustermeier	Scientist 1/Technician	●	MS/2016/Soil Science	●	●	●	●	2 (2)	--	L
R. Lahti	Scientist 2	●	BS/1984/Applied Geophysics	●	●	●	●	5 (34)	PG	L
M. Matteson	Scientist 1/ Technician	●	BS/2013/Geological Engineering		●	●	●	2 (6)	--	R
D. Miller	Scientist 1/Technician		MS/Env. Engineering				●	3 (3)	--	L
J. Wegleitner	Scientist 1 / Technician	●	AA/2003/Architectural Drafting and Estimating	●	●	●	●	5 (11)	--	L
M. Matteson	Scientist 1/ Technician	●	BS/2013/Geological Engineering		●	●	●	2 (6)	--	R

Exhibit 3. Matrix of all Project Staff

CATEGORY A

Name	Classification	OSHA Training	Educational Experience (Highest Degree Shown)	Work Experience				Years of Service	Licenses / Certifications	Location
				A	B	C	D			
C. Smith	Scientist 1/Technician	●	MS/2016/Geology	●	●	●	●	2 (2)	--	L
M. Torres	Scientist 2	●	BA/2000/Geology	●	●	●	●	11 (11)	--	L
J. Wegleitner	Scientist 1 / Technician	●	AA/2003/Architectural Drafting and Estimating	●	●	●	●	5 (11)	--	L
Other										
T. Fischer	Ecological Risk Assessor 2	●	MS/1984/Ecology	●	●	●	●	16 (26)	--	O
S. Mathews	Human Health Risk Assessor 2	●	MS/1989/Environmental Science BS/1985/Biological Science	●	●	●	●	19 (30)	CHMM	O
E. Thomas	GIS/CADD Specialist		MS/2013/ Civil Engineering		●		●	5 (8)	--	R

Licenses/Certifications Abbreviations:	
AEP	Associate Environmental Professional
ARM	Associate in Risk Management Certification
BCEE	Board Certified Environmental Engineer
CEM	Certified Energy Manager
CHMM	Certified Hazardous Materials Manager
CMQ/OE	Certified Manager of Quality/Organizational Excellence
CPCP	Certified Building Commissioning Professional
CPG	Certified Professional Geologist
EAC	Environmental Analytical Chemist
EIT	Engineer-in-Training
LEED AP	Leadership in Energy and Environmental Design Accredited Professional
PE	Professional Geologist
PG	Professional Geologist
RPA	Register of Professional Archaeologists
PMP	Project Management Professional

Work Experience
A = Existing MPCA/MDA Experience
B = MN Site Investigation/Remedial Investigation Experience
C = Risk Based Site Evaluation Manual Knowledge
D= UST/AST Release Cleanup, VIC, Superfund, MDA Guidance Document Knowledge

A.2.3 Firm Locations

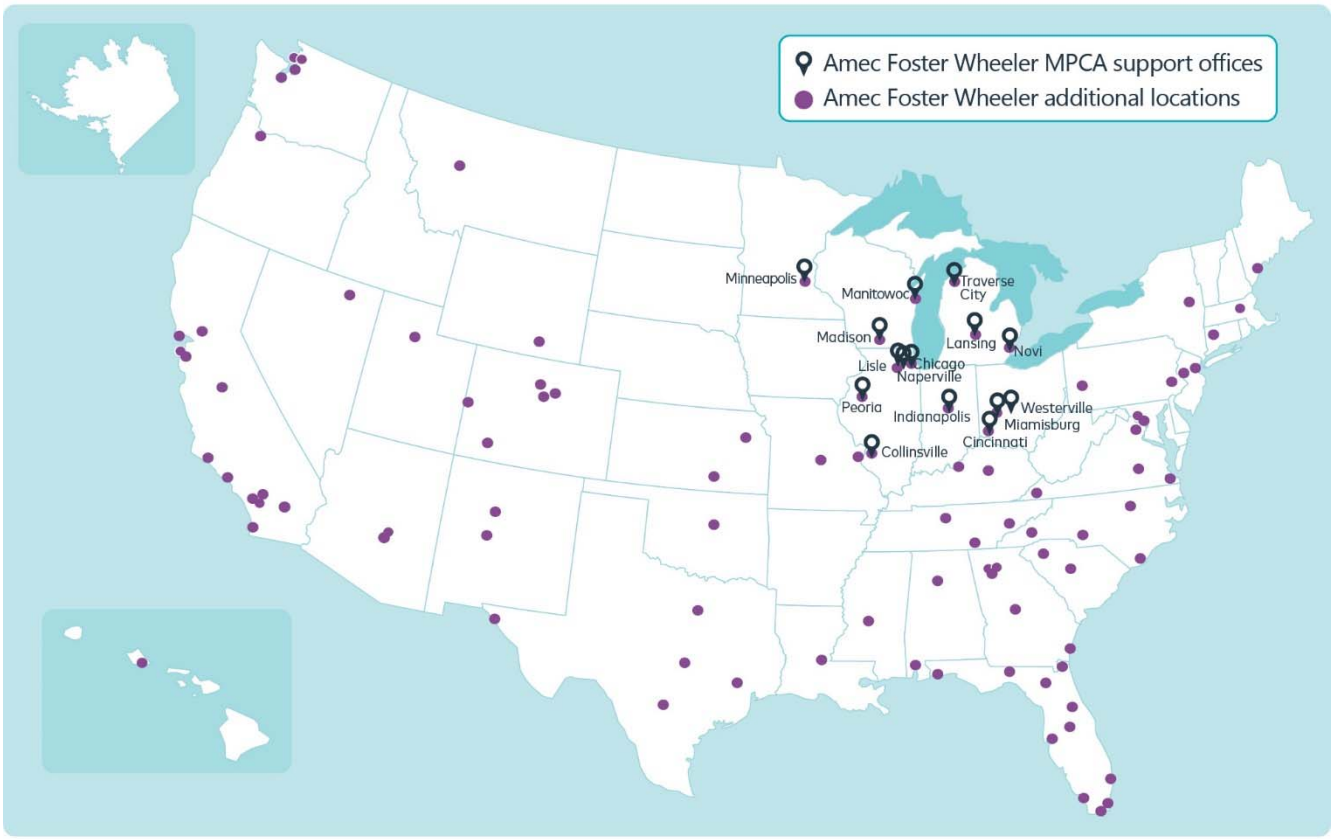
Amec Foster Wheeler's US headquarters and the local office supporting the contract are listed below.

US Headquarters
1105 Lakewood Parkway, Suite 300
Alpharetta, GA 30009
Tel: 770-360-0600

Local Office
800 Marquette Avenue, Suite 1200
Minneapolis, MN 55402
Tel: 612-332-8326

Exhibit 4 presents all offices in the US with additional qualified resources. Offices within Region 5 supporting this contract are designated within the exhibit.

Exhibit 4. US Office Map



A.2.4 Experience with Other Federal and State Agencies or Departments

Amec Foster Wheeler also holds more than 70 Master Service Agreements and has completed projects with more than 60 County departments and more than 90 cities across the US. Our Minneapolis office specifically earns more than 70% of our revenue from federal, state and local government, including but not limited to the State of Minnesota Department of Administration, including the Minnesota Pollution Control Agency, and the Minnesota Department of Transportation; the Air Force; the Army; the Army Corp of Engineers; the National Guard Bureau; and, the General Services Administration.

Amec Foster Wheeler has completed site investigation, remedial investigation and design projects in every state in the US, resulting in good working relationships with state and local regulatory agencies. We are familiar with the agency permitting and review processes necessary to get environmental projects approved, and we are familiar with local codes and requirements that not only affect design projects, but are also required during construction oversight. Our project team has supported site investigation specifically in more than two dozen states across all 10 EPA regions and has interfaced with nearly 40 state and local regulators in support of federal departments, specifically dealing with PFAS. This unique position has given us invaluable insight into not only the technical challenges unique to the emerging contaminant class, but also the regulatory climate surrounding decisions.

Our project team has supported site investigation projects in more than two dozen states across all 10 EPA regions, and have interfaced with nearly 40 state and local regulators in support of federal agencies, specifically dealing with emerging contaminants.

Additionally, Amec Foster Wheeler is an Industry Affiliate Member of the ITRC and has active membership on several Teams include but not limited to the PFAS Team, the Contaminated Sediments Team, Remediation Team, the dense non-aqueous phase liquid (DNAPL) Site Characterization Team, the Geophysical Classification Team, the Petroleum Vapor Intrusion Team and the Fractured Bedrock Team. Our active membership in ITRC allows our staff to not only understand state challenges but also contribute to solutions via contribution to Technical Regulatory publications. To compliment this, our company has many former state and federal regulators who have proven invaluable in helping understand government policy, local laws and regulations. **Exhibit 5** presents examples of these staff.

Exhibit 5. Current Amec Foster Wheeler Staff that were Former Regulators

Staff	Federal or State Agency
Hannah Albertus-Benham	South Dakota Department of Environment & Natural Resources Hydrologist
Garret Bondy	US EPA Region 6 Superfund Chief
Leonard Ledbetter	Georgia EPD Director
Deb Barsotti	ATSDR Toxicology Division Director
Pete Neithercut	US EPA Region 5 On-Scene Coordinator
Nelson Walter	New York State DEC RPM
Warren High	USACE Rock Island, Section 404 Permits
Al Fillip	Vermont DEC, Director Air and Superfund Divisions
Michael Murphy	Massachusetts DEP, Manager Risk Assessment Division

Our staff stay abreast of regulatory changes that occur in federal, state, or local regulations. We belong to professional environmental organizations that often have topics and speakers on upcoming regulations or changes to new regulations. These include NGWA, International Groundwater Association, American Institute of Professional Geologists, American Society of Civil Engineers, Society of American Military Engineers, Water Environment Federation, and Society of Toxicology. We subscribe to regulatory alert services such as Lexology

and Environmental Law 360. We attend technical conferences and subscribe to technical journals to also help us keep up-to-date on changing regulations. However, the most effective way to keep abreast with new regulations is through networking with our customers and our regulatory agency contacts, and frequent visits to agencies to see what the political climate is for regulatory change. Being ahead of the changing regulatory landscape allows us to prepare our customers for the new requirements and makes the transition to compliance more cost effective and less stressful.

Not only do we have several employees that were formerly state regulators, we also have a very robust project portfolio across federal, state, county, and local governments which also lends to our superior knowledge of federal and state regulations. Across Amec Foster Wheeler, more than 40% of our project revenue as a company is directly from federal, state, county, and local government clients. Within the last 8 years alone, Amec Foster Wheeler has completed more than $82M in project work for the EPA. Amec Foster Wheeler has project experience with, and holds Federal Master Service Agreements with several federal agencies as listed below in **Exhibit 6**.

Exhibit 6. Federal Government Clients	
US Air Force	US Fish and Wildlife Service
US Army	General Services Administration
US Army Corps of Engineers, Various Districts	National Park Service
US Navy	National Guard Bureau
Bureau of Indian Affairs	US Postal Service
US Department of Agriculture	US Bureau of Reclamation
US Department of Energy	US Department of Veterans Affairs

Amec Foster Wheeler holds more than 45 Master Service Contracts and executes project work with various state departments in nearly 30 different states. The state departments are listed below in **Exhibit 7**.

Exhibit 7. State Government Clients	
Alabama Department of Economic and Community Affairs	Maryland Department of Transportation
Alabama Department of Transportation	Michigan Department of Environmental Quality
Alabama State Port Authority	Michigan Department of Transportation
Alaska Department of Transportation & Public Facilities	Minnesota Department of Agriculture
Alaska Department of Environmental Conservation	Minnesota Department of Transportation
Arizona Department of Environmental Quality	Minnesota Pollution Control Agency
Arizona Department of Transportation	Mississippi Department of Transportation
California Department of Correction & Rehabilitation (CDCR)	State of New Jersey
California Department of Transportation	New Mexico State Highway and Transportation Department
Commonwealth of Kentucky	New York State Department. of Environmental Conservation
Commonwealth of Massachusetts, Department of Env Protection	North Carolina Department of Transportation
Florida Department of Transportation	State of North Carolina
Florida Department of Management Services	North Texas Tollway Authority (NTTA
Florida Department. of Environmental Protection	Ohio Department of Transportation

Exhibit 7. State Government Clients	
Georgia Department of Natural Resources	Oklahoma Department of Central Services
Georgia Department of Transportation	South Carolina Office of State Engineer
Illinois Department of Transportation	South Carolina State Housing Finance & Development Authority
Illinois Environmental Protection Agency	South Florida Water Management District
Illinois State Toll Highway Authority	Southern California Coastal Water Research (SCCWRP),
Kansas Department of Administration	Southwest Florida Water Management District
Kansas Department of Agriculture	Tennessee Department of Transportation
Kansas Department of Transportation	Texas Department of Transportation
Maine Department of Environmental Protection	Texas Facilities Commission
Maryland Department of General Services	

A.2.5 Knowledge of MPCA-Specific Manuals, Guidance Documents and Fact Sheets

From our nearly 20 years of experience providing environmental services for VIC sites, Petroleum Brownfields sites, RCRA corrective action sites, AgVIC sites and Superfund sites in Minnesota, our staff has gained a valuable and detailed knowledge of the applicable guidance documents and manuals and the federal and state statues and rules upon which they are based. Our knowledge of the applicable guidance documents and manuals is described further as follows.

- **MPCA Risk-Based Site Evaluation (RBSE) manual** – The RBSE manual provides a procedure for the user to make risk-based decisions for site investigations and remedial strategies within the VIC, State Superfund and State RCRA Corrective Action Programs. The documents provide the framework for a tiered decision-making process based on the evaluation of risk to human health and the environment. The RBSE process begins with site characterization, including a review of site specific conditions (geology, hydrogeologic conditions), site history and past operations, and chemical use. Information obtained during the characterization stage is used to develop a preliminary conceptual site model (CSM) that can be continually updated and refined through every step in the process. The RBSE also includes guidance for developing sampling and analysis plans at VIC and Superfund sites to ensure that data of sufficient quality and quantity are collected to facilitate RBSE, remedy selection and remedy verification. Sampling guidance is organized by media (soil, groundwater, air, sediments) and includes guidance for quality assurance/quality control (QA/QC) that can be used to define relevant data quality objectives. The RBSE manual also includes risk based guidance for evaluating contaminant exposure pathways, including soil-human health pathway, soil to groundwater leaching pathway, surface water pathway, groundwater pathway, landfill gas migration. The manual also includes guidance on remedy selection, including a framework for decision making throughout the process.

  Amec Foster Wheeler has utilized the framework outlined in the MPCA RBSE manual on more than 80 Minnesota sites, some of which have been large and complex sites that have had multiple contaminants with both MPCA and MDA jurisdictional oversight. Utilizing this guidance, Amec Foster Wheeler has developed site-specific soil cleanup standards for sites within the MPCA VIC and Superfund programs that have been used for implementing risk-based cleanup actions.

- **Petroleum Remediation Program: Guidance Documents for Underground Storage Tank (UST) and Aboveground Storage Tank (AST) Release Cleanup** – The Petroleum Remediation Program (PRP) guidance documents provide a risk-based approach for investigating and evaluating risks from petroleum tank releases with the main objective of protecting human health and the environment. As defined in PRP guidance, the primary risks evaluated by the program are: i) impacts to groundwater that

threaten human health, ii) petroleum vapors that may lead to dangerous conditions or threaten human health; iii) impacts to surface water quality; and iv) impacts to surface soil that threaten human health or may lead to contaminated surface runoff (PRP, 2017). The guidance documents are organized into the following groups resembling separate stages of investigation and/or cleanup:

- General Guidance
- Release Reporting
- Soil Excavation and Treatment
- Site Investigation and Risk Evaluation
- Corrective Action

Amec Foster Wheeler has conducted projects following PRP guidance in all groups identified above. We understand that the consultant guidance for UST/AST release cleanup presents a streamlined, risk-based approach to petroleum investigation and cleanup. Low-risk sites that can demonstrate the ability to naturally attenuate can be quickly closed. High-risk sites that can potentially impact a receptor are thoroughly assessed and quickly cleaned up to mitigate the impact.

- **Petrofund** – The Minnesota Legislature established the Petroleum Tank Release Cleanup Fund (Petrofund) in part, to provide a financial incentive for responsible parties to investigate and cleanup petroleum releases in a timely manner so that they do not increase the severity of the impact. The Petrofund program is governed by Minnesota Statue (115c) and Minnesota Rule 2890 and is administered by the Minnesota Department of Commerce. Petrofund allows eligible applicants (responsible parties or non-responsible parties that hold legal or equitable title to the property where a release occurred) up to 90 percent of reasonable and necessary costs they incur in responding to a petroleum tank release (PRP, 2017). Amec Foster Wheeler has experience working through petrofund on more than 40 sites.
- **VIC Guidance Documents** – VIC is a fee based program that provides technical, administrative or legal assurances to individuals or businesses for site investigation and/or remediation. The guidance documents provide assistance to the voluntary parties working with VIC personnel. Specifically, the guidance documents provide an overview of the VIC program, describes the types of written assurances available to voluntary parties, and investigation and documentation details that voluntary parties can use on their sites. Amec Foster Wheeler has extensive experience operating within the VIC program, having worked extensively on more than 50 VIC sites within the state, including some of the largest and most complex VIC sites in the Twin Cities. As a result, we have a very good relationship with the MPCA VIC Program staff, based on our detailed knowledge and understanding of the VIC Program and procedures. We are known for being thorough in our preparation for site investigations and cleanups and for our thorough documentation of Remedial Action Plan (RAP) implementation projects.
- **Vapor Intrusion Best Management Practices** – The Vapor Intrusion Best Management Practices (BMPs) were developed by MPCA in concert with MDH and provide guidance for managing projects involving the evolving landscape of vapor intrusion. The documents and procedures define all aspects of conducting vapor intrusion projects from receptor identification to assessment and ultimately mitigation. Amec Foster Wheeler remains up to date on the BMPs through thorough review of the most recent guidance documents, as well as close communication with MPCA Vapor Intrusion professionals. Amec Foster Wheeler is experienced in many aspects of vapor intrusion, excelling in both residential and commercial settings, and especially efficient during vapor intrusion projects requiring expedited actions.
- **MDA Guidance Documents** – These documents provide an overview of the MDA program, and provide specific planning and investigation methods/approaches to characterize sites with agricultural chemical or wood treating impacts. Amec Foster Wheeler staff has utilized MDA Guidance Documents on five sites within the State of Minnesota and has applied this guidance to twelve sites in South and North Dakota, where similar guidance is not available and the use of Minnesota guidance was proposed and acceptable

to the regulatory agencies and the client, a large agricultural chemical distribution company. Our work under MDA guidance includes the highly successful remediation of a pentachlorophenol (PCP) release in Lester Prairie, Minnesota, which was an AgVIC project, in which we developed a very successful working relationship with the MDA staff.

A.2.6 Knowledge of Pertinent State and Federal Regulations

Since our core practice area of remedial investigation and remediation is driven by state and federal regulations, we make it our business to have a thorough knowledge of the statutes, rules and regulations that guide our work and to ensure that all staff assigned to a project has this thorough knowledge. We feel it is vitally important to understand the underlying basis for our work. Consequently, Amec Foster Wheeler staff has a detailed knowledge of applicable Minnesota and federal environmental regulations and statutes. Our knowledge of these regulations, evidenced by the number of projects operating within these regulatory environments, provides Amec Foster Wheeler with the expertise to manage complex and high-profile projects from initial investigation through evaluation, remedial design, implementation and through to project completion/site closure. As a result of the many years spent working within these regulations, the Minneapolis staff of Amec Foster Wheeler provide cost-effective, real-time solutions to projects regulated by MPCA and MDA.

- **Minnesota Environmental Response and Liability Act (MERLA)** – Amec Foster Wheeler staff have extensive experience operating under MERLA regulations. MERLA, commonly known as the 'State Superfund' act, provides regulatory authority to the MPCA and MDA to act to address releases or threatened releases of hazardous substances and agricultural chemicals within Minnesota. The Agencies may take the project lead or pursue action from a 'Responsible Party'. This statute also provides the Agencies authority to recover costs from Responsible Parties for investigation and cleanup work. Amec Foster Wheeler has experience dealing within the regulatory framework of MERLA on more than 80 projects within the State of Minnesota. We understand the statutes and regulatory requirements necessary to deliver a successful project.
- **Land Recycling Act (LRA)** – This act provides the basis and mechanisms for the State to provide liability protection to voluntary parties that address hazardous substance releases. The LRA, along with the prior Brownfield legislation, provides certain statutory liability protections to business and investors affiliated with contaminated sites in Minnesota and extends that protection to consultants and contractors through performance of work consistent with approvals. The Minneapolis staff of Amec Foster Wheeler have worked with the LRA on more than 60 projects within the State of Minnesota, including some of the largest brownfield projects in the Twin Cities.
- **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)** – Known as the Federal Superfund Program, CERCLA has created a tax-based fund for the cleanup of orphaned National Priorities List (NPL) sites. CERCLA also provides authority to the United States Environmental Protection Agency (USEPA) to respond to releases or threatened releases of hazardous substances that may endanger public health or the environment. The local Amec Foster Wheeler staff have worked within CERCLA regulations on approximately 95 sites throughout the United States. Amec Foster Wheeler staff have worked with and applied the requirements of CERCLA specific guidance and policy documents for the feasibility studies, pre-design, design, and construction required for designing and implementing remedial solutions at contaminated sites.
- **Resource Conservation and Recovery Act (RCRA)** – RCRA is the primary Federal law governing the generation, management and disposal of hazardous wastes. RCRA encompasses a cradle to grave approach to waste management that reaches from waste generation to waste disposal and includes provisions for corrective action. The local Amec Foster Wheeler staff have worked within RCRA

regulations on over 55 Minnesota sites, several of which are large, Superfund-like RCRA corrective action projects.

- **National Oil and Hazardous Substances Contingency Plan (NCP)** - The NCP provides a coordinated action plan to minimizing the adverse impacts from oil discharges and hazardous substance releases. The local Amec Foster Wheeler staff have worked with the NCP on approximately 80 sites throughout the United States. Some important details regarding the NCP as it affects our projects include requirements for public notice and public participation in remedy selection and the need for quality assurance project plans. Amec Foster Wheeler staff have demonstrated experience with the presentation of technical site investigation and cleanup details to the public.
- **Other Pertinent state and federal regulations** which we are accustomed to dealing with include restricted waste characterization and disposal, building demolition, storm water management, and land disposal restrictions (LDRs). Additionally, we track emerging contaminant state, federal and international regulatory requirements very closely. For example, for PFAS, our team has interfaced with regulatory agencies from every USEPA region as well as more than 30 State agencies and federal agencies in the US, Canada, Australia, the UK and Germany. We are members of the ITRC PFAS regulatory sub-team and are supporting the periodic updates of global regulations as part of the ITRC PFAS Fact Sheet efforts.

A.2.7 Project Descriptions

Detailed descriptions for the following two projects are provided on the following pages.

- **Remedial Investigation #1 – Duluth Air National Guard Base, Duluth, Minnesota**
- **Remedial Investigation #2 – Confidential Manufacturing Facility, Roseau County, Minnesota**

A.2.7.1 Remedial Investigation and Feasibility Study

Duluth Air National Guard Base
St. Louis County, Minnesota

Client Name: National Guard Bureau

Client Contact: Mr. James King

Telephone: 240-612-8763

Period of Performance: 2015 - present

Site Description

Amec Foster Wheeler was contracted to conduct Remedial Investigations/Feasibility Studies (RI/FS) at two locations referred to as Area of Concern (AOC) sites at the 148th Fighter Wing (FW) of the Minnesota Air National Guard (MNANG) at the Duluth International Airport (DIA) in Duluth, St. Louis County, MN. The AOC sites were identified as a former fire training area (FTA) (AT028) and an aircraft hangar underground storage tank (UST) release (TU001).

The chemicals of potential concern (COPCs) identified at AT028 were per- and polyfluoroalkyl substances (PFAS) associated with the use of aqueous film forming foam (AFFF). Fire training activities were conducted at AT028 twice a month from 1960 until 1987. During that time, jet propulsion fuel #4, along with smaller volumes of contaminated fuels and oils, paint thinners, and solvents, were burned during fire training exercises and the fires were extinguished with AFFF.

The COPCs identified at TU001 include volatile organic compounds (VOCs), lead, total petroleum hydrocarbons (TPH) as both diesel range organics (DRO) and gasoline range organics (GRO). Historical records indicated that a 500-gallon gasoline UST was installed to serve an emergency fire pump generator.

Outcome Achieved

- PFAS plume in groundwater successfully delineated
- Obtained client approval on RI/FS Report – currently in review with the MPCA
- Successful coordination and negotiations with MPCA to determine appropriate sampling locations, media and boundaries
- Preparation of the first PFAS Feasibility Study for the ANG is currently in preparation.

Relevant Agencies, Regulations

- MPCA
- MDH
- USEPA
- CERCLA Remedial Investigation

Tasks Subcontracted Out

- Environmental Drilling – Midwest Drilling
- Laboratory Analysis – Vista Analytical
- IDW disposal – Stevens Environmental
- Private Utility Locates – National GPR
- Registered Land Surveying

Personnel

- C. Vowles – Task/Field Manager
- J. Renier – Regulatory Specialist
- J. Gal – Project Engineer
- S. Thomas – SME – PFAS

Project Description

The overall objectives of the RI/FS project were to (1) delineate the nature and extent of COPCs in both soil and groundwater and to conduct a limited soil vapor investigation relative to the UST release AOC, and (2) develop a path forward for the delineated sites with either recommended future remedial activities via a feasibility study, or recommended NFA status via a decision document.

Work plans, including field sampling plans (FSPs), health and safety plans (HASPs) and UFP-quality assurance project plans (QAPPs) were first developed and approved by the ANG and MPCA.

Field work was carefully coordinated with multiple stakeholders (ANG, FAA/airport personnel, regulators, and base personnel) to minimize disruption to the installation and ensure that all appropriate permits were obtained and approved prior to drilling activities.

Field investigation activities at AT028 were conducted following a staged approach. The first stage consisted of drilling soil borings and temporary monitoring wells using direct push technology (DPT), and sampling soil and

groundwater for PFAS. The borings/temporary monitoring wells were drilled at locations in an attempt to characterize the source area. Two additional phases of step-out sampling were required to delineate the PFAS plume including installation of seven permanent monitoring wells using hollow-stem auger (HSA) drilling methods. Amec Foster Wheeler also conducted sediment sampling for PFAS which included collecting samples from catch basins in the vicinity of the AOC.

RI activities at TU001 included drilling of soil borings and installing five permanent monitoring wells using HSA technology. Soil and groundwater samples were analyzed for the COPCs (VOCs, lead, TPH-DRO and TPH-GRO).

Monitored natural attenuation (MNA) parameters were also collected during RI activities to provide additional site information for proposed remedial design.

Monitoring wells were constructed in accordance with Minnesota Department of Health (MDH) rules. The wells were developed in accordance with our standard operating procedures incorporating MPCA guidance.

Additional activities performed included aquifer testing (slug testing), soil boring and temporary well sealing, surveying and management and disposal of investigation derived waste (IDW). RI reports were prepared and submitted to the MPCA. Based on results of the RI, a FS is currently in development for AT028 that evaluated several alternatives including groundwater extraction and treatment, excavation, permeable reactive barrier (PRB), hydraulic containment and others.

Project Highlights

- Delineated PFAS contamination in soil and groundwater and currently developing the first PFAS FS for the ANG.
- Obtained client approval on RI/FS Report.
- Close collaboration with MPCA during scope of work development and results analysis. MPCA provided guidance and approval on boring and monitoring well locations, sampled media, and potential path(s) forward toward remediation alternatives.

A.2.7.2 Remedial Investigation

Confidential Manufacturing Client Site
Roseau County, Minnesota

Client Name: Confidential

Client Contact: Brad Baumann

Telephone: 218-386-1430

Period of Performance: 2002 to Present

Site Description

The Site is a manufacturing facility where soil, groundwater, surface water and sediment have been impacted by chemicals of potential concern (COPCs) associated with wood preservation/treating and other plant operations. The COPCs include pentachlorophenol (PCP), mineral spirits, and some chlorinated and non-chlorinated volatile organic compounds (VOCs). The Site is located in a topographically flat area on fill and glacial lake clay and silt deposits adjacent a municipal drainage ditch which flows to a lake situated approximately 0.6 miles northeast (downgradient) of the Site.

The Site contains two areas of concern including the facility main process building and a former boiler ash area. Soil and groundwater became impacted with PCP and mineral spirits due to leakage from a former wood treatment process dip tank, USTs, and product circulation lines. These COPCs have migrated downgradient from the main process area in groundwater toward the drainage ditch and lake via groundwater flow and through drainage culverts that intercepted the water table and discharged to the ditch. The boiler ash area became impacted by VOCs associated with solvents that leaked from drums buried at this location and by PCP and mineral spirits that were transported to this site in fill obtained from other portions of the facility.

Currently the Site has a monitoring network consisting of 16 monitoring wells and five established surface water sampling points. It also has an active groundwater pump and treatment system consisting of five groundwater extraction/recovery wells, a bioreactor and carbon polishing system in the main plant process building.

Outcome Achieved

- Remedial Investigations and remediation at Sites A and B have served to characterize the nature and extent of contamination on and off-Site, protect groundwater and surface water quality downgradient from the Sites and have moved the Sites toward closure.

Relevant Agencies, Regulations

- Resource Conservation and Recovery Act (RCRA)
- MPCA Risk-Based Characterization and Sampling Guidance
- MPCA Surface Water Pathway Evaluation Users Guide – Working Draft (January 30, 2006)

Tasks Subcontracted Out

- Drilling and Soil Boring/Well Installation
- Soil and Drum Excavation
- Geophysics
- Culvert and Soil Removal
- Laboratory Analytical
- Waste Hauling and Disposal

Personnel

- J.Renier – Project Manager / Hydrogeologist
- E. Driver – Data Manager
- D. Barsotti – Risk Assessor
- M.Vavra – Field Technician
- M.Bevier – QA/QC Officer

Project Description

Remedial Investigation (RI) activities are being performed under Resource Conservation and Recovery Act (RCRA) guidance in accordance with a consent decree issued by the Minnesota Pollution Control Agency (MPCA). Remedial activities that have been conducted include soil boring and monitoring well installation and sampling, regularly scheduled groundwater and surface water quality monitoring, recirculation line excavation and removal, installation and operation of a groundwater pump and treat system, drainage culvert removal and drum and impacted soil removal and treatment. Current site activities include continued monitoring and assessment of

impacts to the drainage ditch that borders the Site. The ditch is the primary ecological receptor driving site investigation activities at this time.

Descriptions of the primary investigations and remedial measures are as follows:

- **Groundwater/Surface Water Investigations.** Groundwater/Surface water investigations have been conducted in the main process area to determine if PCP and DRO detected above surface water criteria in the drainage ditch were entering the ditch via groundwater flow and/or culvert water discharging to the ditch. This includes installation and sampling of a series of temporary monitoring wells, chemical fingerprinting for DRO, surface water runoff, groundwater, and culvert sampling.
- **Conduit/Culvert and Soil Remediation**. As a result of the groundwater/surface water investigations, a remedial effort that involved excavation and removal of 450 ft of drainage culverts and approximately 135 cubic yards of surrounding impacted soils in the main process area was conducted and has been followed by monitoring ditch surface water to confirm that levels of PCP and DRO decrease to and remain below surface water criteria.
- **Geophysical Survey.** A geophysical survey consisting of an electromagnetic metal detection (EM61) survey and an electromagnetic ground conductivity (EM31) survey was conducted across the boiler ash area. This was employed to determine if buried drums and/or trenches were present and were potentially the source of continued detections of VOCs in groundwater at levels above surface water criteria in downgradient sentinel wells adjacent the ditch. These surveys determined the locations of anomalies as possibly containing buried drums and/or other metallic debris.
- **Soil Gas Survey.** A passive soil gas (PSG) survey was conducted across the boiler ash area using an array of 74 samplers laid out in a 10 foot sampling grid. Samplers were analyzed for VOC's and total petroleum hydrocarbons (TPH) based on a GRO standard. This survey identified multiple areas containing elevated soil gas levels for VOCs and TPH.
- **Trenching Investigation/Remediation.** Amec Foster Wheeler conducted a series of trenches to investigate the geophysical anomalies and soil gas survey hotspots identified in the geophysical and soil gas surveys conducted at the boiler ash area. A total of 21 drums in varying condition were uncovered and removed from one of the trench/pits and approximately 223 yards of soil were removed from the trenches and disposed off-site. An Oxidant EHC-O™ was applied to soils remaining in the trench that contained the drums.
- **Soil Gas, Soil, and Groundwater Investigation.** Based on continuing criteria exceedances found in groundwater at the boiler ash area, Amec Foster Wheeler conducted a second PSG survey using an array of 40 samplers laid out in a modified 10 foot sampling grid, and analyzed for a limited list of VOCs. Based on the results of the second PSG survey, 23 soil borings, along with five temporary wells along the edge of the ditch were installed and sampled for VOCs. The results of these surveys will be used to guide further excavation and remediation efforts at the site.

Project Highlights

Amec Foster Wheeler was able to use the groundwater/surface water investigation and the fingerprinting study at the main process area to show that the COPCs reaching the drainage ditch originate primarily from water travelling through drainage culverts/conduits that discharge to the ditch. This set the stage to develop a work plan for further remediation which involved the removal of the existing drainage culvert system and surrounding impacted soils at the main process area. This action decreased the concentrations of PCP and DRO in ditch water to levels below surface water criteria and have moved the site toward closure.

The geophysical and soil gas surveys conducted at the boiler ash area served to "pinpoint" the locations of buried drums and soil contamination for the trenching investigation. The trenching investigation at the boiler ash area removed a significant amount of impacted media and resulted in some reduction of COPCs in groundwater at the downgradient site monitoring compliance point wells. Additional remediation is being planned to move site toward closure.

A.3 Scope of Services

A.3 Scope of Services

Amec Foster Wheeler's experience as it relates to the scope of services outlined in Section 3 of the RFP is provided in this section.

A.3.1 Experience with Agricultural Chemical Investigation and Cleanups

Amec Foster Wheeler has experience investigating and remediating releases of agricultural chemicals both in Minnesota and around the country. Our experience includes investigation and remediation of organochlorine pesticide releases at chemical distribution sites, the assessment of the baseline conditions and impacts from releases of fertilizers and pesticides/herbicides at agricultural chemical distribution facilities, and the investigation and remedial planning for brownfields sites impacted by agricultural chemicals, including fertilizers and pesticides/herbicides. Amec Foster Wheeler has designed and implemented pilot and full-scale chemical oxidation remediation programs for sites impacted by agricultural chemical releases as evidenced by the following examples:

Phase II Environmental Site Assessment, Otisco Railroad Yard, Waseca County, MN: Amec Foster Wheeler conducted an environmental site assessment (ESA) focused on investigating potential releases of agricultural chemicals and petroleum hydrocarbons at a former pesticide distribution facility that leased property from the railroad. Areas of concern at the facility were identified as a former oil house and railroad tie burning shed, former anhydrous ammonia unloading devices on former lease areas and historical use of the site as a pesticide distribution facility. Amec Foster Wheeler conducted a detailed review of MDA files and developed a sampling plan to investigate the areas of concern in accordance with MDA guidance. Site investigation activities involved the excavating of test trenches and the completion and sampling of soil borings, and the installation of groundwater monitoring wells. All soil and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) as diesel range organics (DRO) and gasoline range organics (GRO), Resource Conservation and Recovery Act (RCRA) metals (plus mercury). In addition, the soil samples obtained from the former unloading device area were sampled for agricultural chemicals, including base/neutral extractable pesticides, nitrate-nitrite, ammonia, total kjeldahl nitrogen (TKN), total phosphorus and potassium. Investigation results were compared to MDA screening levels and documented in a ESA report.

Remediation of Pesticide Contaminated Soil on Stuart Mesa East Agricultural Field / MCB Camp Pendleton, California: Amec Foster Wheeler as a prime contractor, performed environmental remedial design and removal actions to remediate and achieve closure of 236 acres of pesticide contaminated soil at the Stuart Mesa East Agricultural Field (SMEAF) at Camp Pendleton, CA. The site consisted of agricultural fields historically applied with the pesticides toxaphene and dieldrin. To proceed with site redevelopment, NAVFAC determined that remediation to residential goals for toxaphene and dieldrin was necessary. As part of the project, Amec Foster Wheeler conducted site assessment and characterization, remedial/response actions and storm water monitoring. The project required extensive site characterization consisting of the collection of over 4,500 environmental samples. Following a review of the analytical results, Amec Foster Wheeler determined that 102 acres of the site could be closed without remediation. Three in-situ remedial technologies were under review by NAVFAC prior to Amec Foster Wheeler's involvement in the project, however following additional review, Amec Foster Wheeler determined that excavation and disposal was a more cost-effective solution than other proposed alternatives. Remedial actions were completed in a phased approach to meet an aggressive redevelopment schedule. An initial excavation and disposal of approximately 35,000 tons of soil was completed in advance of sewer line construction, with the remaining excavation activities being conducted over a 6-month period. Amec Foster Wheeler personnel continuously sampled soil to confirm that residential clean-up goals had been met. Amec Foster Wheeler closed 236 acres of contaminated land using a low-risk, effective technical and regulatory approach that was accepted by the San Diego Regional Water Quality Control Board.

A.3.2 Experience with Remediation Technologies

Amec Foster Wheeler has been involved in site remediation since the 1980's, throughout the United States, Canada, and other countries. Our broad experience has covered every facility issue from removal of hazardous wastes, to closure of solid waste disposal sites, remediation of chemical leak/spill sites, and multi-media remediation involving groundwater, surface water, sediment, soil, soil vapor and bedrock. Amec Foster Wheeler has experience addressing remediation of all types of organic, inorganic, solid, liquid, reactive, flammable, explosive, and even radiological wastes and hazards under CERCLA, RCRA, TSCA, Voluntary Corrective Action, Emergency Response and through state and local programs.

Amec Foster Wheeler has implemented the remedial technologies shown in **Exhibit 8** at locations across the country, including Minnesota:

Exhibit 8. Remediation Technologies

In addition to implementing the above remedial technologies on project sites, Amec Foster Wheeler has established a Research and Development program that facilitates bench-scale, pilot-scale and full-scale execution of various innovative technologies. Our in-house treatability laboratory, paired with our academic research partnerships, allows

efficient execution of on-going research and development. We currently have more than $2M in research and development projects. We are executing, along with our partner Clarkson University, a PFAS bench study using in-situ chemical oxidation to transform precursor compounds then extracting groundwater and processing it through regenerable ion-exchange resins. A second field demonstration project is currently being executed that applies the same technology in the field at a remediation site where plasma destruction technology is added to the treatment train to ensure complete destruction of the PFAS.

Amec Foster Wheeler developed an internal R&D program that facilitates bench-scale, pilot-scale and full-scale execution of innovative remedial technologies. Our in-house treatability laboratory developed as part of the program currently supports more than $2M in R&D projects, including a PFAS bench-scale study using in-situ chemical oxidation and groundwater extraction and treatment.

A.3.3 Scope of Services Experience Summary

Our proposed project team has experience with each of the bullets listed in Section 3, Category A. Petroleum, Superfund, MDA, Closed Landfill Program Environmental Services of the RFP. Our experience with each of the bullets listed in the RFP is presented below and compared to key Amec Foster Wheeler personnel in **Exhibit 9** at the end of this section. We have also included a key below detailing each scope of services element and where it is located within this section.

Category A Scope of Services	Page No.
Prepare Engineering Evaluation Costs Analysis (EECA)	34
Oversee or conduct pilot testing of remediation systems	34
Operate and maintain remediation systems	35
Prepare corrective action design documents (e.g., CAD design reports, pilot test reports, installation notification reports, monitoring reports, plans, and as-built reports)	36
Prepare Health and Safety Plans (HASP)	37
Oversee site investigation services for soil boring advancement, and monitoring well installation using both standard drilling methods, and direct push methods	37
Conduct ground water, soil, surface water, sediment, and air sampling and monitoring	38
Conduct vapor/air monitoring for health and safety and air quality criteria	40
Conduct and/or oversee site assessment activities (Phase I and Phase II), limited site investigations and remedial investigations	40
Conduct surface water, ground water, air and vapor receptor surveys	41
Oversee construction to mitigate vapors and conduct non-construction mitigation measures such as using fans, etc.	42
Install stainless steel soil gas sampling ports using an electric drill to bore through floor slabs	43
Oversee construction to complete sediment sampling and conduct non-construction sediment sampling as needed	44
Conduct or oversee operation and maintenance on remedial systems	35
Arrange for transportation, storage, and proper management of wastes	44
Evaluate the need for and oversee the implementation of alternative drinking water supply, including point-of-use treatment (i.e. filtration)	44
Evaluate, monitor, design and remediate contaminated sediment and other necessary restorative actions	45

Prepare Engineering Evaluation Cost Analysis (EECA)

Our project team has performed numerous Engineering Evaluation/Cost Analyses in support of CERCLA remedial actions. An EECA, essentially a more focused feasibility study, allows Amec Foster Wheeler to define the scope and objectives of the removal/remedial objectives, provide justification for the proposed action, identify applicable or relevant and appropriate requirements (ARARs), evaluate remedial technologies and develop and evaluate alternative approaches to the remedial action. Each alternative is evaluated in terms of effectiveness, implementability, cost and compliance with the identified ARARs. For each alternative identified, Amec Foster Wheeler evaluates both initial capital cost, and other costs that may be incurred during the entire remedial action (operating and maintenance [O&M], system shut-down, abandonment etc.). The entire life-cycle cost is considered to evaluate cost effectiveness of each alternative. Following the evaluation, a recommendation is made for the removal/remedial action and a schedule for implementation of the preferred alternative developed.

Representative Experience

Amec Foster Wheeler has developed EECAs for two sites defined as Areas 1 and 2 to address PCBs in sediment and floodplain soil. In the Area 1, the use of the "stream-tube" method for SWAC calculation and a geomorphic screening exercise which predicted areas of probabilistic contamination helped to reduce the area for remedial alternative development from 22 to 1.6 river miles. The process also facilitated selection of a favorable remedy (projected savings of $20M) as indicated in EPA's Record of Decision which outlines limited but protective removal of sediment and floodplain soil as its selected remedial alternatives for Area 1. Area 2 included innovative alternatives which feature dynamically stable stream channel design elements to avoid site-wide removal and habitat destruction. Hydrodynamic and sediment transport models are being developed to support FS development for downstream Areas and will include the evaluation of conditions with the dams remaining in place or being removed. As the site and surface water have been determined to be safe for recreation, the primary objective of remedy development and selection is the reduction of PCB concentrations in fish tissue with the goal of achieving fish that are safe to eat, thereby reducing or eliminating the need for fish consumption advisories. Fish contaminant concentrations will continue to be the measure of progress for the site

Oversee or conduct pilot testing of remediation systems

Amec Foster Wheeler has extensive experience in the oversight and implementation of pilot tests for remedial systems. Pilot tests are conducted to evaluate effectiveness of remedial technologies to a site and/or contaminant, obtaining site-specific data for detailed system design, and confirming that bench-scale testing results will translate to full-scale implementation. The type and duration of a pilot test varies based on the type(s) of remedial technologies being studied. For example, an Air Sparge (AS)/Soil Vapor Extraction (SVE)

pilot test would be conducted at varying pressures (AS) and vacuums (SVE) to determine the optimal radius of influence for the wells. Air samples would be collected to determine the concentrations of contaminants at the varying test points. Results of the pilot study would then be used to specify system energy requirements, define the location, spacing and depth of AS/SVE wells and identify the concentrations of contaminants captured for selecting and sizing system components (e.g., carbon) for treating captured vapor.

Our project team has conducted pilot tests for hundreds of remedial systems across USEPA Region 5, including Minnesota.

Representative Experience

- Release of dry-cleaning solvents from a facility in Hibbing, Minnesota resulted in contaminated soil under the building. The solvents accumulated under a wall between an older part of the building and a newer addition. Soil boring data indicated the soil permeability on the older side of the wall was lower than for the soil on the newer side of the wall. Members of our project team conducted SVE pilot tests for each side of the wall. For each test, one SVE well and four observation wells were installed. Each test included a step test at four different flow rates followed by a steady rate test. The results of the tests were used to design separate SVE systems for each side of the wall.

- Our proposed project team performed a pilot test for installation of an SVE system at the site of a former dry-cleaning solvents release in Hennepin County, Minnesota. Following initial soil and groundwater investigation, it was determined that a SVE system be installed to address PCE contamination. The SVE pilot test consisted of the installation of one SVE well and ten temporary monitoring points. The test was conducted at various step flow rates to evaluate the radius of influence. The pilot test results were subsequently used in the design of the full-size system. Following completion of the pilot test, the SVE system was designed and a full-size system has been installed and is successfully operating as designed.
- Members of our proposed team conducted bench and pilot scale testing of regenerable ion-exchange resin in a side-by-side comparison with granular activated carbon (GAC) in response to PFAS drinking water contamination. During the pilot study, Amec Foster Wheeler was able to regenerate the resin to 100% capacity and illustrate successful removal of the more recalcitrant shorter-chain PFAS compounds. The ion-exchange media was regenerated using a regenerate solution which was illustrated to be more cost-effective than GAC. A full-scale ion-exchange resin system was designed and constructed at the site.

Operate and Maintain Remediation Systems/Conduct or Oversee Operation and Maintenance of Remedial Systems

Amec Foster Wheeler staff has extensive experience operating and maintaining both soil, soil vapor, and groundwater remediation systems. Once remediation systems become operational, it is our goal to maintain equipment function and find opportunities to maximize system effectiveness and minimize operational costs. To that goal, we maintain accurate system records, perform routine maintenance, and continually review operational costs.

Amec Foster Wheeler also reviews routinely collected monitoring data to assess the need for system enhancements to shorten the time the remedial system needs to remain in operation, recognizing that it is in the best interest of the environment to leverage environmental dollars to the sites where they are most needed.

Another important aspect to system operation is troubleshooting problems to minimize down time. Amec Foster Wheeler can quickly determine system components that require rehabilitation, repair or replacement, and getting the correct parts and/or contractors on-site to get the system back to operational status.

Representative Experience

- Confidential Manufacturing Facility (Superfund Site), Hennepin County, MN: Members of our proposed project team designed and conducted construction oversight of a groundwater extraction and treatment system (GWETS) installed to address groundwater contaminated with CVOCs, specifically TCE and breakdown products. Prior to commissioning, several permits were obtained, including a Minnesota Department of Health (MDH) well appropriation permit with pumping limits for each well not to exceed between 15-49 gallons per minute (gpm) and a Metropolitan Council Environmental Services (MCES) Industrial Discharge permit which specifies the conditions that the discharged water must meet. Amec Foster Wheeler completed several weeks of system commissioning, which required 24-7 technical staff availability to continually evaluate system performance and properly integrate mechanical, electronic, and remote monitoring functions until an ideal operating state was achieved. Throughout this process, Amec Foster Wheeler's technical on-site staff and engineering team developed an operation, maintenance and monitoring (OM&M) plan containing a sampling plan as well as 32 standard operating procedures (SOPs) specific to the system and its components that ensure successful operation and maintenance of the system and compliance with the MDH and MCES permits. Amec Foster Wheeler has also provided training for an OM&M contractor and continues to review system operation.
- Remedial System Design and O&M, Benton Harbor, MI: On behalf of the Michigan Department of Environmental Quality (MDEQ), Amec Foster Wheeler designed and installed a groundwater collection and treatment system at an abandoned chrome and cadmium plating facility in Benton Harbor, Michigan. The purpose of the system was to prevent migration of groundwater contaminated with VOCs and chromium to sensitive receptors downgradient of the Site. Amec Foster Wheeler designed an iron co-precipitation process to remove the chromium with a GAC polish. The treatment system was designed with a 99% chromium removal rate and treated water was discharged to the local wastewater treatment plant (WWTP) by permit. Following successful construction of the groundwater treatment system, Amec Foster Wheeler has conducted oversight of the O&M contractor. Tasks involve monitoring system effectiveness, verification that treated water is discharged in accordance with the WWTP requirements, troubleshooting, review of contractor deliverables and payment requests.

Prepare corrective action design documents (e.g., CAD design reports, pilot test reports, installation notification reports, monitoring reports, plans, and as-built reports)

Amec Foster Wheeler is experienced at preparing corrective action design (CAD) documents, including; conceptual corrective action design (CCAD) reports, focused investigation work plans and reports, pilot test work plans and reports, remediation system detailed CAD (SDCAD) reports and excavation detailed CAD (EDCAD) reports. As a current Level III Technical and Master services contract holder with the MPCA/MDA, Amec Foster Wheeler is familiar with, and has experience using the MPCA and MDA guidance documents for CAD and CAP.

Prepare Health and Safety Plans (HASP)

Safety is a critical element of our business and each employee understands it is their responsibility to make safety for themselves, and others, a primary concern. To strengthen our culture and reinforce our commitment to Health, Safety, Security and the Environment (HSSE) performance at all levels of the organization, Amec Foster Wheeler set out a standard health, safety, security and environmental approach and policy that is adopted by all businesses across Amec Foster Wheeler to ensure consistency across the company. At its most basic level, our policy provides us with a simple route map for establishing a unique HSSE culture within our operations. The HSSE policy requires that a site-specific Health and Safety Plan (HASP) is completed on every project before any on-site activity is initiated. Each HASP complies with OSHA standard CFR 1910.120.

Health, Safety, Security and the Environment Policy

amec foster wheeler

Purpose of this policy

To share and communicate our commitment to a workplace free from harm, through the prevention of injury, ill health, pollution and operational loss. This policy applies to all Amec Foster Wheeler global operations wherever they are carried out and is reviewed, and if necessary, revised annually as a minimum.

Commitment

The board is responsible for establishing the policy and for monitoring and reviewing overall HSSE performance and is committed protecting the environment and upholding our the value of 'Doing the right thing - putting safety first'.

We accomplish this through the protection and support of our employees and anyone working with us or affected by our activities, and our commitment to continuous improvement.

To meet our commitment

We recognise the right of our workforce to have a safe and healthy workplace and are committed to maintaining a strong and sustainable HSSE culture across all our operations through:

- Deploying the best leadership and management structure required to deliver this policy and to ensure a continuous chain of responsibility and accountability;
- Identifying and controlling the HSSE risks associated from our operational activities;
- Implementing systems for the management of HSSE, ensuring they are communicated and maintained in accordance with the Amec Foster Wheeler HSSE Management Framework;
- Fulfilling applicable HSSE compliance obligations (including legal and industry requirements);
- Establishing and monitoring clear HSSE performance objectives that include both leading and lagging indicators;
- Deploying robust processes for the investigation of incidents and capturing lessons learned to prevent similar events occurring;
- Monitoring and verifying our performance to ensure that the organisation is fully compliant with its standards, requirements and applies the lessons learned;
- Implementing effective processes for workforce consultation and engagement at all appropriate levels, on HSSE issues;
- Establishing personal HSSE roles and responsibilities for all workplace parties and ensuring that they are trained and competent to carry out their activities;
- Consulting with our customers, regulators and other stakeholders to promote continuous improvement in HSSE performance; and
- Working with our Supply Chain and Partners to deliver world class HSSE performance to our customers in their operations.

Date: 1 April 2017

Jonathan Lewis
Chief Executive Officer

BEYOND ZERO

As part of each HASP development, Amec Foster Wheeler conducts a job hazard analysis (JHA) for all routine and non-routine tasks to be conducted during each project. The purpose of developing a JHA is to anticipate and prepare for any potential health and safety related issues. HASPs and JHAs are completed by the competent employees with the assistance from designated Amec Foster Wheeler Health and Safety Coordinators, such as Gabe Sandholm, defined as a key member of the Amec Foster Wheeler Team. Project managers review and approve HASPs for their projects prior to any field activities. All on-site personnel must review the site-specific HASP prior to visiting the site. Tailgate safety meetings must be conducted daily throughout the duration of fieldwork. Safety related forms included in each HASP must be signed off by all employees and subcontractors daily.

Oversee site investigation services for soil boring advancement, and monitoring well installation using both standard drilling methods, and direct push methods

Our project team has vast experience overseeing and completing subsurface investigations across Minnesota. Over the past ten years working with the MPCA/MDA on the Level III Technical and Professional Services contract, Amec Foster Wheeler has safely conducted drilling oversight for thousands of soil borings, monitoring wells and soil vapor probes completed on behalf of the MPCA. A variety of drilling methods, including hollow stem auger (HSA) and direct push, have been utilized in these efforts. Amec Foster Wheeler

has also conducted investigation projects across Minnesota using mud rotary, air rotary, rotosonic, and membrane-interface probe (MIP) methods.

Amec Foster Wheeler understands the importance of collecting data using the most appropriate technology, not only to provide technically sound data but also to prevent unnecessary costs of multiple mobilizations by selecting inappropriate technology. As such, our experienced staff review existing geologic data and available well logs to evaluate site hydrogeologic conditions as part of our project planning and conceptual site model development. Our work plans account for the effect of soil type, depth to bedrock, and the anticipated vertical extent of soil and groundwater impacts on the selected drilling approach and methods.

Many project sites require Amec Foster Wheeler to utilize multiple drilling methods to adequately characterize subsurface conditions. Amec Foster Wheeler typically utilizes push probe methods to provide accurate delineation of soil type and vertical and horizontal extent of shallow contamination such as during evaluation of petroleum releases as part of Limited Site Investigations, while HSA drilling methods are more efficient for installing permanent monitoring wells and vertical aquifer sampling. The HSA approach is well-suited for the common situation where sand lenses or contaminant pathways need to be identified accurately.

Representative Experience

Our project team has provided remedial investigation and groundwater monitoring services at Canadian Pacific's Shoreham Yard Facility located in Minneapolis, Minnesota since 2001. Since that time, Amec Foster Wheeler has completed drilling and sampling of hundreds of soil borings and monitoring wells using various drilling methodologies. Amec Foster Wheeler's conceptual site model included the following hydrogeologic horizons: 1) shallow groundwater horizon (unconsolidated fill, alluvium, till, outwash); 2) intermediate groundwater horizon (Ordovician St. Peter Sandstone [sandstone unit]; 3) deep groundwater horizon (St. Peter Sandstone [mudstone unit]; and 4) underlying bedrock Ordovician Prairie du Chien Group (dolomitic formations, Shakopee Formation and underlying Oneota Dolomite). A buried bedrock valley, filled with outwash deposits incised through the St. Peter Sandstone and Oneota Dolomite, was identified east of the Site trending northeast to southwest. Groundwater was generally encountered at depths ranging from 30 to 50 feet below ground surface in all groundwater horizons. Based on this conceptualization, Amec Foster Wheeler evaluated the most appropriate method for drilling (rotosonic, hollow-stem auger, direct-push, etc.) and completed soil borings and monitoring wells based on the geology. Amec Foster Wheeler provided oversight for drilling over 150 monitoring wells and 400 soil borings at depths ranging from approximately 10 to 280 feet below ground surface.

Conduct groundwater, soil, surface water, sediment, and air sampling and monitoring

Groundwater sampling and monitoring – Our project team is experienced at collecting groundwater samples and monitoring groundwater conditions. Groundwater samples are collected in accordance with MPCA Guidance Document 4-05 *Groundwater Sample Collection and Analysis Procedures* (March 2017) and/or with MDA Guidance Document GD12 *Groundwater Sampling Guidance* (Rev 3/17) as applicable. When applicable, Amec Foster Wheeler staff collects field natural attenuation data in accordance with MPCA Guidance Document 4-03 *Assessment of Natural Biodegradation at Petroleum Sites*.

When groundwater sampling at petroleum sites, we generally utilize Teflon or disposable bottom-filling bailers, dedicated sampling pumps, or a low-flow (e.g. Redi-Flow2) submersible pump with dedicated sampling tubing. Generally, three to five wells volumes are removed and field parameters are stabilized before sampling occurs. We are experienced with the low-flow groundwater sampling techniques. We use owned equipment to monitor and record field parameters, including pH, specific conductivity, temperature, redox potential, and dissolved oxygen.

Amec Foster Wheeler has been a leader in evaluating and implementing passive diffusion bag samplers for long-term groundwater monitoring at RCRA corrective action and superfund sites impacted by VOCs. The use of bag samplers has been shown to improve the efficiency of long-term monitoring programs, particularly where the monitoring networks are large and/or include deep wells.

Soil collection and monitoring - Nearly all our projects involve some type of soil sampling. Consequently, Amec Foster Wheeler staff has vast experience collecting soil samples during the performance of site investigation or clean-up efforts. Soil samples are collected using split spoon methods, conventional drilling techniques, macro-core samplers, hand augers, soil stockpiles, test pits and trenches. All project work conducted under the MPCA/MDA contract follows applicable sampling guidance such as MPCA PRP 4-04 *Soil Sample Collection and Analysis Procedures* dated March 2017 and MDA Guidance Document *Soil Sampling Guidance* GD-11 (Rev 7/11).

Surface water sampling and monitoring - Amec Foster Wheeler's staff collects surface-water samples to assess potential contaminant plume discharges to rivers, lakes and streams. Additionally, surface water sampling is utilized to determine whether storm water or treated water has been discharged to nearby surface waters. Site specific limitations dictate the sampling technique and equipment, such as bottles, bomb samplers, and dip samplers. Amec Foster Wheeler staff have direct experience with remote monitoring of surface water parameters through telemetry based probes for temperature, pH, nitrates, flow, conductivity, dissolved oxygen, phosphorous and turbidity. Amec Foster Wheeler implements industry accepted SOPs for the careful collection of surface water samples and adheres to them in all cases, considering any requirements of the applicable regulatory body in which we serve.

Sediment sample collection and monitoring - Amec Foster Wheeler collects sediment samples to track plume migration and to evaluate the migration and deposition of impacted sediments/soil particles into a waterway. Sediment samples are collected from stream, river, wetland and lake beds using a variety of tools and techniques. Some shallow samples are collected utilizing hand boring tools while deeper samples may require sampling off a barge, or through the ice, using a discrete sampler. Sediment sampling protocol is determined after review of existing information concerning the depth of the targeted waterway. Amec Foster Wheeler implements industry accepted SOPs for the careful collection of sediment samples and adheres to them in all cases, considering any requirements of the applicable regulatory body in which we serve.

Air sample collection and monitoring - Amec Foster Wheeler staff collects indoor/outdoor air samples as part of Vapor Intrusion Assessments (VIA) as well as subsurface soil vapor and sub-slab samples, all utilizing SUMMA® canisters and Tedlar bags. The SUMMA® canisters are used for either discrete samples or time-weighted averages. Additionally, Amec Foster Wheeler collects air samples to assess remediation system (i.e., AS/SVE) effectiveness and effluent treatment effectiveness. SVE and air stripper systems have the potential to discharge VOCs at levels above significant emission rates, and Amec Foster Wheeler monitors and reports these conditions and designs and implements treatment (e.g., GAC) where needed. All project work conducted under the MPCA/MDA contract follows applicable sampling guidance such as MPCA PRP 7-09a *Air Emission Controls* dated January 2011, MPCA PRP4-01a *Vapor Intrusion Assessments Performed during Site Investigations* dated October 2010, and *MPCA Sub-Slab Sampling Methodology* Video, published January 2018.

Representative Experience

- As part of a PFAS portfolio assessment for the Air Force, Amec Foster Wheeler completed Preliminary Assessments (PAs) to identify suspect releases of PFASs from the use of AFFF and then completed Site Inspections (SIs) as a result of AFFF usage at 118 potential release areas across 22 installations. We performed PAs at 39 installations in 19 states and SIs at 22 installations in 13 states. Groundwater, soil, sediment, surface water, drinking water and effluent samples were collected and defensible data was generated using standardized methods and procedures as per our project-specific QPP and PFAS-specific SOPs. The data, along with the results of private and public well surveys and inventories that we conducted, was foundational information required to identify areas downgradient where there may be a complete exposure pathway for drinking water.
- As part of an ongoing soil remediation project located in St. Paul, Minnesota, Amec Foster Wheeler was recently required to collect surface water samples from open excavations. The surface water was potentially contaminated with VOCs, SVOCs, metals and polychlorinated biphenyls (PCBs) and needed to be characterized prior to disposal to ensure that the water characteristics met the MCES special discharge criteria. Discrete surface water samples were collected into laboratory provided unpreserved sample containers via submersion and subsequently transferred into preserved containers. Several locations were inaccessible and therefore surface water samples were collected using a decontaminated dipper attached to an extension rod. Select parameters such as pH were measured on-site with a meter.

Conduct vapor/air monitoring for health and safety and air quality criteria

Amec Foster Wheeler staff has experience providing vapor/air monitoring on a variety of impacted properties utilizing hand held or fixed dust meters, photoionization detectors, organic vapor monitors, explosimeters, and draeger tubes. We also utilize air flow measurement devices, such as inclined water manometers and digital anemometers to evaluate the effectiveness of SVE systems. Specific site conditions dictate the type of air monitoring required. Prior to site mobilization, Amec Foster Wheeler evaluates known site conditions and selects the appropriate air monitoring protocol and equipment.

Conduct and/or oversee site assessment activities (Phase I and Phase II), limited site investigations and remedial investigations

The performance of Phase I, Phase II, limited site investigations and remediation investigations along with site remediation, is the core practice area of the Minneapolis Amec Foster Wheeler office and has been for nearly 20 years. In the past 10 years of holding the MPCA/MDA Level III contract, Amec Foster Wheeler has conducted over 200 site assessments, including Phase I Environmental Site Assessments (ESAs), Phase II ESAs, Limited Site Investigations (LSIs), site assessments, and remedial investigations (RIs).

Amec Foster Wheeler conducts Phase I Environmental Site Assessments (ESAs) in accordance with the ASTM International (ASTM) guidance E1527-13 and the USEPA final rule for All Appropriate Inquiries. The purpose of the Phase I ESA is to evaluate the presence or potential presence of recognized environmental conditions (RECS), including historical RECs (HRECs) and controlled RECs (CRECs). Following completion of a Phase I ESA, Amec Foster Wheeler develops a Phase II scope of work to determine if the RECs have impacted the environment at the site. In proposed redevelopment projects, the Phase II scope of work will also incorporate the planned redevelopment and land use to ensure that appropriate data quality objectives are considered. Amec Foster Wheeler also has extensive experience preparing response action plans (RAPs) in accordance with the RBSE process and both MPCA and MDA guidance. For Superfund and RCRA Corrective Action projects, we follow the guidance for those programs and follow the National Contingency Plan.

Representative Experience

- Melrose Riverview Development: Environmental Site Investigation & Remedial Action Planning: Amec Foster Wheeler conducted ESA activities at the Melrose River View Addition located in the city of Melrose, Stearns County, Minnesota. The project was completed for the City of Melrose under contract to the MPCA and funded under the Minnesota Targeted Brownfield Assistance Program (MNTBAP) through a USEPA 128(a) grant. The Melrose River View Addition property was developed for industrial processes dating back to the 1890s and included a grain and flour milling operation and a food processing plant that utilized railroad transportation. The City of Melrose purchased the Site in 1994 and planned to redevelop the property as a mixed use residential/commercial development with some parking and recreational space. Amec Foster Wheeler conducted a Phase I ESA and identified a series of RECs that were subsequently investigated in a multiple-stage Phase II ESA. Specifically, the Phase II ESA was conducted to investigate potential contamination associated with three former leaking USTs, contaminated fill material that was placed during and after demolition of the former Site structures, and potential contamination associated with historical railroad operations at the Site. Phase II investigation activities included the drilling and sampling of soil borings, installation and sampling of soil vapor probes, and installation of groundwater monitoring wells. Contaminants of concern included CVOCs, TPH and metals. Based on the findings of the site investigation activities, Amec Foster Wheeler developed a remedial action plan. Alternatives considered included: institutional controls (capping), excavation, in-situ soil treatment, groundwater pump and treat and groundwater monitored natural attenuation.
- Focused Site Investigation, Confidential Manufacturing Facility, Hennepin County, Minnesota: Amec Foster Wheeler conducted a time-sensitive soil and groundwater investigation to determine through environmental media sampling, if an accidental release of AFFF from an on-site fire suppression system had impacted the soil and/or groundwater at the site. The investigation was conducted in accordance with MPCA RBSE guidance and in general accordance with the United States Army Corps of Engineers (USACE) Interim Guidance on the Assessment and Management of PFAS. Investigation activities consisted of utility clearance, drilling soil borings and installing monitoring wells using a combination of push-probe and hollow stem auger drilling methods, soil and groundwater sampling, surveying, investigation derived waste management, and well sealing. All investigation activities were conducted in accordance with Amec Foster Wheeler SOPs for sampling PFAS, to prevent cross-contamination from materials used and/or sampling activities. The incident was managed by the MPCA Emergency Management Unit.

Conduct surface water, groundwater, air and vapor receptor surveys

Amec Foster Wheeler staff is experienced with conducting surface water, groundwater, air and vapor receptor surveys. These include walking surveys and identifying water wells, working with City officials to confirm utility locations, construction and connections, drilling borings in utility backfill trenches, vapor monitoring in sewers and basements, collection of water samples from sewer manholes and at treatment plants, and collection of sub-slab soil vapor samples. These activities are required at nearly all our projects as part of the RBSE process. We use this information, along with current and planned land use information, to inform and frame the investigation and remediation work plans and response action plans that we prepare.

Representative Experience

Former All-American Recreation Site (LS 19042). Amec Foster Wheeler conducted a comprehensive receptor survey as part of an environmental investigation conducted at the former All-American Recreation site under Leak Site #19042. The Site is located approximately 400 feet west of the edge of Lake Minnetonka and is in a residential/commercial area. The receptor survey included an assessment of properties within 500 feet of the site via a walking survey supplemented with preparation and mailing of questionnaires to property owners. The questionnaire was developed to determine the presence of water supply wells or confirmation of connection to public water supply, well usage (as applicable), presence of basements/sumps, possible petroleum sources and any other property specific comments. The receptor survey also included a review of the MDH county well index as well as wellhead assessment areas for drinking water receptors within ½ mile of the site, assessment of nearby surface water receptors, and determination of presence and relevant construction details of underground utilities. An added challenge for the site was the fact that it sits on the edge of the boundary between the cities of Shorewood and Tonka Bay, and a Metropolitan Council sanitary sewer line was present to the south of the site. A sewer vapor survey was conducted in the sewer to evaluate the potential presence of hazardous vapors since the sewer line potentially served as a conduit to residential property along the lake.

Oversee construction to mitigate vapors and conduct non-construction mitigation measures such as using fans, etc.

Amec Foster Wheeler oversees the construction of vapor mitigation measures as necessary. Generally, non-construction vapor mitigation efforts are required along storm and sanitary sewer systems or as interim measures until a permanent vapor mitigation system can be constructed. Amec Foster Wheeler staff has training and design and construction experience with the design of ventilation systems, both for specific unit manufacturing operations and for area-wide mitigation of contaminant vapors such as those associated with contaminated soils or vapor migration into building spaces. This work has included below grade spaces on an interim basis and for above grade spaces on a long-term on-going basis.

With an increasing knowledge of the prevalence and long-term effects of soil vapors intruding into living spaces, the need for vapor mitigation systems has grown exponentially in recent years. Amec Foster Wheeler has made it a priority to understand the evolving science behind vapor intrusion and the techniques available to limit the impacts to the both the general population and surrounding environment. Amec Foster Wheeler is adept at incorporating any new guidance towards the issue of vapor intrusion, from assessment phases through to the mitigation phase.

As part of the construction oversight process, Amec Foster Wheeler also understands the importance of educating the property owners of the ramifications of having an SSDS installed in their home. In response to that need to share information with the property owners, Amec Foster Wheeler takes every opportunity to communicate through each step of the process, so that the property owner gains understanding and is less anxious about the prospect of maintaining the SSDS. This is an opportunity to add value to each of the installations we provide oversight on, as it will likely increase the operational lifetime of the systems, thus decreasing the annual cost.

Representative Experience

Former Waldorf Cleaners, Minneapolis, MN: Amec Foster Wheeler is currently overseeing the construction of a vapor mitigation system at a residential home at the Former Waldorf Cleaners property in Minneapolis, MN.

The home presents a wide array of construction types (slab on grade, crawl space, and basement), making the design of the SSDS more intricate. Amec Foster Wheeler understands the need to conduct a comprehensive evaluation of all elements involved in vapor mitigation in individual structures to ensure that the SSDS design includes all technical and regulatory requirements and to avoid any slowdowns during system construction.

Install stainless steel soil gas sampling ports using an electric drill to bore through floor slabs

The Amec Foster Wheeler staff has significant experience installing stainless steel soil gas sampling ports in both residential and commercial settings. Amec Foster Wheeler employs a procedure where a stainless steel Vapor Pin® is installed through a concrete floor slab, upon boring through the floor with an electric rotary-hammer drill. The sample ports are installed with a Teflon® sleeve and pin cap providing vapor seals at the pin and surface in a manner to be air-tight and allow for an accurate assessment of the sub-slab vapor conditions, pursuant to MPCA BMPs for vapor investigations in guidance document c-rem3-06e.

Once a determination is made to conduct a vapor investigation, specifically, including the need for sub-slab soil vapor samples, Amec Foster Wheeler initiates the process by conducting a utility clearance event to allow for the safe installation of an appropriate amount of Vapor Pin® sample ports, dictated by MPCA guidance document c-rem3-06h. Once installation locations are cleared, personnel proceed to install the sample ports following routine installation procedures set forth by Vapor Pin. During the installation process, care is taken to ensure the least impact to the surrounding area, by utilizing a wet/dry vacuum to capture and contain the concrete particulates.

The need for sub-slab sampling most often occurs at inhabited residential or commercial properties where daily activities cannot be hindered, thus Amec Foster Wheeler aims to create the least impact to the building use both during installation and over the course of time in which the sample ports remain in place. To that goal, we strive to coordinate with property owners to choose installation windows which will have the least impact on the building occupants as well as offer the ability to install recessed sample ports, so that traffic is not impeded, even when the sample ports remain for some time. Amec Foster Wheeler has been amenable to installation of sub-slab sample ports in commercial buildings during non-working hours, and offer flush covers to protect sample ports that are needed in high traffic areas.

Upon completion of sub-slab sampling activities, Amec Foster Wheeler can restore the flooring conditions to their original condition by removing the Vapor Pin® sample ports and patching the sample location. These procedures describing the installation, use, and removal of the stainless-steel soil gas sampling ports can be accomplished in a single day, or over the span of multiple seasonal events.

Representative Experience

- Former Stoltz Dry-Cleaners, St. Paul, MN: Amec Foster Wheeler conducted an off-site soil vapor assessment for the former Stoltz Cleaners property. The soil vapor assessment consisted of collecting soil-gas and sub-slab vapor samples from properties within the vicinity of the former Stoltz Cleaners property to further evaluate the extent of potential soil vapor migration from the Site. During completion of the building survey for the building where the sub-slab sample ports were to be installed, it was determined that only a partial basement existed. Consequently, three sub-slab vapor sampling ports were installed from beneath the main floor (slab on grade) and one sub-slab vapor sampling port was installed in the basement.
- Former Morning Star Church Property, St. Paul, MN: On behalf of the MPCA, Amec Foster Wheeler conducted a Soil Vapor Investigation at the Morning Star Church Site, including the installation of sub-slab vapor sample points in several different types of buildings surrounding a former drycleaner operation. Building types ranged from single-family residential to multi-use commercial/residential. Amec Foster Wheeler personnel conducted initial building surveys to assess installation locations and building conditions pursuant to determining 33x Intrusion Screening Values (ISVs) applicability. Amec Foster Wheeler personnel followed MPCA guidance to install and sample the sub-slab sample points. In each of

the properties tested, exceedances to applicable ISV criteria indicated the need for expedited mitigation activities.

Oversee construction to complete sediment sampling and conduct non-construction sediment sampling as needed

Amec Foster Wheeler understands that sediment is considered one of the most damaging pollutants with regards to water quality across Minnesota, especially regarding sediment runoff from urban construction sites. Amec Foster Wheeler has extensive experience in construction oversight, including designing and implementing site specific BMPs in accordance with the MPCA Stormwater Manual and applicable permits for both sediment and erosion control. Amec Foster Wheeler personnel have experience with oversight and sampling in relation to perimeter controls for disturbed areas, at diversion barriers, and to characterize sediment for disposal.

Arrange for transportation, storage, and proper management of wastes

Amec Foster Wheeler has coordinated the transportation, storage, and proper disposal of many types of waste. This includes impacted soil, groundwater, free product, spent carbon, and other impacted waste materials or solid, liquid and hazardous wastes. (e.g., abatement and demolition materials). As wastes are generated on almost all projects, we are very familiar with the applicable waste disposal rules including rules regarding restricted waste and asbestos-containing materials. Several of our local employees are intimately knowledgeable of the proper management of waste. Mr. Bob Marxen, PE, CHMM is both a Certified Hazardous Materials Manager and certified by MnDOT in waste handling.

Representative Experience

Ford Motor Company – Regulated Materials Management & Contractor Oversight: Amec Foster Wheeler provided environmental management, demolition oversight and regulated materials planning and disposal throughout the decommissioning and demolition of the two million-square-foot vehicle assembly plant in St. Paul, Minnesota. Amec Foster Wheeler's involvement in the project also included concrete reuse planning and volume estimation; stormwater pollution prevention planning; and remediation contractor oversight throughout the remediation phase. Amec Foster Wheeler worked with Ford's waste management contractor to characterize waste streams through sampling, approve profiles, sign manifests and shipping papers, and assist with waste tracking. Over 20 waste streams and 20,000 loads have been generated during the project.

Evaluate the need for and oversee the implementation of alternative drinking water supply, including point-of-use treatment (i.e. filtration)

Amec Foster Wheeler has completed well surveys at more than 1,000 residences and has sampled over 300 residential wells to evaluate the need for alternative drinking water supplies. Amec Foster Wheeler has provided bottled water provisions for more than three dozen homes and has installed Point-of-Entry treatment systems. Amec Foster Wheeler has experience evaluating the need for, and overseeing the implementation of, alternative drinking water sources for both personal and business end users. Amec Foster Wheeler can evaluate the total usage required and geologic setting before determining whether supplied

bottled water or individual point-of-use treatment (e.g., carbon filtration) is required. A complete understanding of the subsurface conditions is important in making this determination. Amec Foster Wheeler has the in-house capability for designing and specifying alternative water supply systems.

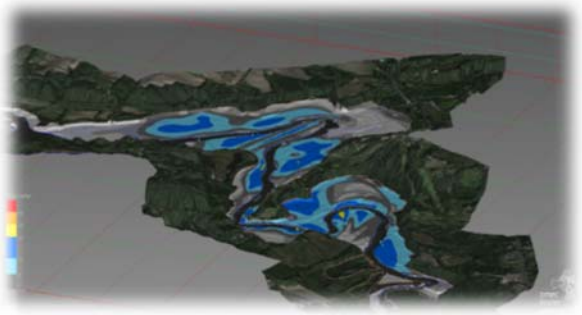
Representative Experience

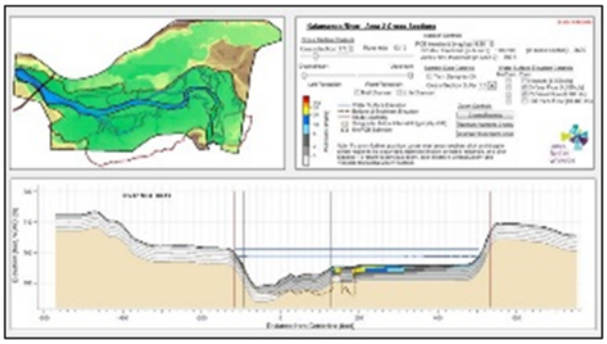
As part of a portfolio assessment, site investigations at 28 installations across 13 states at 244 potential AFFF areas have been in progress since July of 2016. As a result of data collected to date, follow-on activities have been initiated at three installations. At one site, step-out investigations have been conducted. At a second site, conceptual designs for two source wells to be used for drinking water have been completed. At a third site, a larger, complex mitigation response was required because of initial data collected at the fire training area and subsequent data. The activities conducted included: performed three phases of step out sampling to better understand the extent of groundwater impacts; sampled public and private drinking water wells (60 locations); coordinated and distributed bottled water to 19 residences with private drinking water wells; supported distribution of approximately 115,000 gallons of water to the affected residences and businesses. Public meeting support was also required with the production of 6 posters and 7 handouts, coordinating meeting notices in local newspapers; participating in planning and preparation meetings; and providing technical experts at the meeting to answer questions from the public. Mitigation activities were also required and included: developed a conceptual design report for two mitigations systems to treat drinking water for three municipal wells; and evaluated 18 residences for the installation of whole house treatment systems or connection to municipal drinking water.

Evaluate, monitor, design and remediate contaminated sediment and other necessary restorative actions & coordinate remedy planning, restoration planning and end use planning

Amec Foster Wheeler is one of the nation's premier sediment assessment and remediation companies, with our professionals providing support on some of the largest and most complicated sediment remediation projects across the country. Amec Foster Wheeler has been involved with sediment remediation, dredging, and capping; bulkhead design, construction, and installation; and site restoration in many port areas and waterways. Amec Foster Wheeler has also managed and implemented sediment characterization, assessment, design, remediation, and restoration projects from inception through completion.

Our project team has developed innovative approaches for evaluating sediment contamination to assist clients in developing favorable remedial solutions that limit long-term liability and risk. Compiling data sets and using geostatistics to view contamination and geotechnical characteristics in three dimensions supports the development of cost-effective solutions, reliable cost forecasting and sound engineering designs. During construction, these tools are used to forecast upcoming in-field conditions that are relayed to crews in the field to improve efficiencies.





Our project team has also developed tools that link physical and chemical data within GIS. Through use of these tools, project stakeholders can view chemical and physical conditions throughout the study area. This has proven to be highly useful in discussing potential remedial solutions with stakeholders. Dashboards within these tools allow the users to virtually "move" throughout the study are to promote meaningful discussions about practical solutions.

Representative Experience

Remedial Investigation/Feasibility Study, Remedial Design and Remedial Action, Confidential Client (Superfund Site), Ohio River: Amec Foster Wheeler was contracted to assess the extent of contamination; develop and select remedial alternatives; design a remedy and conduct site restoration which included a sediment cap and riverbank stabilization and restoration at a Superfund Site in USEPA Region 5. Amec Foster Wheeler conducted an RI involving an evaluation of previous and new data to characterize the polycyclic aromatic hydrocarbon contamination in groundwater, sediment, surface water and pore water. Multiple techniques were used to characterize the site and evaluate sediment contamination, including: multi-beam bathymetric surveys, side-scan surveys, Acoustic Doppler Current Profiling, hydrologic modeling, and sediment profile imaging. Field efforts included geotechnical studies, vibracoring, and Ponar sampling for sediment and pore-water. As part of the feasibility study, Amec Foster Wheeler evaluated the fate and transport of contaminated sediment and conducted human health and ecological risk assessments to evaluate potential exposures to receptors in surface water and sediment. A 3-dimensional geostatistical model was developed, using sediment sampling data and incorporated other lines of evidence, including bathymetry and historical Site operations to enhance existing data and define the extent of contamination. Amec Foster Wheeler developed a remedial action plan to evaluate remedial alternatives, including no further action, monitored natural recovery, dredging, capping, and a combination of dredging and capping. The recommended alternative was limited sediment removal and capping and river bank stabilization, including native plant species, which was accepted by the public and regulating entities.

GLNPO Projects Experience

Amec Foster Wheeler has assisted clients in reaching favorable cost-share agreements with GLNPO.

- In 2005, Amec Foster Wheeler assisted the State of Michigan in establishing the first GLNPO project agreement under the Great Lakes Legacy Act (GLLA) for a portion (referred to as Black Lagoon) of the Detroit River, Michigan AOC. In support of developing the agreement, Amec Foster Wheeler evaluated characterization data collected by others, developed and evaluated various remedial alternatives (including the development of remedial cost estimates) and assisted the state in selecting a remedy for funding under a project agreement. The project agreement resulted in cost sharing between GLNPO (65%) and the State of Michigan (35%) for dredging 115,000 cubic yards of sediments containing mercury, PCBs and oil and grease.
- In 2008, Amec Foster Wheeler assisted an industrial client in executing a project agreement in the Buffalo River, New York AOC. In support of developing the agreement, Amec Foster Wheeler evaluated characterization data collected by others, collected additional data to fill data gaps, developed and evaluated various remedial alternatives (including the development of remedial cost estimates) and assisted the client in negotiating a remedy with stakeholders that included GLNPO, the State of New York and non-governmental entities. The resulting remedy consisted of dredging and capping of sediments containing various inorganic and organic constituents, including PCBs, and the restoration of submerged vegetation beds and river bank habitats. The project agreement funded these remedial activities with cost sharing between GLNPO (50%) and the industrial client (50%).
- In 2008, Amec Foster Wheeler assisted an industrial client (as part of an industrial consortium) in executing a project agreement for the Ottawa River, a tributary into the Maumee River, Ohio AOC. Work included the evaluation of existing data collected by others, the development of remedial alternatives (including cost estimates) and the negotiation of the final remedy with GLNPO and the State of Ohio. The resulting remedy included the dredging and disposal of 250,000 cubic yards of

sediment containing PCBs, PAHs and lead. The project agreement funded these remedial activities with cost sharing between GLNPO (50%) and the industrial consortium (50%).

- In 2010, Amec Foster Wheeler assisted an industrial client in negotiating a project agreement with GLNPO for RI/FS work in the Rouge River, Michigan AOC. The project agreement funded these activities with costs sharing between GLNPO (65%) and the client (35%). Amec Foster Wheeler assisted the client in negotiating a remedy with GLNPO, which is to include dredging 77,000 cubic yards of coal tar waste in the river and associated sediments containing PAHs, capping of sediments and the installation of 2,500 feet of permanent sheet wall to support the adjacent dredging work and to promote industrial re-use of the river front. The original project agreement was then modified to include remedial design with the same cost sharing split. The design is nearly complete and Amec Foster Wheeler is assisting the client in negotiating modifications to the current agreement to fund remedy implementation.
- Since 2013, Amec Foster Wheeler has been working with the City of Lorain, Ohio on the Lower Black River Restoration project. Through this successful project, we have a close working relationship with GLNPO and the regulatory agencies. Our project responsibilities include site assessment, permitting, remedial technology feasibility studies, and the design of remedial alternatives. We have designed an onsite disposal cell, evaluated the feasibility of natural conveyance and neutralization of storm water, and prepared engineering specifications and construction bid documents for the seep interceptor. We also serve as the Certified Professional for the site under the state brownfield program.

Search, gather, and evaluate bathymetric data

For inland water ponds, lakes and estuaries, Amec Foster Wheeler has experience in determining the best practice for evaluating subsurface features using bathymetry. Bathymetry surveys can be a logistical challenge when an area of interest is extremely shallow, has vegetation and structure concerns and watercraft interference, such as within ports, harbors and shipping channels. Amec Foster Wheeler typically evaluates the types of deployment craft, sensor array (single beam, multi beam or simple echo sounder) and survey parameters to determine which types are appropriate to obtain optimal, accurate and definitive bathymetric data. Amec Foster Wheeler typically utilizes GIS and Geophysical Software (such as Geosoft Oasis montaj) to develop bathymetric maps, contours and profiles of the water body. We also have the capability to utilize other marine geophysical techniques to characterize geologic and water quality characteristics.

Coordinate and cooperate with other State-contracted services such as sampling and analytical, emergency response contractors, and hazardous waste services

As a Level III Technical and Professional Services contract holder with the MPCA/MDA since 2008, Amec Foster Wheeler has extensive experience coordinating and working cooperatively with other State contracted services, with approximately 90 percent of our projects conducted over the past ten years requiring the use of other state contractors (laboratory analytical or hazardous waste services). Amec Foster Wheeler understands that environmental projects are executed most efficiently when all stakeholders work in cooperation as a team throughout the project. State-contracted service providers will be included in the team and function with Amec Foster Wheeler to deliver a seamless, focused, solution to MPCA and MDA projects. Amec Foster Wheeler has worked for many years on projects that utilize a wide range of subcontractors and teaming partners, many of which are State of Minnesota Contractors that serve the MPCA and MDA. The familiarity that State of Minnesota Contractors have with the proper procedures and methods called for under the state contracts, brings value to each project. Amec Foster Wheeler staff are well versed in the use of the MPCA Contractor and Subcontractor Purchasing Manual and associated forms (e.g. State Contract Order Form [SCOF]) and ensure that all state contracted services are managed under the established protocols.

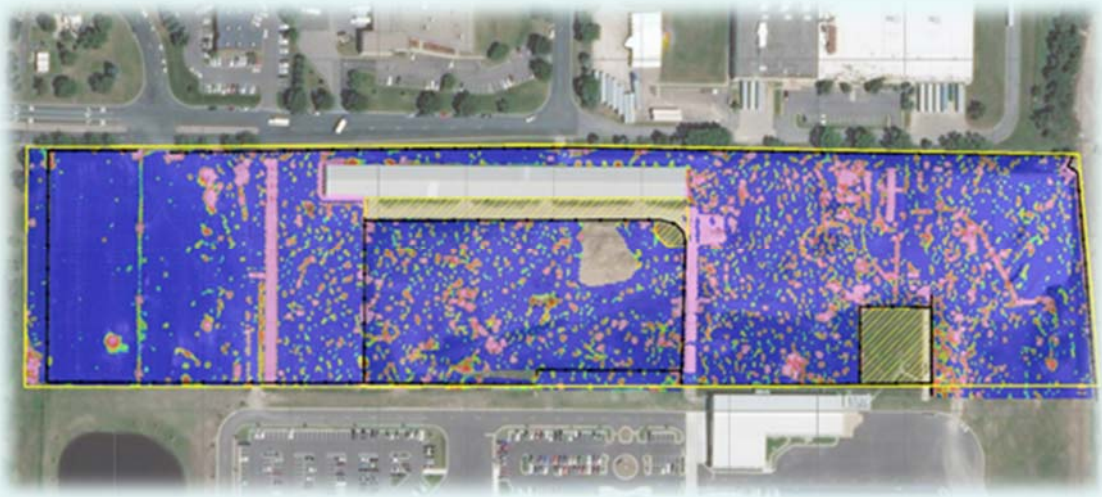
Arrange for geophysical activities

Amec Foster Wheeler has experienced geophysicists that routinely apply surface geophysical methods to provide a cost effective, accurate delineation of buried features and objects such as bedrock depth, bedrock type, fractures and preferential pathways for potential contaminant plumes. We also have performed numerous subsurface surveys tor utility locations, underground storage tanks and piping. We apply our in-house geophysical expertise to assist in the design and optimization of remedial systems across the country. For example, Amec Foster Wheeler has reviewed geophysical reports regarding the location of shallow karst features controlling groundwater flow and LNAPL migration at petroleum release sites, and have targeted the location of LNAPL for recovery and groundwater monitoring efforts. We also have expertise utilizing borehole logging systems such as Natural Gamma, Resistivity and Video that may be useful to evaluate wells as part of remediation system maintenance programs.

Locally, Amec Foster Wheeler has several geophysicists on staff able to support several types of geophysical surveys. We have performed geophysical surveys to characterize subsurface geology, delineate contamination pathways, locate buried utility and infrastructure, and identify munitions and munitions debris. We are fully equipped to support surveys using Electromagnetic, Ground Penetrating Radar, Electrical Resistivity Seismic and Bathymetric tools. We have extensive experience in designing, conducting or overseeing, processing, producing geophysical maps and interpreting geophysical results. We have extensive software for geophysical mapping and processing (such as Geosoft Oasis montaj, Radan, and Earthimager and access to other licensed software used for geophysical data processing.

Representative Experience

Former Aerospace Manufacturing Facility, Fridley, MN: Amec Foster Wheeler conducted a time-domain electromagnetic geophysical survey at the former BAE systems facility to assist other consultants in locating suspected former drum disposal areas and to provide rationale in the placement of exploratory test pits being completed as part of a Phase II ESA (by others). Based on a previously completed Phase I ESA and an ongoing Phase II ESA, drums had previously been discovered and subsequently removed within various portions of the Site.



Oversee subcontractors and state contractors during investigation and cleanups and tank removals

Amec Foster Wheeler is experienced in overseeing subcontractors to ensure the work they perform conforms to the agreed-upon scope, schedule, cost, plans and specifications during all phases of environmental investigation. Amec Foster Wheeler staff oversight begins at the initiation of an investigation through coordinating utility locates and/or meets, where our staff stake proposed drilling locations in the field and

coordinate with the drilling/excavation contractors to ensure that all activities will be free of utilities prior to the onset of drilling/excavation activity. Amec Foster Wheeler staff then provide guidance to subcontractors throughout a field investigation project, including completion of daily tailgate safety meetings, discussion of daily scope objectives and activities, oversight of drilling and decontamination measures, and standard operating procedures. Amec Foster Wheeler staff will also review daily records for state contractors and/or subcontractors and sign any documentation for verification of work conducted (as applicable).

Representative Experience

Tank Removal and Environmental Oversight, Little Falls, MN: Amec Foster Wheeler conducted environmental oversight for removal of an on-site fueling system consisting of an 8,000-gallon diesel fuel fiberglass UST (containing approximately 200 gallons of diesel fuel), and associated dispenser, piping, and vent line. An approximate 600-gallon underground concrete vault that was previously used as an overflow storm water containment structure was also removed. All tank removal activities were conducted in accordance with MPCA UST Program Rules 7150.0410 (Permanent Closure) and 7150.0420 (Site Assessment), and with MPCA guidance document PRP3-01, Excavation of Petroleum-Contaminated Soil and Tank Removal Sampling dated March 2017. We conducted oversight and provided guidance for tank excavation and pumping contractors throughout the duration of the project. Specific tasks included: excavating soil from above the UST to uncover the access ports, pumping remaining diesel fuel from the UST, excavation and cleaning of the UST, excavation of dispensers and associated piping, removal of the stormwater vault, field screening and environmental sampling from excavation sidewalls and floor. Following excavation, clean fill was imported to the site and the excavation was backfilled.

Prepare and evaluate reports (e.g., investigation reports, monitoring reports, free product recovery reports)

Amec Foster Wheeler understands that preparing and evaluating technical reports is an essential component of all MPCA and MDA projects, as it is for most of our environmental projects. Our clients find us to be excellent technical writers, capable of preparing clearly written, concise reports that are thorough and well-grounded in the data. Amec Foster Wheeler reviews and evaluates existing reports, providing informed recommendations for potential site activities. All activities directed or overseen by Amec Foster Wheeler will be documented in a report to MPCA or MDA utilizing appropriate guidance documents and forms where applicable. The report format will depend on the type of activity completed, and we are experienced with all the varying report formats and forms common to MPCA and MDA lead projects. Amec Foster Wheeler also conducts third-party reviews of investigation and remediation designs and reports and assesses technical issues, provides consultation regarding remedial approaches and optimization, and remediation strategy.

Evaluate invoices

Amec Foster Wheeler has experience managing multiple contractors over a range of complex to relatively simple project tasks. We review every invoice to ensure it matches the appropriate bid submittal before approving payment. Items beyond the approved bid submittal must have change order approval or a signed amendment in place before Amec Foster Wheeler authorizes payment. Similarly, data reports delivered by subcontractors are reviewed for completeness and adherence to agreed scope of service. Amec Foster Wheeler approves only those reports that meet the objectives outlined in the subcontractor agreement. As a MPCA/MDA Level III Professional and Technical Master Services contract holder since 2008, Amec Foster Wheeler staff understand the contract requirements and the importance of paying state contractors in a timely manner. As such, our project managers review state contractor invoices upon receipt and request any changes necessary immediately following review.

Collect and manage field and laboratory data for electronic submittal in a format specified by the MPCA

Amec Foster Wheeler is well versed in the collection and management of field and laboratory data for electronic submittal. Amec Foster Wheeler utilizes a variety of electronic data collection technologies and uses field tablets equipped with electronic forms. Forms can then be exported in a variety of formats, including ascii text files for inclusion into project specific databases. Amec Foster Wheeler also works with laboratories to provide electronic data deliverables in a wide variety of formats, including Earthsoft's EQuIS™, and ERPIMs formats. Amec Foster Wheeler personnel manage project data electronically and routinely utilize Earthsoft EQuIS™.

Evaluate data quality and data verification reports

Amec Foster Wheeler chemists have extensive experience in the validation of organic and inorganic data analyzed according to numerous methodologies and within a variety of state and federal regulatory programs, including the use of state or USEPA Region-specific validation SOPs. Amec Foster Wheeler staff perform data validation according to the general guidance provided in the USEPA Contract Laboratory Program (CLP) National Functional Guidelines, including regional or state modifications when applicable. Amec Foster Wheeler chemists also use professional judgment and in-house standard operating procedures for non-CLP data validation.

The validation process begins with the identification of project requirements. Amec Foster Wheeler chemists review project-specific planning documents (i.e., Statements of Work, Field Sampling Plans, Work plans, and Quality Assurance Project Plans [QAPPs]) to determine project data quality objectives (DQOs) to focus on evaluating the usability of the analytical data for the purpose for which it was collected (i.e., were the DQOs achieved?). In many cases, Amec Foster Wheeler chemists are involved with QAPP and DQO preparation. To assess the DQOs, six principal data quality indicators (DQIs) are evaluated: accuracy, precision, bias, representativeness, comparability, and completeness. Depending on the level of review, data validation includes review of the laboratory's certified analytical report, supporting documentation, and raw data for verification of method, procedural, and/or contractual quality control requirements, verification of samples results, including laboratory qualifiers, verification of analyte identification, and checks for transcription and calculation errors. Specific QC parameters reviewed may include, but not be limited to the following: chain of custody compliance; holding time compliance; instrument tune and calibration compliance; presence or absence of laboratory contamination as demonstrated by method blanks; presence or absence of contamination as demonstrated by field blanks; accuracy and bias as demonstrated by recovery of surrogate spikes, laboratory control samples, and matrix spikes; analytical precision as relative percent difference between analyte concentration in primary samples and laboratory duplicates, LCSs and LCS duplicates, MSs and MS duplicates, an/or primary samples and field duplicates; internal standard (IS) response compliance; and sampling precision as RPD between analyte concentrations in primary samples and field duplicates.

The level and depth of the data validation varies depending on project objectives. Amec Foster Wheeler chemists routinely perform five types of data validation in accordance with USEPA guidance.

Arrange for site access

AmecFoster Wheeler understands that environmental issues do not obey site boundaries, and that obtaining access to on-site and off-site properties are an important component of a successful environmental investigation. Amec Foster Wheeler completes access agreements for public and private land owners, discusses planned activities, and secures signed agreements before work is initiated on a property.

Representative Experience

Former Gas Station/Java Detour Site (LS17886): This project was opened after a MnDOT corridor assessment in 2010 which indicated petroleum impacts at the site. Historic records indicate that the site was used as a gas station until 1977. A coffee shop now occupies the site, which is owned by an out-of-state company with a property owner that also lives out of state. Amec Foster Wheeler began LSI activities by contacting the multiple parties involved to explain the necessary investigation activities at the site, directed by the MCPA. The property owner provided very explicit instructions to not disturb operation of the business, which operates from 6:00 am to 9:00 pm, and that drilling could not occur within concrete-paved areas of the site. The owner also required that these restrictions be written into the access agreement along with the specific scope of work, requiring that a new access agreement be written for the site property each year. Given that the site is only 0.3 acres in size, along with a high concentration of utilities in the source area, the additional restrictions imposed by the property owner made characterizing the site contamination an increased challenge. Site investigation activities also required access to work in the MnDOT trunk highway north of the site, which therefore required additional permitting and coordination. Separate access agreements were also obtained to conduct work on the properties to the north, west, and northwest of the site.

Coordinate utility locates by contacting the appropriate entity and if applicable coordinate traffic control

Coordinating the location of subsurface utilities is an important component of any subsurface activity. Amec Foster Wheeler coordinates with GOPHER STATE ONE CALL and private utility locaters to conduct utility locates, meets, and design utility locating tasks. Existing on-site utility drawings also are utilized to determine subsurface features, if available. Amec Foster Wheeler makes it a priority to understand the network of buried utilities at a Site, not only for the safety of the onsite personnel, but also to understand how the location and construction of some utilities may affect the fate and transport of the contaminants of concern.

At times, the need arises for work to be completed either within active roadways, or within a roadway right of way, increasing the need for further safety measures. In those situations, Amec Foster Wheeler coordinates traffic control measures, varying from safety cones and appropriate flagging, to flagmen and even coordination with local emergency services to provide the appropriate level of protection. We are experienced with obtaining right-of-entry permits, encroachment permits and construction permits from local units of government.

Prepare and evaluate bid specifications

Our project team expertise in preparing specifications and evaluating bids is evident in our vast project matrix. Bids are prepared for a variety of activities, including drilling, construction and treatment system installation and demolition. Amec Foster Wheeler routinely evaluates complex bid packages, weighing safety, technical ability and cost, to select the most appropriate contractor for the project. We utilize the American Institute of Architects (AIA) 51 Division or 17 Division format specifications as appropriate to the job. We have developed company and project specific specification sections that help keep project costs to a minimum. As an MPCA/MDA contract holder, Amec Foster Wheeler staff are familiar with all aspects of the MPCA Purchasing Manual and have developed bid specifications and completed procurement activities in accordance with the purchasing manual for remediation systems and other services not covered by existing Department of Administration contracts. Amec Foster Wheeler also has extensive experience working on closed landfill projects for private clients and has developed bid specifications and conducted procurement for landfill

cap/cover repair and maintenance, leachate system maintenance and repair, leachate disposal, gas vent repair/replacement, culvert replacement and many other services.

Representative Experience

Former Soo Line Railroad Site: Amec Foster Wheeler conducted bidding activities for the demolition of a former petroleum recovery and remediation system at a Former Soo Line Railroad site (LS0000544) in accordance with the MPCA purchasing manual. Tasks involved in the project included an asbestos inspection and sampling as necessary, completion of bid specifications, a site walk with the contractors, and finalizing the bid package documents to assess them for bid selection. Amec Foster Wheeler followed the purchasing manual, including completion of the following items, Request for Quotation, Specification for Services, Pricing Bid Sheet, and requests for Responder's Qualification and Example Certification of Liability Insurance forms. Solicitations were submitted to contractors and the contracting was coordinated with the MPCA.

Conduct and review human health and/or ecological risk assessments

One of Amec Foster Wheeler's core practice areas is the preparation and review of human health and ecological risk assessments. Our approach is to integrate risk assessment early into the investigation phase of a project and carry it through the corrective action phase. Our experience includes identifying the chemicals of concern at a site, evaluating the possible exposure pathways to potential human health and ecological receptors, developing risk-based clean-up goals, designing and implementing corrective actions to mitigate potential impacts, and designing and implementing programs to monitor the success of applied corrective actions.

Representative Experience

- Amec Foster Wheeler provided a CERCLA remedial investigation human health and ecological risk assessment at a site in Duluth, MN to delineate the extent of PFAS, VOCs, lead, and petroleum released to the environment at a former fire training area operated by the Air National Guard. The work plan proposed collecting 48 soil samples from 24 borings, installing new monitoring wells followed by two rounds of groundwater sampling, and collecting sediment samples from catch basins at discharge points to surface waterbodies. A baseline risk assessment was completed that compared specific ecological risk-based screening benchmarks to analytical results to ensure that results would be reported at concentrations sufficient for use in an ecological risk assessment. Risk assessment activities to assess risks of PFAS in soil to the environment using benchmark comparison, food chain models, and other lines of evidence were also completed.
- A PFAS investigation and assessment of human exposure to PFAS from land, freshwater, and marine environments at an active navy installation was completed. A conceptual site model was developed and an "outside-in" approach to sampling for PFAS was established with priority given to human health exposure pathways. Calculated health screening levels (HSLs) for incidental ingestion of soil, and dietary ingestion of fish using newly published toxicity criteria for PFAS was completed. Data collected was compared to calculated HSLs soil, and dietary pathways, and a comparison of groundwater data to regulatory guidance values for ingestion and recreational use of groundwater was done.

Prepare and review Quality Assurance Project Plans (QAPP) and Sampling and Analysis Plans (SAP) in accordance with state and federal requirements

Due to our extensive portfolio of federal work, Amec Foster Wheeler is extremely familiar with the preparation of QAPP and SAP documents in accordance with state and federal requirements. Amec Foster Wheeler works under an EPA approved QAPP for work conducted within the Minnesota Targeted Brownfields Assessment Program (MnTBAP) under EPA 128(a) Brownfield Assessment Grants. The QAPP defines data quality objectives (DQOs), including analytical and project quality objectives, and quality assurance objectives to ensure the quality, accuracy and precision of data associated with MnTBAP site assessments.

For each investigation conducted under the MnTBAP, Amec Foster Wheeler develops site specific SAP documents. Each SAP outlines site specific sample design and rationale and references pertinent DQOs and SOPs to ensure the highest quality of data collection.

Perform feasibility and treatability studies

Amec Foster Wheeler has conducted feasibility studies and designed and implemented treatability studies to address identified environmental risks at sites across the country. Amec Foster Wheeler identifies remedial alternatives in consultation with clients, regulators and other project stakeholders and evaluates each alternative against site-specific or state/federal clean-up goals. Engineering and institutional controls are also evaluated as well as active remedial alternatives. On some projects, bench tests and/or pilot studies are conducted in the field under actual site conditions to determine the feasibility of the alternative and to measure specific design parameters required for the design of a full scale remedial system. Amec Foster Wheeler evaluates each alternative for its implementability, constructability, time frame for remediation, effectiveness in meeting clean up criteria, operation and maintenance requirements, and costs. The feasibility report will present a recommendation for a selected alternative. To achieve project clean-up goals and site closure, a combination of technologies is most often the most efficient approach and therefore feasibility studies can be critical in evaluating site specific requirements.

Representative Experience

- Western Area Fire Training Academy (WAFTA), Focused Feasibility Study, Carver County, MN: Amec Foster Wheeler developed a focused feasibility study (FFS) for a 6-acre site located in Carver County, Minnesota that was historically used for a variety of purposes, including agriculture, missile storage/launch facility, and a fire training facility. The FFS was developed to evaluate response action alternatives and associated costs to address soil and/or groundwater impacts at the site related to future planned land use. Chemicals of concern identified included petroleum hydrocarbons, VOCs, and PFASs. Amec Foster Wheeler utilized the CERCLA nine-point remedial evaluation criteria, subdivided into three groups, threshold criteria, balancing criteria and modifying criteria, to identify advantages and disadvantages of each remedial alternative. Soil alternatives evaluated included in-situ and ex-situ alternatives and groundwater alternatives included pump and treatment, air sparging, chemical oxidation and permeable reactive barriers. Costs were evaluated for each alternative and recommendations were made for implementation.

- Milford Township; Old Plank Road Landfill; Village of Milford, MI. Amec Foster Wheeler conducted a remedial investigation of the Old Plank Road Landfill in Milford, Michigan to determine the vertical and horizontal delineations of the extent of soil, groundwater and subsurface landfill gas impacts. Vertical aquifer sampling (VAS) was completed using rotosonic and hollow-stem auger drilling methods, and permanent groundwater monitoring wells and landfill gas probes were installed at depths consistent with identified zones of highest impacts. Findings indicated potential groundwater threats to down-gradient residential water wells. Interim measures consisted of supplying bottled water to residents. Amec Foster Wheeler completed a feasibility study (FS) to evaluate a range of practical and technically feasible remedial alternatives to address impacted on-site soils and groundwater. In agreement with MDEQ, the Village of Milford prepared an interim response action plan (IRA). The IRA presented a focused risk evaluation utilizing a presumptive remedy, and provided response activities consistent with a limited residential clean-up. Response activities selected included an institutional control eliminating the installation of drinking water wells in a defined area, installation of an alternative (municipal) water supply to area properties, drinking water well abandonment, ongoing monitoring of groundwater and landfill gas to ensure that future conditions are consistent with the IRA, established contingencies to address potential changes and established institutional controls. The long-term monitoring is in place to monitor the natural intrinsic biodegradation process that is documented to be degrading the chlorinated volatile organic compounds (CVOCs) in the groundwater and to ensure that the site-specific groundwater to surface water (GSI) criteria is not exceeded in sentinel monitoring wells. Site inspections are also completed to assist with determining required site maintenance activities.

Design comprehensive remedial action remedies and remediation systems

When remediation is necessary, a comparative assessment of remedial alternatives is undertaken to select the most appropriate technology. Amec Foster Wheeler develops integrated remedial solutions that incorporate innovative technologies designed to address complex contamination problems. Amec Foster Wheeler designs remediation schemes that provide cost-effective solutions to meeting clean-up goals. We apply both innovative and established remedial technologies to solve simple to complex environmental problems. Our broad experience in designing remedial technologies has included: chemical mass removal using techniques such as groundwater extraction and treatment, free-phase product removal, vapor extraction and treatment, soil excavation and disposal; engineered containment systems such as slurry cut-off walls, geotextiles, caps; and, in-situ and ex-situ treatment techniques such as chemical fixation, bioremediation, phytoremediation, and bioventing.

Representative Experience

- Pease Air Force Base, New Hampshire; Perfluorinated Compounds Release Response ~ Remedial Action: In response to detections of PFAS in the groundwater and drinking water, Amec Foster Wheeler has conducted remedial action and design under an Administrative Order issued under the Safe Drinking Water Act (SDWA). Remedial action conducted to date has included:
  - Shutdown operation of a municipal water supply well until a treatment system for PFAS could be installed at the local treatment plant.
  - Provision of bottled water to residences where private drinking water wells were contaminated with PFAS above the health advisory
  - Installation of whole-home carbon filtration systems as an interim mitigation step until long-term agreements could be agreed upon with home-owners, such as connection to public water supply system
  - Implementation of a quarterly monitoring program for private drinking water wells to evaluate PFAS concentrations and identify any changes in PFAS concentrations

- Implementation of bench-scale and pilot-test studies to determine best available PFAS treatment technology for long term groundwater treatment
- Sampled soil, groundwater, and pore water to assess the extent of PFAS throughout the areas impacting a municipal water supply well

Remedial design activities have included the design and construction of two interim groundwater mitigation systems. The first system included a 200 gpm Groundwater Extraction/Treatment System that included the first ever regenerable ion-exchange system for PFAS. The second system consisted of a 700 gpm Airfield Interim Mitigation System (AIMS) Groundwater Extraction/Treatment/ Re-injection System. Amec Foster Wheeler also provided ancillary services including risk assessment, off-site sampling of shell fish, groundwater modelling, and public meeting support.

Conduct and oversee remedial investigation

Amec Foster Wheeler has extensive experience conducting and overseeing remedial investigations across the country. We have worked on diverse sites, including former lead smelters, former lithium ore process plants, agricultural chemical distribution facilities, chlorinated solvent storage and distribution facilities, hazardous waste storage facilities, fuel terminals and stations and industrial sites with petroleum contamination, restricted wastes, and asbestos-containing materials.

- Remedial Investigation, Shoreham Yard, Minneapolis, MN. Our project team has provided RI activities at the Canadian Pacific Shoreham Yard in northern Minneapolis since 2001. Environmental investigations conducted at the Site since 1977 detected petroleum and solvent related compounds in soil and groundwater at the site. Based on a review of site history, the site was divided into six areas representing various uses over time. The areas consist of: 1) a lease area that was leased at various times to independent operators (e.g., Murphy Lease Area, Ashland Lease Area); 2) a waste reclamation area; 3) a pump house area; 4) a collector pan area; 5) a round house area; and 6) an ice house area. Amec Foster Wheeler has conducted SI and RI activities to delineate the extent of groundwater contamination and completed a hydrogeologic assessment of local groundwater flow and direction within the groundwater horizons beneath the Site. During well installation, Amec Foster Wheeler logged each recovered soil core and performed hydroprofile sampling. Upon well installation, our project team performed slug tests to obtain estimates of aquifer hydraulic parameters. With each well installation, we evaluated the most appropriate method of drilling (sonic, hollow-stem auger, direct-push, etc.) and installation based on the geology. Amec Foster Wheeler continues to perform quarterly groundwater level measurements and semi-annual groundwater sampling for the Site including collecting samples for monitored natural attenuation.
- Remedial Investigation, Huron Rail Yard, South Dakota. Amec Foster Wheeler conducted a remedial site investigation and remedial action to address soil and groundwater impacts at the facility as a result of historical activities. A Phase I ESA and regulatory review was conducted in 2010 which identified a number of RECs that were subsequently investigated in a Phase II ESA. Following the initial SI, remedial actions were necessary to delineate the soil and groundwater impacts at the site and address the contamination.

RI activities at the facility have included a geophysical survey, UST removal activities and routine groundwater monitoring associated with a former pintsch gas plant; soil and groundwater investigation and soil excavation associated with historical practice of burning locomotive filters, investigation and routine groundwater monitoring of a former bulk fuel/oil storage facility and oil sludge containment area; investigation and soil remedial activities associated with discharge of oil from turntable. A feasibility study was also conducted to address impacts at the former pintsch gas plant; alternatives evaluated included excavation, in-situ soil stabilization/solidification, and in-situ chemical oxidation.

- Former Wickes Manufacturing – TCE Plume Site: Amec Foster Wheeler conducted a RI/FS at a former manufacturing facility in Mancelona, Michigan to delineate and evaluate remedial alternatives to address an expansive TCE groundwater plume. Amec Foster Wheeler conducted a rotosonic drilling program consisting of installing and sampling 30 monitoring wells to depths greater than 600 feet bgs. Over 180 vertical aquifer samples were collected to place well screens at the highest concentrations of TCE and sampling was conducted using passive diffusion bag samplers. Due to the size and depth of the contaminant plume, Amec Foster Wheeler utilized indirect geophysical survey methods (seismic) to focus the drilling program for maximum cost effectiveness. Results of the geophysical survey provided preferential pathways for contaminant migration and defined the extent of confining units. Concurrent with RI activities, Amec Foster Wheeler prepared a feasibility study to evaluate technologies to remediate the plume and source areas. A pathway evaluation was conducted to identify potential exposure routes and receptors.

Oversee installation of remedial actions and remedial systems

Experienced Amec Foster Wheeler staff oversee all field aspects of remedial action system installation. Our staff communicates project schedules and milestones to the selected contractor and work to ensure the field efforts meet project safety and technical objectives, timeframes, and budgets. Part of the field oversight includes providing a detailed record of daily activities, safety procedures, progress milestones, difficulties encountered, and any field modifications required. All changes requiring MPCA or MDA approval are immediately communicated with the Amec Foster Wheeler project manager and MPCA/MDA staff. The field personnel will not authorize any scope change without proper approvals in place.

Representative Experience

Confidential Manufacturing Facility (Superfund Site), Hennepin County, MN: Amec Foster Wheeler designed and conducted construction oversight of a groundwater extraction and treatment system (GWETS) installed to address groundwater contaminated with CVOCs, specifically TCE and associated breakdown products. In

preparation for system installation, six groundwater extraction (GWE) wells were installed. Construction of the system began in 2016 with oversight by Amec Foster Wheeler staff for the system consisting of:

- the system enclosure inside the existing manufacturing facility,
- (2) 3,500-pound GAC units,
- (2) 6,000-gallon equalization tanks,
- (2) bag filters,
- (2) transfer pumps,
- a sump for the treatment room,
- buffering chemical metering to prevent scaling,
- instrumentation and controls (SCADA),
- remote monitoring and control,
- (6) groundwater pumps, and associated supply/discharge piping network.

Additional construction considerations included hundreds of feet of piping trenches from the GWE wells to two mechanical vaults to the GWETS inside a corner of an existing manufacturing facility. The trench work was phased to manage disruption of surrounding businesses as well as stormwater considerations. The project required a construction stormwater permit since it disturbed over one acre of soil, which was managed by the subcontractor and addressed by Amec Foster Wheeler staff as necessary. Throughout construction, Amec Foster Wheeler reviewed and responded to subcontractor submittals as needed. Regular communication between on-site staff and senior engineers was essential for day-to-day trouble-shooting and facilitated a successful completion of the construction of the system.

Conduct surface water, ground water, and hydrodynamic modeling

Amec Foster Wheeler conducts detailed hydrogeologic investigations and data analysis; including groundwater flow and contaminant fate and transport modeling, capture zone analysis, aquifer pumping test design and analysis, slug test design and analysis and specific capacity testing and analysis. We utilize nearly all the commonly-utilized software for hydrogeologic investigations, including MODFLOW, RT3D, BIOCHLOR, BIOSCREEN, NAS, and AQTESOLV. We conduct capture zone analysis for operating groundwater extraction remedies to confirm adherence to remedial action objectives.

We utilize our hydrogeologic skill set to design groundwater remedies, including groundwater pump and treat, in situ bioremediation, in situ chemical oxidation, and air sparging. We model the migration of contaminants between soil and groundwater, groundwater and soil vapor, and groundwater and surface water, because the interactions between these media typically have a significant impact on remedy selection, design, operation and optimization.

Perform asbestos identification and if necessary oversee asbestos abatement and removal

Amec Foster Wheeler has a long history of working on projects with asbestos containing building materials where we have contracted for asbestos surveys or performed those surveys ourselves. We also have extensive experience in the oversight of asbestos abatement in preparation for building demolition. Amec Foster Wheeler typically completes asbestos identification as part of comprehensive regulated materials surveys that are conducted in accordance with the following regulations:

- 40 Code of Federal Regulations (CFR) Part 61, Subpart M, National Emission Standards for Hazardous Air Pollutants: Asbestos.
- 40 CFR Part 763, Subpart E, United States Environmental Protection Agency (USEPA); Toxic Substances Control Act (TSCA), Asbestos-Containing Materials in Schools.
- Minnesota Administrative Rules Chapter 4620.0300, Asbestos Abatement.
- Minnesota Administrative Rules Chapter 7011.9920, Asbestos.
- Minnesota Administrative Rules Chapter 7035.0805, Renovation and Demolition.

Representative Experience

Former Warroad Elementary School, Regulated Materials Survey: Amec Foster Wheeler conducted a regulated materials survey (RMS) at the former Warroad Elementary School located in Roseau County, Minnesota. The objective of the RMS was to identify regulated materials at the Site that have special handling requirements and/or must be removed prior to building demolition in accordance with Minnesota Administrative Rule Part 7035.0805, Renovation and Demolition. This included documentation of the presence, condition and estimated quantity of accessible asbestos containing building materials (ACBM) and other hazardous or regulated materials located on both the exterior and interior of the former school building structures. The RMS was complicated due to the building design and structure that included an initial building constructed in 1918 with major additions constructed in 1951, 1956 and 1967 and other modifications made throughout the site history. During the survey, Amec Foster Wheeler personnel identified suspect asbestos containing materials (ACM) which was grouped into over 120 homogenous sampling areas. Each of which was sampled and submitted for asbestos analysis. The results were documented into sampling material logs and depicted on building plans. In addition to the asbestos survey, Amec Foster Wheeler conducted a non-asbestos regulated materials survey to comply with Minnesota Administrative Rule that requires removal of regulated materials from buildings prior to demolition. The types of materials regulated prior to building demolition are identified by the Minnesota Pollution Control Agency (MPCA) in the "Pre-Renovation/Demolition Environmental Checklist (guidance document w-sw4-20) and include; mixed municipal solid waste, household hazardous waste, industrial or hazardous waste, waste tires, major appliances, items containing elemental mercury, polychlorinated biphenyls (PCBs), chlorofluorocarbons (CFCs), oil, lead, electronics, and other prohibited items.

Conduct third party review and analysis of technical information for the purpose of providing conclusions and recommendations to the State

Amec Foster Wheeler staff performs third-party reviews of technical reports and analytical data for many of our existing clients. The reviewed reports are typically prepared by another engineering consulting company that was previously involved in work at the site. Third party reviews can include review of one document or entire files of documents.

The available Amec Foster Wheeler staff exhibits a level of experience which allows the efficient review and interpretation of data, supporting the preparation of pertinent conclusions and recommendations. MCPA and MDA will benefit from the significant depth of skills and experience that Amec Foster Wheeler brings to the project.

Representative Experience

Closed Sites Vapor Intrusion Evaluation Program, Statewide, MN: Amec Foster Wheeler conducted a regulatory file review and sensitive receptors evaluation, for potential vapor intrusion concerns, for sites that had previously been closed by the MPCA. Specifically, the closed sites were further evaluated to determine the potential for human health risk attributed to previously uninvestigated soil vapor impacts and/or residual groundwater contamination that may exceed current criteria. Amec Foster Wheeler developed an evaluation matrix that included consideration of site background and use, hydrogeologic information, previous investigations, and analytical profiles specifically, including recent analytical results for chlorinated volatile organic compounds (CVOCs). Profile summaries were

developed for all sites and a matrix providing recommendations to the MPCA for additional evaluation was provided.

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

Amec Foster Wheeler can assist MPCA and MDA in developing new program policies and guidance for the development of health and/or ecological risk criteria/standards. We have worked with MPCA to review and evaluate Soil Reference Values (SRVs) for VOCs. Our scope included:

- Serving as a technical resource for SRV workgroup members on the development of SRVs for VOCs.
- Researching other risk assessment methods that could be used in conjunction, or in place of the current SRV model. These may include the use of bioattenuation models/factors, source depletion models/factors, finite source areas, or air dispersion models.
- Development of draft additional exposure scenarios.
- Conducting sensitivity analysis and development of an SRV User Manual.

Perform five-year reviews/and site reviews

Amec Foster Wheeler has the technical background and expertise to perform five-year reviews and site reviews and frequently conducts such reviews for our federal clients and for our CERCLA sites. The purpose of the five-year review is to evaluate the implementation and performance of remedies to determine whether each remedy remains protective of human health and the environment. In situations where the remedy is not functioning as intended, Amec Foster Wheeler will make recommendations to address issues.

Representative Experience

Arrowhead Superfund Site, St. Louis County, MN. Amec Foster Wheeler completed a five-year review for the Arrowhead Refinery Site in St. Louis County, MN to evaluate the effectiveness of a groundwater extraction system, subsequent performance monitoring and institutional controls. The groundwater extraction system operated from 1993 to 2007 at which time the system was shut down for a trial period due to clean up goals having been met at the Site perimeter. The shut-down became permanent, and the groundwater extraction system was decommissioned in 2011. Groundwater performance monitoring was being performed on a semi-annual basis for constituents 1,4-dioxane, DRO, and dissolved arsenic to monitor and evaluate potential impacts to receptors. Previous five-year reviews identified that 1,4-dioxane and DRO were detected at levels above MDH health based values, however no drinking water receptors were present. Amec Foster Wheeler identified that some institutional controls (ICs) for the Site had been implemented; however, to ensure future protectiveness, additional ICs were recommended for the Site.

Prepare draft decision documents and other documents such as grant applications, draft institutional controls, permit applications

Amec Foster Wheeler understands that agency projects require the preparation of a variety of documents, including decision documents, grant applications, institutional control documents, and permit applications. The Amec Foster Wheeler Minneapolis staff has completed approximately 30 projects requiring these types of submittals. Our project teams have a detailed knowledge of what is needed to compile and prepare the submittals. We also work closely with others, such as attorneys, when preparing legally binding instruments.

Representative Experience

Amec Foster Wheeler supported the MPCA with a grant application for Contaminants of Emerging Concern Project Funds in 2018/2019. The grant application requested funds to assist with additional study to support the statewide PFAS inventory evaluation. Sampling of all applicable media at each industrial location type was proposed in each media (i.e. soil, sediment, groundwater, surface water). The intent of the grant was to understand how each industry classification used and possibly discharged PFAS to the environment. It was also intended to help our

understanding of the PFAS transport mechanisms to other environmental media and ultimately exposing human and ecological populations to PFAS.

Perform operation and maintenance system review and optimization

For a number of our sites, including superfund and RCRA corrective action sites, Amec Foster Wheeler has conducted formal remedial system evaluations and optimizations. These typically have been pump and treat systems, SVE systems and SSD systems, looking at reliability, effectiveness and attainment of objectives. We re-evaluate objectives and performance standards and re-design more efficient approaches. In some cases, closure criteria have been ambiguous and we have made these goals more specific, allowing the design of exit and termination strategies.

Amec Foster Wheeler's Minnesota staff has experience operating and maintaining both soil, soil vapor and groundwater remediation systems as well as evaluating effectiveness of landfill cover systems. Once remediation systems become operational, our goal is to maintain equipment function and find opportunities to maximize system effectiveness and minimize operational costs. To that end, we maintain accurate system records, perform routine maintenance, and review operational costs. Amec Foster Wheeler also reviews routine monitoring data to assess the need for system enhancements to shorten the time the remedial system needs to remain in operation.

Another important aspect to system operation is troubleshooting problems to minimize down time. Amec Foster Wheeler has the ability to quickly determine system components that require rehabilitation, repair or replacement, and getting the correct parts and/or contractors on-site to return the system to operational status.

Representative Experience

Confidential Manufacturing Facility (Superfund Site), Hennepin County, MN: Amec Foster Wheeler designed and conducted construction oversight of a groundwater extraction and treatment system (GWETS) installed to address groundwater contaminated with CVOCs, specifically TCE and associated breakdown products. Prior to commissioning, several permits were obtained, including an MDH well appropriation permit with pumping limits for each well not to exceed between 15-49 gpm and a MCES Industrial Discharge permit which specifies the conditions that the discharged water must meet. Amec Foster Wheeler completed several weeks of system commissioning, which required 24-7 technical staff availability to continually evaluate system performance and properly integrate mechanical, electronic, and remote monitoring functions until an ideal operating state was achieved. Throughout this process, Amec Foster Wheeler's technical on-site staff and engineering team developed an OM&M plan containing a sampling plan as well as 32 SOPs specific to the system and its components that ensure successful operation and maintenance of the system and compliance with the MDH and MCES permits. Amec Foster Wheeler has also provided training for an OM&M contractor and continues to review system operation.

- Landfill Operations, Maintenance and Monitoring (OM&M), Winnebago County, Wisconsin: Amec Foster Wheeler recently conducted OM&M services at two separate landfill sites in Winnebago County, Wisconsin to ensure that the landfills remain in compliance with federal, state and local requirements. Routine OM&M activities included quarterly landfill gas monitoring, semiannual groundwater, leachate, and surface water monitoring, coordinating with residents and conducting private water well sampling, analytical data reporting using the Wisconsin Department of Natural Resources (WDNR) Groundwater and Environmental Monitoring System (GEMS), leachate line cleaning, landfill inspections, leachate transport and disposal and routine maintenance. Routine maintenance activities include mowing of the landfill cap, brush clearance along fence lines and around monitoring wells, road repair, landfill cap maintenance, including erosion/settlement repairs, regrading and seeding, and maintenance/repair of sampling points. Amec Foster Wheeler conducted routine inspections to ensure effective operation of the leachate management systems and conducted reviews of leachate system effectiveness. Amec Foster Wheeler also conducted a spatial and temporal evaluation of the historical monitoring data to optimize the long-term monitoring program at one of the facilities. The optimization activities included a statistical evaluation using Monitoring and Remediation Optimization System (MAROS) and Visual Sample Plan (VSP) software. The results of the optimization evaluation determined that the frequency of monitoring could be reduced while still providing sufficient data to illustrate remedy effectiveness.

Research, evaluate and implement innovative technologies

Our technical staff are continually researching and evaluating emerging technologies. We provide our staff the chance to research technologies on their own or give them the opportunity to attend pertinent conferences and seminars.

Amec Foster Wheeler staff has had an active role presenting the findings of our research and development efforts at major conferences and symposia, such as the Battelle Conference on the Remediation of Chlorinated and Recalcitrant Compounds, the Nielsen Field Exposition, and the Battelle On-Site In-Situ Bioremediation Conference. We have also successfully secured funding from the DoD Research entity ESTCP and SERDP to evaluate and implement innovative technologies.

Representative Experience

Amec Foster Wheeler has recently been awarded a project with SERDP called “Combined In Situ / Ex- Situ Treatment Train for Remediation of PFAS Contaminated Groundwater” and a second project with ESTCP called “Removal and Destruction of PFAS and Co-Contaminants from Groundwater” The intention of both projects is to evaluate innovative treatment train technologies to support the eventual on-site destruction of PFAS using an enhanced contact low energy plasma reactor.

Prepare presentations and present information at meetings

Amec Foster Wheeler prepares formal and informal presentations to provide our clients with prompt de-briefing meetings and detailed technical seminars. We work from handouts, white boards, prepare power point presentations, or use virtual meetings via Skype or WebEx. The meeting formats are developed to meet the needs of every project and the client requirements.

- In response to PFAS contamination, Amec Foster Wheeler responded to a Restoration Advisory Board (RAB) reestablished in 2015 due to concerns with PFAS in the community. Amec Foster Wheeler presented at RAB

meetings, reviewed meeting minutes, provided technical support to the Public Affairs team, and addressed questions to for the general public and other project stakeholders.

Oversee stormwater program requirements during construction activities

Amec Foster Wheeler has trained engineers and inspectors to oversee construction activities and compliance with stormwater and erosion control requirements. Our activities typically begin with providing plans and specifications for a project to a contractor. We then work with the contractor to be sure that they completely understand the plan requirements. The contractor and site owner apply for and sign the appropriate permits, with assistance from Amec Foster Wheeler engineers if necessary. Copies of the permit are delivered to the Amec Foster Wheeler project managers and inspectors. Contractors maintain daily logs of site activities related to the permits, but Amec Foster Wheeler inspectors make sure that paperwork is completed and filed. Amec Foster Wheeler inspectors and project managers also have control of site activities so that work can be halted if erosion or sediment control problems are observed or plans are not followed.

Representative Experience

- Amec Foster Wheeler coordinated with a private petroleum refinery client and regulatory entities, including City, MN Department of Health, MN Department of Natural Resources (MnDNR), and MPCA, to ensure appropriate permits were addressed for the construction of a 6-million-gallon fire water supply tank, associated pumps, structures, and groundwater well. Amec Foster Wheeler obtained a Construction Stormwater Permit on behalf of the client for the 2.3 acre project within 1 mile of the Mississippi River. Amec Foster Wheeler developed a Stormwater Pollution Prevention Plan (SWPPP) design and document for the project using the MPCA stormwater manual and associated templates, and completed several revisions in collaboration with the client prior to and throughout the course of construction when warranted by site changes. Changes to the SWPPP were documented within an amendments table within the appendix of the document. A MCES permit application was completed and submitted by Amec Foster Wheeler for the discharge of hundreds of thousands of gallons of waste water during the groundwater well drilling. This required coordinating management of the water using several frac tanks and regular sampling of the water during the four weeks of drilling to ensure compliance with the MCES permit. Weekly stormwater inspections were also conducted by Amec Foster Wheeler certified staff who worked closely with the construction manager to ensure requirements of the SWPPP were met and documentation was in place at all times.
- Amec Foster Wheeler was hired for environmental engineering and regulated materials planning relative to the de-commissioning process at Ford's Twin Cities Assembly Plant beginning in 2012. Subsequently, Amec Foster Wheeler completed a review and a new SWPPP document in 2016 and also assumed inspection responsibilities. This effort required coordination with the client and regulatory entities, including MDH, MnDNR, MPCA, and the Capital Region Watershed District to ensure appropriate permits were addressed for the continued demolition and regulated materials management at this 145-acre site adjacent to the Mississippi River. The document allows for several revisions throughout the course of the project, with changes documented within an amendment log in the appendix of the document and completed by a qualified individual. Amec Foster Wheeler continues to support Ford by conducting weekly stormwater inspections.

Provide technical assistance to the State in the evaluation and interpretation of data and information

The experience level of Amec Foster Wheeler staff allows them the ability to review and interpret data quickly, and provide a list of conclusions and recommendations that are site-specific in nature, drawing from our significant experience with a large number of project sites. Amec Foster Wheeler has recently conducted a number of soil vapor investigations in support of the MPCA Site Assessment program. A component of each project includes an evaluation of lab data and interpretation of how the results refine our understanding of the site conceptual model. With each phase of an MPCA Site Assessment project, Amec Foster Wheeler makes recommendations in our data transmittal reports to ensure that necessary measures are being taken to protect human health.

Oversight of responsible party and voluntary party contractors during site investigations or response actions

Amec Foster Wheeler has extensive experience overseeing both responsible party and voluntary party contractors during the course of site investigations and response actions. Once site work has been initiated, Amec Foster Wheeler staff are on-site during all phases of the project to document the activities performed and collect necessary samples. Field staff are in constant communication with the Amec Foster Wheeler project manager to ensure the field activities comply with the approved scope of work.

Oversee or conduct bench scale lab treatability studies, pilot testing and field demos

Amec Foster Wheeler has an in-house treatability laboratory that is utilized on all projects that have a need for bench-scale and pilot-scale testing.

Representative Experience

Pease Air Force Base

- Developed remedial design for bioremediation treatability study evaluating the efficacy of enhanced aerobic in-situ bioremediation (EISB-a) to treat fuel-related petroleum hydrocarbon compounds in groundwater.
- Selected EISB-a, along with focused ISCO at CAA 4C only for CAA 4C and CAA 7 based on the site-specific geochemical conditions in groundwater and the types of petroleum compounds present.
- Selected DPT as the proposed technology for injecting a slow-release oxygen compound into the TTZ.
- Complied with CERCLA and state regulations.

Assist and provide training as requested by the MPCA or MDA.

Amec Foster Wheeler staff have significant expertise communicating our knowledge, both general and project specific, to our network of private and public clients. Training efforts have included a field-focused event informing MPCA and MDA of the latest sampling techniques to informal presentations communicating project-specific details.

Representative Experience

- Amec Foster Wheeler was selected by the MPCA to provide TMDL Best Management Practices Training.
- Teamed with MPCA VIC staff and MDH staff, to conduct a vapor intrusion seminar for local professionals and property owners.
- Participated in two projects supporting MPCA initiatives in Emerging Contaminants and Soil Reference Values (SRVs). Amec Foster Wheeler was contracted to develop a PFAS Information Clearinghouse that included the compilation of more than 1,200 technical references on PFAS. As part of the project, Amec Foster Wheeler developed a User's Guide and trained MPCA staff on the use of the PFAS clearinghouse tool. Amec Foster Wheeler was also hired to support the evaluation of SRVs in support of the MPCA SRV Work Group and develop a User's Guide to support the revised SRVs.

Follow MPCA Green practices/procedures for remediation projects

The EPA has established recommendations, requirements, standards, and practices that promote sustainable environmental stewardship. Within these items, the MPCA has identified 5 main categories of "green" practices which can be applied in the Petroleum Remediation Program (PRP). The five categories include:

- Purchasing
- Transportation
- Field Work
- Project Management
- Waste Reduction

As a current MPCA and MDA Level 3 Environmental Services contractor, Amec Foster Wheeler has been providing Annual Usage reports as well as Green Practices Work Plans for MPCA projects. Amec Foster Wheeler is also familiar with Green and Sustainable Remediation (GSR) guidance (PRP1-10) and incorporates GSR into our planning and design process.

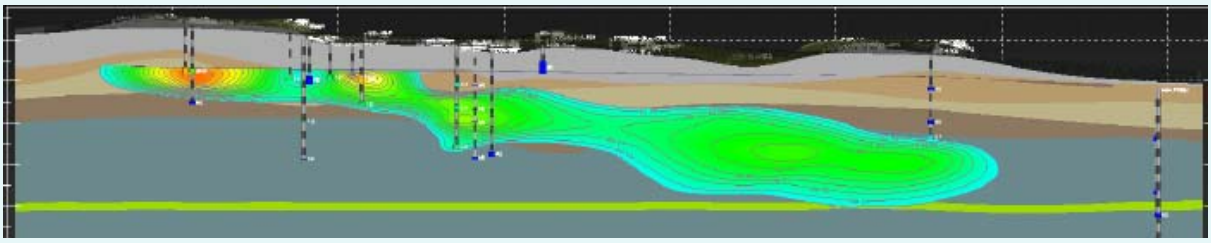
Oversee hydrogeologic investigations, including fate & transport modeling, capture zone analysis and pump tests

Amec Foster Wheeler has vast experience conducting detailed hydrogeologic investigations and data analysis, including groundwater flow and contaminant fate and transport modeling, capture zone analysis, aquifer pumping test design and analysis, slug test design and analysis and specific capacity testing and analysis. We use nearly all the commonly-utilized software for hydrogeologic investigations, including MODFLOW, RT3D, BIOCHLOR, BIOSCREEN, NAS, and AQTESOLV. Amec Foster Wheeler also conducts capture zone analysis for operating groundwater extraction remedies to confirm adherence to remedial action objectives.

Amec Foster Wheeler routinely utilizes our hydrogeologic skill set to design groundwater remedies, including groundwater pump and treat, in-situ bioremediation, in-situ chemical oxidation, and air sparging. We model the migration of contaminants between soil and groundwater, groundwater and soil vapor, and groundwater and surface water, because the interactions between these media typically have a significant impact on remedy selection, design, operation and optimization. Our local Amec Foster Wheeler office also owns the 3D visualization and animation software called Earth Volumetric Studio (EVS) by CTech and we have utilized this package in conjunction with other groundwater modeling software packages to maximize presentation and geostatistical measurement and verification.

Representative Experience

- Groundwater Modeling – Confidential Client – Hennepin County, MN. Amec Foster Wheeler developed a numerical groundwater flow in support of ongoing RI activities consisting of groundwater extraction of a TCE groundwater plume. The groundwater model was developed to assist with extraction system design, as a tool to simulate groundwater flow on and off-Site, and evaluate the hydraulic effect, of groundwater extraction/remediation design. The regional scale Twin Cities Metropolitan Area groundwater flow model v.3.0 (MM3) was used as a basis for the model. A fully integrated pre- and post-processor, Visual MODFLOW, was used to assemble the input data for the model and to present the output results. Simulations were conducted by using MODFLOW-NWT.



- Groundwater Modeling Support, Pease Air Force Base, New Hampshire: Amec Foster Wheeler developed a groundwater model related to PFAS groundwater contamination. Groundwater sampling results showed PFAS detected above the Health Advisory (HA) of 0.07 micrograms per liter (µg/L). A numerical groundwater flow model was deemed appropriate to support addressing the identified data gaps, including visualizing flow patterns at the site, and to aid in decision making with respect to potential future data collection, monitoring, and remedial efforts. The hydraulic flow model was developed using MODFLOW-NWT and covers approximately 32.7 square miles of the Newington peninsula centered on the former base. the flow model was calibrated using manual adjustments of model input parameters in combination with Parameter ESTimation code (PEST). Adjective transport modeling using MODPATH and advection-dispersion modeling using MT3D has been used in conjunction with the MODFLOW-NWT flow model to support selection of sentinel monitoring well locations, selection of a final remedial option, and for the final design of a multi-million-dollar water quality treatment system designed to protect municipal supply wells.

Prepare and determine if the Stormwater Pollution Prevention Plan (SWPPP) is being followed and make recommendations if revisions are needed during the life of the construction project

Amec Foster Wheeler engineers prepare stormwater plans to address stormwater quantity and quality issues at each site with construction activity. Amec Foster Wheeler reviews each site to learn about areas where stormwater management has been a problem in the past. For example, we identify areas that flood frequently during rain events. Next we review changes to the site, such as changes to impermeable surfaces that might impact stormwater runoff. When working on contaminated sites, it is always critical to look at the potential for sediment or other contaminants to be moved within the site or away from the site. Amec Foster Wheeler uses HydroCAD to evaluate most sites, although more complex models are available if necessary. We are very cognizant of the need to protect sensitive natural resources such as impaired waters, trout streams, calcareous fens, and other areas with outstanding resource value. We have experience with stormwater infiltration for maintaining stormwater volume control as well as rate control. Stormwater plans for the periods during construction and after construction are reviewed with cities, watershed districts, MPCA, and other interested parties before being implemented and are amended as changes arise.

Representative Experience

Amec Foster Wheeler prepared a SWPPP in support of a fueling system construction project in Washington County, Minnesota. The SWPPP was developed using the MPCA stormwater manual and associated templates, and Amec Foster Wheeler completed several revisions in collaboration with the client prior to and during the 16-month construction project. Updates to the SWPPP included: updates to terminology and contact information, updates to site layouts as various stages of construction were completed, updates to BMPs associated with performance observations, updates to scope of work and updates to BMPs to address testing activities in the final construction phase.

Exhibit 9. Project Personnel Compared to Scope of Work

	Management												Subject Matter Experts															
	G. Bondy	G. Sandholm	E. Driver	A. Bernhardt	A. Fiskness	J. Murer	S. Murray	E. Siewert	S. Thomas	C. Vowles	C. Hudak	J. Grams	C. Abate	H. Albertus-Benham	D. Barsotti	M. Bevier	J. Caryl	J. Field	G. Haines	W. High	C. Landrum	B. Malyk	B. Marxen	J. Renier	T. Rodolakis	R. Talbot	M. Vavra	D. Woodward
Prepare Engineering Evaluation Costs Analysis (EECA).	●			●			●								●				●				●	●	●	●		●
Oversee or conduct pilot testing of remediation systems.	●				●		●			●				●	●		●	●	●				●	●	●	●	●	●
Operate and maintain remediation systems.	●		●		●		●			●				●			●	●	●				●	●		●	●	●
Prepare corrective action design documents (e.g., CAD design reports, pilot test reports, installation notification reports, monitoring reports, plans, and as-built reports).	●		●	●	●	●	●			●		●		●	●		●	●	●	●			●	●	●	●	●	●
Prepare Health and Safety Plans (HASP).	●	●	●	●	●	●	●		●	●	●	●		●	●		●	●					●	●	●		●	●
Oversee site investigation services for soil boring advancement, and monitoring well installation using both standard drilling methods, and direct push methods.			●		●	●	●			●	●			●									●	●			●	●
Conduct ground water, soil, surface water, sediment, and air sampling and monitoring.			●		●	●	●			●	●			●				●					●	●			●	
Conduct vapor/air monitoring for health and safety and air quality criteria.			●		●	●	●			●				●	●			●	●				●	●	●	●	●	
Conduct and/or oversee site assessment activities (Phase I and Phase II), limited site investigations and remedial investigations.			●		●	●	●			●	●			●									●	●			●	●
Conduct surface water, ground water, air and vapor receptor surveys.	●		●		●	●	●			●				●			●						●	●			●	
Oversee construction to mitigate vapors and conduct non-construction mitigation measures such as using fans, etc.					●	●	●			●				●	●		●	●					●	●	●			
Install stainless steel soil gas sampling ports using an electric drill to bore through floor slabs.					●	●	●			●				●	●			●					●	●	●		●	
Oversee construction to complete sediment sampling and conduct non-construction sediment sampling as needed.	●		●		●	●	●			●							●			●								
Conduct or oversee operation and maintenance on remedial systems.	●				●		●			●				●			●	●	●				●	●		●	●	●
Arrange for transportation, storage, and proper management of wastes.	●		●	●	●	●	●	●		●	●			●			●	●					●	●			●	
Evaluate the need for and oversee the implementation of alternative drinking water supply, including point-of-use treatment (i.e. filtration).	●		●	●		●	●						●		●		●			●		●	●		●			●
Evaluate, monitor, design and remediate contaminated sediment and other necessary restorative actions.	●		●		●	●	●			●			●				●	●		●	●			●			●	
Coordinate remedy planning, restoration planning and end use planning.	●			●		●	●						●		●		●			●		●			●			
Search, gather, and evaluate bathymetric data.	●					●	●				●		●				●			●	●							
Coordinate and cooperate with other State-contracted services such as sampling and analytical, emergency response contractors, and hazardous waste services.	●		●	●	●	●	●	●	●	●	●	●		●			●	●	●				●	●		●	●	●
Arrange for geophysical activities	●		●		●	●	●	●	●	●	●	●		●			●	●	●		●		●	●		●	●	●
Oversee subcontractors and state contractors during investigation and cleanups and tank removals	●		●		●	●	●			●				●			●	●					●	●			●	●
Prepare and evaluate reports (e.g., investigation reports, monitoring reports, free product recovery reports).	●		●		●	●	●		●	●	●	●		●			●	●			●		●	●			●	●
Evaluate invoices.	●		●	●	●	●	●		●	●	●	●		●			●						●	●			●	
Collect and manage field and laboratory data for electronic submittal in a format specified by the MPCA			●	●	●	●	●		●	●	●			●		●			●		●		●	●		●	●	

Exhibit 9. Project Personnel Compared to Scope of Work

	Management												Subject Matter Experts																
	G. Bondy	G. Sandholm	E. Driver	A. Bernhardt	A. Fiskness	J. Murer	S. Murray	E. Siewert	S. Thomas	C. Vowles	C. Hudak	J. Grams	C. Abate	H. Albertus-Benham	D. Barsotti	M. Bevier	J. Caryl	J. Field	G. Haines	W. High	C. Landrum	B. Malyk	B. Marxen	J. Renier	T. Rodolakis	R. Talbot	M. Vavra	D. Woodward
Evaluate data quality and data verification reports.			●	●	●	●			●		●				●				●		●			●	●	●	●	●
Arrange for site access.	●		●		●	●	●		●	●	●	●		●			●				●		●	●			●	
Coordinate utility locates by contacting the appropriate entity and if applicable coordinate traffic control.	●		●		●	●	●	●	●	●	●			●			●						●	●			●	
Prepare and evaluate bid specifications.	●		●	●			●			●		●		●			●	●	●				●			●		●
Conduct and review human health and/or ecological risk assessments.	●		●		●	●	●		●			●			●				●		●				●	●		
Prepare and review Quality Assurance Project Plans (QAPP) and Sampling and Analysis Plans (SAP) in accordance with state and federal requirements.	●		●	●	●	●	●		●	●	●	●		●	●	●	●	●			●		●	●	●		●	●
Perform feasibility and treatability studies.	●		●		●	●	●			●		●	●						●				●	●		●		●
Design comprehensive remedial action remedies and remediation systems.	●				●		●												●	●			●			●		●
Conduct and oversee remedial investigation			●		●	●	●			●	●			●				●	●				●	●		●	●	●
Oversee installation of remedial actions and remedial systems.	●		●		●		●			●		●		●			●	●	●	●			●	●		●	●	●
Conduct surface water, ground water, and hydrodynamic modeling.			●		●					●			●					●	●		●			●		●	●	
Perform asbestos identification and if necessary oversee asbestos abatement and removal.			●											●				●					●					
Conduct third party review and analysis of technical information for the purpose of providing conclusions and recommendations to the State.	●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
Provide support for the analysis and development of program policy and guidance, including developing health or ecological risk criteria/standards (including technical report preparation).	●		●	●	●	●	●		●		●	●			●			●	●	●	●	●	●	●	●	●		●
Perform five-year reviews/ and site reviews.	●		●	●	●	●	●				●	●	●		●								●	●	●			●
Prepare draft decision documents and other documents such as grant applications, draft institutional controls, permit applications	●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●		●	●	●	●		●	●
Perform operation and maintenance system review and optimization.	●		●		●		●					●	●	●			●	●	●	●	●		●	●		●		●
Research, evaluate and implement innovative technologies.	●		●	●	●	●	●			●	●	●	●	●	●		●	●		●	●	●	●	●	●		●	●
Prepare presentations and present information at meetings.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●	●	●	●	●		●	●
Oversee Stormwater Program requirements during construction activities.							●							●			●						●					
Provide technical assistance to the State in the evaluation and interpretation of data and information.	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●		●	●
Oversight of Responsible Party and Voluntary Party Contractors during site investigations or response actions.	●		●		●	●	●		●	●	●	●		●			●						●	●			●	
Oversee or conduct bench scale lab treatability studies, pilot testing and field demos.	●		●		●		●										●		●	●			●	●		●		●
Assist and provide training as requested by the MPCA or MDA. Training must be related to the scope of this contract.	●	●	●	●	●	●	●		●	●	●	●		●	●	●	●				●		●	●	●		●	●
Follow MPCA Green practices/procedures for remediation projects.			●		●	●			●	●	●	●		●				●	●	●	●		●	●		●	●	●
Oversee hydrogeologic investigations including fate & transport modeling, capture zone analysis and pump tests.	●				●	●	●			●	●		●		●				●		●		●	●	●	●	●	●
Prepare and determine if the Stormwater Pollution Prevention Plan (SWPPP) is being followed and make recommendations if revisions are needed during the life of the construction project.			●				●							●			●						●				●	

Exhibit 9. Project Personnel Compared to Scope of Work (continued)

	Engineers														Scientists / Technicians																		Other		
	Z. Al-Yassiri	S. Bashir	A. Gagne	S. Hansen	G. Hauck	K. Krol	J. Moran	D. O'Connell	D. Ott	E. Palomino	J. Paul	C. Starkell	T. Rasmussen	T. Shannon	J. Abid	B. Barnes	C. Buckman	D. Costamagna	R. Crawford	S. Cronin	P. Goudreault	S. Henson	E. Heytens	G. Horstmeier	A. Klaustermeier	R. Lahti	M. Matteson	D. Miller	J. Wegleitner	C. Smith	M. Torres	T. Fischer	S. Mathews	E. Thomas
Prepare Engineering Evaluation Costs Analysis (EECA).		●	●	●	●	●	●	●	●	●	●	●	●	●													●		●			●	●	●
Oversee or conduct pilot testing of remediation systems.		●	●						●				●		●	●	●		●						●		●			●	●	●	●	
Operate and maintain remediation systems.	●	●	●						●				●		●	●	●			●		●			●		●			●	●			
Prepare corrective action design documents (e.g., CAD design reports, pilot test reports, installation notification reports, monitoring reports, plans, and as-built reports).		●	●						●				●		●		●		●								●		●		●	●	●	
Prepare Health and Safety Plans (HASP).		●	●						●				●		●		●	●		●						●	●		●		●			
Oversee site investigation services for soil boring advancement, and monitoring well installation using both standard drilling methods, and direct push methods.	●	●	●						●				●		●	●	●	●	●	●		●			●		●			●	●			
Conduct ground water, soil, surface water, sediment, and air sampling and monitoring.		●	●												●	●	●	●	●	●		●		●	●		●		●	●	●			●
Conduct vapor/air monitoring for health and safety and air quality criteria.		●	●													●			●			●			●		●			●	●	●	●	
Conduct and/or oversee site assessment activities (Phase I and Phase II), limited site investigations and remedial investigations.	●	●	●						●				●		●	●	●	●	●	●		●			●	●	●		●	●	●			
Conduct surface water, ground water, air and vapor receptor surveys.		●	●												●	●	●		●	●		●		●	●		●			●	●			●
Oversee construction to mitigate vapors and conduct non-construction mitigation measures such as using fans, etc.		●	●						●							●						●			●		●			●	●	●	●	
Install stainless steel soil gas sampling ports using an electric drill to bore through floor slabs.									●							●			●			●			●					●	●	●	●	
Oversee construction to complete sediment sampling and conduct non-construction sediment sampling as needed.	●	●							●				●		●				●	●				●			●	●			●			●
Conduct or oversee operation and maintenance on remedial systems.	●	●	●						●				●		●	●	●		●			●			●		●			●	●			
Arrange for transportation, storage, and proper management of wastes.		●	●						●				●		●	●	●	●	●	●		●			●		●			●	●			
Evaluate the need for and oversee the implementation of alternative drinking water supply, including point-of-use treatment (i.e. filtration).		●	●						●				●				●															●	●	
Evaluate, monitor, design and remediate contaminated sediment and other necessary restorative actions.	●	●													●	●			●	●				●	●		●	●		●	●			●
Coordinate remedy planning, restoration planning and end use planning.	●	●							●				●		●				●	●							●					●	●	
Search, gather, and evaluate bathymetric data.	●														●									●				●						●
Coordinate and cooperate with other State-contracted services such as sampling and analytical, emergency response contractors, and hazardous waste services.		●	●						●				●		●	●	●	●	●	●		●	●		●	●	●			●	●			
Arrange for geophysical activities		●	●												●		●			●		●	●			●	●		●		●			
Oversee subcontractors and state contractors during investigation and cleanups and tank removals		●	●												●	●	●	●	●	●		●			●	●	●			●	●			
Prepare and evaluate reports (e.g., investigation reports, monitoring reports, free product recovery reports).		●	●												●	●	●	●	●	●		●			●	●	●			●	●			●
Evaluate invoices.		●	●						●				●		●		●			●						●	●							
Collect and manage field and laboratory data for electronic submittal in a format specified by the MPCA																●	●	●		●		●			●	●		●	●	●	●			●

Exhibit 9. Project Personnel Compared to Scope of Work (continued)

	Engineers														Scientists / Technicians																	Other		
	Z. Al-Yassiri	S. Bashir	A. Gagne	S. Hansen	G. Hauck	K. Krol	J. Moran	D. O'Connell	D. Ott	E. Palomino	J. Paul	C. Starkell	T. Rasmussen	T. Shannon	J. Abid	B. Barnes	C. Buckman	D. Costamagna	R. Crawford	S. Cronin	P. Goudreault	S. Henson	E. Heytens	G. Horstmeier	A. Klaustermeier	R. Lahti	M. Matteson	D. Miller	J. Wegleitner	C. Smith	M. Torres	T. Fischer	S. Mathews	E. Thomas
Evaluate data quality and data verification reports.									●				●			●									●					●		●	●	
Arrange for site access.	●	●	●						●				●		●		●	●	●	●		●				●	●				●			
Coordinate utility locates by contacting the appropriate entity and if applicable coordinate traffic control.	●	●	●												●	●	●	●	●	●		●			●	●	●			●	●			
Prepare and evaluate bid specifications.		●	●	●	●	●	●	●	●	●	●	●	●	●			●			●	●		●				●							
Conduct and review human health and/or ecological risk assessments.																																●	●	
Prepare and review Quality Assurance Project Plans (QAPP) and Sampling and Analysis Plans (SAP) in accordance with state and federal requirements.		●	●						●				●		●	●	●	●		●					●	●	●			●	●	●	●	
Perform feasibility and treatability studies.		●	●						●				●		●		●										●				●			●
Design comprehensive remedial action remedies and remediation systems.									●				●														●							
Conduct and oversee remedial investigation	●	●	●						●				●		●	●	●		●	●		●		●	●		●			●	●			
Oversee installation of remedial actions and remedial systems.		●	●	●	●	●		●	●			●	●	●	●	●	●						●		●		●			●	●			
Conduct surface water, ground water, and hydrodynamic modeling.																	●							●				●						●
Perform asbestos identification and if necessary oversee asbestos abatement and removal.									●				●																					
Conduct third party review and analysis of technical information for the purpose of providing conclusions and recommendations to the State.		●	●	●		●		●	●				●		●		●	●		●	●		●			●	●		●	●	●	●	●
Provide support for the analysis and development of program policy and guidance, including developing health or ecological risk criteria/standards (including technical report preparation).									●				●							●	●					●						●	●	
Perform five-year reviews/ and site reviews.		●	●						●				●		●						●	●					●							●
Prepare draft decision documents and other documents such as grant applications, draft institutional controls, permit applications		●	●						●				●		●		●			●	●	●				●	●				●	●	●	
Perform operation and maintenance system review and optimization.		●	●	●	●	●		●	●			●	●	●			●										●							
Research, evaluate and implement innovative technologies.	●								●				●				●			●						●	●				●	●	●	●
Prepare presentations and present information at meetings.	●	●	●	●		●		●	●				●		●		●			●	●					●	●				●	●	●	●
Oversee Stormwater Program requirements during construction activities.	●			●		●		●	●				●							●		●					●							
Provide technical assistance to the State in the evaluation and interpretation of data and information.		●	●						●				●		●		●	●		●	●			●		●	●	●	●		●	●	●	●
Oversight of Responsible Party and Voluntary Party Contractors during site investigations or response actions.	●	●	●						●				●		●	●	●	●	●	●		●			●	●	●			●	●			
Oversee or conduct bench scale lab treatability studies, pilot testing and field demos.		●	●						●				●				●							●			●				●			
Assist and provide training as requested by the MPCA or MDA. Training must be related to the scope of this contract.	●	●	●						●				●				●			●	●	●					●	●				●	●	●
Follow MPCA Green practices/procedures for remediation projects.									●				●			●	●	●		●	●	●	●		●				●	●	●			
Oversee hydrogeologic investigations including fate & transport modeling, capture zone analysis and pump tests.		●	●						●				●		●		●		●								●				●	●	●	
Prepare and determine if the Stormwater Pollution Prevention Plan (SWPPP) is being followed and make recommendations if revisions are needed during the life of the construction project.	●			●		●		●	●				●							●		●					●							

A.4 Project Descriptions

A.4 Project Descriptions

A.4.1 Hazardous Waste Project Description
Confidential Manufacturing Facility –
Remedial Investigation/Feasibility Study & Corrective Action

Golden Valley, Minnesota

Client Name: Confidential

Client Contact: Chuck Geadelmann

Telephone: 763-954-5418

Period of Performance: 2006 to present

Site Description

The site is an active manufacturing facility located in Golden Valley, Hennepin County, MN. The site consists of several buildings used for manufacturing and office space that covers approximately 1,100,000 square feet. Previous site investigations determined that the site soil, groundwater and soil vapor have been impacted by chemicals of potential concern (COPCs) associated with the use of 1,1,1-trichloroethane (TCA) and trichloroethylene (TCE) at the Site. COPCs include TCA and TCE as well as degradation (daughter) products, and 1,4-dioxane (a TCA stabilizing agent).

Soil and groundwater beneath and adjacent to the facility are impacted due to a 1982 reported release of solvents from underground storage tanks (USTs) on the west side of the site. The Site was placed on the MPCA Permanent List of Priorities (PLP) in October 1984. A groundwater extraction system (GWES) was installed in 1986 to remove contaminants from groundwater in the release (source) area. Extracted groundwater is discharged, untreated, to the municipal sewer under an MCES permit. A Record of Decision (ROD) was issued by the MPCA in 1990 that selected GWE as the Site remedy. COPCs have migrated off-site to the east in unconsolidated glacial deposits and shallow bedrock (downgradient) toward a residential neighborhood.

The glacial deposits beneath the Site are approximately 90 to 150 feet thick and consist of an upper clay-rich till that extends to an average depth of 30 feet below ground surface (bgs). Saturated zones occur locally within the surficial till below the Site (varying between 15 to 25 feet bgs where present). An outwash-derived glacial sand, interbedded with tills of varying thickness extends to the top of bedrock. The regional water table is typically

Outcome Achieved

- Remedial investigations (RIs) have delineated the nature and extent of groundwater impacts in the glacial and underlying bedrock aquifers on and off Site.
- Feasibility Study selected installation of a groundwater extraction and treatment system to hydraulically contain and capture contaminants at the downgradient property boundary to limit further offsite plume migration (verified by a numeric groundwater model).
- GWETS is currently operational and prevents further offsite migration of contaminants at the downgradient property boundary

Relevant Agencies, Regulations

- MPCA Superfund Program
- Minnesota Department of Natural Resources (MnDNR)
- Metropolitan Council Environmental Services (MCES)
- CERCLA
- MPCA Risk-Based Characterization and Sampling Guidance, (Sept 1998).

Tasks Subcontracted Out

- Drilling, VAS/Soil Boring/Well Installation
- Waterloo™ sampling and hydraulic conductivity profiling
- GWE Well, System Trenching, and Treatment System Construction
- Fixed and On-Site (Mobile) Laboratory Analytical
- Private Utility Locating
- Waste Hauling and Disposal

Personnel

- A. Fiskness – Project Manager
- J. Renier – Senior Hydrogeologist
- J. Gal – Project Engineer
- E. Driver – Data Management
- C. Abate – Groundwater Modeling
- E. Siewert – Permit Compliance / Reporting
- H. Albertus-Benham – Field Engineer

encountered at depths of 55 to 60 feet bgs. The affected bedrock unit below the Site is The St. Peter Sandstone (Osp). Through ongoing RI activities, Amec Foster Wheeler has identified glacial valleys off-site that have eroded down into and through the Pigs-Eye Member of the Osp into the top of the Prairie Du Chien Group (Opdc).

Project Description

Amec Foster Wheeler completed an updated remedial investigation (RI) of groundwater on-site, consisting of vertical aquifer sampling (VAS) using a combination of innovative approaches (cone-penterometer, direct-push Waterloo™ sampling, the rotosonic power punch method and downhole geophysical surveys) to laterally and vertically define the plume extent and the geology and hydrology of the impacted aquifer systems.

Amec Foster Wheeler also conducted an On-Site focused feasibility study (FFS) which selected response actions including; installation and operation of a new GWE and treatment system (GWETS) near the eastern property boundary to control off-Site migration of contaminated groundwater; and the enhancement of the existing GWES at the source area on the west side of the facility.

Amec Foster Wheeler designed and conducted construction management activities for the installation of the GWETS. The GWETS was designed to include six 8-inch diameter extraction wells that withdraw groundwater from two preferential migration pathways identified in the glacial aquifer system and the upper bedrock (Osp). The extraction wells were installed in accordance with an approved Minnesota Department of Natural Resources (MnDNR) Water Appropriation Permit prepared by Amec Foster Wheeler). System design also included a human-machine operator (HMI) and Supervisory Control and Data Acquisition (SCADA) to provide real-time shut-off/safety alarms and allow operations to be remotely monitored to minimize O&M costs. Each well is equipped with variable frequency drive (VFD) and in-well transducers to maintain constant groundwater levels to achieve capture and minimize well-related O&M. Extracted groundwater is passed through a treatment train consisting of a deposit control chemical (DCC), and a series of two, 226-gallon per minute (gpm) granular activated carbon (GAC) vessels to remove VOCs and 1,4-dioxane. Treated effluent is discharged to the sanitary sewer under an MCES Industrial Discharge Special Discharge Water Permit.

Amec Foster Wheeler conducts on-going operation and maintenance (O&M) of the GWETS, including permit compliance sampling of system sample ports/effluent and monitoring wells and monitoring of system flow rates daily using SCADA. Amec Foster Wheeler installed a performance monitoring well network which is gauged monthly to ensure the GWETS achieves established hydraulic capture goals. Performance monitoring results are compared to a numerical groundwater model developed by Amec Foster Wheeler for an additional line of evidence to demonstrate that containment and capture goals are achieved.

Amec Foster Wheeler also completed an offsite VAS investigation east of the site in the glacial and bedrock systems (including installation of vertical compliance wells) and continues to assess the offsite plume extent by direct groundwater sampling. Results are then evaluated using the numerical groundwater model. Ongoing project activities include completion of a design investigation in the source area to assess expansion of the existing source area GWES and/or implement other remedial alternatives to more aggressively remove source area mass and reduce the expected property boundary GWETS run time, to continue to move the site towards closure.

Project Highlights

Amec Foster Wheeler has successfully and cost effectively worked with area property owners, the municipality and other governmental agencies to delineate the downgradient plume lateral and vertical extent in multiple aquifer systems. Amec Foster Wheeler has also successfully installed and operates a GWETS to prevent further offsite migration of contaminants at the down gradient property boundary. The effective numeric groundwater model developed by Amec Foster Wheeler of this complex geologic system provided added efficiency during RI activities and continues to provide value as a tool that is able to test current GWES capture, provide a safe platform to assess potential system optimization (i.e., flow rates) and to enhance design of a system to more aggressively address residual mass in the source area.

A.4.2 Agricultural Chemical Investigation
Canadian Pacific Railway - Cedar Service Site
Soil and Groundwater Investigation
Minneapolis, Minnesota

Client Name: Canadian Pacific Railway

Client Contact: LeeAnn Thomas

Telephone: 612-904-6130

Period of Performance: 2002 to Ongoing

Site Description

The Cedar Service Site (Site) occupies a portion of the Shoreham rail yard in Minneapolis, Minnesota. The Site is bounded on the north by Saint Anthony Parkway and Columbia Heights Park, on the east by Central Avenue Northeast (NE), on the southeast by St. Anthony Cemetery and 28th Avenue NE, on the southwest by 27th Avenue NE, and on the west by University Avenue NE. The Site is located approximately 0.7 miles east of the Mississippi River. The land surface at the Site is generally flat at an elevation of approximately 850 feet above mean sea level.

Between 1926 and 1972, tenants at the Site operated pole storage and wood treating businesses. During tenant operations, pentachlorophenol (PCP) solutions were released onto the ground. The last wood treating tenant business to operate at the Site was Cedar Service Inc., which vacated the Site in 1972. Consequently, the Site is referred to as the Cedar Service Site, and it was assigned Case File number 91 0082 by the Minnesota Department of Agriculture (MDA).

Outcome Achieved

- Delineated a groundwater plume extending within unconsolidated and bedrock groundwater horizons.
- Expanded the groundwater monitoring network to include additional deep bedrock monitoring wells.
- Provides a repository of Site groundwater level and groundwater quality data.

Relevant Agencies, Regulations

- Minnesota Department of Agriculture

Tasks Subcontracted Out

- Drilling and Soil Boring/Well Installation
- Laboratory Analytical
- Surveying
- Waste Hauling and Disposal

Personnel

- S.Thomas – Project Manager
- E.Driver – Assistant PM
- J.Renier – Senior Hydrogeologist
- M.Vavra – Data Management
- J.Murer – Project Reviewer
- C.Vowles – Field Scientist
- H.Albertus-Benham – Technician
- M.Bevier – QA/QC Officer

Project Description

Work by another firm that included personnel now at Amec Foster Wheeler began at the property in 1998 as a review and compilation of multiple consultants' efforts to delineate and understand the Site's hydrogeology.

Since then, Amec Foster Wheeler has prepared a site-specific Health and Safety Plan (HASP) for the Shoreham Facility (which includes the Site), coordinated utility locates, overseen Site investigation services for soil boring advancement and monitoring well installation, conducted soil and groundwater sampling, cored bedrock wells, arranged for transportation, storage, and management of wastes, prepared annual groundwater monitoring reports (including PCP isoconcentration plots and PCP isoconcentration maps for groundwater), and prepared and presented information at meetings with the MDA.

Amec Foster Wheeler's ongoing monitoring activities address contaminants of concern including pentachlorophenol (PCP), polycyclic aromatic hydrocarbons (PAHs), and other hydrocarbons potentially associated with PCP solutions in groundwater. Hollow stem auger and rotosonic drilling techniques have been used to complete soil borings, collect soil samples, and install groundwater monitoring wells in shallow, intermediate, deep, and bedrock hydrostratigraphic units. Related activities have included preparing GIS maps, CADD drawings, and

interpreting historical aerial photography. Amec Foster Wheeler manages a very extensive (over 1.2-million records) environmental database for the entire Shoreham Facility (including the Cedar Service Site) that includes historical data and data produced by Amec Foster Wheeler and others. Amec Foster Wheeler's current ongoing Site activities include quarterly groundwater elevation monitoring, semi-annual groundwater sampling, well maintenance and upkeep, and waste management.

Project Highlights

- Amec Foster Wheeler performed groundwater investigations to delineate the vertical and horizontal extent of groundwater impacts in the unconsolidated and bedrock groundwater horizons.
- Amec Foster Wheeler was able to provide groundwater quality data to demonstrate the PCP plume extent and migration.
- Amec Foster Wheeler expanded the existing groundwater monitoring network by installing deep groundwater wells, and used these drilling events to obtain additional estimates of aquifer properties.
- Ongoing groundwater monitoring tracks the current behavior of the plume.
- Managing an over 1.2-million record environmental analytical database containing current and historic information for the Cedar Service site and the other Shoreham Yard investigation and remediation programs.

A.4.3 Hazardous Waste Vapor Mitigation Confidential Commercial Laundering Facility Remedial Investigation

St. Louis County, Minnesota

Client Name: Confidential Commercial Laundering Facility

Client Contact: Randy Cook

Telephone: 612-676-8060

Period of Performance: 2005 to present

Site Description

The Site is an active confidential commercial laundering facility (CLF) where soil, groundwater and soil vapor have been impacted by chemicals of potential concern (COPCs) associated with a former dry-cleaning operation that operated in the CLF building from 1976 to 1990. The COPCs include tetrachoroethene (PCE) and degradation (daughter products) cis-1,2-dichloroethene (cis-1,2-DCE), trichloroethene (TCE) and vinyl chloride (VC).

The Site is located in a topographically flat area on fill and glacial sand and clay deposits in a mixed industrial/residential neighborhood within a small town in outstate Minnesota. The depth to groundwater varies between 8 to 12 feet below ground surface (bgs). Soil and groundwater beneath and adjacent to the facility were impacted due to leakage of dry-cleaning solution, which periodically overflowed from a dry-cleaning machine through holes in the CLF building floor. The COPCs migrated a short distance east (downgradient) from the CLF building in groundwater toward a public utilities building (PUC) and residential neighborhood. The soil and groundwater impacts are contained within the fill and in shallow (upper) sand and clay beneath the facility and in shallow groundwater downgradient (approximately 50 ft) to the west side of the PUC building. A deeper sand exists below the clay unit which is considered a drinking water aquifer in the area. COPCs have also been detected at levels of concern (above MPCA Vapor Intrusion Screening Criteria [air criteria]) in the CLF and PUC buildings.

Currently the Site has a monitoring network consisting of 16 monitoring wells located within and downgradient of the CLF building, three soil vapor monitoring wells in the street south of the CLF building, nine permanent sub-slab soil vapor sampling pins, and 10 ambient air monitoring locations within the CLF.

Project Description

Amec Foster Wheeler is conducting an on-going remedial investigation at the CLF. The Site was initially investigated under the MPCA Voluntary Investigation and Clean-up

Outcome Achieved

- Remedial Investigations have served to delineate the nature and extent of soil and groundwater impacts and SVE remediation of vadose zone soils has reduced soil and groundwater impacts in the contaminant source area below the CLF. A SSDS was installed to mitigate impacts from remaining contamination. This has moved the site toward closure.

Relevant Agencies, Regulations

- MPCA VIC Program
- MPCA Superfund Program
- CERCLA
- MPCA Risk-Based Characterization and Sampling Guidance, (Sept 1998).

Tasks Subcontracted Out

- Drilling and Soil Boring/Well Installation
- Membrane Interface Probe Installation and Sampling
- SVE System Trenching Installation
- Sub-Slab Depressurization System Installation
- Treatability Testing
- Laboratory Analytical
- Private Utility Locating
- Waste Hauling and Disposal

Personnel

- J. Renier – Project Manager / Hydrogeologist
- B. Marxen – Project Engineer
- E. Driver – Data Management
- M. Vavra – Field Technician
- M. Bevier – QA/QC Officer

Continued...

(VIC) Program and was then transferred to the MPCA Superfund Program on March 1, 2012. This investigation has included delineation of soil and groundwater contamination associated with dry cleaning operations (chlorinated volatile organic compounds [CVOCs]) in preparation for site remediation. As part of this investigation, Amec Foster Wheeler completed Limited Groundwater Investigations, a Source Soil Investigation, a pilot study to evaluate the use of soil vapor extraction (SVE) and in-situ chemical oxidation as remedial alternatives for source area soil and groundwater, a vapor intrusion study, and annual groundwater and air monitoring. The Limited Groundwater Investigations included installation and sampling of hydroprofile soil borings and monitoring wells both in and downgradient of the site contaminant source area. The Source Soil Investigation involved a Membrane Interface Probe (MIP) soil boring investigation supported by push-probe confirmation soil borings and mobile and fixed lab soil and groundwater analysis. The pilot study involved installation and testing of SVE wells and collection and treatability testing of soil and groundwater samples to determine oxidation potential by using permanganate and persulfate. The vapor intrusion study involved completing and sampling vapor intrusion wells in the street right-of-ways outside the CLF to determine if soil vapor from the impacted area beneath the CLF building is migrating to adjacent buildings at levels of concern.

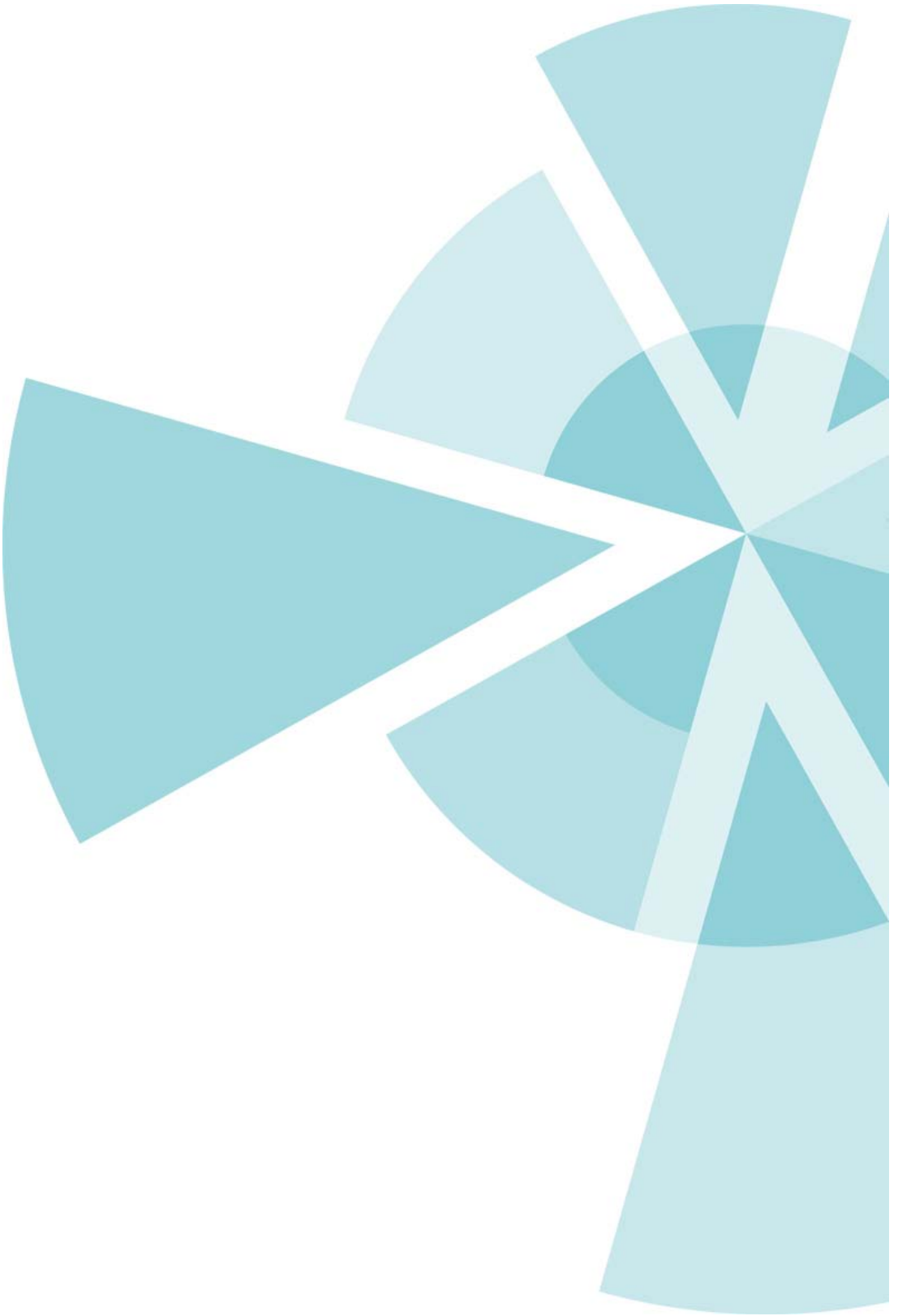
Amec Foster Wheeler also completed a vadose zone response action plan (RAP), installed and operated an SVE system for two years in the CLF building to facilitate source removal in the vadose zone beneath the CLF building, and has monitored soil vapor in the vapor intrusion wells south of the CLF for the same period of time (2 years). The operation of the SVE system resulted in significant contaminant removal in the vadose zone which served to lower CVOC groundwater concentrations in site monitoring wells to all time low levels below or just above groundwater criteria in the upper sand and clay. SVE operation also lowered COPC concentrations in ambient air within the CLF building to concentrations significantly lower than historical concentrations but still above indoor air criteria for PCE, some daughter products and some non-chlorinated VOCs. Due to these exceedances a sub-slab soil vapor investigation consisting of the installation of a series of vapor pins through the building concrete slab was conducted. Paired indoor air monitoring points were also established in the CLF building both in and adjacent the established source areas. This was followed by installation and operation of a sub-slab depressurization system (SSDS) in the source areas designed to lower impacts in sub-slab vapor and above slab indoor air.

The current investigation/remediation includes limited groundwater monitoring of select wells within the CLF building, monitoring sub-slab and indoor air quality in the CLF building and operation of the SSDS. To date, operation of the SSDS (for 8-months) has served to significantly reduce sub-slab and above slab COPC air impacts. One location within the CLF building remains with COPC impacts above indoor air criteria. The CLF and Amec Foster Wheeler are continuing to work with the MPCA to move the Site towards closure and have developed a plan to mitigate this exceedance by upgrading the existing building air ventilation system in the area with remaining exceedances. Following upgrades, a restrictive covenant will be composed for the site specifying continued operation of the SSDS (with the ventilation system upgrade) to maintain indoor air quality in the building.

Project Highlights

Amec Foster Wheeler has successfully delineated the contaminant source area beneath the CLF and the horizontal and vertical extent of groundwater contamination beneath and downgradient of the source area. Amec Foster Wheeler has also successfully installed and operated an SVE system which removed a significant amount of COPCs from the vadose and groundwater smear zones and served to greatly reduce COPC levels in site groundwater within the site source area. Amec Foster Wheeler installed an SSDS and associated monitoring array of sub-slab vapor pins. Operation of the SSDS has served to reduce indoor air impacts to lower levels, with only one location remaining above criteria. Amec Foster Wheeler is currently coordinating upgrades to the building ventilation system to address remaining vapor concerns. this location and allow for site closure.

A.5 Scenario A



MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Scenario A: Former Agricultural Chemical Plant Workplan

Project Title: **Scenario A – Former Agricultural Chemical Plant Workplan**

1. Project Summary:

Organization:	Amec Foster Wheeler
Contractor contact name:	Jonathan Murer
Title:	Project Manager
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Subcontractor(s)/Partner(s):

Example Drilling Contractor

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Example Lab Contractor

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Type of organization:	Laboratory
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Example Land Surveying Contractor

Organization:	HSJ Co. Inc.
Type of organization:	Land Surveying
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MPCA contact(s):

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2. Statement of Problems, Opportunities, and Existing Conditions

Amec Foster Wheeler Environment and Infrastructure (Amec Foster Wheeler) is pleased to submit this Work Plan proposal to conduct a site wide Remedial Investigation (RI) at the site of a former agricultural chemical plant located in east-central, Minnesota. This Work Plan has been prepared for the MPCA and the Minnesota Department of Agriculture (MDA) in response to the Request for Proposal (RFP) for Remediation Master Contract dated February 28, 2018. The Work Plan proposal also incorporates Addendum 1 to the RFP dated March 19, 2018. This Work Plan addresses 'Scenario A' as described in Section 7 Proposal Content, Category A: Petroleum, Superfund, MDA, and Closed Landfill Program Environmental Services.

It is understood that the regulating community conducted a responsible party (RP) search which resulted in no viable RP being identified for the site. The site has recently been purchased for redevelopment into a golf course. The site is being investigated under the MPCA Site Assessment (SA) program because the current property owner is no longer working cooperatively with the MPCA, and several neighborhood communities have expressed concerned about risks to their health.

The information generated during the RI will be used to support the development of Remedial Actions appropriate for the planned site redevelopment activities and be mindful of human and ecological receptors potentially affected by site conditions. The following sections of this Work Plan describe the currently understood characteristics of the site and the assessment scope of work planned to be conducted. The scope of work for this RI has been developed considering the applicable environmental assessment guidance documents available from the MDA Incident Response Unit and the MPCA.

SITE DESCRIPTION

The site is an approximate 59-acre parcel formerly used as an agricultural chemical (ag-chem) plant. The plant operated from 1960 to 1991. A Site location map is provided as Figure 1 and the Site layout is shown on Figure 2. Information provided by the MPCA and MDA indicate the following:

- Two buildings existed at the site to support former operations: a dry fertilizer building (fertilizer building) and a vehicle/maintenance garage.

- Fertilizer Building:
    - The building is no longer present at the Site as it was destroyed by fire in 1999.
    - An associated truck scale structure remains and is located west of the former building location.
    - A cracked concrete foundation slab remains at the site.
    - During the 1999 firefighting effort, firefighting foam was used to suppress the fire.
    - The building had four access doors: the east and west ends of the building had large overhead doors; a small overhead door was in the middle of the building on the north side; and a small service door was located on the south side.
    - There are no records indicating utility locations associated with this building.
    - A pesticide mixer/blender was located inside the former fertilizer building on the west end.
    - A waterfill area was located outside the former fertilizer building at the west end, and a shallow water supply well is still located in the waterfill area and is functional (30 feet deep).
    - Agricultural chemical equipment storage/parking areas were located on the north and south sides of the former fertilizer building.
    - A 1,000-gallon gasoline underground storage tank (UST) is known to exist outside at the southeast corner of the former building location (installed in the 1960s).
    - Discolored soils were reported to the north of the fertilizer building during the last facility inspection. These records suggest a discharge had occurred. Follow-up work was never conducted with regards to these stained soils.

- Vehicle/Maintenance Garage:
    - The building is still present at the site and is located east of the area of the former fertilizer building.
    - The concrete floor in this building is intact, and the building remains in good condition for future re-use.
    - Building records indicate that there were three additions to the building over the years – there are no records indicating utility locations.
    - It is reported that the vehicle/maintenance garage was used to wash and maintain equipment
        - A trench floor drain is present in the western portion of the building.
        - The floor drain is connected to an approximately 500-gallon UST of unknown age (located beneath the concrete floor).
        - There are no records of the tank having ever been removed or cleaned out, and it has been reported that the tank leaked.

- The vehicle/maintenance garage was extensively used as a degreasing area for the entirety of operations.
- A former employee indicated that used parts degreaser contents were regularly poured onto the ground near the stream, north of the building.
- A 500-gallon fuel oil aboveground storage tank (AST), installed in the 1960s, and used to heat the garage, is located adjacent to the south side of the building - stained soils have been noted beneath the AST.
- Discolored soils were reported to the north of the vehicle/maintenance garage during the last facility inspection. These records suggest a discharge had occurred. Follow-up work was never conducted with regards to these stained soils.

PHYSICAL SETTING

The site topography is mostly flat; however, the ground surface does dip downward toward a small stream running through the northern portion of the site. This stream reportedly flows towards the west, into the town which borders the Site to the west (Figure 2). There is an area of gravel surrounding the truck scale and gravel covered vehicle and equipment parking areas exist north and south of the fertilizer building foundation.

General shallow geology at the site is reported to consist of coarse grained sands with thin lenses of silt and clay. Previous investigations encountered shallow groundwater approximately 6-10 feet below the ground surface (ft bgs), with an assumed flow direction heading into town. It is reported that the older portions of the town (i.e., situated closer to the site) are on private well drinking water, with wells typically 30 feet deep (i.e., blocks 3, 5, and 7 of Figure 2). The newer portions of the town (i.e., i.e., blocks 1, 2, 4, and 6) are on community water from the local municipality. Due to the common depth of the water supply wells, it is likely that a low permeability geologic unit, possibly clay, exists beginning at approximately 30 ft bgs.

PREVIOUSLY COMPLETED RELEVANT WORK

Soil and Groundwater

The property owner conducted a limited investigation consisting of several push probes throughout the site and adjacent property. This investigation identified chlorinated ethenes (e.g., most notably trichloroethylene [TCE]) and agricultural chemicals (e.g., nitrogen, dicamba, metolachlor, metribuzin, pendimethalin, and triclopyr) in soils and groundwater above applicable regulatory cleanup goals. Figure 3 shows the approximate TCE groundwater plume associated with the site.

Soil Vapor/Soil Gas

A single round of vapor points was also advanced off-site as part of the property owner's investigation, with some of the detections exceeding the 33X ISV for TCE (Figure 2). The MPCA provided information that a pregnant woman resides at the property where the sub-slab sample was collected. A passive soil-gas sample collected in the vehicle/equipment maintenance garage was noted to be several orders of magnitude above screening criteria.

A secondary investigation conducted by an MPCA contractor was performed at the vehicle/equipment maintenance garage with the intent of evaluating if it was a contributor to downgradient TCE groundwater impacts. The secondary investigation included collecting subsurface media samples from 23 locations within the building footprint. The investigation did not evaluate petroleum impacts potentially located at this area of the site. Based on the data associated with this secondary investigation, three generalized cross-sections of the investigation were prepared by the MPCA contractor.

Phase I Environmental Site Assessment

As is required by applicable MPCA and MDA guidance, it has been assumed that a Phase I ESA has already been completed for the site in accordance with the United States Environmental Protection Agency (EPA) Rule for All Appropriate Inquiry (AAI) in accordance with 40 Code of Federal Regulations (CFR) Part 312 and the American Society for Testing and Materials (ASTM) E1527-13. The site Phase I ESA was supplemented with data requirements specified in MDA Guidance Document 14 – *The Agricultural Environmental Site Assessment (AgESA).*

Stream Surface Water and Sediment

The property owner and MPCA site investigations did not evaluate the stream.

AREAS OF POTENTIAL CONCERN

This Work Plan has been prepared to support completion of a site wide RI to confirm the areas of potential concern, potential contaminants of concern, determine the nature, magnitude and extent of contaminants, and evaluate potential risks to human health and the environment. The results of the RI will be used to develop a Remedial Design/Remedial Action (RD/RA) Work Plan. Based on the historical activities conducted at the site, as well as information from previous site investigations, the areas of potential concern at the site presently include:

- **Former dry fertilizer building** – The presence of fertilizer, herbicide, and pesticide contaminants in soil and groundwater media is currently documented at the site. Surface water and sediments associated with the on-site stream have yet to be evaluated.

- **Vehicle/maintenance garage building** – The presence of TCE in soil, groundwater, and soil vapor media is currently documented at the site. TCE impacts have also been documented in off-site groundwater and soil vapor. There is a waste fluids collection UST known to exist inside of this building, under the concrete foundation. Surface water and sediments associated with the on-site stream have yet to be evaluated.

- **Existing hydrocarbon tanks** – two petroleum product tanks currently exist at the site. One 500-gallon heating oil AST is located south of the vehicle/maintenance garage building and one 1,000-gallon gasoline UST is located at the southeast corner of the former fertilizer building.

CONTAMINANTS OF POTENTIAL CONCERN

The contaminants of potential concern (COPCs) at the Site have been established based on the review of Site-specific information provided by, and discussions with, the MDA and MPCA. Based on historical Site operations and historic circumstances, the site COPCs include the following:

- MDA List 1 Pesticides - from former agricultural chemical storage at fertilizer building
- MDA List 2 Pesticides - from former agricultural chemical storage at fertilizer building
- Nitrate - from former fertilizer storage at fertilizer building
- Total Kjeldahl nitrogen (TKN) - from former fertilizer storage at fertilizer building
- Volatile Organic Compounds (VOCs) – including chlorinated VOCs (CVOCs) and petroleum based VOCs from historic activities conducted at the vehicle/maintenance garage building and from the existing petroleum hydrocarbon tanks.
- Per- and polyfluoroalkyl substances (PFAS) - from fire suppression activities conducted in 1999 at the former dry fertilizer building
- Diesel Range Organics (DRO) – from unused but existing 500-gallon heating oil AST south of vehicle/maintenance garage building
- Gasoline Range Organics (GRO) - from unused but existing 1,000-gallon gasoline UST near fertilizer building
- Polycyclic Aromatic Hydrocarbons (PAH) - from unused but existing 500-gallon heating oil AST south of vehicle/maintenance garage building
- Metals – from vehicle and equipment maintenance activities conducted at the vehicle/maintenance garage building
- Asbestos Containing Materials (ACM) – from building demolition activities conducted after 1999 fire at the former fertilizer building
- Lead - from lead-based paint disturbed during building demolition activities conducted after 1999 fire at the former fertilizer building and from the unused but existing 1,000-gallon gasoline UST

Some of the above COPCs have already been documented to be present in media at the site; however, PFAS, petroleum-related parameters, metals, and ACM have yet to be evaluated.

SUMMARY OF PRELIMINARY CONCEPTUAL SITE MODEL

Based on the information currently available for the site, the following represents the preliminary conceptual site model:

Site Setting
- Agricultural chemicals, solvents and petroleum hydrocarbons were handled at the site for approximately 30 years
- The Site is planned to be redeveloped into a golf course.
- The existing site building may be re-used to support future site activities.
- The ground surface at the site is unpaved.
- Near surface geological conditions consist of consist of coarse grained sands with thin lenses of clay, silt, and gravel to the investigated depths of approximately 30-feet bgs.
- Because the on-site and nearby private water supply wells are 30-feet deep, a horizon of low permeability soil materials likely exists beginning at this depth.
- Depth to groundwater is typically 6 to 10-feet bgs, with flow typically towards the west.
- The stream is classified as a recreational fishery.
- The Site is located adjacent and east of an area of private residences and/or businesses.
- It is not clear what the source of water is for the nearby municipal water system.

Fertilizer Building and Associated UST
- Agricultural chemicals consisting of fertilizers and pesticides were handled at the site for approximately 30 years and have impacted various site media.
- The fire which destroyed the former fertilizer building in 1999 was suppressed with aqueous film forming foam (AFFF) containing PFAS because of the suspected presence of flammable solvents stored in the building.

- Except for elevated nitrate concentrations, agricultural chemical related contaminants are primarily bound in soils and have not resulted in a significant plume of groundwater impacts (relative to more mobile parameters).
- It is possible that agricultural chemicals have discharged to the stream via groundwater flow and/or overland flow of surface water/soil into the stream during precipitation events.
- Due to 1999 firefighting activities, PFAS has entered soil and groundwater around the building, and has percolated through the cracks in the building foundation; these cracks have allowed surface water on the foundation to continue leaching PFAS to groundwater.
- Due to the 1999 fire, and subsequent building demolition activities, ACM may have been buried in the ground near the former building.
- Due to the 1999 fire, and subsequent building demolition activities, lead-based paint may have been released to the ground surface near the former building.
- A 30-ft deep waterfill well located west of former fertilizer building is impacted by agricultural chemical, TCE and PFAS and should be sealed.
- A 1,000-gallon leaking gasoline UST exists near the southeast corner of the fertilizer building.

Vehicle Maintenance/Garage Building and Associated Tanks

- The trench drain and 500-gallon UST inside of the vehicle maintenance/garage building is a source of TCE from degreasing chemical use inside the garage.
- Agricultural chemicals were possibly released to the south of the vehicle maintenance/garage building due to vehicle and equipment cleaning activities and subsequent management of wash-waters through the bay doors located on the south side of the building.
- Spent degreasing solvents were released directly to the ground surface near the stream, north of the vehicle maintenance/garage building.
- A 500-gallon leaking heating oil AST exists outside of the vehicle maintenance/garage building, along its southern wall.
- Although petroleum substances have been released from the 500-gallon heating oil AST and the 1,000-gallon gasoline UST, the soil and groundwater impacts associated with these tanks are localized with only limited concentrations above agency cleanup goals in groundwater.
- There are TCE impacts to soil gas located beneath the building foundation.
- There are no significant petroleum related soil gas impacts beneath the building foundation.

Fate and Transport

- Although petroleum substances have been released from the 500-gallon heating oil AST and from the 1,000-gallon gasoline UST, soil and groundwater impacts are localized, with no concentrations above cleanup criteria migrating off site.
- Prior releases of petroleum hydrocarbons resulted in somewhat anaerobic redox conditions that support some anaerobic (reductive dechlorination) and co-metabolic biodegradation of TCE in groundwater.
- Releases of PFAS have also resulted in lower redox conditions.
- Although groundwater flows west towards the town, some localized discharge of groundwater impacted with agricultural chemicals, TCE, and PFAS may be occurring to the stream.
- No environmental media (surface water or sediment) or biological (fish tissue) sampling has been conducted at the stream to date and therefore nothing is known of contaminant concentrations.
- Aerobic stream conditions result in biotransformation of long chain polyfluorinated compounds to PFOS/PFOA, further increasing stream concentrations.
- A plume of groundwater impacted with nitrate, TCE, PFAS extends westerly from the source areas, toward the town:
    - Anaerobic conditions created around the former fertilizer building from PFAS and petroleum releases locally cause some reductive dechlorination of TCE and nitrate reduction/attenuation.
    - Redox conditions rebound some distance downgradient back to aerobic conditions that typically prevail in shallow aquifers.
    - Long chain polyfluorinated precursor PFAS compounds have biotransformed within this redox recovery zone producing higher concentrations of PFOS/PFOA some distance offsite.
    - The circumstances of shallow groundwater, generally coarse-grained aquifer materials, and associated lack of total organic carbon/retention capacity have allowed certain contaminants to migrate long distances.
    - The PFAS plume extends the greatest distance, beyond the identified off-site groundwater TCE impacts, to older drinking water wells, and possibly towards a municipal supply well or reservoir, present further west of the town.
    - No crops, livestock, or irrigation water has been impacted.

3. Goals, Objectives, Tasks, and Subtasks

Goal: Due to historic practices, certain chemical impacts have been documented both on, and off site. On site, impacts have been documented to exist in soil, groundwater, and soil vapor (i.e., TCE, pesticides, and/or nitrogen compounds). Off site, impacts have been documented to exist in groundwater and soil vapor (i.e., TCE). A site-wide RI is warranted to evaluate risk to the public and environment posed by current site conditions. The goal of this investigation will be to confirm the source areas for COPCs, evaluate the nature, magnitude and extent of impacts, evaluate risks to the public and environment from these impacts, and provide sufficient information for developing a RD/RA work plan for the site.

The Site-wide investigation will be conducted in accordance with:

- MDA Incident Response Unit Guidance Documents
- MPCA Non-Petroleum Guidance Documents
- MPCA Petroleum Guidance Documents
- Minnesota Department of Health (MDH) Guidance Documents

The investigation components will consist of the following objectives:

1. Project Coordination and Safety Planning.
2. Receptor Survey/Contamination Impacts Survey.
3. Site Preparation Activities.
4. Characterization of Soil Contamination.
5. Characterization of Groundwater Contamination.
6. Characterization of Surface Water and Sediment Contamination.
7. Characterization of Soil Vapor Contamination.
8. On-Site Water Supply Well Sealing.
9. RI Report.

OBJECTIVE 1: PROJECT COORDINATION AND SAFETY PLANNING

To ensure that the project progresses in a safe and technically sound manner, Amec Foster Wheeler will lead project coordination and safety efforts which involve the various project stakeholders. All project coordination and safety planning efforts will be documented and maintained in the Amec Foster Wheeler project file.

TASK A: SUBCONTRACTOR PROCUREMENT / COORDINATION

The Amec Foster Wheeler Project Manager will coordinate procurement and scheduling activities for the various subcontractors involved with the project. These activities will ensure the appropriate resources are available to our project staff prior to, and during the implementation of, the field sampling program.

TASK B: INTER-AGENCY COORDINATION

Subtask 1: Field Readiness Review

Amec Foster Wheeler will conduct a Field Readiness Review that will include the preparation and review of a checklist to ensure all permits, procurement items, notifications, and access issues have been addressed and/or completed. A review of field investigation scope of work elements and safety procedures will also be discussed during the Field Readiness Review. This information will be discussed during a teleconference between the Amec Foster Wheeler Project Manager and the various regulatory stakeholders from the MDA and MPCA. The Field Readiness Review will be conducted a minimum of two weeks prior to field work mobilization.

Subtask 2: Communication Plan

Before the start of field assessment activities, the Amec Foster Wheeler Project Manager will provide routine progress updates to the various regulatory and non-regulatory stakeholders (i.e., private water supply well owners). The style (e.g., telephone or email) and frequency of the progress updates will be tailored to the preferences of the individual stakeholders. The routine progress updates will include information related to the following topics:

- Project safety update,
- Activities recently conducted,

- Upcoming sampling activities,
- Technical updates,
- Unanticipated circumstances encountered, and
- Resolution of previous issues.

Subtask 3: Health and Safety Plan

Prior to the start of the project, Amec Foster Wheeler will develop a Site-specific health and safety plan (HSP) in accordance with applicable provisions of the Occupational Health and Safety Act (OSHA) of 1970 and CFR 29 Part 1910. The HSP will be based on Site-specific risks, and will address all Site activities to be conducted as part of the assessment portion of the project.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 1 Timeline: 3 weeks for HSP/Task C, monthly routine activities for Tasks A and B

Objective 1 Deliverables: Documentation of Field Readiness Review, routine progress communications to regulatory stakeholders, HSP

OBJECTIVE 2: RECEPTOR SURVEY / CONTAMINATION IMPACTS SURVEY

It is understood that certain elements of a full receptor survey have already been completed prior to development of this sampling plan. However, to support enhancement of the conceptual site model (CSM) for the project, a receptor survey will be conducted prior to, and during the, implementation of the site field sampling program. The CSM will provide the framework for evaluating site-specific exposure scenarios which in-turn provide the basis for developing and implementing site management decisions.

The planned receptor survey will also serve as the MDA required Contamination Impacts Survey (CIS) and will be conducted in accordance with Attachment 2 to MDA Guidance Document 9, Remedial Investigation Work Plan (CIS Guidance). The following tasks will be completed as part of the receptor survey/CIS objective

TASK A: WELL RECEPTOR SURVEY

Based upon the existing information available, it is understood that certain private residences and/or business located west of the site utilize private water supply wells as sources of drinking water. To supplement this information the well receptor survey task will include the following efforts:

- Perform a walking survey within 500 feet of the site boundary,
- Identify residents and business owners with possible private water supply wells by completing a visual inspection of the subject properties (from an adjacent public right-of-way),
- Confirm public water supply locations in the vicinity of the site by contacting the local utility billing department,
- Contact local utility department regarding any future water development plans in the area.
- Contact the local utility department to ascertain the source of water for the local water supply system, and
- Review the Minnesota Well Index for wells within 1/2 mile of the site boundary.

TASK B: WATER LINE PERMEATION RECEPTOR SURVEY

Because it is known that groundwater impacted with TCE, and possibly other constituents, exists at and off-site to the west, a survey of water supply lines will be conducted as part of the Receptor Survey. Construction details of the water line distribution components in the areas of interest (i.e., on-site and west of the site) will be obtained. This information will be obtained from the local engineering/construction permitting department, and will be obtained prior to conducting the walking survey described in Task A above. If permeable piping or gaskets are identified to be present within a contaminated area, a water line response action plan will be developed to address the circumstances.

TASK C: SURFACE WATER RECEPTOR SURVEY

It is known that a westward flowing stream exists on the site. The stream that exists on the site will be classified according to MN Rules Ch. 7050.0400 through 7050.0470. In addition, if it is found, during the RI, that impacted groundwater is discharging to the stream, potential contaminant mass loading to the stream from impacted groundwater will be calculated using the procedures provided in the CIS Guidance.

To ascertain the presence of other surface water features which may be present within ¼-mile of the site boundary, a surface water receptor survey will be conducted and will consist of the following efforts:

- Perform a walking survey and / or driving inspection of areas within ¼-mile of the site boundary,
- Consult readily available public information to evaluate the presence of surface water features in the vicinity of the site:

- Topographic quadrangle maps,
- Aerial photograph databases, and
- Watershed district GIS databases.

TASK D: SUBSURFACE UTILITIES AND STRUCTURES SURVEY

As there is currently no definitive understanding of the subsurface utilities (and associated structures) which may be present at the site, a subsurface utilities survey will be conducted at the site and will consist of the following efforts:

- Contact the local utility and engineering departments to evaluate the existence of public records associated with underground utilities at the site.
- Conduct a public utility locate for the entire site using the Gopher State One Call (GSOC) system.
- Conduct a private utility locating effort for the site using geophysical methods consisting of the following efforts:
- Visual inspection of the ground surface for evidence of potential subsurface utilities,
- On a pre-determined grid, scan the site with an electromagnetic utility locator in passive 50/60Hz and radio modes to locate and mark potential active electric lines,
- On a pre-determined grid, scan the site with a deep search pipe locater/metal detector to locate and mark potential abandoned or unused conduits that have no surface expression,
- Conduct perpendicular ground-penetrating radar (GPR) traverses on a pre-determined grid to trace and mark utilities,
- Potential utilities identified during the locating effort will be marked on the ground surface with paint and flagging in color coding established by the American Public Works Association, and
- Any utilities identified will be marked on an Amec Foster Wheeler utility clearance form.

TASK E: VAPOR INTRUSION RECEPTOR SURVEY

The soil vapor receptor survey will consist of the following subtasks:

- Contacting local utility companies to confirm subsurface structures,
- Identifying access points (man-ways, etc.) and possible other receptors (e.g. buildings with basements) based on a record search and visual inspection from Task A,
- Mapping subsurface utilities (water, sewer, cable, etc.) within 500 ft of the Site, including all connections,
- Mapping all properties with basements or sumps,
- Contacting the local fire department about reports of petroleum odors within 500 ft of the Site, and
- Assessing groundwater within each of the Site borings during the RI implementation for the presence of free product.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, Human Health Risk Assessor 2, Ecological Risk Assessor 2, GIS / CADD Specialist

Objective 2 Timeline: 2 weeks

Objective 2 Deliverables: CSM update letter report to regulatory stakeholders, input into site-wide RI Report

OBJECTIVE 3: SITE MOBILIZATION ACTIVITIES

It is planned to complete the bulk of the media sampling activities during one mobilization. However, due to the varied nature of the RI sampling program, certain media sampling activities may require follow-up mobilizations to the site. Amec Foster Wheeler will complete the following activities prior to commencement of RI media sampling activities.

TASK A: FIELDWORK PREPARATION

Amec Foster Wheeler will complete the following pre-mobilization activities prior to commencement of RI media sampling activities:

- Obtain all necessary permits including local, state, and federal permits.
- Conduct a site visit to inspect and verify site/location conditions and stake all planned intrusive sampling locations (see Task D below).
- Verify clear access to sampling locations.
- Verify locations for staging of equipment and investigation derived waste (IDW).
- Verify availability of water, electricity, and sanitary services to support for implementation of field activities.
- Implement field sampling procedures and special equipment provisions due to possible presence of PFAS and because PFAS compounds can be present in certain routine sampling equipment (e.g. Teflon tubing, Tyvek suits, etc.). All field personnel will be trained (if not already done so) and required to review our PFAS-specific Standard Operating Procedures (SOPs) for sampling various media.

TASK B: UTILITY LOCATE ACTIVITIES

As described above in Objective 2 Task C, a comprehensive subsurface utilities and structures survey will be completed at the site prior to the start of sampling activities. As part of this task, all planned intrusive sampling locations will be cleared by the methods described in Objective 2 Task C. If warranted, sampling locations will be modified based on the results of the subsurface utilities and structures survey.

TASK C: FIELD MOBILIZATION

Amec Foster Wheeler will mobilize to the Site to oversee field activities. During mobilization, Amec Foster Wheeler personnel will meet with the site contact and confirm access and staging locations, review the work elements, confirm utilities are properly marked, oversee the private utility location contractor to mark utilities as necessary, and oversee the land surveyor to stake sampling locations (grid and non-grid elements).

Amec Foster Wheeler will oversee the setup of decontamination facilities and initial equipment decontamination prior to starting the sampling program.

As will be required by the site HSP, the field team will kick off each field day with a tailgate safety briefing. During the briefing, lessons learned from past work as well as specific safety items for the work at hand will be discussed. Should a member of the team not be present the field team leader will ensure that all safety items are discussed with the employee before they begin work.

TASK D: ESTABLISHMENT OF SAMPLING GRIDS

To guide certain soil sampling efforts related to the Site, sampling grids will be established near the fertilizer building and the vehicle/maintenance garage building. Due to the large size, the former and existing buildings at the site, and the associated large area potentially containing soil impacts, the standard sampling grid described in MDA Guidance Document 11 – *Soil Sampling Guidance* (i.e., 15-foot diameter sampling area for collecting subsamples for compositing), has been modified to account for the very large surface area. The site sampling grids will be based on composite sampling areas 60'x60' in size (i.e., instead 15' diameter areas, which would result in an overly large volume of samples). To create the composite soil samples from each sampling area, four equally spaced borings will be completed to support subsample collection. To ensure that all the sampling locations are precisely documented, Amec Foster Wheeler intends to establish the site sampling grid utilizing a real time kinematic (RTK) global positioning system (GPS).

Subtask 1: **Establishment of Fertilizer Building Soil Sampling Grid**

The planned sampling grid for the area of the fertilizer building has been developed based on the following site circumstances:

- Large size of building (i.e., approximately 345' x 380' in size)
- Existence of truck scale located west of the former building
- Likely truck traffic routes related to the truck scale and the large overhead doors providing access to the building (east and west sides of the former building)
- Location of chemical equipment storage and parking areas (north and south sides of the former building)

The planned sampling grid near the former fertilizer building is shown on Figure 4 and will consist of 62 distinct sampling areas. To create the composite soil samples from each sampling area, four equally spaced borings will be completed to support subsample collection. Any planned sample location deviations which occur during the implementation of the sampling program will be documented and surveyed at the completion of the soil sampling program.

Subtask 2: Establishment of Vehicle/Equipment Maintenance Garage Sampling Grid

The planned sampling grid for the area of the vehicle/equipment garage building has been developed based on the following site circumstances:

- Large size of building (i.e., approximately 310' x 290' in size)
- Likely existence of large overhead doors providing truck and equipment access on the south side of the building – likely providing an area where waste fluids associated vehicle and equipment maintenance could be removed from the building (i.e., excess fluids not captured by the trench drain system in the western portion of the building interior

The planned sampling grid near the vehicle/equipment garage building is shown on Figure 4 and will consist of six distinct sampling areas. To create the composite soil samples from each sampling area, four equally spaced borings will be completed to support subsample collection. Any planned sample location deviations which occur during the implementation of the sampling program will be documented and surveyed at the completion of the soil sampling program.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 3 Timeline: Less than 1 month

Objective 3 Deliverables: Routine documentation of permits, access agreements, utility location results, sampling grid diagram

OBJECTIVE 4: CHARACTERIZATION OF SOIL CONTAMINATION

Efforts associated with this objective will determine the nature, magnitude and extent of impacts to soil that are likely to have occurred from past site operations. In addition to applicable MDA and MPCA guidance, assessment activities completed at the various areas of potential concern will be conducted in accordance with Amec Foster Wheeler SOPs, certain of which are specifically tailored to the evaluation of sites impacted with PFAS. Amec Foster Wheeler has developed PFAS-specific SOPs due to the low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS. Our field personnel will follow strict protocols to help mitigate the potential for false detections of PFAS. A list of prohibited and acceptable clothing/equipment for sampling at PFAS sites is provided in the Amec Foster Wheeler SOPs. Amec Foster Wheeler SOPs will be made available to the MDA and MPCA prior to beginning the field sampling efforts.

Amec Foster Wheeler proposes to use several soil sampling methods to characterize soil impacts at the site, consisting of direct push technology (DPT), hollow stem auger (HSA) drilling methods, hand augers, and small hand tools. All drilling work and borehole sealing activities will be conducted in accordance with the MDH Well Code by a Minnesota licensed drilling contractor.

Figures 4 and 5 show the planned soil sampling locations. Table 1 summarizes the site soil sampling program and defines the depths of sample intervals and the planned laboratory analyses at each location.

TASK A: FERTILIZER BUILDING SOIL CHARACTERIZATION AND SAMPLING

Subtask 1: Soil Boring and Soil Sampling Activities – Outside of Building Foundation Footprint

A DPT rig will be used to advance borings for soil sampling purposes in the sampling **grid (Figure 4).** Soil cores will be collected continuously with a 2-inch diameter, macrocore sampler fitted with an acetate liner. Upon retrieval, the acetate liner will be extruded from the macrocore sampler and cut open to allow for soil description and soil sampling. The macrocore sampler will be decontaminated between soil sampling intervals by washing in a water-alconox solution (non-phosphate) and rinsing with deionized water. A new acetate liner will be used for each sampling interval.

Soil borings will be drilled to allow for the collection of both discrete and composite soil samples. Composite soil samples collected for COPC analysis will be collected in accordance with the soil sampling methods described in MDA Guidance Document 9 - *Remedial Investigation Work Plan* and MDA Guidance Document 11 – *Soil Sampling Guidance*. At each composite sampling area, four soil borings will be advanced to support collection of subsamples for compositing (Figure 4). These subsample collection borings will be advanced to a depth of 2.5-feet. At each subsample boring location, subsamples to be used for compositing will be collected at depth intervals of 0 to 0.5-feet (surface interval) and 2 to 2.5-feet bgs (subsurface interval). If gravel is present at the ground surface at a soil boring location, the surface interval subsample will be collected from the 0 to 6-inch interval beneath the base of the gravel. At each composite sampling area, the subsamples from the surface interval will be thoroughly mixed in a stainless-steel bowl and containerized in laboratory supplied sample containers. The same compositing procedure will be used for the four subsurface subsamples collected at each composite sampling areas. Based on the planned sampling program, two composite samples, representing the two target depth intervals (surface and subsurface depth intervals), will be created at each of the planned composite sampling areas. In addition, one discrete soil sample will be collected from the 2 to 2.5-foot bgs interval for grids 35-40 and 49-54 for VOC analysis. Finally, from the center of each composite sampling area, a discrete soil sample will be collected at the depth interval of 4.5 to 5-feet bgs. This deeper discrete sample will aid in the vertical delineation of impacts, if necessary.

The 2 to 2.5-foot (subsurface) composite and discrete samples collected during the grid sampling program will be submitted under chain-of-custody procedures for immediate laboratory analysis. The 0 to 0.5-foot composite samples (surface samples) and the deeper discrete samples from the center of each composite sampling area will be preserved via freezing for potential future analysis.

All soil samples collected will be logged according to the Unified Soil Classification System (USCS) and in accordance with ASTM standards. Soil samples collected will be field screened using a portable photoionization detector (PID) equipped with a 10.6 eV lamp. PID responses and any visual staining or obvious olfactory indications of impacts will also be recorded on boring logs.

Subtask 2: Soil Boring and Soil Sampling Activities – Within Building Foundation Footprint

It is understood that the foundation of the former fertilizer building exhibits cracking. To evaluate soil conditions directly beneath the fertilizer building foundation structure, a focused drilling and soil sampling program will be conducted. It is planned to complete six soil borings within the area of the foundation, with locations focused on the

areas of the most advanced foundation deterioration and cracking. Figure 5 shows the approximate location of the planned foundation soil borings.

A DPT rig will be used to advance borings for soil sampling purposes beneath the foundation. It is estimated that the concrete foundation of the fertilizer building is approximately 10-inches thick. As such, a concrete coring device will be used to create a pilot hole through which drilling activities can then be conducted. The soil borings will be advanced to the depth of the water table, or to 3-feet below the bottom of the foundation, whichever is shallower. Soil cores will be collected continuously with a 2-inch diameter, macrocore sampler fitted with an acetate liner. Upon retrieval, the acetate liner will be extruded from the macrocore sampler and cut open to allow for soil description and soil sampling. The macrocore sampler will be decontaminated between soil sampling intervals by washing in a water-alconox solution (non-phosphate) and rinsing with deionized water. A new acetate liner will be used for each sampling interval. All soil samples collected will be logged according to the USCS and in accordance with ASTM standards. Soil samples collected will be field screened using a portable PID equipped with a 10.6 eV lamp. PID responses and any visual staining or obvious olfactory indications of impacts will also be recorded on boring logs.

At each soil boring location, two discrete soil samples will be collected for laboratory analyses. The uppermost sample will be collected from the 6-inch interval directly beneath the foundation. The deeper sample will be collected 2.5 to 3-feet below the bottom of the foundation. The discrete soil samples collected during the sub-foundation sampling program will be submitted under chain-of-custody procedures for laboratory analysis. All borings advanced for soil sampling purposes will be sealed in accordance with MDH Well Code. All sub-foundation drilling and soil sampling locations will be surveyed by a Minnesota licensed land surveyor.

Subtask 3: Analytical Testing

Grid Sampling Program
Sixty-two composite and 12 discrete soil samples from the 2 to 2.5-foot depth interval will be submitted for the analyses shown below:

- MDA List 1 Pesticides,
- MDA List 2 Pesticides,
- Nitrate-nitrogen,
- TKN, and
- VOCs (only from grid numbers 35 to 40 and 49 to 54 – north of the former building).

Upon receipt of the analytical results from the 2 to 2.5-foot samples, the results will be forwarded, along with a site map, to MDA staff. After reviewing the data, MDA and Amec Foster Wheeler staff will determine which, if any, of the frozen samples will be analyzed. For this Work Plan, it is assumed that an additional 12 samples (frozen and stored) will be analyzed (i.e., representing approximately 20% of the 2 to 2.5-foot sample group). It is assumed that these additional samples will be comprised of a mixture of shallow horizon composite samples and discrete deeper samples). The VOC testing planned for the grid locations identified above is proposed to address the soil staining previously noted north of the former fertilizer building.

In addition to the analytical testing program outlined above, the following analytical testing will be conducted to evaluate other COPCs associated with the former fertilizer building:

- ACM (contingent only) – ACM testing will be conducted only if soil borings indicate the presence of buried demolition debris within the areas evaluated (the MPCA and MDA will be consulted if demolition debris is encountered).
- Lead – Lead analysis will be conducted on one discrete shallow soil sample collected from each of the 62 soil sampling grids (0 to 0.5 ft bgs).
- PFAS – a total of 40 discrete soil samples from the general composite sampling areas will be submitted for analytical testing of PFAS parameters. These samples will be collected from the 0 to 0.5-foot and the 4.5 to 5-feet bgs depth intervals at the central grid location soil boring, in 20 of the sampling grids.
- Physiochemical properties – three each of the discrete surface and subsurface soil samples collected from the sampling grids, to be submitted for PFAS analysis, will also be submitted for the analyses of physiochemical properties, consisting of soil pH, particle size analysis, and total organic carbon (TOC) content - these parameters are useful in supporting development of potentially applicable remedial actions.

Table 1 summarizes which of the planned grid sampling areas will be subjected to PFAS analytical testing. The PFAS analytical testing program will consist of 14 PFAS parameters (i.e., MDH recommended sampling list).

As indicated previously, given the low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS, field personnel will follow strict protocols to help mitigate the potential for false detections of PFAS. A list of prohibited and acceptable clothing/equipment for sampling at PFAS sites is provided in the Amec Foster Wheeler SOPs.

Sub-Foundation Sampling Program
Twelve discrete soil samples collected from the sub-foundation soil borings will be submitted for the analyses shown below.

- MDA List 1 Pesticides
- MDA List 2 Pesticides
- Nitrate-nitrogen
- TKN
- PFAS

In addition, the surface and subsurface samples collected closest to the 1,000-gallon UST (FD-SB-6) will be analyzed for VOCs, GRO, and Lead.

To ensure the defensibility of the RI soil data, quality control samples will be collected during the area soil sampling program and will consist of laboratory-provided trip blanks, laboratory-provided temperature blanks, duplicate soil samples (one for every 10 primary soil samples), and matrix spike/matrix spike duplicates (one for every 20 primary soil samples). Soil samples will be collected into sealed laboratory-provided containers. Soil samples will be kept on ice and provided to the laboratory under chain-of-custody procedures within the appropriate hold times.

TASK B: VEHICLE/EQUIPMENT MAINTENANCE GARAGE BUILDING SOIL CHARACTERIZATION AND SAMPLING

Subtask 1: Soil Boring and Soil Sampling Activities – Grid Sampling South Side of Building

The grid-based composite sampling activities planned for this area of the site will be conducted in the same manner as described in Task A, Subtask 1 above. Discrete soil samples from the 2 to 2.5-foot bgs range will be collected in all composite areas to allow for VOC analysis in addition to the standard surface and subsurface composite samples, and deeper discrete samples.

Subtask 2: Surface Soil Sampling

Due to the reported existence of stained soils at two locations near this building (i.e., dumping of spent solvent materials on the ground surface north of the building and surface soil staining noted beneath the AST located adjacent to the south wall of the building), shallow soil samples will be collected at each of these areas. It is planned to collect five surface soil samples to evaluate impacts associated with the dumping of the spent solvent and three surface soil samples will be collected to evaluate the staining noted beneath the existing AST. These soil samples will be collected from the interval of 0 to 0.5 ft bgs and will be collected using a hand auger or other hand-held sampling tools.

Subtask 3: Analytical Testing

Grid Sampling Program
Six composites and six discrete soil samples from the 2 to 2.5-foot depth interval will be submitted for the analyses shown below.

- MDA List 1 Pesticides
- MDA List 2 Pesticides
- Nitrate-nitrogen
- TKN
- VOCs

Upon receipt of the analytical results from the 2 to 2.5-foot composite and discrete samples, the results will be forwarded, along with a site map, to MDA staff. After reviewing the data, MDA and Amec Foster Wheeler staff will determine which, if any, of the frozen samples will be analyzed. For this Work Plan, it is assumed that an additional two samples (frozen and stored) will be analyzed (i.e., representing approximately 20% of the 2 to 2.5-foot sample group). It is assumed that these additional samples will be comprised of a mixture of shallow horizon composite samples and discrete deeper samples).

Surface Soil Sampling Program

In addition to the composite sample analytical testing program outlined above, a total of eight discrete surface soil samples, collected from the north (spent solvent dumping area) and south (AST area) sides of the building will be submitted for analytical testing. The surface soil samples collected from the north side of the building will be subjected to the analyses listed below:

- VOCs
- GRO
- DRO
- RCRA Metals

The surface soil samples collected from the south side of the building, beneath the AST, will be subjected to the analyses listed below:

- VOCs
- DRO
- PAHs

TASK C: WASTE CHARACTERIZATION AND DISPOSAL

Soil cuttings, and waste water from decontamination, will be stored in separate new clean 55-gallon drums. Drums will be clearly labeled, indicating content, date generated, name of the responsible party with contact phone number, and that contents are pending analysis.

At the conclusion of RI sampling activities, each waste stream will be sampled by collecting a composite soil or water sample from each set of drums (at a rate of one sample per 20 drums of media/waste). Drums will be closed and stored on-site at a suitable location pending disposal once waste characterization results are available. The drums will be placed on pallets and will be covered with tarps.

All wastes will be analyzed to determine if they meet the definition of a RCRA characteristic waste (i.e., ignitibility, corrosivity, reactivity, and toxicity analyses). The planned characterization analyses will support off-site management planning for the wastes.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 4 Timeline: Approximately 2 months

Objective 4 Deliverables: Routine progress updates to stakeholders, data input to support RI Report preparation

OBJECTIVE 5: CHARACTERIZATION OF GROUNDWATER CONTAMINATION

Amec Foster Wheeler proposes the installation of 14 permanent monitoring wells, and the sampling of offsite water supply wells, to assess groundwater contamination associated with the site. Eleven of the new monitoring wells will be installed on the site and three will be installed at off-site locations. Amec Foster Wheeler field personnel will oversee all field work to ensure the investigation is conducted in accordance with this Work Plan, in addition to appropriate MDA, MPCA, and federal guidelines. Groundwater will be sampled according to MPCA Guidance Document *Ground Water Sample Collection and Analysis Procedure (GD 4-05),* and MDA Guidance Document *Ground Water Sampling Guidance (GD-12).* In addition to applicable MDA and MPCA guidance, assessment activities completed at the various areas of potential concern will be conducted in accordance with Amec Foster Wheeler SOPs, certain of which are specifically tailored to the evaluation of sites impacted with PFAS. Amec Foster Wheeler has developed PFAS-specific SOPs due to the low detection limits associated with PFAS analysis and the many potential sources of trace levels of PFAS in media samples. Our field personnel will follow strict protocols to help mitigate the potential for false detections of PFAS. A list of prohibited and acceptable clothing/equipment for sampling at PFAS sites is provided in the Amec Foster Wheeler SOPs. Amec Foster Wheeler SOPs will be made available to the MDA and MPCA prior to beginning the field sampling efforts. Amec Foster Wheeler field personnel will be on-site during the field work to ensure the investigation is conducted in accordance with this Work Plan, in addition to applicable MDA, MPCA, and federal guidelines.

Figure 5 shows the planned groundwater sampling locations. Table 2 summarizes the site groundwater sampling program and defines the depths of sample intervals and the planned laboratory analyses at each location.

TASK A: NEW PERMANENT MONITORING WELLS

Subtask 1: Drilling and Soil Sampling

Figure 5 shows the locations of the planned monitoring wells. Soil borings to be used for well installation will be drilled using hollow stem auger (HSA) techniques. Except for wells MW18-8, MW18-9, and MW-1810, monitoring wells will be completed to depths of 30 feet bgs. The depth of 30 feet bgs has been targeted for most of the monitoring wells because the private water supply wells located west of the site are completed to depths of 30 feet bgs. Wells MW18-8, MW18-9, and MW18-10 will be completed to depths of 15 feet bgs due to their proximity to the stream located on the site (i.e., evaluation of possible shallow groundwater discharge to the stream). At all soil borings planned for monitoring well installation, soil samples will be collected continuously using 2-inch diameter split-spoon sampling devices. An Amec Foster Wheeler geologist will log the soils to document stratigraphic conditions. All samples will be logged according to the USCS and in accordance with ASTM standards. Soil samples collected will be field screened using a portable PID equipped with a 10.6 eV lamp. PID responses and any visual staining or obvious olfactory indications of impacts will also be recorded on boring logs.

It should be noted that it is not planned to submit soil samples collected during the well installations for analytical testing (with the exception of locations in close proximity to the vehicle maintenance building). However, if elevated PID responses are noted, or obvious visual staining or strong odors are noted in soil above the water table, certain

samples maybe submitted for analytical testing after conferring with MPCA and MDA. Soil samples from the 2.5 to 3 foot bgs interval for monitoring wells MW18-5, MW18-6, and MW18-8, all in close proximity to the vehicle/maintenance garage will be submitted for VOC analysis.

Subtask 2: Monitoring Well Installation and Development

Upon reaching the planned depth of well installation at each boring location, the monitoring wells will be constructed with threaded two-inch diameter, schedule 40 polyvinyl chloride (PVC) casing and 0.010-inch machine slotted two-inch diameter Schedule 40 PVC well screens and end cap. Monitoring well screens will be 10-feet in length. The 30-foot deep wells will have fully submerged screens while the three wells located adjacent to the stream will be constructed with the screened portion positioned approximately 5-feet above, and 5-feet below, the water table. The annular space surrounding the well screen will be backfilled with an appropriately sized clean silica sand (i.e., 20/40 size or larger depending on screen zone stratigraphy) during auger withdrawal to approximately 2-feet above the top of the well screen. A minimum 3-foot thick bentonite seal will then be installed above the filter sandpack and allowed to sufficiently hydrate before sealing the remaining borehole annulus with neat Portland cement grout. All monitoring wells will be completed with above-grade surface completions. The monitoring wells and surface completions will be constructed in accordance with applicable MDH well code. Wells will be assembled and installed by subcontractors wearing clean nitrile gloves.

The newly installed monitoring wells will be developed with a stainless-steel submersible pump (Teflon-free) fitted with disposable high-density polyethylene (HDPE) tubing a minimum of 24 hours after borehole completion, in accordance with Amec Foster Wheeler SOPs. Water quality parameters of the development water will be measured and recorded on well development logs (i.e., pH, specific conductance, temperature, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity), and a minimum of three well-casing, and saturated filter sandpack, volumes of water will be purged from each new well during development. Well development will continue until certain water quality parameters have stabilized (i.e., three consecutive pH, specific conductance, and temperature readings within 10 percent) and the maximum turbidity is 50 NTUs or less, or the well develops dry.

Subtask 3: Monitoring Well Purging and Sampling

One round of groundwater sampling will be completed at the site monitoring well network. Prior to beginning purging, depth to water measurements will be collected from each well using an electric sounding device. The sounding device and measuring line will be decontaminated using an Alconox™ solution prior to start of work and between each well. Depth to water measurements will be recorded to the nearest hundredth of a foot.

Prior to sampling, the monitoring wells will be purged with low-flow purging techniques at a flow rate of <500 milliliters per minute (ml/min) using a rheostat controlled (to obtain low-flow characteristics), stainless steel submersible pump (Teflon-free) fitted with disposable HDPE tubing. Purge water will be monitored for pH, specific conductance, temperature, ORP, and DO utilizing a multi-parameter meter and flow-through cell. Turbidity of the purge water will be measured with a turbidity meter. Purging will continue until parameters have stabilized as described in Amec Foster Wheeler SOPs.

Although not expected, if a monitoring well goes dry during the purging process, the well will be allowed to recharge to at least 50% of its static groundwater elevation prior to evacuating the well again. The well will then again be allowed to recharge to at least 50% of its static groundwater elevation prior to collecting the groundwater sample.

Subsequent to well purging, groundwater samples will be collected. Laboratory supplied sample containers will be filled directly from the tubing, and the tubing will be discarded after each use. Groundwater samples will be kept on ice and stored in coolers and then provided to the laboratory under chain-of-custody procedures within the appropriate hold times.

Subtask 4: Analytical Testing

To support assessment of groundwater contamination associated with all of areas of potential concern at the site, samples collected from all newly installed monitoring wells will be submitted for analytical testing of:

- MDA List 1 Pesticides
- MDA List 2 Pesticides
- Nitrate-nitrogen
- TKN
- PFAS (MPCA Preferred List)
- VOC
- GRO
- DRO
- PAHs
- Low-level analysis for EDB and DBCP

- RCRA Metals

Groundwater quality control samples will consist of a laboratory-provided trip blanks, laboratory-provided temperature blanks, duplicate groundwater samples (one for every 10 primary groundwater samples), and matrix spike/matrix spike duplicates (one for every 20 primary groundwater samples).

Subtask 5: Surveying of Monitoring Wells

Upon installation, the top of casing (TOC) elevation for each monitoring well will be surveyed. The north side of the TOC (or if the casing is uneven, the highest point on the TOC) will be surveyed by a Minnesota licensed land surveyor. Each surveyed elevation will be recorded to the nearest hundredth of a foot.

TASK B: OFF-SITE PRIVATE WATER SUPPLY WELLS

Nine private water supply water wells will be sampled during the RI. The private wells to be sampled are located on city blocks 5 and 7 (Figure 5), south of the stream. Amec Foster Wheeler proposes to collect one round of groundwater samples from each of these private water supply wells.

Subtask 1: Purging

Purging of water supply wells will be conducted in accordance with MPCA Guidance Document 4-05. The volume of standing water in the line and any appurtenances between the well and sampling point will be calculated. The volume of water to be purged will be calculated based on available well construction information. If no construction records are available, the well will be purged for a minimum of 10 minutes at full discharge rates after purging the volume of standing water in the system. Purging will be completed to ensure that the pressure tank, and all conveyance lines, connected to the well have been drained and the well pump has activated such that the water being sampled has been pumped directly from the aquifer.

Subtask 2: Water Supply Well Sampling

Sampling will be completed by filling the laboratory-supplied containers directly from the selected faucet or spigot. Sample containers will be filled slowly to minimize agitation within the sample container.

Subtask 3: Analytical Testing

A total of nine groundwater samples from the offsite wells will be submitted for analytical testing of:

- MDA List 1 Pesticides
- MDA List 2 Pesticides
- Nitrate-nitrogen
- TKN
- PFAS (MPCA Preferred List)
- VOC
- PAHs

Groundwater quality control samples associated with the private water supply sampling effort will consist of laboratory-provided trip blanks, laboratory-provided temperature blanks, duplicate groundwater samples (one for every 10 primary groundwater samples), and matrix spike/matrix spike duplicates (one for every 20 primary groundwater samples).

TASK C: WASTE CHARACTERIZATION AND DISPOSAL

Purge water and waste water from decontamination, will be stored in separate new clean 55-gallon drums. Drums will be clearly labeled, indicating content, date generated, name of the responsible party with contact phone number, and that contents are pending analysis.

At the conclusion of RI sampling activities, the water waste stream will be sampled by collecting a composite water sample (at a rate of one sample per 20 drums of media/waste). Drums will be closed and stored on-site at a suitable location pending disposal once waste characterization results are available. The drums will be placed on pallets and will be covered with tarps.

All wastes will be analyzed to determine if they meet the definition of a RCRA characteristic waste (i.e., ignitibility, corrosivity, reactivity, and toxicity analyses). The planned characterization analyses will support off-site management planning for the wastes.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 5 Timeline: Approximately 6 weeks

Objective 5 Deliverables: Routine progress updates to stakeholders, interim data report updates, data input to support RI Report preparation

OBJECTIVE 6: CHARACTERIZATION OF SURFACE WATER AND SEDIMENT CONTAMINATION

Amec Foster Wheeler proposes to use several sampling methods to characterize surface water and sediments in the stream which is in the northern portion of the site. Figure 5 shows the locations of planned stream sampling activities.

Figure 5 shows the planned stream sampling locations. Table 2 summarizes the stream sampling program and defines the depths of sample intervals and the planned laboratory analyses at each location.

TASK A: SURFACE WATER SAMPLING

Five surface water samples will be collected during the RI. Each surface water sample will be collected from the center of the stream channel at an approximate mid-point location above the stream sediment and below the surface of the water. Depending on the depth and current of the stream, sample locations will be accessed directly by a sampling technician wearing waders, or via a boat. A stainless-steel dipper (i.e., transfer container), attached to an extension rods (if needed), will be used to fill sample containers containing preservatives. For laboratory jars that do not contain preservatives, sampling may be conducted by direct sample container immersion (if the sample depth does not preclude this method).

Field parameters of pH, temperature, specific conductivity, and DO will be measured for each sample point. Water depth at the sampling point will be measured with a graduated staff (e.g., steel yardstick) at shallow depths or with one of various manual or electronic devices available for deeper depths.

To avoid impacting the representativeness of the surface water samples (i.e., by disturbing sediments upstream during sampling activities), the samples will be collected first from the most downstream location, then progressing to the most upstream location. At each sampling point, surface water sampling will be completed before any associated sediment sampling. The location of each surface water sample will be surveyed using a hand-held sub-meter GPS device. Surface water samples will be collected no earlier than one week after a precipitation event.

Surface water samples will be kept on ice and stored in coolers and then provided to the laboratory under chain-of-custody procedures within the appropriate hold times.

TASK B: SEDIMENT SAMPLING

Five submerged sediment samples will be collected during the RI. The sediment samples will be co-located with the surface water samples which were described in the previous section. Each sediment sample will be collected from the center of the stream channel. Depending on the depth and current of the stream, sample locations will be accessed directly by a sampling technician wearing waders, or via a boat.

Due to the long duration of industrial activities conducted at the site, 2-inch diameter core barrel sampler will be used to collect a 2-foot long sample core. This length of core will best represent the historic period of sediment deposition which occurred during the operational period of the facility. The core barrel sampler is a hand-driven, hollow, stainless steel or polycarbonate core barrel, with a beveled edge on the head assembly at the leading end and a check valve or flapper valve at the opposite end to keep the sample in the barrel by partial vacuum. The trailing end has a T-handle to push and/or twist the core barrel into the soft sediment.

After collection, each sample will be extruded from the core barrel, and the resulting sample will be homogenized in a stainless-steel bowl. More than one core barrel sample may be collected from each sample location if more sample volume is required for the desired laboratory analyses. After sample homogenization, the sediment sample will be placed into the laboratory supplied jars. Sediment samples will be kept on ice and stored in coolers and then provided to the laboratory under chain-of-custody procedures within the appropriate hold times.

To avoid impacting the representativeness of the sediment samples (i.e., by disturbing sediments upstream during sampling activities), the samples will be collected first from the most downstream location, then progressing to the most upstream location. The location of each sediment sample will be surveyed using a hand-held sub-meter GPS device. Sediment samples will be collected no earlier than one week after a precipitation event.

TASK C: ANALYTICAL TESTING

To support assessment of potential stream contamination associated with the fertilizer building, surface water and sediment samples will be submitted for analytical testing of:

- MDA List 1 Pesticides
- MDA List 2 Pesticides
- Nitrate-nitrogen
- TKN
- PFAS (MPCA Preferred List)
- VOC
- GRO
- DRO
- PAHs
- Low-level analysis for EDB and DBCP
- Dissolved RCRA Metals

Surface water and sediment quality control samples will consist of a laboratory-provided trip blanks, laboratory-provided temperature blanks, duplicate groundwater samples (one for every 10 primary media samples), and matrix spike/matrix spike duplicates (one for every 20 primary media samples).

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 6 Timeline: 1 month

Objective 6 Deliverables: Routine progress updates to stakeholders, data input to support RI Report preparation

OBJECTIVE 7: CHARACTERIZATION OF SOIL VAPOR CONTAMINATION

Based on the vapor intrusion potential sources and receptors identified in Figure 6, a soil vapor contamination evaluation will be conducted. The evaluation will be conducted in accordance with MPCA BMPs for Vapor Intrusion and documented in the required MPCA Map Templates.

TASK A: SOIL VAPOR INVESTIGATION

Subtask 1: Exterior Soil Gas Sampling

Amec Foster Wheeler proposes to use a DPT rig to advance borings for soil gas sampling purposes. A total of five direct push borings will be advanced to 8 ft bgs, as shown in Figure 7 and summarized in Table 2. Groundwater at the site is reported to occur between 6 and 10 ft bgs. Soil gas samples will be collected from the 7 to 8-foot interval unless groundwater is encountered and a soil gas sample will then be collected two feet above the water table or at the 3 to 4-foot interval. At each sample location, a soil gas sample will be collected using a 6-liter SUMMA® container.

No soil will be collected during the soil gas sampling effort; however, the soil vapor will be field screened at the soil gas collection point using a portable PID equipped with an 11.7 eV lamp.

Each soil gas sample will be analyzed for TO-15 using the Minnesota list.

Subtask 2: Off-Site Sub-Slab Sampling

Amec Foster Wheeler proposes completing a sub-slab vapor investigation by installing a vapor port in the foundation slab of eight off-site properties as shown in Figure 8 and summarized in Table 2. Private utility locates, using a magnetic line locator and a GPR to scan the concrete and soil beneath the slab, will be conducted at each property. The vapor ports will be installed using a hammer drill to core through the foundation slab.

The sub-slab soil gas samples will be collected using a 6-liter SUMMA® container fitted with a 200 milliliter per minute (ml/minute) flow regulator. A shut-in test will be performed on each sampling train and SUMMA® container. A water dam will be placed at each vapor pin to mechanically seal the sampling point from leaks. Prior to sampling, the sample train and vapor point will be purged to remove ambient air.

Sampling is proposed to be conducted during a minimum of two events as described below:

- Eight sub-slab samples will be collect during the initial (non-heating season) sub-slab sampling event.
- Eight sub-slab samples will be collect during the second seasonal (heating season) sub-slab sampling event.
- Should a sub-slab sample result exceed the applicable ISV for TCE at a property, during either event, additional sub-slab vapor ports will be installed based on the building square footage in accordance with applicable MPCA Guidance.

Each sub-slab soil vapor sample will be analyzed for TO-15 using the Minnesota list.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1, GIS / CADD Specialist

Objective 7 Timeline: 3 weeks

Objective 7 Deliverables: Routine progress updates to stakeholders, data input to support RI Report preparation, Interim Vapor Data submittals to MPCA

OBJECTIVE 8: ON-SITE WATER SUPPLY WELL SEALING

Previous site data confirm that the water supply well located in the waterfill area adjacent to the fertilizer building foundation has been impacted by various COPC (e.g., TCE, pesticides, and Nitrates). To eliminate this well acting as a high-conductivity conduit for the migration of site impacts into the subsurface, and to eliminate a well not suitable for its intended uses, the water supply well will be sealed. The water well will be sealed by a MDH licensed well driller in accordance with applicable MDH well code.

Responsible Party(ies): Project Manager, Field Technician, Scientist 1

Objective 8 Timeline: 1 week (notification, sealing, and sealing report)

Objective 8 Deliverables: Water well sealing-related documents to the MDH

OBJECTIVE 9 – RI REPORT

A comprehensive RI Report will be prepared summarizing all the data generated in the above tasks. The report format and contents will be in accordance with applicable MDA and MPCA guidance. Prior to the start of field data collection activities, a detailed outline of the RI Report will be prepared and provided to MPCA and MDA for review and comment.

Responsible Party(ies): Project Manager, Scientist 1, Scientist 2, Engineer 1, Human Health Risk Assessor 2, Ecological Risk Assessor 2, GIS / CADD Specialist

Objective 9 Timeline: 3 months

Objective 9 Deliverables: RI Report to regulatory stakeholders

TABLE 1
SUMMARY OF SOIL SAMPLING ACTIVITIES
Scenario A - RI Sampling Plan

Sampling Location ID	High Risk/Sampling Areas Addressed	Soil Sample Type		Depth Interval (ft bgs)	COPC	Lab Analysis
		Discrete	*Composite*			
Grid Sampling Areas 1 - 62	Former fertilizer building (outside of foundation), scale structure, soil staining north of building	X (PFAS)[1]	X	0-0.5	List A, PFAS[1], ACM, Lead	Method List A (Contingent[2]), EPA Method 537[1], ACM/PLM[3], EPA 6010
		X (VOC)[4]	X	2-2.5	Liast A, ACM, VOC[4], Physiochemical Paramaters	Method List A, ACM/PLM[3], EPA 8260[4], EPA 9045D,Sieve, EPA 9060A
		X		4.5-5	List A, PFAS[1], ACM	Method List A (Contingent[2]), EPA Method 537[1], ACM/PLM[3]
Grid Sampling Areas 63 - 68	Vehicle/equipment maintanance garage (possible building rinse water dumping)		X	0-0.5	List A	Method List A (Contingent[2])
		X (VOC)	X	2-2.5	List A, VOC	Method List A, EPA 8260
		X		4.5-5	List A	Method List A (Contingent[2])
FD-SB-1	Former fertilizer building (beneath foundation)	X		0-0.5 (BF)	List A, PFAS	Method List A, USEPA Method 537
		X		2.5-3 (BF)	List A, PFAS	Method List A, USEPA Method 537
FD-SB-2	Former fertilizer building (beneath foundation)	X		0-0.5 (BF)	List A, PFAS	Method List A, USEPA Method 537
		X		2.5-3 (BF)	List A, PFAS	Method List A, USEPA Method 537
FD-SB-3	Former fertilizer building (beneath foundation)	X		0-0.5 (BF)	List A, PFAS	Method List A, USEPA Method 537
		X		2.5-3 (BF)	List A, PFAS	Method List A, USEPA Method 537
FD-SB-4	Former fertilizer building (beneath foundation)	X		0-0.5 (BF)	List A, PFAS	Method List A, USEPA Method 537
		X		2.5-3 (BF)	List A, PFAS	Method List A, USEPA Method 537
FD-SB-5	Former fertilizer building (beneath foundation)	X		0-0.5 (BF)	List A, PFAS	Method List A, USEPA Method 537
		X		2.5-3 (BF)	List A, PFAS	Method List A, USEPA Method 537
FD-SB-6	Former fertilizer building (beneath foundation), 1,000-gallon gasoline UST	X		0-0.5 (BF)	List A, PFAS, VOC, GRO, Lead	Method List A, EPA Method 537, EPA 8260,WI GRO, EPA 3050
		X		2.5-3 (BF)	List A, PFAS, VOC, GRO, Lead	Method List A, EPA Method 537, EPA 8260,WI GRO, EPA 3050
MW18-1	All site areas of potential concern, side-gradient well	X		TBD	Contingent[5]	Contingent[5]
MW18-2	Area of documented TCE impacts to groundwater	X		TBD	Contingent[5]	Contingent[5]
MW18-3	South of fertilizer building	X		TBD	Contingent[5]	Contingent[5]
MW18-4	Area of documented COPC impacts to groundwater - site water supply well	X		TBD	Contingent[5]	Contingent[5]
MW18-5	Downgradient of vehicle/maintenance garage	X		2.5-3	VOC	EPA 8260
MW18-6	Area of documented TCE impacts to groundwater	X		2.5-3	VOC	EPA 8260
MW18-7	All site areas of potential concern, background/upgradient well	X		TBD	Contingent[5]	Contingent[5]
MW18-8	Between stream and vehicle/maintenance garage	X		2.5-3	VOC	EPA 8260
MW18-9	Between stream and site buildings	X		TBD	Contingent[5]	Contingent[5]
MW18-10	Between stream and former fertilizer building	X		TBD	Contingent[5]	Contingent[5]
MW18-11	All site areas of potential concern, downgradient well at site boundary	X		TBD	Contingent[5]	Contingent[5]
MW18-12	All site areas of potential concern, downgradient well	X		TBD	Contingent[5]	Contingent[5]
MW18-13	All site areas of potential concern, downgradient well	X		TBD	Contingent[5]	Contingent[5]
MW18-14	All site areas of potential concern, downgradient well	X		TBD	Contingent[5]	Contingent[5]
SS-1	Spent solvent dumping	X		0-0.5	VOC, GRO, DRO, RCRA Metals	EPA 8260, WI GRO and DRO, EPA 6010C
SS-2	Spent solvent dumping	X		0-0.5	VOC, GRO, DRO, RCRA Metals	EPA 8260, WI GRO and DRO, EPA 6010C
SS-3	Spent solvent dumping	X		0-0.5	VOC, GRO, DRO, RCRA Metals	EPA 8260, WI GRO and DRO, EPA 6010C
SS-4	Spent solvent dumping	X		0-0.5	VOC, GRO, DRO, RCRA Metals	EPA 8260, WI GRO and DRO, EPA 6010C
SS-5	Spent solvent dumping	X		0-0.5	VOC, GRO, DRO, RCRA Metals	EPA 8260, WI GRO and DRO, EPA 6010C
SS-6	500-gallon heating oil AST	X		0-0.5	VOC, DRO, PAH	EPA 8260, WI DRO, EPA 8270
SS-7	500-gallon heating oil AST	X		0-0.5	VOC, DRO, PAH	EPA 8260, WI DRO, EPA 8270
SS-8	500-gallon heating oil AST	X		0-0.5	VOC, DRO, PAH	EPA 8260, WI DRO, EPA 8270

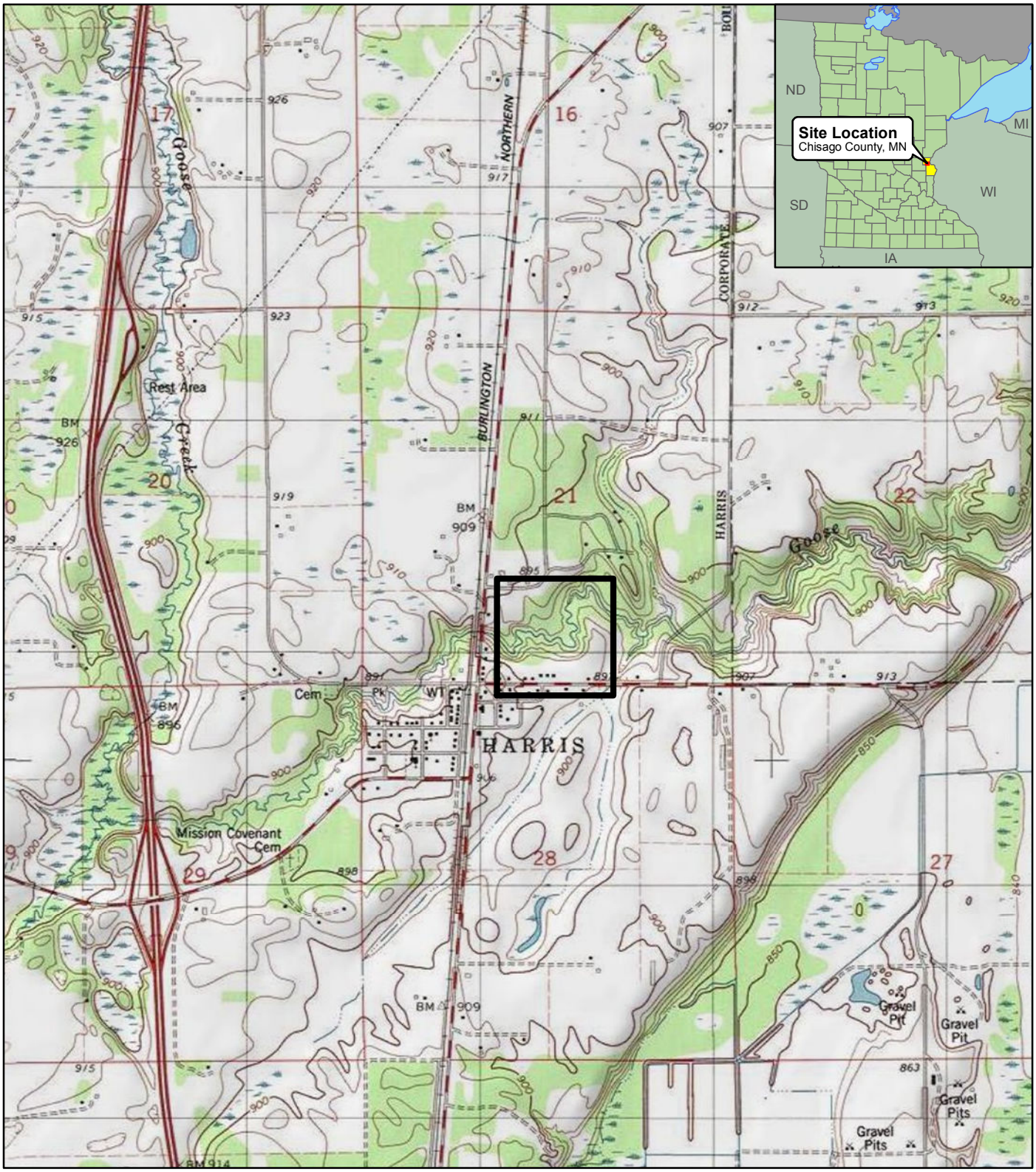
Notes:
(1) = 20 samples each, from discrete horizons of 0-0.5' and 4.5-5' bgs at grid numbers 2, 4, 7, 10, 12, 20, 22, 30, 32, 35, 37, 39, 41, 43, 46, 49, 51, 53, 56, 5
(2) = Contingency samples - frozen - analysis only after consultation with MPCA/MDA
(3) = Laboratroy analysis for asbestos only if demolition debris observed - after consultation with MPCA/MDA
(4) = VOC analysis only on discrete samples from grid numbers 35 to 40 and 49 to 54 (2-2.5 ft bgs
(5) = Soil samples submitted for analytical testing only of field observations and/or field screening warrant - after consultation with MPCA/MDA

ft bgs = Feet below ground surface
COPC = Chemical of Potential Concern
BF = Below bottom of foundation
ACM = Asbestos Containing Material
PLM = Polarized Light Microscopy
List A = MDA List 1 & 2 Pesticides, Nitrate-nitrogen, TKN
Method List A = EPA 8151, EPA 8081, General Chemistry
TBD = Depth to be determined based on field observations/measurements

TABLE 2
SUMMARY OF GROUNDWATER, SURFACE WATER, SEDIMENT AND SOIL GAS SAMPLING ACTIVITIES
Scenario A - RI Sampling Plan

Sampling Location ID	High Risk/Sampling Areas Addressed	Sample Type		Depth Interval (ft bgs)	COPC	Lab Analysis
		Discrete	*Composite*			
Groundwater						
MW18-1	All site areas of potential concern, side-gradient well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-2	Area of documented TCE impacts to groundwater	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-3	South of fertilizer building	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-4	Area of documented COPC impacts to groundwater - site water supply well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-5	Downgradient of vehicle/maintenance garage	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-6	Area of documented TCE impacts to groundwater	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-7	All site areas of potential concern, background/upgradient well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-8	Between stream and vehicle/maintenance garage	X		5-15	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-9	Between stream and site buildings	X		5-15	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-10	Between stream and former fertilizer building	X		5-15	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-11	All site areas of potential concern, downgradient well at site boundary	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-12	All site areas of potential concern, downgradient well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-13	All site areas of potential concern, downgradient well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
MW18-14	All site areas of potential concern, downgradient well	X		20-30	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
PRIVATE WELLS (9)	Wells associated with Buildings 1-5 of Block 5 and Buildings 1-4 of Block 7	X		TBD	List A, PFAS, VOCs, PAHs	Method List A, EPA 537, EPA 8260, EPA 8270
Surface Water						
SW-1	Upstream from the site areas of potential concern	X		Mid	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
SW-2	Downgradient from the vehicle/maintenance garage	X		Mid	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
SW-3	Downgradient from the former fertilizer building	X		Mid	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
SW-4	At downstream site boundary	X		Mid	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
SW-5	Off-site downgradient from the site areas of potential concern	X		Mid	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6020A
Sediment						
SED-1	Upstream from the site areas of potential concern	X		0-2	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6010C
SED-2	Downgradient from the vehicle/maintenance garage	X		0-2	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6010C
SED-3	Downgradient from the former fertilizer building	X		0-2	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6010C
SED-4	At downstream site boundary	X		0-2	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6010C
SED-5	Off-site downgradient from the site areas of potential concern	X		0-2	List A, PFAS, VOCs, GRO, DRO, PAHs, low level EDB and DBCP, RCRA Metals	Method List A, EPA 537, EPA 8260, WI GRO and DRO, EPA 8270, EPA 8011, EPA 6010C
Soil Gas						
SG-1	Southeast corner of Block 2	X		TBD	VOCs	TO-15
SG-2	Northeast corner of Block 4	X		TBD	VOCs	TO-15
SG-3	Northeast corner of Block 6	X		TBD	VOCs	TO-15
SG-4	Southeast quarter of Block 6	X		TBD	VOCs	TO-15
SG-5	South of the former fertilizer building	X		TBD	VOCs	TO-15
Sub-Slab Vapor						
PRIVATE RESIDENCES (8) 2 Events	Buildings 1-5 of Block 5 and Buildings 1, 3, and 4 of Block 7	X		BF	VOCs	TO-15

Notes:
ft bgs = Feet below ground surface
COPC = Chemical of Potential Concern
BF = Below bottom of foundation
List A = MDA List 1 & 2 Pesticides, Nitrate-nitrogen, TKN
Method List A = EPA 8151, EPA 8081, General Chemistry
Mid = Midway between surface of water and top of sediment
TBD = Depth to be determined based on field observations/measurements



Legend

Approximate Site Boundary

1:24,000 — 1 inch equals 2,000 feet

Approximate Scale in Feet

0 — 2,000 — 4,000 — 6,000

SITE LOCATION MAP

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note: 1:24k Topos courtesy of ESRI (North Branch Quad)

Date:	04/05/2018	Project No.	PROPOSAL
Drawn:	MJV	Figure:	1
Checked:	JSM		

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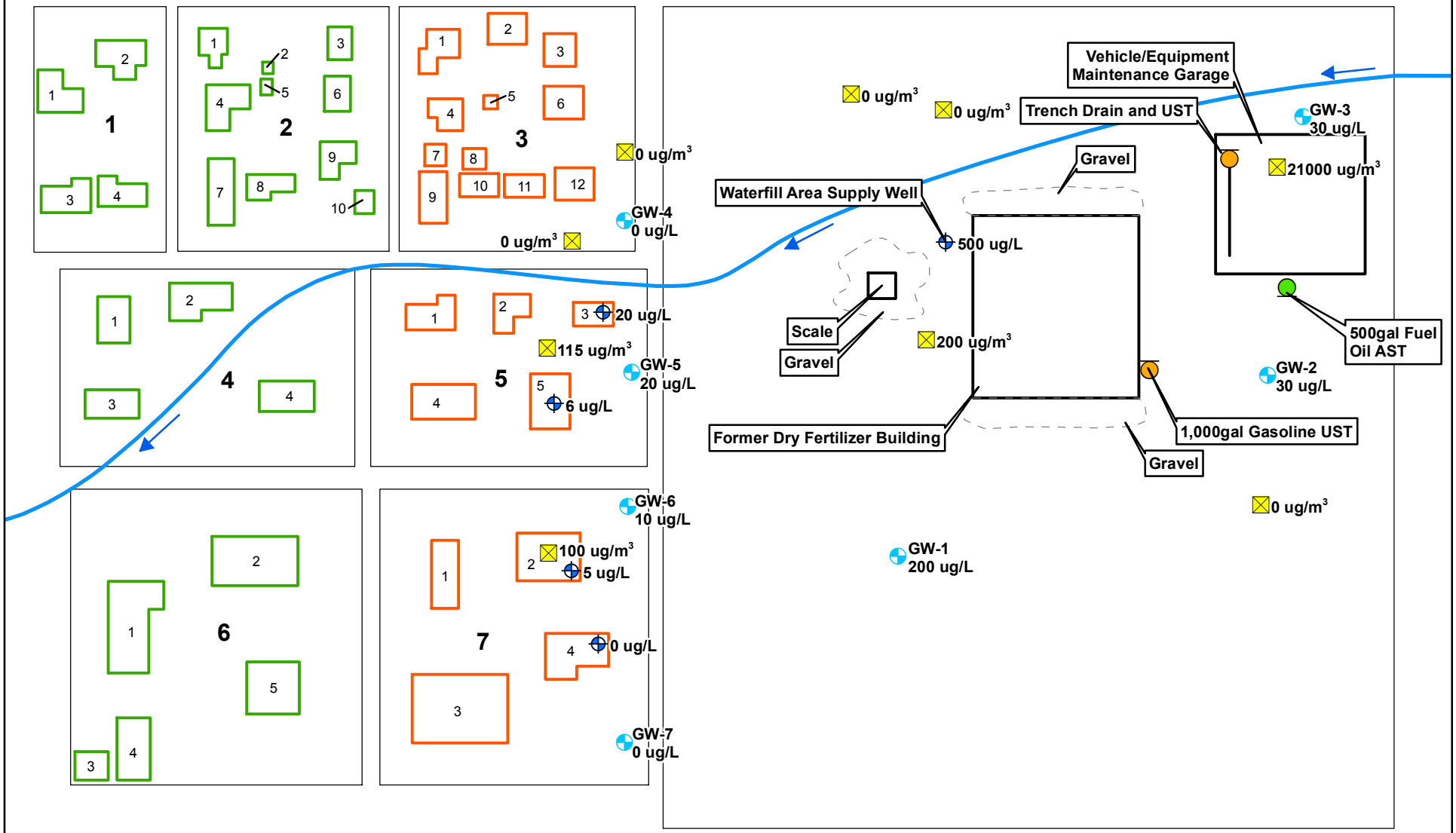

Legend

- Water Supply Well Sample with TCE Result
- Previous Groundwater Sample Location with TCE Result
- Previous Soil Vapor Sample Location with TCE Result
- Aboveground Storage Tank
- Underground Storage Tank
- Stream
- Building Supplied by Municipal Water
- Building Supplied by Private Well
- 1 Block Number
- 1 Building Number
- ug/L micrograms per liter
- ug/m³ micrograms per cubic meter

SITE AREA MAP

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018	Project No. PROPOSAL	
Drawn: MJV	Figure: **2**	
Checked: JSM		

1:3,600 — 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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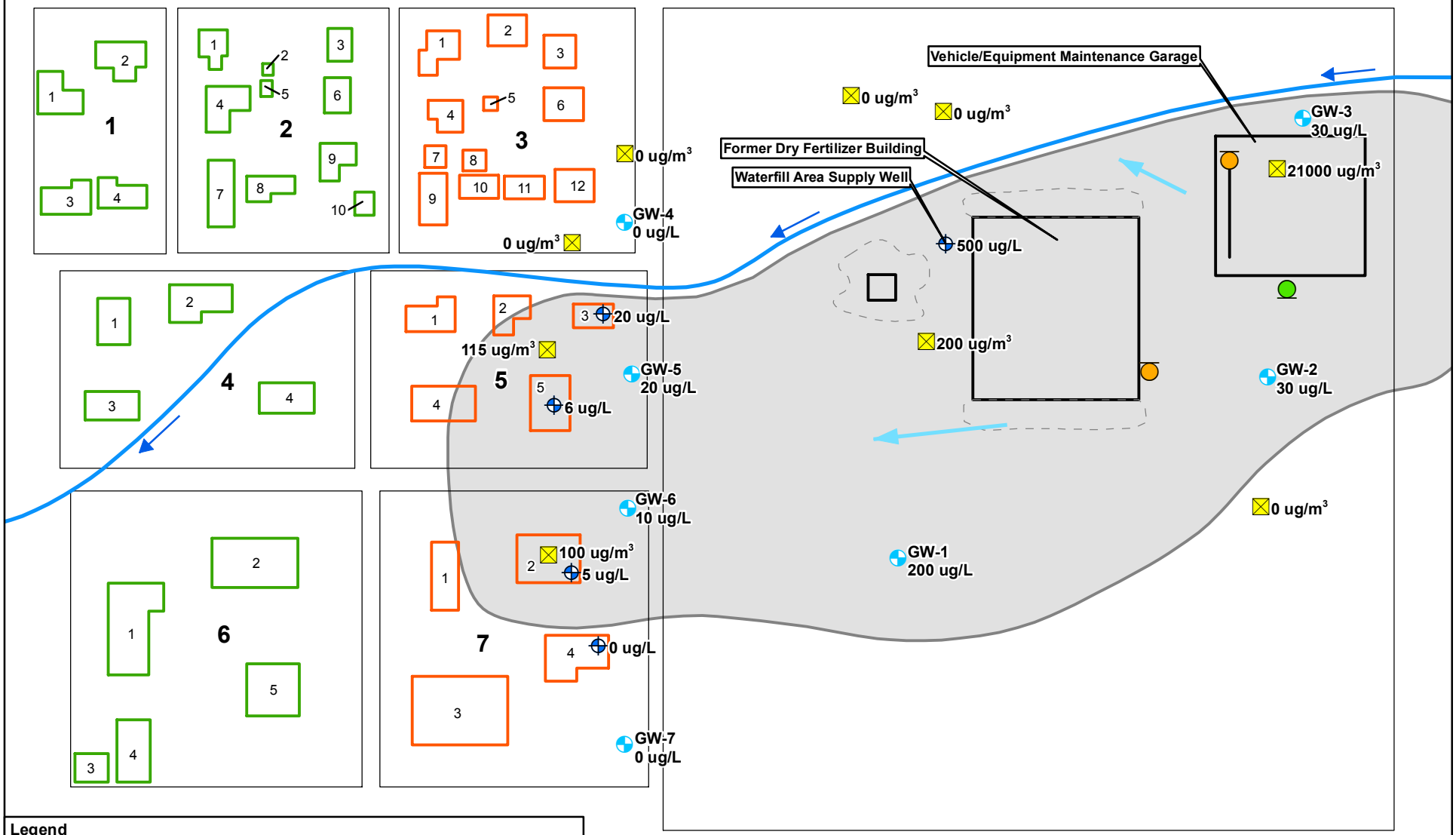

Legend

- Water Supply Well Sample with TCE Result
- Previous Groundwater Sample Location with TCE Result
- Previous Soil Vapor Sample Location with TCE Result
- Aboveground Storage Tank
- Underground Storage Tank
- Stream
- Anticipated Direction of Groundwater Flow
- Building Supplied by Municipal Water
- Building Supplied by Private Well
- Estimated Extent of TCE Above MDH Criteria

ug/L micrograms per liter
ug/m^3 micrograms per cubic meter

APPROXIMATE TCE PLUME

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018
Project No. PROPOSAL
Drawn: MJV
Figure: 3
Checked: JSM

1:3,600
1 inch equals 300 feet
Approximate Scale in Feet
0 300 600 900

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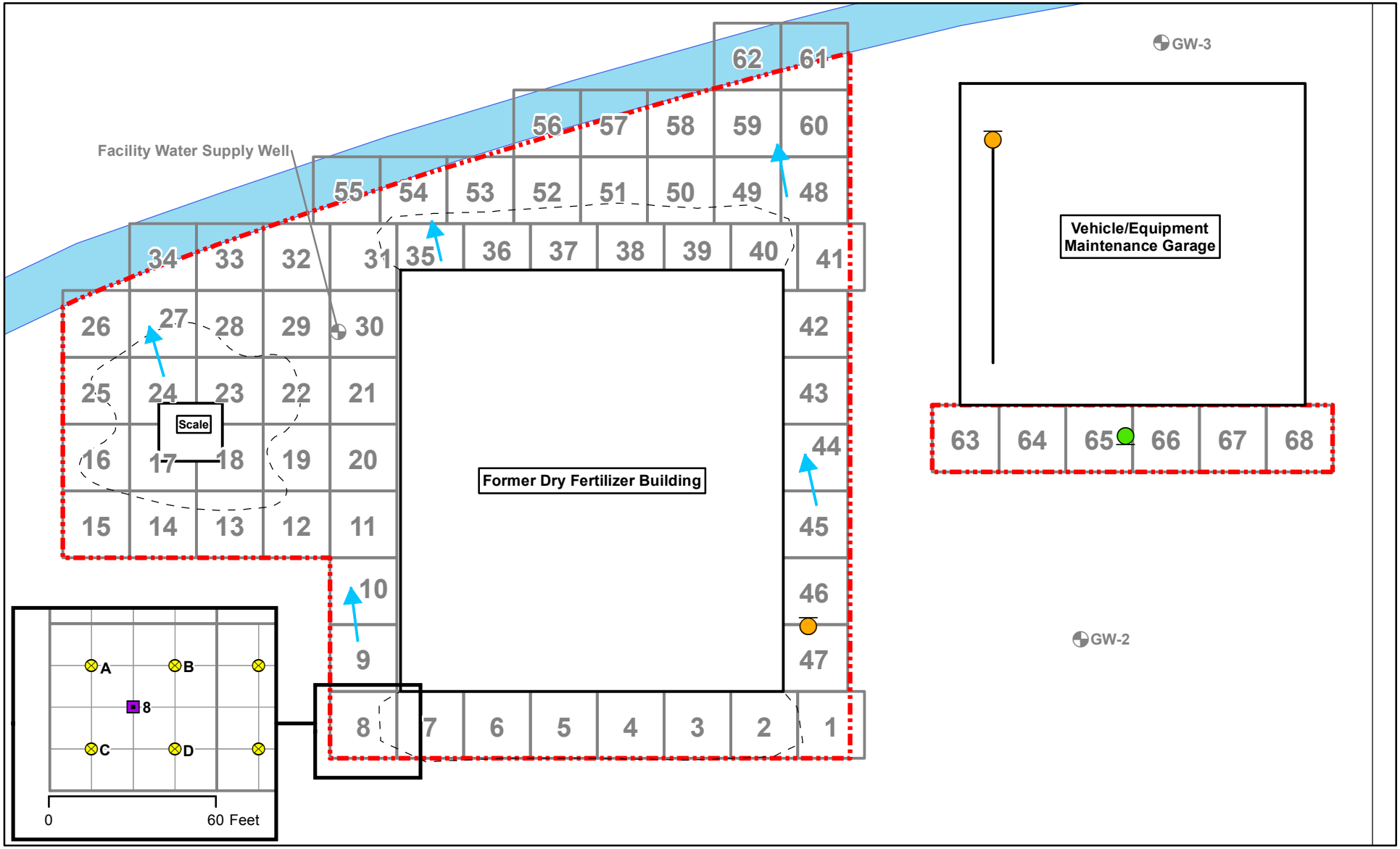

Legend

- 0-0.5' and 2-2.5' Soil Sample Subsample Locations
- 4.5-5' Soil Grab Sample
- Previous Groundwater Sample Location
- Aboveground Storage Tank
- Underground Storage Tank
- Surface Water Flow Direction
- Stream
- Anticipated Impacted Soil Area
- 15'x15' Sampling Sub-Grid
- 60'x60' Sampling Grid

PROPOSED COMPOSITE SOIL SAMPLING LOCATIONS

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018	Project No. PROPOSAL
Drawn: MJV	Figure: 4
Checked: JSM	

1:1,500 — 1 inch equals 125 feet

Approximate Scale in Feet: 0 100 200 300

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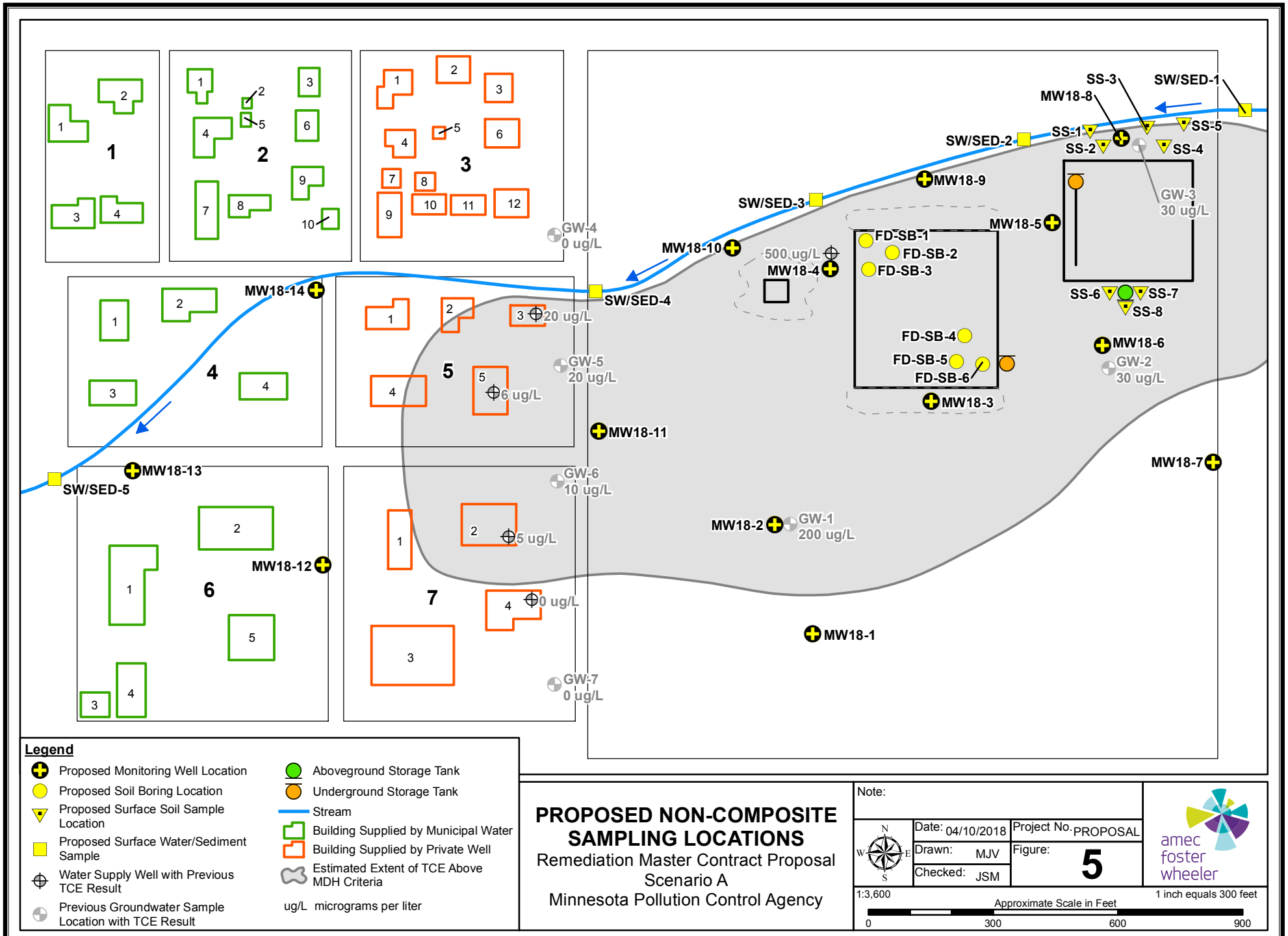

Legend

- Proposed Monitoring Well Location
- Proposed Soil Boring Location
- Proposed Surface Soil Sample Location
- Proposed Surface Water/Sediment Sample
- Water Supply Well with Previous TCE Result
- Previous Groundwater Sample Location with TCE Result
- Aboveground Storage Tank
- Underground Storage Tank
- Stream
- Building Supplied by Municipal Water
- Building Supplied by Private Well
- Estimated Extent of TCE Above MDH Criteria
- ug/L micrograms per liter

PROPOSED NON-COMPOSITE SAMPLING LOCATIONS

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018	Project No. PROPOSAL
Drawn: MJV	Figure: 5
Checked: JSM	

1:3,600 — 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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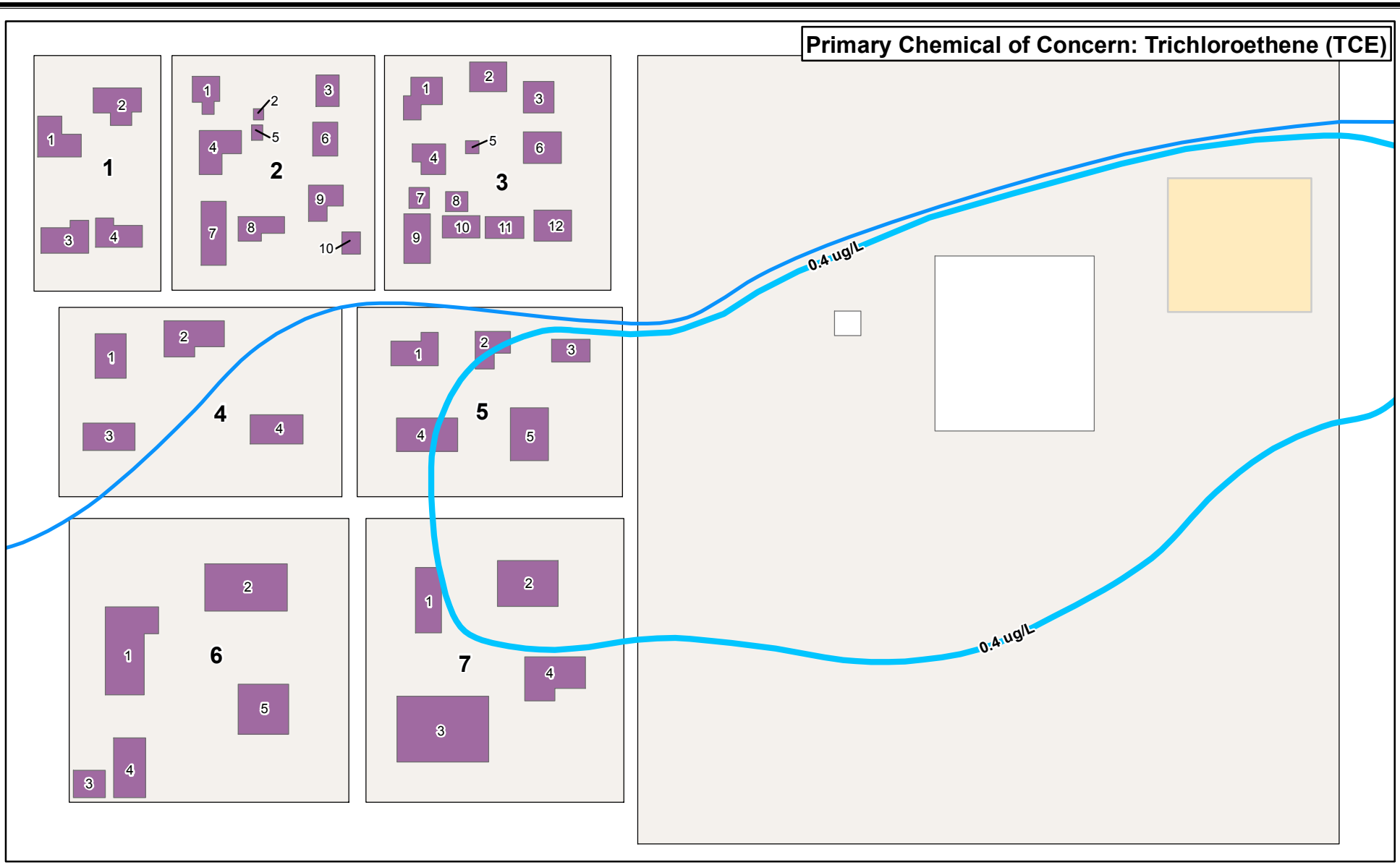

Legend

Stream

Buildings

Residential Properties

Former Commercial/Industrial Properties

1 Block Number

1 Building Number

Known Environmental Conditions

Source Area

Area of Uppermost Groundwater Contamination Above Appropriate Standard

ug/L micrograms per liter

Vapor Intrusion Potential Sources and Receptors

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018	Project No. PROPOSAL
Drawn: MJV	Figure: 6
Checked: AMF	

1:3,600 — 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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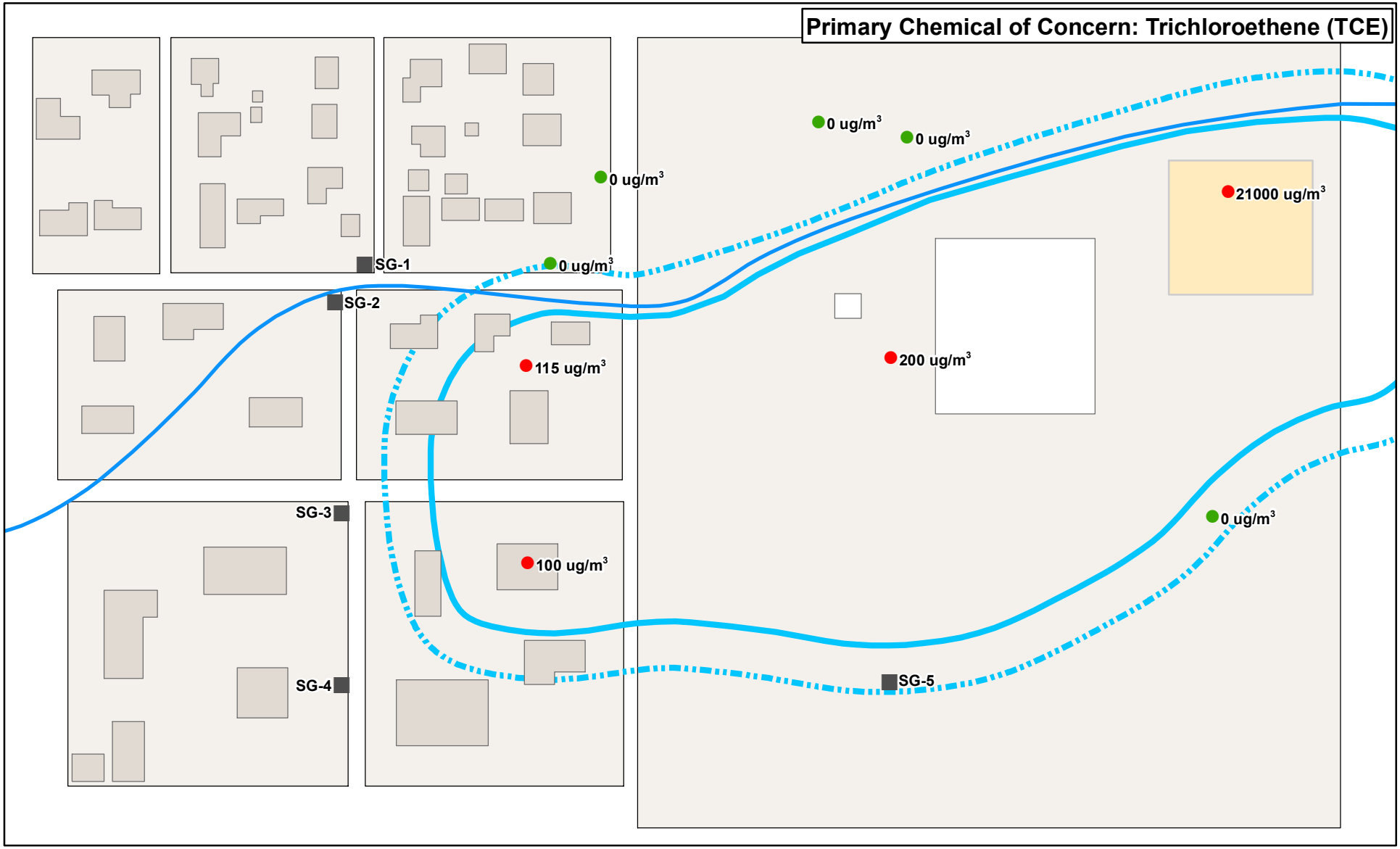

Legend

- Proposed Soil Gas Sample Location
- Existing Soil Gas Sample Above Residential/Commercial Screening Value
- Existing Soil Gas Sample Below Residential/Commercial Screening Value
- Stream
- Buildings
- Former Buildings
- Source
- Area of Uppermost Groundwater Contamination Above Appropriate Standard
- 100-ft Buffer of Known Source Areas/REC

Proposed Soil Gas Investigation

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note:

Date: 04/10/2018	Project No. PROPOSAL	
Drawn: MJV	Figure: 7	
Checked: AMF		

1:3,600 — 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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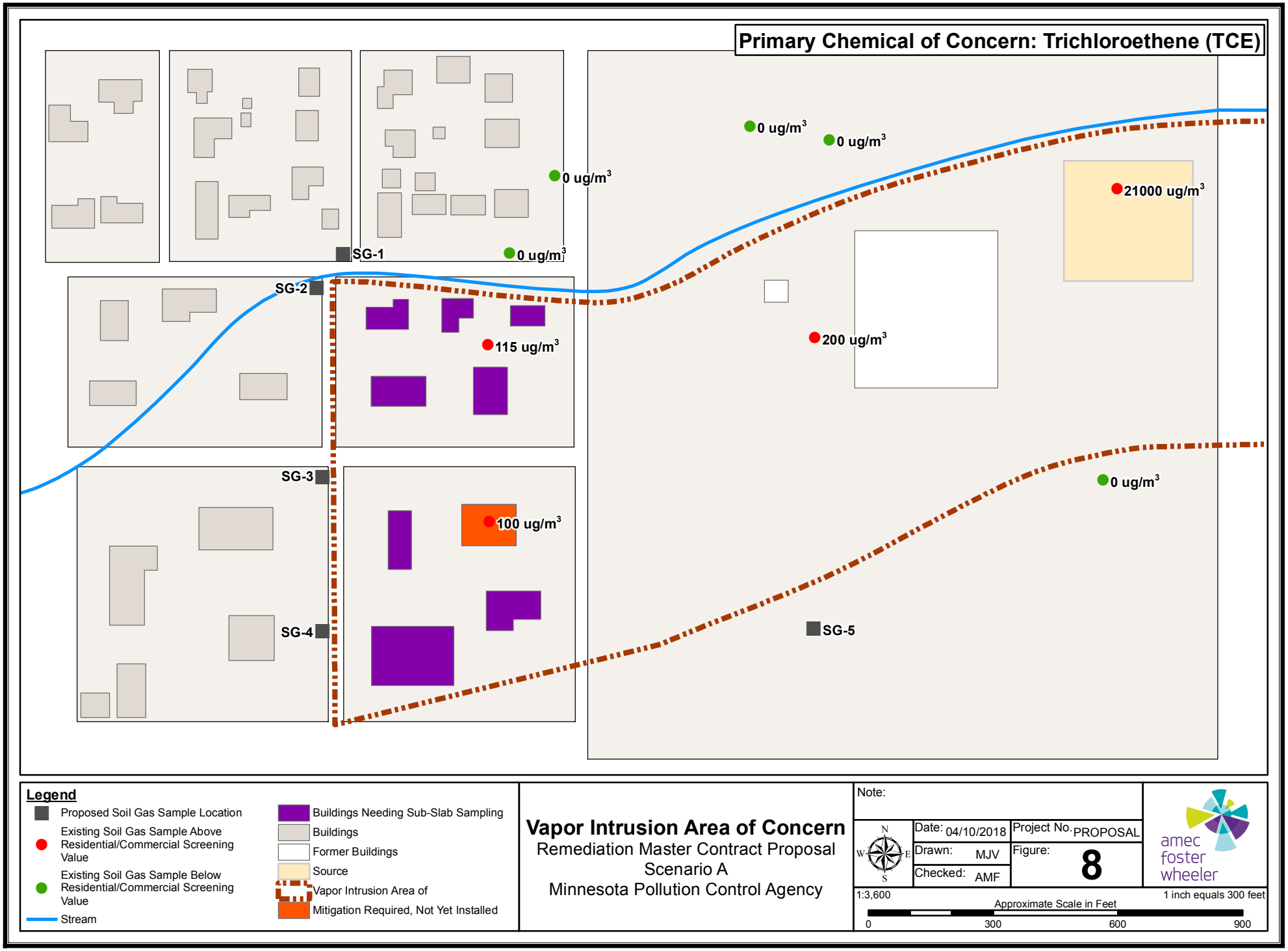
Primary Chemical of Concern: Trichloroethene (TCE)
0 ug/m3
0 ug/m3
0 ug/m3
21000 ug/m3
SG-1
0 ug/m3
SG-2
115 ug/m3
200 ug/m3
SG-3
100 ug/m3
0 ug/m3
SG-4
SG-5
Legend
Proposed Soil Gas Sample Location
Existing Soil Gas Sample Above Residential/Commercial Screening Value
Existing Soil Gas Sample Below Residential/Commercial Screening Value
Stream
Buildings Needing Sub-Slab Sampling
Buildings
Former Buildings
Source
Vapor Intrusion Area of
Mitigation Required, Not Yet Installed
Vapor Intrusion Area of Concern
Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency
Note:
N
W
E
S
Date: 04/10/2018
Project No. PROPOSAL
Drawn: MJV
Figure: 8
Checked: AMF
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1:3,600
1 inch equals 300 feet
Approximate Scale in Feet
0
300
600
900

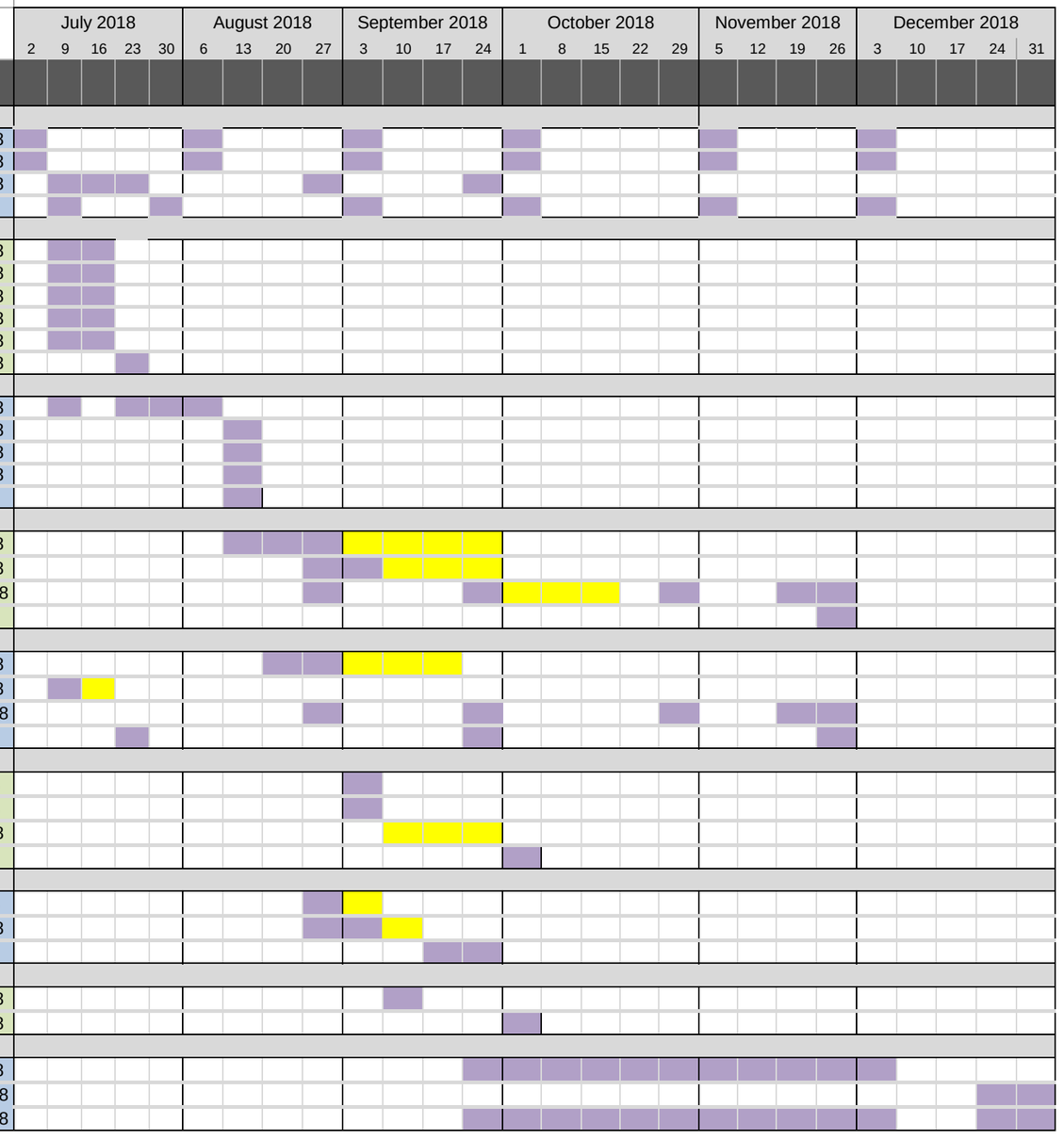
Scenario A - Former Agricultural Chemical Plant - Generalized Schedule For RI Implementation

Amec Foster Wheeler

fertilizer building (outside of foundation), scale structure,

Project Start: Mon, 7/2/2018

TASK	ASSIGNED TO	PROGRESS	START	END
Objective 1 - Project Coordination and Safety Planning				
Task A - Subcontractor Procurement / Coordination	PM, S1	0%	7/2/18	7/18/18
Task B - Inter-Agency Coordination	PM, GIS, S1	0%	7/2/18	7/20/18
Task C - Safety Planning	PM, GIS, S1, FT	0%	7/18/18	7/24/18
Objective 1 - Deliverables	PM, GIS, S1	0%	Routine	
Objective 2 - Receptor / Contamination Impacts Survey				
Task A - Well Receptor Survey	PM, S1, FT	0%	7/9/18	7/25/18
Task B - Water Line Permeation Receptor Survey	PM, S1, FT	0%	7/9/18	7/25/18
Task C - Surface Water Receptor Survey	PM, S1, FT	0%	7/9/18	7/25/18
Task D - Subsurface Utilities and Structures Survey	PM, S1, FT	0%	7/9/18	7/25/18
Task E - Vapor Intrusion Receptor Survey	PM, S1, FT	0%	7/9/18	7/25/18
Objective 2 - Deliverables	PM, GIS, S1, HR, ER	0%	7/23/18	7/27/18
Objective 3 - Site Mobilization Activities				
Task A - Fieldwork Preparation	PM, S1, FT	0%	7/9/18	8/10/18
Task B - Utility Locate Activities	PM, S1, FT	0%	8/13/18	8/15/18
Task C - Field Mobilization	PM, S1, FT	0%	8/13/18	8/15/18
Task D - Establishment of Sampling Grids	PM, GIS, S1, FT	0%	8/13/18	8/17/18
Objective 3 - Deliverables	PM, GIS, S1, FT	0%	Routine	
Objective 4 - Characterization of Soil Contamination				
Task A - Fertilizer Building Soil Characterization	PM, S1, FT	0%	8/15/18	9/25/18
Task B - V/E Maintenance Building Soil Characterization	PM, S1, FT	0%	8/27/18	9/25/18
Task C - Waste Characterization and Disposal	PM, S1, FT	0%	8/27/18	11/29/18
Objective 4 - Deliverables	PM, GIS, S1, FT	0%	Routine	
Objective 5 - Characterization of GW Contamination				
Task A - New Permanent Monitoring Wells	PM, S1, FT	0%	8/20/18	9/21/18
Task B - Off-Site Private Water Supply Wells	PM, S1, FT	0%	7/10/18	7/20/18
Task C - Waste Characterization and Disposal	PM, S1, FT	0%	8/27/18	11/30/18
Objective 5 - Deliverables	PM, GIS, S1, FT	0%	Routine	
Objective 6 - Characterization of SW and Sed Contamination				
Task A - Surface Water Sampling	PM, S1, FT	0%	9/3/18	9/6/18
Task B - Sediment Sampling	PM, S1, FT	0%	9/3/18	9/6/18
Task C - Analytical Testing	PM, S1, FT	0%	9/10/18	9/28/18
Objective 6 - Deliverables	PM, GIS, S1, FT	0%	Routine	
Objective 7 - Characterization of SV Contamination				
Task A - Soil Vapor Investigation	PM, S1, FT	0%	8/27/18	9/7/18
Task B - Off-Site Sub-Slab Sampling	PM, S1, FT	0%	8/27/18	9/14/18
Objective 7 - Deliverables	PM, GIS, S1, FT	0%		
Objective 8 - On-Site Water Supply Well Sealing				
Water Supply Well Sealing	PM, S1, FT	0%	9/10/18	9/14/18
Objective 8 - Deliverables	PM, S1, FT	0%	9/17/18	9/28/18
Objective 9 - RI Report				
Draft RI Report	PM, GIS, S1, S2, E1, HR, ER	0%	9/24/18	12/5/18
Final RI Report	PM, GIS, S1, S2, E1, HR, ER	0%	12/26/18	12/31/18
Objective 9 - Deliverables: RI Report	PM, GIS, S1, S2, E1, HR, ER	0%	9/24/18	12/31/18



MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Project title: Scenario A - Agricultural Chemical Site RI Sampling Plan Impleentation

Project Budget	1. Personnel									Labor Totals by Phase
	Level One				Level Two				Level Three	
	Engineer 1	Field Technician	GIS/CADD Specialist	Scientist 1	Ecological Risk Accessor 2	Human Health Risk Assessor 2	Quality Assurance/ Quality Control Officer	Scientist 2	Project Manager	
Objective 1 - Project Coordination and Safety Planning										
Task A - Subcontractor Procurement / Coordination				12					4	16
Task B - Inter-Agency Coordination			4	6					12	22
Task C - Safety Planning			2	20					8	30
Total Hours for Objective 1	**0**	**0**	**6**	**38**	**0**	**0**	**0**	**0**	**24**	**68**
Objective 2 - Receptor Survey / Contamination Impacts Survey										
Task A - Well Receptor Survey		10		2					1	13
Task B - Water Line Permeation Receptor Survey		8		2					1	11
Task C - Surface Water Receptor Survey		4		1	2				1	8
Task D - Subsurface Utilities and Structures Survey		8	2	2					1	13
Task E - Vapor Intrusion Receptor Survey		**8**		2		2			1	13
Total Hours for Objective 2	**0**	**38**	**2**	**9**	**2**	**2**	**0**	**0**	**5**	**58**
Objective 3 - Site Mobilization Activities										
Task A - Fieldwork Preparation		16		4					2	22
Task B - Utility Locate Activities		4		2					2	8
Task C - Field Mobilization		8		8					2	18
Task D - Establishment of Sampling Grids		16	2	2					2	22
Total Hours for Objective 3	**0**	**44**	**2**	**16**	**0**	**0**	**0**	**0**	**8**	**70**
Objective 4 - Characterization of Soil Contamination										
Task A - Fertilizer Building Soil Characterization and Sampling		80	1	24					10	115
Task B - Vehicle/Equipment Maintenance Garage Building Soil Characterization and Sampling		16	1	16					4	37
Task C - Waste Characterization and Disposal		4		4					1	9
Total Hours for Objective 4	**0**	**100**	**2**	**44**	**0**	**0**	**0**	**0**	**15**	**161**
Objective 5 - Characterization of Groundwater Contamination										
Task A - New Permanent Monitoring Wells		60	2	16					4	82
Task B - Off-Site Private Water Supply Wells		24		4					4	32
Task C - Waste Characterization and Disposal		2		2					1	5
Total Hours for Objective 5	**0**	**86**	**2**	**22**	**0**	**0**	**0**	**0**	**9**	**119**
Objective 6 - Characterization of Surface Water and Sediment Contamination										
Task A - Surface Water Sampling		6	1	6					1	14
Task B - Sediment Sampling		6		6					1	13
Task C - Analytical Testing		1		1					1	3
Total Hours for Objective 6	**0**	**13**	**1**	**13**	**0**	**0**	**0**	**0**	**3**	**30**
Objective 7 - Characterization of Soil Vapor Contamination										
Task A - Soil Vapor Investigation		10	1	2					1	14
Task B - Off-Site Sub-Slab Sampling		20		2					1	23
Total Hours for Objective 7	**0**	**30**	**1**	**4**	**0**	**0**	**0**	**0**	**2**	**37**
Objective 8 - On-Site Water Supply Well Sealing		10		2					1	13
Total Hours for Objective 8	**0**	**10**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**13**
Objective 9 - RI Report	2	20	30	80	4	4	2	4	20	166
Total Hours for Objective 9	**2**	**20**	**30**	**80**	**4**	**4**	**2**	**4**	**20**	**166**
PROJECT TOTALS	**2**	**341**	**46**	**228**	**6**	**6**	**2**	**4**	**87**	**722**

MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Scenario A
Remedial Design/Remedial Action Work Plan

Project Title: Scenario A – Former Agricultural Chemical Plant RD/RA

1. Project Summary:

Organization:	Amec Foster Wheeler
Contractor contact name:	Bob Marxen
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E-mail:	bob.marxen@amecfw.com

Subcontractor(s)/Partner(s):

Example Drilling Contractor

Organization:	Thein Well
Type of organization:	Drilling Company
Project manager:	Mike Thein
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Phone:	(763) 271-4200
Fax:	(320) 847-3459
E-mail:	mike@theinwell.com

Example Lab Contractor

Organization:	PACE Analytical
Type of organization:	Laboratory
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E-mail:	jasmith@pacelabs.com

Example Land Surveying Contractor

Organization:	HSJ Co. Inc.
Type of organization:	Land Surveying
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MPCA contact(s):

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2. Statement of Problems, Opportunities, and Existing Conditions

This Work Plan has been prepared for the Minnesota Pollution Control Agency (MPCA) in response to the Request for Proposal (RFP) for Remediation Master Contract dated February 28, 2018. The work plan proposal also incorporates Addendum 1 to the RFP dated March 19, 2018. This Work Plan addresses 'Scenario A' as described in Section 7 Proposal Content, Category A: Petroleum, Superfund, MDA, and Closed Landfill Program Environmental Services, Part 5 (For Remedial Design/Remedial Action [RD/RA]) subpart 2.

Amec Foster Wheeler Environment and Infrastructure (Amec Foster Wheeler) is pleased to submit this Work Plan proposal to conduct remedial design/remedial actions (RD/RA) at the site of a former agricultural chemical plant located in east-central, Minnesota. It is understood that a responsible party (RP) search was conducted and no viable RP could be identified for the site. The site has recently been purchased for potential redevelopment into a golf course. The site is being investigated under the MPCA Site Assessment (SA) program because the current property owner is no longer working cooperatively with the MPCA, and several neighborhood communities have expressed concerned about risks to their health.

Amec Foster Wheeler has proposed to complete a site-wide Remedial Investigation (RI), the findings from which will be used to refine the conceptual site model and provide the details necessary for refining the concepts and design required for this RD/RA.

The scope of work for these RD/RAs has been developed considering the applicable environmental assessment guidance documents available from the Minnesota Department of Agriculture (MDA) Incident Response Unit and the Minnesota Pollution Control Agency (MPCA) Petroleum and Non-Petroleum Programs.

SITE DESCRIPTION

The site is an approximate 59-acre parcel formerly used as an agricultural chemical (ag-chem) plant that operated from 1960 to 1991. A Site location map is provided as Figure 1 and the Site layout is shown on Figure 2. Figure 2 presents the site layout. Information provided by the MPCA and MDA indicate that the pertinent site characteristics, associated with historic site operations, are as follows:

- Two buildings existed at the site to support former operations: a dry fertilizer building (fertilizer building) and a vehicle/maintenance garage.

- **Fertilizer Building**
  - The building is no longer present at the Site as it was destroyed by fire in 1999.
  - An associated truck scale structure remains and is located west of the former building location.
  - A cracked concrete foundation slab remains at the site.
  - During the 1999 firefighting effort, firefighting foam was used to suppress the fire.
  - The building had four access doors: the east and west ends of the building had large overhead doors; a small overhead door was located in the middle of the building on the north side; and a small service door was located on the south side.
  - There are no records indicating utility locations associated with this building.
  - A pesticide mixer/blender was located inside the former fertilizer building on the west end.
  - A waterfill area was located outside the former fertilizer building at the west end, and a shallow water supply well is still located in the waterfill area and is functional (30 feet deep).
  - Agricultural chemical equipment storage/parking areas were located on the north and south sides of the former fertilizer building.
  - A 1,000-gallon gasoline underground storage tank (UST) is known to exist outside at the southeast corner of the former building location (installed in the 1960s).
  - Discolored soils were reported to the north of the fertilizer building during the last facility inspection. These records suggest a discharge had occurred. Follow-up work was never conducted with regards to these stained soils.

- **Vehicle Maintenance Garage**
  - The building is still present at the site and is located east of the area of the former fertilizer building.
  - The concrete floor in this building is intact, and the building remains in good condition for future re-use.
  - Building records indicate that there were three additions to the building over the years – there are no records indicating utility locations.
  - It is reported that the vehicle/maintenance garage was used to wash and maintain equipment
    - A trench floor drain is present in the western portion of the building.
    - The floor drain is connected to an approximately 500-gallon UST of unknown age (located beneath the concrete floor).

    - There are no records of the tank having ever been removed or cleaned out, and it has been reported that the tank leaked.
- The vehicle/maintenance garage was extensively used as a degreasing area for the entirety of operations.
- A former employee indicated that used parts degreaser contents were regularly poured onto the ground near the stream, north of the building.
- A 500-gallon fuel oil aboveground storage tank (AST), installed in the 1960s, and used to heat the garage, is located adjacent to the south side of the building - stained soils have been noted beneath the AST.
- Discolored soils were reported to the north of the vehicle/maintenance garage during the last facility inspection. These records suggest a discharge had occurred. Follow-up work was never conducted with regards to these stained soils.

PHYSICAL SETTING

The site topography is mostly flat, however the ground surface dips downward toward a small stream running through the northern portion of the site. This stream is reported to flow towards the west, into the town located immediately west of the Site (Figure 2). There is an area of gravel surrounding the truck scale and gravel covered vehicle and equipment parking areas exist north and south of the fertilizer building foundation.

General shallow geology at the site is reported to consist of coarse grained sands with thin lenses of silt and clay. Previous investigations encountered shallow groundwater approximately 6-10 feet below the ground surface (ft bgs), with an assumed flow direction heading into town. It is reported that the older portions of the town (i.e., situated closer to the site) are on private well drinking water, with wells typically 30 feet deep (i.e., blocks 3, 5, and 7 of Figure 2). The newer portions of the town (i.e., further west from the site) are on community water from the local municipality (i.e., blocks 1, 2, 4, and 6). Due to the common depth of the water supply wells, it is likely that a low permeability geologic unit, possibly clay, exists beginning at approximately 30 ft bgs.

PREVIOUSLY COMPLETED WORK

Soil and Groundwater

The property owner conducted a limited investigation consisting of several push probes throughout the site and adjacent property. This investigation identified chlorinated ethenes (e.g., most notably trichloroethylene [TCE]) and agricultural chemicals (e.g., nitrogen, dicamba, metolachlor, metribuzin, pendimethalin, and triclopyr) in soils and groundwater above applicable regulatory cleanup goals.

Soil Vapor/Soil Gas

A single round of vapor points were also advanced off-site as part of the property owner's investigation, with some of the detections exceeding the 33X ISV for TCE (see Figure 2). It is known that there is a pregnant person residing at the property where the sub-slab sample was collected. A passive soil-gas sample collected in the vehicle/equipment maintenance garage was noted to be several orders of magnitude above screening criteria.

A secondary investigation conducted by an MPCA contractor was performed at the vehicle/equipment maintenance garage with the intent of evaluating if it was a contributor to downgradient TCE groundwater impacts; this investigation included collecting subsurface media samples from 23 locations within the building footprint. The investigation did not evaluate petroleum impacts potentially located at this area of the site. Based on the data associated with this secondary investigation, three generalized cross-sections of the investigation are were prepared by the MPCA contractor.

Phase I Environmental Site Assessment

As is required by applicable MPCA and MDA guidance, it has been assumed that a Phase I ESA has already been completed for the site in accordance with the United States Environmental Protection Agency (EPA) Rule for All Appropriate Inquiry (AAI) in accordance with 40 Code of Federal Regulations (CFR) Part 312 and the American Society for Testing and Materials (ASTM) E1527-13. The site Phase I ESA was supplemented with data requirements specified in MDA Guidance Document 14 – *The Agricultural Environmental Site Assessment (AgESA).*

AREAS OF POTENTIAL CONCERN

This Work Plan has been prepared to support completion a site wide RI to confirm the areas of potential concern, potential contaminants of concern, determine the nature, magnitude and extent of contaminants, and evaluate potential risks to the public and environment which will ultimately be used to develop a Remedial Design/Remedial Action (RD/RA) Work Plan. Based on the historical activities conducted at the site, as well as information from previous site investigations, the areas of potential concern at the site presently include:

- **Former dry fertilizer building** – The presence of fertilizer, herbicide, and pesticide contaminants in soil and groundwater media is currently documented at the site. Surface water and sediments associated with the on-site stream have yet to be evaluated.

- **Vehicle/maintenance garage building** – The presence of TCE in soil, groundwater, and soil vapor media is currently documented at the site. TCE impacts have also been documented in off-site groundwater and soil vapor. There is a waste

fluids collection UST known to exist inside of this building, under the concrete foundation. Surface water and sediments associated with the on-site stream have yet to be evaluated.

- **Existing hydrocarbon tanks** – two petroleum product tanks currently exist at the site. One 500-gallon heating oil AST is located south of the vehicle/maintenance garage building and one 1,000-gallon gasoline UST is located at the southeast corner of the former fertilizer building.

CONTAMINANTS OF POTENTIAL CONCERN

The contaminants of potential concern (COPCs) at the Site have been established based on the review of Site-specific information provided by, and discussions with, the MDA and MPCA. Based on historical Site operations and historic circumstances, the site COPCs include the following:

- MDA List 1 Pesticides - from former agricultural chemical storage at fertilizer building
- MDA List 2 Pesticides - from former agricultural chemical storage at fertilizer building
- Nitrate - from former fertilizer storage at fertilizer building
- Total Kjeldahl nitrogen (TKN) - from former fertilizer storage at fertilizer building
- Volatile Organic Compounds (VOCs) – including chlorinated VOCs (CVOCs) and petroleum based VOCs from historic activities conducted at the vehicle/maintenance garage building and from the existing petroleum hydrocarbon tanks.
- Per- and polyfluoroalkyl substances (PFAS) - from fire suppression activities conducted in 1999 at the former dry fertilizer building
- Diesel Range Organics (DRO) – from unused but existing 500-gallon heating oil AST south of vehicle/maintenance garage building
- Gasoline Range Organics (GRO) - from unused but existing 1,000-gallon gasoline UST near fertilizer building
- Polycyclic Aromatic Hydrocarbons (PAH) - from unused but existing 500-gallon heating oil AST south of vehicle/maintenance garage building
- Metals – from vehicle and equipment maintenance activities conducted at the vehicle/maintenance garage building
- Asbestos Containing Materials (ACM) – from building demolition activities conducted after 1999 fire at the former fertilizer building
- Lead - from lead-based paint disturbed during building demolition activities conducted after 1999 fire at the former fertilizer building and from the unused but existing 1,000-gallon gasoline UST

Some of the above COPCs have already been documented to be present in media at the site; however, PFAS, petroleum-related parameters, metals, and ACM have yet to be evaluated.

SUMMARY OF PRELIMINARY CONCEPTUAL SITE MODEL

Based on the information currently available for the site, the following represents our understanding of the preliminary conceptual site model:

Site Setting

- Agricultural chemicals, solvents and petroleum hydrocarbons were handled at the site for approximately 30 years
- The Site is planned to be redeveloped into a golf course.
- The existing site building may be re-used to support future site activities.
- The ground surface at the site is unpaved.
- Near surface geological conditions consist of consist of coarse grained sands with thin lenses of clay, silt, and gravel to the investigated depths of approximately 30-feet bgs.
- Because the on-site and nearby private water supply wells are 30-feet deep, a horizon of low permeability soil materials likely exists beginning at this depth.
- Depth to groundwater is typically 6 to 10-feet bgs, with flow typically towards the west.
- The stream is classified as a recreational fishery.
- The Site is located adjacent and east of an area of private residences and/or businesses.
- It is not clear what the source of water is for the nearby municipal water system.

Fertilizer Building and Associated UST

- Agricultural chemicals consisting of fertilizers and pesticides were handled at the site for approximately 30 years and have impacted various site media.
- The fire which destroyed the former fertilizer building in 1999 was suppressed with aqueous film forming foam (AFFF) containing PFAS because of the suspected presence of flammable solvents stored in the building.
- With the exception of elevated nitrate concentrations, agricultural chemical related contaminants are primarily bound in soils and have not resulted in a significant plume of groundwater impacts (relative to more mobile parameters).
- It is possible that agricultural chemical have discharged to the stream via groundwater flow and/or overland flow of surface water/soil into the stream during precipitation events.

- Due to 1999 firefighting activities, PFAS has entered soil and groundwater around the building, and has percolated through the cracks in the building foundation; these cracks have allowed surface water on the foundation to continue leaching PFAS to groundwater.
- Due to the 1999 fire, and subsequent building demolition activities, ACM may have been buried in the ground in the vicinity of the former building.
- Due to the 1999 fire, and subsequent building demolition activities, lead-based paint may have been released to the ground surface in the vicinity of the former building.
- A 30-ft deep waterfill well located west of former fertilizer building is impacted by agricultural chemical, TCE and PFAS and can no longer be used.
- The waterfill well should be sealed.
- A 1,000-gallon leaking gasoline UST exists near the southeast corner of the fertilizer building.

Vehicle Maintenance/Garage Building and Associated Tanks

- The trench drain and 500-gallon UST inside of the vehicle maintenance/garage building is a source of TCE from degreasing chemical use inside the garage.
- Agricultural chemicals were possibly released to the south of the vehicle maintenance/garage building due to vehicle and equipment cleaning activities and subsequent management of wash-waters through the bay doors located on the south side of the building.
- Spent degreasing solvents were released directly to the ground surface near the stream, north of the vehicle maintenance/garage building.
- A 500-gallon leaking heating oil AST exists outside of the vehicle maintenance/garage building, along its southern wall.
- Although petroleum substances have been released from the 500-gallon heating oil AST and the 1,000 gallon gasoline UST, the soil and groundwater impacts associated with these tanks are localized with only limited concentrations above agency cleanup goals in groundwater.
- There are TCE impacts to soil gas located beneath the building foundation.
  There are no significant petroleum related soil gas impacts beneath the building foundation.

Fate and Transport

- Although petroleum substances have been released from the 500-gallon heating oil AST and from the 1,000-gallon gasoline UST, soil and groundwater impacts are localized, with no concentrations above regulatory agency cleanup goals migrating off of the site although redox conditions remain somewhat anaerobic from these prior releases supporting some anaerobic (reductive dichlorination) and co-metabolic biodegradation of the TCE in groundwater. PFAS releases have also driven redox conditions lower.
- Although groundwater flows west towards the town, some localized discharge of groundwater impacted with agricultural chemicals, TCE, and PFAS may be occurring to the stream.
- To date, there have been no media sampling activities conducted on the stream (e.g., surface water, sediment, fish tissue).
- Aerobic stream conditions result in biotransformation of long chain polyfluorinated compounds to PFOS/PFOA, further increasing stream concentrations.
- A plume of groundwater impacted with nitrate, TCE, PFAS extends westerly from the source areas, toward the town:
    - Anaerobic conditions created around the former fertilizer building from PFAS and petroleum releases locally cause some reductive dechlorination of TCE and nitrate reduction/attenuation.
    - Redox conditions rebound some distance downgradient back to aerobic conditions that typically prevail in shallow aquifers.
    - Long chain polyfluorinated precursor PFAS compounds have biotransformed within this redox recovery zone producing higher concentrations of PFOS/PFOA some distance offsite.
    - The circumstances of shallow groundwater, generally coarse-grained aquifer materials, and associated lack of total organic carbon/retention capacity have allowed certain contaminants to migrate long distances.
    - The PFAS plume extends the greatest distance, beyond the identified off-site groundwater TCE impacts, to older drinking water wells, and possibly towards a municipal supply well or reservoir, present further west of the town.
    - No crops, livestock, or irrigation water has been impacted.

3. Goals, Objectives, Tasks, and Subtasks

The goal of this RD/RA is to describe measures to protect human health and the environment. The data indicate that human health may be impacted by contaminants in drinking water and indoor air, and further indicate that the environment has already been impacted by contaminants in the soil and groundwater. The objectives presented here are intended to mitigate those impacts so that human health does not suffer and impacts to the environment are reversed or stabilized. Compliance with MCPA and MDA policies and regulations forms the basis for these objectives.

OBJECTIVE 1: **MITIGATE EXPOSURE TO CONTAMINATED GROUNDWATER**

Results from the limited investigation documented that three private wells immediately west of the Site are impacted with TCE above current Minnesota Department of Health (MDH) Health Risk Limits (HRLs). Amec Foster Wheeler's proposed Remedial Investigation (RI), discussed in a separate document, will determine if additional private wells have been impacted by TCE and/or other contaminants that were not analyzed as part of the limited investigation. The RI will also evaluate municipal water supply wells (if present), which could be impacted by contaminants such as PFAS due to the high solubility of the compounds and the lack of bioattenuation. As a complete exposure pathway has already been confirmed for groundwater contamination, remedial action (RA) is necessary.

TASK A: INTERIM CORRECTIVE ACTION – PROVIDE BOTTLED WATER Amec Foster Wheeler will coordinate with the MPCA's Emergency Management Unit (EMU) to provide bottled water to the residents of properties downgradient of the Site with private wells. Based on information provided, nine properties downgradient of the Site have private wells. Four of the properties were sampled as part of the initial investigation and three properties had wells with TCE detections above the MDH HRL. Although TCE was not detected in drinking water at one property, no confirmation sampling was conducted to verify the results. As a result, Amec Foster Wheeler recommends that bottled water be provided to all residents in block 5 and block 7 (Figure 2) as an interim measure to ensure that no further consumption of TCE impacted drinking water occurs. As identified in the RI, private wells within blocks 5 and 7 will be sampled immediately to confirm which private wells are impacted.

The provision of bottled water is an interim measure while options for permanent alternate water supplies or treatment options are being evaluated.

Since the Interim Corrective Action (ICA) will continue through the implementation phase, activities conducted will be documented and summarized in a Conceptual Corrective Action Design Report (CCAD) in accordance with MPCA guidance document 7-02 and identified as CCAD for Drinking Water Protection to comply with MDA guidance. The CCAD for Drinking Water Protection will be completed as part of Task B to identify and implement the remedy.

Responsible Party(ies): Project Manager, Engineer II

TASK B: PROVIDE ALTERNATE DRINKING WATER SOURCES TO DOWNGRADIENT PROPERTIES

Information obtained during the limited investigation will be supplemented with RI data to determine which properties downgradient of the Site require alternate drinking water supplies. For any properties with impacted drinking water, Amec Foster Wheeler will evaluate drinking water treatment or replacement alternatives.

Subtask 1: Obtain Decision-Making Data

The RI will provide much of the data for decision-making. The data will show which properties are affected, what contaminants are present, and the contaminant concentrations. Information obtained during the RI will also identify well construction details such as the depth, screened interval, age of the well, current condition and the presence or absence of existing treatment systems. The data will be evaluated on a case-by-case basis to provide the most effective solution.

Subtask 2: **Evaluate and Select Alternatives (Simple Corrective Action)**

Amec Foster Wheeler will develop and evaluate a list of alternatives for drinking water treatment/replacement. A necessary step will be to conduct stakeholder meetings with the MPCA, MDA, the property owners, and local government. The development of alternatives will include consideration of schedule, personal preference, logistics and cost.

Simple corrective action is assumed to require connection of the properties in blocks 5 and 7 to the existing municipal water supply.

Amec Foster Wheeler will prepare and submit a CCAD report that includes the requirements outline in MPCA Guidance Document 7-02 and MDA Guidance Document 15. The CCAD report will identify the most feasible corrective action alternatives. The CCAD will include a discussion of each alternative's capabilities and limitations relative to achieving the corrective action goal and will include major design assumptions, relative life-cycle costs and implementation time frame. Life-cycle cost estimates will also be prepared. The CCAD will be submitted to the MPCA, MDA and other stakeholders, as appropriate, for review. Following review and comment by stakeholders, Amec Foster Wheeler will finalize the CCAD.

Subtask 3: **Implement Simple Corrective Action**

Amec Foster Wheeler will coordinate with the MPCA (EMU and SA personnel) and the local municipality for connecting the private wells to municipal water supply. Amec Foster Wheeler assumes that costs for implementation will not be part of the SA budget.

During implementation, Amec Foster Wheeler will provide project coordination and construction oversight on behalf of the MPCA as necessary.

Subtask 4: **Confirmation Sampling/Response Action Monitoring**

Following implementation of selected RA, one round of samples will be collected from the properties to provide confirmation that the drinking water is safe. Drinking water samples will be collected in accordance with MPCA and MDH guidance for sampling and preservation such as the MPCA groundwater sampling guidance (4-05, subpart 6.6) and MDH Drinking Water Sample Collection and Preservation guidance (for various analytes). Results of verification will be provided to the MPCA, MDA and MDH in a technical memorandum.

Note: For the purpose of this work plan, the municipal water supply is not impacted by contamination from the Site. Amec Foster Wheeler understands that if impacts to the municipal water supply are identified, additional corrective action would be required. Remedial action for municipal water supplies would follow a similar approach as described above, including interim corrective action and alternatives evaluation; however, a detailed corrective action design would be necessary to evaluate additional alternatives. Alternatives to be considered at the scale of municipal water treatment include: an evaluation of pumping rates and possible reduction; shutting down select supply wells, installing new water supply wells, upgrading water treatment facilities or constructing new treatment facilities.

Responsible Party(ies): Project Manager, QA-QC Officer, On-Site Inspector, Engineer II, Scientist II, Scientist I, Field Technician, GIS/CADD Specialist

Objective 1 Timeline (see attached Gantt chart):

Task A: Interim RA – Provide Bottled Water – Immediately

Task B: Provide Alternative Drinking Water (1.5 months)

Subtask 1: Obtain Decision-Making Data – 1 week

Subtask 2: Evaluate and Select Alternatives – 1 week

Subtask 3: Implement Simple Corrective Action – 5 days

Subtask 4: Confirmation Sampling – 2 weeks (sampling and implementation report)

Objective 1 Deliverables:

Task B: Provide Alternative Drinking Water

Subtask 2: CCAD Report

Subtask 3: Daily construction records

Subtask 4: Implementation Report including analytical transmittal.

OBJECTIVE 2: MITIGATE VAPOR INTRUSION EXPOSURE

Sub-slab and soil gas samples collected during the initial investigations have shown elevated concentrations of TCE that require expedited action evaluation. A building within block 7 where a pregnant person is known to be present has a sub-slab concentration of 100 µg/m^3 for TCE, which is greater than 33X the residential ISV for TCE (70 µg/m^3), therefore the house does require active mitigation. However, the detected concentration is less than the 33X residential Expedited ISV (33x EISV) for TCE (210 µg/m^3), meaning more information is required about the building condition before a decision can be made regarding whether active mitigation should be expedited or not.

The maintenance garage has a sub-slab concentration (21,000 µg/m^3) greater than 33X the commercial/industrial EISV for TCE of 700 µg/m^3. While the exceedance of the commercial/industrial 33x EISV would ordinarily call for expedited mitigation, Amec Foster Wheeler understands the garage is currently vacant, and therefore, may not need expedited action at this time. However, as it is also documented that the garage is in good condition, and in the event it is repurposed for use once the golf course is developed, active mitigation efforts would be required before the building be occupied.

TASK A: BLOCK 7 BUILDING ACTIVE MITIGATION.

Based on MPCA guidance, the property located in Block 7 occupied by a pregnant woman requires active mitigation and may need expedited action.

Subtask 1: **Expedited Action Evaluation**

Amec Foster Wheeler will consult with the MPCA about the VI building survey findings from the RI. If the results of the building survey determine that the attenuation factor is applicable, then active mitigation is necessary, though is not required to be expedited. If the results of the building survey indicate that the attenuation factor is not applicable, then expedited action may be required and Amec Foster Wheeler will coordinate with the MPCA to implement that action. If expedited action is deemed necessary, paired sub-slab, indoor air and outdoor air sampling or system installation work will begin as soon as possible.

Subtask 2: **Pre-mitigation Diagnostic Testing and Sub-Slab Depressurization System**

An MPCA SSDS contractor will perform pre-mitigation diagnostic testing and complete the Pre-mitigation Diagnostic Checklist at the Block 7 building. This work will be performed in accordance with Section 3 of the U.S. Environmental Protection Agency (EPA) 1993 and MPCA Guidance Document c-rem3-06 *Diagnostic testing, installation and confirmation sampling for active vapor mitigation systems in single-family residential buildings*. The sub-slab depressurization system (SSDS) installation will consist of installing a suction point, blower and piping and perform pressure field extension (PFE) testing to determine if additional extraction points are needed to meet the MPCA recommended differential pressure of three to five pascals depending on the season of the installation. If needed additional vapor extraction points will be installed. The installation of the systems will be documented on the Active Mitigation System Installation Checklist form.

Subtask 3: **Post-mitigation Diagnostic Testing and Confirmation Sampling**
Post mitigation diagnostic PFE testing will be completed immediately after system startup, in accordance to applicable MPCA guidance. Post-mitigation confirmation sampling with additional PFE testing will be conducted between seven days and 30 days after startup. With the assumption of the SSDS being installed in the summer (non-heating season) a second post mitigation concurrent sampling event will be conducted during the winter heating season. Post-mitigation sampling will consist of concurrent sub-slab and indoor air samples and one ambient outdoor air sample. MPCA Guidance Document c-rem3-06e *Best management practices for vapor investigation and building mitigation decisions* requires one paired sub-slab and indoor air sample be collected per 1,000 sf of building footprint. Based on the scale drawings provided with the RFP, the block 7 house has a footprint of 13,000 square feet (sf) so 13 paired samples will be collected. All samples will be analyzed using EPA Method TO-15 for the full Minnesota Soil Gas list. The first sampling event will be performed between April 1st and October 31st (non-heating season) and an additional concurrent sampling event will be conducted during the heating season between November 1st and March 31st.

Responsible Party(ies): Project Manager, Engineer II, Field Technician, GIS/CADD Specialist

TASK B: EVALUATE NEED FOR VI MITIGATION AT OTHER BUILDINGS

Amec Foster Wheeler will evaluate the need for VI mitigation at other buildings west of the site. The RI will produce the necessary soil vapor, sub-slab, and building data for the evaluation by following MPCA Guidance Document c-rem3-06 to determine the extent of the vapor intrusion area of concern (VI AOC). The analytical data will be compared to the residential ISVs, 33X ISVs, and 33X EISVs to determine what measures need to be taken. If active mitigation is required at any other residence, the steps in Task A will be applied to those properties as well.

Responsible Party(ies): Project Manager, Engineer II, Scientist I, GIS/CADD Specialist

TASK C: EVALUATE NEED FOR VI MITIGATION AT MAINTENANCE GARAGE

Sub-slab TCE concentrations in the maintenance garage exceed the commercial/industrial EISV, which ordinarily triggers

the need for active mitigation and an evaluation of the need for expedited action. Given the vacant status of the building, however, a permanent mitigation system does not appear to be warranted. Amec Foster Wheeler recommends pressurizing the building during RI and RD/RA activities to protect worker health. Amec Foster Wheeler will evaluate the size of the building, building HVAC systems, and building envelope to determine what equipment would be needed to maintain a pressure differential of 3 Pascals between November 1 and March 31, or 5 Pascals between April 1 and October 31. If the building is re-occupied in the future, active mitigation would be required, and the steps in Task A should be taken.

Responsible Party(ies): Project Manager, Engineer II, Scientist I, GIS/CADD Specialist

Objective 2 Timeline (see attached Gantt chart)

Task A: Block 7 Building Active Mitigation

Task A.1: Expedited Action Evaluation – 1 day

Task A.2: Pre-mitigation Diagnostic Testing and Sub-Slab Depressurization System – 3 days

Task A.3: Post-mitigation Diagnostic Testing and Confirmation Sampling – 6 months

Task B: Evaluate Need for VI Mitigation at Other Buildings – 6 months

Task C: Evaluate Need for VI Mitigation at Maintenance Garage – 6 months

Objective 2 Deliverables:

Task A: Block 7 Building Active Mitigation

Task A.1: Expedited Action Evaluation – Expedited action evaluation report

Task A.2: Pre-mitigation Diagnostic Testing and Sub-Slab Depressurization System – Pre-mitigation Diagnostic Checklist and Active System Installation Checklist

Task A.3: Post-mitigation Diagnostic Testing and Confirmation Sampling – Post-mitigation Diagnostic Testing Checklist and Post-mitigation Confirmation Sampling Checklist

Task B: Evaluate Need for VI Mitigation at Other Buildings. Evaluation report for each building and, if necessary, Pre-mitigation Diagnostic Checklists, Active System Installation Checklists, Post-mitigation Diagnostic Testing Checklists, and Post-mitigation Confirmation Sampling Checklists

Task C: Evaluate Need for VI Mitigation at Maintenance Garage – A report of the temporary mitigation measures completed during RI and RD/RA activities.

OBJECTIVE 3: SOIL CORRECTIVE ACTION (ON-SITE SOILS)

Previous investigations have identified areas of known or potential soil contamination, and the RI will further define these areas. The areas include the former dry fertilizer building with nitrates, pesticides, and PFAS, the heating oil AST, the gasoline UST, the trench drain UST, and the solvent dumping area near the stream. These areas are all located on site. Amec Foster Wheeler understands the new site owner intends to redevelop the site. At present, however, the owner is not cooperating, and Amec Foster Wheeler proposes the following tasks to address the contaminated soil without owner's input.

TASK A: **REMOVE GASOLINE UST AND FUEL OIL AST AND EXCAVATE ASSOCIATED CONTAMINATED SOIL**

The 1,000-gallon gasoline UST and 500-gallon fuel oil AST will be removed following the procedures in MPCA Guidance Document Excavation of petroleum-contaminated soil and tank removal sampling, c-prp3-01, March 2017. An MPCA-certified tank contractor will remove the tanks and excavate contaminated soil. The contractor will make the required notifications to the MPCA and fire marshal. The tanks will be emptied and cleaned, and upon removal, will be rendered unusable and disposed or scrapped.

An estimate of the volume of contaminated soil at each tank location will be based on screening data collected during the RI. If the anticipated volume exceeds 200 cubic yards (cy), prior approval will be obtained from MPCA per guidance document c-prp3-01. Soil contamination is assumed to be limited to the immediate vicinity of the tanks and extend to groundwater, estimated to be at a depth of between 6 and 10 feet below ground surface.

Excavated soil will be segregated for potential reuse on-site based on visual and olfactory indications and a soil vapor headspace concentration of 10 ppm, as indicated in c-prp3-01 and the MPCA's Best Management Practices for the Off-

Site Reuse of Unregulated Fill, c-rem1-01, February 2012. Soil that does not meet the criteria will be sampled to characterize for off-site disposal at a permitted facility.

Sidewall, bottom, and stockpile samples will be collected and analyzed per c-prp3-01 and c-prp4-04. The parameters for the gasoline UST, assumed to have contained leaded gasoline during its history, include VOCs, GRO, and lead. The parameters for the fuel oil AST include VOCs, DRO, and PAHs. The samples will also be analyzed for additional analytical parameters identified during the RI such as nitrates, pesticides, and PFAS. The criteria to reuse soil on site are the residential/recreational SRVs and GRO/DRO concentrations less than 100 mg/kg, and as established by MDA Guidance Document GD19. Soil that contains PFAS will not be reused on site.

C-prp3-01 specifies the trigger criteria for a Limited Site Investigation (LSI). Amec Foster Wheeler assumes that an LSI will be required as shallow groundwater will be encountered in the excavation. As such, the petroleum release will be reported to the duty officer and an LSI will be conducted and evaluated separately in accordance with PRP rules.

Responsible Party(ies): Project Manager, Scientist II, Scientist I, GIS/CADD Specialist

TASK B: FORMER FERTILIZER BUILDING SOIL

The soil under the former fertilizer building may be contaminated with nitrates, pesticides, PFAS, petroleum hydrocarbons, ACM debris. Source-area soil remediation will complement and expedite groundwater remediation efforts.

Subtask 1: Obtain Decision-Making Data
The magnitude and extent of soil contamination under and around the former fertilizer building will be assessed during the RI. The RFP noted cracks in the floor slab and discolored soil to the north of the building. Amec Foster Wheeler assumes the soil contamination is limited to the locations of these features.

Subtask 2: Evaluate and Select Alternatives

Amec Foster Wheeler will develop and evaluate a list of alternatives for soil corrective action that address the range of COPCs associated with the fertilizer building. Due to the site-specific cleanup goals of meeting residential/recreation criteria, excavation may be the most feasible and cost-effective solution; however, if the soil contamination is not identified to be a significant contributor to groundwater contamination during the RI, an alternative would be to leave the soil in place to be addressed by the owner and addressed during redevelopment activities under a contingency plan.

Amec Foster Wheeler will prepare and submit a CCAD report that includes the requirements outline in MPCA Guidance Document 7-02 and MDA Guidance Document 15. The CCAD report will identify the most feasible corrective action alternatives. The CCAD will include a discussion of each alternative's capabilities and limitations relative to achieving the corrective action goal and will include major design assumptions, relative life-cycle costs and implementation time frame. Life-cycle cost estimates will also be prepared. The CCAD will be submitted to the MPCA, MDA and other stakeholders, as appropriate, for review. Following review and comment by stakeholders, Amec Foster Wheeler will finalize the CCAD.

Subtask 3: **Design Selected Alternative (Excavation Detailed Corrective Action)**

Based on the nature of COPCs at the Site, Amec Foster Wheeler will prepare an Excavation Detailed Correction Action Design Report (EDCAD) to provide a detailed excavation plan. The EDCAD will include a description of the target zone, a detailed excavation plan documenting the estimated volume of overburden soil to be excavated, the amount of petroleum-contaminated soil being excavated for treatment, information regarding how contaminated soil will be segregated from uncontaminated soil and provide details regarding field decisions that will govern the final excavation limits. The EDCAD will also include a discussion of waste generation, handling and disposal requirements; post-excavation soil sampling and monitoring plan; and, site restoration activities. The EDCAD will also include a schedule for implementation and an evaluation of remedy cost-effectiveness.

The report will be submitted to the MPCA and the MDA for review and approval prior to implementation.

Subtask 4: **Implement Selected Alternative**

Amec Foster Wheeler will solicit and tabulate bids from vendors and contractors and would assist with selection. During construction, we will track progress, conduct meetings or calls, as needed, and submit progress reports. At project completion, Amec Foster Wheeler will submit an as-built report.

Amec Foster Wheeler will complete all necessary permit applications. Coverage under the Minnesota

Construction Stormwater General Permit appears to be necessary based on the area to be disturbed during this excavation and the other excavations included in this work plan. A SWPPP will be prepared, and the necessary BMPs will be put in place.

The positions of the cracks will be located by GPS, and the slab will be removed to access the underlying soil. The concrete will be stockpiled on, and covered with poly. Amec Foster Wheeler assumes that based on the building history none of the concrete is suitable for beneficial use, and the concrete will be sampled under Subtask 5 to characterize for off-site disposal at a permitted landfill.

After the slab is removed, the discolored soil north of the building and around the cracks will be excavated. The soil contamination is assumed to extend to the water table. The soil will be stockpiled on, and covered with poly. The soil will be screened with a photoionization detector (PID) by soil vapor headspace method during excavation. Non-discolored soil with a soil vapor headspace concentration less than 10 ppm excavated to maintain safe side-slopes will be segregated from the discolored soil.

ACM demolition may have been buried on site when the building burned down in 1999. If ACM debris is discovered during the RI, Amec Foster Wheeler will follow MPCA Guidance Document Asbestos Guidance on Excavation Projects, w-sw4-03, October 2013. If ACM debris is not encountered during the RI, provisions for managing ACM debris will be included in the site contingency plan.

Additional soil will be excavated upon completion of the confirmation sampling in Subtask B.5 if the criteria discussed in Subtask B.5 is not met. The excavation will be backfilled with imported fill per the specifications.

Subtask 5: Confirmation Sampling and Characterization for Disposal

Confirmation sidewall and bottom samples will be collected when all the discolored soil is excavated. The number of samples will be based on tables 7A and 7B of the MPCA's Risk Based Site Characterization and Sampling Guidance (Risk Based Guide), September 16, 1998 and will follow the MPCA/MDA EDCAD (as summarized in Objective 3 Subtask 3).

The samples will be analyzed for the contaminants of concern as established during the RI. The cleanup criteria include the MPCA's Residential/Recreational SRVs, and the criteria established by MDA Guidance Document GD19. Additional soil will be excavated where confirmation samples exceed criteria, and additional confirmation samples will be collected until the entire excavation meets criteria.

The discolored soil and soil with a headspace concentration greater than 10 ppm will be sampled to characterize for disposal off-site at a permitted landfill. All stockpiles will be sampled per table 7C of the Risk Based Guide. The samples will be analyzed by the toxicity characteristic leaching procedure (TCLP) where TCLP criteria exist for given parameters. Where no TCLP criteria exist for a given parameter, the sample will be analyzed for total concentration. Soil that exceeds the TCLP criteria will need to be disposed or treated at a Resource Conservation and Recovery Act (RCRA) hazardous waste facility.

Non-discolored soil with headspace concentrations less than 10 ppm, analytical concentrations less than the Residential/Recreational SRVs, and meets the criteria established by MDA Guidance Document GD19 will be used as backfill in the excavation where the soil originated. Soil that contains PFAS will not be reused on site. Any soil with an analytical concentration exceeding Residential/Recreational SRVs will be re-analyzed by the TCLP method to characterize for off-site disposal.

The stockpiled concrete will be sampled based on table 7C in the Risk Based Guide. The slab is assumed to be 10 inches thick, and the total volume of concrete is estimated to be 3,500 cy in place; therefore, the sample frequency will be one per 500 cy. Seven samples will be collected and analyzed for the contaminants of concern indicated by the RI. The samples will be analyzed by the TCLP method where TCLP criteria exist for given parameters. Where no TCLP criteria exist for a given parameter, the sample will be analyzed for total concentration. Concrete that exceeds the TCLP criteria will need to be disposed or treated at a RCRA hazardous waste facility.

Responsible Party(ies): Project Manager, QA/QC Officer, On-Site Inspector, Engineer II, Engineer I, Scientist I, GIS/CADD Specialist

TASK C: MAINTENANCE GARAGE SOIL

The owner's investigation identified soil contaminated with TCE under the Maintenance Garage. The trench drain and UST in Building Addition 2 are a possible source. The data, however, appear to show the source area to be in the central or north central part of the building, based on TCE concentrations in soil, groundwater, and soil gas. A limited silt layer observed in borings 15 and 18 at the water table is of particular concern. TCE was detected at concentrations of 115 and 120 mg/kg in the soil in this layer, and the layer may be recharging the groundwater plume.

Amec Foster Wheeler proposes an in-situ enhanced anaerobic bioremediation treatment program to address TCE and nitrate impacts in source area groundwater, and this is anticipated to also treat sorbed mass in the silt layer in the capillary fringe (resulting from mounding that occurs during carbon substrate injections in support of anaerobic bioremediation and due to water level fluctuations). The approach for soil corrective action is therefore discussed relative to the groundwater pump and treat system in Objective 4.

Note: If following the in-situ treatment, soil beneath the Maintenance Garage still appears to be acting as a recharge for TCE in groundwater, additional corrective action may be necessary.

TASK D: **SOLVENT DUMPING AREA**

The solvent dumping area will be incorporated into the EDCAD documented in Task B for soil corrective action and therefore no separate requirements are discussed in this subtask.

Should data from the RI indicate that additional treatment is necessary, a separate SDCAD or EDCAD may be completed and submitted following the steps outlined in Objective 3, tasks B and C.

TASK E: **CORRECTIVE ACTION EXCATION REPORTING**

Following completion of excavation activities, a corrective action excavation report will be completed and submitted to the MPCA and MDA for review and approval.

Responsible Party(ies): Project Manager, Engineer II, Scientist I, GIS/CADD Specialist

Objective 3 Timeline:

Task A: Remove Gasoline UST and Fuel Oil AST and Excavate Associated Contaminated Soil – 1 month
Task B: Former Fertilizer Building Soil
- Task B.1: Obtain Decision-Making Data – 1 week
- Task B.2: Evaluate and Select Alternatives (CCAD) – 1 month
- Task B.3: EDCAD – 1 month
- Task B.4: ECAD Implementation – 1 month
- Task B.5: Confirmation Sampling and Characterization for Disposal – 1 month (sampling, characterization and disposal)

Task C: Maintenance Garage Soil
(See Objective 4)
Task D: Solvent Dumping Area
(See Objective 3, Task B)
Task E: Corrective Action Reporting – 2 weeks (following receipt of analytical data).

Objective 3 Deliverables:

Task A: Remove Gasoline UST and Fuel Oil AST and Excavate Associated Contaminated Soil – 10-day notification, Excavation Report, Change of Status forms
Task B – Draft CCAD, Final CCAD, Draft EDCAD, Final EDCAD, Draft and Final Corrective Action Excavation Report

OBJECTIVE 4: GROUNDWATER REMEDIATION

The owner's investigation indicated groundwater on and off site is contaminated with TCE. Amec Foster Wheeler's RI will further evaluate the extent of the groundwater TCE plume. For the purpose of this work plan, groundwater is also assumed to be impacted with nitrate and PFAS and requires remediation. Amec Foster Wheeler proposes to install groundwater extraction wells and conduct source area in-situ treatment. The purpose of the groundwater extraction system is to contain the plume, preventing any further migration to the stream (and impacts to recreational fishery) and offsite drinking water

wells west of the site. Amec Foster Wheeler recommends administrative controls for the property that would prohibit the use of groundwater on site for potable use. Groundwater response actions are shown on Figure 2.

TASK A: **FOCUSED INVESTIGATION ~ PUMP TESTING**
In order to adequately design the groundwater extraction system, a focused investigation including aquifer pump testing will be required. One extraction well and observation wells (as required) will be installed between the Maintenance Garage and the stream. A second extraction well and observation wells (as required) will be installed at the west property boundary across from block 5. Pump tests will be conducted to evaluate the drawdown and cone of depression. A portable GAC system will treat the pump test water prior to discharge to the stream through an NPDES permit. Coverage under the Minnesota Ground Water Pump-Out General Permit, MNG790000, will be obtained.

Subtask 1: **Focused Investigation Work Plan**

Amec Foster Wheeler will prepare and submit a focused investigation work plan to outline proposed activities necessary for completion of the pump-test. The focused investigation work plan will be submitted to the MPCA, MDA and other stakeholders, as appropriate, for review. Following review and comment by stakeholders, Amec Foster Wheeler will finalize the work plan.

Subtask 2: **Focused Investigation Implementation**

Amec Foster Wheeler will conduct field activities in accordance with the approved focused investigation work plan. Amec Foster Wheeler will conduct subcontractor procurement, obtain necessary permits and conduct the focused investigation.

Subtask 3: **Focused Investigation Report**

Amec Foster Wheeler will prepare a focused investigation report that provides the results and recommendations of the pump test activities. The information generated during the investigation will be utilized in the design for the groundwater extraction system.

Responsible Party(ies): Project Manager, Engineer II, Scientist II, Scientist I, Field Technician, GIS/CADD Specialist

TASK B: **SOURCE AREA IN-SITU**
Amec Foster Wheeler proposes to complete an in situ enhanced anaerobic bioremediation treatment for mass reduction of TCE and nitrate in the groundwater to reduce load on the treatment system. This would involve injection of a carbon substrate to establish reducing conditions. Although petroleum and PFAS releases are assumed to have utilized some of the available oxygen and created reducing conditions, it is unlikely that the redox would be optimized for anaerobic treatment (i.e. -250 ORP). A pilot study is recommended to evaluate technology and optimize the injection rates. Following completion of a pilot study, the full-scale program will be designed. Bioaugmentation will also be evaluated for the TCE treatment.

Subtask 1: Evaluate and Select Alternatives

Amec Foster Wheeler will prepare a CCAD to provide alternatives analysis for groundwater corrective action, including the source area in-situ enhanced anaerobic bioremediation. The CCAD will be submitted to the MPCA, MDA and other stakeholders, as appropriate, for review. Following review and comment by stakeholders, Amec Foster Wheeler will finalize the CCAD.

Subtask 2: **Pilot Study**

Amec Foster Wheeler will conduct a pilot study to evaluate the technical feasibility of the in-situ technology, and optimize the injection rate. This subtask will involve the preparation of a pilot study work plan which will be submitted for MPCA/MDA review and approval. The pilot test work plan will be conducted in accordance with MPCA Guidance Document 7-05 and will include an overview of the pilot test; a discussion of the target zone; remediation and monitoring points; system equipment, flow and controls; process material chemistry; waste generation, handling and disposal; installation activities; installation activities; subsurface response monitoring; description of the test; and a discussion of technical and economic feasibility. Once the draft pilot study work plan has been reviewed, finalized and approved by the MPCA/MDA, Amec Foster Wheeler will conduct the pilot study and prepare a pilot study report.

Subtask 3: **Design Selected Alternative (Remediation System Detailed Corrective Action Design)**

Based on the recommendation for in-situ enhanced anaerobic bioremediation, and following completion of the

pilot-study, Amec Foster Wheeler will prepare a Remediation System Detailed Corrective Action Design (SDCAD) to describe the detailed corrective action design. The SDCAD will be provided in accordance with the requirements of MPCA Guidance Document 7-07a.
The SDCAD will include an evaluation of the pump test data and design for the well network that will contain the groundwater plume. A MnDNR appropriation permit will be required if pumping exceeds 10,000 gallons per day or 1,000,000 gallons per year. The system would be operated until groundwater concentrations are shown to attenuate to below drinking water criteria at the property boundary.

The effectiveness of the portable water treatment system will be evaluated and a permanent water treatment system will be designed to meet NPDES discharge standards for discharge to the stream. Coverage under the Ground Water Pump-Out General Permit, MNG790000, will be obtained. Amec Foster Wheeler anticipates that the full-scale system will include an air stripper to remove TCE and two beds of selective IX resins (one nitrate and one PFAS). This treatment offers a number of advantages over GAC including:

- The air stripper will remove VOCs (i.e., TCE) and oxidize long chain polyfluorinated precursors that will biotransform into PFOS/PFOA;
- The selective IX resins will remove the remaining nitrate and PFAS prior to discharge;
- This may allow for future destruction of PFAS onsite if a regenerable IX is used.

Note: The use of the air stripped will allow for better treatment system performance evaluations because long chain precursors cannot be analyzed by commercial laboratories. Although the Total Oxidizable Precursor (TOP) assay can be utilized to generally assess the mass of longer chain PFAS present, it requires two analyses per sample and therefore can be more expensive

The anaerobic bioremediation in the source area will reduce the nitrate and TCE concentrations before they reach the extractions wells and will also reduce the burden on the ex situ groundwater treatment system. If the treatment system uses air stripping, air emission controls will be put in place to address acute risk during startup. Amec Foster Wheeler will evaluate vapor phase GAC and other options for air emissions treatment.

The Draft SDCAD will be submitted to the MPCA and MDA for review/approval. Following review, comments will be addressed and the final report submitted and approved prior to implementation.

Subtask 4: **Corrective Action Implementation**
Amec Foster Wheeler will solicit and tabulate bids from vendors and contractors and would assist with selection. We will coordinate activities with the property owner, as necessary. During construction, we will track progress, conduct meetings or calls, as needed, and submit progress reports. At project completion, Amec Foster Wheeler will submit an as-built report.

Subtask 5: **Remediation System Operation Monitoring Report (RSOM)**

A Remediation System Operation Monitoring Report (RSOM) will be completed to document installation and operation of the remediation system. The initial report will be submitted within 30 days of system start-up.

Responsible Party(ies): Project Manager, QA/QC Officer, Engineer II, Engineer I, Scientist II, Scientist I, Field Technician, GIS/CADD Specialist

TASK C: REMEDIATION SYSTEM OPERATION & MONITORING

Subtask 1: **NPDES Monitoring**
The Ground Water Pump-Out General Permit requires submittal of monthly Discharge Monitoring Reports (DMR). The treatment system influent and effluent will be sampled quarterly, in accordance with the permit, unless the MPCA requires more frequent sampling. The samples will be analyzed for the contaminants of concern from the RI.

Subtask 2: **Groundwater Treatment System Air Emissions Monitoring**
Air emissions samples will be collected in accordance with Guidance Document c-prp-09a and evaluated using the Air Emissions Screening Spreadsheet (AESS), c-prp7-09b, April 11, 2011. A sample will be collected one hour after startup, and monthly sampling will be performed thereafter. Emission controls will be discontinued with MPCA approval if it can be demonstrated that acute and chronic exposure levels are not exceeded.

Subtask 3: **Groundwater Monitoring Well Sampling**

The monitoring well network installed during the RI will be sampled quarterly during the first year of system operation. At the end of the first year, the network will be evaluated, and recommendations to add or subtract wells from the network, or increase or decrease frequency will be made.

Subtask 4: **Remediation System Operation Quarterly Monitoring Reports**
Remediation System Operation Monitoring Reports will be completed quarterly to evaluate system performance.

Responsible Party(ies): Project Manager, QA/QC Officer, Engineer I, Scientist II, Scientist I, Field Technician, GIS/CADD Specialist

Objective 4 Timeline:

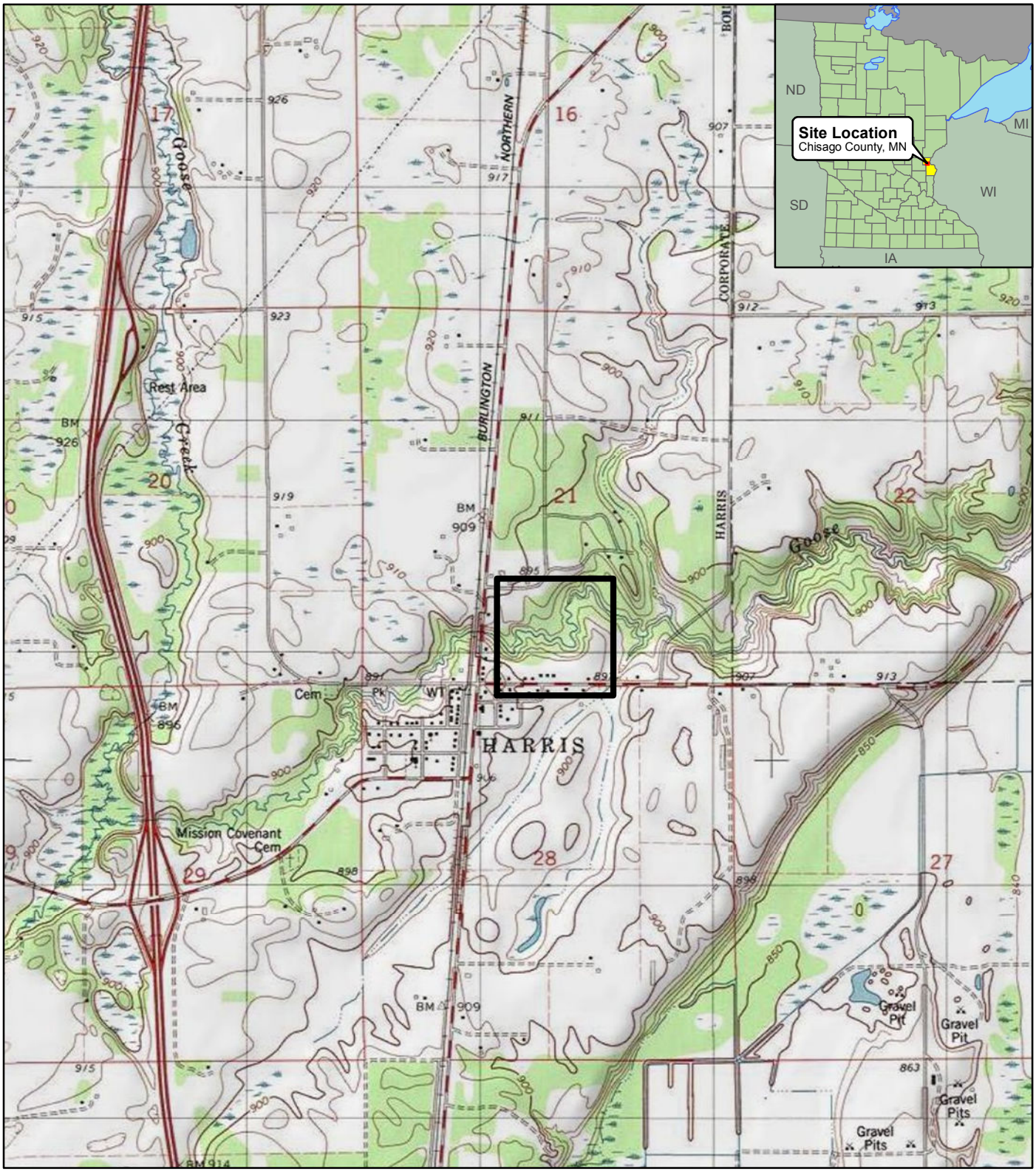
Task A: Focused Investigation – 4 months
Task B: Source Area In-Situ – 12 months
Task C: Remediation System Operation and Monitoring – 12 months

Objective 4 Deliverables:

Task A:
- Draft and Final Focused Investigation Work Plan
- Draft and Final Focused Investigation Report

Task B: Source Area In-Situ
- Draft and Final Pilot Study Work Plan
- Draft and Final Pilot Study Report
- Draft and Final SDCAD
- Draft and Final RSOM

Task C: Remediation System Operation and Monitoring – 12 months
- Draft and Final RSOMs (Quarterly Submittal)



Legend

Approximate Site Boundary

1:24,000 — 1 inch equals 2,000 feet

Approximate Scale in Feet

0 — 2,000 — 4,000 — 6,000

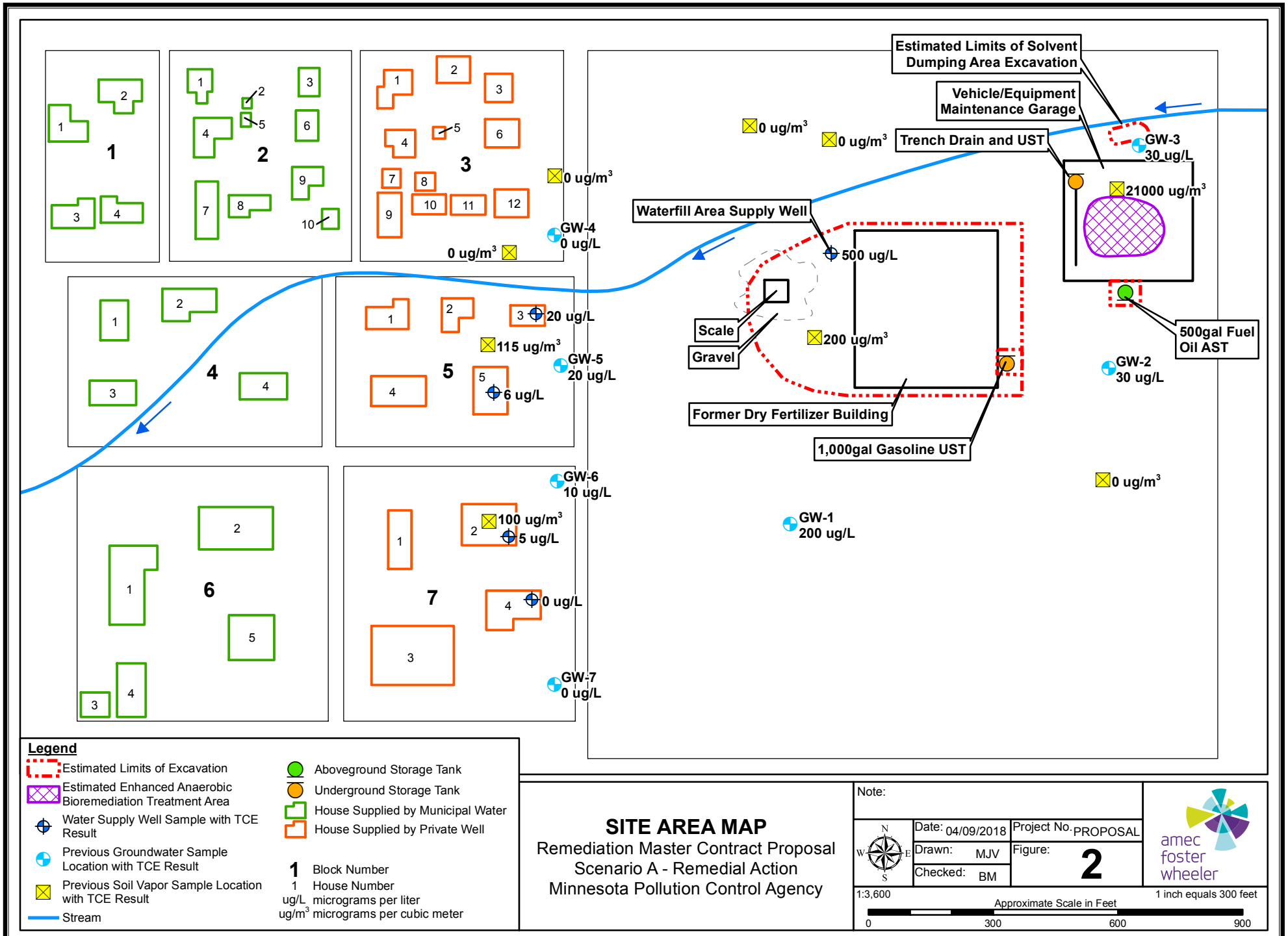
SITE LOCATION MAP

Remediation Master Contract Proposal
Scenario A
Minnesota Pollution Control Agency

Note: 1:24k Topos courtesy of ESRI (North Branch Quad)

Date:	04/05/2018	Project No.	PROPOSAL
Drawn:	MJV	Figure:	1
Checked:	JSM		

amec foster wheeler



SITE AREA MAP

Remediation Master Contract Proposal
Scenario A - Remedial Action
Minnesota Pollution Control Agency

Note:

N W E S

Date: 04/09/2018	Project No. PROPOSAL
Drawn: MJV	Figure: 2
Checked: BM	

1:3,600 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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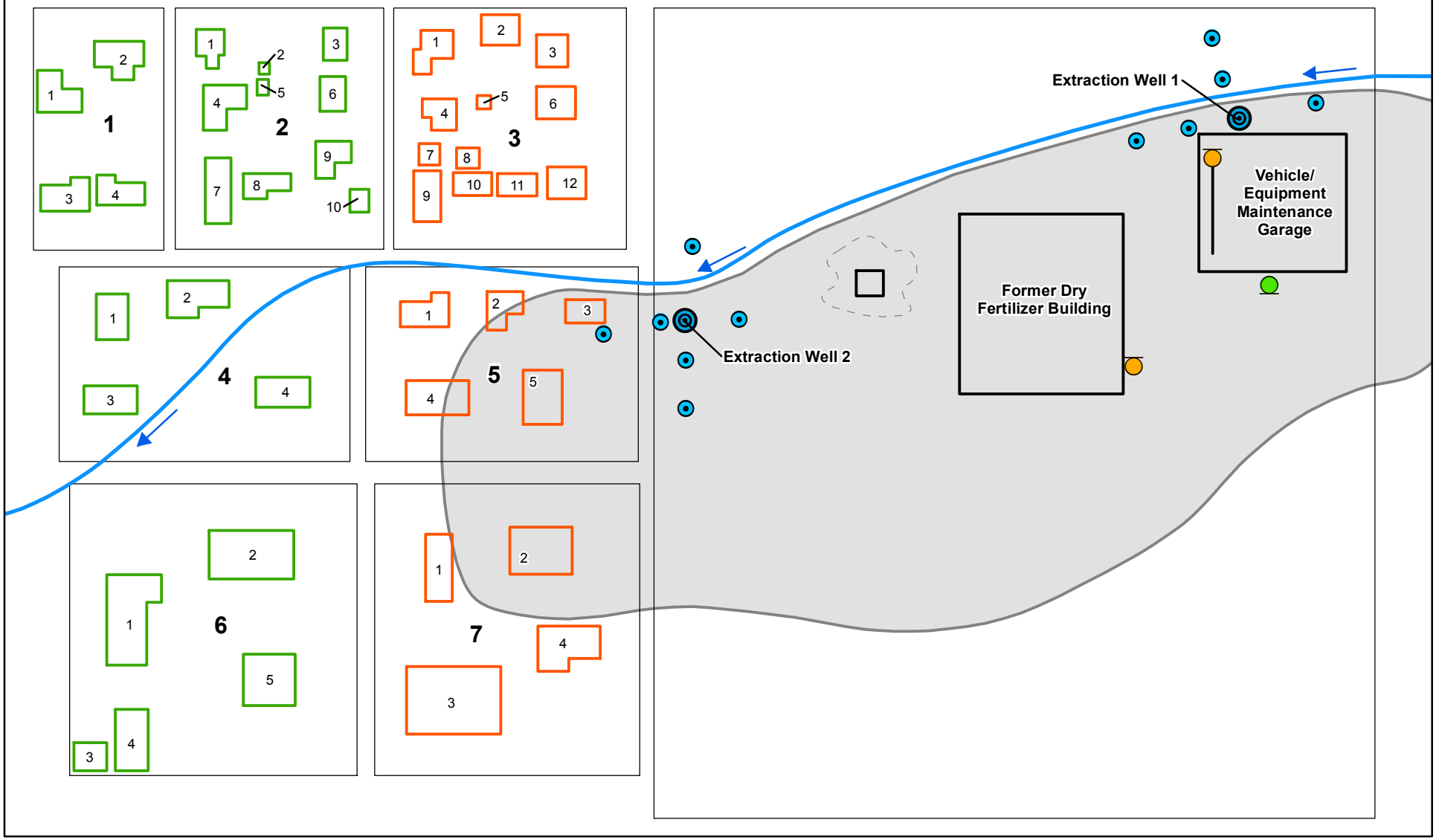

Legend

- Proposed Pump Test Extraction
- Proposed Pump Test Observation Well
- Aboveground Storage Tank
- Underground Storage Tank
- Stream
- House Supplied by Municipal Water
- House Supplied by Private Well
- Estimated Extent of TCE Above MDH Criteria

PROPOSED EXTRACTION WELLS AND PUMP TEST

Remediation Master Contract Proposal
Scenario A - Remedial Action
Minnesota Pollution Control Agency

Note:

Date: 04/09/2018	Project No. PROPOSAL	
Drawn: MJV	Figure: 3	
Checked: BM		

1:3,600 — 1 inch equals 300 feet

Approximate Scale in Feet

0 300 600 900

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Scenario A - Former Agricultural Chemical Plant - Generalized Schedule for RD/RA Implementation

MPCA Use Only	
SWIFT #	
CR #	

		Year 2018												Year 2019												Year 2020											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
OBJECTIVE 1:	**MITIGATE EXPOSURE TO CONTAMINATED GROUNDWATER**																																				
Task A	**Interim Corrective Action – Provide Bottled Water**																																				
Task B	**Provide Alternate Drinking Water Sources to Downgradient Properties**																																				
B.1	Obtain Decision-Making Data																																				
B.2	Evaluate and Select Alternatives (Simple Corrective Action)																																				
B.3	Implement Simple Corrective Action																																				
B.4	Confirmation Sampling/Response Action Monitoring																																				
Objective 1 Deliverables Due																																					
	B.2 :Conceptual Corrective Action Design Report (CCAD) - PRP7-02																																				
	B.3: Daily Construction Records																																				
	B.4: Implementation Report Including Analytical Transmittal																																				
OBJECTIVE 2:	**MITIGATE VAPOR INTRUSION EXPOSURE**																																				
Task A	**Block 7 Building Active Mitigation**																																				
A.1	Expedited Action Evaluation																																				
A.2	Pre-mitigation Diagnostic Testing and Sub-Slab Depressurization System																																				
A.3	Post-mitigation Diagnostic Testing and Confirmation Sampling																																				
Task B	**Evaluate Need For VI Mitigation at Other Buildings**																																				
Task C	**Evaluate Need for VI Mitigation at Maintenance Garage**																																				
Objective 2 Deliverables Due																																					
	A.1: Expedited Action Evaluation Report																																				
	A.2: Pre-mitigation Diagnostic Checklist and Active System Installation Checklist																																				
	A.3: Post-mitigation Diagnostic Testing Checklist and Confirmation Sampling Checklist																																				
	B: Building Surveys / VI checklists - offsite																																				
	C: Building Survey / VI checklist - Maintenance Garage																																				
OBJECTIVE 3:	**SOIL CORRECTIVE ACTION (ON-SITE SOILS)**																																				
Task A	**Remove Gasoline UST and Fuel Oil AST and Excavate Associated Contaminated Soil**																																				
Task B	**Former Fertilizer Building Soil**																																				
B.1	Obtain Decision-Making Data																																				
B.2	Evaluate and Select Alternatives																																				
B.3	Design Selected Alternative (Excavation Detailed Corrective Action)																																				
B.4	Implement Selected Alternative																																				
B.5	Confirmation Sampling and Characterization for Disposal																																				
Task C	**Maintenance Garage Soil**																																				
Task D	**Solvent Dumping Area**																																				
Objective 3 Deliverables Due																																					
	A: 10-day Notification,																																				
	A: Excavation Report																																				
	A: Change of Status Forms																																				
	B: Draft and Final CCAD																																				
	B: Draft and Final EDCAD																																				
	B: Draft and Final Corrective Action Excavation Report																																				
OBJECTIVE 4:	**GROUNDWATER REMEDIATION**																																				
Task A	**Focused Investigation - Pump Testing**																																				
A.1	Focused Investigation Work Plan																																				
A.2	Focused Investigation Implementation																																				
A.3	Focused Investigation Report																																				
Task B	**Source Area In-Situ**																																				
B.1	Evaluate and Select Alternatives																																				
B.2	Pilot Study																																				
B.3	Design Selected Alternative (Remediation System Detailed Corrective Action Design)																																				
B.4	Corrective Action Implementation																																				
B.5	Remediation System Operation Monitoring Report (RSOM)																																				
Task C	**Remediation System Operation and Monitoring**																																				
C.1	NPDES Monitoring																																				
C.2	Groundwater Treatment System Air Emissions Monitoring																																				
C.3	Groundwater Monitoring Well Sampling																																				
C.4	Remediation System Operation Quarterly Monitoring Reports																																				
Objective 4 Deliverables Due																																					
	A: Draft and Final Focused Investigation Work Plan																																				
	A: Draft and Final Focused Investigation Report																																				
	B: Draft and Final Pilot Study Work Plan																																				
	B: Draft and Final Pilot Study Report																																				
	B: Draft and Final SDCAD																																				
	B: Draft and Final RSOM																																				
	C: Draft and Final RSOMs (Quarterly Submittal)																																				

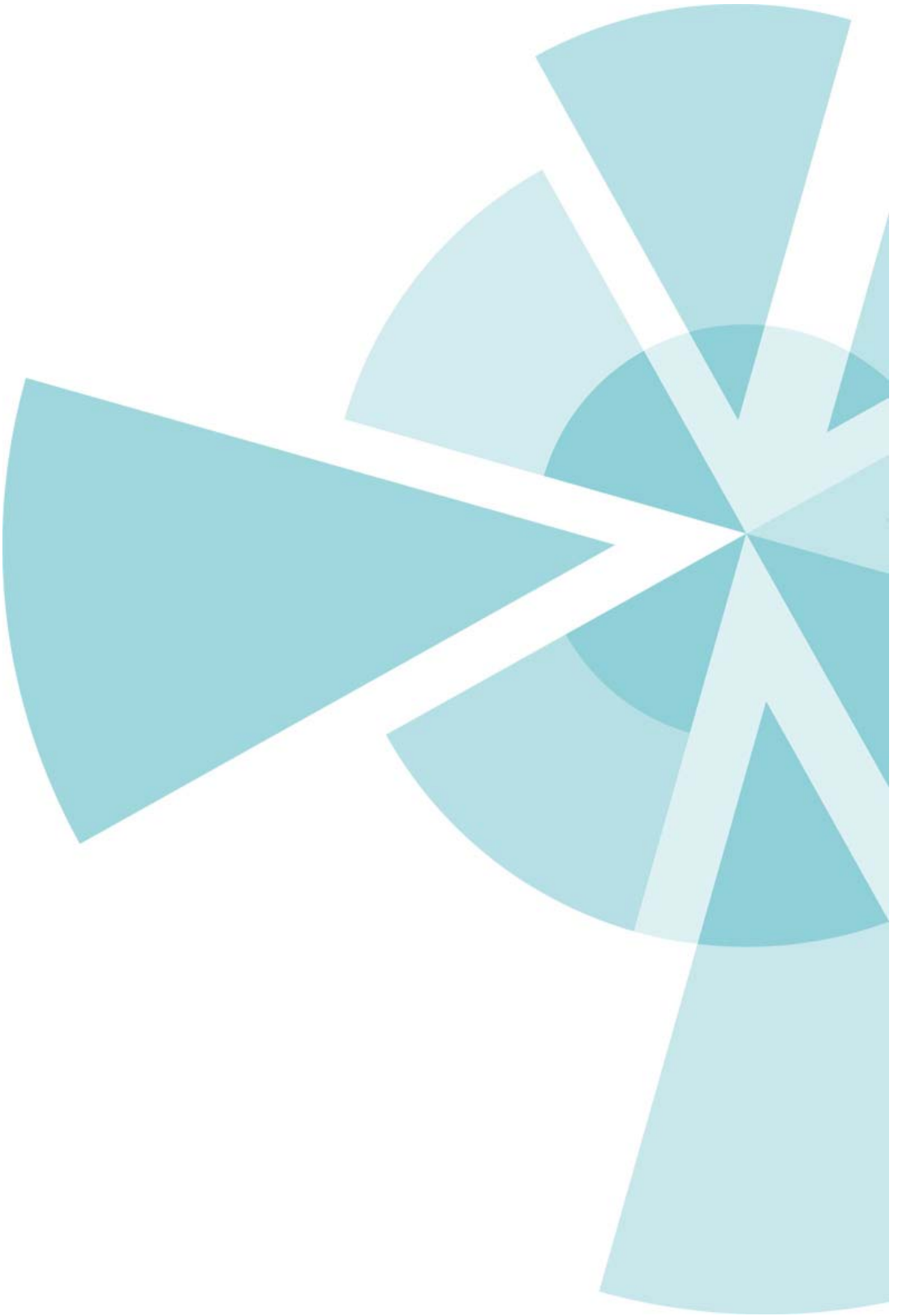
MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Attachment B
RD/RA Work Plan Implementation

Project title: Scenario A - Former Agricultural Chemical Plant RD/RA

	1. Personnel									Totals (Extended)
Project Budget	Project Manager	QA/QC Officer	On-Site Inspector	Engineer II	Engineer I	Scientist II	Scientist I	Field Technician	GIS/CADD Specialist	
OBJECTIVE 1: MITIGATE EXPOSURE TO CONTAMINATED GROUNDWATER										
TASK A - Interim Corrective Action	2			4						6
TASK B - Provide Alternate Drinking Water Sources to Downgradient Properties										0
Subtask 1 - Obtain Decision Making Data	1			4					1	6
Subtask 2 - Evaluate and Select Alternatives (Simple Corrective Action)	2			40		20	8		10	80
Subtask 3 - Implement Simple Corrective Action	2		20	5					4	31
Subtask 4 - Confirmation Sampling	1	2				10		50	2	65
Total for Objective 1 Hrs	**8**	**2**	**20**	**53**		**30**	**8**	**50**	**17**	**188**
OBJECTIVE 2 - MITIGATE VAPOR INTRUSION EXPOSURE										
TASK A - Block 7 Building Active Mitigation										
Subtask 1 - Expedited Action Evaluation	2			1						3
Subtask 2 - Pre-mitigation Diagnostic Testing and Sub-Slab Depressurization System	2			4				10	1	17
Subtask 3 - Post-mitigation Diagnostic Testing	2			4				20	2	28
TASK B - Evaluate Need for VI Mitigation at Other Buildings	4			10			50		3	67
TASK C - Evaluate Need for VI Mitigation at Maintenance Garage	4			4			20		3	31
Total for Objective 2 Hrs	**14**	**0**	**0**	**23**		**0**	**70**	**30**	**9**	**146**
OBJECTIVE 3 - SOIL CORRECTIVE ACTION										
TASK A - UST/AST Removal & Excavation	4					4	40		2	50
TASK B - Former Fertilizer Building Soil										0
Subtask 1 - Decision Making Data Evaluation	1			2						3
Subtask 2 - Conceptual Design	2			20	20				10	52
Subtask 3 - Excavation Detailed Corrective Action	2	1		40			10		20	73
Subtask 4 - Soil Excavation (Remedy Implementation)	4		10	4	80		20		8	126
Subtask 5 - Confirmation Sampling	1	2					20			23
TASK E - Corrective Action Reporting	1			5			30		10	46
Total for Objective 3 Hrs	**15**	**3**	**10**	**71**	**100**	**4**	**120**	**0**	**50**	**373**
OBJECTIVE 4 - GROUNDWATER CORRECTIVE ACTION										
TASK A - Focused Investigation - Pump Test	8			20		80	50	40	2	200
TASK B - Source Area In-Situ Bioremediation										0
Subtask 1 - Decision Making Data Evaluation	1									1
Subtask 2 - Pilot Study	2	1		20			50	30	5	108
Subtask 3 - Remediation System Detailed Corrective Action Design	2			60		20			20	102
Subtask 4 - Remediation System Implementation	2			80	160			100		342
Subtask 5 - Remediation System Operation Monitoring Report	2	1		50	20				2	75
TASK C - Remediation System Operation and Monitoring										0
Subtask 1 - NPDES Reporting	1						8			9
Subtask 2 - Air Emissions Monitoring	1						8			9
Subtask 3 - Groundwater Monitoring	1	2					8	60		71
Subtask 4 - RSOM Quarterly Reports	4	4			80	50	50		4	192
Total for Objective 4 Hrs	**24**	**8**	**0**	**230**	**260**	**150**	**174**	**230**	**33**	**1,109**
Total Project Hours	**61**	**13**	**30**	**377**	**360**	**184**	**372**	**310**	**109**	**1816**

A.6 Attachments



A.6 Attachments

Sample Contract – Attachment C

MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

ATTACHMENT C

Professional and Technical Services Remediation Master Contract

State of Minnesota

SWIFT Master Contract No.:
T-Number:
Agency Interest No.:
Activity ID No.:

This Master Contract is between the State of Minnesota, acting through its Commissioner of the **Minnesota Pollution Control Agency** ("MPCA" or "State") 520 Lafayette Road North, St. Paul, MN 55155 and **Contractor Name** ("Contractor"), address, city, state zip .

Recitals

1. Under Minn. Stats. § § 15.061 and 116.03 Subd. 2, the State is empowered to engage such assistance as deemed necessary.
2. The State is in need of multiple contracts to perform **<Category A > <Category B> <Category C >** program activities.
3. The Contractor represents that it is duly qualified and agrees to perform all services described in this Master Contract ("Master Contract" or "Contract") to the satisfaction of the State.

Master Contract

1. TERM OF MASTER CONTRACT

***1.1. Effective date*: July 1, 2018**, or the date the State obtains all required signatures under Minn. Stat. § 16C.05, Subd. 2, whichever is later. **The Contractor must not accept work under this Master Contract until this Master Contract is fully executed and the Contractor has been notified by the State's Authorized Representative that it may begin accepting Work Orders.**

1.2. Work Order Contracts. The term of the work under Work Order contracts issued under this Master Contract may not extend beyond the expiration date of this Master Contract.

***1.3 Expiration date*: June 30, 2023**, with no contract extensions, or until all obligations have been satisfactorily fulfilled, whichever occurs first.

***1.4 Survival of terms*:** The following clauses survive the expiration or cancellation of this Master Contract and all Work Orders: Indemnification; State Audits; Government Data Practices and Intellectual Property; Publicity and Endorsement; Governing law, Jurisdiction, and Venue; and Data Disclosure.

2. SCOPE OF WORK

The Contractor, who is not a State employee, will upon request from the State, prepare workplans for work outlined in **<Category A > <Category B> <Category C >** outlined in this Master Contract and the Request for Proposal (RFP) which is incorporated herein by reference, and perform the duties authorized in a Work Order and any related Change Order, Work Order Amendment, or Stop Work Order issued by the State, as described in this Master Contract and the RFP. No work shall be performed by the Contractor under this Master Contract without State authorization. In the event of a conflict between the provisions of this Master Contract and the provisions of the RFP, the provisions of this Master Contract shall prevail.

The Contractor shall begin work only upon receipt of a fully executed Work Order that authorizes the Contractor to begin work under this Master Contract. Any and all effort, expenses, or actions taken before the Work Order is fully

executed is not authorized under Minnesota Statutes and is under taken at the sole responsibility and expense of the Contractor.

The Contractor understands this Master Contract is not a guarantee of work under a Work Order contract. The State has determined it may need the services under this Master Contract, but does not commit to spending any money with the Contractor.

<Category A Scope of Services>
<Category B Scope of Services>
<Category C Scope of Services>

3. TIME

The Contractor must comply with all the time requirements described in Work Orders. In the performance of Work Orders, time is of the essence.

4. CONSIDERATION AND PAYMENT

4.1 Consideration. The State will pay for all services satisfactorily performed by the Contractor for all Work Order Contracts issued under this Master Contract. The total compensation of all Work Orders may not exceed $**120,000,000.00 (One Hundred Twenty Million Dollars)** for five (5) years between all Master Contracts.

a. ***Travel expenses.*** Reimbursement for travel and subsistence expenses actually and necessarily incurred by the Contractor as a result of any Work Order will be reimbursed, for travel and subsistence expenses in the same manner and in no greater amount than provided in the current "Commissioner's Plan" promulgated by the Commissioner of Minnesota Management and Budget which is incorporated into this Master Contract by reference which can be viewed at**:** **http://www.mmd.admin.state.mn.us/commissionersplan.htm.**
The Contractor will not be reimbursed for travel and subsistence expenses incurred outside Minnesota unless it has received the State's prior written approval for out-of-state travel. Minnesota will be considered the home State for determining whether travel is out of state. When coming from out-of-state the Contractor's hourly rate for staff will not apply until the Contractor's staff has arrived at the project location.

To qualify for the breakfast and dinner costs, the Contractor must leave the point of mobilization before 6:00 a.m. and arrive back at the point of mobilization after 7:00 p.m., respectively. Lunch reimbursements may be claimed if the Contractor is in travel status more than 35 miles away from his/her normal office or is away from home overnight.

Receipts for meals and lodging must be attached to the Contractor's invoices. Meal receipts are required to be submitted with invoices, and retained in accordance with Clause 33. Meal and lodging costs and any expenses must be summarized in an Expense Worksheet and submitted with invoices.

4.2 Payment

a. ***Terms of Payment.*** The Contractor shall be paid for actual services performed for the State in accordance with Work Orders from the State and in accordance with the Classifications and Rates established in Clause 10, of this Master Contract. The Contractor will be paid in accordance with the Workplan and Budgets for each Work Order.

b. **Invoices.** The Contractor shall submit invoices to the State monthly for work completed during the prior month, unless no costs, or minimal costs are incurred during the billing period. The invoices shall be submitted in the format acceptable to the State. Invoices and attachments should be consistent with the Work Order Budget. Documentation must be itemized and legible. It is the Contractor's sole responsibility to make sure invoices are submitted as required.
Invoices shall include:

a. Contractor name

b. SWIFT Master Contract ID No.
c. Work Order Number
d. Purchase Order Number
e. Invoice number
f. Invoice date
g. State Project Manager
h. Invoicing period (actual working period)
i. Itemized list of all work performed and Brief Update of Tasks Completed
j. Itemized list of all labor, supplies and equipment
k. Subcontractor invoices
l. Mileage expenses
m. Itemized expenses with receipts, for meals, lodging, and parking expenses per person per day (State to provide form)
n. Staff travel logs and/or timesheets (if requested or applicable)
o. Documentation of times and dates must be disclosed on the expense worksheet and attached to invoice
p. Retainage calculation
q. Budget Summary Report (form provided by State) summarizing State approved budget amounts by task and total billed to date for the categories of Contractor and subcontractors labor, expenses, and equipment.
r. Expenses as approved on workplan
s. Brief update of tasks completed for subject invoice

MPCA Work Order invoices will be submitted to mpca.ap@state.mn.us.

If there is a problem with submitting an invoice electronically please contact the MPCA Accounts Payable Unit at 651-757-2491.

Minnesota Department of Agriculture (MDA) Work Order invoices should be submitted by email (preferred) to: MDA.Accounts-Payable@state.mn.us or by US Mail to Finance and Budget Division, Accounts Payable, 625 Robert Street North, Saint Paul, MN 55155.

The State's Authorized Representative shall have the authority to approve invoices, and no payments shall be made without the approval of the State's Authorized Representative. Payment shall be made within thirty (30) days of submission of the Contractor's invoices for services performed. The State shall pay interest at the rate of one and one half percent (1.5%) per month to the Contractor for undisputed billings when the State has not paid the billing within thirty (30) days following receipt of the invoice, in accordance with Minn. Stat. § 16A.124. When discrepancies occur regarding portions of an invoiced amount, the State shall pay the undisputed amount in accordance with this part. The disputed items shall be paid within thirty (30) days of when the discrepancies are resolved.

c. ***Retainage.*** Under Minnesota Statutes §16C.08, subdivision 2 (10), no more than 90 percent of the amount due under any Work Order may be paid until the final product of the Work Order contract has been reviewed by the State's agency head. The balance due will be paid when the State's agency head determines that the Contractor has satisfactorily fulfilled all the terms of the Work Order.

5. CONDITIONS OF PAYMENT

All services provided by the Contractor under a Work Order must be performed to the State's satisfaction, as determined at the sole discretion of the State's Authorized Representative and in accordance with all applicable federal, state, and local laws, ordinances, rules, and regulations including business registration requirements of the Office of the Secretary of State. The Contractor will not receive payment for work found by the State to be unsatisfactory or performed in violation of federal, state, or local law.

6. CONTRACT SERVICE PRICES

When the MPCA Contractor hires a State Contractor, the MPCA Contractor is required to pay the State Contractor within 30 days after receipt of the invoice for undisputed billings from the State Contractor. The MPCA Contractor is responsible to assure the State Contractor's invoice and services were in compliance with the MPCA Work Order, State Contract scope of services and fee schedules.. The MPCA Contractor shall also assure the services were provided. The MPCA Contractor has the option to submit invoices twice a month to expedite payment of State Contractor/Subcontractor invoices.

The Contractor may provide oversight and invoice approval of State Construction Contracts over $50,000 and ensure invoices are in compliance with the scope of work that was performed. However, the Contractor shall not pay the State Construction Contractor directly. The State Construction Contractor shall submit invoices to the State for payment and the State will make payments directly to the State Construction Contractor.

The end of the State fiscal year is June 30. All invoices are due by August 15 of each year for work done prior to July 1 of that year. Charges incurred in two fiscal years (before and after July 1) shall not be on the same invoice. The State closes its fiscal year accounts at the end of August.

Courier services shall be reimbursable when requested by the MPCA. Copies of plans and specifications for bid packages for major construction projects shall be reimbursable when approved in the Work Order. The State shall not pay for markup on Contractor or Subcontractor invoices.

7. PAYMENT TO SUBCONTRACTORS

As required by Minn. Stat. § 16A.1245, the prime Contractor must pay all subcontractors, less any retainage, within ten (10) calendar days of the prime Contractor's receipt of payment from the State for undisputed services provided by the subcontractor(s) and must pay interest at the rate of one and one-half percent per month or any part of a month to the subcontractor(s) on any undisputed amount not paid on time to the subcontractor(s).

8. SUPPLIES AND EQUIPMENT PRICING

Supplies and Expenses: The State considers the following items to be examples of supplies, disposables, and/or equipment that are already part of a Responder's overhead that will not be reimbursed separately. This is not an all-inclusive list.

a. Vehicle or Vehicle daily rates
b. Tool Boxes
c. Hand tools and small electric tools
d. Tri-pod
e. Grease
f. Mobile phone or related fees
g. Answering machine/voice mail systems or access
h. Computer/tablets/field notebooks/printer and ink cartridges
i. Hand-held global positioning system locator
j. Digital/film camera, photo processing and film
k. Bucket
l. Tape measures
m. Gloves
n. Level D personal protective equipment (including but not limited to coveralls, steel-toed boots/shoes, safety glasses or chemical splash goggles, face shield, ear protection, hard hat, gloves)
o. First aid kit
p. Eye wash

q. Trash bags
r. Duct tape
s. Rainwear suits and raingear
t. Distilled water
u. Ice/coolers
v. Bungee cords
w. Alconox
x. Ziplocs or similar plastic bags
y. Electrical cords
z. Stamps or postage
aa. Boot covers
bb. Locks
cc. Tubing
dd. Nails/screws/bolts/fasteners
ee. Items less than $30

Equipment: All anticipated equipment to be used on all projects under this Master Contract is listed on the equipment list. Any equipment not listed, if approved by the MPCA Project/Contract Manager, shall be purchased as required in the MPCA Contractor/Subcontractor Purchasing Manual: https://www.pca.state.mn.us/about-mpca/contractor-and-subcontracting-guidance.

The MPCA will allow the Contractor to use MPCA equipment, if available, with MPCA contract manager approval and proper training as deemed appropriate by the contract manager. The MPCA will not reimburse contractors for this training. The Contractor assumes all risks of loss or damage to the equipment during periods of transportation, installation, and during the entire time the equipment is in possession of the Contractor.

Items shown below shall be billed at the daily or hourly rate shown without further proof of cost.

EQUIPMENT RATES
Effective July 1, 2018 – through June 30, 2023

Equipment	Cost (per day)
Turbidity Meter	$52.00
Oxidation-reduction potential (ORP) Meter	$39.00
Hydrolab Quanta	$80.00
Dissolved Oxygen Meter	$46.00
Temperature, pH, conductivity, ORP meter	$68.00
Temperature, pH, conductivity	$35.00
YSI Multi Meter w/ Flow Cell	$117.00
Flow Cell	$77.00
Water Quality Meter (6 parameters)	$102.00
2" Pump	$189.00
Bladder pump	$118.00
Submersible Pump	$52.00

Peristaltic Pump	$43.00
Diaphram Pump	$53.00
Mechanical Pump Puller	$44.00
Water Level Indicator	$27.00
Hydrocarbon/Water Interface Probe	$55.00
Pump/Slug Testing Equipment	$110.00
Manual direct-push probe equip.	$165.00
X-ray Fluorescent (XRF) for Soil and Lead Paint	$468.00
Nuclear Density Gauge	$69.00
Multi Gas Meter (02/CO/LEL/Methane)	$123.00
O2/Combustible Gas Detector	$110.00
LEL/O2/CO2 Gas Meter	$66.00
LEL/O2Gas Meter	$55.00
Explosimeter	$52.00
Photoionization Detector (PID) 10.6	$99.00
Photoionization Detector (PID) 11.7	$138.00
Flame Ionization Detector (OVA)	$135.00
Velometer / Anemometer	$34.00
Micro Manometer	$64.00
Sound Level Meter	$53.00
Dust Meter	$70.00
Air Compressor	$54.00
Metal/Cable Detector	$47.00
Generator	$65.00
Sump Pump	$33.00
Pressure Washer	$69.00
Magnetometer	$151.00
Coreing Machine with Drill Bits	$110.00
Surveying Equipment - Rotary Laser	$104.00
GPS (Submeter)	$122.00
Laser Level/Lenker Rod	$127.00
Ground Penetrating Radar (GPR)	$426.00
EM-31 Ground Conductivity Meter	$440.00
EM-61 Ground Conductivity Meter	$688.00
55 gal Drums	$70.00
Sub-Slab Soil Gas Sampling Point Insert	$88.00
Screen for Soil Gas Monitoring Points	$51.00
Vapor Pin Installation Kit (per point)	$60.00

Lumex Mercury Monitoring	$187.00
Mercury Analyzer	$179.00

Note: all calibration gasses are included in the price of the meters.
Vibracoring cannot be conducted under this contract.

9. CONTRACTOR STAFFING AND PERSONNEL CLASSIFICATIONS

Classifications are grouped in levels. Each level has an hourly rate. To qualify for a classification, you must have the education, experience and a majority of the qualifications as listed in the RFP, which is incorporated herein by reference. Classifications and hourly rates are as follows below:

Category A: Petroleum, Superfund, Ag, and Closed Landfill Program Environmental Services

The following personnel classifications will be utilized in Category A. Additional personnel classifications other than those listed below will not be accepted.

Ecological Risk Assessor 2
Ecological Risk Assessor 3
Engineer 1
Engineer 2
Engineer 3
Engineer 4
Field Technician
GIS/CADD Specialist
Human Health Risk Assessor 2
Human Health Risk Assessor 3
On-Site Inspector
Project Manager
Quality Assurance/Quality Control Officer
Scientist 1
Scientist 2

Category B. Petroleum Only Environmental Services

The following personnel classifications will be utilized in Category B. Additional personnel classifications other than those listed below will not be accepted.

Engineer 1
Engineer 2
Engineer 3
Field Technician
GIS/CADD Specialist
Project Manager
Scientist 1
Scientist 2

Category C: Closed Landfill Program

The following personnel classifications will be utilized in Category C. Additional personnel classifications other than those listed below will not be accepted.

Engineer 1
Engineer 2
Engineer 3
Engineer 4
Field Technician
GIS/CADD Specialist
On-Site Inspector
Project Manager
Quality Assurance/Quality Control Officer
Scientist 1
Scientist 2

10. CLASSIFICATIONS AND RATES

Classifications are grouped in levels. Each level has an hourly rate. To qualify for a classification, you must have the education, experience and a majority of the qualifications as listed in the RFP, which is incorporated herein by reference. Classifications and hourly rates are as follows below in Rate Schedule 1 and 2:

Rate Schedule 1
Effective July 1, 2018 – June 30, 2020

Level One	Classifications	Hourly Rate
	Engineer 1	$78.09
	Field Technician	$78.09
	GIS/CADD Specialist	$78.09
	Scientist 1	$78.09
Level Two	**Classifications**	**Hourly Rate**
	Ecological Risk Assessor 2	$97.48
	Engineer 2	$97.48
	Human Health Risk Assessor 2	$97.48
	Quality Assurance/Quality Control Officer	$97.48
	Scientist 2	$97.48
Level Three	**Classifications**	**Hourly Rate**
	Ecological Risk Assessor 3	
	Engineer 3	$137.52
	Human Health Risk Assessor 3	$137.52
	On-Site Inspector	$137.52
	Project Manager	$137.52
Level Four	**Classifications**	**Hourly Rate**
	Engineer 4	$205.97

Rate Schedule 2
Effective July 1, 2020 – June 30, 2023

Level One	Classifications	Hourly Rate
	GIS/CADD Specialist	$79.65
	Engineer 1	$79.65
	Field Technician	$79.65
	Scientist 1	$79.65
Level Two	**Classifications**	**Hourly Rate**
	Ecological Risk Assessor 2	$99.43
	Engineer 2	$99.43
	Human Health Risk Assessor 2	$99.43
	Quality Assurance/Quality Control Officer	$99.43
	Scientist 2	$99.43
Level Three	**Classifications**	**Hourly Rate**
	Ecological Risk Assessor 3	$140.27
	Engineer 3	$140.27
	Human Health Risk Assessor 3	$140.27
	On-Site Inspector	$140.27
	Project Manager	$140.27
Level Four	**Classifications**	**Hourly Rate**
	Engineer 4	$210.09

The Contactor will provide resumes to the State Contract Manager for review and approval before new staff can be added or begin work on a Work Order. New staff must meet the requirements in the RFP, which is incorporated herein by reference, of the personnel classification requested.

The Contractor will maintain and update a list of staff in matrix format that shows the personnel classifications and, staff name. The State may request and the Contractor shall comply with any request that a member of the Contractor's staff be removed from working on State projects for unsafe practices, violations of Contract procedures, or other problems. The State will pay the appropriate salary costs for the task being done.

11. BACKGROUND CHECKS. After Contract award and prior to the start of Contract work, the Contractor shall conduct background checks on all current and future employees that will perform the services required in the Contract. The background checks will be conducted through the State of Minnesota Bureau of Criminal Apprehension (BCA) and the Contractor shall also conduct its own check of any job applicant's work background. The State also reserves the right to request employee background checks be performed by the Contractor through the Federal Bureau of Investigation. All costs associated with any background checks conducted by the Contractor shall be the responsibility of Contractor.

The Contractor must review the results of these background checks, and the background checks must show any felony and gross misdemeanor convictions and any misdemeanors for which jail time may be imposed that disqualify the Contractor's employee from performing work on State property or in sensitive work areas.

If the completed background check on an individual employee shows an offense on their record, the Contractor must seek written approval from the State's Authorized Representative prior to allowing that individual to work under this Contract. The State reserves the right to decline any Contractor's employee with an offense on their record.

Before a Contractor's employee is allowed onsite to work, Contractor must certify to the State that it has a printed copy of the required background check on file and will keep it and other information on file and available for a minimum of six years for audit by the State. If requested, the results of the background checks shall be provided to the State.

12. REPORTING REQUIREMENTS

Progress Reports: The Contractor shall submit progress reports monthly or on an as needed basis determined by the State's Project Manager for the appropriate Work Order for each assigned project. This requirement shall be part of the workplan.

Usage Reports: The Contractor is required to submit Usage Reports. Usage Reports are a non-billable task required under the Master Contract. Usage Reports are due every year, no later than November 1, for the previous twelve month period of July 1 through June 30. Usage Reports are to be sent in writing or electronically to the MPCA's Contract Manager.

The Usage Report must include the following information:

a. Contractor's Name
b. Customer Name (MPCA, MDA)
c. Project Name
d. Work Order Number (if applicable) and SWIFT Purchase Order Number
e. Total Dollars by Work Order by Project for All Expenditures
f. Total Dollars Received by the MPCA Multi Site Contractor
g. Subcontractor's Name, Dollars Received, and Type of Service (by Work Order and per project)
h. Total Dollars Received During the Reporting Period by all Subcontractors
i. State Contractor's Name, Dollars Received, and Type of Service (by Work Order and per project)
j. For the report ending June 30, the total amount received for the entire fiscal year (July 1 – June 30) and yearly totals for each Work Order and each Subcontractor per Work Order
k. For the Environmental Products and Services portion of the Report, list products the Contractor is using or steps it is taking that are environmentally responsible (i.e. identify if the Contractor uses an E-85 vehicle and E-85 gas, or products made of recycled material)

The MPCA will provide a form to submit the above information as required.

Equipment Report: The Contractor shall submit Equipment Reports for State-owned equipment. Equipment Reports are a non-billable task required under the Master Contract. Reports are due every six months. Reports are due on March 1 for the previous six month period of July 1 through December 31 and on November 1 for the previous six month period of January 1 through June 30. Reports shall be sent electronically to the MPCA Contract Manager.

The Equipment Report shall include the following information:
a. Contractor Name
b. Item Description and Quantity
c. Purchase Date and Price
d. Make, Model, and Serial Identification Number of the Item
e. State Asset Number (items over $5,000)
f. Storage Location
g. Work Order or Purchase Order Number
h. Site Name

When State-owned equipment is lost or stolen, the Contractor must report the loss or theft to the MPCA Contract Manager within 24 hours.

13. SUBCONTRACTING

MPCA Contractors may subcontract tasks within the scope of this Master Contract and construction tasks assigned to it under this Master Contract as specified in the MPCA Contractor and Subcontracting Purchasing Manual which is incorporated by reference. The MPCA Contractor shall follow the MPCA Contractor/Subcontractor Purchasing Manual to subcontract services. The MPCA reserves the right to reject or accept Subcontractors as defined in the current MPCA Contractor/Subcontractor Purchasing Manual available at the MPCA website: https://www.pca.state.mn.us/about-mpca/contractor-and-subcontracting-guidance. The State reserves the right to update said instructions at any point. Once the State has posted revised instructions, the Contractor is required to implement all changes based on the revision date of the MPCA Contractor and Subcontracting Purchasing Manual

All construction activities must be subcontracted. The Contractor must not subcontract over $50,000. MDA is not authorized to use the MPCA Contractor and Subcontracting Purchasing Manual.

If MPCA Contractors decides to fulfill its obligations and duties under this Master Contract through a Subcontractor, to be paid for by funds received under this Contract, the Contractor shall not execute a contract with the Subcontractor or otherwise enter into a binding agreement until it has first received written approval from the State's Authorized Representative. All subcontracts shall reference this Master Contract and require the Subcontractor to comply with all of the terms and conditions of this Master Contract. The Contractor shall be responsible for the satisfactory and timely completion of all work required under any subcontract and the Contractor shall be responsible for payment of all subcontracts.

Professional / Technical Services: **Professional / Technical services cannot be subcontracted under this Master Contract.**

14. PREVAILING WAGE

The Contactor shall follow the MPCA Contractor and Subcontracting Purchasing Manual in regards to subcontracting construction activities. Any work on real property which uses the skill sets of any trades covered by Labor Code and Class under prevailing wages is construction and requires prevailing wages must be attached to the bid solicitation. For more information see http://www.doli.State.mn.us/LS/PrevWage.asp for the list of affected trades.

15. CONTRACTOR / SUBCONTRACTOR RESPONSIBILITIES

The Contractor is responsible for all work assigned to the Contractor under this Master Contract whether the work is actually performed by the Contractor or a Subcontractor. The State considers the Contractor to be the sole point of contact with regard to matters governed by this Contract, including payment of any and all charges resulting from this Master Contract. The Contractor is responsible for ensuring that the Subcontractor complies with all provisions of this Master Contract. The Contractor shall not utilize the services of any firms that have been debarred or suspended under Federal Regulation, 40 CFR Part 32. The MPCA will reject or accept Subcontractors as provided in the MPCA Contractor and Subcontracting Purchasing Manual: https://www.pca.state.mn.us/about-mpca/contractor-and-subcontracting-guidance

The use of temporary staff services must be authorized by the State's Contract Manager prior to use.

In the event the Contractor fails to make timely payments to a Subcontractor, the State may, at its sole option and discretion, pay a Subcontractor any amounts due from the Contractor for work performed under the Master Contract and deduct said payment from any remaining amounts due the Contractor. Before any such payment is made to a Subcontractor, the State shall provide the Contractor written notice that payment will be made directly to a Subcontractor. If there are no remaining outstanding payments to the Contractor, the State shall not have obligation to pay or be responsible for the payment of money to a Subcontractor except as may otherwise be required by law.

The MPCA Contractor is the oversight Contractor and will provide direction to the State Contractor and Subcontractor. The MPCA Contractor is responsible for informing the MPCA Contract Manager or State's Project Manager in regards to non-performance by a State Contractor.

16. WORKPLANS:

The workplan shall set forth the tasks the Contractor proposes to perform, a time schedule, and workplan budget. Upon request by the State Project Manager, the Contractor is required to submit Workplans for Work Orders. The Workplan shall be submitted to the requesting State Project Manager for review and approval within the time period prescribed by the State.

The State and the Contractor may negotiate changes to the Workplan prior to issuing the Work Order. The Workplan, once approved by the State, becomes an integral part of the resulting Work Order.

Billable hours and expenses must not exceed the State's approved Workplan amounts. The total labor amount of staff classifications shall not exceed the approved labor amount on the Workplan per task. Only the preapproved staff classifications shall be used and the task must be completed by the appropriate level of staff classification.

Additional personnel classifications will not be permitted.

Classifications may be substituted within a level upon approval by the MPCA Project Manager. If a substitute is outside of the level, the change must be approved prior to any work being done by that classification through either a change order or amendment. Additional personnel classifications shall not be utilized.

Any hours charged to a classification not approved under this Master Contract, or on the budget submitted with the Workplan, will not be considered for payment.

The State may solicit Workplans from multiple Contractors and shall base Contractor selection on the factors set forth in Section 15, Work Orders.

The State shall not pay for the preparation of Workplans or any other work conducted by the Contractor prior to issuance of a Work Order, including time for reviewing files and meeting with State staff. However, when substantial file review is required and/or an extensive Workplan is required, the State may agree to pay for the Workplan preparation.

17. WORK ORDERS

A Work Order is a contract document that is signed by the State's Authorized Representative, the Contractor's Authorized Representative, and if applicable the Department of Administration, requiring the Contractor to perform tasks pursuant to this Master Contract. Each Work Order shall become an integral and enforceable part of the Master Contract once executed by the State. The Workplan, Budget and Timeline must be attached to the Work Order.

Work Orders may be amended by a Change Order or a Work Order Amendment as described in this Master Contract.

Work Orders shall be issued under this Master Contract at the State's discretion. Whether or not a Work Order is issued shall be based on: the Contractor's performance on previous Work Orders; potential or actual conflicts of interest; availability of staff; the need for specialized skill or experience; or other factors as determined by the State's Authorized Representative.

The Contractor shall not begin work under this Master Contract until the Contractor has received an executed Work Order from the State's Authorized Representative.

A Work Order may be issued under this Master Contract with the State's prior approval utilizing funds other than the funds available from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Minnesota Environmental Response Liability Act (MERLA), and the Minnesota Petroleum Tank Release Cleanup Account (Petrofund). The State's Authorized Representative has sole discretion regarding when this option is available.

The State fiscal year ends June 30 of each year. All Work Orders written within a fiscal year must end June 30 of that year. Should work need to continue beyond June 30, a new Work Order beginning July 1 will be required.

18. CHANGE ORDERS:

If the State's Project Manager or the Contractor's Authorized Representative identifies a change needed in the workplan and/or budget, either party may initiate a Change Order using the Change Order Form provided by the MPCA. Change Orders may not alter the overall scope of the Project, increase or decrease the overall amount of the Work Order, or cause an extension of the term of the Work Order. Major changes require an Amendment rather than a Change Order.

The Change Order Form must be approved and signed by the State's Project Manager and the Contractor's Authorized Representative in advance of doing the work. Documented changes will then become an integral and enforceable part of the Work Order. The MPCA has the sole discretion on the determination of whether a requested change is a Change Order or an Amendment. The state reserves the right to refuse any Change Order requests.

19. WORK ORDER AMENDMENTS

Except for changes made by Change Orders described in Clause 18, Change Orders, of this Master Contract, all other changes to the Workplan established in a Work Order shall be made by a Work Order Amendment, signed by the State's Authorized Representative, the Contractor's Authorized Representative, and the Department of Administration Authorized Representative.

A Work Order Amendment may be initiated by the State or by the Contractor. Under no circumstances shall the Contractor proceed with work beyond the work authorized by a Work Order unless a Change Order or a Work Order Amendment has been approved by the State. Each Work Order Amendment shall become an integral and enforceable part of the Master Contract once executed by the State. Changes in Work Order end dates must be processed through a Work Order Amendment.

A revised Workplan must be attached to the Work Order Amendment. All Work Order Amendment amounts shall not exceed 10% of the cost established in the original Work Order or $50,000.00, whichever is less, of the overall Work Order, cumulatively.

20. STOP WORK ORDERS

The State's Contract Manager, State's Project Manager, or the State's Authorized Representative may issue a Stop Work Order if it is determined, for any reason, work authorized under a Work Order shall stop. A Stop Work Order may be verbal, but shall be confirmed in writing by the State. The Contractor shall immediately comply with the terms of the Stop Work Order, which may include steps to leave the site in a safe condition.

The Contractor shall be paid for costs properly invoiced for all work satisfactorily completed up to the date of the Stop Work Order. Costs incurred by the Contractor as a result of the issuance of a Stop Work Order shall be paid by the State through a Work Order Amendment.

21. STATE'S AUTHORIZED REPRESENTATIVES

The State's Authorized Representative has the responsibility to monitor the Contractor's performance and the authority to accept the services provided under this Master Contract. If the services are satisfactory, the State's Authorized Representative will certify acceptance on each invoice submitted for payment.

- The MPCA's Authorized Representatives for this Master Contract are: **name and contact information** 520 Lafayette Road North, Saint Paul, Minnesota 55155, or any other person the Commissioner of the MPCA designates in writing to the Contractor. The MPCA's Project Manager shall be designated in writing by the State before the Contractor begins work on a Work Order and may be changed by written notice to the Contractor.

- The MDA's Authorized Representative is **name and contact information** 625 Robert Street North, Saint Paul, Minnesota 55155, or any other person the Commissioner of the MDA designates in writing to the Contractor. The MDA's Project Manager shall be designated in writing by the State before the Contractor begins work on a Work Order and may be changed by written notice to the Contractor.

22. CONTRACTOR'S AUTHORIZED REPRESENTATIVES

The Contractor's Authorized Representative are **name and contact information**, and is authorized to sign Contracts and accept Work Orders from the State on behalf of the Contractor. If the Contractor's Authorized Representative changes at any time during this Master Contract, the Contractor must immediately notify the State.

The Contractor's Authorized Representative may designate alternative or additional representatives by written notice to the State's Authorized Representative.

23. CONFLICTS CHECK

Prior to beginning any work on a project, the Contractor shall determine whether it has any actual or potential conflict of interest in working on the project. If the Contractor determines it has no conflict of interest, it shall provide to the State the following certification within five (5) business days of receiving the first Work Order from the State per site and prior to beginning any work under the Work Order.

> *[To the best of the [name of Contractor]'s knowledge, no conflict of interest would be created by this firm's performance of work for the State at this site. To the best of the firm's knowledge, no relationship exists between this firm, its parent companies, affiliates, Subcontractors and subsidiaries, or any potentially responsible persons involved with the work described in this Workplan, except [disclose any relationship the Contractor has that does not rise to the level of a conflict of interest].*

If the State determines that there is an actual or potential conflict of interest, the State may revoke any previously issued related Work Order. In the event that a conflict is discovered after the Contractor has begun work under the Work Order, the Contractor shall immediately notify the State's Project Manager in writing with a copy sent to State's Contract Manager, and cease work on the project until the conflict is resolved. The cost of demobilization because of a conflict shall be paid by the State unless the State's Authorized Representative finds that the Contractor should have previously discovered the conflict. The Contractor shall not conduct work for any other party on projects for which the Contractor has accepted a State project assignment unless specifically authorized to do so by the State's Authorized Representative.

24. CONTRACT RELATIONS

The Contractor shall cooperate and coordinate with other State Contractors and shall ensure all subcontractors cooperate and coordinate with other State Contractors. The Contractor and Subcontractor shall use their company's personnel assigned to the Master Contract in the Response to the RFP, which is incorporated herein by reference, or as subsequently approved by the State.

Communication among the Contractors shall be as efficient as possible. The State's use of this Master Contract must be easy and efficient, with no extra administrative burden for the State.

25. CONTRACTOR MEETINGS AND TRAINING

The Contractor shall meet with the State's representatives to discuss matters relevant to this Master Contract and the work assigned to the Contractor, upon request of the State Contract Manager, State's Project Manager and/or the State's Authorized Representative. The State's Contract Manager, State's Project Manager and/or the State's Authorized Representative shall meet with the Contractor upon the Contractor's request to discuss matters relevant to this Contract and projects assigned to the Contractor under this Master Contract. The State shall pay for meeting time only for project specific meetings. The State shall not pay for time for Master Contract status meetings or other meetings requested by the State's Authorized Representative.

The Contractor must attend training required by the State.

26. SITE ACCESS

The Contractor shall be responsible for checking property ownership and obtaining access to property needed to accomplish work assigned under this Master Contract unless otherwise notified by the State's Project Manager. However, if, after making reasonable efforts, the Contractor cannot obtain access to the site, the Contractor shall seek assistance from the State's Project Manager. The State will not pay for access to property, but it shall make other reasonable efforts to gain access to the Site. The Contractor shall use the forms provided by the State for obtaining access.

27. PERMITS AND LICENSES

The Contractor shall obtain and maintain all patents, licenses, permits, authorizations, or any other documents required by federal, State, or local governments, patent holders, or other authorities, that are needed for work the Contractor shall perform pursuant to this Master Contract. With limited exception, the State will not pay patent, permit, license, authorization, or other fees, but shall provide reasonable assistance to the Contractor in obtaining such patents, permits, licenses, authorizations, or other documents.

28. GENERAL HEALTH AND SAFETY

The Contractor shall ensure that its personnel assigned under this Master Contract, and the personnel of the State Contractor and all Subcontractors have received the appropriate level of health and safety training as specified by all applicable laws. The Contractor shall be responsible for the health and safety of its employees, and the employees of the State Contractor, and all Subcontractors in connection with the work performed under this Master Contract. The Contractor must have a copy of the project specific Health and Safety Plan available upon request at the project site. Site Security Plans will be developed as needed.

The Contractor is responsible to assure the Contractor, Subcontractor, and the State Contractor follow the Contractor's Health and Safety Plan. The Contractor must notify the State Project Manager in regards to non-performance or health and safety conditions.

29. SITE SECURITY PLAN

After award of a Work Order the Contractor shall prepare a site specific Health and Safety Plan (HASP) that complies with all applicable State and federal laws and regulations.

The Contractor shall submit a copy of the Contractor's HASP and SSP to the State's Project Manager, for review only. MPCA staff shall comply with the provisions of the Contractor's HASP and SSP when on-site. The Contractor's HASP and SSP shall not place more stringent requirements on MPCA staff than on the Contractor's employees. The Contractor must have a copy of the HASP and SSP available upon request at the project site.

Site Safety Conditions: The Contractor shall have authority to restrict from the project site anyone not complying with the Contractor's HASP and SSP. Any person so restricted from the project site shall be allowed to return to the project site after meeting all provisions of the Contractor's HASP and SSP. The Contractor must notify the MPCA Project Manager regarding non-compliance with the HASP or SSP.

The Contractor shall hold regular safety meetings. State staff may attend when appropriate. The topic of the meetings shall specifically involve safety and attendees shall, at a minimum, discuss safety problems and requirements related to the project.

The Contractor shall not be required to supply personal protective equipment or monitoring equipment for any persons other than Contractor's employees. However, the Contractor shall make available its decontamination facilities to those persons who reasonably require access to the work site, including Subcontractors, State, and other regulatory authorities. The Contractor shall be solely responsible for ensuring compliance by all persons with Contractor's HASP. However, the Contractor shall not unreasonably restrict State access to the site. If the State requests the right to observe work and State staff are denied access because of noncompliance with the Contractor's Health and Safety Program, the Contractor shall not proceed with the work until the State may observe the work.

30. SITE STABILIZATION

If the Contractor becomes aware that a site assigned to the Contractor requires immediate corrective action to stabilize the site to prevent further damage to the environment or to remove a threat to public health or welfare, the Contractor shall immediately notify the State's Authorized Representative or State's Project Manager of the situation. If authorized by the State's Authorized Representative or State's Project Manager, the Contractor shall take appropriate measures to stabilize the site.

31. WASTE REMOVAL AND WELL OWNERSHIP

The Contractor shall manage all hazardous and non-hazardous wastes according to applicable local, State and federal laws. The Contractor shall recommend to the State the means of disposal of hazardous waste. In the event the Contractor is required to manage hazardous wastes, the State's Project Manager shall obtain an U.S. Environmental Protection Agency (EPA) hazardous waste identification number to identify the State as generator of the waste. The Contractor is not responsible for the long term maintenance and proper abandonment of wells installed pursuant to this Master Contract unless the Contractor is directed to do so by a Work Order.

32. BROWNFIELD SITE-SPECIFIC STANDARDS AND PRACTICES

Contractor working on Brownfield site-specific activities must meet interim standards and practices established in EPA's proposed All Appropriate Rule, and the standards and practices contained in EPA's All Appropriate Rule when promulgated: http://www.epa.gov/brownfields/aai/index.htm

33. STATE AUDITS

Under Minn. Stat. § 16C.05, Subd. 5, the Contractor's books, records, documents, and accounting procedures and practices relevant to this Work Order are subject to examination by the State and/or the State Auditor or Legislative Auditor, as appropriate, for a minimum of six years from the end of this Master Contract.

34. ASSIGNMENT, AMENDMENTS, WAIVER, AND MASTER CONTRACT COMPLETE

34.1 Assignment. The Contractor may neither assign nor transfer any rights or obligations under this Master Contract without the prior consent of the State and a fully executed assignment agreement, executed and approved by the same parties who executed and approved this Master Contract, or their successors in office.

34.2 Amendments. Any amendment to this Master Contract must be in writing and will not be effective until it has been executed and approved by the same parties who executed and approved the original Master Contract, or their successors in office.

34.3 Waiver. If the State fails to enforce any provision of this Master Contract or any Work Order, that failure does not waive the provision or its right to enforce it.

34.4 Contract complete. This Master Contract and any Work Order contains all negotiations and agreements between the State and the Contractor. No other understanding regarding this Master Contract or Work Order, whether written or oral, may be used to bind either party.

35. CANCELLATION / TERMINATION, CONTINUITY OF SERVICES

Termination by the State: The State or Commissioner of Administration may cancel this Master Contract and any Work Orders at any time, with or without cause, upon thirty (30) days' written notice to the Contractor. Upon termination, the Contractor will be entitled to payment, determined on a pro rata basis, for services satisfactorily performed.

In the event this Master Contract is cancelled or expires, the Contractor shall provide phase-in phase-out (PIPO) training if required to do so by a Work Order. The PIPO services shall be provided to enable the State or another Contractor to continue, extend, or expand the work to be performed by the Contractor. The PIPO training may include conducting a training program and establishing dates for transfer of responsibility to new personnel. During the PIPO period, the Contractor shall provide sufficient experienced personnel to allow the work governed by this Master Contract to proceed without a loss of efficiency. The Contractor shall also provide the State with copies of computer models, data tapes, and other records developed under this Master Contract, and ensure training is provided on the use of these materials. The Contractor shall be reimbursed for its PIPO costs at the rates specified in the attached fee schedule.

Termination for Insufficient Funding: The State may immediately terminate this Master Contract and any Work Order if it does not obtain funding from the Minnesota Legislature or other funding source; or if funding cannot be continued at a level sufficient to allow for the payment of the services covered here. Termination must be by written or fax notice to the Contractor. The State is not obligated to pay for any services that are provided after notice and effective date of termination. However, the Contractor will be entitled to payment, determined on a pro rata basis, for services satisfactorily performed to the extent that funds are available. The State will not be assessed any penalty if the Contract or Work Order is terminated because of the decision of the Minnesota Legislature or other funding source, not to appropriate funds. The State must provide the Contractor notice of the lack of funding within a reasonable time of the State's receiving that notice.

36. INDEMNIFICATION

In the performance of this Contract by Contractor, or Contractor's agents or employees, or Subcontractors, the Contractor must indemnify, save, and hold harmless the State, its agents, and employees, from any claims or causes of action, including attorney's fees incurred by the State, to the extent caused by Contractor's:

a) Intentional, willful, or negligent acts or omissions; or
b) Actions that give rise to strict liability; or
c) Breach of contract or warranty.

The indemnification obligations of this section do not apply in the event the claim or cause of action is the result of the State's sole negligence. This clause will not be construed to bar any legal remedies the Contractor may have for the State's failure to fulfill its obligation under this Contract.

37. LIABILITY

Liability under MERLA

A. When performing work under the Contract for the State when the State is acting pursuant to Minn. Stat. § 115B.17 of the Minnesota Environmental Response and Liability Act (MERLA), the Contractor that is not otherwise responsible for a release or threatened release of hazardous substances or pollutants or contaminants is considered to be a Contractor that is performing response actions in accordance with a plan approved by the Commissioner, for purposes of Minn. Stat. §115B.03, Subd. 10.
B. When performing work under the Contract for the State when the State is acting:
   i. pursuant to Minn. Stat. § 115B.17 of MERLA, or
   ii. in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300), promulgated by the U.S. Environmental Protection Agency (EPA) pursuant to 42 U.S.C. § 9605 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) with respect to any release or threatened release of a hazardous substance, the Contractor is considered to be engaged in acts taken or omitted in preparation for, or in the course of rendering care, assistance and advice to the Commissioner or the Agency for purposes of Minn. Stat. § 115B.04, Subd. 11, and, in the event a third

party claims injury or damages resulting from acts or omissions arising from performance of the Contract, the defense provided under Minn. Stat. §115B.04, subd. 11, is intended, but not warranted by the State, to be available to the Contractor and the State as a defense to MERLA liability claims. The provisions of the Liability under MERLA paragraphs are intended, but not warranted by the State, to include subcontractors approved by the State.

Liability under CERCLA

To the extent that the Contractor meets the definition of a "response action contractor" under 42 U.S.C. § 9619(e) of CERCLA, it is intended, but not warranted by the State, that the Contractor be exempt from liability under CERCLA or other federal law as is provided in 42 U.S.C. § 9619. Furthermore, 42 U.S.C. § 9619 provides the President with discretionary authority to indemnify response action contractors for releases of hazardous substances or pollutants or contaminants arising out of negligence in the course of Superfund work. No indemnification by the State is created by the Contract. The term "response action contractor" is intended, but not warranted by the State, to include subcontractors approved by the State. Nothing in this Part is intended to be construed as a waiver by the State of the Tort Claims Act, Minn. Stat. §3.736, or any other law, legislative or judicial, limiting government liability. The duties and obligations imposed by the Contract and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law. No action or failure to act by the State or the Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

38. INSURANCE

Contractor certifies that it is in compliance with all insurance requirements specified in the solicitation document relevant to this Master Contract. Contractor shall not commence work under the Master Contract until they have obtained all the insurance specified in the solicitation document. Contractor shall maintain such insurance in force and effect throughout the term of the Master Contract.

A. Contractor shall not commence work under the Contract until they have obtained all the insurance described below and the State of Minnesota has approved such insurance. Contractor shall maintain such insurance in force and effect throughout the term of the Master Contract.

B. Contractor is required to maintain and furnish satisfactory evidence of the following insurance policies:

Workers' Compensation Insurance: Except as provided below, Contractor must provide Workers' Compensation insurance for all its employees and, in case any work is subcontracted, Contractor will require the Subcontractor to provide Workers' Compensation insurance in accordance with the statutory requirements of the State of Minnesota, including Coverage B, Employer's Liability. Insurance **minimum** limits and coverages are as follows:

$100,000 – Bodily Injury by Disease per employee
$500,000 – Bodily Injury by Disease aggregate
$100,000 – Bodily Injury by Accident
Waiver of Subrogation in favor of the State of Minnesota

If Minn. Stat. § 176.041 exempts Contractor from Workers' Compensation Insurance or if the Contractor has no employees in the State of Minnesota, Contractor must provide a written statement, signed by an authorized representative, indicating the qualifying exemption that excludes Contractor from the Minnesota Workers' Compensation requirements.

If during the course of the Master Contract the Contractor becomes eligible for Workers' Compensation, the Contractor must comply with the Workers' Compensation Insurance requirements herein and provide the State of Minnesota with a certificate of insurance.

Commercial Automobile Liability Insurance: Contractor is required to maintain insurance protecting it from claims for damages for bodily injury as well as from claims for property damage resulting from the ownership, operation, maintenance or use of all owned, hired, and non-owned autos which may arise from operations under this Master Contract, and in case any work is subcontracted the Contractor will require the Subcontractor to maintain Commercial Automobile Liability insurance. Insurance **minimum** limits are as follows:

a. Minimum Limits of Liability:
   i. $2,000,000 – per occurrence Combined Single limit for Bodily Injury and Property Damage
b. In addition, the following coverages should be included:
   i. Owned, Hired, and Non-owned Automobile
   ii. CA9948 Endorsement – Pollution Liability – Broadened
   iii. MCS90 Endorsement

(NOTE: CA9948 and MCS90 Endorsement is required if service includes the transport of pollutants. Refer to MPCA Contractor and Subcontracting Purchasing Manual.)

Commercial General Liability Insurance: Contractor is required to maintain insurance protecting it from claims for damages for bodily injury, including sickness or disease, death, and for care and loss of services as well as from claims for property damage, including loss of use which may arise from operations under the Master Contract whether the operations are by the Contractor or by a subcontractor or by anyone directly or indirectly employed by the Contractor under the Contract. Insurance **minimum** limits are as follows:

a. Minimum Limits of Liability:
   i. $2,000,000 – Per Occurrence
   ii. $2,000,000 – Annual Aggregate
   iii. $2,000,000 – Annual Aggregate – Products/Completed Operations
b. The following coverages shall be included:
   i. Premises and Operations Bodily Injury and Property Damage
   ii. Personal & Advertising Injury
   iii. Blanket Contractual Liability
   iv. Products and Completed Operations Liability (If applicable)
   v. State of Minnesota named as Additional Insured
   vi. Waiver of subrogation in favor of the State of Minnesota

Pollution Liability Insurance: Contractor's Pollution Liability (or equivalent pollution liability coverage endorsed on another form of liability coverage, such as general liability or professional errors and omissions policy).

a. Minimum Limits of Liability:
   i. $2,000,000 – Per Claim
   ii. $2,000,000 – Annual Aggregate
b. Coverages:
   i. Policy will include Non-Owned Disposal Site Pollution Liability.
   ii. Policy will not contain a lead exclusion.
   iii. Owner named as an Additional Insured.
   vii. . Waiver of subrogation in favor of the State of Minnesota

Professional/Technical, Errors and Omissions, and/or Miscellaneous Liability Insurance: This policy will provide coverage for all claims the Contractor may become legally obligated to pay resulting from any actual or alleged negligent act, error, or omission related to Contractor's professional services required under the Master Contract.

Contractor is required to carry the following **minimum** limits:

$2,000,000 – per claim or event
$2,000,000 – annual aggregate

Any deductible will be the sole responsibility of the Contractor and may not exceed $50,000 without the written approval of the State. If the Contractor desires authority from the State to have a deductible in a higher amount, the Contractor shall so request in writing, specifying the amount of the desired deductible and providing financial documentation by submitting the most current audited financial statements so that the State can ascertain the ability of the Contractor to cover the deductible from its own resources.

The retroactive or prior acts date of such coverage shall not be after the effective date of this Master Contract and Contractor shall maintain such insurance for a period of at least three (3) years, following completion of the work. If such insurance is discontinued, extended reporting period coverage must be obtained by Contractor to fulfill this requirement.

Builder's Risk Insurance: The Contractor shall be responsible for providing and maintaining "All Risk" or equivalent Builder's Risk policy insuring the interest of the State, Contractor, and any tier of Subcontractor or the Contractor shall be responsible for requiring that their Subcontractor provide and maintain Builder's Risk policy insuring the interest of the State, Contractor, and any tier of Subcontractor. Coverage on an "All Risk" or equivalent basis shall include the perils of flood, earthquake and pollution cleanup expense. Builder's Risk limit of liability shall be equal to the construction cost. Any deductible shall be the sole responsibility of the Contractor and shall not exceed $10,000 without the written approval of the State.

1. The Builder's Risk policy will cover all materials, supplies and equipment that are intended for construction and specific installation in the project while such materials, supplies and equipment are located at the project site, in transit and while temporarily located away from the project site for the purpose of repair, adjustment or storage at the risk of one of the insured parties.

2. Any property not covered by the Builder's Risk policy, such as the Contractor's or any tier of Subcontractor's licensed motor vehicles or personal property, including job trailers, machinery, tools, equipment and property of a similar nature not destined to become a part of the project, shall be the responsibility of the Contractor or Subcontractor at any tier, and such person or organization may self-insure or provide other insurance at its option for the same.

3. ***Waiver of Liability.*** Absent State or Architect sole negligence or breach of specific Contractual duty specifically and logically related to the damage or loss, the State or Architect will not be responsible for loss or damage to property of any kind owned, borrowed, rented or leased by the Contractor, Subcontractors of all tiers and/or the Contractor's/Subcontractors employees, servants or agents.

4. ***Waivers of Subrogation***. The State and Contractor waive all rights against (1) each other and any of their Subcontractors of all tiers and (2) the Architect, and the Architect's Subcontractors of all tiers for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to the provisions of paragraph 31.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the State or Contractor as fiduciary. The State or Contractor, as appropriate, shall require of the Architect, and the Architect's Subcontractors of all tiers, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

5. All losses and claims shall be immediately reported to the Contractor, State and applicable insurance carrier, under loss notice procedures as directed by the Contractor.

6. Any loss insured under Section 31.3 is to be adjusted with the Contractor and made payable to the Contractor as trustee for all insured parties, as their interests may appear, subject to the requirements of any applicable mortgage clause. The Contractor shall pay the State a just share of any insurance moneys received, and by appropriate agreement, written where legally required for validity, shall require the Contractor to make just share payments to the Subcontractors and lower tiered Sub-Subcontractors in similar manner.

7. Partial occupancy or use shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise.

8. ***Boiler and Machinery Insurance***. The Contractor shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the State; this insurance shall include interests of the States, Contractor, Subcontractors and Sub-Subcontractors in the Work, and the State and Contractor shall be named insureds.

   Loss of Use Insurance. The State, at the State's option, may purchase and maintain such insurance as will insure the State against loss of use of the State's property due to fire or other hazards,

C. Additional Insurance Conditions:

- Contractor's policy(ies) shall be primary insurance to any other valid and collectible insurance available to the State of Minnesota with respect to any claim arising out of Contractor's performance under this Master Contract;

- If Contractor receives a cancellation notice from an insurance carrier affording coverage herein, Contractor agrees to notify the State of Minnesota within five (5) business days with a copy of the cancellation notice, unless Contractor's policy(ies) contain a provision that coverage afforded under the policy(ies) will not be cancelled without at least thirty (30) days advance written notice to the State of Minnesota;

- Contractor is responsible for payment of Master Contract related insurance premiums and deductibles;

- If Contractor is self-insured, a Certificate of Self-Insurance must be attached;

- Contractor's policy(ies) shall include legal defense fees in addition to its liability policy limits, with the exception of B.4 above;

- Contractor shall obtain insurance policy(ies) from insurance company(ies) having an "AM BEST" rating of A- (minus); Financial Size Category (FSC) VII or better, and authorized to do business in the State of Minnesota; and

- An Umbrella or Excess Liability insurance policy may be used to supplement the Contractor's policy limits to satisfy the full policy limits required by the Master Contract.

D. The State reserves the right to immediately terminate the Master Contract if the Contractor is not in compliance with the insurance requirements and retains all rights to pursue any legal remedies against the Contractor. All insurance policies must be open to inspection by the State, and copies of policies must be submitted to the State's Authorized Representative upon written request.

E. The Contractor is required to submit Certificates of Insurance acceptable to the State of Minnesota as evidence of insurance coverage requirements prior to commencing work under the Master Contract.

Further, the Contractor certifies that it is in compliance with Minn. Stat. § 176.181, Subd. 2, pertaining to Workers' Compensation insurance coverage. The Contractor's employees and agents will not be considered State employees. Any claims that may arise under the Minnesota Workers' Compensation Act on behalf of these employees or agents and any claims made by any third party as a consequence of any act or omission on the part of these employees or agents are in no way the State's obligation or responsibility.

39. GOVERNMENT DATA PRACTICES AND INTELLECTUAL PROPERTY

39.1 Government data practices. The Contractor and State must comply with the Minnesota Government Data Practices Act, Minn. Stat. Ch. 13, as it applies to all data provided by the State under any Work Order and as it applies to all data created, collected, received, stored, used, maintained, or disseminated by the Contractor under the Work Order. The civil remedies of Minn. Stat. § 13.08 apply to the release of the data referred to in this Clause~~,~~ by either the Contractor or the State.

If the Contractor receives a request to release the data referred to in this Clause, the Contractor must immediately notify the State. The State will give the Contractor instructions concerning the release of the data to the requesting party before the data is released.

39.2 (A) Intellectual property rights.

The State owns all rights, title, and interest in all of the intellectual property rights, including copyrights, patents, trade secrets, trademarks, and service marks in the Works and Documents *created and paid for under Work Orders.* Works means all inventions, improvements, discoveries (whether or not patentable), databases, computer programs, reports, notes, studies, photographs, negatives, designs, drawings, specifications, materials, tapes, and disks conceived, reduced to practice, created or originated by the Contractor, its employees, agents, and Subcontractors, either individually or jointly with others in the performance of this Master Contract or any Work Order. Works includes "Documents." Documents are the originals of any databases, computer programs, reports, notes, studies, photographs, negatives, designs, drawings, specifications, materials, tapes, disks, or other materials, whether in tangible or electronic forms, prepared by the Contractor, its employees, agents, or Subcontractors, in the performance of a Work Order. The Documents will be the exclusive property of the State and all such Documents must be immediately returned to the State by the Contractor upon completion or cancellation of the Work Order. To the extent possible, those Works eligible for copyright protection under the United States Copyright Act will be deemed to be "works made for hire." The Contractor assigns all right, title, and interest it may have in the Works and Documents to the State. The Contractor must, at the request of the State, execute all papers and perform all other acts necessary to transfer or record the State's ownership interest in the Works and Documents

(B)Obligations:

1. ***Notification:*** Whenever any invention, improvement, or discovery (whether or not patentable) is made or conceived for the first time or actually or constructively reduced to practice by the Contractor, including its employees, agents, and Subcontractors, in the performance of the Work Order, the Contractor will immediately give the State's Authorized Representative written notice thereof, and must promptly furnish the State's Authorized Representative with complete information and/or disclosure thereon.

2. ***Representation:*** The Contractor must perform all acts, and take all steps necessary to ensure that all intellectual property rights in the Works and Documents are the sole property of the State, and that neither Contractor nor its employees, agents or Subcontractors retain any interest in and to the Works and Documents. The Contractor represents and warrants that the Works and Documents do not and will not infringe upon any intellectual property rights of other persons or entities. Notwithstanding Clause 24, the Contractor will indemnify; defend, to the extent permitted by the Attorney General; and hold harmless the State, at the Contractor's expense, from any action or claim brought against the State to the extent that it is based on a claim that all or part of the Works or Documents infringe upon the intellectual property rights of others. The Contractor will be responsible for payment of any and all such claims, demands, obligations, liabilities, costs, and damages, including but not limited to, attorney fees. If such a claim or action arises, or in the Contractor's or the State's opinion is likely to arise, the Contractor must, at the State's discretion, either procure for the

State the right or license to use the intellectual property rights at issue or replace or modify the allegedly infringing Works or Documents as necessary and appropriate to obviate the infringement claim. This remedy of the State will be in addition to and not exclusive of other remedies provided by law.

40. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION

Federal money will be used or may potentially be used to pay for all or part of the work under the Master Contract, therefore Contractor certifies that it is in compliance with federal requirements on debarment, suspension, ineligibility and voluntary exclusion specified in the solicitation document implementing Executive Order 12549. Contractor's certification is a material representation upon which the Master Contract award was based.

41. PUBLICITY AND ENDORSEMENT

41.1 ***Publicity*****.** Any publicity regarding the subject matter of a Work Order must identify the State as the sponsoring agency and must not be released without prior written approval from the State's Authorized Representative. For purposes of this provision, publicity includes notices, informational pamphlets, press releases, research, reports, signs, and similar public notices prepared by or for the Contractor individually or jointly with others, or any subcontractors, with respect to the program, publications, or services provided resulting from a Work Order. During State contracted work, the Contractor shall defer all interviews and requests for information from the media, private citizens or public officials to the State unless the State specifically requests the Contractor to handle such requests.

39.2 Endorsement. The Contractor must not claim that the State endorses its products or services

42. GOVERNING LAW, JURISDICTION, AND VENUE

Minnesota law, without regard to its choice-of-law provisions, governs this Master Contract and all Work Orders. Venue for all legal proceedings out of this Master Contract and/or any Work Order, or its breach, must be in the appropriate state or federal court with competent jurisdiction in Ramsey County, Minnesota.

43. DATA DISCLOSURE

Under Minn. Stat. § 270C.65, Subd. 3 and other applicable law, the Contractor consents to disclosure of its social security number, federal employer tax identification number, and/or Minnesota tax identification number, already provided to the State, to federal and State agencies, and State personnel involved in the payment of State obligations. These identification numbers may be used in the enforcement of federal and State laws which could result in action requiring the Contractor to file State tax returns, pay delinquent State tax liabilities, if any, or pay other State liabilities.

44. NON-DISCRIMINATION (IN ACCORDANCE WITH MINN. STAT. § 181.59)

The Contractor will comply with the provisions of Minn. Stat. § 181.59 which requires:
Every contract for or on behalf of the State of Minnesota, or any county, city, town, township, school, school district, or any other district in the State, for materials, supplies, or construction shall contain provisions by which the Contractor agrees: (1) That, in the hiring of common or skilled labor for the performance of any work under any contract, or any subcontract, no contractor, material supplier, or vendor, shall, by reason of race, creed, or color, discriminate against the person or persons who are citizens of the United States or resident aliens who are qualified and available to perform the work to which the employment relates; (2) That no contractor, material supplier, or vendor, shall, in any manner, discriminate against, or intimidate, or prevent the employment of any person or persons identified in clause (1) of this section, or on being hired, prevent, or conspire to prevent, the person or persons from the performance of work under any contract on account of race, creed, or color; (3) That a violation of this section is a misdemeanor; and (4) That this Master Contract may be canceled or terminated by the State, county, city, town, school board, or any other person authorized to grant the contracts for employment, and all money due, or to become due under the Master Contract, may be forfeited for a second or any subsequent violation of the terms or conditions of this Master Contract.

45. STANDARD OF WORK

The Contractor shall comply with the terms of this Master Contract and Work Orders, Change Orders, Work Order Amendments, and Stop Work Orders from the State. The State shall not approve, and no payment shall be made for, work that does not meet these standards. The State reserves the right to request that any data deliverables improperly formatted be corrected before the submittal will be accepted. Any extra expenses incurred due to such edits will be the Contractor's responsibility.

Unless the Force Majeure clause applies, failure to meet such deadline dates shall be a basis for a determination by the State's Authorized Representative that the Contractor has not complied with the terms of the Master Contract.

46. FORCE MAJEURE

Failure to meet time lines established in Work Orders, Change Orders, Work Order Amendments, and Stop Work Orders when caused by acts of God, war, strike, riot or other catastrophe or by acts or omissions of the State or the State's Authorized Representative, or by other reasons beyond the reasonable control of the Contractor, which are not due to negligence or lack of diligence on the Contractor's part, and which occur despite the Contractor's good faith efforts to meet the time lines, shall not be considered to be noncompliance with the Master Contract if the Contractor promptly notifies the State's Authorized Representative of the failure to meet the time lines and the reasons therefore and takes all necessary steps to bring about compliance as soon as practicable.

The Contractor shall have the burden of proof that the failure to meet the schedule was caused by events beyond the reasonable control of the Contractor which could not have been overcome by due diligence. In the event of such interruptions or delays, the date for completion of the Work Order shall be extended for a period of time equal to that of the interruption or delay.

47. PERFORMANCE DEADLINES

The Contractor must comply with all of the time requirements described in this Master Contract. In addition to any other remedy authorized by this Master Contract, the State may elect to invoke the liquidated damages remedy provided in this part.

If the Contractor misses a deadline, and if the Force Majeure clause does not apply, the State's Authorized Representative shall send the Contractor a written notice that a deadline has been missed and that in no sooner than ten (10) days a second written notice shall be sent. No sooner than ten (10) days after the initial written notice, unless the matter has been resolved, the State's Authorized Representative shall send the Contractor a second written notice stating that liquidated damages pursuant to this Master Contract shall begin to accrue twenty (20) days after receipt of the second notice. If pursuant to the Change Order clause or the Work Order Amendments clause of this Master Contract a request for extension has been received and if the State considers the extension request reasonable and the delay does not substantially affect the public interest, the State shall issue a Change Order or Work Order Amendment with the new deadline. If the State considers the request unreasonable, or if a delay would substantially affect the public interest, the State shall not extend the performance deadline.

The Contractor shall pay the State liquidated damages in the amount of $3,000, or 5% of the budget amount authorized in the Work Orders from the State, whichever is less, per week beginning twenty (20) days after the Contractor receives a second written notice of the deadline violation and ending when the performance is complete. The State may also deduct the liquidated damages from its payments to the Contractor under this Master Contract.

48. USE OF STATE CONTRACTS

Contractors and Subcontractors may provide oversight to State Contractors as appropriate, or the State may directly use the State Contractors.

49. FOREIGN OUTSOURCING

Contractor agrees all services under this contract shall be performed within the borders of the United States. All storage and processing of information shall be performed within the borders of the United States. This provision also applies to work performed by subcontractors at all tiers.

50. AFFIRMATIVE ACTION

Affirmative Action Requirements for Contracts in Excess of $100,000 and if the Contractor has More than 40 Full-time Employees in Minnesota or its Principal Place of Business

The State intends to carry out its responsibility for requiring affirmative action by its Contractors.

50.1 ***Covered Contracts and Contractors***. If the Contract exceeds $100,000 and the Contractor employed more than 40 full-time employees on a single working day during the previous 12 months in Minnesota or in the state where it has its principle place of business, then the Contractor must comply with the requirements of Minn. Stat. § 363A.36 and Minnesota Rule Parts 5000.3400-5000.3600. A contractor covered by Minn. Stat. § 363A.36 because it employed more than 40 full-time employees in another state and does not have a certificate of compliance, must certify that it is in compliance with federal affirmative action requirements.

50.2 ***Minn. Stat. § 363A.36.*** Minn. Stat. § 363A.36 requires the Contractor to have an affirmative action plan for the employment of minority persons, women, and qualified disabled individuals approved by the Minnesota Commissioner of Human Rights ("Commissioner") as indicated by a certificate of compliance. The law addresses suspension or revocation of a certificate of compliance and contract consequences in that event. A contract awarded without a certificate of compliance may be voided.

50.3 ***Minnesota Rule Parts 5000.3400-5000.3600.***

A. *General*. Minnesota Rule Parts 5000.3400-5000.3600 implement Minn. Stat. § 363A.36. These rules include, but are not limited to, criteria for contents, approval, and implementation of affirmative action plans; procedures for issuing certificates of compliance and criteria for determining a contractor's compliance status; procedures for addressing deficiencies, sanctions, and notice and hearing; annual compliance reports; procedures for compliance review; and contract consequences for non-compliance. The specific criteria for approval or rejection of an affirmative action plan are contained in various provisions of Minnesota Rule Parts 5000.3400-5000.3600 including, but not limited to, parts 5000.3420-5000.3500 and 5000.3552-5000.3559.

B. *Disabled Workers*. The Contractor must comply with the following affirmative action requirements for disabled workers.

1. The Contractor must not discriminate against any employee or applicant for employment because of physical or mental disability in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled persons without discrimination based upon their physical or mental disability in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. The Contractor agrees to comply with the rules and relevant orders of the Minnesota Department of Human Rights issued pursuant to the Minnesota Human Rights Act.
3. In the event of the Contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with Minn. Stat. § 363A.36, and the rules and relevant orders of the Minnesota Department of Human Rights issued pursuant to the Minnesota Human Rights Act.
4. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the commissioner of the Minnesota Department of Human Rights. Such notices must state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled employees and applicants for employment, and the rights of applicants and employees.
5. The Contractor must notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of

Minn. Stat. § 363A.36, of the Minnesota Human Rights Act and is committed to take affirmative action to employ and advance in employment physically and mentally disabled persons.

C. *Consequences*. The consequences for the Contractor's failure to implement its affirmative action plan or make a good faith effort to do so include, but are not limited to, suspension or revocation of a certificate of compliance by the Commissioner, refusal by the Commissioner to approve subsequent plans, and termination of all or part of this Master Contract by the Commissioner or the State.

D. *Certification*. The Contractor hereby certifies that it is in compliance with the requirements of Minn. Stat.§ 363A.36 and Minnesota Rule Parts 5000.3400-5000.3600 and is aware of the consequences for noncompliance.

51. TESTIMONY

If requested by the State's Authorized Representative, the Contractor agrees to testify at any State, federal, judicial or administrative proceeding brought by federal or State agencies or by a political subdivision of the State in which the work performed under this Master Contract is relevant. The Contractor agrees to meet and cooperate with the State's legal counsel as necessary to prepare for such testimony, and if so requested by the State's Authorized Agent, the Contractor shall prepare written testimony, graphs, diagrams or other visual aids to be used by the State in the proceeding(s). The Contractor shall be reimbursed at the rates for participation in State or federal judicial or administrative proceedings as specified in the Classifications and Rates.

52. ANTITRUST

The Contractor shall assign to the State any and all claims for overcharges as to goods or services provided in connection with this Contract resulting from antitrust violations which arise under the antitrust laws of the United States or the antitrust laws of the State.

53. E-VERIFY CERTIFICATION (IN ACCORDANCE WITH MINN. STAT. §16C.075)

For services valued in excess of $50,000, Contractor certifies that as of the date of services performed on behalf of the State, Contractor and all its Subcontractors will have implemented or be in the process of implementing the federal E-Verify program for all newly hired employees in the United States who will perform work on behalf of the State. Contractor is responsible for collecting all Subcontractor certifications and may do so utilizing the E-Verify Subcontractor Certification Form available at http://www.mmd.admin.State.mn.us/doc/EverifySubCertForm.doc. All Subcontractor certifications must be kept on file with Contractor and made available to the State upon request.

54. Certification of Nondiscrimination (In accordance with Minn. Stat. § 16C.053)

The following term applies to any contract for which the value, including all extensions, is $50,000 or more: Contractor certifies it does not engage in and has no present plans to engage in discrimination against Israel, or against persons or entities doing business in Israel, when making decisions related to the operation of the vendor's business. For purposes of this section, "discrimination" includes but is not limited to engaging in refusals to deal, terminating business activities, or other actions that are intended to limit commercial relations with Israel, or persons or entities doing business in Israel, when such actions are taken in a manner that in any way discriminates on the basis of nationality or national origin and is not based on a valid business reason.

[Signatures as required by the State]

Affidavit of Noncollusion– Attachment D

ATTACHMENT D

STATE OF MINNESOTA
AFFIDAVIT OF NONCOLLUSION

I swear (or affirm) under the penalty of perjury:

1. That I am the Responder (if the Responder is an individual), a partner in the company (if the Responder is a partnership), or an officer or employee of the responding corporation having authority to sign on its behalf (if the Responder is a corporation);

2. That the attached proposal submitted in response to the MPCA PT RFP Remediation Master Contract Request for Proposals has been arrived at by the Responder independently and has been submitted without collusion with and without any agreement, understanding or planned common course of action with, any other Responder of materials, supplies, equipment or services described in the Request for Proposal, designed to limit fair and open competition;

3. That the contents of the proposal have not been communicated by the Responder or its employees or agents to any person not an employee or agent of the Responder and will not be communicated to any such persons prior to the official opening of the proposals; and

4. That I am fully informed regarding the accuracy of the statements made in this affidavit.

Responder's Firm Name: Amec Foster Wheeler Environment & Infrastructure, Inc.

Authorized Representative (Please Print): Curtis Hudak

Authorized Signature: _____

Date: 03/29/2018

Subscribed and sworn to me this 2nd day of April

Notary Public Signature: _____

My commission expires: January 31, 2019

SPENCER ACE CRONIN
NOTARY PUBLIC - MINNESOTA
My Commission Expires
January 31, 2019

Affirmative Action Certification of Compliance – Attachment E

ATTACHMENT E
STATE OF MINNESOTA – WORKFORCE CERTIFICATE INFORMATION

Required by state law for ALL bids or proposals that could exceed $100,000

Complete this form and return it with your bid or proposal. The State of Minnesota is under no obligation to delay proceeding with a contract until a company becomes compliant with the Workforce Certification requirements in Minn. Stat. §363A.36.

BOX A – MINNESOTA COMPANIES that have employed more than 40 full-time employees within this state on any single working day during the previous 12 months, check one option below:

☑ Attached is our current Workforce Certificate issued by the Minnesota Department of Human Rights (MDHR).

☐ Attached is confirmation that MDHR received our application for a Minnesota Workforce Certificate on _____ (date).

BOX B – NON-MINNESOTA COMPANIES that have employed more than 40 full-time employees on a single working day during the previous 12 months in the state where it has its primary place of business, check one option below:

☐ Attached is our current Workforce Certificate issued by MDHR.

☐ We certify we are in compliance with federal affirmative action requirements. Upon notification of contract award, you must send your federal or municipal certificate to MDHR at compliance.MDHR@state.mn.us. If you are unable to send either certificate, MDHR may contact you to request evidence of federal compliance. The inability to provide sufficient documentation may prohibit contract execution.

BOX C – EXEMPT COMPANIES that have not employed more than 40 full-time employees on a single working day in any state during the previous 12 months, check option below if applicable:

☐ We attest we are exempt. If our company is awarded a contract, we will submit to MDHR within 5 business days after the contract is fully signed, the names of our employees during the previous 12 months, the date of separation, if applicable, and the state in which the persons were employed. Send to compliance.MDHR@state.mn.us.

By signing this statement, you certify that the information provided is accurate and that you are authorized to sign on behalf of your company.

Name of Company: Amec Foster Wheeler Environment & Infrastructure, Inc. Date 03/29/2018

Authorized Signature: _____ Telephone number: 612-252-3757

Printed Name: Curtis Hudak Title: Branch Manager

For assistance with this form, contact:

Minnesota Department of Human Rights, Compliance Services

Web: http://mn.gov/mdhr/
Email: compliance.mdhr@state.mn.us

TC Metro: 651-539-1095

Toll Free: 800-657-3704
TTY: 651-296-1283

Minnesota Department of
HUMAN RIGHTS

WORKFORCE
CERTIFICATE OF COMPLIANCE

The Commissioner of the Minnesota Department of Human Rights by the signature below attests that **AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE INC** is hereby certified as a contractor under the Minnesota Human Rights Act, §363A.

Certificate start date: **3/7/2016**
Certificate expiration date: **3/6/2020**

Minnesota Department of Human Rights

FOR THE DEPARTMENT BY:

Kevin M. Lindsey, Commissioner

Certification Regarding Lobbying – Attachment F

ATTACHMENT F

CERTIFICATION REGARDING LOBBYING

For State of Minnesota Contracts and Grants over $100,000

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

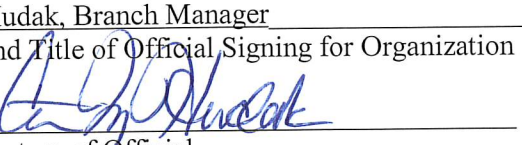
(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, A Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, Disclosure Form to Report Lobbying in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Amec Foster Wheeler Environment & Infrastructure, Inc.
Organization Name

Curtis Hudak, Branch Manager
Name and Title of Official Signing for Organization

By: 
Signature of Official

03/29/2018
Date

Equal pay certificate – Attachment G

ATTACHMENT G

State of Minnesota – Equal Pay Certificate

If your response could be in excess of $500,000, please complete and submit this form with your submission. **It is your sole responsibility to provide the information requested and when necessary to obtain an Equal Pay Certificate (Equal Pay Certificate) from the Minnesota Department of Human Rights (MDHR) prior to contract execution. You must supply this document with your submission.** Please contact MDHR with questions at: 651-539-1095 (metro), 1-800-657-3704 (toll free), 711 or 1-800-627-3529 (MN Relay) or at compliance.MDHR@state.mn.us.

Option A – If you have employed 40 or more full-time employees on any single working day during the previous 12 months in Minnesota or the state where you have your primary place of business, please check the applicable box below:

☐ Attached is our current MDHR Equal Pay Certificate.

☑ Attached is MDHR's confirmation of our Equal Pay Certificate application.

Option B – If you have not employed 40 or more full-time employees on any single working day during the previous 12 months in Minnesota or the state where you have your primary place of business, please check the box below.

☐ We are exempt. We agree that if we are selected we will submit to MDHR within five (5) business days of final contract execution, the names of our employees during the previous 12 months, date of separation if applicable, and the state in which the persons were employed. Documentation should be sent to compliance.MDHR@state.mn.us.

The State of Minnesota reserves the right to request additional information from you. **If you are unable to check any of the preceding boxes, please contact MDHR to avoid a determination that a contract with your organization cannot be executed.**

Your signature certifies that you are authorized to make the representations, the information provided is accurate, the State of Minnesota can rely upon the information provided, and the State of Minnesota may take action to suspend or revoke any agreement with you for any false information provided.

Curtis Hudak	Branch Manager
Authorized Signature — Printed Name	Title
Amec Foster Wheeler Environment & Infrastructure, Inc. 91-1641772	03/29/2018
Organization — MN/FED Tax ID#	Date
Issuing Entity	Project # or Lease Address

DEPARTMENT OF HUMAN RIGHTS

EQUAL PAY
CERTIFICATE OF COMPLIANCE

The Commissioner of the Minnesota Department of Human Rights by the signature below attests that AMEC FOSTER WHEELER ENVIRONMENT & INFRASTRUCTURE INC is hereby certified as a contractor under the Minnesota Human Rights Act, §363A.44.

Certificate start date: March 27, 2018

Certificate expiration date: March 26, 2022

Minnesota Department of Human Rights

FOR THE DEPARTMENT BY:

Kevin M. Lindsey, Commissioner

Resident Vendor Form – Attachment H

ATTACHMENT H
STATE OF MINNESOTA
RESIDENT VENDOR FORM

In accordance with Laws of Minnesota 2013, Chapter 142, Article 3, Section 16, amending Minn. Stat. § 16C.02, subd. 13, a "Resident Vendor" means a person, firm, or corporation that:

(1) is authorized to conduct business in the state of Minnesota on the date a solicitation for a contract is first advertised or announced. It includes a foreign corporation duly authorized to engage in business in Minnesota;
(2) has paid unemployment taxes or income taxes in this state during the 12 calendar months immediately preceding submission of the bid or proposal for which any preference is sought;
(3) has a business address in the state; and
(4) has affirmatively claimed that status in the bid or proposal submission.

To receive recognition as a Minnesota Resident Vendor ("Resident Vendor"), your company must meet each element of the statutory definition above by the solicitation opening date and time. If you wish to affirmatively claim Resident Vendor status, you should do so by submitting this form with your bid or proposal.

Resident Vendor status may be considered for purposes of resolving tied low bids or the application of a reciprocal preference.

I HEREBY CERTIFY THAT THE COMPANY LISTED BELOW:

1. Is authorized to conduct business in the State of Minnesota on the date a solicitation for a contract is first advertised or announced. *(This includes a foreign corporation duly authorized to engage in business in Minnesota.)*
   _✓__Yes ___No (must check yes or no)

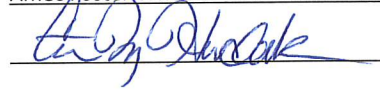
2. Has paid unemployment taxes or income taxes in the State of Minnesota during the 12 calendar months immediately preceding submission of the bid or proposal for which any preference is sought.
   _✓__Yes ___No (must check yes or no)

3. Has a business address in the State of Minnesota.
   _✓__Yes ___No (must check yes or no)

4. Agrees to submit documentation, if requested, as part of the bid or proposal process, to verify compliance with the above statutory requirements.
   _✓__Yes ___No (must check yes or no)

BY SIGNING BELOW, you are certifying your compliance with the requirements set forth herein and claiming Resident Vendor status in your bid or proposal submission.

Name of Company: Amec Foster Wheeler Environment & Infrastructure, Inc. Date: 03/29/2018

Authorized Signature:  Telephone: 612-252-3757

Printed Name: Curtis Hudak Title: Branch Manager

IF YOU ARE CLAIMING RESIDENT VENDOR STATUS, SIGN AND RETURN THIS FORM WITH YOUR BID OR PROPOSAL SUBMISSION.

Veteran-owned Preference – Attachment I

ATTACHMENT I

STATE OF MINNESOTA
VETERAN-OWNED PREFERENCE FORM

Unless a greater preference is applicable and allowed by law, in accordance with Minn. Stat. §16C.16, subd. 6a, the state will award a 6% preference on state procurement to certified small businesses that are majority owned and operated by veterans.

Veteran-Owned Preference Requirements - *See* Minn. Stat. § 16C.19(d):

1) The business has been certified by the Office of Equity in Procurement as being a veteran-owned or service-disabled veteran-owned small business.

   or

2) The principal place of business is in Minnesota AND the United States Department of Veterans Affairs verifies the business as being a veteran-owned or service-disabled veteran-owned small business under Public Law 109-461 and Code of Federal Regulations, title 38, part 74 (Supported By Documentation).

Statutory requirements and appropriate documentation must be met **by the solicitation response due date and time** to be awarded the veteran-owned preference.

Claim the Preference

By signing below I confirm that:

My company is claiming the veteran-owned preference afforded by Minn. Stat. § 16C.16, subd. 6a. By making this claim, I verify that:

- The business has been certified by the Office of Equity in Procurement as being a veteran-owned or service-disabled veteran-owned small business.
  or
- My company's principal place of business is in Minnesota **and** the United States Department of Veteran's Affairs verifies my company as being a veteran-owned or service-disabled veteran-owned small business (Supported By Attached Documentation)

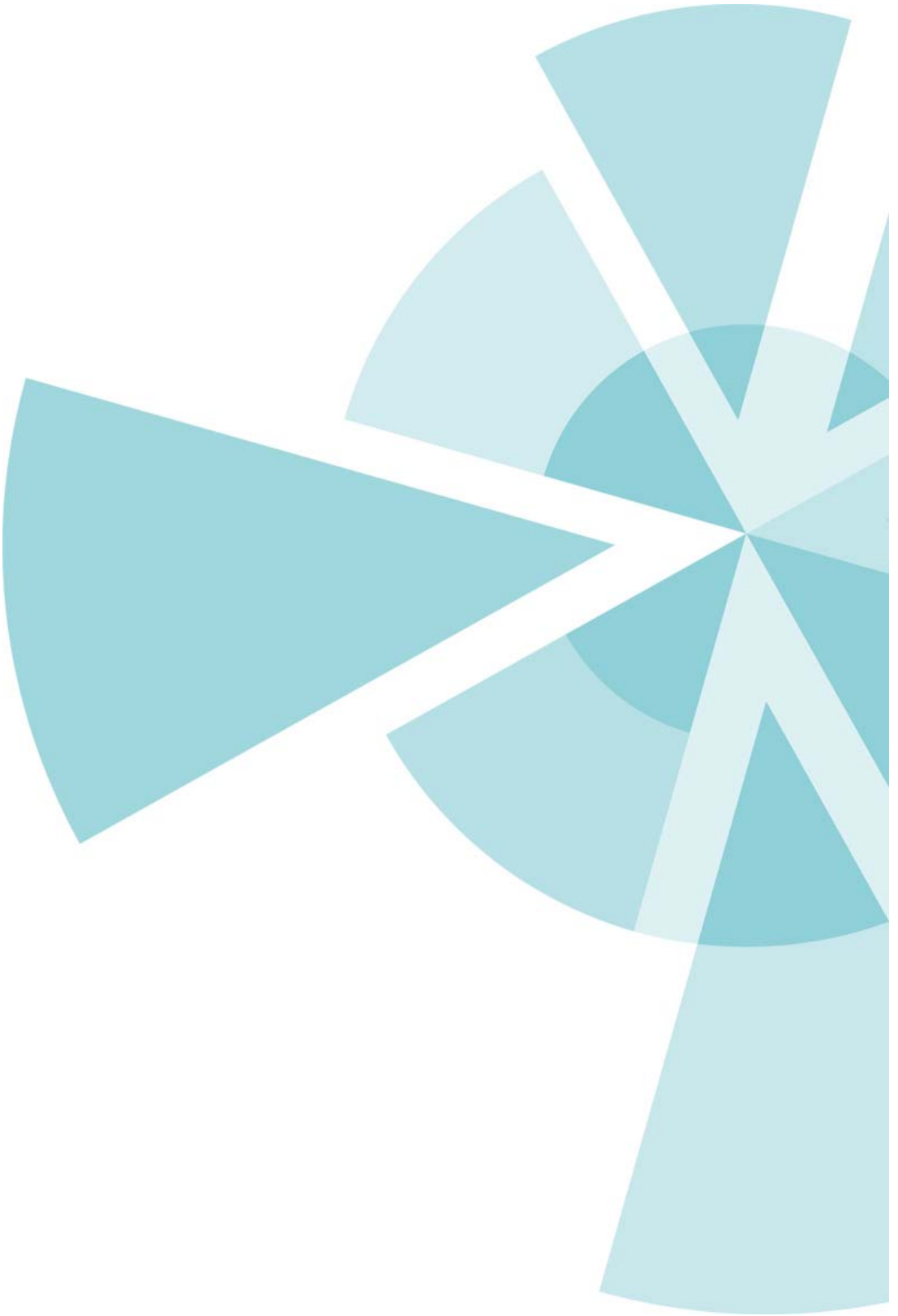
Name of Company: _____ Date: _____

Authorized Signature: _____ Telephone: _____

Printed Name: _____ Title: _____

Attach documentation, sign, and return this form with your solicitation response to claim the veteran-owned preference.

Appendices



Appendix A – RFP Acknowledgement

MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

REQUEST FOR PROPOSAL (RFP) ADDENDUM

Addendum No.: 1 Date of Addendum: March 19, 2018

Due Date, Time: April 11, 2018, 2:00 PM

Title: MPCA PT RFP – REMEDIATION MASTER

SCOPE OF ADDENDUM

The Request For Proposal (RFP) is revised as follows with additions underlined, and deletions are ~~struck out~~:

Revision 1. RFP Section 2: Project Goals, Page 3, is amended as follows:

The total amount of money available for work under this Master Contract is approximately ~~$120,000,000.00 (One Hundred Twenty Million Dollars)~~ $420,000,000.00 (Four Hundred Twenty Million Dollars) for five years between all Master Contracts issued under this RFP. No payments will be made except for work authorized by a Work Order that is issued from the State. No minimum payment is guaranteed by the State.

Revision 2. RFP Attachment C. Sample Contract, Page 2, Clause 4.1 Consideration. is amended as follows:

4.1 Consideration. The State will pay for all services satisfactorily performed by the Contractor for all Work Order Contracts issued under this Master Contract. The total compensation of all Work Orders may not exceed **~~$120,000,000.00 (One Hundred Twenty Million Dollars)~~ $420,000,000.00 (Four Hundred Twenty Million Dollars)** for five (5) years between all Master Contracts

Revision 3. RFP Section 7. Proposal Content, Category A: Petroleum, Superfund, MDA, and Closed Landfill Program Environmental Services, A.3, Page 31, is amended as follows:

Provide a detailed description of the company's experience as it relates to the scope of services outlined in this RFP; specifically, describe the company's experience with each of the bullets listed in **Section 4 3** of this RFP. The Proposal shall contain the following additional details specific to Category A services:

- A summary of Proposer's experience with agricultural chemical investigation and cleanups.
- A list of remediation technologies with which the Proposer has experience.
- Provide a detailed description of the company's experience as it relates to the scope of services outlined in this RFP for Category A.

Revision 4. RFP Section 3: Scope of Services, Page 3, is amended as follows:

The Contractor shall submit a separate proposal for each Category of Service for which the Contactor would like to be considered. Proposals will be evaluated individually for each Category of Service for which they were submitted. Category B is a subset of Category A. If the Contractor submits Proposals for both Category A and Category B, Category A will be evaluated first for qualification. If the Contractor is not approved for Category A, they will then be evaluated for Category B. Category C will be evaluated individually. Contractors can submit Proposals for all three Categories if desired.

Should a Contractor be approved and selected for more than one Categories, the Contractor will receive only one Master Contract containing all the approved and selected Categories.

Joint ventures and teaming among groups of Contractors is not allowed.

Revision 5. RFP, Attachment C Sample Contract, Clause 38. C. Additional Insurance Conditions, Bullet #5, Page 21, is amended as follows:

- Contractor's policy(ies) shall include legal defense fees in addition to its liability policy limits, with the exception of ~~B.4~~ Professional/Technical, Errors and Omissions, and/or Miscellaneous Liability Insurance above;

Revision 6. RFP, Section 4. Personnel Classifications and Qualifications, Category C: Closed Landfill Program, Project Manager Qualifications,Second Bullet, Page 23, is amended as follows:

- Minimum of three years experience working with landfill, investigation and closure. ~~Minnesota Guidance and Policy with the Superfund/ Petroleum programs. https://www.pca.state.mn.us/waste/cleanup-guidance~~

Revision 7. RFP, Section 6. Supplies and Equipment Pricing, EQUIPMENT RATES, Pages 28 and 29, and RFP, Attachment C, Sample Contract, EQUIPMENT RATES, Pages 5,6,7, is amended as follows:

Equipment	Cost (per day)
Turbidity Meter	$52.00
Oxidation-reduction potential (ORP) Meter	$39.00
~~Hydrolab Quanta~~	~~$80.00~~
Dissolved Oxygen Meter	$46.00
Temperature, pH, conductivity, ORP meter	$68.00
Temperature, pH, conductivity	$35.00
~~YSI Multi Meter w/ Flow Cell~~	~~$117.00~~
Flow Cell	$77.00
Water Quality Meter (6 parameters)	$102.00
2" Trash Pump	~~$189~~75..00
Bladder pump	$118.00
Submersible Pump	$52.00
Peristaltic Pump	$43.00
Diaphram Pump	$53.00
Mechanical Pump Puller	$44.00
Water Level Indicator	$27.00
Hydrocarbon/Water Interface Probe	$55.00
Pump/Slug Testing Equipment	$110.00
Manual direct-push probe equip.	$165.00
X-ray Fluorescent (XRF) for Soil and Lead Paint	$468.00

Nuclear Density Gauge	$69.00
Multi Gas Meter (02/CO/LEL/Methane)	$123.00
O2/Combustible Gas Detector	$110.00
LEL/O2/CO2 Gas Meter	$66.00
LEL/O2Gas Meter	$55.00
Explosimeter	$52.00
Photoionization Detector (PID) 10.6	$99.00
Photoionization Detector (PID) 11.7	$138.00
Flame Ionization Detector (OVA)	$135.00
Velometer / Anemometer	$34.00
Micro Manometer	$64.00
Sound Level Meter	$53.00
Dust Meter	$70.00
Air Compressor	$54.00
Metal/Cable Detector	$47.00
Generator	$65.00
Sump Pump	$33.00
Pressure Washer	$69.00
Magnetometer	$151.00
Coreing Machine with Drill Bits	$110.00
Surveying Equipment - Rotary Laser	$104.00
GPS (Submeter)	$122.00
Laser Level/Lenker Rod	$127.00
Ground Penetrating Radar (GPR)	$426.00
EM-31 Ground Conductivity Meter	$440.00
EM-61 Ground Conductivity Meter	$688.00
55 gal Drums	$70.00
Sub-Slab Soil Gas Sampling Point Insert	$88.00
Screen for Soil Gas Monitoring Points	$51.00
Vapor Pin Installation Kit (per point)	$60.00
Lumex Mercury Monitoring	$187.00
Mercury Analyzer	$179.00
Canoe	$15.68
Boat (includes motor and trailer)	$58.24
ATV **(Hourly Rate)**	$16.80

Revision 8. RFP, Section 7. Proposal Content, Category B. Petroleum Only Remdiation Environmental Services B.5., Scenario 1: Petroleum Only Environmental Services, Page 39, is amended as follows:

5. Scenario ~~1~~ B: Petroleum Only Environmental Services

Scenario ~~1~~B:

Revision 9. RFP, Section 6. Supplies and Equipment Pricing, Item cc., Page 27 and RFP, Attachment C, Sample Contract, Clause 8, Page 5, is amended as follows:

cc. Tubing less than $100.00

Revision 10. RFP, Section 7. Proposal Content, 5. Scenario A., Page 33, is amended as follows:

The property owner conducted a limited investigation consisting of several push probes throughout the facility and adjacent property. This investigation identified chlorinated ethenes (most notably trichloroethylene [TCE]) and agricultural chemicals (nitrogen, dicamba, metolachlor, metribuzin, pendimethalin, and triclopyr) in soils and groundwater above agency-regulated cleanup goals. General geology was noted to generally consist of coarse grained sands with thin lenses of silt and clay. The investigation encountered shallow groundwater approximately 6-10 feet bgs, with an assumed flow direction heading into town. All groundwater samples (blue GW samples) were collected at 30 feet for domestic wells, and 15 feet for investigation borings. The investigation did not evaluate the stream.

A single round of vapor points were also advanced off-site as part of the property owner's investigation, with some of the detections exceeding the 33X ISV for TCE (Figure 1). Vapor samples (orange vapor samples) were collected above the water table. MPCA is aware there is a pregnant person at the property with the sub-slab point. A passive soil-gas sample collected in the vehicle/equipment maintenance garage was several orders of magnitude above screening criteria; however, additional characterization nor remediation occurred in the building by the property owner.

Revision 11. RFP, Section 7., Proposal Content, Category A..; Scenario A, 2nd Paragraph, Page 32, is amended as follows:

The site topography is mostly flat, however the elevation does dip downward toward a small stream running through the northern portion of the property. This stream continues into the town which is located in the west adjoining property (see Figure 1). Older portions of the town (situated closer to the former ag-chem plant) are on private well drinking water (blocks 3, 5, and 7) that are 30 feet deep. Newer portions of the town (farther from the former plant) are on community water from the local municipality (blocks 1, 2, 4, and 6).

Revision 12. RFP, Section 7., Proposal Content, Category B. #5. Scenario 1: Petroleum Only Environmental Sercices, 5th Paragraph , Page 39, is amended as follows:

Municipal services are available in the area; however, the lakeside homes are all on private wells. The wells are 80 feet deep. The fueling station is hooked up to municipal water and other utilities at the site include storm sewer, sanitary sewer, and water that run along main street.

This addendum shall become part of the RFP and MUST be returned with the RFP Response.

RESPONDER NAME: Curtis M. Hudak

TITLE: Branch Manager

DATE: 4/9/2018

Appendix B – Resumes of Key Personnel and Subject Matter Experts

Emma Driver, PMP

Contract Manager/Project Manager

Ms. Driver has over 17 years of experience in the environmental industry specializing in site investigation/remediation, groundwater monitoring programs and landfill operations maintenance and monitoring (OM&M). Ms. Driver has also significant experience in conducting CERCLA preliminary assessments and site inspections, regulated materials surveys, hazardous and non-hazardous waste assessments, due diligence, soil vapor investigations, environmental compliance assessments, GIS and data management. Ms. Driver is currently serving as contract manager under the existing MPCA/MDA Technical Services contract and has worked on and managed projects as part of the contract since 2008. Ms. Driver has a thorough working knowledge of the MPCA Risk Based Site Evaluation (RBSE) Manual, PRP guidance for UST/AST release cleanup, hazardous and solid waste rules, VIC and MDA guidance, and MPCA vapor intrusion BMPs documentation.

Classification
Program Manager/ Project Manager

OSHA Certification(s)
40-hr OSHA HAZWOPER with current refresher

Years with Amec Foster Wheeler: 16

Years of Experience: 17

Education
BSc Hons. Geography

Regulatory Experience
ADEQ, IDNR, MPCA, MDA, MnDOT, IDNR, NDDH, NMED, SDDENR, WDNR

Licensing / Certifications
PMP

Relevant Work Experience

Focused Site Investigation, Confidential Manufacturing Client, Hennepin County, MN. Project Manager. Conducted a focused site investigation as part of spill response activities to address an accidental release of AFFF from a fire suppression system. Investigation activities were time-sensitive and involved the drilling of soil borings and monitoring wells using a combination of push-probe and hollow-stem auger drilling methods. Investigation activities were conducted in accordance with MPCA RBSE guidance and following strict PFAS sampling protocols to avoid potential cross-contamination. In the role of project manager, Ms. Driver developed project scope, conducted subcontractor procurement and management, managed schedule and budgets, provided guidance for project team and held routine meetings with project stakeholders including clients (local and at corporate level), regulators, subcontractors and project team.

Superfund Site Investigation, Former Universal Plating Facility, Minneapolis, MN. Project Manager. Amec Foster Wheeler conducted an off-site soil vapor investigation in accordance with MPCA best management practices at the Former Universal Plating (state superfund site) to address potential vapor intrusion concerns at properties adjoining the site. In the role of project manager, Ms. Driver developed project scopes of work, conducted subcontractor procurement, prepared monthly invoices, prepared information for public meetings and participated in stakeholder meetings informing residents of investigation findings and next steps.

Closed Sites Soil Vapor Evaluation Program, MPCA, Statewide, MN. Project Manager. Amec Foster Wheeler conducted a regulatory file review and sensitive receptors evaluation to evaluate sites that had previously been closed by the MPCA for potential vapor intrusion concerns. Specifically, the closed sites are being further evaluated as they may have potential human health concerns attributed to previously uninvestigated soil vapor impacts and/or residual groundwater contamination that may exceed current criteria. Amec Foster Wheeler developed an evaluation matrix that included consideration of site background and use, hydrogeologic information, previous investigations, and analytical profiles specifically including recent analytical results for chlorinated volatile organic compounds (CVOCs). Profile summaries were developed for all sites and a matrix providing recommendations for additional evaluation/investigation was provided.

Architect-Engineering (A-E) Services to Support Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas, Environmental Programs Worldwide, U.S. Air Force Civil Engineer Center (AFCEC), San Antonio, TX. Project Manager. Amec Foster Wheeler performed ongoing site investigations for the USAF-wide initiative to assess the presence or absence of PFAS at 28 active Air Force installations across the United States. Ms. Driver currently serves as a base project manager responsible for completion of SI activities at three installations in several states. Technical components of the program include conducting site inspection activities at AFFF release areas previously identified during Preliminary Assessment

activities to confirm if a release of AFFF occurred in groundwater, soil, surface water and sediment in concentrations greater than the USEPA health advisory (HA) values or other applicable state and/or federal standards. In her role as base project manager, Ms. Driver is responsible for writing work plans, developing subcontractor scopes of work, overseeing field activities (drilling, sampling, surveying, investigation derived waste management), developing subcontractor scopes of work, preparing monthly project status reports, reviewing project financials, and communicating with project stakeholders including project manager, AFCEC contract managers, local environmental managers, regulators and the project team.

Soil Vapor Investigation, Stoltz Cleaners, St. Paul, MN. Project Manager. Amec Foster Wheeler conducted an off-site soil vapor investigation in accordance with MPCA best management practices in relation to the former Stoltz dry-cleaning facility in St. Paul. Project activities included coordinating site access and drilling schedules, utility locates, obtaining necessary permits, collecting soil-gas and sub-slab soil vapor samples and preparation of data reports. In the role of project manager, Ms. Driver developed project scopes of work, conducted subcontractor procurement, prepared monthly invoices, conducted quality assurance/quality control and coordinated with project stakeholders.

Landfill Operations, Maintenance and Monitoring, North and Vinland Landfills, Winnebago County, WI. Project Manager. Ms. Driver served as project manager for the OM&M activities conducted at two landfills in the town of Vinland, Winnebago County, Wisconsin. She developed a compliance matrix for each of the landfills to provide a framework of all the OM&M requirements to ensure that the landfills remain in compliance with federal, state and local requirements. Routine OM&M activities include quarterly landfill gas monitoring, semiannual groundwater, leachate, and surface water monitoring, coordinating with residents and conducting private water well sampling, analytical data reporting using the WDNR Groundwater and Environmental Monitoring System (GEMS), leachate line cleaning, landfill inspections, leachate transport and disposal and routine maintenance. Routine maintenance activities include mowing of the landfill cap, brush clearance along fence lines and around monitoring wells, road repair, landfill cap maintenance including erosion/settlement repairs, regrading and seeding, and maintenance/repair of sampling points. Throughout the course of the contract, Ms. Driver successfully reduced costs of the OM&M activities. Following initial transition activities, Amec Foster Wheeler was able to modify the groundwater sampling methodology that resulted in efficiencies in the groundwater sampling program. Ms. Driver also successfully completed a revision to the Plan of Operations reducing the frequency of groundwater and surface monitoring at the Vinland landfill. The Plan of Operations update included an evaluation of spatial and temporal optimization of the long-term monitoring network that included a statistical evaluation using Monitoring and Remediation Optimization System (MAROS) and Visual Sample Plan (VSP) software. In her role as project manager, Ms. Driver has coordinated with regulatory officials at both the WDNR and the Town of Vinland for modification of the OM&M Plan of Operations at the Vinland landfill. Ms. Driver also conducts monthly invoicing, leachate volume tracking, subcontractor coordination and evaluation. Non-routine tasks have also included development of an alternatives evaluation focusing on leachate reduction options and development of a beneficial reuse cost evaluation for several options designed to close the North landfill.

Site Investigation and Regulated Materials Survey, Confidential Manufacturing Client, Northern Minnesota. Ms. Driver served as project manager for a site investigation project that consisted of a Phase I, Phase II and Regulated Materials Survey (RMS) as part of transactional due diligence. In her role as PM, Ms. Driver provided support for all stakeholders including regular communication with the client, regulators, property owner and client attorneys. Ms. Driver managed the project scope, schedule and budget and worked closely for the client to provide budgetary tracking on a quick turn project. At the on-set of the project, Ms. Driver provided an overview of the regulatory framework to the client and provided frequent updates regarding next steps in the process and schedule relative to the property transfer process. The RMS was conducted in support of pre-demolition activities.

Preliminary Site Assessment/Site Investigation, Fridley Industrial Corridor, MPCA, St. Paul, MN. Project Manager. Project manager for a CERCLA Preliminary Site Assessment/Site Investigation to evaluate soil vapor impacts associated with an industrial corridor consisting of approximately ten industrial properties and two superfund sites located in Fridley, Minnesota. Soil vapor sampling was conducted over a year to monitor chlorinated solvent and petroleum vapor migration from suspected source areas to residential neighborhoods adjoining the corridor. Ms. Driver conducted meetings with regulators, worked with adjoining property owners and attorneys regarding obtaining site access and provided frequent project updates to the client and other stakeholders in support of community action group involvement.

Garret Bondy, PE

Engineer 4
Principal-in-Charge

Introduction

Mr. Bondy is a Regional Manager and Senior Principal Engineer at Amec Foster Wheeler, with over 30 years of environmental experience across EPA Region 5. Mr. Bondy, has extensive environmental and engineering experience in support of brownfield redevelopment projects; site and remedial investigations; remedial design and remedial action; construction management and oversight; landfill engineering; sediment sampling design and remediation; and, regulatory negotiations. Mr. Bondy also serves as Program Manager for multiple state contracts including an Environmental Remediation contract with the Michigan Department of Environmental Quality. Prior to his career at Amec Foster Wheeler, Mr. Bondy also served as a Superfund Enforcement Section Chief in EPA Region 6.

Classification
Engineer 4

OSHA Certification(s)
HAZWOPER, 40-hour

Years with Amec Foster Wheeler: 26

Years of Experience: 34

Education
BS., Environmental Science & Engineering

Regulatory Experience
CERCLA, RCRA, MPCA, MDEQ

Licensing / Certifications
PE – MI

PE-OH

Relevant Work Experience

Fort Gratiot Landfill; Landfill Cover System Design; Port Huron, MI. Principal-in-Charge. Served as principal-in-charge and senior engineer for the implementation of a remedial action at the Fort Gratiot Landfill, a 19-acre landfill. Mr. Bondy provided final review of a dual liner cover system, leachate pumping system, groundwater interceptor, passive gas venting system, storm water management facilities, and SESC controls. Provided review during construction of the remedy reviewing shop drawings, survey data, test results, and directed walkover inspection for substantial completion. Mr. Bondy currently serves as program Manager for the Fort Gratiot Landfill operation and maintenance program including maintenance of the cover system, storm water facilities, and leachate pumping system.

Remedial Action, Confidential Manufacturing Client, Hennepin County, MN. Program Manager. Mr. Bondy currently serves as program manager in support of the remedial action for a confidential manufacturing client in Hennepin County, Minnesota. Project activities included design, construction, start-up and ongoing operations and maintenance of a groundwater treatment and extraction system. In the role of program manager, Mr. Bondy reviewed design documents, provided guidance for project team and held routine meetings with project stakeholders including clients (local and at corporate level), and regulators.

Kalamazoo River Superfund Site, Multiple RI/FS for Sediments; Kalamazoo and Allegan Counties, MI. Confidential Client. Mr. Bondy served as program manager conducting strategy development, serving as client and regulatory interface, and conducting principal review of overall project status for multiple RI/FS projects for sediment at the Kalamazoo River Superfund Site. PCBs are the constituent of concern in river sediments and floodplain soils. Amec Foster Wheeler has been integral in all aspects of the CERCLA process including remedial investigation, risk assessment, modeling, feasibility study and developing detailed remedial alternatives.

Remedial Site Investigation, Confidential Manufacturing Client, Minnetonka, MN. Project Manager. Mr. Bondy currently serves as program manager in support of a groundwater and soil vapor investigation for a confidential manufacturing client located in Minnetonka, Minnesota. Site activities have included groundwater and soil vapor investigation, data analysis and technical report preparation. In the role of program manager, Mr. Bondy

reviewed design documents, provided guidance for project team and held routine meetings with project stakeholders including clients (local and at corporate level), and regulators.

Wickes Manufacturing; Focused Feasibility Study and Bid Specifications. Principal Engineer. Mr. Bondy served as principal engineer for a focused feasibility study and development of bid specifications for a remedial investigation of a 5-mile long TCE plume located in Mancelona, MI. In his role as principal engineer, Mr. Bondy conducted technical review of the focused feasibility, evaluating several remedial action alternatives. Mr. Bondy also supported the development and review of bid specifications to conduct sonic drilling operations valued at over $3.2 million. The project scope also included conducting investigation [vertical aquifer sampling, geophysical surveys (seismic profiling, induced polarity and electrical resistivity, and down hole gamma logging) multiple drilling methods for deep monitoring well installations], community relations for TCE plume extending 5 miles from source area, affecting more than 1,200 properties.

MDEQ Part 201/CERCLA; Tar Lake Superfund Site; Mancelona, MI. Program Manager. Developed strategic approach to implementation of a 20 well bio-sparge system and site monitoring well network. AMEC is currently managing operation of groundwater bio-sparge system to mitigate off site migration of groundwater plume by enhancing in situ bioremediation of aromatic hydrocarbons and phenols in groundwater. Pilot testing of the system was performed to optimize how system was operated to meet oxygen demand of biota and minimize excessive oxygen delivery which would result in plugging of the aquifer formation. Responsibilities included the review of primary project deliverables.

Confidential Client, Detroit Refinery Remedial Investigation/Feasibility Study (RI/FS)/Remedial Action, Detroit, MI. Program Manager. As Program Manager, developed strategic approach and directed the remedial investigation and development of the feasibility study. An interim groundwater collection system was installed at this 12-acre site to prevent discharge of contaminated groundwater to the Rouge River. The interim system includes installation of 48 extraction wells with individual vacuum lines. The vacuum system consisted of high vacuum liquid-ring pumps, vapor-liquid separation, vapor phase granular activated carbon. The system is fully automated with instrumentation, PLC control and a Supervisory and Data Acquisition System. Following decommissioning to the site a comprehensive remedial investigation was completed to delineate extent of coal tar, soil and groundwater contamination. Offsite investigation activities posed significant challenges due to active industrial road with many utilities present and an active railroad line requiring extensive coordination of sampling activities. Laser-induced fluorescence (LIF) techniques were implemented to expedite coal tar NAPL delineation. The feasibility study analysis is in progress and a number of alternatives are being evaluated as a final remedy to address exposure risks.

MDEQ Part 201, Remedial Investigation, Feasibility Study, Interim Measures and Source Remediation; Former Magnetek Site, Owosso, MI. Program Manager. As Program Manager, developed strategic approach and directed the remedial investigation of a former electronic parts manufacturer and drycleaner. The former dry cleaners contributed to the groundwater contaminant plume and caused indoor air issues in a restaurant and medical center. Thermally enhanced soil vapor extraction was selected as the most efficient and cost effective (proven) technology for cleaning up the second source area. Amec Foster Wheeler prepared a bid specification package of the remediation system on behalf of the MDEQ and MDTMB supported the procurement of an experienced contractor, provided construction oversight during implementation of the remedy. The system was installed in less than 90 days, achieved temperature in 60 days, reduced contaminant mass more than 90 % following 2.5 months of operation. Results indicate project goals are achieved and indoor air inhalation risks are mitigated.

Anne Bernhardt, CMQ/OE, CPM

Corporate Quality Manager

Ms. Bernhardt is a Quality Control Program Manager with 25 years of experience. She has served as a QA/QC Manager on multiple government contracts overseeing the quality of our team's delivery primarily executing site characterizations, site investigation, feasibility study, remediation, and construction projects. She has successfully led the quality program for Air Force, Navy, Coast Guard, EPA and multiple commercial clients. Ms. Bernhardt has a background in analytical data quality, has previously worked as a chemist in environmental laboratories, and is very familiar with EPA analytical methods and laboratory quality systems. She works with project teams to resolve sampling strategies, required physical, biological, and analytical testing, and selection of accredited laboratories best qualified to provide these services. Her efforts focus on large-scale environmental programs with an emphasis in information management and data quality.

Ms. Bernhardt is the Director of Quality Assurance for Amec Foster Wheeler, Environment & Infrastructure, Americas. She oversees the development, improvement, and implementation of our company's quality program. Our quality program is based on ISO principles and provides the basis for consistent, reliable project delivery. The effectiveness of our program is measured through Customer Satisfaction surveys, audits, and management reviews. We continuously integrate improvements to our program that increase the value of our project delivery to our Customers. Ms. Bernhardt oversees Quality Leads across Americas to facilitate execution of our program.

Relevant Work Experience

Air Force Perfluorinated Compounds Release Determination, Delineation, and Remediation at BRAC Installations. QA/QC Officer. This large-scale sampling and analysis program has over 1000 samples for PFC sample analysis at 39 bases. As Amec Foster Wheeler's Quality Manager, Ms. Bernhardt has worked to establish the quality assurance program for successful sampling and analysis of PFCs. She has worked closely with the chemistry team to review laboratory methods and establish a team of laboratories able to support the program. She supported the quality plan preparation and regularly monitors performance of the established procedures for sampling and analysis by conducting field audits and review of analytical QC data. Amec Foster Wheeler is recognized for providing high quality analytical data for this emerging contaminant class. Our project delivery has been rated as Excellent and Very Good under two separate task orders for this client.

Performance-Based Environmental Multiple Award Contract (PERMAC) for Environmental Remediation Services. QA/QC Officer. Amec Foster Wheeler has been awarded five task orders totaling $91M under the current $120M PERMAC. Ms. Bernhardt is the Quality Control Program Manager for PERMAC. She is responsible for Sampling and Analysis Plan preparation adhering to the UFP-QAPP requirements and the quality control of Amec Foster Wheeler field programs, construction activities, and

Classification

Corporate Quality Manager (QA/QC Officer)

OSHA Certification(s)

40-Hour OSHA HAZWOPER with current 8 hr refresher

Hazardous Waste Worker Supervisor Training, OSHA, 1998

Construction Quality Management for Contractors (#NWP-01-14-00372, exp 10/11/2018)

Years with Amec Foster Wheeler: 23

Years of Experience: 25

Education

B.S., Environmental Science, University of Wisconsin, Madison, 1991

Licensing / Certifications

Certified Manager of Quality/ Organizational Excellence, No. 11430, 2011

Certified Project Manager, Project Management Institute, 2015

Certified Manager of Quality/Organizational Excellence, American Society for Quality, #11430

Certified Project Manager, Project Management Institute. October 30, 2015.

deliverables across all task orders. Projects include design and construction of a soil cover over a landfill and groundwater remediation at the former NAS Alameda (CTO 0002), Site-Wide Groundwater Monitoring, Alameda California (CTO 0003). This large-scale monitoring program includes the sampling and analysis of over 300 monitoring wells. Additional projects include Alameda Petroleum Field Work (CTO 0004), Removal Action at Hangar One Moffett Field (CTO 0005); and Pesticide Remediation at Camp Pendleton performed under CTO 0006. Amec Foster Wheeler has received an "OUTSTANDING" ACASS rating for its work on the Camp Pendleton project.

Hydro One Networks, Inc., Polychlorinated Biphenyl Program, Laboratory Audit. QA/QC Officer. Amec Foster Wheeler provided expert, third party review and audit of the polychlorinated biphenyl (PCB) analytical methodologies and statements of measurement uncertainty associated with the analysis of PCBs. Amec Foster Wheeler reviewed quality system documentation, verified measurement uncertainty calculations, and verified methods used in analysis. The purpose of the work was to evaluate uncertainty in the reported data versus compliance requirements so that Hydro One could establish decision points for acceptance. Ms. Bernhardt was the Project Manager and provided led the review of quality systems.

AFCEE 4PAE08 Contract. QA/QC Officer. Ms. Bernhardt is the Program QA Manager, serving 218 Task Orders (TOs) valued at $220M since the start of the contract in 2008. Responsible for the analytical program QA in addition to establishing the quality program under which all projects are executed. Worked with project managers to identify, screen and select qualified laboratories based on project scope, world-wide location, and required certifications (including host-nation requirements). Established and oversees the quality program for a large, challenging TO addressing perfluorinated compounds (PFCs), an emerging contaminant present in aqueous film forming foam used in fire training/fighting of fuel related fires. Work is underway to assess PFC presence across 39 bases.

Laboratory Program Management, CSX Transportation. QA/QC Officer. Ms. Bernhardt created a laboratory program for this major US railroad company which established quality laboratories in the program, leveraged the volume of analytical work to achieve cost-effective pricing, and standardized data reporting across hundreds of consultants working for CSXT. The project establishes quality guidelines for environmental laboratory analysis, web-based tools for initiating lab services, and quality monitoring of a network of laboratories. Amec Foster Wheeler assisted CSXT in the selection of the laboratories by developing a SOW, issuing an RFP, evaluating and rating proposals for final selection by CSXT. After establishment of the program, Ms. Bernhardt conducted annual laboratory audits and coordinated performance evaluations studies to assess and monitor performance across a network of approximately 12 labs. She evaluated laboratory reports for completeness, verification of reporting limits, laboratory standard operating procedures and compliance with NPDES required parameters. Her reports gave assessments of the labs' performance and ability to provide high quality defensible data and identify areas where improvements were required. The program continues through present day and leadership is handled by another Amec Foster Wheeler Chemist.

Gabe Sandholm

Corporate Health & Safety
Scientist 2

Classification
Scientist 2

Years with Amec Foster Wheeler: 15

Years of Experience: 17

Education
BA, English, University of Iowa, 2000
MBA, City University of Seattle, 2008

Regulatory Experience
H&S Oversight

Licensing / Certifications
Certificate in Human Resources Management; Senior Professional in Human Resources (SPHR) Certification; Associate in Risk Management (ARM) Certification

Mr. Sandholm has over 17 years of experience in Human Resources and Health & Safety/Risk Management having spent over 15 years at Amec Foster Wheeler, filling several roles including Human Resources Manager and Loss Prevention Manager. Mr. Sandholm's roles have allowed him to partner with staff at all levels throughout Amec Foster Wheeler with a focus on proper implementation, management, and communication of Human Resources and Health & Safety policies, procedures, and programs. Mr. Sandholm is the Amec Foster Wheeler Minneapolis office's Health and Safety Coordinator and provides guidance and training to all project staff in regards to safety analysis and reporting.

Relevant Work Experience

Health & Safety and Loss Prevention Manager. As a member of Amec Foster Wheeler Environment & Infrastructure's corporate Health & Safety department, Mr. Sandholm provides oversight to Amec Foster Wheeler Environment & Infrastructure's North American offices with respect to safety, incident record keeping and analysis. In addition, Mr. Sandholm manages several Health & Safety programs including Amec Foster Wheeler E&I's motor vehicle safety program, medical surveillance program, monthly safety communication program, and HSSE efforts required by the proposal team, specifically the Oil and Gas sector of E&I. Duties include production of monthly, quarterly, and annual claim management and safety statistical reports for Amec Foster Wheeler Management, preparation of OSHA 300 logs and related reports, maintenance of company participation in safety pre-qualification organizations (ISNetworld, PICS, etc.), and development of best management practices in Health & Safety advising Amec Foster Wheeler management on best strategies to reduce claims severity and frequency, achieving continuously improving experience modification rates and OSHA recordable incident rates. Along with the Vice President of Health & Safety and Regional HSE Managers at Amec Foster Wheeler, Mr. Sandholm also reviews, revises, creates and communicates the policies and procedures that make up Amec Foster Wheeler Environment & Infrastructure's Health, Safety & Environment program. .

Regional Human Resources Manager. Mr. Sandholm's experience in Human Resources includes providing counsel to senior management in the areas of training, performance management, compensation planning, and employee relations. Mr. Sandholm has been responsible for conducting internal investigations and for developing, interpreting, and administering Human Resources policies and procedures to ensure a consistent message exists throughout the company. Mr. Sandholm has provided guidance to employees at all levels regarding career development, conflict resolution, and other issues as they arise. Mr. Sandholm's additional Human Resources skills include ensuring company compliance with legal employment requirements. identification and resolution of staffing and retention needs, analysis and production of affirmative action plans, management of work visa and immigration needs, management of worker's compensation and unemployment programs, management of pre-employment programs including background screening, drug and alcohol testing programs, and medical screening.

Andrew Fiskness, PG, PMP

Project Manager

Mr. Fiskness has 19 years of experience in the environmental field as a project manager and geologist. He has participated in several large projects for private sector clients in Minnesota, Iowa and Ohio involving environmental remediation and restoration. His experience includes project management, budgeting, subcontractor management, scheduling, remedial investigation/feasibility studies, sampling, systems operation & management, oversight, drilling, well and borehole installation, and systems construction. Mr. Fiskness' expertise includes shallow and deep groundwater and bedrock drilling, systems troubleshooting, and accelerated remediation technology (ART), vapor intrusion investigation and mitigation. Mr. Fiskness has a thorough working knowledge of the MPCA Risk Based Site Evaluation Manual, PRP guidance for UST/AST release cleanup, MPCA vapor intrusion best management practices, VIC guidance documents and MDA guidance documents.

Classification
Project Manager

OSHA Certification(s)
40-Hour HAZWOPER

Site Supervisor

Years with Amec Foster Wheeler: 8

Years of Experience: 19

Education
Bachelor of Science, Geology, University of Minnesota Duluth, 1998

Regulatory Experience
US EPA Superfund, RCRA

MPCA VIC, Superfund

IDNR

MDEQ Part 201

Licensing / Certifications
Professional Geologist, TN, 5078, 2010

Professional Geologist, MN, 44133, 2005

Project Management Professional/#2020335/US/03/31/2020

Certified Groundwater Professional/#2059/IA/12/31/2019

Relevant Work Experience

Remedial Action, Confidential Manufacturing Client, Hennepin County, MN. Task Manager. Mr. Fiskness currently serves as project manager in support of startup and transition of an ongoing groundwater treatment and extraction system for a confidential manufacturing client in Hennepin County, Minnesota. Site remediation activities include sampling groundwater monitoring wells, logging instrumental data from the groundwater treatment system, and OM&M maintenance on the system. Mr. Fiskness managed the operation of a groundwater treatment system using sixteen groundwater recirculation wells (GCWs) along the eastern property line of a contaminated industrial site. Mr. Fiskness maintained the treatment trailer equipped with blower, air / water separator and air compressor, in addition to vapor phase activated carbon units, located at the northeast corner of client's parking lot. Managed the semi-annual cleaning of GCWs and associated maintenance activities. Quarterly groundwater sampling and annual system operation report generation conveying annual activities. In the role of project manager, Mr. Fiskness developed project scope, conducted subcontractor procurement and management, managed schedule and budgets, provided guidance for project team and held routine meetings with project stakeholders including clients (local and at corporate level), regulators, subcontractors and project team.

Remedial Site Investigation, Confidential Manufacturing Client, Minnetonka, MN. Project Manager. Mr. Fiskness currently serves as project manager in support of a groundwater and soil vapor investigation for a confidential manufacturing client located in Minnetonka, Minnesota. Site activities have included groundwater and soil vapor investigation, data analysis and technical report preparation. In the role of project manager, Mr. Fiskness developed project scope, conducted subcontractor procurement and management, managed schedule and budgets, provided guidance for project team and held routine meetings with project stakeholders including clients (local and at corporate level), regulators, subcontractors and project team.

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Confidential Client, Interim Response Measure and Remedial Action Plan, Minnetonka, MN. Project Manager. Project involved an evaluation of Sub Slab Depression Systems and floor sealants and conducted an engineering evaluation on Vapor Intrusion mitigation technologies for to support the future property use at a former circuit board manufacturing Site where releases of TCE, 1,1,1-trichlorethane (TCA) and 1,4-dioxane occurred. Project tasks included development of cost estimates and feasibility evaluations for several VI technologies, and conducting installation of a vapor intrusion floor sealant. Mr. Fiskness served as project manager responsible for developing project scope of work, communications with project team and client, technical support and quality assurance/control.

Groundwater Monitoring Program/OM&M, Confidential Client, Postville, IA. Project Geologist. Mr. Fiskness served as Project Geologist for a current industrial manufacturing plant with historic groundwater contamination. Mr. Fiskness conducted ongoing performance of project management and administrative activities including budget tracking, invoicing, scheduling, and coordination of labor and subcontract resources. Managed the preparation and submittal of annual groundwater monitoring report which includes results of the semi-annual sitewide groundwater sampling. Mr. Fiskness also initiated a trial shutdown of the source groundwater pumping system and assisted with the generation of potentiometric surface maps to evaluate groundwater flow directions before, during, and after shutdown. Following field activities, the data was analyzed and a report generated to evaluate the potential to cease pumping operations at the site.

Groundwater Monitoring Program/OM&M, Confidential Client, South Point, OH. Project Geologist. Mr. Fiskness performed project management oversight of operation, monitoring, and maintenance activities at South Point Plant Site. Project support included conducting ongoing performance of project management and administrative activities including budget tracking, invoicing, scheduling, and coordination of labor and subcontract resources. Also assisted in managing the preparation and submittal of quarterly site inspection reports. Performed the preparation and submittal of annual groundwater monitoring report which includes results of the semi-annual sitewide groundwater sampling.

Site Investigation/Groundwater Monitoring Program, Confidential Client, Ironton, OH. Project Geologist. In his role as Project Geologist, Mr. Fiskness performed management oversight for operation, monitoring and maintenance activities at an industrial remediation site. Project management tasks included budget tracking, invoicing, scheduling, coordination of labor and subcontract resources and support for the preparation of monthly progress submittals to the agencies. Mr. Fiskness also assisted in managing the preparation of the quarterly groundwater monitoring reports for compliance with agency requirements, performed groundwater system evaluation to ensure that the pumping well system remains effective in operation and capture of impacted groundwater at the site.

Jonathan Murer, PG

Project Manager

Mr. Murer has over 29 years of experience in the environmental consulting field as project manager and geologist. Mr. Murer has been responsible for the performance of hundreds of environmental projects for various public and private sector clients. Mr. Murer has extensive experience with the planning and implementation of multi-media assessment and remediation projects, including numerous sites with per- and polyfluoroalkyl substance (PFAS) contamination. He is a valuable resource in the development, implementation, and monitoring of project scopes of work, safety plans, budgets and schedules. Mr. Murer currently serves as a technical reviewer under the existing MPCA-MDA Technical Services contract and is familiar with the MPCA Risk Based Site Evaluation Manual, UST and AST release cleanup guidance documents, VIC guidance documents and MDA guidance documents.

Classification
Project Manager

OSHA Certification(s)
40-hour HAZWOPER with current refresher

Years with Amec Foster Wheeler: 3

Years of Experience: 29

Education
MS Water Resources Management

BS Geology/Geophysics

Regulatory Experience
MPCA RBSE, VIC, Superfund, CERCLA, MERLA, RCRA, WDNR, IDNR, NDDH

Licensing / Certifications
Professional Geologist, #668, Wisconsin

Specialized Training
eRAILSAFE

CPR & First Aid Certified

Relevant Work Experience

Railroad Corridor Due-Diligence Projects (Phase I and II ESAs), Class I Railroad, North Dakota. Project Manager. Lead concurrent project teams in the performance of over 25 ASTM-compliant Phase I ESA projects, and subsequent Phase II ESA projects, for a Class I Railroad client. The project sites consisted of operating railyards and lease properties along multi-mile railroad corridors located in four cities in North Dakota. For both the Phase I ESA and Phase II ESA phases, Mr. Murer was responsible for project scoping, budget control, schedule maintenance, client communications, and safety coordination. During the Phase I ESA phase, tasks completed at each property included environmental database evaluation, historic land use assessment, site inspection, interviews, and production of a Phase I ESA report. Based on the results of the Phase I ESA activities, 15 of the properties were selected for the completion of Phase II ESAs. Tasks completed at each of the selected properties during the Phase II ESA phase included multi-media sampling, data evaluation, preparation of assessment reports, and regulatory communications. The types of properties for which these due diligence projects were conducted included rail yards, spur lines, general railroad corridors, and lease properties (e.g., bulk oil sites, agricultural chemical facilities, stockyards, grain elevators, seed processing facilities, scrap metal yards, automobile salvage facilities, and vehicle repair shops).

Expedited VI Investigation at Former Drycleaner, MPCA, Minneapolis, MN. Technical Review. In 2017, Amec Foster Wheeler conducted an expedited vapor intrusion investigation which included indoor sub-slab soil vapor and paired indoor/outdoor ambient air assessment activities, at a former drycleaner which currently operated as a laundromat, with two residential units above. Results of a previous Phase II ESA soil vapor sampling revealed the presence of chlorinated volatile organic compounds (CVOCs), specifically tetrachloroethene (PCE), at levels above the expedited intrusion screening value (EISV). Based on the results of the Phase II ESA, the MPCA moved to conduct an expedited soil vapor intrusion assessment to ensure the health and safety of residents at the Site. Based on the findings from this sub-slab soil vapor and ambient air investigation, contamination at levels above applicable criteria was confirmed to be present both beneath the Site building, as well as within the building which contains both commercial (main floor) and residential (2nd floor) settings. Mr. Murer reviewed technical deliverables which were provided to MPCA to ensure they were compliant with applicable MPCA guidance.

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PFAS Site Investigation Program, USACE/AFCEC, Las Vegas, NV. Base Project Manager. Amec Foster Wheeler was retained by the United States Army Corps of Engineers (USACE) to conduct PFAS multi-media investigation activities at multiple Air Force bases across the country. Mr. Murer served as the Base Project Manager for Nellis Air Force Base located in Las Vegas, Nevada. Mr. Murer was responsible for project scoping, budget control, technical deliverable preparation, subcontractor procurement, schedule maintenance, base logistics management, USACE communications, FAA coordination, and safety planning. Mr. Murer lead a project team which completed tasks including the development of project work plans, T&E species assessments, multi-media sampling for PFAS constituents, and preparation of a subsurface investigation report. The types of areas evaluated for PFAS contamination included fire stations, firefighting training areas, aircraft crash sites, a waste water treatment plant, aircraft hangars, surface water drainage areas, and sludge ponds.

PFAS Site Investigation Program, USACE/AFCEC – Multiple Air Force Bases, Arkansas and New Mexico. Senior Geologist. Amec Foster Wheeler was retained by the United States Army Corps of Engineers (USACE) to conduct PFAS multi-media investigation activities at multiple Air Force bases across the country. For three of these bases, Mr. Murer lead, or participated in, the development of project planning documents, subcontractor procurement activities, base logistics coordination, field assessment programs, and preparation of subsurface investigation reports. The types of areas evaluated for PFAS contamination included fire stations, firefighting training areas, waste water treatment plants, aircraft hangars, and surface water drainage areas.

Dump Site Investigation, Private Client, Maplewood, MN. Project Manager. The project included conducting a Limited Phase II Investigation at a portion of an approximately 74-acre parcel of land operating as a manufactured home park with approximately 350 mobile home sites. Mr. Murer was responsible for scope of work development, budget maintenance, safety planning, client communications, and preparation of a final technical deliverable. Historic data indicated the presence of a dump site on the adjoining property to the west, which encroached onto a portion of the Site. To address the possible encroachment of the dump onto the Site, Amec Foster Wheeler conducted Limited Phase II activities including soil, soil vapor, and groundwater sampling.

Operations, Maintenance, and Monitoring (OM&M) at North and Vinland Landfills, Georgia Pacific, Menasha, WI. Technical Review. Mr. Murer performed senior technical review and document QA for deliverables associated with the completion of routine and non-routine OM&M activities for two landfills containing paper mill-related bulk sludge in eastern Wisconsin. Activities for the sites included routine semi-annual water sampling, leachate monitoring and system maintenance, landfill inspections, landfill gas monitoring, reporting, routine maintenance oversight, leachate disposition oversight, and life cycle planning.

Sub-Slab Soil Vapor Assessment - Unidale Mall, MPCA, St. Paul, MN. Technical Review. In 2017, Amec Foster Wheeler conducted a sub-slab soil vapor assessment at a previously closed Voluntary Investigation and Cleanup (VIC) site that was selected for re-evaluation by the MPCA based on recent updates to Minnesota Department of Health (MDH) screening criteria (specifically the health-based values [HBVs] for tetrachloroethene [PCE] and trichloroethene [TCE]). The site was selected by the MPCA for further evaluation following nearby soil vapor levels of volatile organic compounds (VOCs) in relation to other closed sites, as well as the historical presence of a drycleaner facility within the mall. As part of the project, Amec Foster Wheeler reviewed historical reports and worked closely with the MPCA to secure site access. Amec Foster Wheeler conducted detailed indoor building surveys, installed sub-slab vapor sampling points and completed sub-slab vapor sampling. Future phases of the project may involve further installation of sub-slab vapor sampling points and the potential installation of a vapor mitigation system. Mr. Murer reviewed technical deliverables which were provided to MPCA.

Steven Murray, CPG

Project Manager

Classification
Project Manager

Years with Amec Foster Wheeler: 21

Years of Experience: 25

Education
BS, Geology, Hope College, 1985

Regulatory Experience
Represented client at regulatory meetings

Licensing / Certifications
Certified Geologist, US, 10542

As a Geologist and Senior Project Manager, Mr. Murray has supported more than 30 across the United States for public and private clients, involving environmental remediation and restoration, Brownfield redevelopment, and construction. These projects have ranged in value from $3,000 to $3,400,000, and in duration from 1 month to over 10 years. His experience includes managing construction projects, and planning and coordinating complex drilling and site characterization programs. He has served as field manager on large Brownfield demolition projects where activities included asbestos abatement, underground storage tank (UST) removals, utility cut-offs, PCB transformer removals, building demolition, excavation of soils contaminated with listed waste, backfilling and compaction, manifesting of hazardous and non-hazardous materials for offsite disposal, and verification sampling. Mr. Murray possesses skills in environmental data management using GIS relational database systems to support project work.

Relevant Work Experience

Project Manager: Confidential Client, Golden Valley Groundwater OM&M, Golden Valley, MN. Operation of groundwater treatment system using sixteen groundwater recirculation wells (GCWs) along eastern property line of a contaminated industrial site. Treatment trailer equipped with blower, air / water separator and air compressor, in addition to vapor phase activated carbon units, located at northeast corner of client's parking lot. Semi-annual cleaning of GCWs and associated maintenance activities. Quarterly groundwater sampling and annual system operation report generation conveying annual activities. Responsible for daily site operations; coordinated all project communications and administrative activities.

Project Manager: Confidential Client, Minnetonka Site Interim Response System Construction & Operations Maintenance & Monitoring, Minnetonka, MN. Design, construction, operation and maintenance of interim response system to mitigate chlorinated VOCs from soil and groundwater beneath building. System consists of 8 groundwater circulation wells (GCW) and two 100-foot-long soil vapor extraction trenches; treatment area includes blower and sparge compress with remote monitoring telemetry and vapor phase carbon for treatment of off-gases. Responsible for serving as the technical leader for design and construction.

Project Manager: Confidential Client, Area 14 West Site Investigation and Preliminary Design, South Bend, IN. Pre-design site investigation and preparation of preliminary design for GCW/SVE system to mitigate TCE from soil and groundwater beneath prior painting and degreasing area of former manufacturing facility (covering approximately 8,000 SF). Project objectives were to use risk-based strategy to focus remedial efforts on areas of concern (AOCs) posing significant threat to on-site workers potentially exposed to BTEX and chlorinated solvent releases via vapor migration, and offsite residents via exposures to off-site groundwater. Area-specific remediation work plan submitted to IDEM and approval obtained to move forward with construction. Responsible for serving as technical leader for final investigation and design.

Project Manager: Confidential Client, HWSB Groundwater Extraction System Operations & Maintenance, South Bend, IN. Operation monitoring, maintenance and reporting for groundwater extraction systems at 110-acre industrial complex being renovated as engineering test facility. Nine groundwater extraction wells control groundwater from leaving site; permit allowable discharge limit 225 gpm total discharge. Services keep systems in compliance with the city POTW. Responsible for technical, operational, and financial aspects.

Continued...

Project Manager: Confidential Client, Mansfield Site Soil Remediation System Construction and Groundwater Monitoring, Mansfield, OH. Excavation and disposal of 2,500 tons of f-listed waste (soil contaminated with 1,1,1-TCA) at former industrial products operating facility, now site of food processing facility. Also, constructed treatment cell within excavation for residual source reduction. Following installation of sheet pile, excavation took place in area of 55 feet by 70 feet by 17 feet deep. Excavation and transportation and disposal carried out over a six-week period. Also prepared specifications for removal; hired and managed subcontractor to perform work. Responsible for overseeing project activities, scheduling, and maintaining contact with client.

Project Manager: Confidential Client, Spring Valley Facility IRM System Construction / OM&M, Spring Valley, IL. Environmental services including pre-design study to support design and construction of Interim Response (IRM) System to capture contaminated groundwater at eight-acre facility site property line, and follow-up operations monitoring and maintenance (OM&M). Responsible Project Implementation and Management.

Project Manager: Michigan Department of Environmental Quality Wickes Manufacturing TCE Plume Site Remedial Investigation / Feasibility Study, Mancelona, MI. Remedial Investigation / Feasibility Study (RI/FS) and community relations services at site of TCE plume extending into groundwater over 5 miles from source area (manufacturing facility) and out approximately 1.25 miles in width at leading edge of plume, affecting more than 1,200 properties. Coordinate development of GIS webpage, which is updated on annual basis to present changes in groundwater flow and plume characteristics, http://bizhost-c5.mactec.biz/wickes/. Services included geophysical survey, groundwater modeling / evaluation and data management. Responsible for providing Principal-level oversight and management in all phases of project and assist client with public relations.

Project Manager: Michigan Department of Environmental Quality LOE State Superfund Sites Environmental Project Management Services, Various Locations (35+ Sites), MI. Environmental services including remedial investigations / feasibility studies, remedial design and risk assessment services at 35 state Superfund sites throughout State of Michigan. Responsible for managing and directing environmental activities at Tar Lake Superfund Site, which included design, installation groundwater monitoring network and operation of biosparge system, various contractor management to support site operations.

Erin Siewert, PMP

Project Manager

As a Project Manager, Ms. Siewert has 9 years of experience with a focus on industrial remediation, regulatory compliance, reporting and client portfolio management at 70 sites throughout EPA Region V including two MPCA Superfund sites. Ms. Siewert has experience in project management, data management, data analysis, operation and maintenance program development and tracking, NPDES permitting, wetland monitoring, and report development and generation for environmental remediation projects. She provides direct client support for portfolio financial management, insurance tracking, regulatory compliance, program and policy development and project coordination duties. Ms. Siewert has a thorough working knowledge of the MPCA Risk Based Site Evaluation (RBSE) Manual, PRP guidance for UST/AST release cleanup and VIC documentation.

Relevant Work Experience

Portfolio Management, Confidential Manufacturing Client, Hennepin County, MN. Project Manager. Ms. Siewert has served as client portfolio manager over nine years for over 70 sites in EPA Region V. Ms. Siewert's portfolio management consists of all aspects of financial management including budgeting, forecasting, annual planning; policy and document review; quality control and outside consultant support for a complex range of industrial projects with an average annual spend of $25 million. Ms. Siewert works directly with the client to address any needs or concerns regarding changing regulatory landscapes and internal client needs.

Remedial Action, Confidential Manufacturing Client, Hennepin County, MN. Task Manager. Ms. Siewert served as task a manager in support of startup and transition of a groundwater treatment system for a confidential manufacturing client in Hennepin County. Site remediation activities include sampling groundwater monitoring wells, logging instrumental data from the groundwater treatment system, and OM&M maintenance on the system. In her role as a task a manager, Ms. Siewert directed the startup and transition of the OM&M operations into the client managed portfolio of sites to ensure uniformity with client standard operating procedures.

Remedial Site Investigation, Confidential Manufacturing Client, Minnetonka, MN. Task Manager. Ms. Siewert served task manager in support of previous and ongoing groundwater and soil vapor investigation for a confidential manufacturing client located in Minnetonka, Minnesota. Site activities have included groundwater and soil vapor investigation, data analysis and technical report preparation. Ms. Siewert provided support for pre-task planning, subcontract setup, data analysis, report review and project closeout activities.

Remedial Action, Confidential Manufacturing Client, Lawrence County, OH. Project Manager. Ms. Siewert has served as an environmental scientist, task manager and project manager in support of an ongoing remedial action for a confidential manufacturing client in Lawrence County, Ohio. Site activities include OM&M of a groundwater extraction and treatment system, NPDES compliance, remedy inspections, and routine reporting. Ms. Siewert serves as the point of contact for site operations and monitors adherence to both client and regulatory policies. Ms. Siewert has prepared and reviewed agency required analytical, monitoring and inspection reports. She monitors and control site financials to identify and document any site increases or decreases on operating budget. Annual operating costs have been reduced by over 20 percent in the past four years.

PRP Site Management and Review, Confidential Manufacturing Client, Hennepin County, MN. Project Manager. Ms. Siewert served as the project manager of a historical review and forecasting exercise of a portfolio of 15 PRP sites in EPA Region V. She coordinated historical file review, memo reports and future financial requirements and presented to the client for review and approval.

Classification
Project Manager

OSHA Certification(s)
40-Hour HAZWOPER with current refresher

Site Supervisor

Years with Amec Foster Wheeler: 9

Years of Experience: 12

Education
Bachelor of Science, Environmental Studies, Bemidji State University, 2005

Master of Science, Environmental Management and Sustainability, American Public University, 2014

Regulatory Experience
US EPA Superfund, RCRA

MPCA VIC, Superfund

Ohio EPA, DERR, VAP, NPDES

MDEQ Part 201

Licensing / Certifications
Project Management Professional, 2020767

Shalene Thomas

Project Manager

Mr. Shalene Thomas is a project manager and currently serves as the Emerging Contaminant Program Manager for Amec Foster Wheeler. She has more than 19 years of experience in environmental consulting that includes 10 years of experience supporting per- and polyfluoroalkyl substance (PFASs) evaluations. She has extensive program and project management, human health risk assessment, data management, GIS and 3D visualization and animation, and site investigation experience and has supported State, Federal and industrial clients with PFAS evaluations. She currently serves as the PFAS Work Group Manager for Amec Foster Wheeler and has supported PFAS projects in 32 different states in 9 of the 10 USEPA regions as well as projects in Australia and Canada. She led the ITRC PFAS Team Proposal and serves on the regulatory/risk task force for the ITRC PFAS Team as well as the co-lead for AFFF Fact Sheet. She also was a contributing author for the regulatory section of NGWA PFAS State of Knowledge and Practice document.

Classification
Project Manager

OSHA Certification(s)
40hr HAZWOPER

Years with Amec Foster Wheeler: 16

Years of Experience: 19

Education
Bachelor of Science, Biology

Master of Science, Environmental Science and Management

Regulatory Experience
MPCA, IDNR, NDDH, WDNR, NYDEC, PADEP, MIDEQ, CA DTSC, MA DEP, NHDES, TX CEQ,

Relevant Work Experience

Per- and Polyfluoroalkyl Substances Program State Inventory of Current Users, MPCA, State-wide MN. Phase I and II Project Manager. County level surveys of potential PFAS users and their proximity to various identified receptors to aid MPCA in determining state-wide priorities for future anticipated PFAS investigations. Various industries likely to utilize PFAS in their processes/tasks were identified based on Federal industry databases and were subsequently geo-located, and categorized based on their proximity to various water receptors (e.g. water supply wells, Public Waters surface water bodies, wellhead protection areas, sensitive aquifers) and whether they had registered tanks or previous environmental investigations. Provided Project Manager and technical lead for the effort, including development of scope and pilot test protocol for prioritization.

Perfluorochemical Information Clearinghouse, MPCA, State-wide MN. Project Manager. Research and development of an information clearinghouse that identified PFCs, their usage in products and industrial processes, legacy stores or stockpiles in the US and products or synthesis components or ingredients that were or are imported into the US. The objective of the project scope is to develop a Clearinghouse Reference Tool that may be used by MPCA staff for informing remediation investigations, exploring pollution prevention opportunities and to help make management decisions related to PFCs. Served as project Manager and Lead Scientist to develop conceptual model and clearinghouse design. Led team to develop clearinghouse and provided training to State employees.

Soil Reference Value (SRV) Work Group, MPCA, St. Paul, MN, Project Manager. Amec Foster Wheeler was contracted to assist MPCA with a technical review of its Soil Reference Values (SRVs) for volatile organic compounds (VOCs). The purpose of the technical review was to determine if MPCA should consider recent developments in fate and transport modeling and risk assessment for VOCs in its calculations of SRVs. In her role as project manager, Ms. Thomas developed the work plan, schedule, and budget, collaborated with the project team, conducted regular meetings with the MPCA regarding the project progress, and issued invoices. The outcome achieved was a final deliverable that included a review of screening criteria around the US, an exposure scenario evaluation, a sensitivity analysis, and a draft User's Guide so that the MPCA could make more informed regulatory decisions.

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Shoreham Yard Remedial Investigation, Canadian Pacific, Minneapolis, MN. Program, Project Manager. Ongoing remedial investigation and monitoring for the Shoreham rail yard in northern Minneapolis. Scope included semiannual groundwater sampling for a variety of petroleum products, creosote by-products and solvents, along with quarterly water level measurements. Performed project management in support of the ongoing monitoring program including annual scope and cost. Provided project management oversight of the day-to-day operations including scheduling, deliverable tracking, cost estimation, task order management, vendor and subcontractor management, field crew management and leadership.

PFAS Investigation, Confidential Manufacturing Facility, Minnetonka, MN. Technical Advisor. Amec Foster Wheeler conducted a focused site investigation in response to an accidental release of AFFF from a fire suppression system. Investigation activities consisted of completing soil borings and temporary monitoring wells at the Site, installing three permanent monitoring wells, conducting soil and groundwater sampling and completing a site investigation report. Rigorous internal protocols involving the collection of samples for PFAS compounds were followed to prevent cross-contamination.

PFC Release Investigations Multiple Base Realignment and Closure (BRAC) Bases, Air Force Civil Engineer Center (AFCEC), Nationwide. Technical Lead for the Base Realignment and Closure (BRAC) PFC Program, Technical Lead. As the Technical Lead, Ms. Thomas acted as the primary technical lead by supporting the three Regional Leads with PFC technical expertise, providing regulatory/stakeholder interface on PFC technical issues, and developing sampling SOPs and providing guidance and instruction during the Team calibration sessions to ensure consistent, accurate, precise data collection, interpretation and communication across the entire program. Technical components of the program include, evaluating the release mechanisms and investigation of PFCs at 39 Air Force BRAC installations across 11 States.

ANG Well Sampling and Provisions for Supply of Alternate Water at Multiple Air National Guard Bases, Multiple Sites, Nationwide. Technical Advisor. Amec Foster Wheeler was contracted to support well sampling and alternatives for water supply when a release of PFOS/PFOA may be impacting municipal and/or home/business owner's drinking water supplies. Scope of work and specific tasks include Quality Control Plan, public meeting support and attendance, private and public well surveys, comprehensive communications planning, well sampling, notification, point of entry device installation and maintenance, well abandonment, and bottled water supply. Ms. Thomas' role to date has been primarily in support of regulatory review and risk communication support.

Baseline Risk Assessments, Australian DoD, HMAS Stirling, Australia, Project Manager/Technical Advisor. Amec Foster Wheeler is currently leading baseline human health and ecological risk assessments at a former military base near Perth. Ms. Thomas leads the project team with PFAS technical expertise, providing scope, schedule, and budget management for the execution of risk assessments, as well as database management for Site Investigation activities executed by prime contractor RPS. Ms. Thomas also provides technical advisor role for SAP, QAPP, and work plans developed by RPS as well instruction during the team calibration training sessions.

Site Investigation, Stakeholder and Community Engagement and Baseline Risk Assessments, Australian DoD, Lavarack Army Barracks, Australia, Project Manager/Technical Advisor. Amec Foster Wheeler is currently leading site investigation, stakeholder and community engagement, and baseline human health and ecological risk assessments at a former military base near Townsville. Ms. Thomas leads the project team with oversight of scope, schedule, and budget management. The scope of work includes planning documentation, detailed site investigation, human health and and ecological risk assessments, and stakeholder and community engagement, hydrological modelling, and database management. Ms. Thomas also provides instruction during the team calibration training sessions.

Cory Vowles

Project Manager

Mr. Cory Vowles is a project manager with over a decade of experience primarily in the field of environmental assessment and remediation, as well as industrial hygiene and transportation. Mr. Vowles has worked with and developed lasting relationships with clients from city, municipal, commercial, private, state, and federal sectors.

During his career, Mr. Vowles has been certified as an asbestos inspector, airfield pavement inspector, and has also undergone trainings for Stream Condition Index and Habitat Assessment as well as project management. Core skills include project planning, workplan development, field implementation, sampling protocol, technical specifications, subcontractor procurement, budgeting, and customer service. Mr. Vowles currently serves as a project manager under the existing MPCA-MDA Technical Services contract and is familiar with the MPCA Risk Based Site Evaluation Manual, PRP guidance for UST/AST release cleanup, MPCA vapor intrusion BMPs, VIC guidance documents and MDA guidance documents.

Classification
Project Manager

OSHA Certification(s)
40hr HAZWOPER

30hr Construction Safety and Health

Years with Amec Foster Wheeler: 12

Years of Experience: 12

Education
Bachelor of Science, Biochemistry

Regulatory Experience
MPCA, FDOT, IDNR, NDDH, WDNR

Relevant Work Experience

Morning Star Missionary Church, MPCA, St. Paul, MN. Project Manager. Amec Foster Wheeler conducted a Soil Vapor Investigation including the installation of seven sub-slab vapor sample points in seven different buildings surrounding a former drycleaner operation. Building types ranged from single-family residential to multi-use commercial/residential. Amec Foster Wheeler personnel conducted initial building surveys to assess installation locations and building conditions pursuant to determining 33x Intrusion Screening Values (ISVs) applicability. Amec Foster Wheeler personnel followed MPCA guidance to install and sample the sub-slab sample points. In each of the seven properties tested, exceedances to applicable ISV criteria indicated the need for expedited mitigation activities. Data was immediately submitted to the MPCA based on the understanding of the time-sensitive nature of the results. Project is ongoing, with installation and subsequent confirmation sampling of the SSDS imminent.

Waldorf Expedited VI Investigation, MPCA, Minneapolis, MN. Project Manager. Amec Foster Wheeler conducted an expedited vapor intrusion investigation which included outdoor soil gas and indoor sub-slab soil vapor assessment activities, at a former drycleaner site where soil vapor contamination was detected as part of a Limited Soil Gas Sampling Event (LSGSE) conducted earlier in 2017. Results of the previous soil vapor sampling from two soil borings revealed the presence of chlorinated VOCs (CVOCs), specifically tetrachloroethene (PCE) at levels above the 33x Residential Intrusion Screening Value (33x Residential ISV) of 110 micrograms per cubic meter (µg/m3), initiating the need for an expedited investigation response. Amec Foster Wheeler was able to mobilize to the site and implement the expedited workplan within 2 weeks of being awarded the project, clearly within the required 30-day window to perform expedited actions. Results of the investigation proved a need to follow up with mitigation activities in each of the three buildings, as concentrations exceeded 33x Expedited ISVs (33x EISVs). Amec Foster Wheeler is currently contracted to provide oversight of the installation of a vapor mitigation system at one of the properties, where construction is set to commence immediately. Managed all phases of the project including site access negotiations, subcontractor procurement, expedited scheduling, invoicing, as well as provided immediate project updates to the MPCA site team as soon as data was available, based on the time-sensitive nature of the project.

Continued...

Monite Building, MPCA, Minneapolis, MN. Project Manager & Field Lead. The project included conducting a Limited Site Investigation (LSI) at a Leak Site based on the historic presence of above-ground storage tanks (ASTs). Amec Foster Wheeler has conducted a receptor survey of the surrounding properties within 500 feet of the historical ASTs, which includes a survey of the county well index, identification of nearby surface water, as well as determination of drinking water supply in the immediate vicinity. As part of the receptor survey, Amec Foster Wheeler also extended notifications to the property owners within the affected radius of the receptor survey to identify the investigation objectives as well as collect data on private water use and building details.

The field activities of the LSI were implemented to include collection of soil, soil vapor and groundwater samples by Direct Push Technology drilling, to be analyzed for possible contaminants related to the ASTs. The results of the multi-media sampling were used to define the vertical and horizontal extent and magnitude of the possible contamination stemming from the Leak Site, as well as identified a chlorinated solvent plume in groundwater which was proven to originate offsite. Ultimately, Amec Foster Wheeler continued assessment activities until the extent was determined, and the leak Site was closed by the MPCA, and the chlorinated solvent plume referred to the site assessment division.

Ottumwa Rail Yard – Land Recycling Program, Canadian Pacific, Ottumwa, IA. Project Manager. Project Manager on long term monitoring and assessment of a railroad yard in Iowa, being enrolled in the Land Recycling Program, to allow for repurposing land for uses after industrial impacts. Key contaminants of concern include arsenic and total extractable hydrocarbons. Notable actions at the Site include a Phase I, delineation of contaminant extent and magnitude, background arsenic study, installation of a network of approximately 30 bedrock, intermediate and shallow monitoring wells, quarterly groundwater monitoring, and working in coordination with the IDNR site managers. One key step was the production of a Risk Evaluation / Remedial Action Plan to move the Site towards compliance within the IDNR LRP framework. Managed all aspects of the project since 2016 including subcontractor procurement, invoicing, field investigations and reporting, to support the investigation.

Rolling Hills Estates – Former Dump Site, Private Client, Maplewood, MN. Assistant Project Manager & Field Lead. The project includes conducting a Limited Phase II Investigation (Phase II) at portion of an approximately 74-acre parcel of land operating as a manufactured home park with approximately 350 mobile home sites. Evidence from a 1966 aerial photograph indicated the presence of a dumpsite on the adjoining property to the west, which encroached onto the Site in the northwest corner. The presence of the former dumpsite (Maplewood Dump) on the adjacent property was considered in the Phase I ESA to be an environmental concern in relation to the Site, as was the presence of the Oakdale dump to the east, which exhibited groundwater impacts in the Site vicinity. In response to the location of the Site in relation to the Oakdale Dump, Amec Foster Wheeler conducted a review of available information to evaluate if the Site is within an area of former and/or active per- and polyfluoroalkyl substances (PFAS) investigation for groundwater contamination due to its location within an existing and well-documented regional-level PFAS plume. To address the possible encroachment of the Maplewood dump onto the Site, Amec Foster Wheeler conducted Phase II activities including soil, soil vapor, and groundwater sampling, all utilizing Direct Push Technology drilling. Observations made during the field activities included the presence of landfill debris in four of the six soil borings. Conducted the field portion of the project, collecting samples from each of the media types and provided subcontractor oversight.

PFAS Investigation, Confidential Manufacturing Facility, Minnetonka, MN. Field Lead. Amec Foster Wheeler conducted a focused site investigation in response to an accidental release of AFFF from a fire suppression system. Investigation activities consisted of completing soil borings and temporary monitoring wells at the Site, installing three permanent monitoring wells, conducting soil and groundwater sampling and completing a site investigation report. Rigorous internal protocols involving the collection of samples for PFAS compounds were followed to prevent cross-contamination.

Curtis M. Hudak, PhD, PG

Project Manager

Introduction

Dr. Hudak is a Professional Geologist (MN) in, and the Branch Manager of, the Amec Foster Wheeler Minneapolis Office. His services include managing and implementing large and complex Phase I & II Environmental Site Assessments, drilling investigations, groundwater and surface water studies, site selection strategies, and environmental strategies for both public and private assets and liabilities. He is often employed to assist our clients with discovering and developing the best strategic, long-term, value-added solutions for our clients' challenging and routine processes. Dr. Hudak employs standard work, namely Lean Management Processes and Tools, in his complex office and project management activities.

Classification
Project Manager

OSHA Certification(s)
HAZWOPER, 40-hour

Years with Amec Foster Wheeler: 2

Years of Experience: 35

Education
PhD, Geology

Regulatory Experience
Assisted North Dakota Department of Health with their Landfill Leachate Bed Materials Regulations

Licensing / Certifications
P.G. (MN-30013) CPG-7771

Specialized Training
First Aid / CPR / AED
Lean Management

Location
Minneapolis, MN

Relevant Work Experience

Development of Statewide High-Resolution Databases and Environmental Models, MnDOT, MN. Project Manager & Project Geologist. Dr. Hudak helped to manage, develop, and edit high resolution, GIS-based, statewide databases and models being developed for better resource management activities associated with improvement of Minnesota's transportation infrastructure. The data sets include vegetation, hydrography, geomorphology, terrain, original GLO land surveys and others. These data were assembled from smaller data sets, which required us to georeference, georectify, clip, and mosaic into one contiguous statewide data set. Some of these data are now housed on MnIT servers, and are available to the public.

Construction Observation for the Expansion of a Private Landfill Cell, Sargeant County, ND. Project Manager. Dr. Hudak managed an 11-acre landfill cell expansion for Waste Management, Inc.'s Big Dipper Landfill. His work included proposing, budgeting, organizing the Owner's construction observers, and quality control of the construction record report. Hudak also helped to negotiate the acceptance of a proof of concept document regarding variable leachate bed materials because of the regional lack of silicate sands in the eastern half of North Dakota. This negotiation led to our leachate bed material document methods being adopted into the North Dakota Department of Health's Division of Waste Management leachate bed materials guidance documents.

Hydrogeologic Investigation for the Expansion of a Private Landfill, Sargeant County, ND. Project Manager and Hydrogeologist. Dr. Hudak performed a systematic drilling program for proposed expansion of three landfill cells for Waste Management, Inc. His work included describing glacial tills, hydrogeology, topography, wetlands, and performing a potential receptor survey. Hudak collected Shelby Tube soil samples for laboratory-run vertical hydrologic conductivity tests, and conducting slug tests on temporary and permanent monitoring wells for horizontal conductivity. His reports assembled these data and interpreted detailed cross-sections, particle-size graphs, hydrogeologic conductivity results, stratigraphic anomalies, and other information. His report was accepted without change by the North Dakota Department of Health's Division of Waste Management.

RI/FS for a Private Landfill, Anoka County, MN. Regulatory Agency Liaison. Dr. Hudak's responsibilities included negotiations with the Minnesota Pollution Control Agency and other regulatory agencies on behalf of Waste

Management of Minnesota, Inc., at the Anoka Regional Landfill during remedial investigation/feasibility study and remedial action program.

Remedial Action Plan Hydrogeology for a Private Landfill, Anoka County, MN. Project Manager and Geologist. Dr. Hudak was the project geologist and project manager for the implementation of 12 barrier wells and eight (8) recovery wells at the Anoka Regional Landfill. Pump tests were performed and analyzed to achieve a more efficient barrier and recovery of contaminated groundwater.

Wetland Delineation at a Solid Waste Landfill, Medina, MN. Project Geomorphologist. Dr. Hudak performed a wetland delineation at the Wood Lake Solid Waste Landfill in Medina, Minnesota, under the Closed Landfill Unit of the MPCA. Responsibilities included hydric soil delineation (using USDA terminology) and interfacing with a wetland biologist.

Process & Technical Audit, JLARC & TPAB clients, Olympia, WA. Project Manager. Dr. Hudak managed a Process and Technical Audit on the Washington Department of Transportation's (WSDOT) $275MM Hood Canal Bridge and Port Angeles Graving Dock Project, which was about to lose ~$85MM and the public's support. The audit was commissioned by the Transportation Performance and Audit Board (TPAB) and the Joint Legislative and Audit Review Committee (JLARC) to make suggested improvements to the WSDOT management and project process. Dr. Hudak led a team of experts across the fields of Project Management, Transportation, Environmental Assessments, Ocean Ecology, Geology, and Cultural Resource Management to identify multiple methods and processes that would help to improve communication, management, and technical efficiencies. The Audit Team delivered 38 Recommendations to the TPAB/JLARC based upon the lack of employing standard work and Best Management Practices. This audit was awarded the prestigious National Legislative Program Evaluation Society's "Impact Audit of the Year." WSDOT has adopted the recommendations.

Environmental Compliance Calendar Development, Confidential Sporting Goods Manufacturer, 22 North American Cities. Lean Project Management Facilitator. Dr. Hudak facilitated the development of a Lean Visual Project Management Environmental Compliance Calendar for a 22-facility sporting goods manufacturer across North America. His process and its associated tools increased efficiencies with both the organization of company-wide environmental compliance data, and the annual compliance reporting to regulators.

Environment & Infrastructure Permitting and Design for a Confidential Industrial Sand Mine Operation and Processing Facility, WI. Lean Visual Project Facilitator. Dr. Hudak organized a series of client and consultant planning and design tasks for a new industrial sand mine and transload facility in central Wisconsin. Hudak facilitated the tracking of milestones and deliverables for this new mining operation via weekly 15-minute stand-up meetings between clients and consultants.

Munitions Water Quality Study for Minnesota National Guard, Camp Ripley, MN. Project Manager. Dr. Hudak was Project Manager for a large water, soil, and sediment study around two artillery/bombing ranges and two small-arms ranges within Camp Ripley, Minnesota. The project intended to identify potential plumes and soil/sediment contamination from decades of artillery and bombing practice exercises, as well as small arms fire in and around the intended target ranges. Work included developing a sampling plan that would identify the potential escape of various munitions' analytes and their daughter products from the military reservation, as well as coordinating around normal base activities. The work required extraordinary health and safety measures, which included coordinating with Unexploded Ordinance (UXO) Teams prior to implementing the relatively comprehensive drilling and sampling program. This investigation was only the second munitions study of its kind ever conducted on a military base or reservation in the United States.

John Grams, PG, CPG

Project Manager

Mr. Grams is a Professional Geologist who has over 26 years of experience specializing in environmental compliance for the oil industry. His experience environmental consulting, operational compliance for an integrated oil company, management of a pipeline terminal, financial analysis for an oil company, and operations management and business development for a consulting firm.

Classification
Project Manager

Years with Amec Foster Wheeler: 4

Years of Experience: 26

Education
MBA Coursework – Carlson School of Management
MS, Geochemistry - State University of New York, 1987
BS, Geology - University of Minnesota, 1984

Regulatory Experience
Program manager and primary client representative for regulatory interaction.

Licensing / Certifications
PG, Minnesota
Certified PG, American Institute of Professional Geologists
OSHA 40 hr Hazwoper
Member of Board of

Relevant Work Experience

Contaminated Site Management, Spring Valley Terminal; Spring Valley, MN. Project Manager for investigation and corrective action at a bulk terminal subject to state consent order. Challenges of the project resulted from gasoline and diesel fuel impacts to a fractured limestone aquifer with complicated hydrogeology, a strong downward vertical component of flow, and the existence of high permeability pathways for horizontal migration at depth. Free phase product was present at depths greater than 250' at the source of the contamination, while MTBE had migrated to over 1 mile from site. Several potable wells were impacted by contaminants and required replacement. As Project Manager, Mr. Grams prepared numerous communications with the state, prepared community outreach newsletters, client communications, facilitated meetings, and prepared annual budgets and lifecycle spending forecasts. Field work included installation of multi-level sampling wells (Westbay and FLUTe systems), mapping of surficial geology, completing a sodium bromide tracer study, redesign of the terminal's surface water management system, soil excavation, and installation and operation of remediation systems at two distinct areas of the terminal.

Petroleum Bulk Terminal and Pipeline Investigation and Remediation, numerous locations in Northern and Central US. Project Manager on large scale investigation and remediation projects at several petroleum pipeline terminals located in North Dakota, South Dakota, Minnesota, Wisconsin and Michigan. Projects include AST spill response, pipeline spill response, and corrective actions to address issues resulting from legacy site operations. Experience includes addressing environmental impacts resulting from refined products, crude oils, ethanol, and various fuel additives. Coordinated site investigation, site safety, contractor management, reporting, permitting, remediation management, budgeting and financial reserve estimation. Project experience includes fractured limestone, igneous bedrock, and a range of unconsolidated sediments.

Investigation into Vapor Impacts to Hotel and Utilities. Mr. Grams was the project manager and hydrogeologist on a project that was initiated by complaints of petroleum odors in a residential hotel. Field work included supervision of underground tank removal and excavation of approximately 400 tons soil, identifying and removing two previously unidentified tanks and documenting significant contribution from a waste oil tank operated by a former site owner. Follow up investigation with soil borings and monitoring wells. Soil and ground water contamination identified off-site in downtown business district. Investigated reports of vapors in neighboring buildings. Perform vapor survey of sanitary and storm sewers and buildings. Vapor impacts to hotel successfully remedied by installation of vapor vent system in basement and elevator shaft. Sparge and vent system installed to address residual soil and ground water impacts.

Continued...

Terminal Manager, Jamestown, ND. Manager of a refined products marketing terminal located in Jamestown, ND. Terminal received gasoline and distillates by pipeline, received additives by truck, and distributed final blended products to commercial customers. Operational responsible included:

- Ensuring proper blending of gasoline detergent additives, diesel performance additive, and diesel dye for high sulfur fuel, and prepare related reports required for fuel compliance documentation.
- Manage fuel inventory system tracking and controlling customer allocations, daily inventory reconciliation, and fuels blending.
- Perform routine maintenance on facility equipment including pumps, valves, pressure relief valves, gauges, injector calibrations and meter proving.
- Supervise contractors working on site to ensure work is done properly and safely.
- Manage exchange agreements, additive blending and reporting, and customer allocations at seven third party terminals located in South Dakota and Nebraska.
- Prepare annual expense budget, track performance, exercise expense control.
- Serve as Incident Commander for local emergency response team.
- Ensure facility is operating in compliance with applicable health and safety regulations.
- Conduct monthly EH&S training sessions.
- Conduct periodic audits at other Amoco terminals as part of continuous improvement process.

Environmental Management Plans. Mr. Grams developed the format and prepared comprehensive compliance management plans for 23 refined products terminals. The plans evaluated periodic and event based requirements contained in applicable local, state and federal regulations, permits and other compliance plans and documents. The information was presented in a clear format for implementation by the terminal operations teams.

Environmental Program Management.

- Represented Amoco Oil Company on the American Petroleum Institute's Marketing Environmental Subcommittee. Primary focus was on evaluating and providing industry input on the Gasoline Distribution MACT rule.
- Represented Amoco on the Minnesota Above Ground Storage Tank Task Force, a group including representatives from industry and the state regulatory agency (Minnesota Pollution Control Agency (MPCA)), led by the Minnesota Petroleum Council. Purpose was to find common ground and work out an agreement on how to regulate above ground storage tank facilities under Minnesota's Above Ground Storage Tank rules.
- Member of task force assembled by MPCA to prioritize environmental risks posed by issues under the jurisdiction of MPCA's hazardous waste division.
- Member of a team that developed a Microsoft Access based compliance management program to aid terminals ensuring operations are in compliance with federal and state environment, health and safety requirements.
- Developed a training program and provided training for terminal personnel to meet federal and state training requirements on environmental issues such as SPCC, CWA, CAA, RCRA, TSCA, Emergency Response.
- Conducted environmental file reviews for proposed purchases and sales of service station and terminal properties.
- Environmental specialist on Amoco's corporate Process and Program Review compliance audit team.

Robert Marxen, PE, CHMM, PMP

Engineering Lead/Project Manager

Mr. Marxen has over 30 years of professional consulting experience as an engineer, project manager, and construction manager. He is familiar with compliance requirements for a wide range of regulations including RCRA, TSCA, EPCRA, SPCC, NESHAP, wastewater, and stormwater. He has experience with demolition and decommissioning, environmental site assessment and remediation, and construction. Mr. Marxen has extensive environmental experience with soil and groundwater remediation, site assessments, and brownfield redevelopment. His experience includes all facets of remediation including project management, system design, hands-on installation, system operation, and site closure.

Relevant Work Experience

Dry Cleaning Solvent Remediation, Schloff Chemical, MPCA, St. Louis Park, MN. Project Manager. The facility distributed dry cleaning solvents, and the soil and groundwater became impacted with chlorinated compounds. The Minnesota Pollution Control Agency retained Amec Foster Wheeler to prepare the specification for a soil vapor extraction system. Mr. Marxen helped prepare the specifications and a startup workplan for a system that would use one vapor extraction well. The specifications included a 2.5HP regenerative blower, controls, remediation building, gauges, and moisture separator. Mr. Marxen assumed the role of project manager in 2016. He has overseen operation, maintenance, and monitoring of the SVE system and semi-annual groundwater monitoring. He is currently working with the MPCA to perform additional groundwater monitoring to update the conceptual site model.

Former Warroad Elementary School Demolition, Warroad Real Estate LLC, Warroad, MN. Engineer. Warroad Real Estate, LLC contracted with Amec Foster Wheeler to demolition the former Warroad Elementary School building. The building totaled 70,000 square feet and was comprised of four major additions constructed from 1918 to 1967. Mr. Marxen planned and performed an asbestos inspection in 2015 to comply with the NESHAP regulations, including collecting 282 bulk samples to supplement an inspection completed in 1988. Additionally, Mr. Marxen collected concrete samples to determine the suitability for beneficial use and inventoried other regulated materials including mercury-containing switches, fluorescent light tubes and ballasts, and ozone depleting substances. Mr. Marxen prepared bid specifications for the demolition project and solicited bids from contractors. During demolition, Mr. Marxen performed construction management services for the owner. Site restoration is scheduled to be completed in May 2018.

Demolition of Auto Assembly Plant, Ford Motor Company, St. Paul, MN. Environmental Manager and Project Manager. A two million square feet auto assembly plant in St. Paul, Minnesota was demolished. Ford contracted with Amec Foster Wheeler to provide environmental oversight and regulated materials planning. Mr. Marxen is the project manager and on-site construction manager. His duties include observing contractors, managing solid and hazardous wastes regulations, and verifying compliance with wastewater discharge and stormwater permits. Ford needed to replace one of the temporary stormwater

Classification
Engineer 3/Project Manager

OSHA Certification(s)
HAZWOPER

Years with Amec Foster Wheeler: 14

Years of Experience: 30

Education
BS, Chemical Engineering

BS, Mathematics

Regulatory Experience
MPCA RBSE, MDA, NDDH,

Licensing / Certifications
Professional Engineer, Chemical, #22501, Minnesota, 6/30/2018

Certified Hazardous Materials Manager, #14437, 8/31/2018

Project Management Professional, #1624845, 6/27/2019

Asbestos Inspector, #AI12120, Minnesota, 10/3/2018

Specialized Training
Stormwater Construction Site Management

Railroad eRailSafe

sediment basins, and Mr. Marxen oversaw Amec Foster Wheeler's engineering team to design an expansion of another existing temporary sediment basin. Mr. Marxen has reviewed and organized existing regulated materials sampling data and identified data gaps. Mr. Marxen has sampled a wide variety of materials including concrete, roofing materials, and sealants to determine the suitability for reuse and characterize for disposal.

UST Removal and Replacement, USPS Vehicle Maintenance Facility, Minneapolis, MN. Project Engineer. The USPS contracted with Amec Foster Wheeler to replace six diesel, gasoline, motor oil, and used oil USTs with three new USTs and an AST at a vehicle maintenance facility in Minneapolis, Minnesota. Mr. Marxen coordinated equipment submittals with the subcontractors, and guided Amec Foster Wheeler's construction manager during the project. He directed the collection of soil samples and a subsequent limited site investigation to determine the magnitude and extent of remaining contaminated soil.

Response Action Plan and Regulated Materials Survey, Melrose Riverview Addition, MPCA, Melrose, MN. Project Engineer. The City of Melrose and a private developer were seeking to redevelop a property on Melrose Lake. Mr. Marxen assisted prepare a Response Action Plan including excavating and managing contaminated soil. He developed a soil boring program to define the extent of contaminated soil that would be disturbed during development. Mr. Marxen also conducted an asbestos inspection and regulated materials survey on a vacant 1,300-square foot office building on the site in anticipation of demolition.

Remedial Action Plan, Former Depot, City of Hutchinson, Hutchinson, MN. Project Engineer. The former rail depot in Hutchinson, Minnesota soil impacted with petroleum and heavy metals. The City of Hutchinson wished to develop the site into a trailhead, and the Minnesota Pollution Control Agency contracted with Amec Foster Wheeler to prepare a response action plan (RAP) to address the impacts. Mr. Marxen worked with the City and MPCA to develop options for remediating the site to recreational standards. The selected option included excavating portions of the site to depths of two and four feet. Mr. Marxen assisted with preparing the cost estimate which included approximately $500,000 to excavate and dispose of 8,000 cubic yards of soil.

Phase I and II Environmental Site Assessments, Canadian Pacific Railway, Callaway and Strandquist, MN. Project Manager. Canadian Pacific Railway contracted with Amec Foster Wheeler to complete Phase I and Phase II Environmental Site Assessments (ESA) at two rail corridor and lease properties sites in northern Minnesota. During their history, the sites had been used for the transportation and storage of agricultural products. Mr. Marxen wrote the work plan and managed the project. Mr. Marxen coordinated the field work with the client, Amec Foster Wheeler's project team, and subcontractors. Mr. Marxen assisted with development of the work plan and Phase I and II ESA reports. His duties also included updating the client on project progress, and tracking budget and schedule.

Site Assessment and Regulated Materials Survey, CSM Investors Inc, St. Paul, MN. Project Engineer. The facility had manufactured adhesives since the 1950s. The site had petroleum and non-petroleum impacts from aboveground and underground storage tanks. Mr. Marxen helped develop a construction contingency plan and a development response action plan (DRAP) for the site. Mr. Marxen conducted a pre-demolition hazardous materials survey at the site. He also oversaw excavation of petroleum-impacted soil from under the footprint of the proposed new construction and placement of the material elsewhere on-site under paved areas and green spaces. Mr. Marxen also collected samples of residual material discovered in a sump during demolition of the existing structure.

Joseph Renier, PG

Scientist Lead

Classification
Scientist 2/Project Manager

OSHA Certification(s)
40-hr HAZWOPER with current 8-hr refresher

Years with Amec Foster Wheeler: 17

Years of Experience: 37

Education
MS, Geology

Regulatory Experience
CERCLA, RCRA, MPCA, WDNR, SDDENR, IDNR, NDDH

Licensing / Certifications
PG - Wisconsin

Mr. Renier has over 30 years of experience as a hydrogeologist, project manager and senior technical reviewer. Mr. Renier has extensive experience in remedial site investigation and is well-versed well and aquifer hydraulics, aquifer test interpretation, well and well field design. He also has experience in groundwater modeling, possesses an in-depth knowledge of water supply and monitoring well construction practices, drilling techniques, well rehabilitation and maintenance. Mr. Renier is also experienced with Resource Conservation and Recovery Act (RCRA) including waste management, remediation and spills. Mr. Renier has a thorough working knowledge of the MPCA Risk Based Site Evaluation Manual, UST and AST release cleanup guidance documents, VIC guidance documents and MDA guidance documents.

Relevant Work Experience

Regional Site Inspections for Per-fluorinated Compounds (PFCs), Multiple Air National Guard Installations, Minnesota, South Dakota and Kansas. Regional Base Lead. Mr. Renier is the Regional Base Lead for three Air National Guard (ANG) bases in Minnesota, South Dakota and Kansas for per-fluorinated compound (PFC) site inspections (SIs). SIs involve investigation of potential release locations (PRLs) of PFC containing aqueous film forming foam (AFFF) at multiple sites on the referenced installations. Inspections include soil boring and well installation with soil, groundwater, surface water and sediment sampling and analysis.

Remedial Investigation, Commercial Site, Upper Midwest. Project Manager. Mr. Renier is the Project Manager for a remedial investigation at a commercial site where soils have been impacted by polychlorinated biphenyls (PCBs) and metals associated with paper mill sludge and municipal wastes deposited in a former (buried) borrow pit complex. Investigated to determine nature and extent of PCBs and metals, first by conducting an electronic and physical regulatory file review to obtain historical aerial photo coverage and maps. These were used to help delineate the former borrow pit geometry/dimensions and document fill nature and extent within the pits. File review was followed by installing and sampling a series of soil borings and temporary monitoring wells via direct push drilling technology (DPT) across the site, and mapping the stratigraphic and analytical results. Analysis of PCB aroclors was conducted to assess potential sources of the PCBs detected, and a risk analysis using calculated exposure point concentrations (EPCs) for PCBs and metals was conducted to understand potential site risk due to PCB and metal impacts in near surface soils. Based on these results a site capping plan (using landscaping techniques) has been formulated and will be implemented to strategically cover those areas that could be of potential risk if disturbed.

Remedial Site Investigation, Confidential Laundering Facility, Outstate MN. Project Manager. Mr. Renier serves as Project Manager and provides technical guidance to the project team and develops project work plans, schedules and budgets, conducts meetings with the client and MPCA regarding project progress, reviews project reports, coordinates with subcontractors and completes project invoicing. The Site is an active confidential commercial laundering facility where soil, groundwater and soil vapor have been impacted by chemicals of potential concern (COPCs) associated with a former dry-clean operation that operated in the building from 1976 to 1990. The COPCs include tetrachoroethene (PCE) and degradation (daughter products) cis-1,2-dichloroethene (cis-1,2-DCE), trichloroethene (TCE) and vinyl chloride (VC). Currently conducting an on-going remedial investigation at the CLF. Investigated under the MPCA Voluntary Investigation and Clean-up (VIC) Program and

was then transferred to the MPCA Superfund Program. Completed Limited Groundwater Investigations, a Source Soil Investigation, a pilot study to evaluate the use of soil vapor extraction (SVE) and in-situ chemical oxidation as remedial alternatives for source area soil and groundwater, a vapor intrusion study, and annual groundwater and air monitoring. Completed a vadose zone response action plan (RAP) and installed and operated an SVE system for two years to facilitate source removal in the vadose zone beneath the building and has monitored soil vapor in the vapor intrusion wells south of the Site for the same period of time (2 years).

Site Investigation/Groundwater Monitoring Program, Shoreham Facility, Canadian Pacific, Minneapolis, MN. Senior Geologist/Technical Lead. As Senior Geologist and Technical Reviewer, Mr. Renier developed work plans, conducted field oversight, reviewed all project reports, developed and refined a site conceptual model, collaborated with all members of the project team including client, regulators and engineers from other consulting firms. Site investigation and characterization activities including installation of over 200 monitoring wells were completed at the Shoreham Rail Yard under the MPCA VIC and Superfund programs. Soil and groundwater contamination included volatile organic compounds, semi-volatile organic compounds and petroleum-related compounds in a highly complex glacial and karst environment where glacial material of varying composition overlays an incised bedrock surface creating complex groundwater flow directions and contaminant transport problems. Karst investigation included drilling and geologic and groundwater flow characterization of the dolomitic bedrock in the area of the site.

Underground Storage Tank (UST) Removal, Huron Rail Yard, Canadian Pacific, Huron, SD. Technical Lead. In his role of Technical Lead, Mr. Renier conducted development of work plans, field oversight, coordination of subcontractors; investigation derived waste management and disposal coordination. Conducted senior technical review of all reporting. Mitigated our client's liability by removing the abandoned tanks and by disposing of investigation derived waste in a cost-effective manner and in compliance with waste disposal regulations. Characterized the remaining impacts in the excavation sidewalls and bottom for the planning of subsequent investigations. Contracted by Canadian Pacific to conduct a Site investigation including UST removal at the Huron Rail Yard in South Dakota. During completion of a Phase I ESA, identified the presence of a former pintsch gas manufacturing plant with the potential presence for USTs to remain at the Site. Conducted a geophysical and trenching investigation which identified that three USTs remained at the Site. The USTs were identified as containing a mixture of water and floating product.

Remedial Site Investigation, Confidential Manufacturing Facility, Outstate MN. Senior Technical Advisor. As Senior Technical Advisor, Mr. Renier provides technical guidance and oversight to the project team, develops work plans and coordinates with the project manager, client and regulators. Mr. Renier also serves as technical review for all reporting and has conducting technical field oversight. The Site is an active confidential manufacturing facility where soil, groundwater and surface water have been impacted by chemicals of potential concern (COPCs) associated with wood preservation/treating and other plant operations. The COPCs include pentachlorophenol (PCP), mineral spirits and some chlorinated and non-chlorinated volatile organic compounds (VOCs). The remedial investigation is being performed under Resource Conservation and Recovery Act (RCRA) guidance in accordance with a consent decree issued by the Minnesota Pollution Control Agency (MPCA). Since the beginning of field investigation activities in the late 1980s, Phase I, Phase II, and subsequent investigations have been conducted by Amec Foster Wheeler and other consulting firms that have largely delineated the extent of contamination. Remedial activities that have been conducted include soil boring and monitoring well installation and sampling, regularly scheduled groundwater and surface water quality monitoring, recirculation line excavation and removal, installation and operation of a groundwater pump and treat system, drainage culvert

Matt Vavra

GIS/CADD Lead / Scientist

Mr. Vavra has 16 years of working experience in the field of GIS and environmental science. Mr. Vavra has experience in technical support and project delivery in a multitude of service lines, including GIS data analysis and mapping, database support, site investigation and monitoring, task and field management, PFAS investigation, soil vapor intrusion, NEPA analysis and documentation, utility siting and permitting, construction and demolition oversight, and general environmental science. With a Masters Degree in GIS, specializing in natural resources planning and management combined with a B.S. in Wildlife Biology, Mr. Vavra combines a thorough understanding of environmental science with the use of advanced data analysis.

Classification
GIS Lead/Scientist 2

OSHA Certification(s)
OSHA 1910.120 40-Hour HAZWOPER Certification

Years with Amec Foster Wheeler: 13

Years of Experience: 16

Education
Master of Science, GIS,

Bachelor of Science, Wildlife Biology

Relevant Work Experience

Closed Sites Regulatory File Review / Desktop Receptor Evaluation, MPCA, State-wide MN. GIS and Data Support. Evaluation of MPCA formerly closed environmental investigation sites to determine and rank the potential need for re-investigation for potential soil vapor intrusion concerns. Regulatory file reviews were completed for a number of formerly closed sites to determine whether remaining volatile contamination at the sites, if any, may pose a threat to area receptors. Identified sites were further analyzed through GIS to determine the number and proximity of various sensitive receptors (e.g. schools, medical facilities). Provided GIS support for the effort, including site identification and digitizing, sensitive receptor dataset formulation from State and County based records, and proximity analysis and tabulation. Resulting site cut sheets assisted the MPCA in determining a priority ranking of sites for further investigation.

Per- and Polyfluoroalkyl Substances Program State Inventory of Current Users, MPCA, State-wide MN. GIS and Data Support. County level surveys of potential PFAS users and their proximity to various identified receptors to aid MPCA in determining state-wide priorities for future anticipated PFAS investigations. Various industries likely to utilize PFAS in their processes/tasks were identified based on Federal industry databases and were subsequently geo-located, and categorized based on their proximity to various water receptors (e.g. water supply wells, Public Waters surface water bodies, wellhead protection areas, sensitive aquifers) and whether they had registered tanks or previous environmental investigations. Provided GIS support for the effort, including site identification and digitizing, receptor dataset formulation from State and County based records, and proximity analysis.

Shoreham Yard Remedial Investigation, Canadian Pacific, Minneapolis, MN. Program, Field, GIS, and Environmental Support. Ongoing remedial investigation and monitoring for the Shoreham rail yard in northern Minneapolis. Conducted semiannual groundwater sampling for a variety of petroleum products, creosote by-products and solvents, along with quarterly water level measurements. Performed GIS data and mapping functions in support of the ongoing monitoring program. Updated legacy data and imported new data into the existing site monitoring database. Managed a 1.5-million plus record site analytical database. Assisted in helping the client to acquire Petrofund Program funding for previous site investigation efforts. Oversaw pump maintenance and well rehabilitation efforts for the well network. Completed annual report drafting and edits, along with figure and table creation. Provided assistant project management oversight of the day-to-day operations including scheduling, deliverable tracking, cost estimation, task order management, vendor and subcontractor management, field crew management and leadership, and primary point of contact role.

Continued...

North and Vinland Landfills Operation, Maintenance, and Monitoring (OM&M), Georgia Pacific, Vinland Twp, WI. Program, Environmental, Field, and GIS Support. Management and completion of OM&M activities for one closed and one temporarily capped landfills containing paper mill related bulk sludge in eastern Wisconsin. Activities for the sites include semi-annual water sampling, leachate monitoring and system maintenance, landfill inspections, landfill gas monitoring, reporting, maintenance oversight, leachate disposal oversight, and life cycle planning. Organized and lead field sampling events, including scheduling, vendor coordination, and stakeholder communication. Provided subcontractor oversight and coordination for site maintenance and leachate hauling. Provided database support for historic and current analytical data. Drafted and coordinated reporting to State and local agencies. Assisted with the completion of site conceptual model formulation in support of requested reductions in monitoring scope. Assisted with Wisconsin DNR coordination leading to approval of scope changes. Provided assistant project management oversight of the day-to-day operations including scheduling, deliverable tracking, cost estimation, and work flow monitoring.

AFFF Release Areas TO 0004, AFCEC, San Antonio, TX. GIS Support. File review, documentation, and remediation planning and implementation regarding potential PFC contamination at multiple Air Force sites countrywide. Completed site research and potential contamination area delineation. Provided mapping and database support for the effort, including installation specific work plan mapping, site inspection report mapping, and well inventory mapping. Worked on over 15 bases nationwide. Submitted Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE) compliant data submittals, including mandated attributing and metadata.

Marvin Remedial Investigation, Marvin Windows, Warroad, MN. Field, Environmental, and GIS Support. Ongoing remedial investigation and monitoring support for the Marvin Windows plant in Warroad. Conducted semiannual surface and groundwater sampling to monitor for wood treatment by-product and petroleum plumes on the site. Completed annual report drafting and edits, along with figure and table creation. Conducted passive soil gas (PSG) sampling to focus further investigation.

AmeriPride Remedial Investigation, AmeriPride Services Inc, Hibbing, MN. Field, Environmental, and GIS Support. Ongoing remedial investigation and monitoring of a historic dry-cleaning chemical spill for the AmeriPride plant in Hibbing. Conducted groundwater sampling to verify plume stability. Conducted periodic indoor air monitoring and exterior soil vapor intrusion sampling for VOCs by Summa canister. Installed and periodically sampled sub-slab soil vapor sample. Provided confirmation sampling for SVE and SSDS effectiveness.

GP Ashwaubenon PCB Impact Review, Georgia Pacific, Ashwaubenon, WI. GIS, Environmental, and Field Support. Regulatory file review and synopsis, with further site investigation in support of potential litigation surrounding a former paper sludge and municipal landfill located in Ashwaubenon, WI. Historical photo review to estimate the potential extent of the former landfill. Review and synopsis of previous studies conducted on the site, including review of soil boring logs, locations, and PCB analytical results. Mapping support for client communications and limited site investigation activities at the adjacent apartment complex. Conducted hand auger soil sampling to further delineate the northern boundary of contamination.

Montana Tie, Montana Alberta Tie, Ltd., Great Falls, MT. GIS, Permitting, and Field Support. Two hundred plus mile transmission line siting and permitting project between Lethbridge Canada and Great Falls Montana. Performed GIS, database, and permitting support for the 130-mile U.S. portion. Acquired and analyzed GIS information for a five-county area, 1.5-million-acre study area. Digitized initial routes and performed ongoing GIS line edits to establish final routes. Performed ongoing map, route editing and data support for over five years of continuing route modification and client/government/citizen interaction.

GIS Support for Multiple SI/RI Projects, MPCA, State-wide MN. GIS Support. GIS mapping, analysis, and data support for over 20 site investigation and/or remedial projects conducted under the MPCA Superfund and Petroleum Remediation programs.

Marie Bevier, CHMM

QA/QC Officer

Ms. Bevier has 24 years of environmental chemistry experience. She has an in-depth working knowledge of United States Environmental Protection Agency (EPA) environmental analytical methods and EPA contract Laboratory Program (CLP) National Functional Guidelines for Data Review. Her experience includes environmental analysis, data verification and validation, preparation of quality assurance documentation, and coordination of subcontracting laboratories. In her experience at Amec Foster Wheeler, Ms. Bevier has specified analytical methods, outlined data deliverables, and prepared tables of laboratory detection limits, regulatory compliance limits, and method and matrix-specific sampling, QC, and cleanup guidelines for project-specific quality assurance project plans (QAPPs) and sampling and analysis plans (SAPs). Ms. Bevier has performed data verification and validation using CLP guidelines, EPA QA/G-8 guidelines, EPA regional guidelines, and her knowledge of environmental analytical methods and QC requirements on data from a number of Superfund sites. She has also performed validation on data used for NPDES discharge compliance, routine monitoring, and human health risk assessment. Ms. Bevier has provided data quality assurance and quality control (QA/QC) for the Minneapolis office for over 15 years and has a thorough working knowledge of the MPCA quality management plan

Classification
QA/QC Officer

OSHA Certification(s)
-

Years with Amec Foster Wheeler: 21

Years of Experience: 21

Education
Bachelor of Science, Liberal Arts with Chemistry Emphasis, The Evergreen State College, 1992

Regulatory Experience
CERCLA, RCRA, MPCA,

Relevant Work Experience

Regional Site Inspections for Per-fluorinated Compounds (PFCs), Multiple Air National Guard Installations, Minnesota, South Dakota and Kansas. QA/QC Officer. Provided laboratory analytical services including developing QAPP and data validation services for a CERCLA remedial investigation to delineate the extent of perfluorinated substances (PFASs), volatile organic compounds (VOCs), lead, and petroleum released to the environment at a former fire training area (FTA) operated by the Air National Guard. The project involved collecting 48 soil samples from 24 borings, installing new monitoring wells followed by two rounds of groundwater sampling, and collecting sediment samples from catch basins at discharge points to surface waterbodies.

Remedial Site Investigation, Confidential Manufacturing Facility, Outstate MN. QA/QC Officer. Ms. Bevier conducted QA/QC of soil and groundwater analytical data to evaluate the usability of the data including data package completeness, chain of custody (COC) compliance, holding time compliance, presence or absence of laboratory contamination (as demonstrated by method and trip blanks), accuracy and bias (as demonstrated by surrogate and spike recovery) and analytical precision as relative percent difference. The data quality review was conducted in general accordance with the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review.

Remedial Site Investigation, Confidential Dry-cleaning Facility, Outstate MN. QA/QC Officer. Ms. Bevier conducted QA/QC of soil vapor, air and groundwater analytical data to evaluate the usability of the data including data package completeness, chain of custody (COC) compliance, holding time compliance, presence or absence of laboratory contamination (as demonstrated by method and trip blanks), accuracy and bias (as demonstrated by surrogate and spike recovery) and analytical precision as relative percent difference. The data quality review was conducted in general accordance with the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review and the Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography (EPA, 1999).

Continued...

Groundwater Monitoring Program, Shoreham Facility, Canadian Pacific, Minneapolis, MN. QA/QC Officer. Site investigation activities including the installation of over 200 monitoring wells were completed at the Shoreham facility under the MPCA VIC Program. Ms. Bevier has conducted ongoing QA/QC of analytical data to evaluate the data usability per the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review. The QA/QC includes a review of data package completeness, chain of custody (COC) compliance, holding time compliance, presence or absence of laboratory contamination (as demonstrated by method and trip blanks), accuracy and bias (as demonstrated by surrogate and spike recovery) and analytical precision as relative percent difference. Ms. Bevier also completes summary reports describing findings from the data quality review.

Phase I/II Site Investigation, Otisco Railroad Corridor, Waseca County, MN. QA/QC Officer. Amec Foster Wheeler was contracted by Canadian Pacific to conduct Phase I/II environmental site assessments at the Otisco Railroad Corridor in order to evaluate potential soil and groundwater contamination at the Site. Ms. Bevier conducted QA/QC of soil and groundwater analytical data to evaluate the usability of the data including data package completeness, chain of custody (COC) compliance, holding time compliance, presence or absence of laboratory contamination (as demonstrated by method and trip blanks), accuracy and bias (as demonstrated by surrogate and spike recovery) and analytical precision as relative percent difference. The data quality review was conducted in general accordance with the EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review.

Deborah Barsotti, PhD, DABT

Human Health Risk Assessor

Dr. Barsotti has more than two decades of experience focused on risk-based solutions for environmental problems. As a Diplomate of the American Board of Toxicology, Dr. Barsotti promotes the use of sound science when conducting human health and ecological risk assessments for use making risk management decisions. She has extensive experience dealing with the toxicological and risk assessment issues surrounding a variety of relevant issues and substances including manufactured gas plants (MGP), polychlorinated biphenyls (PCBs), polychlorinated dioxins and furans, polyaromatic hydrocarbons (PAHs), petroleum hydrocarbons, chlorinated solvents, 1,4 dioxane, arsenic, lead, hexavalent chromium and other metals. In addition, Dr. Barsotti is a recognized published expert on numerous substances including PCBs and dioxin/furan toxicity and risk assessment. In her role as Director of Toxicology and ATSDR, she participated in the identification of and research needs for emerging chemicals such as 1,4-dioxane and PFASs. She serves as the subject matter expert for vapor intrusion including toxicology and risk assessment of potential indoor air impacts.

Classification
Human Health Risk Assessor 3

OSHA Certification(s)
-

Years with Amec Foster Wheeler: 22

Years of Experience: 25

Education
Doctor of Philosophy (PhD), Pathology, 1980

Bachelor of Arts, Biology with Medical Technology Option, 1972

Regulatory Experience
CERCLA, RCRA

Licensing / Certifications
Diplomate, American Board of Toxicology

Relevant Work Experience

US Army, Technical Assistance, Joliet Army Ammunition Plant, Human and Ecological Risk Assessment, Joliet, IL. Risk Assessor. Provided technical input to address the Army's remediation and transfer of properties to the trustees; includes technical strategy presentations and negotiations with EPA Region 5, Illinois DEP, Illinois Fish and Game and US Department of Agriculture; the objective is to transfer the properties remediated to the intended use (industrial/commercial) yet to address the ecological damage concerns for future land use, e.g., long-grass prairie on a cost-effective fashion.

US Army, Technical Assistance, Louisiana Army Ammunition Plant Human and Ecological Risk Assessment, Shreveport, LA. Risk Assessor. Assisted the Army in developing a strategy for protecting human health and the environment in a cost-effective and technically sound fashion; determining naturally occurring background concentrations to eliminate "risks" not associated with site activities; developing exposure point concentrations rather than using maximum concentrations for assessing relevant receptors, identifying realistic exposure assumptions and receptors.

Big River Mine Tailing Superfund Site (BRMTS), Missouri, OU-2 Feasibility Study (FS). Human Health Risk Assessor. As part of the FS team and responsible for the baseline human health risk assessment for the nonresidential soils (banks and floodplain) as well as other media within the watershed, background lead conditions and bioavailability of lead and other metals were brought to bear in understanding the potential risk posed by the mine tailings (predominately lead but also barium, cadmium, zinc) in floodplains and sediment within the Big River Watershed. Recreational use including swimming, hiking and fish consumption was assessed for adult and children.

Chevron Corporation Perth Amboy Refinery RCRA Facility Investigation (RFI), Chevron Corporation, Perth Amboy, NJ. Project Manager. Responsible for providing management and principal scientist oversight of all phases, and regular interaction with client; used Synthetic Precipitation Leaching Procedure (SPLP) for weathered petroleum product including tars and asphalts to address NJDEP's conservative impact to groundwater and free and residual product concerns; developed a risk-based prioritization system for LNAPL areas; developed technical position for ammonia criteria in groundwater to change NJDEP's interim specific

ammonia groundwater criterion; conducting Environmental Indicator (EI) report for submission to EPA Region 2. Corrective Action and other environmental services for a 368-acre, operating refinery and storage complex, in operation since the late 1800s, featuring wharf, processing and storage facilities. Conducted regulatory and permitting negotiations, prepared work plan, performed multi-phased site investigations, conducted groundwater monitoring and soil sampling, performed LNAPL delineation, enacted interim stabilization measures, developed GIS data management system, completed corrective measures study (CAMU and GW strategy) and remedial life-cycle cost and liability evaluation / analysis, and provided health and safety, strategic planning, community relations and CAD support.

Technical Member, the Chemical Council's Hexavalent Chromium Panel. As a technical panel member, Dr. Barsotti determined focus of and peer reviewed results of studies to address the critical data needs for oral exposure to hexavalent chromium. As a result, a series of state of the art, peer-reviewed mode of action studies provides clear data that can help regulators confidently set safe drinking water standards and other environmental cleanup levels for hexavalent chromium. This research includes four multifaceted studies using cutting-edge science and advanced approaches for toxicity testing, including:

a. Comprehensive examination of the genomic changes that precede tumor formation;
b. Biochemical and cytogenetic investigations to evaluate mutations, genotoxicity, and other potential key events in the mode of action;
c. An in vitro high-content imaging study to investigate key events of the mode of action; and
d. A pharmacokinetic study (absorption, distribution and deposition of hexavalent chromium in tissues in the body) to develop the data supporting physiologically-based pharmacokinetic (PBPK) models.

PSEG Construction Worker Risk Assessment, New Jersey. Technical Lead. For three fossil fuel generating stations, PSEG Services Corporation requested that Harding ESE perform a health and ecological risk assessment concerning potential construction activities at the stations in former fly ash ponds and/or ash fill. The proposed construction sites were typically underlain with fill material consisting of ash, cinders, and slag; fly ash analytical data was used to assess potential exposures by construction workers and ecological receptors as well as the potential to leach to groundwater; for direct contact (ingestion, inhalation and dermal absorption), the principle constituents of interest to human health (exceeded health based cleanup criteria) included arsenic and beryllium. Constituents of ecological concern included mercury, selenium, vanadium and zinc; based on exposure point concentrations (rather than maximum concentrations), demonstrated the lack of unacceptable risks or hazards to human and ecological receptors; using the synthetic precipitation leaching procedure (SPLP) and dilution attenuation fact, could demonstrate that fly and bottom ash constituents did not impact groundwater above groundwater criteria or background concentrations.

Anthony Rodolakis

Ecological Risk Assessor

Mr. Rodolakis has 24 years of experience directing, managing and executing ecological risk assessments and other hazardous waste and environmental permitting projects. He has performed risk assessments and impact studies following national USEPA, Environment Canada, Australian EPA, and other internationally recognized programs across North America, South America, and the Caribbean including CERCLA, RCRA, and more than 25 states and provincial programs. Project sites include landfills, mining, petroleum, port, manufacturing, and commercial sites. Mr. Rodolakis applies site-specific weight of evidence approaches to ecological risk assessment based on state-of-the art science to help clients eliminate negligible exposure pathways and chemicals from costly investigation, and to reduce mitigation efforts by developing risk-based clean-up goals. Mr. Rodolakis also specializes in habitat assessment and emerging contaminants.

Classification
Ecological Risk Assessor 3

OSHA Certification(s)
-

Years with Amec Foster Wheeler: 13

Years of Experience: 24

Education
Master of Environmental Science, Aquatic Ecology, 2000

Bachelor of Science, Biology, 1994

Regulatory Experience
CERCLA, RCRA, MPCA, WDNR, SDDENR, IDNR, NDDH

Relevant Work Experience

Regional Site Inspections for Per-fluorinated Compounds (PFCs), Multiple Air National Guard Installations, Minnesota, South Dakota and Kansas. Lead Ecological Risk Assessor. Provided senior technical review of a CERCLA remedial investigation to delineate the extent of perfluorinated substances (PFASs), volatile organic compounds (VOCs), lead, and petroleum released to the environment at a former fire training area (FTA) operated by the Air National Guard. The project involved collecting 48 soil samples from 24 borings, installing new monitoring wells followed by two rounds of groundwater sampling, and collecting sediment samples from catch basins at discharge points to surface waterbodies. Mr. Rodolakis compared laboratory reporting limits for each parameter to promulgated medium-specific ecological risk-based screening benchmarks to ensure that results would be reported at concentrations sufficient for use in an ecological risk assessment. A screening level ecological risk assessment (SLERA) compared soil concentrations to ecological benchmarks. Food chain models using biota-soil-uptake factors (BSAFs) and toxicity reference values (TRVs) obtained from the scientific literature were also conducted to refine risk estimates to birds and mammals. The SLERA found that there were no adverse effects to the environment from PFAS in soil.

Department of Defence (DOD) PFAS Site Investigation, HMAS Stirling, Perth, WA, Australia. Lead Ecological Risk Assessor. Directing strategy and technical approach for assessing ecological risk from PFAS to land, freshwater, and marine environments at an active navy installation where aqueous film forming foam (AFFF) was stored and used. Collaborated on the conceptual design and execution of an “outside-in” approach that prioritizes characterizing off-site exposures at the beginning of the investigation process to help the client get ahead of risk and public relations management. The program is being administered under intense public and regulatory scrutiny to meet time critical deadlines.

Authored a technical memorandum comparing PFAS concentrations in upland (soil) and marine (surface water, sediment, sediment porewater) environments to international (Australian) ecological screening benchmarks protective of direct contact and benchmarks (UK, Canadian) protective of food chain exposures. While PFASs in undeveloped areas and the ocean were compared to stringent protection levels, PFASs in active areas were compared to industrial/commercial standards in recognition of their ongoing use. The technical memorandum eliminated the for further risk evaluation in site uplands found but that data gaps associated with marine exposures required additional delineation of nature and extent of release at the sediment/porewater interface

and testing of macroinvertebrate tissue. To address these data gaps, Mr. Rodolakis developed a baseline ecological risk assessment (BERA) Sampling & Analysis Plan that focuses on sampling ecological food items (mussels, crabs, amphipods, sand worms, seagrass, fish, and bird eggs) to quantify effects of PFAS on the food chain and on bird and mammal receptors at 6 Areas of Concern, including a fire training area (FTA), demolition grounds, waste water treatment plant, helicopter support facility, aviation carrier turbine (AVCAT) fuel storage farm, fire station, flammable/hazardous goods and waste storage, ship sullage, and dredged sediment storage.

Litigation Support, TCE Site, Remedial Investigation Peer Review, Confidential Client, PA. Lead Ecological Risk Assessor. Mr. Rodolakis performed 3rd party peer review of a Draft Screening Level Ecological Risk Assessment (SLERA) Report in anticipation of federal CERCLA litigation. Found that overall, the SLERA takes a circuitous route riddled with technical deficiencies that would not pass USEPA's review and recommend corrective actions. Despite the deficiencies, the SLERA manages to arrive at some of the same conclusions that would have been arrived at had the SLERA been correctly executed. Found that a more aggressive approach to the SLERA would be able to argue more strongly and more convincingly that no further assessment of ecological risk is necessary.

Buried Waste Superfund Site, Confidential Client, Midwest, USA. Lead Ecological Risk Assessor. Authored Screening Level Ecological Risk Assessment (SLERA) at a 40-acre recreational park constructed on top of buried industrial waste. Upland habitats consisted of manicured lawns and landscaped trees. Aquatic habitats consisted of a 4-acre pond originally constructed as a stormwater treatment and infiltration basic. The large site was divided into 32 grid-cells, each approximately 1 acre in area. Within each cell, four composite samples were collected for laboratory analysis. Each composite sample consisted of five discrete subsamples collected from a depth of 0-0.5 feet within a 5-ft diameter of each other. Sediment samples consisted of discrete samples. The SLERA concluded that a Baseline Ecological Risk Assessment (BERA) was not necessary considering site-wide exposure concentrations and possible sources of ongoing non-site related contamination.

Shpack Landfill Superfund Site, USEPA Region I RAC, Attleboro, MA. Lead Ecological Risk Assessor. Mr. Rodolakis prepared a screening-level ecological risk assessment (SLERA) and Baseline Ecological Risk Assessment (BERA) for a radioactive waste landfill. Mr. Rodolakis successfully persuaded federal environmental regulators to eliminate radiological exposure from the scope of work and to focus the BERA only on chemical exposure. The BERA addressed five areas of concern, include an aquatic exposure area consisting of an approximately 20 hectare wetland inhabited by the protected spotted turtle (Clemmys guttata), a hardwood forest, an upland meadow, and open chemical burn pit.

Landfill Superfund Site CERCLA Investigation and Related Services, Confidential Client, Winthrop, ME. Lead Ecological Risk Assessor. Responsible for identifying ARARs and devising sampling strategy to collect and analyze surface water and sediment toxicity samples; interpreted toxicity test results; coordinated investigation and findings with USEPA Region I and Maine DEP; identified precedents in existing RODs for permissible risk management options included armoring a 100 square-foot of the banks and stream bottom. Scope: Environmental services for CERCLA investigation, risk assessment, remedial design, construction management and remedial systems optimization for 16-acre closed municipal landfill on the NPL (Superfund list) bounded by wetlands, streams and lake. Primary contaminants of concern were VOCs; leachate plume from landfill contained anomalous arsenic concentrations.

Hannah Albertus-Benham, PE

On-Site Inspector / Field Technician Lead

Ms. Albertus-Benham has eight years of experience in the environment and water resources field following completion of a Master's Degree in Civil Engineering. She has worked on a wide variety of projects, including site investigations at government and private/ commercial/ industrial sites involving soil, groundwater and soil vapor contamination according to MPCA guidance; various work involving the emerging contaminants per- and polyfluoroalkyl substances (PFAS), including site investigations field management, reporting, and tabletop research; environmental remediation systems writing SOPs, providing technical assistance with OM&M, as well as specifications for construction and/or demolition; stormwater plan (SWPPP) design and inspections; Phase I and Phase II environmental assessments in rural and urban settings; SPCC plans and inspections at industrial/commercial facilities; and construction and demolition management and oversight at UST facilities. Outside of work, she also participates in multiple engineering and environmental professional societies and has been actively involved in the Interstate Technology & Regulatory Council (ITRC) PFAS Team, developing sampling protocols as well as the regulatory environment surrounding use of PFAS-containing AFFF.

Relevant Work Experience

Storage Tank Removal/Installation, United States Postal Service, Minneapolis, MN. Construction Supervisor/Environmental Professional. Ensured demolition, underground storage tank removals (x6), tank installations (3 USTs, 1 AST, and related pumps and piping) and related construction activities were completed according to drawings and specifications at vehicle maintenance facility; regularly called out discrepancies between contractor materials or methods and the specifications. Completed daily and weekly reporting with photo logs. Completed environmental sampling and documentation for former site tank closure according to MPCA PRP guidance, including a LSI due to a small leak discovered during excavation. Completed safety oversight during all site activities. Consistent attention to detail and working well in a team environment helped Ms. Albertus-Benham ensure all client requirements were met.

Groundwater Extraction/Treatment System Commissioning and O&M, Manufacturing Facility, Golden Valley, MN. Field Engineer. Conducted commissioning of a granular activated carbon (GAC) groundwater remediation system at a large TCE-related MPCA Superfund site consisting of system troubleshooting, coordination with subcontractors, system sampling, task management, and communication with various stakeholders. Reviewed specifications and compared to system equipment, instrumentation and materials. Reviewed submittals from subcontractors. Consistent attention to detail and working well in a team environment helped Ms. Albertus-Benham ensure a successful O&M program into the future.

PFASs Release Detection, Delineation, and Remediation at 39 BRAC (former USAF) Bases, U.S. Air Force Civil Engineer Center (AFCEC), Holloman AFB and Cannon AFB, NM. Field Manager. Coordinated field activities for site investigation of potential PFAS contamination resulting from release of AFFF from firefighting activities at two bases in NM. Ms. Albertus-Benham coordinated the field activities, including hollow stem auger drilling oversight; soil logging; well development oversight and sampling via drilling subcontractor; soil, groundwater and surface water sampling; all using PFAS-free protocols; as well as safety oversight and waste management. This also included upfront permitting and coordination according to base procedures. Ms. Albertus-Benham received very high commendations from the base contacts for her communication of progress or challenges encountered and responsiveness throughout the project which ensured project timeliness and success.

Rolling Hills Estates Former Dump Site, Private Client, Maplewood, MN. Field Engineer. Conducted a Limited Phase II Investigation (Phase II) at a portion of an approximately 74-acre parcel of land operating as a manufactured home park which,

Classification
On-Site Inspector (OSI) / Engineer 2

OSHA Certification(s)
40-hr HAZWOPER

30-hr Construction Safety

Years with Amec Foster Wheeler: 5

Years of Experience: 8

Education
BS/MS Civil Engineering

Regulatory Experience
MPCA RBSE, UST/AST, VIC, SDDENR

Licensing / Certifications
Professional Engineer, MN, 53152, 2015

Erosion and Stormwater Management Certification, University of Minnesota: Construction Site Management (Exp. May 31, 2018); BMP Maintenance (Exp. May 31, 2018); Construction Installer (Exp. May 31, 2018)

Asbestos Inspector, Minnesota Department of Health, Exp. March 27, 2020

Specialized Training
CPR/First Aid, American Red Cross, Exp. June 16, 2019

during the Phase I ESA, was found to have a dumpsite ("Maplewood dump") which encroached onto the Site in the northwest corner. In addition, due to the location of the Site relative to the Oakdale Dump, an existing and well-documented regional-level PFAS plume, Amec Foster Wheeler (Ms. Albertus-Benham) also reviewed available information to evaluate if the Site is within an area of former and/or active PFAS investigation for groundwater contamination. To address the possible encroachment of the Maplewood dump onto the Site, Amec Foster Wheeler conducted Phase II activities including soil, soil vapor, and groundwater sampling, all utilizing Direct Push Technology drilling. Observations made during the field activities include the presence of landfill debris in four of the six soil borings, but the groundwater did not exhibit detections above applicable criteria. Methane detections were observed in all five soil vapor samples from the subsurface of the portion of the property which overlies the former dump, with elevated detections in four of those samples above the National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life and Health (IDLH) value for methane in human occupied spaces of 5,000 ppm. As a result, Amec Foster Wheeler conducted a sewer vapor survey to address the possible pathway for methane within utility corridors. Ms. Albertus-Benham assisted with the field work, collecting samples from each of the media types, provided contractor oversight, and completed reporting.

Ford Decommissioning, Ford Motor Company, St. Paul, MN. Environmental Project Management/SWPPP Design and Implementation. Project involved environmental engineering and regulated materials planning relative to de-commissioning process at Ford's Twin Cities Assembly Plant. Coordinated with client and regulatory entities, including MN Department of Health, MN Department of Natural Resources, and MPCA, to ensure appropriate permits are addressed to update the SWPPP for the demolition of a vehicle assembly plant adjacent to the Mississippi River. Completed Stormwater Pollution Prevention Plan document for the project, including several revisions throughout the course of the project. Currently assisting with additional stormwater management issues that arise and assist with weekly inspections when needed.

Fire Water Tank EPC at a Refinery, Private Client, Southeast Minnesota. Environmental Project Management/SWPPP Design and Implementation. Coordinated with client and regulatory entities to ensure appropriate permits are addressed for the construction of a 6-million-gallon fire water supply tank, associated pumps and groundwater well at a refinery within 1 mile of the Mississippi River. Submitted pre-construction Conditional Land Use Permit application and coordinated follow-up with client and city planner. Completed Stormwater Pollution Prevention Plan design and document for the project, including several revisions throughout the course of the project. Completed Metropolitan Council Environmental Services (MCES) permit application for the discharge of hundreds of thousands of gallons of waste water during the groundwater well drilling, coordinate management of the water, and conducted regular sampling of the water during the four weeks of drilling. Conducted weekly stormwater inspections and worked closely with construction manager to ensure requirements of the SWPPP were met and documentation was in place at all times.

Java Detour/Former Gas Station, MPCA, Rochester, MN. Project Manager. Conducted a Limited Site Investigation (LSI) at a former gas station site to evaluate soil, soil vapor and groundwater impacts associated with a petroleum leak that was detected during a highway construction project adjoining the Site. Coordinated site access with multiple stakeholders including city, county and state planning officials, the current Site and neighboring property owner(s), the site and neighboring property occupant(s), and third-party consultants working on behalf of the property owner. Coordinated with drilling and laboratory analytical subcontractors in accordance with MPCA contract protocols. Conducted a receptor survey including identification of potential receptors within 500-feet of the Site and sewer vapor sampling.

Former Schloff Chemical Superfund Site, MPCA, St. Louis Park, MN. Assistant Project Manager & Field Engineer. In 2014, Amec Foster Wheeler was the lead contractor for installation of a Soil Vapor Extraction (SVE) system after determining that trichloroethene (TCE) and tetrachloroethylene (PCE) contamination was impacting the site as a result of a former dry-cleaning facility. Ms. Albertus-Benham worked closely with the MPCA, reviewed historical reports, reviewed technical specifications for and oversaw installation of the SVE system, continued the groundwater monitoring program, and updated the site conceptual model. Conducts SVE system monitoring, sub-slab vapor monitoring, and groundwater sampling at the site on a regular basis and in accordance with MPCA guidance. Additionally, conducts investigation derived waste management, data management, and reporting activities for this on-going Superfund site.

Dave Woodward

Scientist 2
Subject Matter Expert ~ Remediation

Mr. Woodward has 32 years of experience in environmental consulting with a significant focus on research and development (R&D) and emerging contaminants. He has managed and served as Technical Program Director for large scale (>$500 million) remedial programs in the United States, South America, Canada, Mexico, Australia, and throughout Europe. He also has experience managing and supporting large scale RCRA, CERCLA, Department of Defence (DOD), and state lead projects. He has authored or co-authored over 100 publications, given over 50 platform conference presentations, served as an invited expert panelist at leading remediation conferences, led the development of numerous state policies/guidance, ITRC guidance and ASTM standards, and prepared 100's of technical reports covering all aspects of soil and groundwater investigation and remediation. He has also developed several Corporate Green and Sustainable Remediation Programs

Mr. Woodward has over 10 years of experience conducting PFAS investigations and remediation for private industry, the Australian DOD, and the U.S. DOD in the U.S. Canada, Europe, and Australia. He also has led and supported PFAS R&D for the American Petroleum Institute, U.S. Air Force, Canadian Government, and on a SERDP SEED project. He also has significant 1,4 Dioxane remediation experience and has conducted 1,4 Dioxane R&D under U.S. Air Force, SERDP, and ESTCP R&D grants.

Classification
Scientist 2

Years with Amec Foster Wheeler: 27

Years of Experience: 32

Education
Bachelor of Science, Earth Sciences, Cartography, Mined Land Reclamation, 1984

Regulatory Experience
Interstate Technology & Regulatory Council

Relevant Work Experience

Confidential Fire-Fighting Equipment Manufacturer, Fire Training Center Remediation, Waderslough, Germany. Served as a Project Advisor on the remediation of a large fire training center impacted with comingled PFASs, petroleum hydrocarbons, and chlorinated VOCs. The remediation involved the capping and containment of soil, installation of a groundwater containment and GAC treatment system, and excavating and reconstructing a contaminated pond.

U.S. Naval Facilities Command (NAVFAC), Former NAS Joint Reserve Base Willow Grove, Willow Grove, PA. Served as Project Advisor for evaluating remediation alternatives for the PFAS-impacted site and providing overall remediation strategy support.

Air National Guard (ANG), Delaware ANG Base, Investigation and Remediation, New Castle, DE. Project Advisor. Performance-based task order for investigation and remediation of four sites. Project will result in regulatory closure of two sites and will advance the remaining two sites through the Record of Decision (ROD) phase under the CERCLA process. Also serving as technical advisor for PFAS investigation and offsite source study.

Confidential Client, Greer, SC. Technical advisor on a corrective measures study and pilot testing to remediate a large 1,4 dioxane plume in a fractured rock aquifer. The project involves the use of innovative aerobic cometabolic biosparging using propane injection, which will be the first time this technology has been demonstrated in the field.

Confidential Client, Worldwide Remediation Support. Served as the outsourced global coordinator for European remediation projects. Provided ongoing technical support on several large remediation projects in the US and

Continued...

South America. Also provided remediation and asset retirement obligation liability forecasting support in accordance with the Sarbanes-Oxley Act.

Confidential Client, Chemtronics Superfund Site, North Carolina. Technical advisor providing strategic consulting for one responsible party and providing direct oversight coordination on behalf of the client. This project involves both CERCLA and RCRA issues and the remediation of chlorinated solvents, explosives, propellants and perchlorate in groundwater.

Confidential Client, Orlando, FL. Technical advisor on a large multi-plume RCRA Corrective Action remediation project associated with several landfills. Remediation technologies include: air sparging; chemical oxidation; and reductive dechlorination. The project was successfully performed at a fixed cost under a performance-based contract.

Confidential Client, CERCLA Management Activities, Multiple Locations. Managed a project involving the development and implementation of an innovative Superfund portfolio tracking and strategic management process. Continuing to track the status of CERCLA activities at more than 50 sites that include multiple third party PRPs. Maintained a database to compile site information, coordinate the status of environmental activities, track financial information, and assess additional future potential client liabilities. Also managed participation in PRP technical committees at several of the Superfund sites.

U.S. Air Force Civil Engineer Center, Broad Agency Announcement R&D-Treatment of PFASs. Conducted PFAS treatment laboratory and field research using Enzyme Catalyzed Oxidative Coupling (ECOC) Technology. Preliminary data resulted in expansion of the project to also include ex situ ECOC treatment using GAC to temporarily adsorb PFASs while also serving as an enzymatic growth substrate for subsequent PFAS enzymatic degradation and GAC regeneration.

Confidential Industrial Client, Decatur, AL. Served as Project Advisor on a PFAS project involving the characterization of PFASs in surface water, sediments, soil, groundwater, agricultural crops, and livestock. The PFASs originated in wastewater biosolids from a municipal wastewater treatment plant. The biosolids were beneficially reused as fertilizer on agricultural fields across several rural Counties and resulted in PFAS contamination throughout the food chain and dozens of impacted groundwater supply wells. The project is currently the subject of several class action lawsuits.

Confidential Industrial Client, Uppsala, Sweden. Served as Project Advisor and technical lead on a source study and site-wide investigation of PFAS impacts at an active pharmaceutical manufacturing facility. Also provided consulting associated with an emergency accidental AFFF release and infrastructure cleaning during facility transition from C8 to C6 foam. Also provided consulting associated with offsite drinking water impacts in a nearby city and supported identification of other offsite sources.

Confidential Industrial Client, Milwaukee, WI. Provided strategic consulting on a research and development project associated with treating PFAS in a wastewater stream. Several different novel technologies and combinations of technologies were evaluated.

NAVFAC Atlantic, Naval Air Station, New Brunswick, ME. Serving as Project Advisor on a large Naval Air Station impacted by PFASs. Characterization of the site has focused on a variety of sources including a landfill, several chromium plating areas, a former fire training area, and several AFFF storage areas.

American Petroleum Institute. Served as the Project Director and Principal Author for a PFAS Literature Review and development of a PFAS White Paper.

Carla Landrum, PhD

Scientist 2

Subject Matter Expert ~ Geostatistics and Data Management

Classification
Scientist 2

Years with Amec Foster Wheeler: 3

Years of Experience: 10

Education
PhD, Soil Science / Geostatistics, University of Kentucky, 2013
MS, Geosciences, University of Tulsa, 2010
BS, Biogeosciences, University of Tulsa, 2007

Regulatory Experience
Modeling using state and federal regulatory frameworks

Location
Whiterock, CA

Dr. Landrum has 10 years of experience in geostatistical (2D and 3D), geospatial, statistical, and time series modeling with a focus in water resource management and environmental remediation. She employs techniques prescribed in state and federal environmental regulatory frameworks, in addition to more novel techniques, to quickly and defensibly process information from environmental data. She uses streamlined information frameworks to build real-time and defensible conceptual site models (CSM) that are applicable throughout the project lifecycle. Dr. Landrum approaches data analysis as an evolving and multidisciplinary process that requires standard quality procedures, strong teamwork collaboration, and streamlined data workflow and information services.

Her current services help project team members make cost effective and defensible project decisions regarding environmental site characterization, risk assessment, remedial design, and site closure. She works closely with hydrogeologists, geologists, geochemists, ecologists, risk assessors and engineers to: optimize sampling and monitoring programs; model and reduce sampling uncertainty; pinpoint source(s), spatial extent(s), and potential migration pathway(s) of constituents; generate cost and uncertainty scenarios for remedial assessment and design; predict surface areas and volumes of impacted earth material(s); and generate probabilistic environmental and cultural resource models.

Relevant Work Experience

Geostatistics Task Lead, Landfill Site Groundwater Sampling Optimization. Data-driven sampling frequency optimization for an interwell groundwater monitoring well network. Temporal trends are assessed using linear and seasonal temporal models. Optimization criteria are set using non-detectable sample concentration frequencies and/or using the temporal variance in the well constituent sample data. Parallel statistical analyses include calculating background threshold values for compliance assessment in addition to groundwater fingerprinting to help the assess adequacy and representativeness of background well designations.

Assistant Project Manager and Statistical Modeling Task Lead, Coal Combustion Residual (CCR) Groundwater Compliance Monitoring. Conceptual site model development and statistical data analyses to assess site groundwater compliance in accordance with CCR Rule requirements (40 CFR Section 257.93). Assessing data gaps and uncertainty in current groundwater monitoring network; providing guidance to optimize groundwater monitoring network performance. Using statistical "fingerprinting" analysis to investigate potential alternative sources. Performing groundwater compliance statistical analyses in accordance with EPA's Unified Guidance. Using ArcGIS, R, ProUCL, Isatis and GWSTAT software packages.

Geostatistical Task Lead, Groundwater Compliance Monitoring and Conceptual Site Model Development. Data-driven groundwater conceptual site model development, sampling design and groundwater monitoring network optimization. Constituents of concern include heavy metals, salts and hydrocarbons. Performing data adequacy assessment and statistical analyses in accordance with EPA's Unified Guidance. Calculating nature and extent and mass to support risk assessment and remedial design; generating spatial moments (2D and 3D) to determine

remedial effectiveness as it relates to total mass, center of mass, the spread of plume over time. Assessing spatial and temporal data uncertainty to optimize engineering design and operation. Performing temporal trend modeling and fingerprinting to identify potential sources of groundwater impact, including regional and on-site anthropogenic source differentiation. Generating 3D simulated lithologic models to understand subsurface heterogeneity and uncertainty with identifying preferential transport pathways. Long-term monitoring optimization using data-driven techniques, such as data redundancy analyses and detection frequency. Multidisciplinary project collaboration with project hydrogeologists, geochemists, engineers, risk assessors and geologists. Using ArcGIS, GWSTAT, Visual Sampling Plan, Isatis, R and ProUCL software packages.

Assistant Project Manager and Statistical Modeling Task Lead, MnDOT Archeological Predictive Modeling. Generating archeological predictive statistical models to locate cultural resource areas across the state of Minnesota. Multivariate analysis using hydrography, soil, terrain, anthropogenic and geomorphologic geospatial data. Applying machine learning and data mining methods, such as logistic regression, tree methods, multinomial logistic regression, naïve bayes, PCA and stepwise logistic regression. Integrating geographic information system and soil science skillsets to develop statistical models. Deliverable is a "click and go" statistical/GIS interface for client to easily predict cultural resource areas across the state of Minnesota. Participation is part of a multidisciplinary and streamlined project workflow. Using the R-ArcGIS software bridge interface to build, interpret, validate and run models.

Spatial Visualization and Data Uncertainty Task Lead, Engineering Remedial Alternatives Study. Generating spatially weighted average total mercury concentrations in river sediments along 30 river miles using geostatistics and geospatial techniques. Exploring data uncertainty using geostatistical and traditional statistical techniques; recommending best approach for incorporating uncertainty into remedial alternative selection. Using ArcGIS and Isatis software packages.

Hydrogeology Studies Task Lead, Superfund Project. Orchestrated and supported tasks among a strong project team consisting of hydrogeologists, engineers, and geologists. Tasks included RI/FS conceptual site model development, data gap and uncertainty analysis, long-term monitoring optimization, fate and transport modeling, and remedial design for groundwater impacted by chlorinated solvents. Provided geographic information system, geodatabase, and geostatistical technical services. Used ArcGIS, GWSDAT and Isatis software packages.

Project Geostatistician, Region 9 Superfund Project. Developed a data-driven phased sampling program using real-time portable x-ray fluorescence (XRF) spectroscopy (Phase I) and discrete soil sampling (Phase II) to assess heavy metal distributions in soil; phased sampling design reduced the initially planned sampling and analysis effort by approximately half. Performed multivariate geostatistics to fuse portable XRF with discrete soil sample analytical data and predict metal distributions in unsampled locations with measured confidence. Performing conditional simulation using portable XRF and discrete soil sample analytical data to pinpoint unsampled areas where there is an increased probability of metals concentrations exceeding human health and ecological exposure risk concentrations.

Simulating volume of impacted soil to inform remedial design, costs and uncertainty. Used ArcGIS and Isatis software packages.

Christopher Abate

Scientist 2

Subject Matter Expert ~ Groundwater Modeling

Dr. Abate has 27 years of experience in environmental geology, hydrogeology, modeling of water resources, project management, and litigation support. He has provided technical and management support for site investigations and remedial design efforts under the RCRA/CERCLA/MCP programs for a range of federal and private clients. Dr. Abate has specific expertise in the application of quantitative methods to water resource problems including wellhead protection, groundwater remediation system design, stormwater management, and non-point source pollution. He has developed and calibrated groundwater flow models for the purposes of risk assessment, wastewater permitting, water supply management, mine dewatering, and assessing contaminant fate and transport and also performed and analyzed aquifer tests and sited water supply wells for clients in coastal plain, glaciated, and hard rock terrains. In addition, he has experience in assessment of munitions and explosives of concern (MEC) distribution and environmental impacts at Department of Defense (DOD) sites with military training ranges. Dr. Abate has provided expert testimony and made numerous presentations at stakeholder meetings and technical conferences on quantitative methods for site assessment and remedial design as well as other aspects of applied hydrogeology and environmental geology.

Classification

Scientist 2

Years with Amec Foster Wheeler: 17

Years of Experience: 27

Education

Doctor of Philosophy (PhD), Geosciences, 1993

Master of Science, Environmental Pollution Control, 1990

Bachelor of Science, Geology, 1985

Relevant Work Experience

Remedial Investigation, Confidential Manufacturing Client, Hennepin County, Minnesota. Senior Hydrogeologist and Groundwater Modeler. Dr. Abate served as technical lead for regional modeling of a complex aquifer system comprised of unconsolidated glacial deposits and sedimentary rocks. Modeling objectives include calibration to static water levels and drawdown during pumping tests, demonstrating groundwater extraction wells successfully capture a VOC plume, and continually refining the model as new stratigraphic data becomes available.

Shepleys Hill Landfill/AOC72, U.S. Army Corps of Engineers, New England District, Devens, MA. Senior Hydrogeologist. Senior Hydrogeologist for comprehensive site assessment including risk assessments, to support an RI/FS at a closed landfill at Devens with Arsenic impacted groundwater. The project has multiple stakeholders and involves conceptual model development, assessment of ETR system performance, and use of a numerical groundwater flow model to assess potential contaminant plume interaction with offsite municipal water supply wells and achieve risk-based closure. Responsible for project management, hydrogeologic assessments, groundwater modeling activities, and technical presentations to stakeholders.

NIPSCO Bailly Generating Station, Northern Indiana Public Service Co., Chesterton, IN. Senior Hydrogeologist. Responsible for development and calibration of groundwater flow and contaminant transport models to support a Corrective Measures Study at a landfill for coal combustion residuals containing boron. Included predictive simulations of multiple remediation scenarios and simulating groundwater interactions with sensitive surface water bodies in a stratified glacial deposit aquifer system.

White Swan/Sun Cleaners Area Groundwater Contamination Superfund Site, Bank of America, N.A., Wall Township, NJ. Senior Hydrogeologist. Responsible for development and calibration of multiple models of groundwater flow and contaminant transport to support comprehensive RI/FS efforts addressing a large solvent

plume with multiple source areas. Unique dimensions of the project include evaluation of municipal and commercial pumping stresses, simulating groundwater interactions with tidally-influenced surface water bodies, and evaluation of structures and hydrogeologic properties in a stratified coastal plain aquifer system. Amec Foster Wheeler performed a series of environmental site investigations and remedial actions that assisted the client and their legal counsel in the successful negotiation of a Settlement Agreement defining the environmental liabilities for the White Swan/Sun Cleaners National Priority List (Superfund) site and its environmental cleanup. These investigations and subsequent actions included a Remedial Investigation/Feasibility Study (RI/FS) under EPA Region 2 supervision; surface and subsurface investigations; soil and groundwater sampling and analyses; aquifer testing and monitoring; treatability studies; building demolition; remedial design; remedial action; sub-slab depressurization system (SDS) installations; and annual inspections. Volatile organic compounds (VOCs), particularly tetrachloroethylene (PCE), were detected in area ground and surface water, as well as indoor air of residences and businesses. The source of contamination consisted of comingling groundwater plumes from two former dry-cleaning operations.

AIG - Harvard Mills - Remediation Design and Construction Oversight, AIG Global Claims Services Inc., Wakefield, MA. Senior Hydrogeologist. Groundwater monitoring network evaluations and 3-D visualization of geologic structures and groundwater plumes. Amec Foster Wheeler performed a series of site investigations, including groundwater, indoor air, and sub-slab vapor; and characterized impacts from chlorinated solvents and petroleum hydrocarbons found in the soil and groundwater of a 100-year-old brick former mill building. Performed a risk evaluation and feasibility study. Designed and oversaw the installation of a sub-slab vapor mitigation system at the site.

Gorham Remediation, Confidential Client, Providence, RI. Senior Hydrogeologist. Developed a groundwater flow model and used it to design a dewatering program to facilitate sediment removal operations. Amec Foster Wheeler performed site investigations and remediation of this former smelting and metals casting operation. The 38-acre property was being converted to retail space, a high school, proposed sports fields and a park along the adjacent 70-acre pond. The Site Investigation Reports (SIR) were completed and the Program Letter issued by RIDEM. Prepared the Remedial Action Work Plan (RAWP) and received the Remedial Approval Letter RIDEM to address the metals, petroleum and dioxin-contaminated soils and pond sediment. Prepared the construction design, contractor bid documents, and regulatory permits. Provided construction oversight and reporting for the site remediation. Amec Foster Wheeler's community outreach activities converted an initially hostile public to stakeholders interested and supportive of the revitalization of their neighborhood.

U.S. Army Corps of Engineers, New England District, Massachusetts Military Reservation. Technical lead for quantitative assessment of hydrogeology and contaminant fate and transport at multiple sites across the 22,000-acre facility, Services have included conceptual model development, numeric modeling of groundwater flow and contaminant fate and transport, and 3-D visualization\animation of subsurface conditions being applied to remedial feasibility studies. Unique dimensions of this project include MEC assessments, modeling leaching and fate and transport of explosive compounds and perchlorate, evaluating remedial alternatives for soil and groundwater, and assessing contaminant plume interaction with offsite municipal water supply wells.

Randy Talbot, PE

Engineer 4, Leachate Management

Classification
Engineer 4

Years with Amec Foster Wheeler: 26

Years of Experience: 44

Education
BS, Civil and Environmental Engineering, 1974

Regulatory Experience
Engineering support

Licensing / Certifications
Professional Engineer, MA, 41399
Professional Engineer, NH, 9466

Mr. Talbot is Senior Principal Engineer with environmental technical expertise ranging from municipal and industrial wastewater treatment to feasibility studies and remedial investigations at RCRA sites. Through more than two decades of experience, Mr. Talbot has developed practical engineering and construction experience and developed a reputation for expeditiously addressing design and construction issues and for maintaining a true partnership between the engineer, owner, and contractor. His project experience and personal attributes have been invaluable in conducting successful remedial system optimization (RSO) evaluations, involving participation by owners, regulatory agencies, operators, consultants, and property owners. Mr. Talbot is a key member of Amec Foster Wheeler's team serving a Fortune 500 corporation in achieving nationwide savings in the operation and maintenance costs for over 140 remediation system sites. He has prepared guidance documents and questionnaires for the national program and conducted numerous RSO evaluations for this and other clients.

Relevant Work Experience

Confidential Client, Former Coke Plant Tar Site Interim Response Action and Remedial Investigation, Major Industrial Manufacturer, Detroit, MI. Responsible for performing senior-level technical review and providing regulatory compliance support. Amec Foster Wheeler provided environmental services to design and implement response measures to mitigate former Allied Chemical site of 12 acres with groundwater and soil contamination from coal tar refining wastes (VOCs, SVOCs, metals, LNAPL, and DNAPL) migrating toward the Rouge River. Design / build services provided for installation of vacuum extraction system at site; three operating treatment plants set up at site. RI work plan developed and negotiations conducted to minimize final closure cost and foster site redevelopment. Design / build services also provided to re-configure site utilities (power, water, and gas) for decommissioning and demolition.

Confidential Client, UND 4&5 Area Soil Vapor Extraction (SVE) Rebound Test, El Segundo, CA. Provided overall technical oversight of the project. Performed routine interface with the client. Amec Foster Wheeler planned and performed a rebound test, soil confirmation sampling, and a closure report on a 12.9 acre former industrial site that was being treated with a deep soil vapor extraction (SVE) system. Primary contaminants had been carbon tetrachloride and chloroform. Amec Foster Wheeler's efforts and closure report successfully convinced the regulators of the Los Angeles Regional Water Quality Control Board (LARWQCB) to make a No Further Action (NFA) determination because the site cleanup goals for the deep soil and deep soil vapor had been met and continued operation of the SVE system was no longer needed.

Confidential Client, OU-1 and OU-2 Non-Routine Maintenance (NRM), Great Neck Remediation Site, New Hyde Park, NY. Responsible for Principal level review on project tasks. Coordinated and directed all design and construction activities. Conducted design review. Led final specific capacity (injection) testing, start-up, and commissioning activities. Recognized that the internal wall at the OU1 NRM project was not required by code and convinced the client it was not necessary, resulting in construction savings. Evaluation of diffusion well balancing has led to more reliable and sustainable management of the diffusion wells. Amec Foster Wheeler provided Design/Build services for new smoke/fire detection and alarm systems for the groundwater treatment system

buildings at the OU-1 and OU-2 sites. The scope also included building repairs: roof replacement: coping repairs; waterproofing and cleaning of roof drains for the OU-2 air stripper; replacement of sealant for exterior doors; repair, replacement, and painting of exterior trim; and replacement of mold damaged gypsum board ceilings. Design services included a technical review of the previous design and preparing construction documents (specifications and drawings) of the new design. Competitively bid the project to construction subcontractors and selected the subcontractor. Prepared and obtained required project permits. Administered and supervised subcontractors during construction. Provided start-up and commissioning services on the finished project.

Confidential Client, TCE Contamination Site Investigation and Remediation, Major Industrial Client, Fort Washington, PA. Responsible for independent RSO evaluation of the corrective measure, with review of the removal rate of the contaminant in the groundwater indicating completion of the corrective measure beyond 80 years out; recommended source reduction through in-situ chemical oxidation in the bedrock with feasibility study underway; recommended that the initial steps be taken to pursue a technical impracticability (TI) waiver; recommended that alternates to ultraviolet oxidation be evaluated because of low contaminant concentrations in the groundwater being treated.

Confidential Client, Operations & Maintenance Nationwide Improvements (OMNI) Cost Reduction Program, Major Industrial Client, Various Cities, US. Responsible as the lead professional serving client's OMNI Team; authored or reviewed many of OMNI RSO checklists; conducted a number of optimization studies under this program; primary author of the standard specification used for bidding O&M projects. Amec Foster Wheeler provided environmental consulting services developing and implementing a program to decrease O&M costs nationwide via its "Six Sigma Plus" process. Services included prioritizing sites, developing process maps, defining program elements, generating layout strategy for site-by-site initiation of program, developing templates and guidelines forming the backbone of the OMNI Program, and site testing and implementation.

Former Williams Air Force Base Performance Based Remediation, U.S. Air Force Civil Engineer Center (AFCEC), Mesa, AZ. Since December 2011, Amec Foster Wheeler has been responsible for performing Preliminary Assessments, Site Inspections, Remedial Investigations/Feasibility Studies, Remedial Designs/Remedial Actions, and Long Term Operations and Maintenance for six complex sites on the former Williams AFB that have not yet received regulatory closure under a performance-based remediation (PBR) contract with the U.S. Air Force (USAF). Discharges and disposal at the base resulted in soil and groundwater contamination. Contaminants of concern have included chlorinated solvents, jet fuel, gasoline, and pesticides. Implemented a variety of remedial approaches in support of site closure including human health risk assessment, soil vapor extraction, steam-enhanced extraction (SEE), bioremediation, in-well air stripping, chemical oxidation, long-term monitoring, and excavation with offsite disposal. The 4,043-acre former William AFB is a Superfund site (on the National Priorities List) with an expansive, mixed use property. The environmental restoration was funded by the USAF with oversight from the U.S. Environmental Protection Agency (USEPA), the Arizona Department of Environmental Quality, and the Arizona Department of Water Resources.

General Dynamics Armament & Technical Products Industrial Wastewater Treatment Plant Upgrade Design / Build, General Dynamics Ordinance & Tactical Systems (GD-OTS), Saco, ME. Responsible for project management and oversight; directed design coordination and construction inspection; conducted design review. Amec Foster Wheeler prepared an environmental design for design / build approach to upgrade industrial wastewater treatment plant processing 50,000 gpd of metals precipitation for aircraft and aircraft weapons systems development / production facility. Design and construction monitoring services for system including chemical feed, pump and hydraulic systems and process instrumentation.

Gil Haines, BCEE, PE

Project Manager
Subject Matter Expert ~ Landfill Design/Repair

Classification
Project Manager

Years with Amec Foster Wheeler: 3

Years of Experience: 30

Education
MS - Civil Engineering, 2009
BS, Civil Engineering Technology, 1986

Regulatory Experience
Represented client at regulatory meetings

Licensing / Certifications
Board Certified Environmental Engineer
Professional Engineer, GA, 20637; Professional Engineer, AL, 25587; Professional Engineer, LA, 31143; Professional Engineer, TN, 113595; Professional Engineer, NC, 35966

Mr. Haines is a civil and environmental engineer who has over 25 years of experience specializing in solid waste management and facilities planning, design, permitting, construction and project management. His experience includes all aspects of landfill design and construction including waste disposal cells, leachate collection and treatment systems, landfill gas collection and control, and final closure. Mr. Haines has also provided planning and design of municipal and private solid waste facilities for waste collection, transfer and recycling including site selection, assessments permitting and construction. His work has included the design and management of site studies, hydrogeologic assessments, alternative liner and leachate collection system design, landfill gas collection and control systems, operational plans, environmental monitoring plans, closure and post-closure care plans, stormwater control systems, solid waste master plans, solid waste management plans and recycling and collection systems. For municipalities and private industry throughout the country and Puerto Rico, Mr. Haines has successfully managed all aspects of solid waste programs by reducing costs, initiating innovative technologies, and procuring state funding from solid waste programs. He has also worked closely with private sector, government and concerned citizens to implement successful design and management strategies for project development.

Relevant Work Experience

Project Engineer: North and Vinland Landfills Options Evaluation, Winnebago County, WI. Technical team lead for the development of a landfill closure options and sludge management evaluation for the North Landfill. The options evaluated included closure-in-place, removal to an offsite landfill, and alternatives for material reuse and disposal options with the potential for soil amendment of the Vinland Landfill final cover system to improve performance. The evaluation included volume analyses, cost estimates, regulatory acceptability and advantages and disadvantages for the purpose of future site decisions for the North and Vinland Landfills.

Project Manager: Ash Basin and CCR Unit Closure Evaluation, Design and Permitting, Confidential Client, Midwest US. Project Manager responsible for the feasibility analysis and closure plans for ash basins, ash stacks and landfill units in the Midwest. These projects included the review and summary of site data, identification of data gaps, readiness review and site-specific health and safety plan, site characterization with ash basin drilling, interpretation and analysis with report, closure options evaluation, and closure plan preparation and permitting of 5 ash basins and 7 ash stacks, and 2 landfill units. The evaluations performed at the site included ash inventories, geotechnical analyses, groundwater assessments, and hydrologic and hydraulic analyses.

Project Engineer: Georgia Pacific, Ash Pond Closure, Gurdon, AR. Technical expert providing engineering to the Amec Foster Wheeler environmental team for the closure of a wood ash pond located at the plywood and lumber complex in Gurdon, AR. Services included identification of regulatory challenges and strategy to accomplish the ash pond closure. Project is currently ongoing.

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Project Engineer: Confidential Client, Waste Disposal Area Investigation, Charleston, TN. Amec Foster Wheeler provided environmental consulting services to evaluate potential closures of several waste disposal areas. Delineated the horizontal extents of four inactive waste disposal areas at a former chlor-alkali manufacturing facility using geophysical surveying techniques. Developed waste limits drawings for field surveying and development of legal descriptions for the waste units.

Project Manager: Ash Pond Closure Evaluations, and Design, Confidential Client, Southeastern US. Project Manager responsible for the feasibility analysis and closure plans for 2- 270-acre ash ponds in the southeastern USA. These projects included the review and summary of site data, identification of data gaps, site characterization, closure options evaluation, and closure plan preparation. The sites are in karst geology with a history of dropouts requiring advanced engineering methods to overcome of the geotechnical and hydrogeologic challenges. The evaluations performed at the site included ash inventories, geotechnical analyses, groundwater modeling, and development of a conceptual site model.

Project Manager: Richland Creek Road MSW Landfill, Gwinnett County, GA. Project Manager responsible for design, permitting, and construction oversight of a 50-acre Subtitle D landfill closure. The final cover system included a composite liner system with 18 inches of clayey soil, a 50-mil high density polyethylene geomembrane and a drainage layer and 24 inches of protective cover soils. Project included underdrains to collect perched leachate zones, modifications to the existing landfill gas system, transmission line relocations, construction of a cutoff wall system for methane migration remediation, and implementation of an alternative design with alternative materials.

Project Director: Hickory Ridge MSW Landfill, DeKalb County, GA. Project Director responsible for design, surveying, permitting, and construction oversight of a Subtitle D landfill closure. Project also included modifications to the landfill gas collection system for well extensions and modifications to landfill gas control valves. This 30-acre closure also required the implementation of an odor control plan to control landfill gas odors during construction. Innovative alternative liner systems were evaluated and permitted for the remainder of the closure. Landfill planning services were also conducted to assist the client with maximizing the permitted airspace while addressing access considerations.

Project Manager: Seminole Road Sanitary Landfill, DeKalb County, GA. Mr. Haines was project manager responsible for management of a solid waste program for the county including design and permitting of the landfill gas extraction system, a landfill closure project, haul road for construction access, sanitary sewer layout, and management of environmental monitoring and reporting activities. The landfill gas system and closure construction included a qualifications-based process to provide qualified contractors for consideration. Mr. Haines developed a comprehensive solid waste strategy for the county, including budgetary considerations that were adopted. Mr. Haines also served as the project manager for the development and implementation of a solid waste processing facility that included a 40,000-square-foot transfer station building to accept 4,500 tons per day of solid waste, a 15,000-square-foot office/administration building, a maintenance shop, truck parking, truck scales, and scale house and all associated utilities. He was responsible for the multi-discipline design, permitting, bidding and construction oversight project worth $25 million. The project was the site of an old solid waste incinerator that required demolition, soil and groundwater environmental assessments and evaluations for ash contaminated soil, asbestos and lead base paint. The project included the remediation of the ash and soils and special permitting for disturbance of the stream buffers and restoration of an onsite stream. The project was awarded LEED Certification at the Bronze level.

Joseph Caryl, AC

Project Manager

Subject Matter Expert ~ Construction Management

Classification
Project Manager

Years with Amec Foster Wheeler: 13

Years of Experience: 30

Education
MS, Construction Management
BS, Biology

Regulatory Experience
Construction management support

Licensing / Certifications
Michigan Department of Environmental Quality, Certified Wastewater Treatment Plant Operator (B-3b)

As a Principal Construction Manager, Mr. Caryl has participated in multiple projects for public and private sector clients throughout the US involving new construction, vertical construction, environmental remediation and restoration. These projects have ranged in value from $50,000 to over $10 million, in longevity from 5 days to 1 year and in geographic coverage from 1/2-acre to approximately 50 acres His experience includes all aspects of engineered construction/construction management, including brownfield and CERCLA projects, with expertise in contracting, constructability reviews, procurement, construction quality assurance (CQA) scheduling, budgeting and cost control, permitting, public relations, surveying (boundary and topo), temporary construction easements and permitting, lead-based paint abatement, UST investigation and removal, groundwater collection and treatment systems, commissioning, in-situ thermal, dredging, sediment removal, dewatering, Hazardous Waste Management, , stormwater erosion and sedimentation controls, industrial water/wastewater treatment and SPCC, and Phase II assessments.

Relevant Work Experience

Groundwater Extraction (GWE) and Groundwater Treatment (GWT) System Design, CONFIDENTIAL CLIENT, Golden Valley, MN. Responsible for design/constructability review, management and effective communication with the local municipality, facility owner and regulatory agencies for construction on of a 120 gpm groundwater collection and treatment system. The system included installation of six groundwater recovery wells and several thousand feet of force-main/power/instrumentation utility trench. The treatment system was constructed inside of an operating industrial plant and treatment elements chemical injection (sequestering agent), equalization, bag filtration and granular activated carbon. The system was fully automated with instrumentation, PLC control, Supervisory and Data Acquisition System with remote viewing capability. Duties included permit acquisition, preparation of bidding documents, contractor selection, work plan/submittal review, design change bulletins, responses to contractor Request for Information, site management of contractors, safety compliance (OSHA/HAZWOPER), scheduling, change management, Construction Quality Assurance, startup and commissioning, and development of a comprehensive Operation, Maintenance and Monitoring Manual.

Confidential Client, Interim Response Measure and Remedial Action Plan, Minnetonka, MN. As construction manager, developed the scope of work, bidding documents, provided procurement support, and construction management activities to install a sub-slab depressurization system, improve HVAC/ventilation in the building, and application of an epoxy floor coating to prevent indoor air contamination from historic site contamination.

Ironton Tar Plant Superfund Site, RCRA Landfill Cap and Storm Water Collection System Design; Confidential Client; Ohio River, Ironton, OH. As the Construction Manager and design team member, Mr. Caryl provided technical support for the Tar Plant that is one of three operable units of this Superfund site. Responsible for evaluating alternatives for constructability, value engineering, reviewing cost estimates and developing schedules for design alternatives, development of subcontractor pre-qualification packages, bidding, and contractor selection for the final remedy.

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Construction Manager; Spring Valley Facility (In-situ Thermal Remediation); Confidential Client; Spring Valley, IL. Responsible for design review, permit acquisition, preparation of bidding documents, contractor selection, work plan/submittal review, design change bulletins, responses to subcontractor Request for Information, site management of subcontractors, safety compliance (OSHA/HAZWOPER), scheduling, change management, Construction Quality Assurance, startup and commissioning, and operation and maintenance for an electrical resistivity heat (ERH)/soil vapor extraction system for source area treatment to remediate 25,000 yards of in-place soil source area beneath a former manufacturing building and adjacent to the building. Remediation goals achieved in 207 days of system operation.

Construction Manager; Brown Bridge Dam Removal and River Restoration Project; Boardman River Dams Settlement Agreement Implementation Team (IT); Traverse City, MI. Construction Manager for the Brown Bridge Dam Removal and River Restoration project to restore 2.5 miles of natural river channel and 12.2 acres of floodplain through handling and grading of 260,000 cubic yards of sediment. Responsible for managing subcontractor activities, submittals, requests for information, construction quality assurance, health and safety audits, conducting weekly progress meetings, reviewing subcontractor invoices, scheduling/critical project activity sequencing and pre-planning, implementation of the drawdown plan, permit compliance, communication with the owner/regulators/volunteer organizations, negotiating change orders/change management, development of Field Orders, and budget tracking.

Construction Manager; MDEQ Spartan Chemical Superfund Site, Remedial Design for Soil and Groundwater Treatment; DTMB; Wyoming, MI. Responsible for constructability review of proposed remedial actions including air sparge/soil vapor extraction (AS/SVE) and in-situ chemical oxidation.

Boardman River Flood Event, Boardman River Dams Settlement Agreement, Traverse City, MI. Following a major flooding event associated with the Boardman River and the removal of the Brown Bridge River Dam, Amec Foster Wheeler performed a series of assessments and restorations including: an environmental assessment and a dam assessment of the Brown Bridge River Dam; technical services in support of the removal of the Brown Bridge Dam and the subsequent site restoration; assessments of the Boardman river and impacted residential properties and their subsequent restoration; emergency response; water well chlorination; and litigation support.

Confidential Client, Danville Works Plant Phase II Remedial Investigation, Major Industrial Client, Danville, IL. Phase II Remedial Investigation for 86-acre industrial manufacturing complex with multiple buildings (main plant and support facilities), onsite aboveground tanks, railroad spurs and capped waste ponds. Facility produced and packaged freon (CFC refrigerants) from 1955 to 1994, then switched to packaging only. Contamination of soil and groundwater with volatile organic compounds (VOCs) identified since 1970s. Investigative activities to determine vertical / lateral extent of carbon tetrachloride and other CFCs and VOCs detected in soil and groundwater, and to verify if contaminant groundwater plume extended offsite. Investigation also evaluated eight onsite solid waste management units (SWMUs) to determine necessary steps to meet U.S. EPA and state EPA cleanup goals.

Confidential Client, Detroit Coke Corporation Interim Response Action and Remedial Investigation, Major Industrial Client, Detroit, MI. Responsible for construction of treatment facility, site demarcations, and interaction with City of Detroit. Amec Foster Wheeler provided environmental services to design and implement response measures to mitigate a 120-acre former Allied Chemical facility site with groundwater contaminated with coking wastes (VOCs, SVOCs, mercury, LNAPL, DNAPL) migrating toward the Rouge River. Designed and implemented a groundwater treatment system and extraction trenches at the site. Negotiations to minimize final closure costs and foster site redevelopment; negotiation anticipated for final closure requirements.

William J. Malyk, M.Eng., P.Eng.

Engineer 4

Subject Matter Expert ~ Drinking Water Replacement

Classification
Engineer 4

Years with Amec Foster Wheeler: 20

Years of Experience: 25

Education
M.Eng. – Chemical Engineering, 1993
BS, Chemical Engineering, 1990

Regulatory Experience
Engineering Support

Licensing / Certifications
Professional Engineer, Ontario No. 90381997;
Professional Engineer, Manitoba No. 22840;
Professional Engineer, New Brunswick No. 3686;
Professional Engineer, Alberta No. 140374

Mr. Malyk is a Principal Engineer with over 20 years of experience in managing projects dealing with industrial water and wastewater treatment. His areas of expertise include in-plant water audit investigations and preliminary and detailed designs of water and wastewater treatment systems. Mr. Malyk is also experienced in wastewater treatment plant modeling using the computer simulation tools for treatment system evaluation and design, and has extensive knowledge of waste treatment reactor design and operation. His experience has been developed working on projects in Canada, the United States, Europe, the UK, India, and China.

Relevant Work Experience

Wastewater Treatment Plant Study, Plover, WI. Project Manager for an engineering study to evaluate the possible effects a production change could have on the operation of the wastewater treatment system for a potato processing facility. The facility was shifting from a 6 day on, 1 day off schedule to 10 days on, 4 days off operation. The study included reviewing the current biological phosphorus removal regimen in comparison to a chemical phosphorus removal system; evaluating the effect of operational changes in the production facility on the wastewater treatment system; and reviewing the overall wastewater treatment system equipment in order to identify areas that require upgrading.

Recycled Water Treatment, Saginaw, MI. Project manager/interim site engineer for the construction, start-up, testing/validation, and operator training at a recycle water treatment facility for a malleable iron foundry. The new facility was to treat and recycle 6,000 US gpm of water for use in the air scrubber systems. The system consisted of vortex grit removal, lamella clarifiers, and a 2 m belt press. The blowdown from the system consisted of powdered activated carbon (for low level phenols), pH adjustment (for zinc precipitation), and lamella clarification, followed by sand filtration.

Water Treatment Plant Evaluation, California Institute for Men, Chino, CA. Project Manager for an in-depth evaluation of an existing water treatment plant servicing the California Institute for Men in Chino, CA. The evaluation included a detailed on-site review of the system operating program, instrumentation and the treatment system process which includes water softening, nitrate removal and disinfection with sodium hypochlorite. The groundwater pump controls, capacity and pressure were evaluated in relation to the water supply required. The information collected, recommendations and cost estimates were provided to the State of California for upgrade consideration.

Wastewater Characterization, Saginaw, MI. Project engineer for a sampling and testing program for the wastewater characterization for a malleable iron foundry. The program included a water audit and waste reduction study to reduce the flow and mass loadings of contaminant to the final end of pipe treatment system.

Wastewater Treatment System Design, Kitchener, ON. Project manager/engineer for the preliminary and detailed design of a treatment system for the removal of chrome and zinc from the plating wastewater at a Kitchener,

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Ontario furniture components manufacturing facility. Responsibilities included equipment selection, drawing production, and jar testing to confirm chemical dosing rates.

Wastewater Treatment Plant Upgrade Design, PVC Manufacturer, Niagara Falls, ON. Project engineer on the preliminary design of wastewater treatment plant upgrades for a PVC manufacturer. The project consisted of evaluation of water recycling and heat recovery options. Duties included sampling program execution, data analysis, treatment technology review, and alternative selection based on a cost-benefit analysis.

Bench-scale and Pilot-scale Treatability Program. Project engineer for a bench-scale and pilot-scale treatability program for high-strength fluoride-containing wastewater. The treatability work involved multiple bench- and pilot-scale plate and frame filter press trials using various pre-treatment, chemical aids, and cake washing combinations. This project involved coordination through a UK consultant with the pharmaceutical manufacturing facility in Ireland.

Site Remediation Project, Xstrata Copper, Timmins, ON. Provided engineering, permitting and construction management support including treatment guidance and onsite assistance for contractors undertaking the treatment of the Jarosite pond water. The pond water was highly impacted by zinc with concentrations in excess of 40,000 mg/L as zinc and TDS in excess of 60,000 mg/L. Amec Foster Wheeler conducted treatability testing and developed options for treatment of the pond contents to allow the water to be discharged to the facility wastewater treatment system without impact on their regulatory compliance limits.

CAM West Production Field – Rocky Point, WY. Project engineer for the evaluation of a produced water treatment system at an oil production facility in Wyoming. As part of the site visits site visits that were conducted to coincide with the historically worst case operation of the produced water treatment systems at the field. Observations made during the site visit were used to develop recommendations for process improvements to the treatment system. A follow on site visit and subsequent analytical information forwarded indicated that there were improvements in the performance of the produced water treatment system at the field. At a minimum, the physical improvements to the treatment equipment appeared to have resulted in an improvement in the quality of water discharged from the individual treatment systems.

Development of a Water/Wastewater Management (WWM) Tool, Confidential Client, Marcellus Shale. A WWM Tool was developed to evaluate water needs and wastewater treatment demands to support shale gas development. The tool is used to analyze the limited water resources and disposal options to maximize production, reduce time constraints, water footprint, trucking and disposal costs, reclaim water assets, and avoid potential regulatory impacts on production.

The models evaluate drilling needs, fresh water needs, liquid volumes, TDS levels, supply and disposal costs, trucking costs and permitting costs. The WWM Tool evaluates several scenarios for wastewater recycling, treatment, and disposal, based on user inputs such as flow rate, volume and TDS of flow back and produced water, available fresh water, and the available disposal options. Along with the development of the WWM Tool, water sources and wastewater treatment technologies were researched to support the development of the models.

PFAS Column Study. Removal of PFAS with six GAC and ion exchange media was tested in bench scale columns. The columns were operated at our in-house treatability lab for five months. Test water was supplied from an area contaminated with aqueous film forming foam. The most highly concentrated PFAS in the source water was PFOS. All media were found to remove the thirteen PFAS species detected with differences observed within each media type and for specific substances. The project included extensive collaboration with three GAC/ion exchange suppliers during all phases of the project including the study design, media selection, operation, and reporting.

Warren High

Scientist 2, Subject Matter Expert ~ Natural Resource Damage Restoration

Mr. High is a Senior Principal Biologist and Project Manager with nearly three decades of experience in ecological restoration. His duties include the design, management, permitting, installation, and monitoring of wetland and stream restoration projects. Mr. High has had advanced training in stream restoration including: bioengineering coursework at Rutgers University, Level I-IV training with Wildland Hydrology (Dave Rosgen), Stream Restoration Design by Newbury Hydraulics, and Natural Rivers Mechanisms, Morphology, as well as Management (Richard Hey), Waterways Experimental Station, Robin Sotir, and numerous others. Mr. High's specific experience includes watershed assessment, public funding, public education, resource agency permitting, preparation of cost estimates, specifications, vegetation lists, bid packages, construction inspection, monitoring, and all other aspects of restoration. Mr. High is a guest lecturer at numerous colleges teaching various aspects of stream restoration and he has served on the Bioengineering Committee for ASTM.

Relevant Work Experience

ALCOA Eastalco Stream Design Environmental Consulting Services, Alcoa, Inc., Frederick, MD. Responsible for review of design, development of concepts, and coordination with resource agencies. Eastalco Aluminum Company, a subsidiary of ALCOA Inc, requested Amec Foster Wheeler to develop a restoration design and mitigation banking plan related to monetizing credits for 3 miles of Tuscarora Creek and a major tributary, located at its facility in Frederick, Maryland. Amec Foster Wheeler studied existing streams and wetlands to provide a restoration design plan sufficient to gain approval from regulators, while accounting for monetary worth of mitigation credits for restoration, enhancement and preservation of existing resources.

Bluegrass Contracting Company Boone National Forest Design/Build for Major Culverts with Aquatic Organism Passage, Bluegrass Contracting Company, Corbin, KY. Task manager and principal for the replacement and/or retrofit of three culverts in Daniel Boone National Forest. Duties included site inspection, problem definition, developing preliminary design, coordinating and reviewing all design, and modeling and permitting. The projects were performed to allow fish passage of a federally endangered fish (blackside dace) and required close coordination with all resource agencies and Section 7 coordination. The designs included replacement of two failed corrugated pipes with open bottom culverts. The plunge pools associated with all culverts were resized and the banks stabilized with bioengineering. The flow through the culverts was set under low flow using Newbury riffles and boulder clusters. Duties included construction oversight and sediment and erosion control as a design/build project. Design/build for removal and replacement of two steel plate culverts (10 feet high by 20 feet wide by 61 feet long, and 6 feet high by 9 feet wide by 96 feet long, respectively) and enhancement of a third (10 feet high by 20 feet wide by 46 feet long). Aquatic organism passage (AOP) improvements upstream and downstream of the culverts. Services included limited topographic survey, hydrologic and hydraulic analyses to support streambed simulation analyses, limited geotechnical site reconnaissance, civil engineering design and plan preparation, specification preparation, and final bridge design.

Classification
Scientist 2

Years with Amec Foster Wheeler: 15

Years of Experience: 37

Education
MS, Environmental Management, University of Findlay, 2000
BS, Fisheries & Wildlife Biology, Iowa State University, 1982

Regulatory Experience
Represented client at regulatory meetings

Licensing / Certifications
Bioengineering / Streambank Stabilization (Rutgers U.); ISO 14000 Environmental Management Systems; Natural Rivers: Mechanisms, Morphology and Management; Newbury Hydraulics Stream Restoration Design; Rosgen Applied Fluvial Geomorphology (1), River Assessment and Monitoring (3), River Morphology and Application (2), and River Restoration and Natural Channel Design (4)

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Butler County (Ohio) / Woolpert LLC Beckett Ridge Stream Stabilization, Woolpert, LLP, OH. Responsible for assessment of existing stream conditions and identifying lack of habitat as main cause of stream degradation; performed fluvial geomorphologic measurements, benthic sampling, project design, property owner contacts, permitting, specifications, cost estimates, bid meetings, construction supervision, and aquatic monitoring. Under a Master Services Agreement provided as-needed support for stream stabilization in Butler County, Ohio. Included stream stabilization design, riparian restoration, problem identification, alternatives analysis, mitigation measures, regulatory agency support, permitting, and construction inspection, and monitoring.

Confidential Client, Buffalo River Sediment Contamination Evaluation and Strategy Support, Major Industrial Client, Buffalo, NY. Responsible for the development of river restoration concepts including bank treatments, instream structures, quantities, cost estimate, and discussion of benefits. Evaluation of data from river sediment and regulatory agency reports, development of deliverables and participation in presentations, and other client assistance in addressing potential liability for sediment contamination at a major river adjacent to client industrial facility. Presentations developed and made to client and legal counsel, regulatory agency representatives, and stakeholder groups regarding agency-driven RI/FS for river sediment. Also assisted client management with development of strategy to address potential liability. Geochronological evaluation was completed. Completed aquatic vegetation survey and bathymetric survey field work. Initiated communications to move channel reauthorization process forward in accordance with conceptual plan. Monitored GLNPO sediment sampling efforts. Completed benthic invertebrate mobilization and Tonawanda Creek reconnaissance.

Confidential Client, 316(b) Compliance Support, Major Regional Energy Supplier, Miamisburg, OH. Technical Advisor. Responsible as Senior Advisor for technical review and oversight, and management and direction of field staff handling entrainment and impingement sampling. Technical support services for coal-fired power facility to help client come under compliance with Phase II of the U.S. EPA's 316(b) Rule under the Clean Water Act. Conducted entrainment and impingement sampling and source water sampling for adult and larval fish in Greater Miami River, within Station's vicinity. Prepared a report of findings to be included in Comprehensive Demonstration Study (CDS) Document for submission to Ohio EPA in conjunction with its NPDES permit reissuance application.

Constellation Energy Nine Mile Point Nuclear Power Station Environmental Consulting, Reporting and Permitting Assistance, UniStar Nuclear Energy, LLC, Scriba (Oswego), NY. Performed review of baseline documents for compliance with NEPA and NRC guidelines. Assessed sampling methodology, analysis, and results for scientific accuracy and data gaps. Coordinated with resource agencies. Assisted in responding to comments provided by NRC concerning the studies. Environmental consultation and permitting assistance for siting of Nine Mile Point Nuclear Power Station Unit #2. Facility planned as AREVA U.S. Evolutionary Power Reactor (EPR), and is situated adjacent to existing Unit #1 on Lake Ontario. Services included developing sections of environmental report, one of two parts of license application process required for permitting new nuclear power plants; and assisting in developing responses to Nuclear Regulatory Commission (NRC) comments on report.

GP-Kalamazoo River OU-5-Area 3, Georgia-Pacific Corporation, Kalamazoo, MI. Amec Foster Wheeler performed a Supplemental Remedial Investigation (SRI) and Feasibility Study (FS) activities for Area 3 of the Kalamazoo River Superfund Site OU-5. Evaluated PCB impacts of the Site consisting of over 80 miles of river sediment and associated floodplains. Prepared reports documenting results and recommendations for proposed remedial action.

James B. Feild, PhD, RG

Scientist 2

Subject Matter Expert ~ Groundwater Protection Studies

Classification
Scientist 2

Years with Amec Foster Wheeler: 17

Years of Experience: 20

Education
PhD, Hydrogeology, 2000
MS, Hydrogeology, 1990
BS, Geological Oceanography, 1986

Regulatory Experience
Represented client at regulatory meetings

Licensing / Certifications
Registered Professional Geologist, Oregon #G1962; Licensed Professional Geologist / Hydrogeologist, Washington #565; Professional Geologist, Florida, #0001496; Professional Geologist, Georgia, #001513; Professional Geologist, Utah, #5200044-2250; Oregon Certified Water Rights Examiner #72434WRE; Certified Ground Source Heat Pump (GSHP) Installer

Dr. Feild provides project management, technical support, and technical review for projects. His 20 plus years of experience includes many phases and types of environmental and hydrogeologic assessments, in both the vadose zone and saturated zones. Dr. Feild has experience with technology selection, numerous groundwater and soil feasibility testing projects such as aquifer pumping tests, bail/slug tests, vapor extraction pilot tests, air sparge tests, and bioremediation / bioventing tests. Dr. Feild also has experience designing remediation systems. His strengths include analytical and numerical computer modeling of both saturated and unsaturated zone flow and contaminant transport. Dr. Feild has experience using a variety of natural tracers such as chloride, deuterium, oxygen-18, carbon-13; radiogenic tracers such as carbon-14, tritium, radium-226 and other naturally occurring isotopes of Uranium and Thorium; and anthropogenic tracers such as bromide, fluorescein dye, krypton gas, and sulphur hexafluoride.

Relevant Work Experience

Assessment and Remediation, Former Medical Pharmaceuticals Facility, Portland, OR. Dr. Feild was the Project Hydrogeologist for a site contaminated with chlorinated solvents. The hydrogeological investigation included an evaluation of the effects of nearby municipal water supply wells on site groundwater flow conditions, estimating the mass of the historical solvent release, evaluating mass removal and efficiency of the remediation systems, estimating time to achieve groundwater cleanup, and evaluation of hypothetical sensitive receptor water supply wells on the groundwater plume migration. Remedial action implementation consisted of Electric Resistive Heating (ERH) and biosparging.

Fueling Facility at Tehachapi – California Corrections Institution prison, Tehachapi, CA. Dr. Feild was the Project Reviewer for the California Corrections Institution prison in Tehachapi, California. A plume of gasoline constituents and chlorinated hydrocarbons was identified near the prison's fueling islands. The main driving constituents were high concentrations of MTBE and TBA. Dr. Field oversaw and was the Project Reviewer for a basin-wide groundwater model used for evaluating extraction well design and location, and for estimating capture zones of the pump and treat groundwater remediation system.

Assessment and Remediation, Confidential Client, Vancouver WA. Dr. Feild served as an Assistant Project Manager and provided expert witness and litigation support from 2001 through 2005 in defense of a $50 million lawsuit related to environmental contamination. Primary contaminants of concern at the site were Trichloroethene (TCE), Tetrachloroethene (PCE) and other volatiles in soil, groundwater and air. Contamination extended 200 feet below the water table in some areas, and covered an area of two square miles. The lawsuit stemmed from contamination that had spread from our client's two manufacturing facilities beneath a municipal property. In addition to the existing lawsuit, there also was a potential for lawsuits from other affected parties, including a neighborhood of 375 homes that overlie a portion of the contaminant plume, as well as regulator's requirements to clean up contamination which remained on the client's

property. Amec Foster Wheeler performed a wide array of contaminant investigation, groundwater plume modeling, stable isotope analysis, regulatory negotiation (Ecology and Dept. of Health), and multi-media remediation services. Remediation services included feasibility testing, system design, permitting, and the installation and operation of three types of systems. These systems included a large soil vapor extraction and air sparging system (73 injection wells) to treat soils and groundwater in the source area; soil vapor vacuum systems installed in six of the most-effected homes to clean indoor air; and seven large recirculating groundwater remediation wells with sodium permanganate injection to treat groundwater beneath the neighborhood. In early 2006 the litigation was successfully settled and no further lawsuits have been brought forth. In addition, Amec Foster Wheeler has cleaned up 95% of the contamination beneath the manufacturing facility and adjacent neighborhood.

Construction of an Algae and Debris Skimmer – Lake Oswego Corporation, Lake Oswego, OR. Dr. Feild was the Project Manager and Client Manager for the construction of an algae, garbage and debris skimmer for Lake Oswego Corporation. Algae and debris had become a problem in Lake Oswego as a result of diverting water from the Tualatin River to Lake Oswego. The algae had become not only an annoyance but also a health hazard for the homes along the 13-mile-long shoreline of the lake. Odors in some of the most concentrated areas can be pungent, and, along with the toxic dangers and damaged aesthetic, prevent normal swimming and other recreation activities. Amec Foster Wheeler designed, coordinated construction of, and tested a high-powered skimmer and filtration system mounted aboard a pontoon barge. The filtration system can handle anything from the gelatinous biomass and stringy plants to four-inch thick chunks of wood, skimmed off the lake surface, and can be operated by a single person.

In-Situ Thermal Remediation, East Gate Disposal Yard, Ft. Lewis, WA. Dr. Feild was the Project Hydrogeologist of record for evaluating the application of electrical resistance heating (ERH) and multi-phase extraction (MPE) at three areas of the East Gate Disposal Yard (EGDY) where non-aqueous phase liquid (NAPL) is believed to be present. Groundwater and soil at the three sites were contaminated with chlorinated solvents. Dr. Feild's responsibilities included review and assessment of existing hydrogeological data, groundwater modeling for capture zone and remediation system design, design and placement of groundwater extraction wells, evaluating the use of injection wells versus infiltration galleries, and design and placement of injection wells and/or infiltration galleries.

Assessment and Remediation, Metals Casting Facility, Portland, OR. Dr. Feild was the Project Manager for a Remedial Investigation/Feasibility Study at a metals casting facility located in Portland, Oregon. Groundwater and soil at the site were contaminated with chlorinated solvents used to degrease parts following casting. The remedial investigation included source investigation, magnitude and extent of soil and groundwater contamination, and preparation of a conceptual hydrogeologic site model. The project was complex due to the presence of DNAPL in the shallow aquifer. Groundwater concentrations in the shallow aquifer exceeded 1 million µg/L, and soil concentrations exceeded 1,500,000 mg/kg. The groundwater plume extended approximately 1,200 feet downgradient from the source area. The hydrogeology of the area is intricate, and is complicated by the presence of numerous surface water bodies, an historical alluvial channel of the Willamette River, and multiple aquifers separated by aquitards. Because the facility was operational and equipment could not be relocated, in-situ remedial alternatives such as soil vapor extraction, air sparging, total fluids extraction, chemical oxidizers (Fenton's Reagent), reducing agents (Hydrogen Release Compound), permeable reactive barriers, electrical resistive heating, and enhanced bioremediation were evaluated for implementation.

Jerry Eykholt

Engineer 3 / Sediment Subject Matter Expert

Dr. Eykholt is an environmental/geotechnical engineer providing innovative solutions to complex environmental site problems. Taking an interdisciplinary and often fundamental approach to problems, he is an expert-level engineer in the areas of contaminated sediments, surface water quality modeling, and some aspects of groundwater fate and transport modeling. With over 21 years of experience in consulting, academia, and industrial R&D, Jerry has a broad set of technical, communication, and team skills to manage complex environmental problems in ways that lead to consistently responsive, high quality designs and other services to the client. For the contaminated sediments area, Dr. Eykholt has project experience as an engineering/design leader in preparing workplans, remedial investigations, feasibility reports, remedial designs, and post-remediation evaluations. His work in 3D delineation modelling for large and small sites is notable, but his passion is to use the modelling results effectively, as integrated site knowledge for engineering evaluations and designs. The sediment models he develops are designed to be efficient, accessible, and collaborative.

Classification
Engineer 3

Years with Amec Foster Wheeler: 7

Years of Experience: 26

Education
BS, Civil Engineering
MS, Civil Engineering
PhD Civil Engineering

Licensing / Certifications
Professional Engineer, MN, 48096
Professional Engineer, WI, 34775-006
Professional Engineer, MI, 6201055340
Professional Engineer, FL, 72771

Relevant Work Experience

Confidential Client, Coke Corporation Interim Response Action and Remedial Investigation, Major Industrial Client, Detroit, MI. Senior Principal Engineer. Preparation of work plans for sediment investigation, preliminary sediment modeling and quality assurance. Amec Foster Wheeler provided environmental services to design and implement response measures to mitigate a 120-acre former Allied Chemical facility site with groundwater contaminated with coking wastes (VOCs, SVOCs, mercury, LNAPL, DNAPL) migrating toward the Rouge River. Designed and implemented a groundwater treatment system and extraction trenches at the site. Negotiations to minimize final closure costs and foster site redevelopment; negotiation anticipated for final closure requirements.

Confidential Client, Tar Site Remedial Investigation Services, Major Industrial Client, Ironton, OH. Senior Principal Engineer. Lead on sediment remedial design, sediment modeling and development of work plans. Amec Foster Wheeler performed a variety of Remedial Investigation activities to characterize nature and extent of contamination, assess potential migration pathways and transport mechanisms, and evaluate risks posed by hazardous substances on a 28-acre former industrial tar plant site. The plant ceased operations in 2000 and the site has been a Superfund site on the National Priorities List (NPL) along with the adjacent coke plant, lagoon, and disposal area since 1983. In August 2003, USEPA issued an Administrative Order on Consent for a Remedial Investigation / Feasibility Study (RI/FS) and designated plant site as Operable Unit 3. Provided other services including preparation of the RI report and utilization of RI information to prepare a Feasibility Study to evaluate potential remedial options.

Confidential Client, Kalamazoo River Superfund Site Environmental Investigation and Remediation Services, Kalamazoo, MI. Feasibility Study Leader. Amec Foster Wheeler is conducting an investigation and providing remediation services for contaminated sediments along an 80-mile segment of the Kalamazoo River, including Lake Allegan, in western Michigan. Contaminants are primarily PCBs resulting from discharges from former paper mills along the river, and from uncapped landfills near the river. Five dams on the river (two functional, others non-operational) impact flow and accumulation of contaminants. Our services are designed to bring the

site under environmental compliance with the U.S. Environmental Protection Agency and the Michigan Department of Environmental Quality; to expedite approval of a Monitored Natural Recovery (MNR) remedy for the site at the most reasonable cost; to effect ultimate removal of all fish advisories in the area; and to develop a long-term goal for maintaining a clear, coordinated environmental strategy for the entire river area.

Confidential Client, Gorham Remediation, Providence, RI. Project Engineer. Amec Foster Wheeler performed site investigations and remediation of this former smelting and metals casting operation. The 38-acre property was being converted to retail space, a high school, proposed sports fields and a park along the adjacent 70-acre pond. The Site Investigation Reports (SIR) were completed and the Program Letter issued by RIDEM. Prepared the Remedial Action Work Plan (RAWP) and received the Remedial Approval Letter RIDEM to address the metals, petroleum and dioxin-contaminated soils and pond sediment. Prepared the construction design, contractor bid documents, and regulatory permits. Provided construction oversight and reporting for the site remediation. Amec Foster Wheeler's community outreach activities converted an initially hostile public to stakeholders interested and supportive of the revitalization of their neighborhood.

GP-Kalamazoo River OU-5-Area 3, Georgia-Pacific Corporation, Kalamazoo, MI. Sediment Specialist. Amec Foster Wheeler performed a Supplemental Remedial Investigation (SRI) and Feasibility Study (FS) activities for Area 3 of the Kalamazoo River Superfund Site OU-5. Evaluated PCB impacts of the Site consisting of over 80 miles of river sediment and associated floodplains. Prepared reports documenting results and recommendations for proposed remedial action.

MDOT Callahan Mine OU3 Remedial Design, Maine Department of Transportation, Brooksville, ME. Engineer. Amec Foster Wheeler designed a mine tailings impoundment closure including an impermeable cap, a passive groundwater dewatering collection and treatment system, wetland restoration, excavation and disposal of waste rock piles containing high concentrations of heavy metals, and dredging and disposal of contaminated sediments in an onsite confined aquatic disposal cell. The site is a 150-acre former copper/lead/zinc open-pit mine located in a tidal inlet on Penobscot Bay that is now designated as a NPL Superfund site.

Penobscot River Mercury Remediation Phase III Engineering Study, United States District Court, Bangor, ME. Engineer. Amec Foster Wheeler investigated and developed remedial alternatives to address mercury contamination from a 37-mile length of the Penobscot River estuary in Maine. The Penobscot River and its estuary is the second longest river in New England. The Phase III Engineering Study focused upon the river stretch from the former Veazie Dam south to the Upper Penobscot Bay, including Mendall Marsh and the Orland River. The study continued to evaluate the consequences of mercury release from a chlor-alkali facility in Orrington, ME into the estuary during plant operations. The Phase III study collected additional field data to further refine the conceptual site model of mercury in the ecosystem, included analysis of surface water, sediment, woodchips, and biota throughout all trophic levels. Met the ultimate goal of the Phase III Engineering Study, which was to evaluate potential and cost-effective engineering alternatives to reduce mercury concentrations in the estuary/ ecosystem to project remediation goals, thereby mitigating harm to the people, biota, and environment in the Penobscot River estuary.

Confidential Client, Sikorsky Stratford Site RCRA Corrective Action Program (CAP), Stratford, CT. Senior Principal Engineer. Lead on sediment remedial design, sediment modeling and development of work plans. Amec Foster Wheeler performed a variety of Remedial Investigation activities to characterize nature and extent of contamination, assess potential migration pathways and transport mechanisms, and evaluate risks posed by hazardous substances on a 28-acre former industrial tar plant site. The plant ceased operations in 2000 and the site has been a Superfund site on the National Priorities List (NPL) along with the adjacent coke plant, lagoon, and disposal area since 1983. Provided other services including preparation of the RI report and utilization of RI information to prepare a Feasibility Study to evaluate potential remedial options.