MINNESOTA POLLUTION CONTROL AGENCY

amec foster wheeler

Minnesota Pollution Control Agency

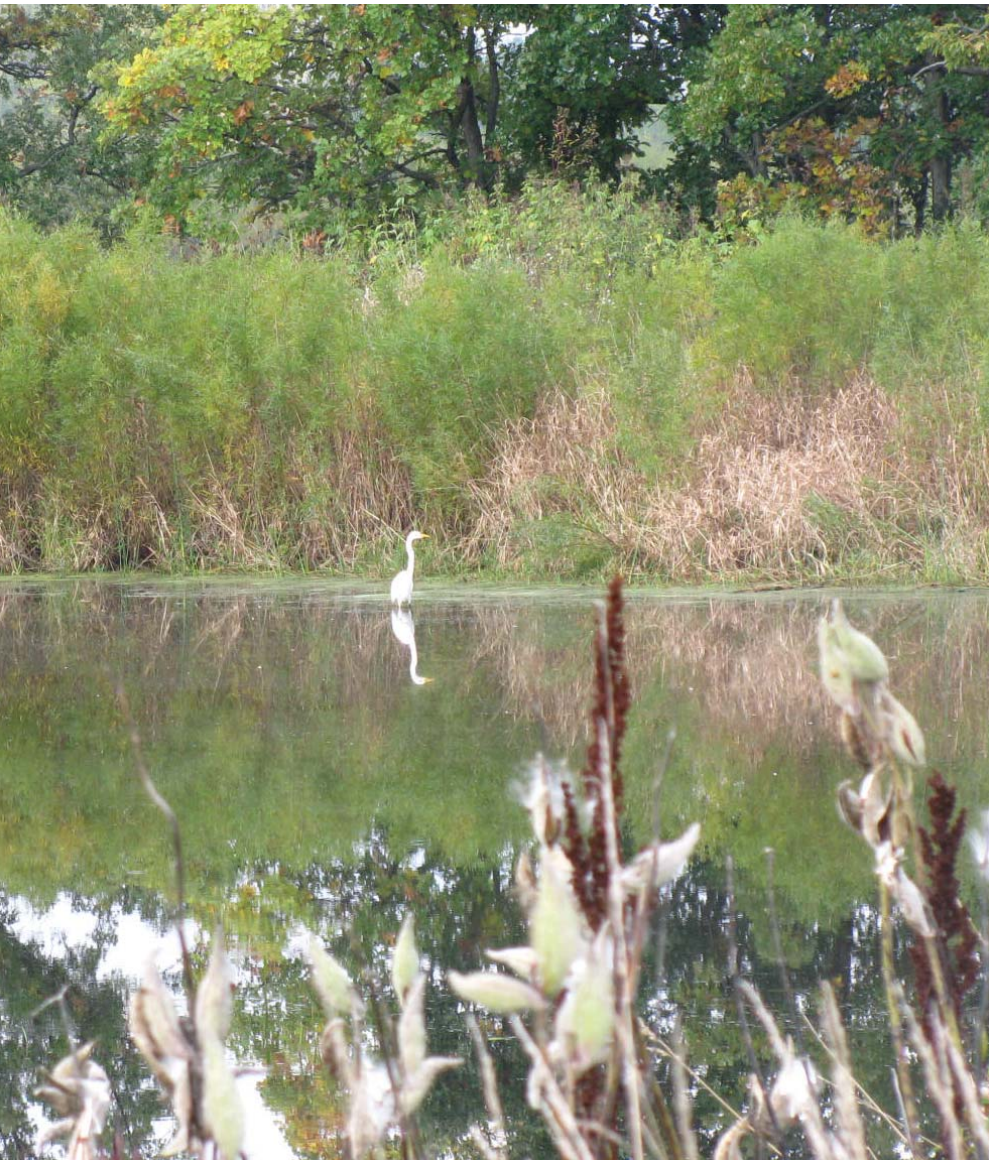
Remediation Master Contract

Category C – 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



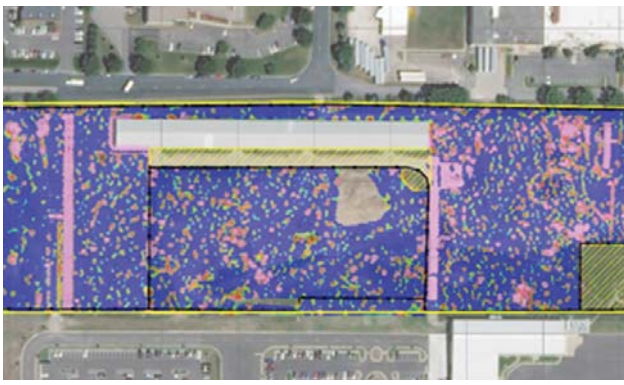


Table of Contents

C.1 Cover Letter

C.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 C: 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) with this response to the Request for Proposal for Remediation Master Contract (RFP) dated February 28, 2018. This response, for Category C: 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 clients 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, 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 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.

Curtis M. Hudak, PhD, PG
Minneapolis Office Manager
Direct Tel.: 612-252-3757
Cell: 612-406-9644
E-mail: curtis.hudak@amecfw.com

Emma Driver, PMP
MPCA Contract Manager
Direct Tel.: 612-252-3641
Cell: 612-381-7845
E-mail: emma.driver@amecfw.com

C.2 Qualifications and Capabilities

C.2 Qualifications and Capabilities

C.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) Closed Landfill Program (CLP) 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, 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.

- **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.
- **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 are able to offer Project teams that can 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 can 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 challenges faced by the CLP continue to evolve as 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 landfill gas migration and 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.

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.

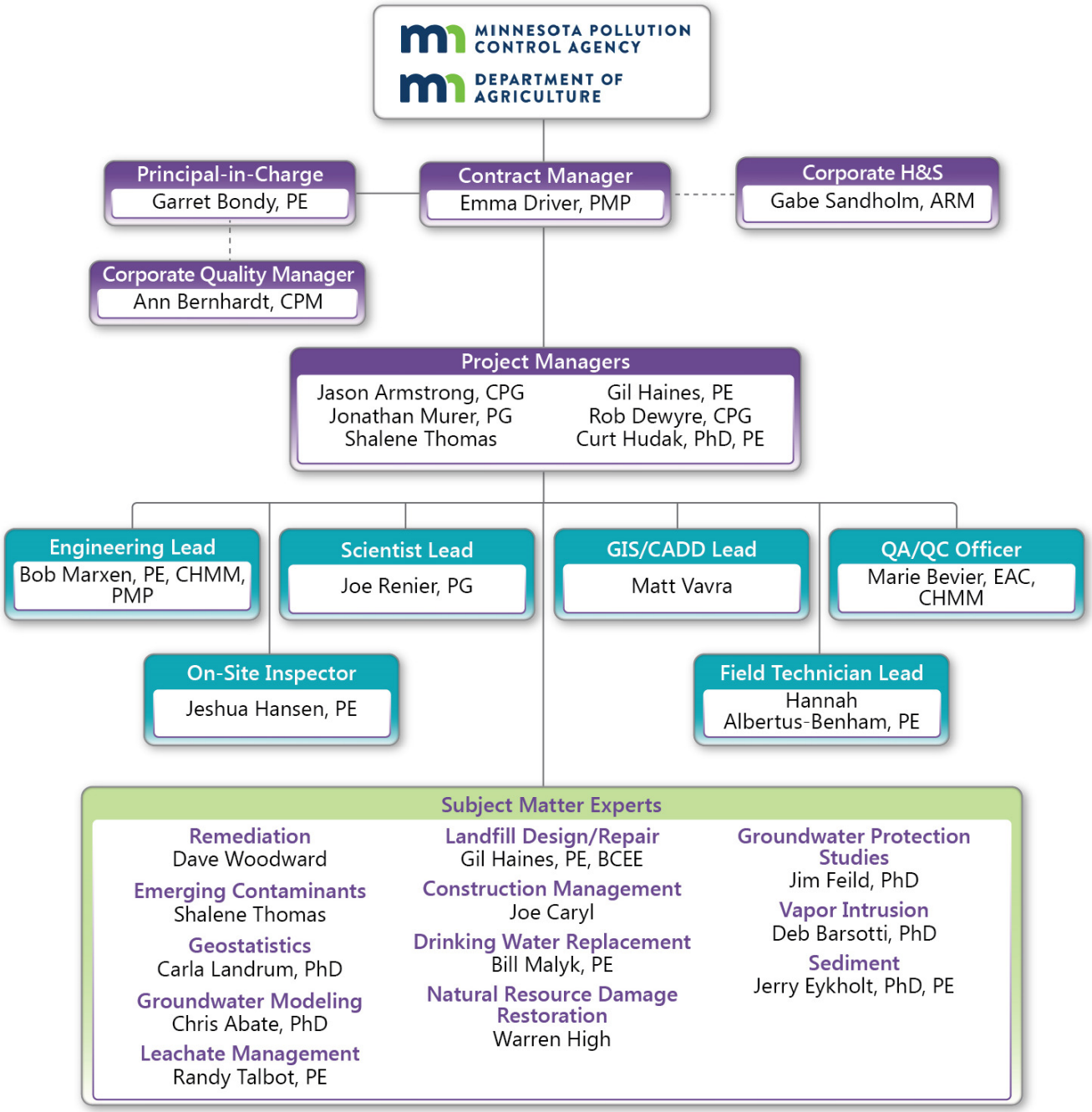
Our project team is uniquely qualified to support the MPCA CLP in addressing these challenges through demonstrated project experience and expertise in each of the areas as summarized below.

- **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.
- **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.

C.2.2 Resumes of Key Staff

The key staff assigned to the contract are presented in **Exhibit 1**.

Exhibit 1. 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.

On-Site Inspector, Jeshua Hansen, PE

Mr. Hansen, will serve as the lead on-site inspector for the CLP. Mr. Hansen has 18 years of experience working in the environmental industry as an engineer. He has experience in all aspects of landfill design including solid

waste design, developing construction plans and specifications, remedial systems design including landfill cap and storm water system design, landfill gas mitigation design and leachate management. Mr. Hansen has also conducted landfill site evaluations, inspections, and characterization for landfill sites in EPA Region 5. Mr. Hansen also serves as a construction manager and is well versed in developing bid packages, developing project schedules, managing subcontractors and contract scope. Mr. Hansen has regulatory experience under CERCLA, and RCRA provisions, knowledge of hazardous and solid waste rules and is experienced with the MPCA RBSE manual and guidance.

Field Technician Lead, Hannah Albertus-Benham, PE

Ms. Hannah Albertus-Benham will serve as 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 in compliance with 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 2.**

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.

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.

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.

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.

Vapor Intrusion, 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.

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 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 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.

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.

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

C.2.2.1 Contractor Staff Matrix

Exhibit 2 presents a matrix of the all project staff offered for the contract. The matrix includes name, primary classification, OSHA certification, and years of service with the company, years of service with other firms, summary of educational experience, work experience, licenses and certifications held, and the location of those individuals (i.e., local (L), outside Minnesota (O)).

Exhibit 2. Matrix of all Project Staff

CATEGORY C										
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	Engineer 2 (Field Technician Lead)	●	MS/2009/Civil Engineering	●	●	●	●	1 (3)	PE - MN Asbestos Inspector (State of MN), Stormwater Construction Site Management	L
J. Armstrong	Project Manager	●	BS/1999 Env. Geosciences		●	●	●	9 (17)	CPG	R
D. Barsotti	Scientist 2 (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
R. Dewyre	Project Manager	●	BS/1989/Hydrogeology		●	●	●	22 (24)	CPG	R
E. Driver	Project Manager (Contract Manager)	●	BS/2000/Geography	●	●	●	●	16 (18)	PMP	L

Exhibit 2. Matrix of all Project Staff										
CATEGORY C										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
J. Eykholt	Engineer 4 (SME – Sediment)	●	PhD Civil Engineering		●	●	●	7 (26)	PE-MN Registered Engineer/Surveyor	R
J. Field	Scientist 2 (SME – Groundwater Protection Studies)	●	PhD/2000/Hydrogeology	●	●	●	●	17 (20)	RG Certified Ground Source Heat Pump (GSHP) Installer	O
J. Gal	Engineer 2	●	BSE/2004/Civil Engineering		●	●	●	5 (13)	PE-MN	R
G. Haines	Project Manager (SME – Landfill Design/Repair)	●	MS/2009/Civil Engineering		●	●		3 (31)	BCEE	O
J. Hansen	On-Site Inspector	●	MS/2000/Env. Engineering	●	●	●	●	8 (18)	PE - MI	R
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
J. Renier	Scientist 2 (Scientist Lead)	●	MS/1982/Geology	●	●	●	●	16 (30)	PG	L
G. Sandholm	Scientist 2 (Corporate Health & Safety)		MBA/2008	●				16 (18)	ARM	L

Exhibit 2. Matrix of all Project Staff										
CATEGORY C										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
🗝 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
🗝 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
S. Hansen	Engineer 3		BS/Chemical Engineering		●	●		6 (9)	PE-MN	L
G. Hauck	Engineer 3		BChE				●	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
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

Exhibit 2. Matrix of all Project Staff										
CATEGORY C										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
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
A. Fiskness	Scientist 2	●	BS/1998/Geology	●	●	●	●	8 (19)	PG, PMP	L
P. Goudreault	Scientist 2		MS/1985 Hydrogeology	●	●	●	●	5 (24)	--	L
J. Grams	Project Manager	●	MS/1987/Geochemistry	●	●	●	●	4 (26)	PG, CPG	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
S. Murray	Scientist 2	●	BS/1985/Geology		●	●	●	21 (25)	CPG	R
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
E. Siewert	Scientist 2	●	BS/2005/Env Studies	●	●	●	●	9 (12)	PMP	L
C. Smith	Scientist 1/Technician	●	MS/2016/Geology	●	●	●	●	2 (2)	--	L

Exhibit 2. Matrix of all Project Staff										
CATEGORY C										
Name	**Classification**	**OSHA Training**	**Educational Experience (Highest Degree Shown)**	**Work Experience**				**Years of Service**	**Licenses / Certifications**	**Location**
				A	**B**	**C**	**D**			
M. Torres	Scientist 2	●	BA/2000/Geology	●	●	●	●	11 (11)	--	L
C. Vowles	Scientist 2	●	BS/2006/Biochemistry	●	●	●	●	12 (12)	--	L
J. Wegleitner	Scientist 1 / Technician	●	AA/2003/Architectural Drafting and Estimating	●	●	●	●	5 (11)	--	L
Other										
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

C.2.3 Firm Locations

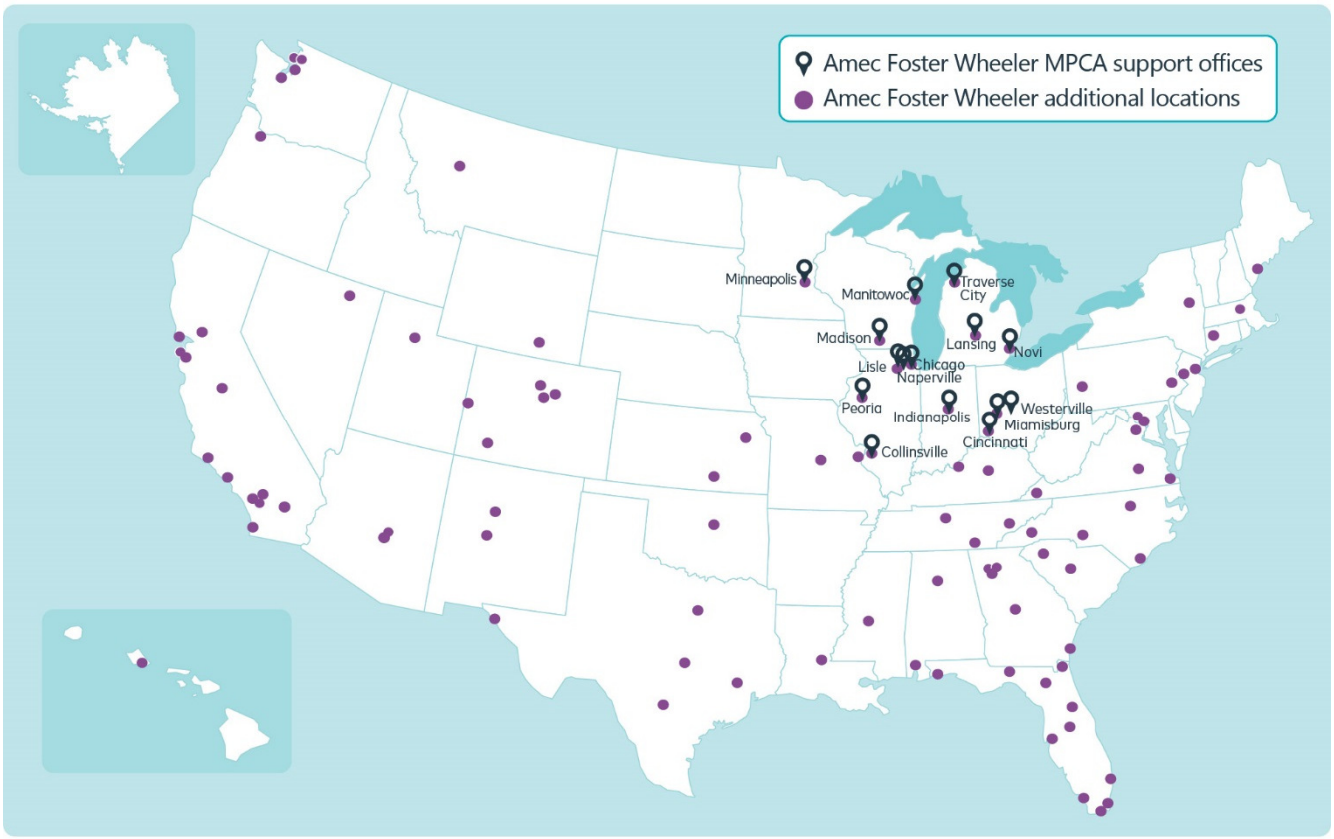
Amec Foster Wheeler's US headquarters and the local office supporting the contract are listed below.

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

Exhibit 3. US Office Map



C.2.4 Solid Waste Experience

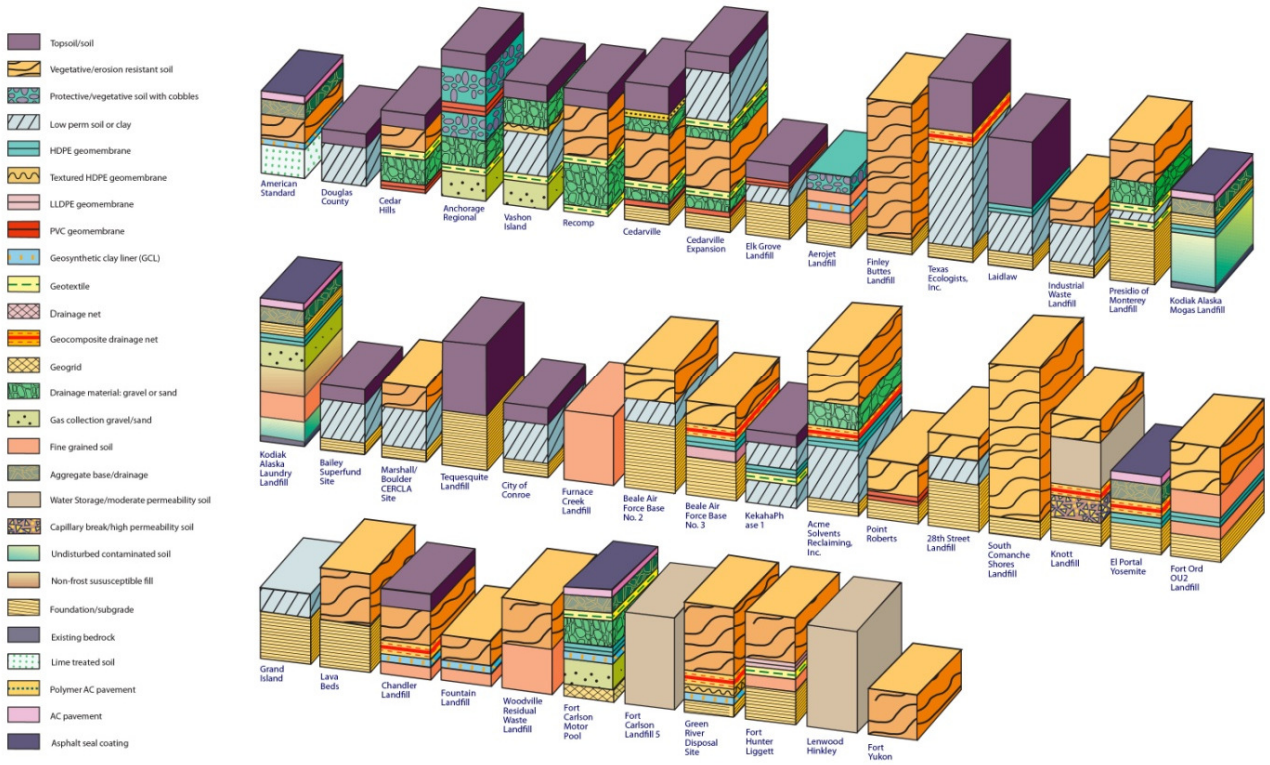
Amec Foster Wheeler has over 40 years of solid waste experience and our team has experience on over 300 solid waste projects in the past 10 years including three sites in Minnesota in the past five years. Our staff support projects ranging from inception and design through implementation, operation and maintenance (O&M) and closure. We have the expertise to design and manage landfill closures with advanced methods that fulfil regulatory requirements. Our solid waste management services are shown in **Exhibit 4.**

Exhibit 4. Amec Foster Wheeler Solid Waste Management Services

Landfill and Disposal Site Closure Services	Solid and Hazardous Waste Disposal Facility Management Services
Waste Characterization Studies	Integrated waste management and recycling plans
Developing closure plans	Conducting solid waste rate studies
Closure design and bid specifications	Developing model commercial recycling programs
Managing and treating leachate	Systems operations and management reviews
Geologic, hydrogeologic, geophysical, and geotechnical investigations	Incinerator permitting, testing, and pollution prevention design
Landfill gas collection designs and bid specifications	Designing of materials recovery, composting, and waste transfer facilities
Providing construction quality assurance and quality control	Design of incinerator ash landfills
Performing groundwater and air quality monitoring	Assessing environmental impacts and natural resource damage assessments
Data management and risk assessment	Securing regulatory permits for wetlands, surface water, air, and groundwater
Designing and building groundwater and landfill gas treatment facilities	Siting new facilities
Landfill site redevelopment	Site development including geotechnical investigations
Operations and maintenance of closed facilities	Designing new solid waste landfills
Landfill site repurposing (such as open space development or alternative energy	Modifying existing landfill permits for optimal cost-efficiency and environmental protection
Managing landfill gas	Performing air quality management services
Protecting and managing groundwater and surface water resources	Managing landfill gas
Protecting and managing groundwater and surface water resources	

Amec Foster Wheeler personnel have demonstrated reduced construction costs through the design of over 30 different types of multi-layer landfill cover systems, ranging from simple 'single-layer' covers to covers requiring nine or more separate layers (**Exhibit 5**). 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.

Exhibit 5. Amec Foster Wheeler Landfill Cover Systems



C.2.5 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 team has supported PFAS site investigation specifically in more than two dozen states across all 10 USEPA 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 6** presents examples of these staff.

Exhibit 6. 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 National Ground Water Association, International Groundwater Association, 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 Environmental Protection Agency. Amec Foster Wheeler has project experience with, and also holds Federal Master Service Agreements with several federal agencies as listed below in **Exhibit 7**.

Exhibit 7. 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	US Postal Service
Bureau of Indian Affairs	US Bureau of Reclamation
US Department of Agriculture	US Department of Veterans Affairs
US Department of Energy	

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 8**.

Exhibit 8. 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
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	

C.2.6 Knowledge of Pertinent State and Federal Regulations including Closed Landfill Program

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.

- **Closed Landfill Program** – The MPCA Closed Landfill Program (CLP) was developed through the 1994 Landfill Cleanup Act as an alternative to Superfund to characterize, remediate, close, monitor and maintain closed municipal landfills. The goals of the CLP are in alignment with the MPCA's fundamental goal of protecting human health and the environment from adverse risks posed by contamination of environmental media. The CLP specificially identifies these risks as human exposure to landfill contaminants including methane gas, and degradation of groundwater and surface water. The CLP manages risk at closed landfill sites using the "Risk Management Cycle" which defines a framework for which projects are conducted under the CLP. The stages identified in the Risk Management Cycle are as follows:

  - Stage 1: File Review and Characterization: this stage includes obtaining an understand of risk posed by a landfill. This stage typically involves site characterization activities such as conducting reviews of landfill permit documents (including but not limited to, solid waste management plans, operations manuals, closure and post-closure plans, construction plans) and annual reports. Investigation activities will be conducted as part of the characterization phase to obtain information about the current potential risk.
  - Stage 2: Risk Identification: this stage consists of evaluating all the data obtained during Stage 1 in order to identified the risks at each site. The CLP uses a risk-scoring model to determine risk and assign priority for remedial action; landfills with high risk scores will receive a high ranking on the CLP Risk Priority List (MPCA, 2018).
  - Stage 3 – Response Action: Based on the results from the risk identification stage, the CLP will evaluate and implement response actions in order to reduce the overall risk associated with a landfill. Response actions range from constructing new liners, conducting cap/cover repair, installation of gas vents to implementing closed landfill plans.
  - Stage 4 – Maintenance/Monitoring: The final stage consists of maintainance and monitoring of the implemented response actions to ensure remedy effectiveness.

  Amec Foster Wheeler has extensive experience conducting services in alignment with the CLP Risk Management Cycle at solid waste and closed landfill sites throughout the country. Amec Foster Wheeler has also utilized MPCA guidance specific to sampling at or adjacent to landfills or on projects in states where similar guidance does not exist. Such guidance includes MPCA CLP guidance *c-clfl-03 Closed Landfill Proram Sampling Protocol for Monitoring Wells* (October 2008) and *c-rem3-04 Guidelines for Monitoring for Landfill Gas at and Near Former Dumps* (November 2011).

- **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 take action 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 approximately 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).

C.3 Project Descriptions

C.3.1 Ironton Tar Plant Superfund Site – RCRA Landfill Cap Design/Remedial Investigation

Ironton, Ohio

Client Name: Ironton Tar Plant

Client Contact: Chuck Geadelmann

Telephone: 763-954-5418

Period of Performance: 2002 to present

Site Description

The Ironton Tar Plant is a Superfund Site located next to the Ohio River and Ice Creek in Ironton, Ohio. Soil, sediment, and groundwater have been impacted by chemicals of potential concern (COPCs) associated with the former Tar Plant operation that operated from 1917 to 1982. The 95-acre site is comprised of a historic coke plant and five lagoons, a tar plant, portions of Ice Creek, and a pit used for the disposal of tar plant waste (Goldcamp Disposal Area). The COPCs include PAHs (benzo[a]anthracene, benzo[a]pyrene, chrysene, and dibenzo[a,h]anthracene), naphthalene, benzene, phenolics, and inorganic compounds including arsenic and cyanide. The COPCs migrated southeast from the tar plant in groundwater toward the Ohio River.

The Site is located in a topographically flat alluvial terrace in a mixed industrial/residential neighborhood in Ironton, Ohio. Soil, sediment, and groundwater beneath and adjacent to the facility were impacted due to improper discharge/disposal of tar plant wastes.

Project Description

Amec Foster Wheeler (AmecFW) designed a low-permeability cover system for the 16-acre Main Parcel portion of the Tar Plant to prevent human, wildlife and stormwater contact with contaminated soils. The cover system consists of a dual liner comprised of a geosynthetic clay liner and linear low-density polyethylene (LLDPE) liner overlain by a drainage layer, vegetative layer and topsoil. The dual liner system also performs as a vapor barrier minimizing the potential for vapors to enter future buildings.

Amec Foster Wheeler designed the drainage layer above the liner using a 3.5 percent grade, a deviation from the minimum 5 percent grade requirement. Amec Foster Wheeler completed hydraulic calculations to demonstrate that the drainage layer as designed was capable of removing infiltrated stormwater from the liner and prevent sloughing. The modification was approved by the regulatory agencies including USEPA Region 5. The modification allowed the final grades to be shaped and finished using existing onsite soils as approved by the USEPA and avoid the cost of imported fill.

Outcome Achieved

- Two landfill cap/cover systems were designed for the site based on differing conditions at different areas.
- Low-permeability cover system was designed and constructed to prevent human, wildlife and stormwater contact with contaminated soils.
- Passive methane gas venting system was designed/constructed to prevent off-site migration of methane.
- A stormwater system was installed to remove stormwater off the landfill cover to a new perimeter storm sewer system.
- Prepared design documents and supported the client with development of bid packages, holding pre-bid meetings and evaluating construction bids.
- Conducted construction management services throughout construction of the cover system.

Relevant Agencies, Regulations

- OEPA Superfund Program
- CERCLA
- RCRA

Tasks Subcontracted Out

- Laboratory analysis
- Landfill Cap Cover Construction

Personnel

- Garret Bondy – Program Manager
- Jeshua Hansen – Design Engineer
- Justin Gal – Design Engineer
- Andrew Fiskness – Project Scientist
- Erin Siewert – Project Scientist//Task Manager
- Joe Caryl – Construction Manager

Amec Foster Wheeler also designed a stormwater system to remove stormwater from the landfill cover to a new perimeter storm sewer system. Soil loss calculations were completed to demonstrate that sheet flow to the storm sewer catch basins and manholes would have minimal soil loss and stormwater diversion berms were not necessary. Avoiding diversion berms allows more opportunity for potential future redevelopment as a brownfield site. The collected stormwater from the landfill cover was designed to be discharged under adjoining railroad tracks and subsequently to the Ohio River. Amec Foster Wheeler completed permit applications and assisted the client in obtaining long-term agreements to utilize culverts under the railroad tracks for permanent storm sewer piping.

Amec Foster Wheeler also designed a soil cover system on a five-acre river parcel portion of the Tar Plant that is adjacent to the Ohio River. The soil cover system design included 18 inches of soil and 6 inches of topsoil on portions of the site above the normal high water elevation. Marine mattresses and rip rap were designed to be placed from the high water elevation to two feet below the low water elevation. Shrub and tree plantings were completed on three to 10-foot spacing over the site to provide slope stability of the cover system, and provide an aesthetically pleasing riverbank. The construction schedule was also designed around the roosting season for the Indiana bat (an endangered species), and the schedule for work conducted in the river was designed to avoid fish spawning periods.

A passive methane gas venting system was also designed to reduce the potential for pressure buildup under the liner and prevent offsite migration of methane. Nested soil gas monitoring probes were installed along the perimeter of the site. The gas monitoring probes are monitored quarterly for the presence of methane. Amec Foster Wheeler also developed a contingency plan in the situation that methane concentrations are detected above action levels. Current steps include increasing monitoring frequency, install gas monitors inside adjoining buildings, or install active gas vents with solar powered flares.

Design drawings and specifications were prepared in CSI format detailing the proposed remedial actions. The drawings and specifications were reviewed and approved by the USEPA at the 30 percent, 95 percent, and 100 percent stages under the CERCLA program. Amec Foster Wheeler prepared two separate bid packages; one for the Main Parcel low-permeability cover system; and the second for the River Parcel soil and streambank cover system. The bid packages include contract requirements, drawings and specifications, and appendices summarizing previous investigations (boring logs, analytical data, railroad requirements, etc.) to assist the contractor in providing a comprehensive bid. Amec Foster Wheeler also supported the client in holding a mandatory pre-bid meeting including a site visit where Amec Foster Wheeler answered questions for prospective bidders.

Amec Foster Wheeler also provided construction management services throughout construction of the remediation system. Multiple Amec Foster Wheeler personnel were on-site throughout construction and managed multiple work crews throughout project completion. Our staff were responsible for conducting daily health and safety meetings, weekly progress meetings, and monthly meetings with regulators and other external project stakeholders. The Amec Foster Wheeler construction managers assured construction was completed ensuring to specifications, on time and within budget.

Project Highlights

Amec Foster Wheeler designed two cover systems for the tar plant and an adjacent river parcel based on differing site conditions. Utilizing an alternative design to the state solid waste rules that was proven to be comparable to the state rules, and equally protective of human health resulted in significant cost savings.

C.3.2 Landfill Remedial Investigation/Design

Fort Gratiot Landfill

Port Huron, Michigan

Client Name: Michigan Department of Environmental Quality

Client Contact: Kevin Wojciechowski

Telephone: 586-753-3891

Period of Performance: Ongoing

Site Description

The Fort Gratiot landfill is a 19-acre landfill located in Port Huron, Michigan that received construction, demolition, domestic and industrial solid wastes. Amec Foster Wheeler was contracted to close the landfill in accordance with Michigan PA451, Part 201. Amec Foster Wheeler conducted a site characterization, an evaluation of potential human health and sensitive environmental receptors, developed a design plan for landfill closure and conducted construction management oversight for implementation of the remedial design.

Outcome Achieved

- Remedial Investigations have served to cap landfill soil, contain landfill leachate for proper disposal, and vent gas from the contaminant source area below the Landfill. This has moved the site toward closure.

Relevant Agencies, Regulations

- MDEQ

Tasks Subcontracted Out

- Landfill Cap Design
- Methane Gas Vent System Design
- Groundwater/Leachate Interceptor System Design
- Wetland Mitigation
- Cover System and Groundwater Extraction System Maintenance

Personnel

- Garret Bondy – Program Manager
- Jason Armstrong – Project Manager

Project Description

In order to close the landfill and implement the most cost effective design, while providing the highest level of protection to human health and environment, the project was conducted in phases. The first phase consisted of site characterization including conducting a contaminant assessment and a review of potential human health and sensitive environmental receptors. In addition, Amec Foster Wheeler conducted an evaluation of the current landfill conditions, including leachate disposal, the integrity of the existing cover system, the effectiveness of the landfill containment dike and the landfill gas venting system.

Following the site characterization phase, Amec Foster Wheeler conducted a design phase. The landfill cover design included an impermeable 40-mil linear low-density polyethylene (LLDPE) geomembrane followed by a geocomposite drainage layer, two feet of low permeability clay, top soil, and seed. A leachate control system consisting of a leachate/ groundwater collection trench, was designed to address leachate collection from both the landfill and the leachate generating waste outside the footprint of the landfill. The leachate collection system design also included leachate treatment, a pumping station and a 6-inch sewer allowing gravity discharge to the city sewer and discharge to the Port Huron wastewater treatment plant (WWTP).

A landfill gas venting system was also designed consisting of a sand gas vent layer, placement of horizontal gas collection piping, three gas collection trenches, and installation of 24 passive gas vents. Amec Foster Wheeler also designed a methane monitoring system including the installation of 27 perimeter monitoring points and five methane gas monitors.

Since the northern edge of the designed landfill cap would intersect with an existing surface water retention basin, the intersection was designed to enhance the retention basin and create a wildlife habit.

A Soil Erosion and Sedimentation Control (SESC) Plan was prepared detailing the measures to prevent soil/sediment from entering the public storm sewer system during construction.

Following completion of the design phase, Amec Foster Wheeler was involved in construction management activities. Amec Foster Wheeler construction managers provided procurement assistance, including preparation of the advertisement, pre-bid meeting, issuance of addendum, pre-award meeting with the apparent low bidder, review of low bidders references, completion of a bid tabulation comparing bids and to identify bid discrepancies, preparation of the contract form, and making recommendation to client.

Amec Foster Wheeler provided construction management oversight throughout system installation and provided one-year of operation and maintenance (O&M) support following completion of the installation. Throughout construction and during O&M, Amec Foster Wheeler reviewed the contractor's technical and equipment submittals for conformance with the specifications, and provided full-time project representation to observe that the work was performed in accordance with the drawings and specifications. Progress meetings were held to discuss the construction schedule and work completed. Amec Foster Wheeler developed bulletins for changes in scope items and coordinated any required changes with the client.

Amec Foster Wheeler also prepared a Quality Control Assurance Plan detailing the test procedures and acceptance criteria for the installation of the flexible membrane liner and soil cover system and ensured that the test procedures were followed and the acceptance criteria met at the end of construction.

Current O&M activities involve reviewing contractor reports, and providing assistance to the long-term O&M contractor with any technical issues arising from the operation of the landfill cover, leachate recovery, gas monitoring, and stormwater systems. Since completion of construction, Amec Foster Wheeler was able to reduce the amount of monitoring and reporting required by the City of Port Huron for discharge of treated leachate to the WWTP.

Project Highlights

Amec Foster Wheeler successfully designed and provided construction oversight for the landfill cap, gas venting system, and leachate collection systems to achieve closure of the landfill. Amec Foster Wheeler also provided beneficial use through incorporation of wetland mitigation measures into the design and which resulted in providing habitat for waterfowl.

C.4 Scope of Services

C.4 Scope of Services

Amec Foster Wheeler's experience with each of the bullets listed in Section 3, Category C. Closed Landfill Environmental Services of 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.

C.4.1 Scope of Services Experience Summary

Design Remediation Systems and Strategies for Remediation of Subsurface Contamination.

Amec Foster Wheeler is experienced in developing strategies and designing systems for all types of subsurface contamination including soil, solid waste, sediment, groundwater, surface water, methane and/or vapor. With complete, in-house engineering and design resources, Amec Foster Wheeler offers real flexibility and rapid turnaround in design. Relying on our team of remediation experts and state-of-the-art technology, Amec

Foster Wheeler effectively designs and manages a wide variety of remediation system projects, including but not limited to: air emission control components; in-situ oxidation and reduction technologies tailored to site-specific source conditions; physical, chemical, and thermal treatment technologies; constructed wetlands remediation systems, including recirculating well technology; landfill development, capping, and closure, and sewer rehabilitation and discharge controls.

Upon selection of a preferred remedial alternative, a design package is developed for the client for use in procuring a construction contractor for constructing the alternative. The design packages include detailed design specifications, and engineering drawings, materials, costs and schedules for implementation.

Amec Foster Wheeler has designed landfill cover systems, leachate and groundwater controls, and methane gas controls and monitoring systems. Specifications are prepared to provide detailed descriptions of the work, equipment, and performance requirements for landfill systems. A Principal Engineer is assigned to each design and is responsible for all technical input and quality assuring that proper engineering techniques are utilized and the system will be able to achieve remediation objectives.

Representative Experience

- Stan's Trucking Landfill – Methane Gas Control: Amec Foster Wheeler designed and installed an in-situ automated methane monitoring system to provide long-term monitoring and gas venting at a former construction, demolition, and domestic solid waste landfill located in Rochester Hills, MI. Following landfill closure, houses were constructed along the eastern side of the property and unbeknownst to property owners, the waste fill area extended onto their properties. Landfill gas posed a potentially hazardous condition for the residences. To mitigate the risk of explosion in adjacent structures, a 1,500-foot long landfill gas collection trench with passive venting was installed between the landfill and adjacent properties. Amec Foster Wheeler also designed and conducted construction oversight of a soil vapor extraction (SVE) system as a fail-safe measure between the collection trench and the residences. Amec Foster Wheeler also conducted a bi-weekly methane monitoring program. To provide long-term monitoring and gas venting, Amec Foster Wheeler designed, the in-situ automated methane monitoring system to monitor vadose zone soil adjacent to the houses and in the residential backyards. System design included catalytic bead sensors, which have high sensitivity, installed next to the houses and infrared sensors, which are less sensitive, installed in the backyards and at the residential property boundaries. The SVE system was designed to automatically activate an autodialer that alerts Amec Foster Wheeler personnel when concentrations exceed 500 parts per million near a house, if 25% of the lower explosive limit is exceeded in a backyard, or if any portion of the system fails. In addition, eight passive gas vents were installed in areas of historically high methane concentrations between the landfill gas collection trench and the adjacent properties. Construction oversight activities were managed by Amec Foster Wheeler and included installation of the monitoring points and passive vents, wiring to connect the monitoring sensors to a microprocessor to manage the sensors and alarm relays to the auto-dialer, and installation of a building to house the control system and the SVE blower. Once the in-situ monitoring system was installed Amec Foster Wheeler verified through periodic monitoring that the automated system was working correctly.
- Five County Area Development District (FIVCO) Landfill Improvement, Eastern KY: Amec Foster Wheeler completed a remedial design and construction monitoring at an orphaned 7-acre landfill site in Eastern, Kentucky. Improvement included supplementation of existing soil cap, extensions to existing leachate

collection system, installation of interceptor trench for impacted groundwater at toe of site, and construction of a lined leachate treatment wetland in the location of the sediment basin. A drop inlet and storm-water pipe were installed to bypass upgradient run-off. This treatment wetland had 2 cells: one free water and the other subsurface, intended to provide some biological treatment in the root zone in winter. Given the fact that this was an unoccupied site, particular attention was paid in the design process to make the improvements as low maintenance as possible. Drainage improvements were also designed for the steep perimeter ditches to minimize erosion and maintenance requirements. Per our client's request, multiple options were evaluated for the site's leachate, including deep well injection and spray-irrigation.

Oversee, design, and/or conduct pilot testing, bench scale testing, field demos and treatability studies of remediation systems or technologies

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 particular 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 AS/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.

Amec Foster Wheeler staff has conducted pilot tests for hundreds of remedial systems across USEPA Region 5 including Minnesota.

Representative Experience

- 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.
- Bench-Scale and Pilot-Scale Testing of Ion-Exchange Resin for Drinking Water Treatment: Amec Foster Wheeler conducted bench and pilot scale testing of regenerable ion-exchange resin in a side-by-side comparison with granular activated carbon in response to PFAS drinking water contamination. 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.

- Dry-Cleaning Facility, St. Louis County, MN: Release of dry-cleaning solvents from a facility in St. Louis County, 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. Amec Foster Wheeler conducted soil vapor extraction pilot tests for each side of the wall. For each test, one soil vapor extraction well and four observation wells 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.

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 Corrective Action Plan (CAP).

Representative Experience

- Cedar Ridge Landfill, Lewisburg, Marshall County, TN: Amec Foster Wheeler prepared a CAP to address violations in the facility National Pollutant Discharge Elimination System (NPDES) Permit. AMEC provided oversight of activities to remove sediment from a karst feature per the CAP and conducted sediment assessments in on-/off-site receiving streams following alleged failure of on-site sediment basins. Other tasks included: Delineation of jurisdictional waters, verification of their boundaries, subsequent water quality permitting, compensatory mitigation plan, public hearing participation, and stream assessment (benthic macroinvertebrates) following alleged failure of leachate collection system

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

Amec Foster Wheeler staff 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 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

- Landfill Operations and Closure Plan, Newmont Landfill Site: Amec Foster Wheeler was retained to prepare a Landfill Operation and Closure Plan for the Golden Giant Mine landfill in Ontario, Canada. The project included installing a new network of monitoring wells to establish and delineate a contaminant attenuation zone. The project also involved the development of conceptual designs and alternatives for closing the inactive portions of the landfill and the continued operation of the active portion of the landfill until final closure. The operations and closure plan included an evaluation of leachate, surface, and landfill gas management plans, a groundwater compliance and predictive trigger level monitoring program and documentation of site facilities and operations.
- Shoreham Rail Yard Remedial Investigation: Amec Foster Wheeler 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 ground water, soil, surface water, sediment, and air sampling and monitoring

Groundwater sampling and monitoring - Amec Foster Wheeler staff 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 technique. 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 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, taking into account 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 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, taking into account 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.

Landfill Gas Monitoring – Amec Foster Wheeler staff conducts landfill gas monitoring at numerous sites across the country as part of ongoing operations maintenance and monitoring projects. Amec Foster Wheeler utilizes various types of equipment for gas monitoring including; combustible gas detectors, infrared gas analyzers, oxygen meters, potable gas chromatographs, flame ionization detectors (FID) and photoionization detectors (PID). Amec Foster Wheeler evaluates the type of monitoring equipment based on site-specific conditions such as levels of gas anticipated based on historical knowledge and the degree of concern for potential explosive hazards.

Representative Experience

- As part of landfill permit compliance for OM&M of two landfills located near Oshkosh, Wisconsin, Amec Foster Wheeler was recently required to conduct quarterly and semi-annual landfill gas monitoring at the facilities. Both landfills contained sludge generated by the local paper industry, with one landfill being closed and conducting post-closure care monitoring, while the second landfill was temporarily capped and had not been in active use in almost two decades. Contaminants of potential concern were sulfate and chloride, with no identified VOC impacts, thus landfill gas monitoring was primarily for methane. Between the two landfills, 48 landfill gas vents and five perimeter gas probes were monitored semi-annually, and two perimeter gas probes were checked quarterly. Methane, carbon dioxide, and oxygen were recorded using a LANDTEC GEM-2000 monitor, along with wellhead pressure for the perimeter gas probes. Data were collected to verify system maintenance and ongoing compliance.
- 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 aqueous film forming foam (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 (including OH and NY) and SIs at 22 installations in 13 states (including NY). 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 foundation required to identify areas downgradient were 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 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 has completed environmental assessments in support of federal and state permit applications for proposed expansion or closure.

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 has also extensive experience preparing response action plans (RAPs) in accordance with the RBSE process and MPCA guidance. For Superfund and RCRA Corrective Action projects, we follow the guidance for those programs and follow the National Contingency Plan.

Representative Experience

- Site Assessment for Landfill Expansion, Louisville/Jefferson County, KY: Amec Foster Wheeler completed environmental assessment and document preparation in support of federal and state permit applications for a proposed landfill expansion. In the siting process, staff environmental planners used a GIS to eliminate areas that were unsuitable for use as a facility site. Phase I applied regional screening criteria to the entire study area using considerations such as haul distance, transportation routes, soils, geology, hydrology, wetlands, flooding, demographics, political boundaries, and land use. The Phase I resulted in identification of several potential sites, 500 acres each, that were evaluated in detail through the application of Phase II site-specific criteria. Each site was characterized and compared using both economic and environmental related criteria including: site availability, site accessibility, potential ecological impacts, liner material availability, and potential groundwater contamination, to identify the preferred site for landfill construction the one having no, or the least, significant impacts. The environmental assessment component of the report included both ecological and cultural resource site characterizations. Ecological field investigations by staff biologists, ecologists, and botanists, included habitat descriptions, protected/endangered species surveys, and a detailed wetland function and value analysis. Staff archaeologists conducted both literature and field reviews for significant historic and prehistoric cultural resources at the project site. In the final portion of the report a mitigation plan was designed to compensate for unavoidable wetland impacts.
- 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 aqueous film forming foam (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 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 standard operating procedures for sampling PFAS, to prevent cross-contamination from materials used and/or sampling activities. The incident was managed by the MPCA Emergency Management Unit.

- Landfill Expansion and Base Liner Modification, Domtar Espanola Landfill Site: Amec Foster Wheeler was retained by Domtar Incorporated to prepare a Pre-Assessment for a Landfill Expansion and subsequently a Landfill Expansion and Liner Design for the Domtar Espanola Waste Disposal Site. The project included an assessment of the current layout of the landfill area and the approved landfill expansion designs. Amec Foster Wheeler determined that a vertical expansion of the landfill was the most feasible way to accomplish the expansion and stay within the limits of the Certificate of Approval. The proposed base liner consists of a 1.5 mm thick HDPE geomembrane in combination with a geosynthetic clay liner (GCL) to form a composite liner providing an excellent barrier against leachate migration. The Landfill Expansion and Liner Design included: calculation of landfill volumes and site life; development of waste footprint, buffer zones, base contours, final contours and cover soil requirements; detailed leachate collection system design and supporting documentation for the Environmental Compliance Approval Amendment application.

Conduct surface water, ground water, 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 for hazardous vapors since the sewer line potentially served as a conduit to residential property along the lake.

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). Because this issue arises on nearly all our projects, we are very familiar with the waste disposal rules including rules regarding restricted waste and asbestos-containing materials. Several employees are intimately knowledgeable about the proper management of waste. Mr. Bob Marxen, PE, CHMM is both a Certified Hazardous Materials Manager and certified by DOT 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 1000 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 3 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 3 installations. At one site, step-out investigations have been conducted. At a second site, conceptual designs for two source wells used for drinking water has been completed. At a third site, a larger, complex mitigation response was required as a result 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 residences and business. 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 3 municipal wells; and evaluated 18 residences for the installation of whole house treatment systems or connection to municipal drinking water.

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.

Oversee subcontractors and state contractors during investigation and cleanups and construction activities

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: Amec Foster Wheeler conducted environmental oversight for removal of an on-site fueling system consisting of an 8,000-gallon diesel fiberglass UST (containing approximately 200 gallons of diesel), and associated dispenser, piping, and vent line. An approximately 600-gallon underground concrete vault that was previously used 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. Amec Foster Wheeler 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 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 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 of these report documents and forms.

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 and Data Reports

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 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, Workplans, 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): was opened as a result of 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 locates. 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 Documents/Assist the MPCA during the Bidding Process

Amec Foster Wheeler's 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 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 has also 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.

Amec Foster Wheeler has also prepared bidding documents and supported contractor selection and procurement processes for private clients. Amec Foster Wheeler has conducted pre-bid meetings, developed addendums to specifications, reviewed bids, checked references and prepared contractor selection recommendation letters for the lowest, responsive and responsible bidders.

Former Soo Line Railroad Site: Amec Foster Wheeler conducted bidding activities for the demolition of a former petroleum recovery and remediation system at the 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.

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/Oversee Remedial Actions/Installation of 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 objectives, timeframes, and budgets. Part of the field oversight includes providing a detailed record of daily activities, including progress, difficulties encountered, and any field modifications. 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

- E.H. Schilling Superfund Site Landfill, Hamilton, Ohio – Amec Foster Wheeler provided environmental services for remediation of this Superfund Site, including construction of the landfill cap and containment system, on behalf of our chemical manufacturer client and Group. The remedy included an integrated deep grout curtain and slurry wall structure, earthen dam improvements, cutoff wall construction, surface

water management, RCRA Cap and landfill dewatering wells, landfill cap construction, and groundwater / leachate collection and treatment system construction. The project also included chemical analysis and sampling, quality assurance, health and safety risk assessment, geologic survey, air quality monitoring, hydrogeologic study, and negotiation under a consent agreement with USEPA Region V and Ohio EPA. As a result of AMEC's interaction with the regulatory agencies, the amount of grading and capping at the facility was reduced, and a significant portion of the projected $5 million remediation construction amount was saved.

- 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 breakdown products. In preparation for system installation, six groundwater extraction wells were installed. Construction of the system began in 2016 with oversight by Amec Foster Wheeler staff for the system consisting of:
    - the 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 1 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 of 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.

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 Amec Foster Wheeler staff exhibits a level of experience which allows the ability to review and interpret data quickly, and provide a list of conclusions and recommendations. MCPA and MDA will benefit from the significant depth of skills and experience that Amec Foster Wheeler brings to the project teams.

Representative Experience

Closed Sites Vapor Intrusion Evaluation Program, Statewide, MN: 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 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.

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 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. 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.

Review Groundwater Remediation Technologies, Perform Operation and Maintenance System Review and Recommend Alternatives and Optimization Options

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 and SVE 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 and groundwater remediation system 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 quarterly and/or annual 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

- Landfill Operations, Maintenance and Monitoring (OM&M), Winnebago County, Wisconsin: Amec Foster Wheeler recently conducted OM&M services at two 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 system 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 the facility. 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.

- 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 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

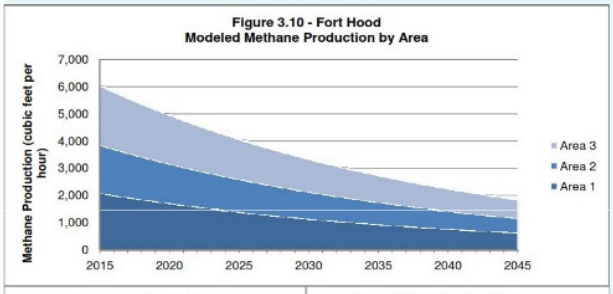
sampling plan as well as 32 SOPs specific to the system and its components that ensure successful operation and maintenance of the system and compliance with the MDH and MCES permits. Amec Foster Wheeler has also provided training for an OM&M contractor and continues to review system operation.

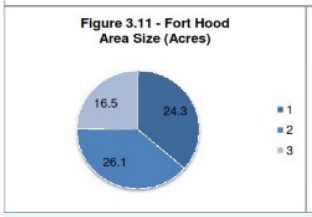
Provide Evaluation and Design of Energy Recovery Systems Utilizing Landfill Gas

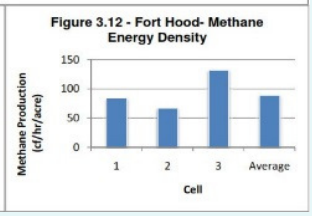
Amec Foster Wheeler utilizes a proprietary landfill gas modeling tool with integrated financial pro forma calculator providing our clients with the information they need when evaluating the development or purchase of a landfill gas to energy system. Our services range from initial desktop studies to gas monitoring and records review with full feasibility analysis.

Representative Experience

United States Army Corps of Engineers Landfill Gas to Energy Feasibility Study: Amec Foster Wheeler provided a comprehensive feasibility study that addressed 121 Army landfills through the continental U.S. The first phase of the project was to conduct a desktop study, records review, and site prioritization to identify those assets which may meet established economic thresholds. The desktop study considered landfill age, landfill size, waste composition, gas collection system type, methane generation rate, and local energy rates. Amec Foster Wheeler recommended that five locations be included for a second phase analysis based on their potential for successful landfill gas to energy project implementation. A site investigation was performed at each of the five landfills, which included a detailed records review and methane monitoring. The model was further updated to consider local climate, waste deposit rates and deposit types by year by closure cell, methane generation and capture rate. The feasibility study included a conceptual design (specifying additional landfill gas well locations, where required), a continuous duty low-btu engine, recommended system duty cycle, accompanying estimate of probable cost, and life cycle analysis over the specified 30-year project horizon.







Research, Evaluate and Implement Innovative or New Technologies

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.

Amec Foster Wheeler with our energy service company partners have completed landfill redevelopment projects including design and construction of solar arrays on closed landfill sites. Where portions of a property may be contaminated, such as landfills or former ponds, Amec Foster Wheeler has unique capabilities for placing solar arrays on impaired land as we have successfully been able to negotiate more appropriate cover measures for impoundments when placing solar arrays due to highest-and-best land use and the agency's preference for renewable repurposing.

Representative Experience

- Re-Purposing Landfills with Landfill Solar Photovoltaic – Acton, Lowell and Sudbury, Massachusetts: Amec Foster Wheeler completed redevelopment of former landfill properties into three solar photovoltaic installations in Massachusetts. In Sudbury, the closed landfill was redeveloped as a 1.509 megawatt solar photovoltaic generating system. The project included engineering and permitting to require a Post-Closure Use Permit through Massachusetts Department of Environmental Protection. The engineering evaluation included geotechnical analysis of bearing capacity, slope and sliding stability, and settlement; structural design of cast-in-place concrete equipment pads; and stormwater analysis to assess the increase potential increase in stormwater runoff volume and rate due to the proposed development. The Lowell landfill consisted of redevelopment of a closed landfill as a 1.502 megawatt solar photovoltaic generating system with similar permitting requirements to Sudbury, however additional engineering evaluation was required due to the landfill being capped with a geomembrane. In Acton, a significant earthwork/grading design was required to ensure stability of the solar array on the unsuitable existing slopes. Amec Foster Wheeler provided an earthwork design to enable maximizing the available area for the solar array. Amec Foster Wheeler also provided construction oversight for throughout the redevelopment projects.

- 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 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.

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. 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 sensitive to protecting 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. Amec Foster Wheeler coordinated with the client and regulatory entities, including City, MN Department of Health, MN Department of Natural Resources, 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. 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. 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.

Prepare Erosion Control Plans and Oversee Implementation

Amec Foster Wheeler frequently develops soil erosion and sediment control plans as part of our remedial design projects. The soil erosion and sediment control plans detail the required measures to prevent soil erosion on upland work areas and sedimentation controls to prevent soil from entering water courses. The soil erosion and sediment control plans identify measures such as silt fences, catch basin filters, entrance stabilization, wheel

washing pad, erosion ells, etc. for excavations and sites where vegetated areas have been cleared. Amec Foster Wheeler develops such plans to include a project description, construction sequence, best management practices to be used for controls. The plans also document inspection, reporting and documentation requirements during construction. Typically, the construction contractor obtains necessary permits and Amec Foster Wheeler conducts oversight throughout construction to ensure that all the requirements of the plan are being met.

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 considerable experience with a large number of project sites. Amec Foster Wheeler has recently conducted a number of soil vapor investigations in support of the 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 a 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.

Representative Experience

City of Xenia Municipal Landfill Monitoring, Xenia, Ohio: In support of the EPA, Amec Foster Wheeler performed landfill post-closure activities including a monitoring program for a 2,500-acre site that includes a closed municipal landfill (160 acres), an active C&DD landfill, the source water protection area, the water treatment plant, and agricultural land. Landfill gas issues were an item of concern to the City and the EPA and Amec Foster Wheeler's assistance was requested to provide recommendations for a gas migration system for the facility. The previous venting approach was not mitigating the accumulation of methane gas in the subsurface near the Public Service Building and a residential plat near the closed landfill; the City retained Amec Foster Wheeler for assistance with the gas monitoring program to characterize the occurrence and predicted duration of methane generation from the landfill, and to let bids for the installation of a landfill gas control system. Amec Foster Wheeler provided estimates of subsurface landfill gas storage and rates of landfill gas generation, prepared a conceptual design of a recovery system for presenting recommendations to the City. Amec Foster Wheeler subsequently prepared a request for proposal package in conformance with City of Xenia protocols, conducted procurement and recommended a contractor for implementation.

Assist and provide training as requested by the MPCA or MDA. Training must be related to the scope of this contract

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.

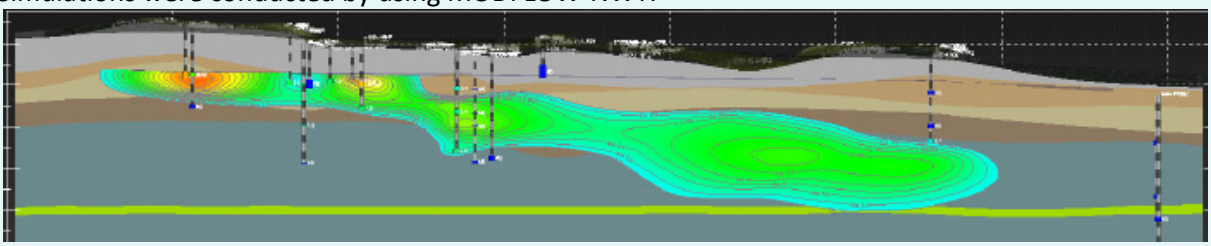
Oversee hydrogeologic investigations including fate & transport modeling, capture zone analysis and pump tests

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 utilize 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.

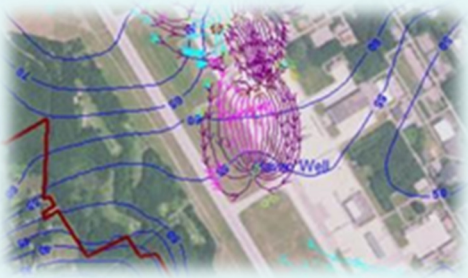
Amec Foster Wheeler routinely utilizes our hydrogeologic skill set to design groundwater remedies including groundwater pump and treat, in situ bioremediation, in situ chemical oxidation, and air sparging. We model the migration of contaminants between soil and groundwater, groundwater and soil vapor, 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 groundwater contamination by PFAS. 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.



Perform/oversee Evaluation of Soil Borings, Test Pits, Environmental Boring and Soil Testing to Determine Cover Integrity.

Amec Foster Wheeler has conducted oversight of drilling environmental and geotechnical borings, soil testing in support of evaluations to determine landfill cover integrity on landfill sites across the country.

Representative Experience

Waddy Landfill Characterization, Shelby County, Kentucky: Amec Foster Wheeler completed a landfill characterization project in Shelby County, KY with the primary objectives of identifying potential environmental concerns, conducting site investigation activities and conducting a geotechnical investigation to evaluate the integrity of the landfill cover system and slope stability. Site investigation activities included evaluation of leachate outbreaks, surface water, and the landfill cap. Amec Foster Wheeler collected soil and water samples from 10 suspected leachate outbreaks. Three surface water samples were also collected along the property boundary to determine the extent to which leachate was impacting area streams. Geotechnical investigations were conducted at two general locations identified c completion of a Phase I ESA. Sixteen Borings were advanced using a hollow-stem auger drill rig along the north of the north ridge to evaluate areas of slope instability. Borings were drive sampled in accordance with Am Society for Testing and Materials (ASTM) D 1586, and six undisturbed Shelby tube samples were collected. Sa collected during the geotechnical investigation were analyzed to determine the soils hydraulic conductivity, i weight, percent fines, moisture content, standard Proctor value, and Atterberg limits. In addition, 16 borings advanced along the northeast ridge to evaluate cover depth.

Arrange for geophysical activities

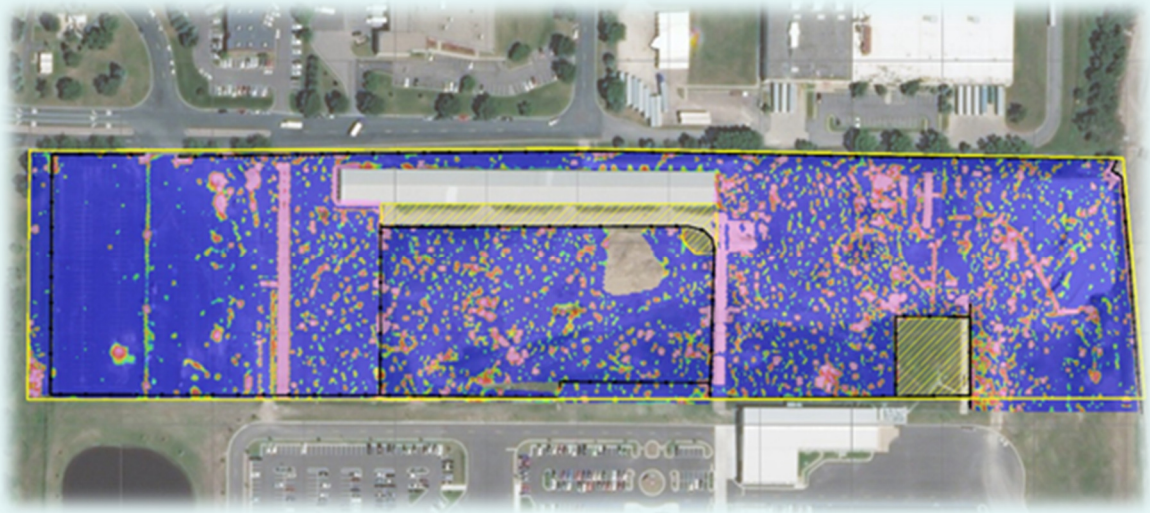
Amec Foster Wheeler has experienced geophysicists that routinely apply surface geophysical methods to provide a cost effective, accurate delineation of buried features and objects such as bedrock depth, bedrock type, fractures and preferential pathways for potential contaminant plumes. We also have performed 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 with our E and IS teams. 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.



Conduct/Oversee Studies of Hydrogeology, Geology and Soils using Geophysical Studies, Modeling and Dye Trace Studies.

Amec Foster Wheeler has experience conducting landfill site evaluations for a wide variety of purposes, and during various stages of a landfill life-cycle. Amec Foster Wheeler has conducted hydrogeological studies including geophysical studies, modeling and dye trace studies to evaluate site conditions to develop detailed conceptual site models, for monitoring environmental impacts, to support remedial design and implementation, and to evaluate effectiveness of existing landfill cap and/or liners.

Representative Experience

City of Franklin, Kentucky Landfill Characterization:

Amec Foster Wheeler conducted a landfill characterization study to evaluate the City of Franklin landfill in Simpson County, Kentucky. The landfill characterization project involved, conducting a regulatory file review and historical research, performing a karst hydrogeologic inventory, fluorescent dye trace, and sampling, conducting a geotechnical evaluation of the existing landfill cap and liner and performing a geophysical survey of a suspect unpermitted section of the landfill. Special emphasis was placed on evaluating the karst hydrogeological setting. A karst hydrogeological inventory was conducted to locate potential karst features (e.g. springs, sinkholes, etc.) with the potential to impact surface water resources. A karst dye trace study was conducted to determine a connection between the landfill and karst features that would facilitate transport of contaminants to surface water resources. Data collected during field activities was managed in ESRI's ArcGIS software.

Multiple sampling events were conducted following the dye trace study to determine if landfill leachate was impacting surface or groundwater resources.

A geotechnical evaluation included an evaluation of cap and liner thickness, depth to bedrock, and waste thickness. A direct push GeoProbe® technology rig was used to determine depth to bedrock and install landfill gas monitoring points. A hollow-stem auger drill rig was used to evaluate the thickness and geotechnical engineering properties of the landfill cap and liner.

Finally, a geophysical survey was conducted to evaluate the area outside of the permitted landfill boundary that may have been used for waste disposal. Multiple areas were evaluated and confirmed to contain waste material.

Prepare Construction Cost Estimates using Standard Engineering Practices

Cost estimates are developed utilizing contractor and vendor supplied budgetary quotes and a mixture of top down and bottom up estimating techniques based on project experience. Vendor quotes provide the basis for major cost items. Work items not covered by quotes, are estimated primarily by bottom up estimating. Published cost data is also utilized to cost items as well as provide a check on the bottom up estimated items. Cost estimates are often developed using RSMeans and other applicable software and reviewed by a senior estimator following Amec Foster Wheeler standard operating and QA/QC procedures. Estimates are reviewed for accuracy upon receipt of bids and updates are made to cost items based current industry trends.

Provide Project Management and Construction Oversight/Construction Documentation Reports

During construction Amec Foster Wheeler provides office and field construction administration services. A qualified construction manager and one or more qualified representatives are assigned to the project and are responsible for providing effective administrative procedures to monitor the work progress and quality of the construction contractor. Senior engineering and scientific staff support the project. The construction manager presides over all project related meetings, and prepares the meeting minutes, reviews contractor requests for payment and forwards a recommendation for payment to the agency. The construction manager works closely with Amec Foster Wheeler's onsite field representative to confirm that work is

completed in accordance with the design package and that the quantity of work included in the pay request has been completed.

Amec Foster Wheeler's engineering and scientific staff review general requirement submittals (e.g. HASP, Work Plan, Spill Plan, Schedule), and technical submittals for equipment and materials. Submittal procedures are detailed in the specifications, and discussed at a pre-construction conference so the trade contractor understands the obligation for a complete submittal package, and procedures for review and resubmittal, if required.

Throughout the project duration, the construction manager also oversees the preparation of modifications to the work, and review of contractor submittals and backup cost information. If the contract requires testing of materials the construction manager coordinates with the contractor the testing, quality control and quality assurance procedures, and review of test results.

Amec Foster Wheeler qualified representatives monitor the work of the contractor for quality and adherence to the drawings and specifications. Conflicts that arise are discussed with the construction manager. The qualified person attends the pre-construction meeting with the contractor to discuss work procedures, schedule, quality control procedures, payment procedures, and change order procedures. Amec Foster Wheeler representatives also conduct regularly scheduled progress meetings with the construction manager during which the past work completed, future work activities, problems and conflicts, potential change orders, schedule, and quality issues are discussed. Meeting minutes are prepared to document the decisions made at the progress meeting. A punch list of issues is developed with a schedule for completion by the contractor.

When the trade contractor believes the work to be substantially complete the construction manager makes a final site walk over of the site and prepares a punch list of deficiencies of the work to be completed or corrected by the contractor, along with a schedule for completion of punch list items. When the punch list items have been completed another walkover is completed to confirm final completion of the work. The construction manager assures that close out documentation has been provided by the contractor. This documentation includes the following:

- Substantial Completion Form (with punch list)
- Guarantee and Indebtedness Statement
- Consent of Surety and Power of Attorney
- Letter stating there are no claims against the project
- Final payment request
- Balancing bulletin to zero-out the contract fees.

Amec Foster Wheeler prepares a Construction Documentation Report that details the work completed and provides documentation of the work, including:

- Project team
- Project chronology
- Pay items and final quantities
- Site photographs
- Daily construction logs
- Progress meeting minutes
- Contractor pay requests
- Bulletins
- Weight tickets for backfill material.

Prepare Operation and Maintenance (O&M) Manuals and Conduct O&M

Amec Foster Wheeler staff has experience designing remedial systems and developing operation and maintenance manuals for long-term operation of such 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 quarterly and/or annual 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 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 get the system back 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 breakdown products. Prior to commissioning, several permits were obtained, including a 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.
- 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 granulated activated carbon (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.

Exhibit 9. Project Personnel Compared to Scope of Work

	Management										Subject Matter Experts														
	G. Bondy	G. Sandholm	E. Driver	A. Bernhardt	J. Murer	S. Thomas	C. Hudak	J. Armstrong	G. Haines	R. Dewyre	C. Abate	H. Albertus-Benham	M. Bevier	J. Caryl	J. Eykholt	J. Field	D. Barsotti	J. Hansen	W. High	C. Landrum	B. Malyk	B. Marxen	J. Renier	R. Talbot	M. Vavra	D. Woodward
Design remediation systems and strategies for remediation of subsurface contamination. Contaminated subsurface media includes, but is not limited to, soil, solid waste, groundwater, methane, and/or other vapor.	●								●									●	●			●		●		●
Oversee, design, and/or conduct pilot testing, bench scale testing, field demos and treatability studies of remediation systems or technologies.	●		●						●					●			●	●	●			●	●	●		●
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.	●		●		●			●		●		●		●				●				●	●		●	
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).	●		●	●	●					●	●			●			●	●	●		●	●				●
Coordinate and cooperate with other State-contracted services such as sampling and analytical, emergency response contractors, and hazardous waste services.	●		●	●	●	●	●	●	●	●		●		●		●		●				●	●	●	●	●
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 and data reports.	●		●	●	●	●	●	●		●		●		●				●				●	●		●	
Collect and manage field and laboratory data for electronic submittal in a format specified by the MPCA			●	●	●	●	●		●			●	●					●		●		●	●	●	●	
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 documents (e.g. plans and specifications), suitable for advertisement for bids, including but not limited to, landfill cover systems, remediation systems, landfill gas systems and erosion repair projects. All plans shall comply with the rules and requirements of the Minnesota Department of Administration and the MPCA.	●		●	●					●			●		●		●		●				●		●		●
Prepare and review Quality Assurance Project Plans (QAPP) and Sampling and Analysis Plans (SAP) in accordance with state and federal requirements.	●		●	●	●	●	●	●		●		●	●	●		●	●	●		●		●	●		●	●
Perform/oversee remedial action plans.	●		●					●	●	●		●		●		●		●	●			●	●	●	●	●
Conduct surface water, ground water, and hydrodynamic modeling.			●						●		●				●	●		●		●			●	●	●	
Conduct third party review and analysis of designs, reports and technical information when requested by the MPCA for the purpose of providing conclusions and recommendations to the State.	●		●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Perform five-year reviews/ and site reviews.	●		●	●	●		●	●		●	●						●					●	●			●
Review groundwater remediation technologies and recommend alternatives and optimization options.	●		●	●	●		●				●	●		●	●	●		●	●	●	●	●	●		●	●
Provide evaluation and design of energy recovery systems utilizing landfill gas.	●								●	●														●		
Research, evaluate and implement innovative technologies.	●		●	●	●		●				●	●		●	●	●		●	●	●	●	●	●		●	●

Exhibit 9. Project Personnel Compared to Scope of Work

	Management										Subject Matter Experts															
	G. Bondy	G. Sandholm	E. Driver	A. Bernhardt	J. Murer	S. Thomas	C. Hudak	J. Armstrong	G. Haines	R. Dewyre	C. Abate	H. Albertus-Benham	M. Bevier	J. Caryl	J. Eykholt	J. Field	D. Barsotti	J. Hansen	W. High	C. Landrum	B. Malyk	B. Marxen	J. Renier	R. Talbot	M. Vavra	D. Woodward
Prepare presentations and present information at meetings.	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●	●	●	●		●	●
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.			●					●		●		●		●				●				●			●	
Prepare Erosion Control Plans and oversee implementation.			●					●		●		●		●				●				●			●	
Provide technical assistance to the State in the evaluation and interpretation of data and information.	●		●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
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.	●				●		●	●	●	●	●						●	●		●		●	●	●	●	●
Complete capture zone analyses.	●				●		●	●	●	●	●							●		●		●	●	●	●	●
Perform/oversee aquifer pump tests.	●				●		●	●	●	●	●							●		●		●	●	●	●	●
Perform/oversee evaluation of soil borings, test pits, environmental boring and soil testing to determine cover integrity and availability of suitable soils.			●		●		●	●		●		●						●				●	●		●	●
Arrange for geophysical activities	●		●		●	●	●	●	●	●		●		●		●		●		●		●	●	●	●	●
Conduct/oversee studies of hydrogeology, geology and soils utilizing geophysical studies, modeling, and dye trace studies.	●		●	●	●	●	●	●	●		●	●		●		●		●				●	●	●	●	●
Prepare construction cost estimates using standard engineering practices.	●			●					●									●				●	●	●		●
Assist the MPCA during the bidding process. The Contractor shall develop, advertise, distribute plans and specifications and addenda, answer bid questions, conduct pre-bid meetings, evaluate bid submittals, including bidder qualifications, and provide a recommendation for bid award.	●		●		●	●	●					●		●				●					●			●
Provide construction oversight	●													●				●								
Prepare construction documentation reports.	●		●	●	●			●	●	●		●		●		●		●	●			●	●	●	●	●
Prepare Operation and Maintenance (O&M) Manuals.									●			●		●		●		●				●				

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

	Engineers														Scientists / Technicians																			
	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	E. Thomas
Design remediation systems and strategies for remediation of subsurface contamination. Contaminated subsurface media includes, but is not limited to, soil, solid waste, groundwater, methane, and/or other vapor.									●				●														●					
Oversee, design, and/or conduct pilot testing, bench scale testing, field demos and treatability studies of remediation systems or technologies.		●	●						●				●				●							●			●				●	
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.		●	●												●	●	●		●	●		●		●	●		●			●	●	●
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).		●	●						●				●				●															
Coordinate and cooperate with other State-contracted services such as sampling and analytical, emergency response contractors, and hazardous waste services.		●	●						●				●		●	●	●	●	●	●		●	●		●	●	●			●	●	
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 and data reports.		●	●						●				●		●		●			●						●	●					
Collect and manage field and laboratory data for electronic submittal in a format specified by the MPCA																●	●	●		●		●			●	●		●	●	●	●	●
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 documents (e.g. plans and specifications), suitable for advertisement for bids, including but not limited to, landfill cover systems, remediation systems, landfill gas systems and erosion repair projects. All plans shall comply with the rules and requirements of the Minnesota Department of Administration and the MPCA.		●	●	●	●	●	●	●	●	●	●	●	●	●			●			●	●		●				●					
Prepare and review Quality Assurance Project Plans (QAPP) and Sampling and Analysis Plans (SAP) in accordance with state and federal requirements.		●	●						●				●		●	●	●	●		●						●	●			●	●	
Perform/oversee remedial action plans.		●	●	●	●	●		●	●			●	●	●	●	●	●						●		●		●			●	●	
Conduct surface water, ground water, and hydrodynamic modeling.																	●							●				●				●
Conduct third party review and analysis of designs, reports and technical information when requested by the MPCA for the purpose of providing conclusions and recommendations to the State.		●	●	●		●		●	●				●		●		●	●		●	●		●			●	●		●	●	●	●

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

	Engineers														Scientists / Technicians																			
	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	E. Thomas
Perform five-year reviews/ and site reviews.		●	●						●				●		●						●	●					●					●
Review groundwater remediation technologies and recommend alternatives and optimization options.	●								●				●				●			●						●	●				●	●
Provide evaluation and design of energy recovery systems utilizing landfill gas.							●																									
Research, evaluate and implement innovative technologies.	●								●				●				●			●						●	●				●	●
Prepare presentations and present information at meetings.	●	●	●	●		●		●	●				●		●		●			●	●					●	●				●	●
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.	●			●		●		●	●				●							●		●					●					
Prepare Erosion Control Plans and oversee implementation.	●			●		●		●	●				●							●		●					●					
Provide technical assistance to the State in the evaluation and interpretation of data and information.		●	●						●				●		●		●	●		●	●			●		●	●	●	●		●	●
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.		●	●						●				●		●		●		●								●				●	
Complete capture zone analyses.		●	●						●				●		●		●		●								●				●	
Perform/oversee aquifer pump tests.		●	●						●				●		●		●		●								●				●	
Perform/oversee evaluation of soil borings, test pits, environmental boring and soil testing to determine cover integrity and availability of suitable soils.	●	●	●						●				●		●	●	●	●	●	●		●			●		●			●	●	
Arrange for geophysical activities		●	●												●		●			●		●	●			●	●		●		●	
Conduct/oversee studies of hydrogeology, geology and soils utilizing geophysical studies, modeling, and dye trace studies.		●							●				●				●															
Prepare construction cost estimates using standard engineering practices.		●	●	●	●	●	●	●	●	●	●	●	●	●													●		●			●
Assist the MPCA during the bidding process. The Contractor shall develop, advertise, distribute plans and specifications and addenda, answer bid questions, conduct pre-bid meetings, evaluate bid submittals, including bidder qualifications, and provide a recommendation for bid award.									●				●		●		●	●		●	●										●	
Provide construction oversight					●		●			●	●	●		●																			
Prepare construction documentation reports.		●	●						●				●		●		●		●								●		●		●	
Prepare Operation and Maintenance (O&M) Manuals.			●	●	●	●	●																									

C.5 Scenario C

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

Scenario C: Closed Landfill Program Environmental Services Workplan

Project Title: **Scenario C: Closed Landfill Program Environmental Services Workplan**

1. Project Summary:

Organization:	Amec Foster Wheeler Environment and Infrastructure, Inc
Contractor contact name:	Emma Driver, PMP
Title:	Project Manager
Address:	800 Marquette Ave, Suite 1200 Minneapolis, MN 55402
Phone:	611-2-252-3641
Fax:	612-332-2423
E-mail:	Emma.driver@amecfw.com

MPCA contact(s):

MPCA project manager:	Jamie Wallerstedt, PE
Title:	Closed Landfill Program Supervisor
Address:	520 Lafayette Program Supervisor St. Paul, MN 55155
Phone:	651-757-2094
E-mail:	Jamie.wallerstedt@state.mn.us

Project information

Latitude/Longitude:	TBD		
***County:**	TBD		
Start date:	07/2018 *(mm/dd/yyyy)*	**End date:**	03/2020 *(mm/dd/yyyy)*
Total cost:	TBD		
***Full time equivalents:**	TBS		

2. Statement of Problems, Opportunities, and Existing Conditions

This Work Plan has been prepared in response to the February 28, 2018, Request for Proposal (RFP) from the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Agricultural (MDA). This Work Plan addresses the Closed Landfill Program (CLP) Scenario C (CLP Scenario C), described in the following section of the RFP: Section 7 Proposal Content, C. Technical Proposal – Category C, Part 5 – Scenario C: Closed Landfill Program Environmental Services.

SITE DESCRIPTION

A 30-acre closed landfill is located in rural Minnesota near a growing city whose east boundary is adjacent to the landfill parcel. A residential housing development exists west of the landfill with the closest homes being about 150 feet from the landfill property boundary. Another residential development is located about a half-mile south along a mid-sized river which flows east. Both developments are served by municipal water and sewer but not all residents were required to connect to city water; some residents still have shallow wells for irrigation purposes. Approximately a quarter mile to the east is a farm that has a private drinking water well that also supplies water to about 75 cattle. The depth of the well is unknown. The City's comprehensive plan guides the city for additional residential development south and west of the landfill, between the existing developments and the landfill. A Site Plan is provided as Figure 1.

SITE HISTORY

The landfill began as a non-permitted dump in 1965, but was permitted by the MPCA in 1972 for the disposal of municipal solid waste. The landfill closed in 1983. During the landfill's operation, waste was placed near the east, south, and west property boundaries, within 20 feet in many locations. The depth and volume of waste is unknown. The existing landfill cover is flat and experiences ponding in multiple locations. There is uncertainty about the composition of the cover material across the site. Twenty passive gas vents are installed across the cover. The farmer on the adjacent property located east of the site claims that his corn within 30 feet of the landfill has grows poorly and/or has died.

A limited investigation was completed after the site closed, with few monitoring points installed further outside the footprint of the landfill. Results of the investigation showed that volatile organic compounds (VOCs) and metals were detected at elevated concentrations, some exceeding health risk limits near the landfill. Recent records are limited because the landfill is outside of its post-closure care period.

Some residents south of the landfill have complained to the City about "strange odors" emanating from their irrigation wells.

Boring logs indicate that the geology is glacial till with sand layers intermixed with clay.

STATEMENT OF PROBLEMS

The owner/operator of this closed landfill wishes to enter the MPCA's CLP. The site meets the definition of a qualified facility according to the Landfill Cleanup Act. Prior to acceptance into the CLP and development of a long-term remedy and/or long-term monitoring and maintenance activities, additional information is required to develop a conceptual site model (CSM). The CSM will provide a detailed description and understanding of contaminant sources, minor and major environmental fate and transport processes, and potential exposure to receptors.

Based on the limited investigation data available, several potential data gaps have been identified. These potential data gaps will need to be addressed to develop a CSM before the site accepted in the CLP. Prior to any site investigation, a comprehensive review of the site files will be completed. Additionally, a receptor survey will be completed to identify any imminent risks.

Assumptions

In accordance with the RFP requirements, Amec Foster Wheeler has made assumptions about site conditions in order to develop this work plan. For this evaluation the following assumptions were made.

- The landfill received municipal solid waste containing various per- and poly-fluoroalkyl substance (PFAS) compounds including long chain polyfluorinated precursors that can biotransform (under aerobic conditions) and dead end at PFOS/PFOA.
- PFAS are also present in landfill leachate.
- The landfill did not receive or accept biosolids from a municipal WWTP.
- The landfill does not have a leachate collection system
- The landfill does not have gas probes at the compliance boundary
- Groundwater flows south-southeast towards the river.

- Based on a review of previous site investigation data and water well logs available on the Minnesota Well Index https://apps.health.state.mn.us/cwi/, the regional geology consists of a sand layer with some clay intermixed that is 30-feet in thickness, underlain by a sandy clay layer that is approximate10-feet thick, underlain by a sand layer that varies in thickness from 20-feet to 30-feet, underlain by a clay layer that is 40-feet thick, and underlain by a sand and gravel aquifer (at approximately 100 feet below ground surface [bgs]) where the majority of water wells in the area are screened.
- There are two saturated zones at the site that the landfill may have impacted. The shallow saturated zone is encountered at approximately 15 feet bgs. The deeper saturated zone is encountered at approximately 50 feet bgs. The existing monitoring wells at the site are screened within the shallow saturated zone.
- The first encountered sandy clay layer varies in thickness and does not appear to be contiguous. The sandy clay layer is not encountered in some water well logs near the river. It appears that the shallow and deeper saturated zones are connected downgradient of the landfill.
- The sand and gravel aquifer located at approximately 100 feet bgs is not impacted.
- Irrigation wells are assumed to be screened within the deeper saturated zone at approximately 50 feet bgs.
- Groundwater in the vicinity of the landfill and immediately downgradient is anaerobic in response to prior releases of a variety of compounds that have utilized the available oxygen.
- Redox conditions rebound some distance downgradient back to aerobic conditions that typically prevail in shallow aquifers.

3. Goals, Objectives, Tasks, and Subtasks

Goal: The goal for this site is to collect additional information to develop a CSM to evaluate the landfill before it is accepted into the CLP. The information collected will also be used to develop long term remedial alternatives for the site. The initial focus is to identify any imminent risks by conducting a file review, initial site assessment and receptor survey. An initial CSM will be developed based on information from the site assessment, receptor survey, and file review. That information will be used to develop a scope of work to investigate landfill gas migration, contaminated groundwater migration, and other potential data gaps identified in the CSM. The data collected during the subsequent site investigation will be used to refine the CSM and evaluate the site's acceptance into the CLP. Additionally, the information collected will be used to evaluate potential remedial alternatives for the site.

The work plan addresses three objectives:

- Objective I – Risk Evaluation and CSM Development
- Objective II – Landfill Gas and Groundwater Investigation
- Objective III – Evaluate risks and develop a long-term remedy

After each phase of the work plan is completed the results will be evaluated and used to modify subsequent phases as appropriate. An initial CSM will be developed early in the investigation and then updated as additional site information becomes available. The CSM will then also be used to develop and select long-term remedial alternatives for the landfill.

OBJECTIVE 1: RISK EVALUATION AND CSM DEVELOPMENT:

Objective 1 will be completed to identify any imminent risks and develop an initial CSM

TASK A: FILE REVIEW

Documents included in the request (as available) include: Solid Waste Management Plan, Operations Manual and Contingency Action Plan, Closure and Post-Closure Plan, Construction Plans/Drawings/Specifications, Physical Site Characterization Data, Gas Monitoring Plan, Annual Report from the previous 5 years. Additionally, a Freedom of Information Act (FOIA) request will be submitted to local governmental agencies, such as the health department, fire department, etc. for information pertaining to the closed landfill.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, GIS/CADD Specialist

TASK B: RECEPTOR SURVEY

A receptor survey will be conducted to identify potential receptors relative to the landfill site and to evaluate risks posed to each type of receptor. The receptor survey will be conducted in accordance with MPCA receptor survey guidance (Guidance Document 4-02) and will include a risk evaluation for water supply well receptors (private and public water supplies), surface water receptors and vapor receptors.

Subtask 1: Develop a Health and Safety Plan

Prior to mobilization to the Site for conducting field receptor survey activities, Amec Foster Wheeler personnel will develop a site-specific health and safety plan to address any potential health and safety concerns for the project.

Subtask 2: Complete water well survey within 0.5 miles of the site.

Typically, surveys are conducted of all properties within 500 feet of the source. However, given that residents half of a mile away have reported "strange odors" coming from their irrigation water, the survey will be extended to a 0.5-mile radius. The survey will include a visual inspection of all properties within 0.5 mile and will document water supply wells, subsurface structures (basements, manholes, etc.), surface water features and potential pathways. Amec Foster Wheeler will:

1. Identify and contact residents and business owners, and complete a visual inspection of the properties;
2. Confirm public water supply at any of the included properties by contacting the city utility billing department;
3. Review the Minnesota County Well Index for wells within 0.5-mile of the sources.
4. Amec Foster Wheeler will assess sensitive groundwater conditions by first accessing the PRP Maps online, and if necessary, determine the aquifer's susceptibility to contamination. As the depth to bedrock at the Site is less than 50 ft bgs, a sensitive groundwater condition exists. Risk evaluation activities will also include determination of flow direction and calculation of hydraulic gradient in the case that monitoring wells are installed as part of remedial investigation activities.

Subtask 3: Complete surface water survey.

It is known that a river exists 0.5 mile south of the site. Any other surface water features and potential pathways such as ditches, drain tiles, storm sewers, will be identified and documented.

Subtask 4: Complete vapor receptor survey.

As part of the receptor survey all buildings with basements and sumps will be identified. Additionally, the survey will identify utilities including manways, sanitary and storm sewers, water, electric, telephone, gas, etc. that can act as preferential pathways. The soil vapor receptor survey will consist of:

1. Contacting local utility companies to confirm subsurface structures;
2. Identifying access points (man-ways, etc.) and possible other receptors (e.g. buildings with basements) based on a record search and visual inspection;
3. Mapping subsurface utilities (water, sewer, cable, etc.) within 500 ft of the Site, including all connections;
4. Mapping all properties with basements or sumps.
5. Mapping all distressed vegetation
6. Contacting the local fire department about reports of odors within 500 ft of the Site.

Subtask 5: Analytical sampling.

All private water supply wells and irrigation wells identified during the receptor survey will be monitored using a photoionization detector (PID) and multi gas detector that can monitor for methane, oxygen, carbon monoxide, and hydrogen sulfide. Any drinking water wells identified during the receptor survey will also be sampled. The samples will be analyzed for:

- VOCs using EPA Method 8260;
- PFAS by Modified EPA Method 537 (Minnesota Department of Health sample list of 14 PFAS compounds);
- Select metals by EPA Method 6010/7471

If an imminent risk is identified (e.g. gas accumulation in a basement or subsurface structure, unacceptable surface water impact, unacceptable water well impact) the MPCA project manager and appropriate emergency response personnel will be contacted immediately.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, Field Technician, GIS/CADD Specialist

TASK C: CONDUCT AN INITIAL SITE INSPECTION AND ASSESSMENT.

Subtask 1: Complete on-site inspection.

The site inspection will incorporate inspections tasks identified in the Operations Manual (if available), but at a minimum will identify deficiencies in the landfill cover system, such as areas of ponding, slumping, erosion, animal burrows, sedimentation in the drainage ditches, and stressed vegetation. The passive gas vent system will also be inspected for signs of physical damage.

Subtask 2: Complete geophysical investigation to identify extent of buried waste.

As part of the site inspection, an integrated non-intrusive geophysical investigation will be completed to determine the horizontal and vertical extents of the buried waste at the landfill. The survey will be conducted using frequency-domain electromagnetic (FDEM) and electrical resistivity imaging (ERI) methods. A differential global positioning system (DGPS) for horizontal control of all geophysical information and a rod and transit for vertical elevation control of the ERI electrodes will be used. This information will allow for direct integration with geographic information system (GIS) databased or Computer Aided Design (CAD) systems.

FDEM is a non-intrusive ground conductivity and metal detection geophysical technique implemented to map subsurface electrical conductivity variations. An electromagnetic field generated by the instrument is induced into the ground and is altered by the heterogeneity of the material. The resulting difference between the generated (primary) and received (secondary) EM fields are recorded, processed, and interpreted to reveal the spatial nature of the anomaly.

Electrical resistivity profiling is performed by transmitting a very low amperage direct current (DC) electrical current in the subsurface between stainless steel electrodes spaced equally along a profile. The subsurface current flow is mapped by measuring the electrical potential at the ground surface using a high-sensitivity resistivity meter. Resistivity profiling can be

used to image unconsolidated sediments/layering, fresh water/high total dissolved solids (TDS) transition, near-surface geologic stratigraphy, bedrock fractures, and air-filled and clay-filled voids. These features represent zones of variable electrical conductivity, and by mapping the flow of electrical current throughout the subsurface, it is possible to image the lateral and vertical distribution of these features.

Responsible Party(ies): Project Manager, On-Site Inspector, Engineer 2, Scientist 2, GIS/CADD Specialist

TASK D: DEVELOP AN INITIAL CSM.

The information collected as part of the file review, site inspection, and receptor survey will be documented in a technical memorandum (tech memo) and used to develop an initial CSM. The CSM will then be used to guide and potentially modify the next phase of the investigation.

Responsible Party(ies): Project Manager, On-Site Inspector, Engineer 2, Scientist 2, GIS/CADD Specialist

Objective 1 Timeline: 2 months to complete tasks and provide deliverables

Objective 1 Deliverables:

- File Review Report
- Receptor Survey Report
- Analytical Results (Private Well Water and Landfill Gas)
- Figures documenting results of geophysical investigation
- Initial CSM Summary

OBJECTIVE 2: **LANDFILL GAS AND GROUNDWATER MIGRATION INVESTIGATION**

Conduct a landfill gas and groundwater investigation and refine the CSM. If landfill gas and/or groundwater extents are not defined during the initial investigation, an additional investigation will be necessary. The CSM will be updated with the investigation data and used to determine the potential for or existence of a completed exposure pathway to identified receptors.

TASK A: PREPARE A SITE INVESTIGATION WORK PLAN.

Amec Foster Wheeler will use the CSM developed in Objective 1, Task D to develop a work plan for the landfill gas and groundwater investigation. This data will be used to determine proposed gas probe and monitoring well locations.

Amec Foster Wheeler will solicit bids from and contract with a Minnesota State certified contractor for drilling and laboratory services where possible.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, QA/QC Officer, GIS/CADD Specialist

TASK B: COORDINATE SITE ACCESS AND PERMITTING.

Prior to conducting field investigation activities, Amec Foster Wheeler will coordinate all access agreements and obtain all necessary investigation permits to conduct the investigations.

Prior to the start of work, Amec Foster Wheeler will have the site and investigation areas cleared for utilities using Gopher State One Call. Amec Foster Wheeler will use the services of a private utility locator to clear all gas probe/monitoring well locations on the first day of work.

Responsible Party(ies): Project Manager, Scientist 2, GIS/CADD Specialist

TASK C: INVESTIGATE THE EXTENT OF LANDFILL GAS MIGRATION

Subtask 1: Landfill Gas Monitoring.

The scenario indicated that there is limited landfill gas monitoring data. The scenario also identified poorly growing/dead corn east of the site. Dead or poorly growing vegetation can be a sign that landfill gas is migrating through soil at shallow depths. The information gathered during Phase I will be used to modify the landfill gas migration investigation (i.e. if stressed vegetation is found west of the site or gas is detected in a residential basement during the initial vapor survey then additional gas probes will be installed at these locations). Landfill gas can migrate significant distances, especially if

there are preferential pathways such as underground structures or if native soils are permeable. Additionally, impermeable surface boundaries such as pavement or frozen soils can serve as a barrier to vertical (i.e. upward) migration and result in horizontal migration for greater distances.

To address this potential data gap, the existing passive landfill gas vents will be monitored using a multi-gas detector and PID in accordance with MPCA Guidelines (c-rem3-04). Additional gas probes along the compliance boundary will need to be established and monitored to assess potential gas migration, pursuant to MPCA Guidelines for Monitoring for Landfill Gas at and Near Former Dumps c-rem3-04, November 2011.

Subtask 2: Install and monitor gas probes.

Amec Foster Wheeler will install 11 gas probes around the perimeter of the compliance zone and off site to determine the extent of landfill gas migration. Proposed gas probe locations are shown on Figure 2.

Gas probes will be installed in native material along the boundary of the landfill to assess gas migration. An additional gas probe will be installed to delineate gas migration east of the distressed vegetation/dead corn. The existing gas vents and proposed gas probes will be monitored using a portable multi gas detector and a PID. If these gas probes show methane concentrations greater than the lower explosive limit (LEL) of 5%, then additional gas probes will be installed to determine the extent of gas migration.

Multi-depth gas probes will be installed. Since the depth of the waste is unknown, the lower screen interval will be set just above the water table with a 5-foot screen. The 5-foot screen accounts for any fluctuation in the water table. The upper screen will be set between the ground surface and the top of the lower screen interval. The screen intervals for the gas probes will be adjusted based on methane/PID readings and/or lithology (i.e. the screen will be set to intersect high methane/PID readings or set to intersect a more conductive material like sand).

Subtask 3: Collect up to 5 gas samples from the gas vents and/or gas probes.

Samples will be collected and analyzed for characterization of the landfill gas and to ensure proper quality assurance/quality control of the field monitoring equipment. Samples will be collected using laboratory provided canisters and submitted, under chain-of-custody, to an approved-laboratory for analysis of VOCs using EPA Method TO-15 and for analysis of methane, oxygen, nitrogen, and carbon dioxide using EPA Method 3C. Additional analysis may be warranted pending the results of the file review, receptor survey, and site inspection.

Data on ambient conditions, including temperature, barometric pressure, weather conditions, and any unusual conditions noted during the monitoring process, will also be collected during landfill gas investigation.

Subtask 4: Monitor gas probes.

Per MPCA guidelines (c-rem3-04), the monitoring frequency of the gas probes will be dependent on the gas concentrations detected, the location of gas detections, the degree of concern and potential for significant seasonal temperature and barometric fluctuations in the area of the site. For this initial work plan it is assumed that three additional monitoring events (for a total of four) during the first 12 months will be conducted to account for seasonal variance.

Gas probes will be monitored with a multi-gas detector and a PID a total of 4 times during the first 12 months to account for seasonal fluctuations, with at least two sampling events completed when the ground is frozen and there is a higher potential for gas migration. Gas samples will be collected from select gas probes to ensure proper quality assurance/quality control of field monitoring equipment.

Subtask 5: Prepare Landfill Gas Monitoring Report.

The data collected during the landfill gas investigation will be documented in a tech memo and incorporated into the CSM. The results from the landfill gas migration investigation will be incorporated into the CSM and be used to modify the next phase of the investigation, if warranted.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, Field Technician, GIS/CADD Specialist

TASK D: INVESTIGATE THE EXTENT OF CONTAMINATED GROUNDWATER

The scenario indicated that only a limited remedial investigation was completed, with few monitoring points installed outside the boundary of the site. At some locations, VOCs and metals were detected at concentrations that exceeded the Minnesota

Department of Health (MDH) health risk limits (HRLs) near the landfill. Additionally, strange odors reported by residents to the south, suggest a wide area of impact to shallow groundwater.

Although not specifically stated, it is reasonable to assume that PFAS are present in groundwater due to the widespread use of PFAS in household goods (e.g. food packaging). PFAS are anticipated to be detected at relatively low concentrations but above MDH screening criteria. The landfill cover is flat and experiences ponding in multiple locations, which is allowing precipitation to infiltrate through the cover and leach contaminants from the waste to the groundwater. The discovery of VOC and metals in groundwater is an indication that leachate has contaminated the groundwater beneath the landfill. The reported "strange odors", by residents south of the site, coming from their irrigation wells may be an indication that the anaerobic conditions caused by the landfill extends to the irrigation wells. Contaminants from the landfill could also extend a significant distance offsite. Long chain polyfluorinated precursor PFAS compounds could biotransform within the redox zone, located downgradient of the site, producing higher concentrations of PFOS/PFOA some distance offsite.

The irrigation wells of the residents located west of the site, the farmer's private drinking water well located east of the site and the river located south of the site are other potential receptors of the contaminated groundwater. The information gathered during Objective I and the landfill gas portion of Objective II will be used to update the CSM and modify the groundwater investigation (e.g. if the survey identifies water wells to the west that have a strange odor or taste, then additional monitoring wells will be installed at those locations).

Subtask 1: Monitor and sample the existing monitoring wells.

Groundwater sampling procedures will be conducted in accordance with MPCA guidance document c-prp4-05.

Once depth to water has been measured, a low flow sampling method will be employed to collect a groundwater sample. Prior to sampling the monitoring wells, a small volume will be purged to reduce sample turbidity, generate effluent for measurement of field parameters, and to remove water that has leaked into the sampling point through probe rod or auger flight joints during installation. Field parameter measurements including specific conductance, temperature, pH, dissolved oxygen, and redox potential will be recorded in the field utilizing a flow cell just prior to sampling or immediately thereafter. Tubing will be discarded after each use.

Groundwater quality control samples will consist of a laboratory-provided trip blank, a laboratory- provided temperature blank, and a duplicate groundwater sample (1 for every 10 primary groundwater samples). Since new tubing will be used each time, no equipment blanks are necessary.

Groundwater samples will be collected into laboratory-provided containers. Groundwater samples will be kept on ice and provided to the laboratory under chain-of-custody procedures within the appropriate hold times.

All new monitoring wells will be sampled and analyzed for VOCs, PFAS, and select metals. Select samples (around or near the landfill source) will also be analyzed for the Total Oxidizable Precursor (TOP) assay which is a screening tool that can generally assess the mass of long chained PFAS compounds that may be present but can't currently be identified as individual PFAS analytes. This hidden PFAS mass could result in increasing concentrations of PFOS/PFOA in redox recovery zones offsite.

Subtask 2: Install monitoring wells offsite to investigate the extent of contaminated groundwater.

To address the potential data gap, groundwater monitoring wells will be installed to determine the extent of groundwater contamination. The investigation will consist of installation of two monitoring wells upgradient of the landfill to determine water quality, two monitoring wells cross-gradient (east and west of the site) to determine if there is a lateral component to the groundwater flow, and two monitoring wells downgradient to the south to delineate groundwater contamination between the site and the irrigation wells and the river. The proposed groundwater monitoring well locations are shown on Figure 3. Based on the results of the groundwater investigation, additional monitoring wells may be installed to delineate groundwater contamination above MDH criteria.

Nested pairs of monitoring wells will be installed to investigate potential contamination in the shallow and deeper saturated zones. The screen intervals for the monitoring wells will be adjusted based on PID readings and/or lithology (i.e. the screen will be set to intersect PID readings or set to intersect a more conductive material like sand).

All newly installed monitoring wells will be surveyed to document locations and elevations. Any other relevant site features that may be identified by the field crew may also be included in the survey.

Subtask 3: Aquifer determination.

To better assess the shallow and deep saturated zones of the hydrologic unit, soil samples will be collected during monitoring well installation and submitted for grain-size analysis. Hydraulic conductivity and transmissivity will be determined from both saturated units. Amec Foster Wheeler assumes that up to 3 samples will be submitted; however, the final number of grain size samples will be determined in the field based on observed field conditions.

Subtask 4: Semi-annual Groundwater Sampling.
Monitor and sample the newly installed monitoring wells quarterly during the first 12 months.
All monitoring wells will be sampled and analyzed for VOCs, PFAS, and select metals. Select samples (around or near the landfill source) will also be analyzed for the TOP assay

Subtask 5: Surface water sampling.
Surface water samples may be collected pending the results of the surface water survey. If there is evidence that surface water (ditches, storm sewers, drains, etc.) are a potential migration pathway, then surface water samples will be collected to determine if they are impacted. Surface water samples will be collected for VOCs, PFAs, and select metals.

Subtask 6: Prepare tech memo. The data collected during the groundwater investigation will be documented in a tech memo.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, Field Technician, GIS/CADD Specialist

Task E: Refine CSM. The data collected during Objectives I and II will be used to refine the CSM. The CSM provides a site-specific summary of the understanding of the site geology, hydrogeology, contaminant sources, fate and transport processes, and potential exposure routes to receptors.

Responsible Party(ies): Project Manager, Engineer 2, Scientist 2, GIS/CADD Specialist

Objective 2 Timeline: 18 months

Objective 2 Deliverables: Work plan, Tech memo documenting investigation, and CSM

OBJECTIVE 3: EVALUATE RISKS AND DEVELOP A LONG-TERM REMEDY

Support the MCPA to identify and evaluate the risks and develop response actions/remedial alternatives for a long-term remedy, prior to acceptance into the CLP. The CSM will be used to identify and evaluate the risk the landfill poses to public health, safety, and the environment. Amec Foster Wheeler will support the MPCA project manager to identify the most practical response actions/remedial alternatives to address those risks. The response actions/remedial alternatives may include the development of land use, groundwater use restrictions, and zoning restrictions with the Local Unit of Government, consolidation of waste and an engineered cover with storm water drainage system, expansion of the gas venting system, including additional vents, cutoff trench, and installation of an active system, installation of a leachate/groundwater collection and treatment system. A feasibility-level cost estimate (+50%/-30%) will be prepared in support of the MPCA's decision regarding entry into its CLP.

TASK A: DEVELOP RESPONSE ACTIONS/REMEDIAL ALTERNATIVES

Subtask 1: Prepare a risk assessment/pathway evaluation that identifies the potential for or existence of a completed exposure pathway to identified receptors. Amec Foster Wheeler will support the MPCA project manager to identify and evaluate those risks posed at the site.

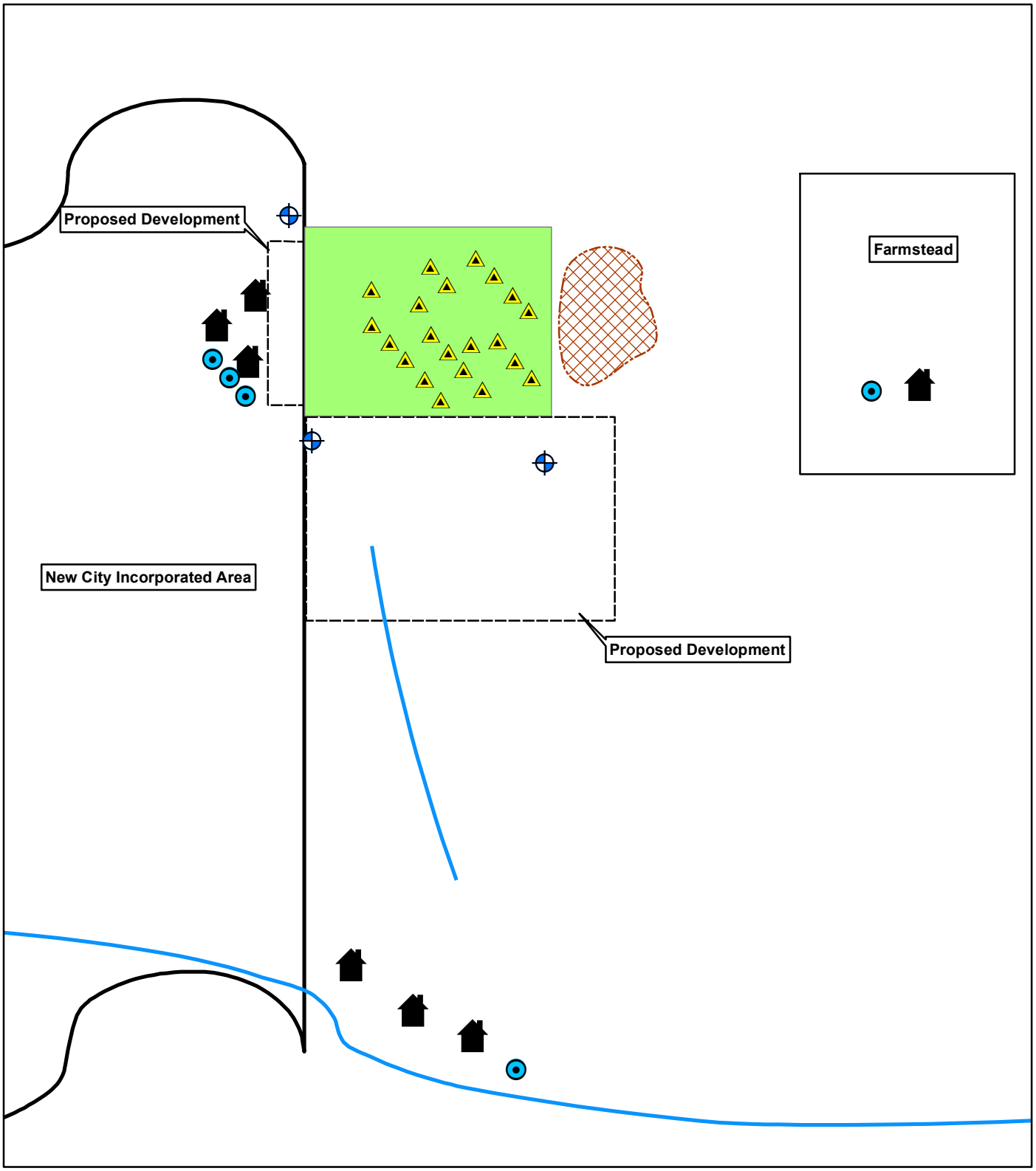
Subtask 2: Develop response actions/remedial alternatives to address those risks identified.

Subtask 3: Prepare a FS-level Cost Estimate (+50% - 30%) for those response actions/remedial alternatives developed under Subtask 2.

Responsible Party(ies): Project Manager, Engineer 3, Engineer 2, GIS/CADD Specialist

Objective 3 Timeline: 4 months

Objective 3 Deliverables: Risk assessment and remedial alternatives evaluation and FS-level Cost Estimate



Legend

- Passive Landfill Gas Vents
- Private Supply Wells
- Unused Monitoring Wells
- River
- Approximate Area of Distressed Corn
- Closed Landfill

1:9,000 — Approximate Scale in Feet — 1 inch equals 750 feet

0 — 1,200 — 2,400

SITE AREA MAP

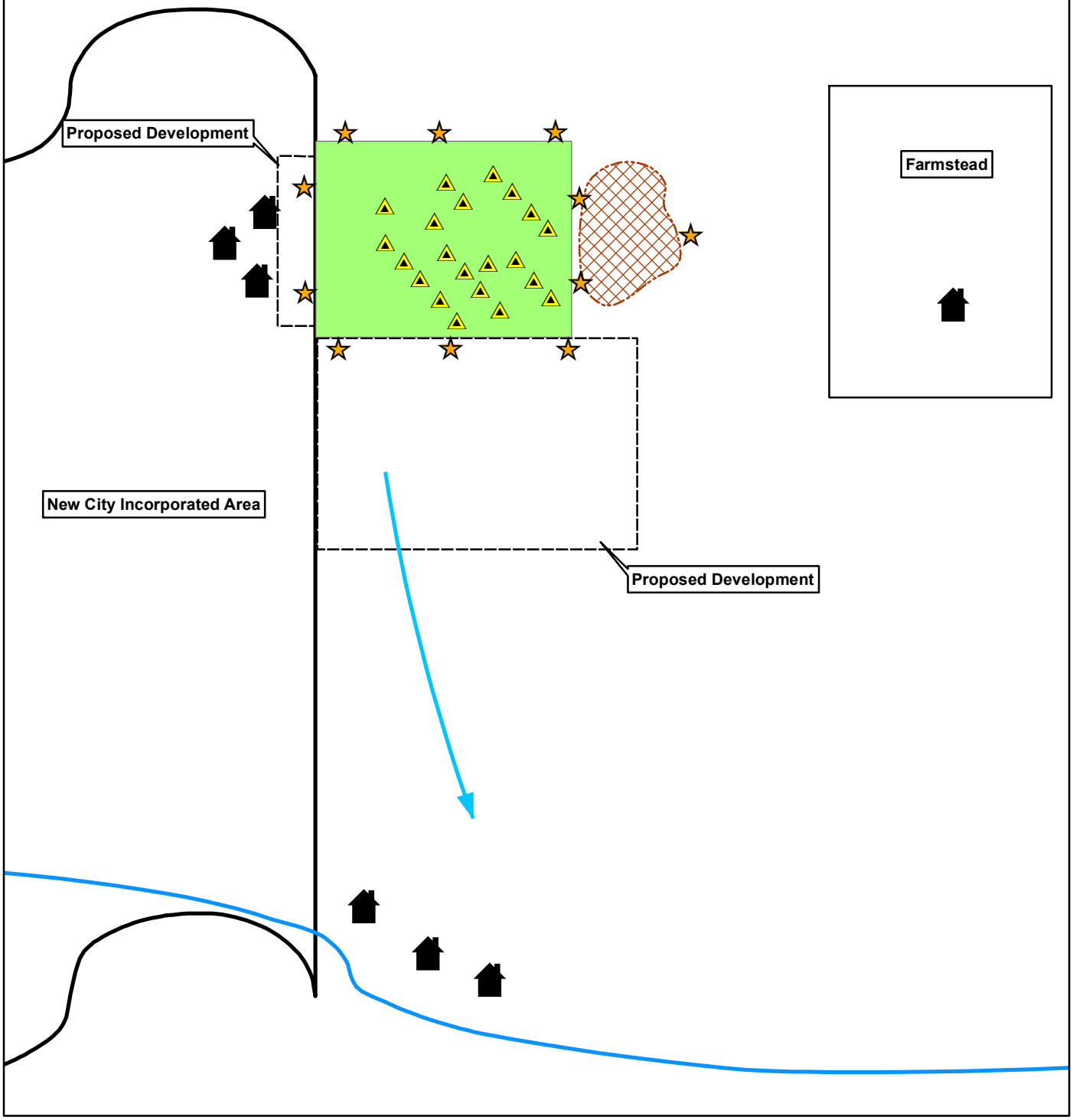
Remediation Master Contract Proposal
Scenario C
Minnesota Pollution Control Agency

Note:

N W E S

Date:	04/10/2018	Project No.	Proposal
Drawn:	MJV	Figure:	1
Checked:	JJH		

amec foster wheeler



Legend

- Proposed Landfill Gas Sample Locations
- Existing Passive Landfill Gas Vents
- River
- Regional Groundwater Flow Direction
- Approximate Area of Distressed Corn
- Closed Landfill

1:9,000 — 1 inch equals 750 feet

Approximate Scale in Feet

0 — 1,200 — 2,400

PROPOSED LANDFILL GAS SAMPLING LOCATIONS

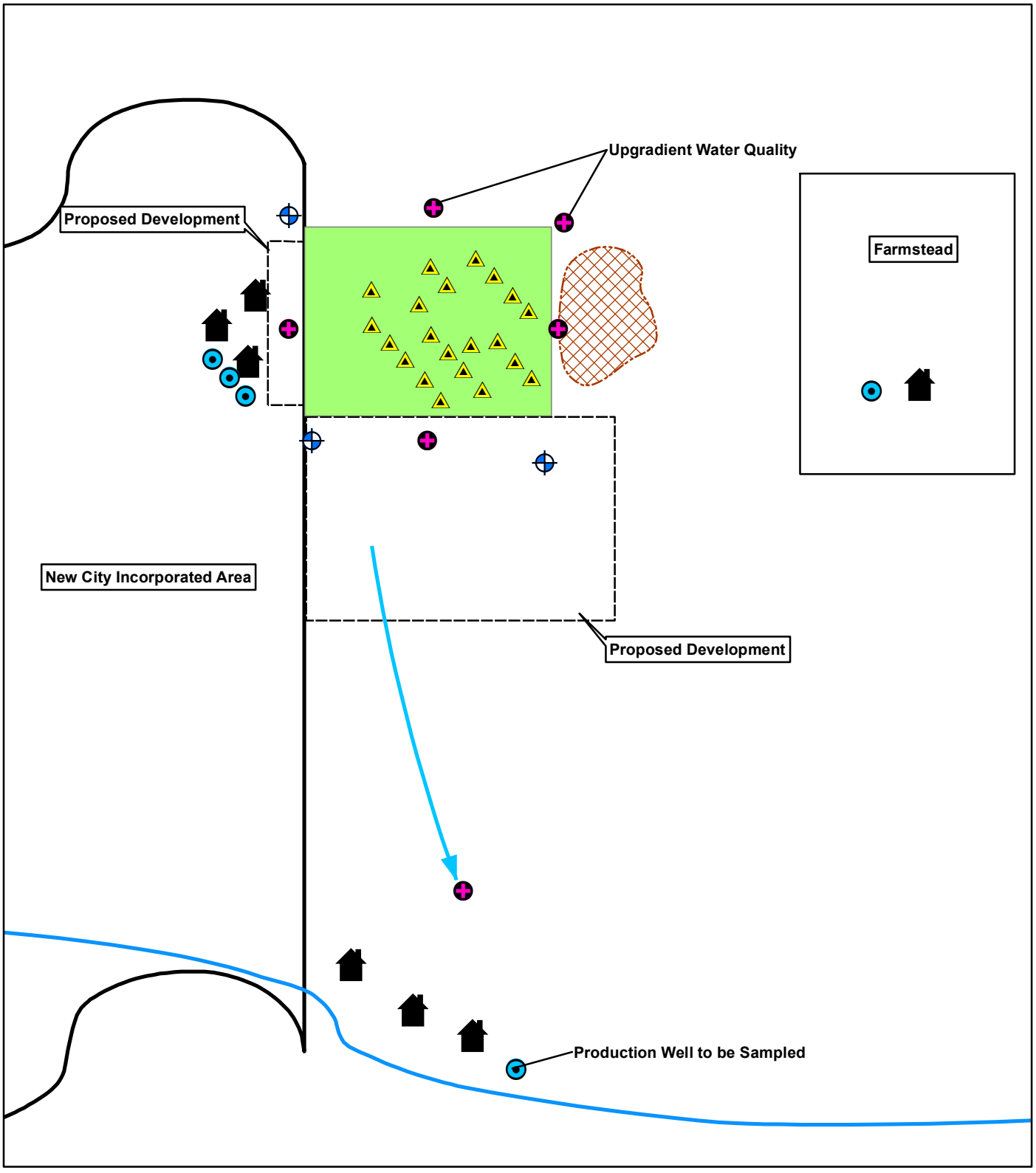
Remediation Master Contract Proposal
Scenario C
Minnesota Pollution Control Agency

Note:

N W E S

Date:	04/10/2018	Project No.	Proposal
Drawn:	MJV	Figure:	2
Checked:	JJH		

amec foster wheeler



Legend

- Proposed Groundwater Sample Locations
- Existing Passive Landfill Gas Vents
- Private Supply Wells
- Exisiting Unused Monitoring Wells
- River
- Regional Groundwater Flow Direction
- Approximate Area of Distressed Corn
- Closed Landfill

1:9,000 — 1 inch equals 750 feet

Approximate Scale in Feet

0 — 1,200 — 2,400

PROPOSED GROUNDWATER SAMPLING LOCATIONS

Remediation Master Contract Proposal
Scenario C
Minnesota Pollution Control Agency

Note:

N W E S

Date:	04/10/2018	Project No.	Proposal
Drawn:	MJV	Figure:	3
Checked:	JJH		

amec foster wheeler

Gantt Chart

Doc Type: Contract

MPCA Use Only	
SWIFT #	
CR #	

Project title: Scenario C: Closed Landfill Program

		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	**RISK EVALUATION AND CSM DEVELOPMENT**																																						
Task A	File Review																																						
Task B	Receptor Survey																																						
Task C	Conduct Site Inspection and Assessment																																						
Task D	Develop CSM																																						
Objective 1 Deliverables Due																																							
	File Review Summary																																						
	Receptor Survey Report																																						
	Analytical Results Summary (Private Well Water and Landfill Gas)																																						
	Geophysical Survey Results																																						
	Initial CSM																																						
OBJECTIVE 2	**SITE INVESTIGATION**																																						
Task A	SI Work Plan																																						
Task B	Access and Permits																																						
Task C	LFG Investigation (Quarterly Monitoring)																																						
Task D	GW Investigation (Quarterly Monitoring)																																						
Task E	Refine CSM																																						
Objective 2 Deliverables Due																																							
	SI Work Plan																																						
	Analytical Results Summary																																						
	Updated CSM																																						
OBJECTIVE 3	**Evaluate and Develop Remedy**																																						
Task A	Develop Response Action/Remedial Alternatives																																						
Objective 3 Deliverables Due																																							
	Response Action Plan																																						
	Cost Estimate																																						

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

Scenario C
Project Spreadsheet

Project title: Scenario C: Closed Landfill Program Environmental Services

	1. Personnel								Totals by Task (Extended)
Project Budget	Project Manager	On-Site Inspector (OSI)	Engineer 3	Engineer 2	Scientist 2	QA/QC Officer (QA/QC)	Field Technician	GIS/CADD Specialist	
*** Objective 1: Identify any imminent risks and develop an initial CSM**									
A. File Review	2			2	16			4	**24**
B. Receptor Survey	2			8	50		30	16	**106**
C. Conduct Site Inspection and Assessment	1	20		16	2			8	**47**
D. Develop CSM	2	2		20	40			40	**104**
Total for Objective 1 Hrs	**7**	**22**	**0**	**46**	**108**	**0**	**30**	**68**	**281**
Objective 2: Conduct a site investigation and refine the CSM									
A. SI Work Plan	4			10	32	4		8	**58**
B. Access and Permits	2				16			4	**22**
C. LFG Investigation (Quarterly Monitoring)	6			4	10		96	16	**132**
D. GW Investigation (Quarterly Monitoring)	6			4	8		80	16	**114**
E. Refine CSM	2			16	40			40	**98**
Total for Objective 2 Hrs	**20**	**0**	**0**	**34**	**106**	**4**	**176**	**84**	**424**
Objective 3: Evaluate risks and develop long-term remedy.									
Task A: Evaluate risks and develop remedial alternatives	10		20	100		4		32	**166**
Task B Cost Estimate	5		8	24	8	2		10	**57**
Total for Objective 3 Hrs	**15**	**0**	**28**	**124**	**8**	**6**	**0**	**42**	**223**
Total Project Hours	**42**	**22**	**28**	**204**	**222**	**10**	**206**	**194**	**928**

C.6 Attachments

C.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.

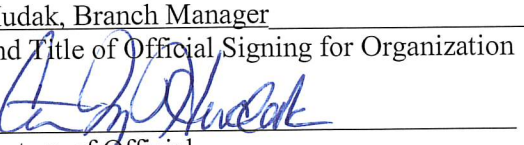
(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, A Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this 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 program and project management, site investigation/remediation, groundwater monitoring programs and landfill operations, maintenance and monitoring (OM&M). Ms. Driver also has 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. In the role of project manager, Ms. Driver has developed project scopes of work, prepared sampling plans, developed comprehensive health and safety plans, developed project schedules and budgets, managed project teams, prepared invoices and monthly progress reports, conducted subcontractor procurement and oversight and prepared and reviewed technical reports. 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
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
MPCA, MnDOT, MDA, ADEQ, IDNR, NDDH, NMED, SDDENR, WDNR

Licensing / Certifications
PMP

Relevant Work Experience

Landfill Operations, Maintenance and Monitoring (OM&M), Vinland Landfill, Winnebago County, WI. Project Manager. Ms. Driver served as project manager for OM&M activities at the Vinland landfill, a closed paper sludge landfill located in Winnebago County, Wisconsin. Routine OM&M activities include semi-annual landfill gas, groundwater, leachate, surface water, and drinking water 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 water monitoring to an annual basis. 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.

Landfill Operations, Maintenance and Monitoring (OM&M), North Landfill, Winnebago County, WI. Project Manager. Ms. Driver served as project manager for OM&M activities associated with an interim cover at the North landfill, an inactive landfill located in Winnebago County, Wisconsin. Ms. Driver developed a compliance matrix for the landfill 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 local 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. Non-routine tasks also included a feasibility study to evaluate potential leachate reduction alternatives. In her role as project manager, Ms. Driver has developed project scopes of work, budgets and schedules; conducted subcontractor procurement including preparation of bid documents; conducted

subcontractor oversight; managed the Amec Foster Wheeler project team; completed monthly invoicing and prepared monthly progress reports; generated monthly leachate tracking reports; provided technical review of project deliverables; and held stakeholder meetings.

Centerville Dump Superfund Site, Off-Site Drinking Water and Vapor Investigation, White Bear Lake, MN. Project Manager. Amec Foster Wheeler conducted an off-site soil vapor and private drinking water survey in relation to activities associated with the former Centerville Dump Superfund Site. Project activities included coordinating site access with residents of several neighborhoods in order to complete soil vapor sampling and collect water samples from private wells located down-gradient of the former dump site. In the role of project manager, Ms. Driver developed project scopes of work, communicated with local residents, prepared data summary reports, coordinated with the Minnesota Department of Health regarding drinking water advisories, prepared monthly invoices, conducted quality assurance/quality control and coordinated with project stakeholders.

Landfill Closure Evaluation, Confidential Client, WI. Project Manager. Conducted a landfill closure evaluation including an assessment of paper sludge management alternatives for an active landfill site located in northeastern Wisconsin. The overall goal of the evaluation was to provide alternatives for elimination of the landfill and associated ongoing operations and maintenance costs. Various landfill closure options were identified including soil amendments, off-site disposal of waste at nearby landfills, land application of wastes for beneficial reuse, and closure in place. Each alternative was evaluated on the basis of implementation cost, regulatory acceptance, environmental considerations, and the timeframe for completion (schedule). Additional factors were also included in the evaluation through development of an options evaluation scoring matrix. In her role as project manager, Ms. Driver managed the project scope, schedule and budget, conducted internal and external meetings with project stakeholders (client, regulators and project team), completed monthly invoicing and progress reports and conducted technical review of all project deliverables.

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. Base 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. AFFF areas investigated included on-base landfill sites that had either received AFFF contaminated soil following release cleanup activities, or had cover systems irrigated using water potentially containing PFAS. 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.

Remedial Investigation, Commercial Site, Upper Midwest. Technical Reviewer. Ms. Driver has served as technical reviewer for a remedial investigation at a former borrow pit complex where paper mill sludge and municipal wastes were deposited. Soils were impacted by polychlorinated biphenyls (PCBs) and metals. Remedial investigation was conducted 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. Ms. Driver served as technical reviewer for project deliverables including work plans and remedial investigation reports.

Garret Bondy, PE

Engineer 4
Principal-in-Charge

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

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.

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.

Jason Armstrong, CPG

Project Manager

Classification
Project Manager

OSHA Certification(s)
40-hr OSHA HAZWOPER with current refresher

Years with Amec Foster Wheeler: 9

Years of Experience: 17

Education
BS, Environmental Geosciences

Regulatory Experience
MDEQ

Licensing / Certifications
Certified Professional Geologist

Mr. Armstrong is a Certified Professional Geologist with over 17 years of experience as a project manager and hydrogeologist. Mr. Armstrong specializes in remediation; landfill operations, maintenance and monitoring; wastewater treatment plant compliance, leaking underground storage tank (LUST) site investigation and remedial investigation; and municipal and private water supply evaluations. Mr. Armstrong's experience has enabled him to guide each of these projects through site initial site assessments, data evaluations, the development of conceptual site models (CSMs), and the development and implementation of corrective action measures achieving both unrestricted and restricted closures.

Relevant Work Experience

Landfill Remedial Investigation/Design and Ongoing Operations and Maintenance – Fort Gratiot Landfill; Port Huron, MI. Project Manager. Mr. Armstrong served as project manager in support of the operations and maintenance (OM&M) activities at the Fort Gratiot Landfill. Activities involve reviewing contractor reports, and providing assistance to the long-term O&M contractor with any technical issues arising from the operation of the landfill cover, leachate recovery, gas monitoring, and stormwater systems. Since completion of construction, Amec Foster Wheeler has been able to reduce the amount of monitoring and reporting required by the City of Port Huron for discharge of treated leachate to the WWTP.

OM&M Four Kalamazoo Area Landfills; Georgia Pacific; Kalamazoo, MI. Task Manager. Mr. Armstrong served as task manager in support of the operations, monitoring and maintenance (OM&M) at four Georgia-Pacific closed landfills in Kalamazoo, Michigan. OM&M activities are conducted to provide long-term post-remediation preventative care for the design features implemented as part of remedial action. Mr. Armstrong manages all OM&M activities including: quarterly landfill gas monitoring and groundwater monitoring; data evaluation; landfill inspections to identify the need for repairs and/or maintenance to any of the landfill design components; completion of routine and non-routine site maintenance activities including cap/cover repair; and semi-annual report preparation. Recent negotiations with the regulators has resulted in an agreement in principal for optimization of the monitoring program, through reductions in sampling frequency and corresponding analytical parameters, along with revisions to sampling methodology that will significantly improve project efficiency.

Remedial Investigation: Milford Township; Old Plank Road Landfill; Village of Milford, MI. Task Manager. Mr. Armstrong served as task manager for a remedial investigation of the Old Plank Road Landfill (OPRL) 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 in accordance with Part 201. 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. Recent negotiations with the MDEQ resulted in an agreement in principal to optimize and reduce required and ongoing quarterly monitoring and reporting.

OM&M, Unregulated Solid Waste Landfill; City of East Lansing: East Lansing, MI. Technical Lead. Mr. Armstrong served as technical lead responsible for routine quarterly environmental monitoring surveys and corresponding regulatory reporting at a closed, unregulated, municipal solid waste landfill. Mr. Armstrong was responsible for the development, implementation, and construction of a passive landfill gas management system. Groundwater, leachate, landfill gas and surface water samples were collected in accordance with an approved Hydrogeologic Monitoring Program. The groundwater samples were collected utilizing approved sampling methods and site-specific sampling equipment. Following sampling activities, data was reviewed for exceedances of applicable regulatory criteria. Project activities also included evaluating landfill gas migration into nearby residential areas, and installing and maintaining landfill gas detectors in residential dwellings. Information summarizing activities performed at the site were submitted to MDEQ.

OM&M Privately Owned Municipal Solid Waste Landfill; Pollard Landfill: Montrose, MI. Environmental Scientist. Mr. Armstrong was responsible for routine quarterly environmental monitoring surveys and corresponding regulatory reporting at a closed municipal solid waste landfill. Responsible for the operation and management of a landfill gas collection system. Groundwater, leachate, landfill gas and surface water samples were collected in accordance with an approved Hydrogeologic Monitoring Program. The groundwater samples are collected utilizing approved sampling methods and site-specific sampling equipment. Following sampling activities, data is reviewed for exceedances of applicable statistical comparison criteria. All information including groundwater contour diagrams for multiple flow systems were summarized reports that were submitted to the MDEQ.

Privately Owned Type III Solid Waste Landfill; Edw. C. Levy Co.; Taylor, MI. Project Manager. Mr. Armstrong served as project manager for routine quarterly environmental monitoring surveys and corresponding regulatory reporting at a Type III landfill. Groundwater, leachate and surface water samples are collected in accordance with an approved Hydrogeologic Monitoring Program. The groundwater samples are collected utilizing dedicated sampling equipment. Wastewater samples from pretreated wastewater are also sampled in accordance with local regulatory requirements to comply with an Industrial Wastewater Discharge Permit. Following sampling activities, data is reviewed for exceedances of applicable comparison criteria. All information is summarized in the required regulatory reporting. Additional activities consist of the abandonment and replacement of groundwater monitoring wells and associated reporting.

Privately Owned Municipal Solid Waste Landfill; Republic Services: Birch Run, MI. Project Manager. Mr. Armstrong served as project manager responsible for routine quarterly environmental monitoring surveys and corresponding regulatory reporting at closed municipal solid waste landfill. Groundwater, leachate, landfill gas and surface water samples are collected in accordance with an approved Hydrogeologic Monitoring Program. The groundwater samples are collected utilizing approved sampling methods and site-specific sampling equipment. Following sampling activities, data is reviewed for exceedances of applicable statistical comparison criteria. All information including groundwater contour diagrams for multiple flow systems are summarized reports that are submitted to the MDEQ.

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 former municipal dump sites and 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

Former Municipal Dump Assessment and Remediation in Support of Site Redevelopment, Class I Railroad, St. Paul, MN. Project Manager. Mr. Murer led MPCA VIC Program compliant assessment and remediation activities, and the environmental aspects of on-going redevelopment activities of property adjacent to an active railroad yard. The site is located on approximately 25 acres of a former 300-acre municipal dump (state superfund site) located in St. Paul, Minnesota. The client railroad desired to redevelop the site such that it would support the operations of the adjacent railroad yard. Planned development activities consisted of a new Yard Office, a vehicle garage building, and a railroad car classification and storage facility. Project activities which were successfully completed included subsurface assessment, dump waste material mapping, corrective action planning, site-wide near-surface soil/waste corrective actions, geotechnical investigations, soil vapor assessment, development of construction-focused materials management plans, focused deep soil/waste corrective actions to facilitate construction of new railroad yard office and associated infrastructure, and design and installation of sub-slab vapor mitigation system in new yard office building. In his role as project manager, Mr. Murer coordinated with regulatory officials and client environmental and facilities development groups to ensure environmental aspects of the construction project were addressed. Mr. Murer also conducted monthly invoicing, safety monitoring and reporting, and subcontractor coordination and evaluation.

Landfill Operations, Maintenance and Monitoring (OM&M), Vinland Landfill, Winnebago County, WI. Technical Review. Mr. Murer served as the project technical reviewer for deliverables associated with OM&M activities at the Vinland landfill, a closed paper sludge landfill located in Winnebago County, Wisconsin. Routine OM&M activities include semi-annual landfill gas, groundwater, leachate, surface water, and drinking water 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, Amec Foster Wheeler 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. Amec Foster Wheeler also successfully completed a revision to the Plan of Operations reducing the frequency of groundwater and surface water monitoring to an annual basis. 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 his role as senior technical reviewer, Mr. Murer performed senior QA review of technical deliverables provided to the client and regulating entity.

Landfill Operations, Maintenance and Monitoring (OM&M), North Landfill, Winnebago County, WI. Project Manager. Mr. Murer served as the project technical reviewer for deliverables associated with an interim cover at the North landfill, an inactive landfill located in Winnebago County, Wisconsin. Amec Foster Wheeler developed a compliance matrix for the landfill 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 local residents and conducting private water well sampling, analytical data reporting using the WDNR 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. Non-routine tasks also included a feasibility study to evaluate potential leachate reduction alternatives. In his role as senior technical reviewer, Mr. Murer performed senior QA review of technical deliverables provided to the client and regulating entity.

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.

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.

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.

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.

Continued...

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.

Rob Dewyre, CPG

Project Manager

Classification
Project Manager

OSHA Certification(s)
40-hr OSHA HAZWOPER with current refresher

Years with Amec Foster Wheeler: 22

Years of Experience: 24

Education
BS, Hydrogeology

Regulatory Experience

MDEQ

Licensing / Certifications
Certified Professional Geologist

Mr. Dewyre is a Certified Professional Geologist with over 24 years of experience as a project manager. He has project management expertise for a multitude of routine sampling, reporting and maintenance activities at approximately 20 landfill and dump sites across EPA Region 5. Mr. Dewyre's project management responsibilities include development of project strategy, preparation of proposals, coordinating staff, evaluating and interpreting complex geological data, reviewing staff level project data and reports, preparing final reports, conducting subcontractor procurement and scheduling, invoicing and maintaining project budgets. Mr. DeWyre has worked with a wide-range of client types including commercial, industrial, municipal, private, attorneys, and financial institutions, to achieve specific and variable project objectives within desired budget ranges. Mr. Dewyre has conducted projects across the upper mid-west and is knowledgeable of hazardous and solid waste rules and MPCA guidance documentation.

Relevant Work Experience

OM&M Four Kalamazoo Area Landfills; Georgia Pacific; Kalamazoo, MI. Project Manager. Mr. Dewyre served as Project Manager in support of the operations, monitoring and maintenance (OM&M) at four Georgia-Pacific closed landfills in Kalamazoo, Michigan. OM&M activities are conducted to provide long-term post-remediation preventative care for the design features implemented as part of remedial action. Mr. Dewyre manages all OM&M activities including: quarterly landfill gas monitoring and groundwater monitoring; data evaluation; landfill inspections to identify the need for repairs and/or maintenance to any of the landfill design components; completion of routine and non-routine site maintenance activities including cap/cover repair; and semi-annual report preparation. Recent negotiations with the regulators has resulted in an agreement in principal for optimization of the monitoring program, through reductions in sampling frequency and corresponding analytical parameters, along with revisions to sampling methodology that will significantly improve project efficiency.

Hydrogeologic Evaluation and Remedial Investigation ~ Richfield Landfill; Richfield Equities; Davison, MI. Project Manager. Mr. Dewyre served as project manager for hydrogeologic evaluations, remedial investigations, environmental monitoring and remediation activities at an active non-hazardous waste landfill. Activities completed included: design and installation of multiple aquifer groundwater and landfill gas monitoring networks; on-site and off-site hydrogeologic investigation; development of assessment monitoring program; development of response action plan; preparation of multiple alternate source demonstrations; and development of groundwater, landfill gas and remedial action monitoring plans. Preparation of an environmental assessment, all associated monitoring programs and hydrogeologic investigation activities in support of a solid waste landfill construction permit application. Collected and evaluated, on a quarterly basis, hydrogeologic monitoring data from detection, assessment and remedial action monitoring programs and submitted reports to the MDEQ. Mr. DeWyre, directed the completion of a limited feasibility study and remedial action plan. All associated documents were approved by the MDEQ as a comprehensive remedial plan to address both on-site and off-site groundwater impacts in accordance with both Part 115 and Part 201. As part of the remedial activities, Amec Foster Wheeler completed the development and installation of a groundwater recovery system to capture impacted groundwater for proper

disposal, the installation and evaluation of the effectiveness of a hydraulic containment system that includes a soil bentonite cut-off wall with a gravity interior drain, including the completion of ongoing operations and maintenance evaluation and reporting activities. Remedial activities also included implantation of an off-site institutional control area with municipal water supplied to impacted residential drinking water supply wells and a groundwater mixing zone determination to evaluate impacts that had migrated into a large regional surface water body.

Site Characterization Municipal Solid Waste Landfill; Confidential Client; Bad Axe, MI. Project Manager. Mr. Dewyre served as project manager responsible for the completion of on-site soil boring and monitoring well installations that were utilized to determine site geologic characteristics and to evaluate on-site groundwater quality. Completed routine quarterly environmental monitoring surveys and corresponding regulatory reporting. Groundwater, leachate, landfill gas and surface water samples were collected in accordance with an approved Hydrogeologic Monitoring Program. Following sampling activities, data was reviewed for exceedances of applicable statistical comparison criteria. All information including groundwater contour diagrams for multiple flow systems were summarized reports that are submitted to the MDEQ.

Collett Dump Site; Brighton Township; Brighton Township, MI. Project Manager. This Mr. Dewyre serves as project manager for routine long-term monitoring, reporting and maintenance activities at the Collett Dump Site to ensure that VOC impacts in groundwater do not migrate and pose a threat to down-gradient residential water wells. Responsible for overseeing quarterly environmental monitoring surveys that include groundwater, drinking water and landfill gas samples which are collected in accordance with approved sampling plans. Following sampling activities, data is reviewed for exceedances of applicable MDEQ criteria. All information including groundwater contour diagrams for multiple flow systems are summarized reports that are submitted to the MDEQ. Site inspections are also completed to assist with determining required site maintenance activities which are then contracted to completion to ensure the integrity of the former dump site is not compromised. Negotiations with the MDEQ resulted in a monitoring plan revision that optimized and reduced the required and ongoing quarterly monitoring and reporting, and the implementation of a local ordinance restricting the usage of groundwater in certain areas.

Bogie Lake Wastewater Treatment Plant (WWTP); Huron Valley Schools; White Lake, MI. Project Manager. Mr. Dewyre served as project manager for completion of an RI and closure of a former WWTP groundwater discharge site. The project also involved determining the nature and extent of groundwater impacts identified in excess of applicable criteria in site monitoring wells. Activities included the negotiation of a remedial investigation work plan, including a residential drinking water well sampling program. Residential well sampling was completed to determine if wells in the adjacent neighborhood had been impacted and help guide the placement of off-site monitoring wells. The investigation was completed over an off-site area encompassing a half mile of residential properties, and included the vertical and horizontal definition of the extent of groundwater impacts. The remedial investigation identified impacts to multiple residential drinking water wells. Interim response measures included notices of off-site migration of contamination and providing bottled water to residents whose wells had been impacted. A remedial investigation report was prepared that included feasible alternatives to supply the residents clean drinking. Routine groundwater and drinking water sampling and corresponding reporting is currently completed. Annual sampling plan reviews result in continual optimization changes and requests. The project also included the closure of the former WWTP, including the former lagoons and rapid rate infiltration beds.

Curtis 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. He technically specializes in Environmental Compliance. 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 with current refresher

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

Relevant Work Experience

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.

Continued...

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.

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.

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.

Shalene Thomas

Project Manager

Classification
Project Manager

OSHA Certification(s)
40hr HAZWOPER with current refresher

Years with Amec Foster Wheeler: 16

Years of Experience: 19

Education
BS, Biology
MS, Environmental Science and Management

Regulatory Experience
MPCA, IDNR, NDDH, WDNR, NYSDEC, PADEP, MIDEQ, CA DTSC, MA DEP, NHDES, TX CEQ

Ms. 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.

Relevant Work Experience

Centerville Dump Superfund Site, Off-Site Drinking Water and Vapor Investigation, White Bear Lake, MN. Technical Reviewer. Amec Foster Wheeler conducted an off-site soil vapor and private drinking water survey in relation to activities associated with the former Centerville Dump Superfund Site. Project activities included coordinating site access with residents of several neighborhoods in order to complete soil vapor sampling and collect water samples from private wells located down-gradient of the former dump site. In the role of technical reviewer, Ms. Thomas reviewed project scopes of work and data summary reports, and provided quality assurance and quality control support.

Landfill Site Inspections and Risk Assessments, USFS, Chequamegon-Nicolet National Forest, WI, Risk Assessor Municipal Landfill Assessments (x3) to determine potential human and ecological risks across soil, groundwater, air, and sediment matrices. Other scope elements included landfill waste characterization, soil boring advancement, soil logging, screening, and sampling, groundwater monitoring well installation, groundwater sampling, monitoring well slug testing, surveying of well elevations, and sediment sample collection. In the role of risk assessor, Ms. Thomas 1) provided review of previous Site reports and compilation of data to establish conceptual site model and potentially complete pathways, 2) Performed a quantitative screening assessment against State of Wisconsin and Federal Ecological and Human Health Criteria, and applicable EPA STORET background concentrations, 3) Collaborated with project hydrogeologist to determine modelled concentrations at target off-site receptor locations, 4) Incorporated results and recommendations into Site Inspection Reports, and 5) Provided client interface.

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.

Continued...

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.

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, Minnesota. 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.

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

Continued...

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.

Jeshua Hansen, PE

On-Site Inspector / Engineer 3

As a Senior Associate Engineer, Mr. Hansen has participated in projects for public and private sector clients for environmental assessment and remediation projects across the country. He has worked on projects ranging in value from $2,000 to >$10,000,000, in duration from 2 weeks to >6-years, and in geographical coverage from less than one-acre to >20 acres. Mr. Hansen has managed/supported more than 300 projects for public and private clients in across EPA Region 5, including CERCLA/Superfund Feasibility Studies and landfill design and remedial action. His experience and expertise also includes: Environmental Engineering, Storm Water Inspection, Landfill inspections, Site Investigation and Remediation Management, Remediation System Design, Risk Assessment Modeling, Contaminant Transport/Ground Water Modeling. Also, he has project management, construction site management, general civil engineering experience, vapor intrusion evaluation and mitigation system design, underground storage tank project experience, soil erosion and sedimentation permitting, NPDES permitting, and air permitting experience. He specializes in feasibility studies, remediation system design and construction oversight, remediation system operations and maintenance oversight, and risk assessment modelling. Mr. Hansen has regulatory experience under CERCLA, and RCRA provisions, knowledge of hazardous and solid waste rules and is experienced with the MPCA RBSE manual and guidance.

Relevant Work Experience

IRP Multiple ANG Installations, National Guard Bureau (ANG), Duluth, MN. Associate Engineer. Multi-Site, Multi-Base Remedial Activities project. Remedial activities conducted include biopile deconstruction, earthwork, large scale in-situ ISCO at three sites, performance and long term monitoring to site closure at Duluth, ANGB; and AST decommissioning, soil excavation, ozone system design/installation/implementation, injection and monitoring well installation, vapor intrusion survey, performance and long term monitoring and system O&M. Other activities included preparation of a Contaminated Media Management Plan, well abandonments and site close out activities. Performed all aspects of project management including scheduling, budget allocation/tracking, resourcing, quality control, client liaison, quality control and technical reviews. Project received “Very Good” interim CPARS rating from client.

Ironton Tar Plant Superfund Site, RCRA Landfill Cap and Storm Water Collection System Design; Confidential Client; Ohio River, Ironton, OH. Associate Engineer. Designed a low-permeability cover system and storm water collection system for a 16-acre site. The cover system consists of a dual liner comprised of a geosynthetic clay liner and linear low-density polyethylene liner overlain by a drainage layer, vegetative layer, and topsoil. The storm water collection system consisted of 15 catch basins, 15 manholes, and over 2,000 lineal feet of storm water conveyance pipe that discharged to two plunge pools. The project also included a separate design for a soil cover system on the 5-acre parcel adjacent to the Ohio River. The design included the placement of 18 inches of soil and 6 inches of topsoil on portions of the site above the normal high water elevation. The designs were prepared in CSI format detailing the proposed remedial actions. The bid

Classification

On-Site Inspector / Engineer 3

OSHA Certification(s)

40-hr HAZWOPER with current refresher

Years with Amec Foster Wheeler: 8

Years of Experience: 18

Education

BS, Agricultural Engineering
MS, Environmental Engineering

Regulatory Experience

MPCA – RBSE, MDEQ, CERCLA, RCRA

Licensing / Certifications

PE - Environmental, IL, 062-058/617

PE- Environmental, MI, 6201052695

PE, OH, 77570

Certified Class K Industrial Wastewater Treatment Works Operator /IL

Certified Industrial Commercial Waste Water Operator/W6350/MI

Certified Underground Storage Tank Professional/1129/MI

Certified Storm Water Operator Construction Site/15323/MI

Certified Storm Water Operator Industrial Site/12181/MI

documents include contract requirements, drawings and specifications, and appendices summarizing previous investigations. Also, provided engineering support for implementation of the remedies.

Selfridge Air National Guard Base; DRMO Site, Remedial Actions; Mount Clemens, MI. Associate Engineer. The DRMO Site was used for land-filling activities between 1930 and 1950. In addition, the area was identified as the "Post Dump" on a 1935 boundary map in the Base Master Plan. At DRMO Site completed data gap investigations and bench scale studies to support design of the proposed remedies of excavation of source area soils and sediments and installation of a permeable reactive barrier (PRB) to intercept and treat potentially contaminated groundwater before discharge into the Clinton River located 120 feet south of the site. Data gap investigation activities included aquifer testing, groundwater sampling, sediment and soil sampling to define areas of excavation, soil borings along the proposed PRB location, installation of staff gauges, groundwater modeling, mixing zone determination, and pre-characterization of site soil and groundwater. Bench scale studies include a laboratory treatability study to evaluate effectiveness of several in-situ chemical reduction (ISCR) compounds to initiate chemical reduction, precipitate metals and promote reductive dechlorination of vinyl chloride. After the treatability study a mulch/compost mixture was selected to complete a column study to provide final design of the PRB. Based on the results of the data gap investigation, the Conceptual Site Model (CSM) was revised and the corrective actions revised to include the excavations of identified hot spots, installation of an asphalt cap and storm sewer system.

Operation, Maintenance and Monitoring at Four Landfills, Confidential Client, Southwest Michigan. Senior Associate Engineer. Provide technical/engineering support for operations, monitoring and maintenance (O&M) activities at four of Georgia Pacific's closed landfills identified as King Highway Landfill (Operable Unit 3), Willow Boulevard/ A-Site Landfills (Operable Unit 2) and the Charleston Township Landfill. These projects are conducted with the intention of providing long-term post-remediation preventative care for the design features implemented as part of the remedies at both sites, and to evaluate the effectiveness of the remedies and the protection of human health and the environment. Quarterly landfill gas monitoring is conducted to evaluate the effectiveness of the landfill gas management system and to demonstrate that methane migration beyond their property boundaries is not occurring. Evaluation of the data and reporting of both the landfill gas and groundwater monitoring data has also been completed since monitoring activities began at each of these sites. In addition to the environmental monitoring activities, landfill inspections have been conducted to identify the need for repairs and/or maintenance to any of the landfill design components, and the restored/mitigated wetland areas at Operable Unit 2. Routine maintenance to these system components has been conducted on an as-needed basis, along with completion of routine site maintenance and non-routine site maintenance activities. Semi-annual reporting of the landfill inspection observations and documentation of the routine maintenance activities conducted at the site have been submitted to both USEPA and MDEQ. Recent negotiations with the regulators has resulted in an agreement in principal for optimization of the monitoring program, through reductions in sampling frequency and corresponding analytical parameters, along with revisions to sampling methodology that will significantly improve project efficiency.

Groundwater and leachate samples are collected in accordance with an approved Hydrogeologic Monitoring Program. In addition to the environmental monitoring activities, landfill inspections and leachate system inspections have been conducted to identify the need for repairs and/or maintenance to any of the landfill design components and/or the leachate collection system. Routine maintenance to these system components has been conducted on an as-needed basis, along with completion of routine site maintenance and non-routine site maintenance activities.

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 environmental remediation systems writing Standard Operating Procedures (SOPs) related to the mechanical systems operations and maintenance (O&M), providing technical assistance with system commissioning, as well as specifications for construction and/or demolition using MPCA project guidance and bidding requirements; closed landfill biennial monitoring and maintenance inspections; stormwater plan (SWPPP) design and weekly inspections; 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; 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 nationally recognized field protocols.

Relevant Work Experience

Groundwater Extraction/Treatment System Commissioning and O&M, Manufacturing Facility, Golden Valley, MN. Field Engineer. Conducted commissioning and O&M of a granular activated carbon (GAC) groundwater remediation system at a large TCE-related MPCA Superfund site consisting of system troubleshooting, coordination with subcontractors, communication with various stakeholders, system sampling, task management, and development of SOPs. Reviewed specifications and compared to system mechanical equipment, instrumentation and materials. Reviewed submittals from subcontractors.

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. Conducted SVE system operations, maintenance and monitoring oversight, sub-slab vapor monitoring, and groundwater sampling at the site on a regular basis and in accordance with MPCA guidance. Additionally, conducted investigation derived waste management, data management, and reporting activities for this on-going Superfund site.

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

Classification
On-Site Inspector (OSI) / Engineer 2

OSHA Certification(s)
40-hr OSHA HAZWOPER with current refresher
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, #53152, MN

Erosion and Stormwater Management Certification, University of Minnesota: Construction Site; BMP Maintenance; Construction Installer

Asbestos Inspector, Minnesota Department of Health

Specialized Training
CPR/First Aid, American Red Cross

Continued...

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, coordinated 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. This required a general understanding of mechanical components and construction operations at the site.

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 a vehicle maintenance facility. Regularly called out discrepancies between contractor materials or methods and the specifications. This required a detailed understanding of the mechanical operations and systems of the project. 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.

Former Soo Line Railroad Petroleum Leak Site Remediation System Demolition, MPCA, Minneapolis, MN. Demolition Coordinator/Field Engineer. Completed specifications and coordinated construction and safety oversight for the demolition of a petroleum product recovery system at a former MPCA petroleum leak site. Conducted pre-demolition investigation work, including product recovery and monitoring. Completed and submitted bid documents in order to subcontract the demolition work following the 2012 MPCA purchasing manual. Demolition work involved disassembling the remediation equipment and tanks for disposal and abandoning the sewer line connection. Facilitated communication between MPCA and current site owner.

Landfills OM&M, Georgia-Pacific, Menasha, WI. Field Engineer. Assisted with field efforts, including groundwater sampling, landfill gas monitoring, and O&M inspections at two landfill sites in Wisconsin to ensure compliance with on-going landfill permits that specify groundwater analytical requirements, stormwater requirements, and engineered landfill cap maintenance. Field efforts also included obtaining samples from domestic wells on private properties surrounding the landfills while homeowners were present.

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, 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, 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.

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

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, PhD

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.

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.

Continued...

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 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,

Continued...

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)

Continued...

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 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.

Deborah Barsotti, PhD, DABT

Scientist 2 / Vapor Intrusion Subject Matter Expert

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
Scientist 2

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.

Jerry Eykholt, PhD, PE

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.