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Engineering & Scientific Consulting

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Professional Profile

Dr. Higgins is a Managing Scientist in the Environmental & Earth Sciences practice with over 13 years of experience in environmental site investigation, fractured bedrock hydrogeology, and litigation support. His expertise in conceptual site model (CSM) development, contaminant fate and transport analysis, and technical communication helps equip clients with the knowledge and understanding necessary to navigate complex environmental challenges. He has led remedial investigations for PFAS and VOC contamination and managed expert consulting teams in support of multi-year litigation matters for stakeholders across various sectors, including chemical and general manufacturing, aerospace, energy, defense, government, agriculture, and drinking water supply.

Dr. Higgins excels in technical communication, bridging the gap between clients, regulators, and multidisciplinary teams to achieve project goals. His expertise is often pivotal in strategic advising for litigation matters, regulatory negotiations, and development of innovative solutions in challenging environmental conditions. He brings a unique combination of technical skill and strategic insight to his clients and project teams. With a Ph.D. in Geological Sciences and a strong background in geographic information systems (GIS), data analysis, and technical communication, he is committed to advancing industry standards and delivering clear, actionable results.

Academic Credentials & Professional Honors

Ph.D., Geological Sciences, University of Connecticut, 2021

M.S., Geological Sciences, University of Connecticut, 2020

B.S., Geological Sciences, University of Connecticut, 2011

Academic Appointments

Adjunct Lecturer & Instructor of Geographic Information Systems, School of Engineering and Technology, Three Rivers Community College, Norwich, CT, 2018-2021

Professional Affiliations

Memberships:

International Association of Hydrogeologists – U.S. National Chapter Board Member (2021-2024)

National Groundwater Association (NGWA)

Environmental Professionals Organization of Connecticut (EPOC)

Publications

Metcalf, M.J., Higgins, M.A., Robbins, G.A., Stakeholder Participation in High-Resolution Monitoring of Salt Contamination. Groundwater Monitoring & Remediation. 2023. https://doi.org/10.1111/gwmr.12571

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., 2021. Non-point Source Arsenic Contamination of Soil and Groundwater from Legacy Pesticides. Journal of Environmental Quality, v. 51(66-67) https://doi.org/10.1002/jeq2.20304

Higgins, Mark A., Robbins G.A., Maas K.R., Binkhorst G.K., 2020. Use of Bacteria Community Analysis to Distinguish Groundwater Recharge Sources to Shallow Wells. Journal of Environmental Quality, v. 49(1530). https://doi.org/10.1002/jeq2.20150

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., 2020. An Assessment of Hydrologic Factors that Influence Contaminant Concentrations Determined from Domestic Well-Water Samples. Environmental Earth Sciences, v. 79(399). https://doi.org/10.1007/s12665-020-09133-w

Presentations

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., (20 October 2022). Persistence of Arsenic from Legacy Pesticides in Northeastern U.S. Soils and Groundwater. Oral Presentation. AEHS-East Annual Conference, Amherst, MA.

Turner, Christopher M., Higgins, M.A., Einarson, M.E., Robbins, G.A., (13 September 2022). Use of High-Resolution Characterization Tools in an Angled Boring for CSM Development in a Fractured Granite Oral Presentation. NGWA Meeting the Challenges of Groundwater in Fractured Rock, Burlington, VT.

Higgins, Mark A., (2 October 2021). Deriving Spatial Groundwater Datasets from Legacy Well Records: Efforts in Digitization and Data Management. Oral Presentation. NGWA Advances in Groundwater Data Management and Conceptual Site Models: Why They Matter to Multigenerational Projects (#5043). Virtual.

Higgins, Mark A., (4 May 2021). Arsenic and Road-salt impacts to domestic wells. Two CT case studies. (Invited Oral Presentation). Connecticut DEEP Remediation Roundtable. Virtual.

Kornegay, Travis, Higgins, M.A., Robbins, G.A., Metcalf, M.J., (15 March 2021). Effective Digitalization of Well Records to Create a Groundwater Resource Management Tool in the State of Connecticut. Poster Presentation. Geological Society of America Abstracts with Programs. 53(1). doi: 10.1130/abs/2021NE-361721

Higgins, Mark A.., Kornegay, T., Robbins, G.A., Metcalf, M.J., (14 March 2021). Deriving Spatial Hydrogeologic Datasets from Digitalized Legacy Well Records. Oral Presentation. Geological Society of America Abstracts with Programs. 53(1). doi: 10.1130/abs/2021NE-361713

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., Romanowicz, E.A., Ordung, R. J., (27 October 2020). Use of Bacteria Community Analysis and Discrete Groundwater Sampling to Improve Hydrogeologic Characterizations. Oral Presentation. Geological Society of America Abstracts with Programs. 52(6), 2020. doi: 10.1130/abs/2020AM-359128

Higgins, Mark A., Robbins, G.A., Binkhorst, G.K., Maas, K.R., (December 2019). Using Bacteria DNA Sequencing to Identify Nitrate Sources in a Coastal Groundwater Aquifer. Oral presentation, National Groundwater Association Annual Groundwater Summit, Las Vegas, NV

Robbins, Gary A., Higgins, Mark A., Metcalf, M.J., Romanowicz, E.A., (27 September 2019). Determining the Source of Deicing Salt Contamination to Bedrock Wells Using Downhole Logging Methods. Oral presentation, 46th International Association of Hydrogeologists Congress, Malaga, Spain 2019

Higgins, Mark A., Robbins, G.A., Maas, K.R., Binkhorst, G.K., (23 September 2019). Use of 16S rRNA Sequencing Analysis on Bacteria in Well-Water to Identify Groundwater Recharge Sources. Oral presentation, 46th International Association of Hydrogeologists Congress, Malaga, Spain 2019

Higgins, Mark A., Robbins, G.A., Maas, K.R., Binkhorst, G.K., (2019, March). Use of Next-generation Sequencing and Bacterial Community Analysis in Private Groundwater Wells to Identify Common Recharge Sources. Oral presentation, 2019 Northeast Geological Society of America Meeting, Portland, ME.

Webb, J. F., Robbins, G. A., Higgins, M.A., Hess, B., (4 December 2018). Monitoring Hydrologic Factors Influencing Bog Turtle Population Persistence at a Fen in Connecticut. Proceedings of the 2018 Range wide Bog Turtle Symposium, Richmond, Virginia.

Higgins, Mark A., Ordung, R. J., Maas, K.R., Robbins, G.A., (19 November 2018). Using NexGen Sequencing to Characterize Groundwater Transport of Road Salt into Residential Wells. (Invited Oral Presentation) Center for Open Research Resources & Equipment (COR²E) Symposium, Storrs, CT.

Metcalf, Meredith J.*, Higgins, Mark A.*, Robbins, G.A., (14 November 2018). Factors Influencing Deicing Salt Contamination of Bedrock Wells in Connecticut. (*Invited Oral Co-presentation), Connecticut Environmental Health Association Fall Chloride Workshop, CT Dept. of Public Health Laboratory, Rocky Hill, CT

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., (2018 November) Investigating Farm Related Sources of Arsenic in Relation to Contaminated Residential Wells in Connecticut. Poster, Geological Society of Connecticut Annual Meeting, Hartford, CT. Ordung, Ryan J., Robbins, G.A., Maas, K.R., Higgins, M.A., (2018, November) Characterization of Indigenous Bacteria as a Groundwater Tracer in Fractured Bedrock. Oral Presentation. 2018 Geological Society of American National Meeting, Indianapolis, IN.

Higgins, Mark A., Robbins, G.A., Metcalf, M.J., (2018, March). Improving Water Quality Data from Fractured Bedrock Wells in Consideration of Concentration Averaging. Oral presentation, 2018 Northeast Geological Society of America Meeting, Burlington, VT.

Higgins, Mark A., Keller, C.K., (2017, May). FLUTe Liner Technology in Fractured Rock – An Evolution in Groundwater Characterization. (Invited Oral Presentation), Vermont Environmental Consortium Spring Conference, Vermont Technical College, Randolph, VT.

Project Experience

PFAS Litigation – Multiple

Mark serves as technical consulting expert and strategic advisor for manufacturing clients on multiple litigation matters involving PFAS contamination (including AFFF), product liability, property damage, and/or personal injury. Services include expert hydrogeologic support, contaminant fate & transport, technical communication to multi-party attorney groups, technical advising of client counsel during live mediation, discovery, negotiation with regulatory authorities, etc.

VOC and 1,4-Dioxane Litigation – Multiple

Consulting expert on State and Federal matters involving matters relating to the fate & transport of volatile organic compounds (VOCs) in groundwater and alleged damages to public water supply wells.

Confidential Client, Confidential Location

Consulting expert on personal injury matter involving historic release of VOCs and alleged exposures relating to consumption of public drinking water and/or vapor intrusion.

PFAS Remedial Investigation –Confidential Site, New York

Mark led a remedial investigation to assess PFAS contamination in soil and groundwater for a confidential manufacturing client. He was responsible for identifying and delineating potential PFAS source areas in soil, designing an effective multi-level well network, and implementing sampling protocols that meet rapidly evolving regulatory guidelines. Additionally, Mark facilitated technical communication and negotiation with state regulatory authorities to support compliance and alignment with remedial goals.

Fractured Bedrock Investigation, Landfill, North Carolina

Mark oversaw and led an investigation into VOC contamination in fractured bedrock at a landfill site in North Carolina. His responsibilities included characterizing the extent of contamination, designing and executing a drilling and monitoring program tailored to complex bedrock hydrogeology, and developing a groundwater sampling strategy that accounted for the potential need to sample for PFAS in the future. Mark also collaborated with state and federal regulatory agencies on behalf of the client to confirm that the investigation aligned with the appropriate environmental standards and long-term site remediation goals.

Federal Superfund Remedial Monitoring Program –Landfill, Michigan

Mark served as the Technical Expert and Lead Hydrogeologist for a long-term remedial monitoring program at a Superfund landfill in Michigan. He oversaw the monitoring of VOC contamination in groundwater, optimized the well network and facilitated consistent data collection for ongoing site evaluation. Mark worked closely with regulatory agencies and stakeholders to maintain compliance with environmental standards and guide the site's long-term remediation efforts.

Confidential site, Landfill VOC remedial investigation and monitoring, North Carolina

Mark worked with North Carolina Department of Environmental Quality (NCDEQ) on behalf of an energy provider to prepare a Work Plan, conduct a bedrock groundwater assessment, develop a Conceptual Site Model, and implement a monitoring program at a complex landfill Site with VOCs impacts in the underlying competent bedrock.

Confidential aerospace client, VOC remedial investigation and monitoring, Greater Boston, Massachusetts

Mark acted as the technical lead and managed a multi-million-dollar subset of work as part of a chlorinated solvent investigation. This included numerous phases of hydrogeologic characterization and development of an expansive network of remedial groundwater monitoring systems. Mark worked with the engineering consultant to coordinate on-site work between multiple contractors and meet aggressive scheduling deadlines. This involved dealing with challenging well installation locations such as in submerged wetland areas, inside active warehouse buildings, and in high-traffic residential areas.

Confidential chemical client, VOC & NAPL investigation and remedial monitoring, Leipzig, Germany

Mark planned and conducted high-resolution downhole characterization of open boreholes wells in non-aqueous phase liquid (NAPL) source areas that included more than 20 chlorinated hydrocarbons, solvents, benzene, toluene, ethylbenzene, and xylene. He then worked with a multi-consultant team to design and implement custom high-resolution, multi-level monitoring systems that pushed the limitations

of the available single-borehole technologies. This included 20 discrete/isolated groundwater sampling ports, each with dedicated transducers to monitor the head at each depth in the formation. Mark also returned to the site in future years to train local staff, maintain the systems, conduct groundwater sampling events, and maintain the large digital datasets being collected.

University of Connecticut, College of Agriculture, Health, and Natural Resources, regional arsenic investigation, Connecticut

Mark managed a three-year U.S. Department of Agriculture Multi-State Hatch funded project to investigate the extent and mobility of arsenic in areas of Connecticut with high rates of groundwater contamination. Soil and groundwater samples were collected from hundreds of properties and subsurface characterizations were conducted using innovative field screening methods to map arsenic contamination in real time. Legacy agricultural arsenic was found to be prevalent throughout historic orchard soils across the state with evidence of leachability under natural conditions. Statistical spatial analyses found a strong relationship between arsenic contamination in wells and their proximity to former orchards. This served as the basis to increase awareness of potential exposure and to propose expanded investigation efforts to the state public health and environmental protection departments.

Confidential Superfund Site, high-resolution hydrogeologic characterization and groundwater monitoring systems design, California

Mark acted as the technical lead while coordinating with the engineering consultant to perform high-resolution downhole hydrogeologic characterizations, design and implement multi-level groundwater monitoring systems, and maintain the network of monitoring systems that had been installed throughout the previous decade. Mark provided effective solutions to achieve data collection goals in a complex hydrogeologic setting, which included extreme hydraulic head gradients, deep water tables, semi-competent fractured rock prone to collapse, and many point-sources of varying contaminants of concern. The site has been the subject of numerous peer-reviewed research publications, many of which incorporate data stemming from Mark's contributions to the project.

Former Potash Mine, mining waste investigation, Canada

Facilitated years of on-site work as part of a fractured bedrock groundwater investigation at a former potash mining site with legacy tailings ponds. Mark worked with the engineering consultant to plan and conduct site characterization efforts, advise the client on long-term remediation monitoring strategies, and implement a multi-million-dollar network of multi-level groundwater monitoring systems. He provided innovative solutions to meet aggressive scheduling goals while overcoming challenging site conditions that included wells greater than 1,000 feet in depth, high-flow (200-gallon-per-minute) artesian pressures that exceeded 30 feet above grade, and implementing safe work practices in extreme weather conditions. He also provided ongoing support to maintain the monitoring systems and manage the large datasets being collected from hundreds of discrete groundwater monitoring locations.

Mansfield Trail Dump Superfund Site, VOC investigation and remedial monitoring systems design, New Jersey

Facilitated and oversaw multiple phases of hydrogeologic characterization work at the Mansfield Trail Dump Superfund Site, which is the source of trichloroethylene (TCE) and other volatile organic compounds (VOCs) in over 75 receptor wells in the area. He also worked with multiple engineering consultants and U.S. Environmental Protection Agency representatives to design and install an effective network of remedial monitoring systems in a challenging hydrogeologic setting.

Naval Air Warfare Center Superfund Site, VOC hydrogeologic characterization and monitoring systems design, New Jersey

Implemented a series of cutting edge hydrogeologic characterization and sampling methods as part of a collaborative effort with the U.S. Geological Survey and Beth Parker's g360 research group from the University of Guelph. The work involved an unprecedented side-by-side comparison of numerous high-resolution site characterization methods. The success of these efforts served as the basis for the Environmental Security Technology Certification Program (ESTCP) sponsored project ER 201630, Evaluation of FLUTe FACT as a Screening Technology for VOC Distribution in Fractured Rock Boreholes. Mark's contributions included the design, application, and/or installation of the following FLUTe™ methods: transmissivity profiling, rapid NAPL-FACT detection, multi-level sampling systems, depth-discrete hydraulic head measurements, and depth-discrete VOC sample collection. Bucks Harbor Former Air Force Radar Tracking Station Site, Army Corps of Engineers, VOC remedial monitoring well network development, Maine Worked with the managing engineering consultant to evaluate hydrogeologic datasets and design a network multi-level bedrock well system for remedial monitoring of TCE across the site. Mark constructed and oversaw the installation of numerous well systems and provided long-term support during the following years.

Peer Reviews

Research Manuscript Review. Environmental Science and Pollution Research (February 2021). ISSN: 1614-7499

Research Manuscript Review. Journal of Environmental Quality (October 2020). ISSN:1537-2537

Research Manuscript Review. Chemosphere (May 2020). ISSN: 0045-6535