Rachel McQuiggan

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PROFESSIONAL EXPERIENCE

Delaware Geological Survey, University of Delaware, Newark, DE

Research Associate III	January 2022 – Present
Research Associate II	June 2017 – December 2021

- PI and Co-PI for multiple ongoing hydrogeologic research projects to study climate and anthropogenic influences on Delaware's water resources, combining field work and conceptual modeling to test hypotheses and monitor ambient conditions
- Collects and interprets geologic and hydrogeologic data through on-site testing, reviewing publications and State and Federal databases, and coordinating with outside agencies; this data is used to build and enhance existing groundwater conceptual and numeric models
- Develops new and maintains existing relational databases to aid in research and dissemination of data, creates internal data best management practices, codes and tools for students and researchers to process and visualize their data, metadata templates for use in dataset submission to an open-access repository, and web maps to foster public engagement and collaboration with other research groups
- Supports student research by collaborating with faculty from different UD departments to develop and guide undergraduate research projects and obtain funding
- Engages with stakeholders to identify important issues to Delaware communities and encourage participation and cooperation in research efforts; outreach has led to a local farmer reconfiguring their irrigation pond water supply to prevent saltwater intrusion, Dover Water adjusted their pumping schedule to address future concerns around aquifer depletion
- Prepares technical reports, peer-reviewed publications, project plans, budgets, proposals and maps to support ongoing and future research projects
- Coordinates and supervises outside contractors and students during field efforts including monitoring well installation, soil logging, hydraulic testing and water quality sampling

International Asbestos Testing Laboratory, Mt. Laurel, NJ   October 2013 – May 2017
Senior Laboratory Analyst

- Analyzed bulk material and air samples for asbestos minerals using the following techniques: polarized light microscopy (PLM), transmission electron microscopy (TEM), electron diffraction, energy-dispersive X-ray spectroscopy (EDX/EDS)
- Characterized, quantified and identified fibrous minerals and non-crystalline fibers from observed characteristics such as optical properties, crystal structure and chemical signature
- Additional responsibilities included sample management, quality control and data entry

Fuss & O'Neill, Inc., Manchester, CT   October 2007 – May 2013
Hydrogeologist, Assessment & Remediation, Brownfields Group

- Performed environmental subsurface investigation and remediation at various sites throughout New England, including sites that fall under RCRA, CERCLA, State and Federal regulations
- Created groundwater elevation maps and contaminated soil and groundwater plume maps

- Evaluated chemical contaminant data to define the nature and extent of contamination and determine the potential fate and transport of contaminants and remedial options, including in-situ chemical methods
- Wrote technical reports including conceptual site models, Phase I/II/III reports, project plans, investigation reports, technical memoranda, remedial action plans and remediation reports
- Oversight and management of field staff during site investigations

EDUCATION

Additional Coursework and Training, University of Delaware, Newark, Delaware
Environmental Computing with R/Spatial Computing with Python (GEOG473/673)   Fall 2019
Hydrogeology Seminar: Groundwater Modeling (GEOL630)   Spring 2019

McGill University, Montreal, Quebec, Canada   2003-2007
Bachelor of Arts, Classical Studies
Minor, Earth & Planetary Science

PUBLISHED OR IN PRESS

McQuiggan, R., Andres, A.S., He, C., Hingst, M., McKenna, T. & Michael, H.A. (in press). Kent County Groundwater Monitoring Project: Hydrogeology and Saltwater Intrusion Dynamics in the Columbia Aquifer of Eastern Kent County. Delaware Geological Survey: Report of Investigations No. 86.

Andres, A.S., **McQuiggan, R.**, He, C. & McKenna, T. (in press). Kent County Groundwater Monitoring Project: Results of Hydrogeological Studies. Delaware Geological Survey: Report of Investigations No. 85.

Peters, C.N., Kimsal, C., Frederiks, R.S., Paldor, A., **McQuiggan, R.** & Michael, H.A. (2022). Groundwater pumping causes salinization of coastal streams due to baseflow depletion: Analytical Framework and application to Savannah River, GA. *Journal of Hydrology*, 604, 127238. https://doi.org/10.1016/j.jhydrol.2021.127238

Andres, A.S., **McQuiggan, R.** & He, C. (2019). Kent County Groundwater Monitoring Project: Results of Subsurface Exploration. Delaware Geological Survey: Open-File Report No. 53.

IN REVIEW OR DRAFT

McQuiggan, R., Andres, A.S., Roros, A. & Sturchio, N. (in draft). Stormwater drives seasonal geochemical processes beneath an infiltration basin.

Hingst, M., **McQuiggan, R.,** Peters, C.N., He, C., Andres, A.S., Michael, H.A. (in draft). Mechanisms of saltwater intrusion from the coast.

CONFERENCE PRESENTATIONS & PUBLISHED ABSTRACTS

Hingst, M., **McQuiggan, R.,** Andres, A.S., Michael, H. (December 2021). *Saltwater Intrusion – Early awareness leading to early mitigation*. Abstract #H45W-1482. Poster presented at AGU Fall Meeting 2021, San Francisco, CA, 13-17 Dec.

McQuiggan, R., Andres, A.S. (September 2021). *Field Study of Deicing Salt Impacts On Groundwater From Stormwater Infiltration Best Management Practices*. Oral presentation at the American Water Resource Association (AWRA) Mid-Atlantic Conference 2021, held virtually, 22-24, Sept.

Andres, A.S., **McQuiggan, R.** (December 2019). *Challenges of characterizing impacts of de-icing salt in a heterogeneous aquifer*. Abstract #495277. Poster presented at AGU Fall Meeting 2019, San Francisco, CA, 9-13 Dec.

Hingst, M., **McQuiggan, R.,** Peters, C., Andres, A.S., Michael, H. (December 2019). *A-Salt on Delaware Farmland: Investigation of Pathways and Dynamics of Saltwater Intrusion near Dover*. Abstract #617689. Poster presented at AGU Fall Meeting 2019, San Francisco, CA, 9-13 Dec.

McQuiggan, R., Hingst, M., Michael, H., Andres, A.S., and He, C. (March 2019). *Flow Dynamics and Salinity of Groundwater and Surface Water in East Dover*. Poster presented at DENIN Symposium Series II: Future of Water in the Mid-Atlantic: Agriculture, Restoration and Technology: Stroud Water Research Center, Avondale, PA.

McQuiggan, R. and Andres, A.S. (September 2018). *Groundwater Level Decline in the Piney Point Aquifer of Delmarva*. Oral presentation at the annual Maryland Groundwater Symposium: Baltimore, Maryland. Abstract available here: http://www.mcet.org/Assets/mcet/MDE/2018GWSGuide.pdf

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CURRENT GRANT-FUNDED RESEARCH

Total funded to date (June 2022) as PI: $33,783
Total funded to date (June 2022) as Co-PI: $177,935

Delaware Groundwater Monitoring Network (DE GWMN)   June 2017 – ongoing
Role: Co-PI (Feb 21 – current), Participant (Jun 17 – Feb 21)
PI: C. He
Operation and maintenance of an existing, state-wide water level monitoring network and recently included ambient groundwater chemistry with a focus on aquifers that contribute to water supply systems

NSF Critical Zone Collaborative Network   September 2020 – September 2025
Role: Data Manager
Lead PI: H.A. Michael; Co-PIs: Y. Chin, J. Miller, A. Seyfferth, S. Stotts
"The Coastal Critical Zone: Processes that transform landscapes and fluxes between land and sea" coordinating data acquisition, storage, processing and management with individual group leads and the larger CZCN Data Hub (Award #2012484)

NSF EPSCoR RII Track 1   September 2018 – September 2023
Role: Participant
Lead PI: K. Messer; Co-PIs: D. Sparks, H.A. Michael, M. D'Souza, C. Winstead, Y. Yan
"Water Security in Delaware's Changing Coastal Environment" (Project WiCCED); Investigating the pathways and dynamics of salinization to groundwater and surface water in the east Dover area, an area with competing water demands of shallow and deep aquifers (Award # 1757353)

Deicer Salt Impacts to Groundwater Quality   December 2018 – June 2023
Role: PI (Oct 21 – current), co-PI (Jun 20 – Oct 21), participant (Dec 18 – Jun 20)
Former lead PI: A.S. Andres
Investigating the impacts to groundwater from winter roadway salt applications through monitoring DelDOT-managed stormwater best management practice sites. FY23 funding includes an additional soil study to test chemistry and infiltration pre- and post-winter salt application.

National Groundwater Monitoring Network (NGWMN)   July 2020 – June 2022
Role: Participant
Lead PI: A.S. Andres, Co-PI: C. He
Managing and operating an automated, high-frequency monitoring network and associated data used to evaluate long-term trends in the major aquifers of Delaware

PAST GRANT-FUNDED RESEARCH

Groundwater and Saline Intrusion Monitoring, Kent County, Delaware   June 2017 – September 2021
Role: Participant
Lead PI: A.S. Andres, Co-PI: C. He
Install new infrastructure and monitoring groundwater conditions in areas of Delaware that have been identified as spatial data gaps

PROFESSIONAL AFFILIATIONS

Geological Society of America   2019 – present

SUPERVISORY EXPERIENCE

University of Delaware, Newark, DE
Project advisor to summer research intern (Kim Bieksha)   June – August 2020
  - Worked with intern and supervisor (Dr. Chelsea Peters) to come up with research project idea
  - Advised on data acquisition, management and processing to achieve research goals
Supervisor to summer intern (Monica DiBartolomeo)   May – August 2019
  - Instructed on basic field monitoring principles and how to operate sensors and monitoring equipment
  - Shared scheduling duties with Jaime Tomlinson of the DGS in order to accomplish summer field goals for two projects
  - Developed the internship into a summer research project using data collected during the summer and coordinated with Dr. Dana Veron (UD CEOE) for the intern to receive 3-credits
Supervisor to undergraduate field assistants (Colin McGee and Edward Weiss)   May – August 2018

- Taught field and monitoring techniques and basic data processing and management and relational database skills

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TECHNICAL SKILLS

Software: Microsoft Office, ArcGIS (10.8.1 and Pro), AutoCAD, Grapher, AquiferTest Pro, Visual MODFLOW Flex, Solinst Levelogger software, Win-situ, Campbell Sci LoggerNet

Languages: SQL, VBA, Python, R

FIELD WORK & LABORATORY SKILLS

- Monitoring well installation
- Hydraulic testing
- Soil coring and logging
- Rock core logging
- Automated sensors and data loggers
- Transmission electron microscopy

- Geophysical logging (gamma, induction/EM)
- Soil sampling
- Groundwater sampling
- Level surveying
- Multi-parameter sondes
- Polarized light microscopy