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GRO Summer Internship Final Report

Characterizing and Minimizing Drinking Water Treatment Plant Residuals

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In May of 2010, I moved to Cincinnati, OH for my Greater Research Opportunities (GRO) Internship at the Environmental Protection Agency (EPA) National Risk Management Research Laboratory (NRMRL) in the Water Supply and Water Resources Division (WSWRD) under Darren A. Lytle, PhD, P.E., Chief of the Treatment Technology Evaluation Branch (TTEB). Suddenly joining one the brightest teams I have had the opportunity to be a part of, I was amazed at how easy it was to relate to my supervisor and coworkers. They provided me with helpful insight and feedback on my projects and papers. I also found the missions of both the NRMRL and the EPA to be very motivating. The NRMRL's mission is to "prevent and reduce pollution of air, land, and water," and, more broadly, the EPA's mission is to "protect human health and safeguard the natural environment upon which life depends." Working to uphold these missions provided a great deal of purpose to my internship. Outside of work, I was surprised at how quickly I embraced living in the city of Cincinnati. My level of personal growth throughout the GRO Internship was exceptional, not only for my academic future and career, but also for my lifelong goals.

The theme of my GRO Internship was *Characterizing and Minimizing Drinking Water Treatment Plant Residuals*. In drinking water filtration processes, a waste product, such as a sludge, brine, or backwash water, is created alongside the final product. Handling this waste residual is often very difficult or expensive to do, which makes it a key factor for drinking water treatment design. The two projects I worked on focused on dealing with drinking water treatment waste residuals, one about characterization and the other about minimization. After reviewing the final reports from EPA demonstration plants for arsenic removal from drinking water, I collected site-specific waste residual data for my project on characterizing drinking water treatment residuals. This project allowed me to use and expand my data analysis capabilities and report writing skills with Microsoft Excel and Microsoft Word. I organized the data using tables and figures, and I analyzed the data in a report. Several connections between levels of arsenic and iron were noted. I also showed how much of the arsenic in the backwash wastewater stream was in particulate form and in soluble form. At first, the characterization project seemed fairly simple, but it ended up being quite complex.

My other project, which focused on minimizing waste residuals, was titled, *The Use of Conventional and Microwave Drying to Treat Water Treatment Plant Waste Residuals*. The project looked into the use of microwave technology to dry down the waste residuals to a small or even negligible volume in a relatively short amount of time. I worked on carrying out a literature review, planning and conducting drying experiments, and writing preliminary documents to develop the project. All of these things were conducted with the goal that a future, more developed study might emerge. Not only did I learn a lot about drinking water filtration and the management of its waste residuals, I also learned a great deal about what goes into planning, preparing, and successfully conducting a project. It was challenging to stay on schedule without becoming overwhelmed; however, I found it to be very helpful to talk through the mechanics of the project with Dr. Lytle and my coworkers. One thing I would recommend to future GRO students is to take advantage of being surrounded by plenty of well-educated people who are ready and willing to help. The experience of working through this research project will help with my future research-based studies in graduate school.

My GRO internship encompassed more than the two projects on drinking water treatment residuals. I had a small role in a project in which the EPA was working with the Cincinnati Zoo. After the unexpected death of one of their rhinos, the zoo wanted some tests run on samples from the animal's pen. I used the EPA's stereo-microscope to take pictures of several samples. It was exciting to be a part of a project that came together due to the collaboration of many different people. I also had a few chances to get out of the office to a local water utility in Greene County, OH where the EPA has set up a pilot scale study to look at biological filtration. Throughout all of these experiments, I discovered the importance of teamwork within a project involving several people, each with different strengths.

A highlight of the summer was having the opportunity to attend the American Water Works Association (AWWA) Annual Conference and Exposition on Water in Chicago, IL. Sitting in on different sessions, examining posters, and talking with potential employers, I learned quite a bit about water research and made many connections. It was motivating to see the professional presentations. Dr. Lytle also attended and was helpful in pointing me in the right direction as to what talks might be valuable, meetings I should sit in on, and people I should meet. He introduced me to a spokesperson for one of the grad schools I am considering. It was a very beneficial conference, and spending a few days in Chicago was very nice.

Taking part in the EPA GRO internship was an amazing step in the right direction for my academic interests and my career. Having previously planned on finishing my education with a Bachelor's degree, I now plan to pursue a Master's degree in environmental engineering. Finding new friends and fun things to do in and around Cincinnati was not nearly as difficult as I first imagined. After my experience this summer, I have become much more passionate about my career choice and confident about my academic abilities.

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