This summer I worked with four other research students in Sewanee's Chemistry Department under the direction of the University's environmental chemist, Dr. Emily White. We measured various physical, chemical, and biological properties of Sewanee's wastewater. This work is part of a larger project investigating the efficiency of the Sewanee Utility District's wastewater treatment system to remove nitrogen, phosphorus, and pharmaceutical and personal care products (PPCPs). In order to accomplish this goal, we analyzed water samples collected from the various stages of the treatment process, which consists of three lagoons and a chlorination tank that cleans the wastewater before it is sprayed into the forest. Our research served to establish an idea of the effectiveness of Sewanee's current wastewater system, which will be used to compare the current system with that of a proposed constructed wetland.

To gather information on the current wastewater system, we studied the levels of iron, chlorine, phosphorous, nitrogen, conductivity, total coliforms/*E. coli*, conductivity, pH, temperature, total suspended solids, dissolved oxygen, and turbidity of the water. We learned to measure pH, conductivity, dissolved oxygen, and temperature with probes and to measure total coliforms/ *E. coli* with Colilert packets. However, for my work, I focused on learning to measure total nitrogen, nitrate, nitrite, and ammonia using the standard methods: SM 4500-N C, SM 4500-NO_3 E, SM 4500-NO_2 B, SM 4500-NH_3 D, respectively.

I began my internship by reading the standard method for nitrite and calculating the concentrations of the nitrite standards with which we could create a calibration curve for the nitrite analysis. In the second week, we realized that the spectrophotometers were not accurately reading the standards we created, so we tested the spectrophotometers to find the most precise machines. After another week of working on the nitrite analysis, we recorded a satisfactory

calibration curve and began working on testing standards for the nitrate analysis. We achieved a satisfactory calibration curve within three days of beginning the nitrate analysis, so we continued to the total nitrogen digestion. I began learning the method for ammonia analysis with an ion selective electrode. After a week of testing the ion selective electrode, we retrieved wastewater samples from the chlorination tank, two treatment lagoons, and three streams in the Sewanee's Utility District wastewater treatment plant. We also received samples from a chicken farm waste treatment system. We tested both sets of samples for iron, total suspended solids, chlorine, phosphorous, and nitrogen. I measured and calculated the concentration of ammonia and nitrite in the chicken plant water and wastewater and helped another research student perform the nitrate and total nitrogen analyses on the samples. After recording the data, we calculated the concentrations of these analytes in the samples. During the last week of my internship, I collected and tested samples from the wastewater plant's three streams to compare with the previous week's concentrations.

Although our main focus was on the wastewater treatment plant, we also measured the concentrations of nitrogen and phosphorus and monitored the total coliforms/*E. coli* in Harrison Spring (from the pipe, the stream next to the pipe, and in a pool from where the pipe water originates). Total coliforms/*E. coli* were also measured in Tremlett Spring in Abbo's Alley and the stream in Buckets of Blood cave along the Sewanee Highway. We found high counts of both total coliforms and *E. coli* in the three sections of Harrison Spring and in the Buckets of Blood cave but lack the equipment to determine from where these contaminants originate.

Additionally, we had the opportunity to speak with prospective students in both the Bridge Program and the Sewanee's Pre-College Field Studies Experience on separate occasions.

We spoke to students in the Bridge Program about our research and answered questions about the research. We, also, assisted Dr. White in a lab exercise to eliminate iron from water samples for the Field Studies Experience students. Both experiences allowed us to explain our research to those outside of the chemistry department as well as answer questions about Sewanee.

Over the summer, we gained experience in the research process; research possesses both exciting and tedious moments. Much of the excitement of the research came towards the end when results could be calculated and compared amongst the five research students working under Dr. White. For part of the summer, however, we ran standards, practiced analysis techniques, and completed the daily routine of washing glassware, all of which could be considered tedious. However, running standards and practicing the techniques greatly aided our precision in the tasks by familiarizing us with lab equipment and techniques such as pipetting, making solutions, and utilizing reduction columns. Washing glassware not only allowed us to maintain a proper lab environment, but it also gave us time to reflect on the day's progress.

Through this internship, I gained valuable experience in working in a lab setting. I learned to properly make solutions, which I can utilize in my chemistry work-study job. I worked with specialized equipment such as two types of spectrophotometers and a cadmium reduction column; learned to run different analyses on wastewater; and shared ideas and results with others working on the project. I believe this summer painted a model for a research-oriented career, and provided an opportunity to understand the applicability of environmental chemistry as well as research-oriented careers.