Executive Summary

The goal of the Farming in the Climate Change Era project is to create a field deployable system to monitor the volume of water that is applied to a field. Gerrad Jones, an environmental engineer and chemist at Oregon State University, has tasked our team to develop this system of water management for the Quechan Indian Tribe in Southern California. The tribe is located in Imperial Valley, near the US/Mexico border, in one of the most agriculturally productive areas in the world; however, this region is naturally very dry and must be irrigated year-round. The system will measure and record instantaneous flow data, and then send that data to a remote server where it can be displayed and viewed by water managers to track water application in real time.

The Quechen people need to be able to more effectively utilize the scarce water resources that they have available to them. Imperial Valley receives only 3" of rainfall per year, and the state of California is now requiring water application data that would require the tribe to purchase expensive systems to record the data. There are expensive alternatives available, but the tribe does not have the budget for these options. Ultimately, our system will be able to take pressure off of the tribe and allow its 2000 members to more effectively and efficiently produce crops and sustain their livelihood.

The project went through several phases until completion. First was the research, analysis and design phase. The impacts of our project on society, the environment, and the tribe were all considered. Analysis of the problem and how to most efficiently and effectively solve it were all important stages of the design process. In addition, the requirements of our project were defined in a way that the team can meet each of them, but they also satisfy the project needs. The system measures water flow through irrigation gates, transmits, and reports that data. This was done using Maxwell's equation for water flow, and the LORA communication method. In addition, it has a solar power system, and also a reserve battery. It is also designed ruggedly so that it can survive without maintenance for extended periods of time outdoors. Then the block diagram and interface definitions were created, and the project was designed and built block by block. Finally, the assembly and testing of the system as a whole was done to verify each of the requirements were satisfied.

Several key lessons were learned during this process. The first and most important thing that this project taught our group was that communication is key. We each designed our individual blocks, but there were communication errors that made integration more difficult. Had we cooperated more effectively with each other in the block stage, the integration would have been much easier because it would have been plug and play. Second, we should have discussed our visions for the project as a group, because there were times late in the process when we all had different ideas on how it was going to work, which led to different designs. This is something we should have nailed down earlier. Lastly, we learned that meeting weekly with the instructor was a huge help to keeping us on track and in line, and it greatly helped our project. Ultimately, we learned some valuable lessons about teamwork and coordination that can be carried into our future team projects and work environments.