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Duke Engineers for International Development (DEID) has developed a relationship with the community of El Pital in Atlántida, Honduras over the past several years. Previous teams constructed and tested a greywater treatment system to reduce the damage that El Pital wastewater causes to the health of the town, the surrounding communities, and local ecosystems. The efforts undertaken by the town's Water Board and the local NGO, Un Mundo, to reduce the number of households dumping greywater in turn required expansion of the water treatment system, crucially the grease traps designed to separate oil, grease, and miscellaneous macro-particulate matter, (abbreviated to MMPM and includes food matter, dirt, hair, and other small refuse) from the water before treatment in underground gravel filters. Un Mundo requested that our team of five undergraduate engineering students and one graduate advisor design and test a new grease trap to replace the old grease trap design with the hopes that the Water Board can use our designs to expand the existing system in a locally sustainable manner. Separately, El Pital has struggled in the past years to reduce the devastating health impact that smoke particulate from adobe stoves has on women in the town. Un Mundo requested that DEID design and test a simple adobe brick stove with ventilation to remove smoke from the household during cooking. With a month to complete the research, our goal was to build and test two grease traps and use whatever time we had towards the end of the project to attempt to construct our adobe stove design.

Upon arrival, we walked straight in to catastrophe, as we realized that all the piping for water filtration systems had been clogged by MMPM and that all the grease traps were either destroyed or overflowing. Following emergency discussions, we concluded that fine mesh filters are needed to remove the MMPM from the greywater before it enters the grease traps in order to prevent future destruction of the filtration systems. Our grease trap design effectively amounts to a large concrete box with central wall that only allows water to pass underneath it through small channels, separating grease as it floats to the surface. Mesh grids below the inlet piping and in front of the channels in the wall provide two layers of defense against MMPM. Our testing sampled inlet water, water exiting the grease trap, and water flowing out of the gravel filters as well as monitored MMPM build up on the mesh filters during both peak and low water flow. The testing (shown in pictures attached to this report) demonstrates a drastic reduction in water contamination as the water passes through our system.

While the second grease trap was under construction, our group split up to begin construction of the ventilated adobe stove we designed. Un Mundo instructed us as to whom we were to build the stove for and we bought adobe bricks from a local brick maker to construct the it. The benefactor of the stove used it in cooking over a period of five days before the end of our project and reported that the stove heated adequately and that the smoke vented up through the chimney rather than in to the house. We did encounter an issue with the metal cooking plate top on the adobe stove. It appears that a thin layer of rust tends to build up on the metal after days of heavy rain. We suggested that the sheet be replaced and that all future designs use either galvanized or stainless metal plates. As the cost of this stove was near to the cost of existing adobe brick stoves, the Water Board was excited to begin building more stoves around the town using our design

Our team is currently writing detailed manuals in Spanish on how to build these stoves and grease traps. These will be delivered to Un Mundo for use in both El Pital and the surrounding region. I strongly believe that our research project will help El Pital take a long stride towards sustainability for two reasons. The first is that our testing ensures that the designs will in fact function under the unique conditions of the town, rather than naively assuming designs used elsewhere in the world will work in Honduras. The second, and perhaps most crucial, is that by only building and testing a couple proofs of concept, we leave the community with the means and motivation to affect their own development. Throughout the time we spent working in El Pital, we observed a large level of community involvement and concern in the greywater treatment system. I am excited to see this community use our work to improve itself and create a sustainable future for its progeny.