

## Building a Water Distribution System in Honduras - Engineers Without Borders

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Students in the Northeastern University student chapter of Engineers Without Borders (EWB-NEU) have undertaken a series of water supply and distribution projects in the rural mountain villages of Honduras. EWB-NEU was founded in 2004 and is part of the national organization EWB-USA, a non-profit humanitarian organization established to partner with developing communities to improve their quality of life. In 2005, EWB-NEU undertook its first project when two students and their professional mentor traveled to the Yoro District of Honduras to conduct a site assessment in the rural mountain village of El Tecuán.

This village was identified by the non-profit organization Americans Caring Teaching and Sharing (ACTS), which has worked in the nearby village of El Rosario for more than 20 years. Over this time ACTS has established a health clinic as well as a bunkhouse for visiting doctors - and now engineers - to stay.

During EWB-NEU's initial assessment trip to El Tecuán, ACTS guided the group through many

of the local communities. One of these villages was Los Planes, home to 18 indigenous families, none of which have running water.

### Preparations at Home

After returning to Boston, students began work on a design to help improve the reliability of the El Tecuán water system. The previous system supplied water sporadically throughout the day, with some houses losing service for hours at a time.

After analyzing their survey data and considering different options, the students prepared a design to replace a 1,200-foot section of 1-inch PVC pipe with 2-inch pipe. The new 2-inch pipe connects the storage tank to the existing valve box, which splits the supply between three 1-inch lines servicing the homes. This simple design would not only provide a more consistent flow of water to the families, but also allowed EWB-NEU to learn more about construction techniques in the area that could be used in the future on more complex projects, like the one needed in Los Planes.

With this design complete, and with approval from the national organization, EWB-NEU prepared for another trip to Honduras. Before leaving for Honduras, however, the Northeastern team needed the people of El Tecuán to dig a 1,200-foot trench to lay the new pipe. This would allow the team to better manage its time and focus more on assessing the situation in Los Planes during its site visit. With no electricity or telephone service in the area, the group's only means of communicating its message was by sending a letter with an ACTS team traveling to the area earlier in the year.

EWB-NEU now focused primarily on fundraising. In the months leading up to the trip the group gained support from family, friends, local companies, and the Northeastern

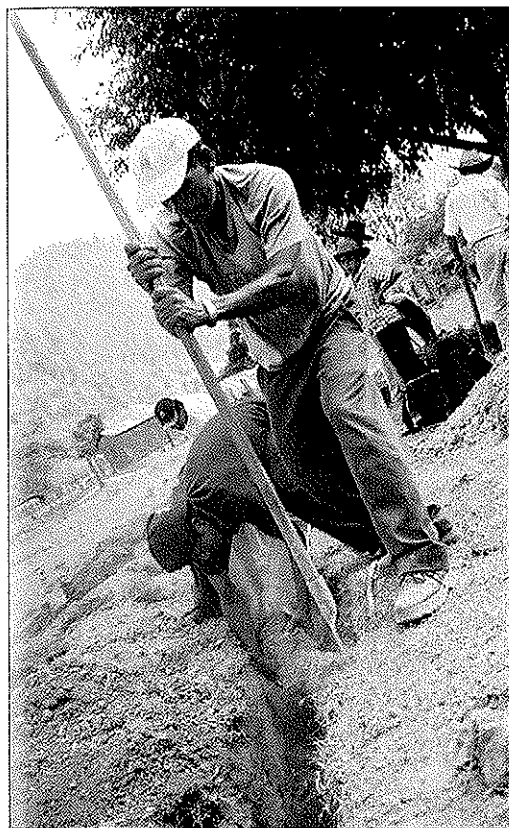


*Two children from Los Planes pose for a picture. The girl on the right holds a bottle of vegetable oil. ACTS donated oil to each family in the village to help increase its caloric intake.*

College of Engineering, which allowed five students and their professional mentor to travel with ACTS back to the bunkhouse in El Rosario. They stayed there for two weeks in April 2006, traveling between villages during that time.

### Into the Unknown

EWB-NEU split its time between design implementation in El Tecuán and site assessment in the neighboring village of Los Planes.



*Villagers from El Tecuán diligently fix sections of their trench before laying the new pipeline.*

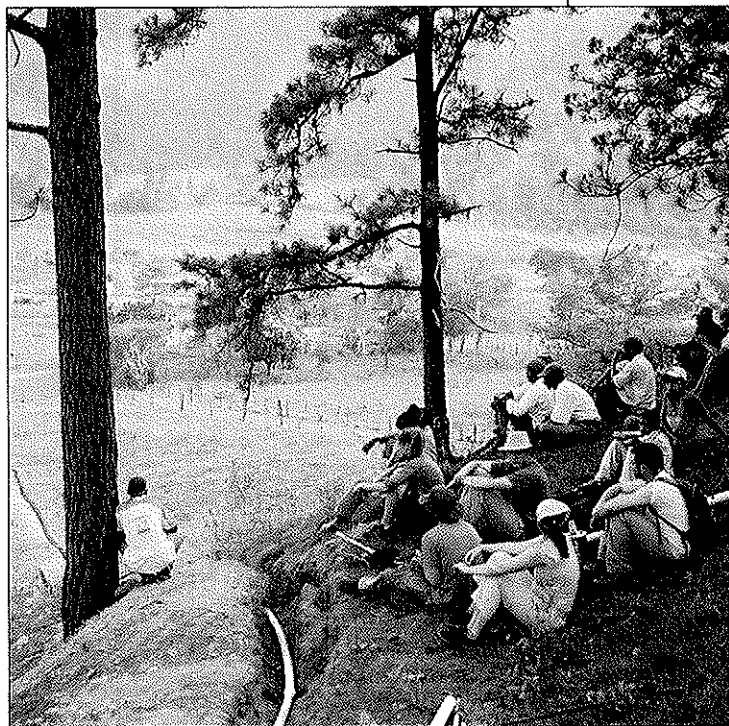
The Northeastern team was pleased to find the villagers of El Tecuán had received the letter and the men of the water board had already dug the 1,200-foot trench with the few hand tools they owned. However, the group hit a minor roadblock. There were a few sharp turns in the trench and no attachments available to allow a bend in the pipe. So, with the temperature nearing 100° F, the villagers used two pick-axes and a shovel to fix the problem. A few members from the Northeastern team made a valiant effort to help, but eventually

surrendered their tools to the acclimated Hondurans.

The pace was quick after this problem was fixed. A team of students and villagers swiftly made their way from the storage tank down into the village, stopping every 20 feet to connect the next segment of pipe.

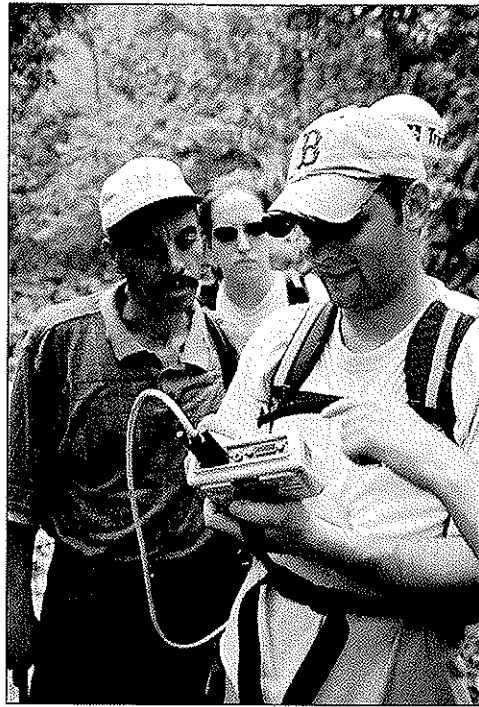
Having laid nearly 1,200 feet of pipe, the team was ready to connect the existing 1-inch lines, but they were short by one 1-inch fitting. Before this point all the piping was belled at one end, but the existing pipe did not have this luxury. Again the Hondurans quickly fixed the problem. The president of the water board dropped some newspaper he was carrying and struck a match. Another man took the pipe and began slowly rotating the end of it in the fire. After some time he raised the end, and another man took a small piece of pipe and started working it inside the heated piece. This process was repeated until the end of the pipe was visibly flared.

In fact, this technique is how this village and many in the area have always installed new pipe; the PVC glue we brought to secure the fittings was novel to many of them. For the Hondurans, most pipe fittings involved a fire



*EWB-NEU students sit with villagers from El Tecuán, waiting for the glue to set on the newly laid PVC pipe before turning on the water.*

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**Justin Roy (NEU Civil '08) shows the group's local guide, Dioniso, how to use a GPS unit to track the points along the proposed pipeline in Los Planes.**

and brute force to fit the sections together.

After working out some problems in the distribution line in El Tecuán, the team shifted its focus to Los Planes. There was a drastic difference between this village and El Tecuán. The faces were solemn and the children were quiet. A health survey revealed the average life expectancy is in the mid-40s. Many of the common illnesses are malnutrition, diarrhea, fever, and headaches, much of which can be attributed to a lack of clean water.

The current water source for the village is a small stream about a 15-minute hike from the village center. The women and children walk there daily with buckets and bottles to collect water for use in their homes. The women also do their laundry and bathe their children in this stream. Water tests indicate this source is contaminated with *E. coli* and other harmful bacteria. Without easy access to clean water the villagers of Los Planes cannot farm, which is the main source of income in the area. There was also very little livestock, mainly due to the fact these animals could not be properly cared for.

After collecting a great deal of GPS and

surveying data, the Northeastern team had enough information to start the design back home. Before leaving, EWB-NEU met with the people of Los Planes to discuss the possible plans.

### Preparing for the Next Phase

During the months following EWB-NEU's return from Honduras the team designed a system to bring water from an existing spring-box located almost two miles away from Los Planes. This source was tapped after Hurricane Mitch devastated the area, and it is currently being used as the source for the neighboring village of La Reinada. There is significant overflow at this source and also further down the line at a pressure break tank. The design calls for Los Planes to use the overflow from the break tank. La Reinada has agreed to help with this project and understands the great need of their neighbors in Los Planes.

The initial phase of this design brings water from this tank, across two river crossings, and to a few community taps in the village. In a second phase a storage tank will be built in Los Planes and more taps will be installed.

EWB-NEU returned to Los Planes in April 2007 to begin the first phase of its design. During this trip the team worked with the villagers to dig a nearly two-mile-long trench. In addition to this, EWB-NEU began construction of two galvanized iron suspension bridges. The team completed one bridge and made significant progress on the second during its two-week stay. The materials needed for the main pipeline and other structures were also acquired and a local mason began construction on a community tap.

The team returned again to Honduras in December 2007 to find the people of Los Planes had finished laying the pipeline and had running water at a community tap in the center of the village. The people of Los Planes had ingeniously rigged a suspension bridge using barbed wire and PVC pipe. During this visit the team from Northeastern finished constructing the second bridge and also disinfected the line. The reservoir tank for the village and the distribution system is now under construction.



*The EWB-NEU travel team poses with local guides in front of the suspension bridge they constructed during their most recent trip to the area.*

EWB-NEU has also begun identifying a new project in the area and will return in April 2008.

With Los Planes now having easy access to clean water, other non-profit organizations in the area such as Sustainable Harvest International (SHI) will be able to work with farmers to develop sustainable agricultural practices. In time, this will bring more nutrition to the area and hopefully drastically improve the quality of life for many. ■

*For further information and updates on this project please check out the EWB-NEU website at [www.ewb.neu.edu](http://www.ewb.neu.edu), or direct inquiries to Ethan LaRochelle at [larochelle.e@neu.edu](mailto:larochelle.e@neu.edu).*

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