



Safe Drinking Water for US - Mexico Border Colonias

Texas-New Mexico-Chihuahua Regional Workgroup

KEY PROJECT HIGHLIGHTS:

- Improved water quality for 74 families
- Reduced drinking water costs for US families
- Installed 14 In-Line reverse Osmosis systems installed in US Colonias
- Installed 60 Sawyer-Point Gravity Driven Buckets distributed in Mexico
- 175 US & MX Residents educated



Figure 1. Location of Colonias

In communities in West Texas and Northern Chihuahua, known as colonias, there are families that still lack access to safe drinking water. These communities often rely on private water haulers, which can often cost families up to \$100 per month or more, to provide water for their daily use. A major concern for these communities is safe water for drinking and cooking purposes. The water delivered to them, is stored in large tanks adjacent to their homes for days or weeks before piping it in for use. This practice can create a serious risk of water borne illnesses since disinfectant residual in the water begins to degrade within hours, creating the potential for dangerous levels of microbial growth to occur. In addition, water stored in these tanks can be prone to environmental contamination from dust or rainwater or improper maintenance. In addition, colonias where there is a source of water, such as a well, often lacks inadequate treatment of it before it is distributed. Some of these communities, are years away or will never be connected to a properly management water system. In these situations, Point of Use water units (POUs) are being considered to provide safe drinking water for families.

Dr. Yvonne de Santiago from the University of Texas at El Paso (UTEP), received a Border 2020 Grant to work with communities in West Texas (Far East Montana and Hueco Tanks) and Northern Chihuahua (Kilometers 27-32 of Mexico 2 highway to Casas Grandes; Anapra) to provide education on environmental health issues related to water to residents in these Colonias (Figure 1). It also helped with low cost alternatives and appropriate POU systems.

Several POU systems were evaluated to help determine which would work best in each colonia. Based on several factors (i.e. type of contamination removal, compliance with regulatory compliance for small system, socially acceptable, sustainability and cost), the project team determined that residents from colonias in Juárez required a portable, low energy consuming system, and residents in El Paso County would benefit from in-line systems. Focus groups were also conducted in the Mexican colonias to gain additional insight to people’s concerns, willingness and adaptability to utilize POUs. The two types of systems (Table 1) selected were the Sawyer Point ONE gravity driven filter with a 5-gallon bucket for Colonias in Juárez and an in-line Reverse Osmosis (RO) under the sink setup for Colonias in El Paso.

Table 1. Point of Use systems of project

	Colonias in El Paso	Colonias in Juárez
Analysis	Whirlpool Reverse Osmosis Under the Sink System	Sawyer Point One Bucket System Filter
Cost	\$150.00 - \$170.00 U.S. dollars	\$25.00 - \$60.00 U.S. dollars
Capacity cost by flow rate	\$8.00 - \$9.20 U.S. dollars/gal	\$0.15 - \$ 0.35 U.S. dollars/ gal
Maintenance Cost	\$60.00 Dollars every 6 Months	Maintenance consists of backwashing the filter with kit supplies.
Life cycle	10-15 Years	50 + years
Microbiological Contaminant removal	Yes	Yes
Heavy Metal Removal	Yes	No
Needs Electricity and Connection to Water Line	Yes	No
Daily Capacity (6 hour use)	4.6 Gal	42.5 Gal
Meets EPA requirements	Yes	Yes
NSF	Certified for Standard 42 (reduction of Chlorine, taste, and odor), Standard 58 (reduction of arsenic, barium, cadmium, chromium (hexavalent), chromium (trivalent), copper, cysts, lead, nitrate, radium 226/228, selenium, turbidity, and TDS)	Exceeds NSF Recommendations for Viruses, Bacteria, and Protozoa. Not certified

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A total of 14 under-the-sink Point of Use systems were installed in the US Colonias and 60 bucket filters (Figure 2) were delivered to families in the Mexican Colonias.



Figure 2. UTEP Student, Arahim Zuñiga, displays Bucket system.

UTEP students collected a total of 84 water samples, a combination of pre POU and post POU samples. Water was analyzed for pH, Conductivity, Total Dissolved Solids (TDS), Alkalinity, Hardness, Total Chlorine, Free Chlorine, Chlorophyll A and B, Heavy Metals and Microbiologic (Total Coliforms, E.coli and Enterococci). Some key results showed that prior to filter installation or bucket use, in both US and Mexican colonias, water samples tested for the presence of microbial contamination in varying degrees. Once the RO or Bucket system was used, water samples showed that microbial contamination was almost eliminated to 0%.

Dr. Santiago and her team of community health workers and students conducted educational outreach to over 175 residents through workshops, focus groups and home visits, in both US and Mexican Colonias. Education workshops were held on environmental health issues related to drinking water in their community. Pre and Post surveys were utilized to assess water practices and perceptions of colonia residents concerning the water quality of their hauled, and to note any behavioral changes.

In the pre-surveys, community perception on their hauled water varied based on the Colonia. In both the US and MX Colonias, more than 50% of residents agreed that their hauled water was not safe to drink. Residents worried about microbial and/or chemical contamination, taste and odor, felt that the water could or has caused illness within their families after drinking it. On both sides, Colonia residents purchased additional bottled water for drinking purposes (100% on US; 76% in Mexico). After conducting education and home visits to each of the communities, residents purchasing additional drinking water dropped to 31% and 40% respectively. For the US Colonia residents that had a POU installed, residents had an 80% trust and satisfaction with the POU, felt that it was easy to use (90%) and indicated they would consistently be using it (80%). In the case of those in Mexico, those that received a bucket system, 88% were satisfied with the unit, 94% trusted it and 60% indicated they would consistently use it.

During the course of the project, one of the UTEP student's working on it was able to complete their Master's thesis, "Assessment of Point of Use (POU) systems for reducing health risks associated with drinking water along the U.S.-Mexico Colonias in the Paso del Norte region", as well as, another student, Arahim Zuñiga, is set to complete their Master's thesis in 2020. At the end of the project, EPA and NADB staff visited one of the homes of a colonia resident. One of the most powerful testaments to the success of the project was that the resident indicated that with the installation of the reverse osmosis POU, they had completely stopped purchasing bottled water for drinking purchases.

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Dr. Ivonne de Santiago, Phd, P.E.

I recently read a quote that read: "Once you carry your own water you will learn the value of every drop." When I work in the Colonias, it is a different world within our world, whereas in many other places, most times the burden of those buckets fall on the shoulders of women and children. The results of this project clearly demonstrate that POU's are a sustainable and reliable option to ease those burdens and help residents of Colonias improve their water quality and thus the quality of life of those residents.
