Single-Family Pump Systems

In the rural context of Guatemala, there are communities settled in places where water access is difficult. It is not always possible to build a conventional aqueduct due to certain conditions:

- There are no water sources with sufficient flow.
- Communities are located in high altitude areas where building a conventional gravity aqueduct is not possible and pumping systems are required; at very high altitudes project costs can be prohibitive.
- A large percentage of the rural population does not have sufficient economic resources to build a pumping system.

As part of Water For People's Everyone Forever model and as the human right to water, all communities - including those with these difficult conditions - must have safe water. The Water For People Guatemala team addresses this challenge with what we call "Single-Family Systems." We work with individual households and use non-conventional methods to obtain access to water, such as rainwater harvesting cisterns and mini-systems that use gravity or pumps to supply one or more homes.

Cisterns	Single-family gravity-fed system	Single-family pump system
Ferrocement tanks to store rainwater so that a household can use it during the dry season	• Catchment (similar to conventional projects but smaller) • Conduction line (with smaller diameter) • Chlorinator • Storage tank (750-liter tank on a wooden base) • Household connection	• Catchment (similar to conventional projects but smaller) • Suction tank (usually $1m^3$) • Conduction line (with smaller diameter) • Chlorinator • Storage tank (750-liter tank on a wooden base) • Household connection

How does Water For People build a single-family pump system?

To build a single-family pump system, we follow context-appropriate criteria. We must know the flow rate (gallons or liters per minute), the working pressure required for a given flow rate (operating point), the available voltage, where the pump takes water from, the pump height with respect to the distance from the water suction point, and the source type, among other factors. The infrastructure team visits each interested household to gather field data.

Water source type	Headwaters or surface spring	Artesian well	Conduction line
Based on the source type available, we determine the amount of water that produces flow and whether it is sufficient to provide an adequate supply for an average household of six people.	The source must provide a minimum of 60 liters per inhabitant per day, according to the manual for drinking water system design for rural areas in Guatemala.	The recovery period must be determined by emptying the well and recording the time it takes for it to fill up again. If the well has a water volume of $1m^3$, and its recovery time is 24 hours, the well is considered capable of adequately supplying an average household.	Topographical data such as distance and elevation difference (height between the water source and reservoir) are considered. Generally, distances vary between 20-150m, so using an appropriate pipe diameter should not generate much head loss.

How do we choose the pumping equipment?

This choice is fundamental for ensuring the operation and maintenance of the system. It must adequately cover the needs of the beneficiaries according to their context.

Advice from the infrastructure team	Cost of single-family pumping system	Operational expenses
• Data collection and preparation of a project technical study • A quote scheme for households interested in implementing a pump system • Conduction line design for each household • Preparation of technical specifications with pump equipment characteristics (pump system, manometric height, etc.)	• Local material • Non-local material • Pipes and accessories • Unskilled labor • Skilled labor • Technical assistance • Transportation • Contingencies	Main expense is electricity

Challenges

Challenges related to system infrastructure include:

- Implementation of a disinfection system that works better in chlorination.
- Training more masons in the correct construction of the various single-family system elements.
- Developing a strategy to ensure each system's sustainability.