Water Supply and Distribution System

Embera Puru, Panama

KRV Water Solutions, Inc.

International Senior Design
Summer/Fall 2019
CEE4915/6

1 BACKGROUND

Location: Darien, Panama
Population: 305 people, Central Community Area
Community: Indigenous, emphasis on tradition
Project Stakeholders: Community Members, Footprint Possibilities Panama (FPP) & Global Brigades Panama (GBP)
Our Goal: Provide potable water to meet water demand of 20-year projected population, 74 faucets

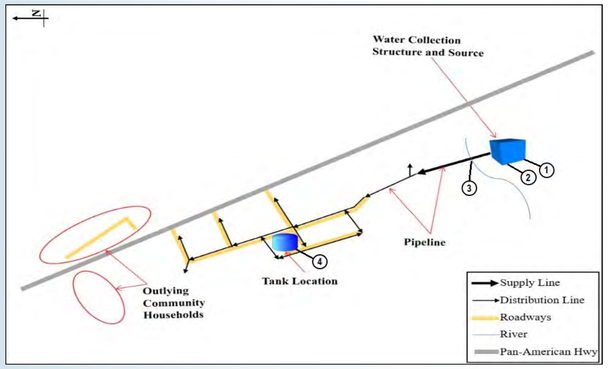
2 PROBLEM DEFINITION

- Extreme Poverty Level
- Population growth
- Increase in water demand
- End of Functioning System: Water Shortages
  - ◊ Wet Season: 1-2 days per week
  - ◊ Dry Season: Lack of water

Two Previously Implemented Water Systems

- Existing System (Built in 1994):
  - ◊ Gravity-fed from the Rio Sabana (~50 km away)
  - ◊ Supplies 13 communities along the Highway
  - ◊ Embera Puru is located at the end of the system
- Abandoned Ultrafiltration System:
  - ◊ Not salvageable: Abandoned for 7 years
  - ◊ Not appropriate technology for the area

3 DESIGN PARAMETERS



Criteria:

- Appropriate Technology
- Mitigate Safety and Environmental Hazards
- Capacity Requirements:
  - ◊ Current Design Population: 305 people
  - ◊ 15.85 gallons (60 liters)/person/day
  - ◊ 4% Population Growth Factor
  - ◊ 20 year projection (670 people)
- Metered Distribution System
- Protective Barriers (i.e. fences, locks, etc.)

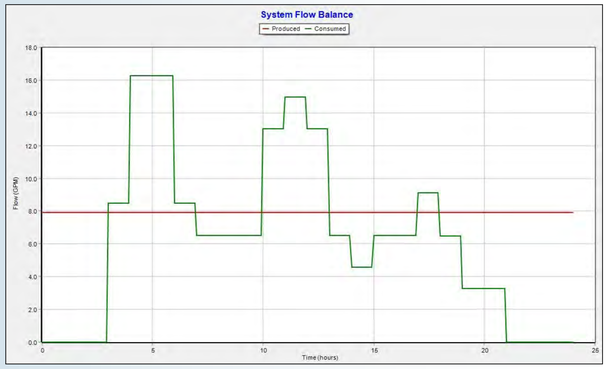
Constraints:

- Viability of Spring Source: Flow Rate
- Electrical Power Supply: Pumps & Controls

Assumptions:

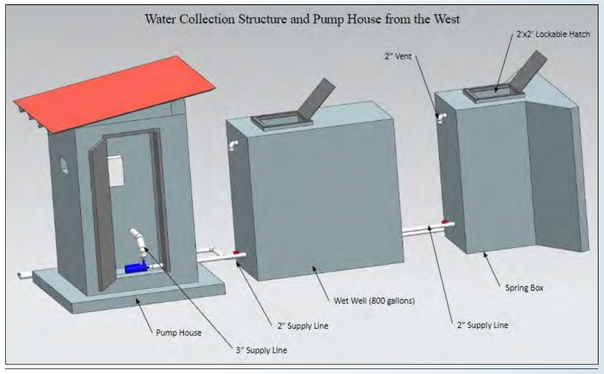
- Spring Source: Enough water to meet criteria
  - ◊ Min. Flow Rate: 7.9 GPM
  - ◊ Min. Water Output: 10,600 gallons per day
- Household Height
  - ◊ 7-ft above ground elevation

4 SYSTEM ANALYSIS



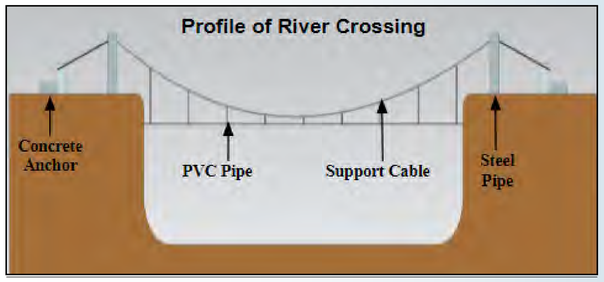
24-HOUR USAGE PATTERN FOR PROJECTED POPULATION

5 FINAL DESIGN COMPONENTS

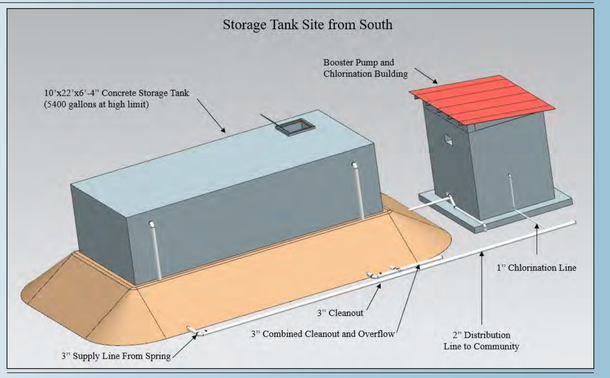


1. WATER COLLECTION STRUCTURE

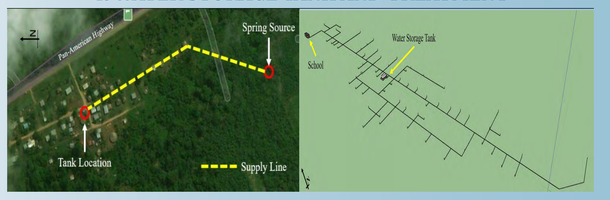
2. PUMPS, PUMP STATION, ELECTRICAL SUPPLY & CONTROLS



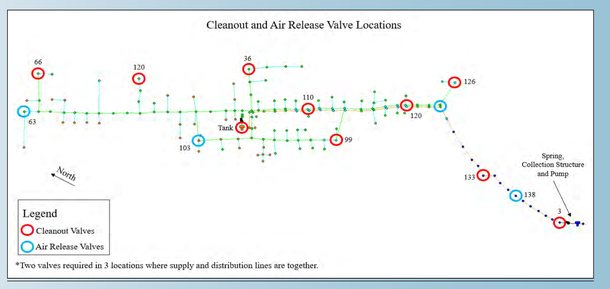
3. RIVER CROSSING CONCEPTUAL DESIGN



4. WATER STORAGE TANK AND TREATMENT

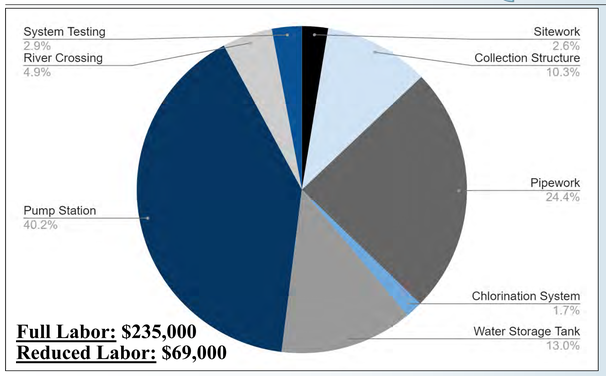


5. SUPPLY & DISTRIBUTION PIPELINE MAPS



6. STRATEGICALLY LOCATED SYSTEM VALVES

6 COST ESTIMATE (U.S. PRICES) AND SCHEDULE



Full Labor: $235,000
Reduced Labor: $69,000

Task Name	Duration of Task
Project Start	0 days
Order Materials	2.25 days
Remove Ultrafiltration	1 day
Pipe Installation	136.5 days
Piping Complete	0 days
Build Water Collection Structure	38 days
Build Water Storage Structure	126 days
Storage Tank Complete	0 days
Install Fencing	8.25 days
Install Pump and Solar Array	2.25 days
Install Chlorination System	1.25 days
Electrical Work	8 days
Pre-Start Tasks	6.75 days
Project Complete	0 days
Project Total Duration	**208 days**

Conclusion: The system is designed to provide a sanitary water supply to the central Embera Puru community for at least the next 20 years. Installation is affordable with community volunteers providing the majority of labor. The design and protective barriers minimize safety and environmental hazards.

M. Victoria Quinde (ME), *Project Manager*
Ross T. Hogan (ME), *Applications Engineer*
Kelsey M. Fournier (CEE), *Technical Writer*

We would like to acknowledge: Our advisors Dr. Watkins and Professor Mike Drewyor; our clients FPP (Ricardo Motanari) and GBP (Julio Granados) for being excellent hosts in Panama and for their collaboration in this project; and Michigan Tech Faculty Dr. Ahlborn, Dr. Bulleit, Dr. Swartz, and Dr. Vitton.

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