Valle Risco Water Distribution System Improvements
Bocas del Toro, Panama

Background

- Sultan Consultants traveled to Valle Risco, Panama in Summer 2019 (Fig. 1)
- Valle Risco has a population of 500 and is inhabited by the Ngabe indigenous people
- The team worked with the established Water Committee and their Peace Corps Volunteer, Tristan Odekirk, on their current water distribution system
- Current water distribution system is sourced by two streams supplied by springs

Figure 1: Map of Panama

Problem

Problem Statement: The community of Valle Risco does not have a safe or reliable water distribution system.

- No water storage tank for times of drought
- No water treatment in place
- Current water pipeline is unburied PVC pipe (Fig. 2)
- Frequent breaks and leaks (Fig. 3)
- Villagers experience times of no water


Figure 2: Existing Pipe


Figure 3: Leak in Existing Pipe

Data Collection and Analysis

- Current water distribution pipeline was surveyed (Fig. 4)
- Water quality was tested at sources and tap
- E. coli was found in water and can cause illness (Fig. 5)

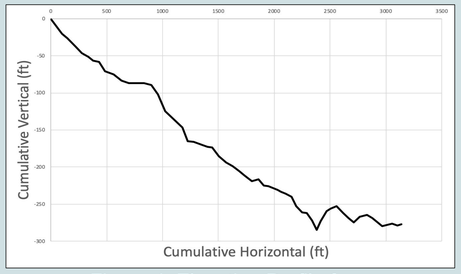

Figure 4: Elevation Profile from Sources to Proposed Tank

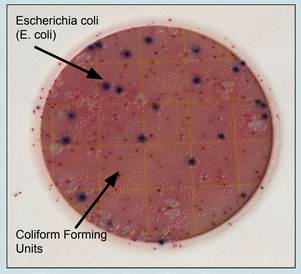

Figure 5: Petrifilm Results from Tap Water

Proposed Design

Hydraulic Model

- EPANET ™
- Inputs
  - Survey Data
  - Water Demand
  - Tank Parameters
- Calculates & Models (Fig.6)
  - Flow Rate
  - Daily Water Usage
  - Pipe Diameters
  - Pressure

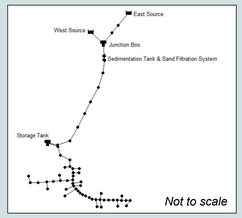

Figure 6: Hydraulic Model

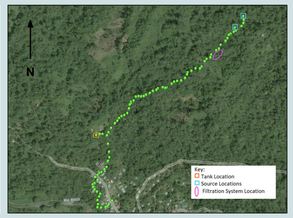

Figure 7: Plan View of Water Trunk Line

Sedimentation Tank

- Removes large suspended particles by gravity settling (Fig. 8)
- Wiers control velocity & distribute water evenly
- Particle settling ramp aids in cleaning
- Floor and roof slabs built of poured concrete and rebar
- Walls built of concrete block and rebar
- All tanks built similarly

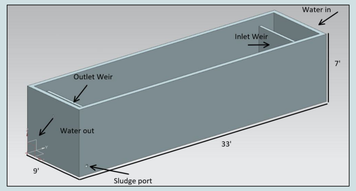

Figure 8: Sedimentation Tank

Slow Sand Filtration Tank

- Removes small, dissolved particles, and some pathogens (Fig. 10)
- Removes particles by physical straining and biological uptake
- Mixture of sand and gravel filter media (Fig. 9)

Layers:
1. Large gravel
2. Medium gravel
3. Small gravel
4. Fine sand
5. Biofilm

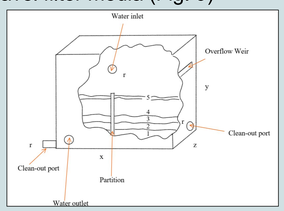

Figure 9: Media Layers

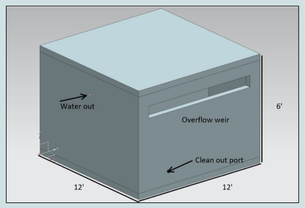

Figure 10: Sand Filtration Tank

Chlorine Disinfection

- Ensures water quality by deactivating pathogens
- Eliminates remaining E. coli and coliforms that pass the filtration tanks
- Chlorine pucks will be placed at the storage tank inlet

Storage Tank

- Volume is built for a 20 year estimated population's single day's use
- Assuming the average person uses 30 gallons/day
- 14,000 gallons


Figure 11: Sample Tank

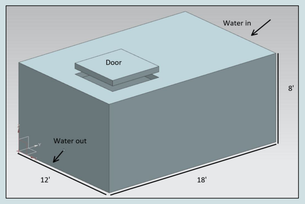

Figure 12: Storage Tank

Stream Pipe Crossings

- 5 stream/pipe crossings throughout system
- Pipe will be suspended by cable and stringers (Fig. 13)
- Anchors will hold the cable in place
- Ensuring pipe stability and rigidity against debris in the streams

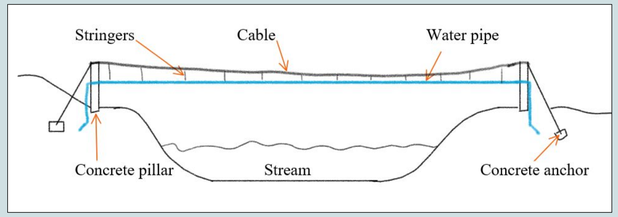

Figure 13: Pipe Crossings

Cost Estimate

- The estimated cost of the system is $10,000
- Assuming donated labor
- All new PVC pipes and concrete blocks for tank account for $7,000 of estimate
- There is currently no funding secured to implement these improvements
- Tristan will search for available grants or other funding

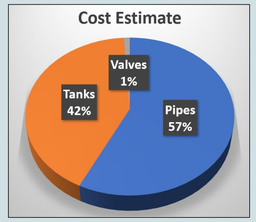

Figure 14: Cost Estimate Pie Chart

Construction Schedule

- Constructed by the residents of Valle Risco with Tristan's guidance
- Estimated duration 3-6 months
- Trenching and pipe laying will take 2-3 months
- Construction of tanks will take 1-2 months

Looking Forward

- Design will be sent to Tristan in Valle Risco, along with an operation and maintenance manual
- Tristan will share design with Water Committee and advocate for construction
- Funds will need to be acquired in order for design to be built

Acknowledgements

Special thanks to Tristan Odekirk, our main client, and our in country advocate for this project. Thank you to the wonderful people of Valle Risco, and the Water Committee, for welcoming us with open arms and being our guides. Thank you to Ian Jarvis, a past Valle Risco Peace Corps Volunteer, for teaching us about water distribution systems in the developing world.

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