

# Engineers Without Borders



Pajuya, Joyabaj, Guatemala  
January 4-18, 2014

# Engineers Without Borders

- EWB-USA supports community-driven development programs worldwide by collaborating with local partners to design and implement sustainable engineering projects, while creating transformative experiences and responsible leaders. Our 13,800 members work with communities to find appropriate solutions for water supply, sanitation, energy, agriculture, civil works, structures and information systems.



# Pajuya, Joyabaj, Guatemala



# Joyabaj, Guatemala

- Terrain – Rugged Highlands
- Population – Mostly Indigenous (Mayan)
  - 73% Below Guatemalan Poverty Line
  - 28% in Extreme Poverty
- Language – Quiche and Spanish
- Main Industry – Farming (Much of it being Subsistence), Immigration into U.S.
- 50% of Children Under the Age of 5 Years Old are Chronically Malnourished

# Pajuya





# Pajuya





# Pajuya





# UW-Madison EWB Travel Team



# Drinking Water System Coordination

- Partner NGO = Agua Para Salud (Water for Health)
  - Provide construction management after trip.
- EWB Guatemala Employee
  - Helped secure material and community coordination.
- Community
  - Provides labor



# Drinking Water Source

- Natural spring at top of mountain.
- Tested using 3M Pretrifilm Coliform Count Plates
- Flowrate:
  - Rainy Season (July) – 0.86 L/s = 13.6 gpm
  - Dry Season (May) – 0.93 L/s = 14.7 gpm
- Volume of Water Available:
  - 74,200 L/day = 19,600 gal/day
- Serves 48 families, approximately 285 residents.  
(1/3 of the Pajuya)
- Design life of project 20 years
- Maximum population served by source:
  - 155 families or 920 people

# Drinking Water System

- Main Goals:
  - Provide clean drinking water
  - Protect source from contamination
  - Capture as much water as possible
- Components Constructed:
  - 2 Source Boxes
  - Storage Tank
  - Pipe Network
  - Stream Crossing

# Source Boxes

- 1m x 1m x 1m box with wing walls used to capture water.
- Directs water into 2 inch pipe that leads to the storage tank.
- Pervious fill behind wing walls allows water to enter box.
- Capped with geosynthetic, clayey soil, and concrete.
- Fenced off to prevent livestock from entering source area.
- Drainage ditch to prevent first flush from draining over source.



# Source Boxes





# Source Boxes





# Source Boxes





# Source Boxes





# Storage Tank

- Size: 10,000 L or 2640 gallons
- Materials: Ferrocement (stucco type material)
- Fills overnight to meet morning demands.

# Storage Tank





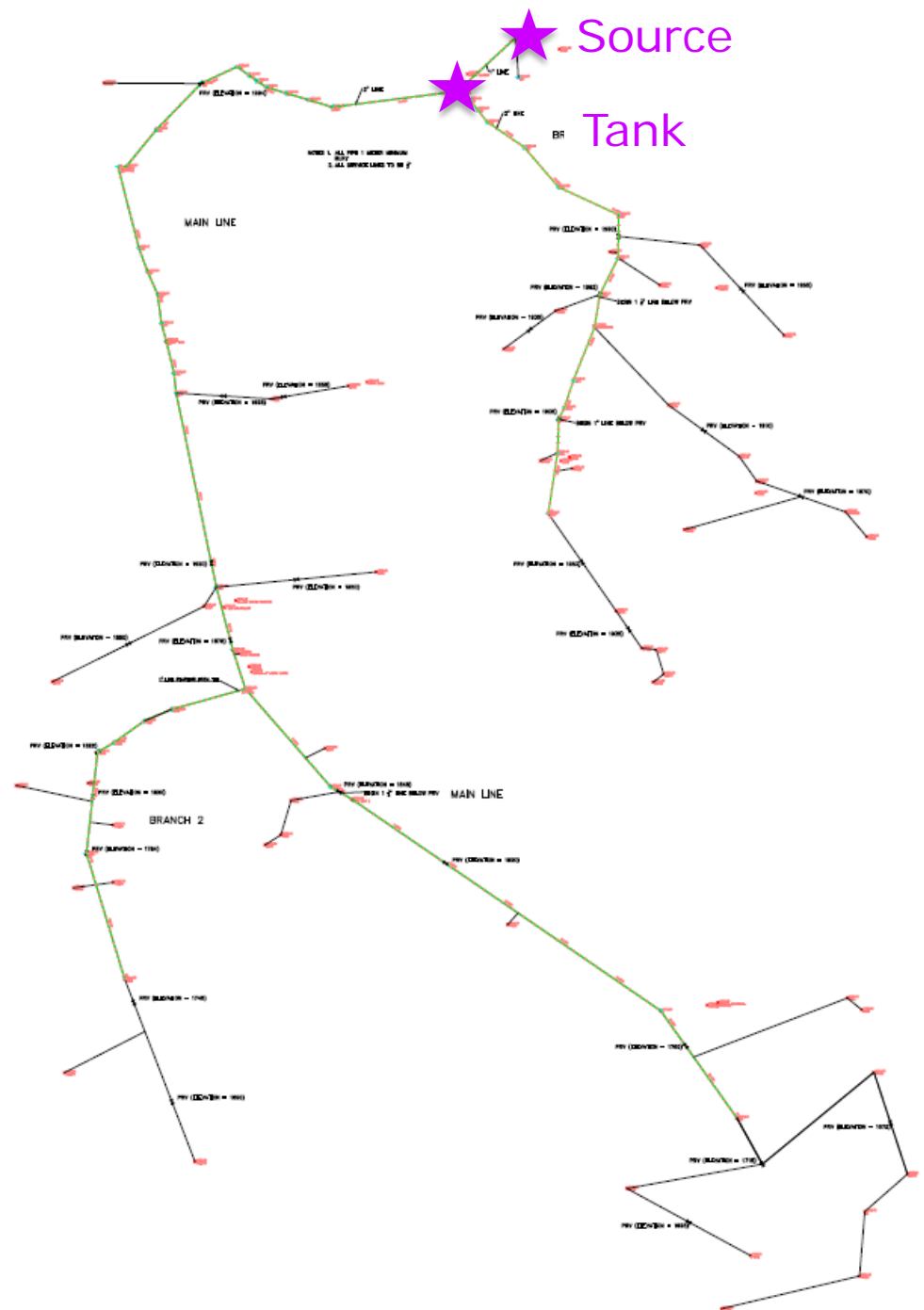
# Storage Tank



# Pipe Network

- Material – Schedule 40 PVC (1/2", 1", 1 1/2", and 2")
- Geometry:
  - 2 main lines: 2500 m (1.6 miles) and 1000 m (0.6 miles)
  - 1 meter deep trench for entire system
  - Approximately 1000 vertical feet from source to final house
- Pressure reducing valves
  - Pressure in line less than 100 psi
  - Pressure at taps between 13 and 40 psi

# Pipe Network





# Pipe Network



# Stream Crossing

- Cable suspension stream crossing.
- 3" galvanized steel carrier pipe.
- 2" PVC interior pipe.



# Stream Crossing





# Constructability





# Constructability





# Constructability



# Water Usage Metering

- 1<sup>st</sup> metered system in Joyabaj
- Instills a sense of value for clean drinking water.
- Reduce wasteful usage of water
  - Do not want flush toilets because no sanitation.
- 80 L/person/day allotment
- Meter read monthly by municipality



# Community





# Community





# Community





# Gracias Fiesta





# Gracias Fiesta





# Gracias Fiesta



# How Can You Get Involved?

- Contact:

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- Join Local Professional Chapter



# Questions?



























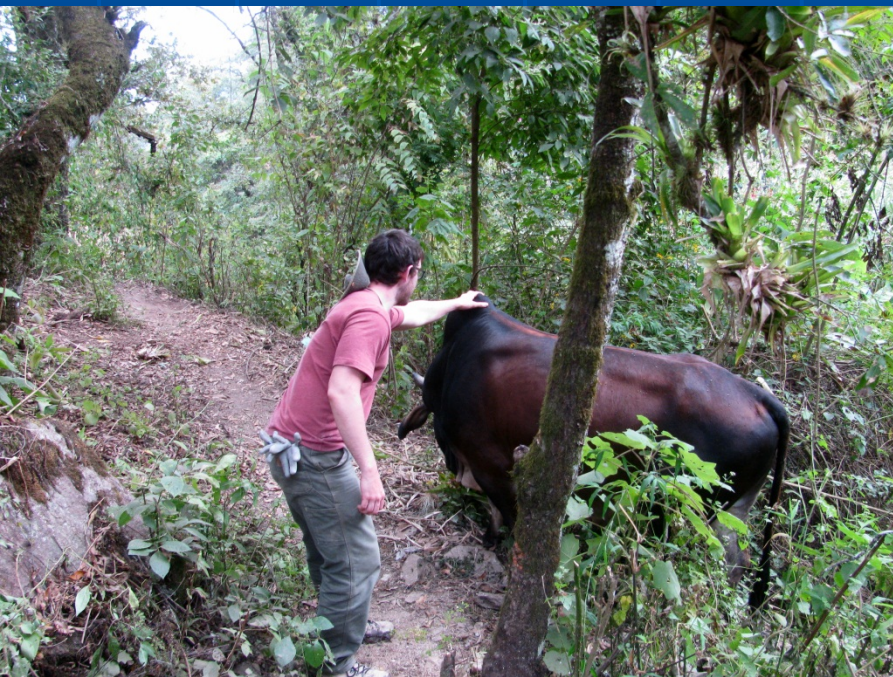














































# Pacaya, March 2, 2014

[www.bbc.com](http://www.bbc.com)

