



Document 522
POST-ASSESSMENT REPORT

CHAPTER: Jacksonville Professionals
COUNTRY: Guatemala
COMMUNITY: Nebaj Municipality
PROJECT: Xevitz Water Distribution
Improvement and Supply Study

PREPARED BY
Crystal Markley and Rich Roberts

August 14th, 2011

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Jacksonville Professionals**Nebaj Municipality, Guatemala****Xevitz Water Distribution Improvement and Supply Study****Post-Assessment Report Part 1 – Administrative Information****1.0 Contact Information**

	<i>Name</i>	<i>Email</i>	<i>Phone</i>	<i>Chapter or Organization Name</i>
<i>Project Lead #1</i>	TBD			<i>Jacksonville Professionals</i>
<i>Project Lead #2</i>	TBD			<i>Jacksonville Professionals</i>
<i>President</i>	Katrina Myers	kmyers@taylorengeering.com	904-731-7040	<i>Jacksonville Professionals</i>
<i>Mentor #1</i>	Richard Roberts	rroberts@earthsys.net	904-704-5894	<i>Jacksonville Professionals</i>
<i>Mentor #2</i>	Ashley Evans	aevans@hdrinc.com	904-598-8941	<i>Jacksonville Professionals</i>
<i>Health and Safety Officer</i>	Leslie Malick	lmalick@taylorengeering.com	561-640-7310	<i>Jacksonville Professionals</i>
<i>Assistant Health and Safety Officer</i>	Crystal Markley	crystal@czo.net	940-463-4573	<i>Jacksonville Professionals</i>
<i>Education Lead</i>	Leslie Malick	lmalick@taylorengeering.com	561-640-7310	<i>Jacksonville Professionals</i>
<i>NGO/Community Contact</i>	Lynn Roberts	lynnrober@gmail.com	7-755-8113	<i>Agua Para La Salud</i>

2.0 Travel History

<i>Dates of Travel</i>	<i>Assessment or Implementation</i>	<i>Description of Trip</i>
<i>September 16 -24, 2009</i>	<i>Assessment</i>	<i>Assessment of 2 healthy schools programs (Xepiun & Xevitz). Gathered survey and site data and met with communities.</i>
<i>April 17 – May 8, 2010</i>	<i>Implementation/Assessment</i>	<i>Construction at Xepiun and Xevitz, performed field-testing and surveys, education. Also, collected assessment data for Visibakvitz.</i>
<i>May 28 – June 26, 2011</i>	<i>Implementation/Assessment</i>	<i>Construction of Visibakvitz Water Distribution Systems. Also assess potential future projects within Nebaj Municipality.</i>

3.0 Travel Team

This assessment was conducted by the travel team members listed below. This team was the final of three teams that traveled in June/July 2011 as part of the Visibakvitz implementation trip.

#	Name	E-mail	Phone	Chapter	Student or Professional
1	Crystal Markley	crystal@czoee.net	940-463-4573	Jax Prof	Professional
2	Ashley Naimaster	anaimaster@taylorengineering.com	410-241-5128	Jax Prof	Professional
3	Rich Roberts	rroberts@earthsys.net	904-704-5894	Jax Prof	Professional

4.0 Health and Safety

4.1 Incident Reports

Did any safety incidents occur during this trip? ___Yes **X** No

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5.0 Budget

The section on budget is being omitted due to the fact that this assessment was not performed as a standalone trip. This assessment was conducted as part of the implementation trip for the Visibakvitz water improvement project and costs and hours were captured as part of the Visibakvitz report.

6.0 Project Discipline(s): Check the specific project discipline(s) addressed in this report. Check all that apply.

Water Supply

- Source Development
- Water Storage
- Water Distribution
- Water Treatment
- Water Pump

Structures

- Bridge
- Building

Agriculture

- Irrigation Pump
- Irrigation Line
- Water Storage
- Soil Improvement
- Fish Farm
- Crop Processing Equipment

Civil Works

- Roads
- Drainage
- Dams

Sanitation

- Latrine
- Gray Water System
- Black Water System

Energy

- Fuel
- Electricity

Information Systems

- Computer Service

7.0 Project Location

Longitude: 15 23.200 N

Latitude: 91 07.155 W

Post Assessment Report Part 2 – Technical Information

1.0 INTRODUCTION

The Engineers Without Borders - Jacksonville Professionals Chapter (EWB-JAX) conducted an assessment for a new project in Xevitz. This assessment was conducted during the implementation trip for the Visibakvitz water distribution project. Xevitz has an existing water distribution system in place, but it is not clear when the system was installed, or who assisted the community with the system. The system is not currently functioning in a way that meets the needs of all the users in the community.

2.0 PROGRAM BACKGROUND

In 2009, EWB-JAX started a Program in the Nebaj Municipality in Guatemala. EWB-JAX intends on serving small villages located in close proximity to each other and located in the Nebaj Municipality for a minimum five-year period.

EWB-JAX has previously worked in the village of Xevitz installing a latrine and black water system which was implemented in May 2010.

In June/July 2011 EWB-JAX implemented a water distribution project in the village of Visibakvitz.

3.0 TRIP DESCRIPTION

The team conducted this assessment trip at the end of the Visibakvitz implementation trip. The team traveled to Xevitz with Jackie and Diego from APS, and met with members of the village water board. The team visited the lower spring and a potential site for an additional water tank. Then the team split into two groups. One group visited the upper spring and existing storage tank, and performed GPS survey of the piping system above the lower spring. The second group visited the second proposed new tank site and performed GPS survey of the lower portion of the piping system. After the site visit, the team shared the findings with Lynn Roberts and also discussed potential outcomes and community needs based on Lynn's knowledge of similar systems and his relationship with the village of Xevitz. Daily Field Logs were completed during the trip and are provided in Appendix A.

Xevitz currently has two springs and one 20,000L storage tank. The upper spring feeds the storage tank while the lower spring feeds directly in the distribution line. The entire gravity fed system supplies 115 faucets at 80 homes for a total of 560 people. The issue the community has

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been dealing with is that there is not enough water to supply the needs of the community during the afternoons and evenings. There is plenty of water for needs during the morning hours, but some villagers towards the end of the line are not getting enough water during the later portion of the day. It has been proposed that a second, 10,000L, storage tank be constructed down-gradient of the 20,000L tank. There are two possible locations for the new tank, each requiring different modifications to the system. Either site would place the new 10,000L tank below the lower spring such that the tank would be fed by both springs. The new tank would service the downstream homes and would be equipped with a float valve such that the existing tank would fill up after the new tank becomes full. In addition to providing addition storage capacity for the system, a water use study would be conducted to identify where other system adjustments need to be made.

4.0 COMMUNITY INFORMATION

4.1 Description of Community

The Municipality of Nebaj is located in West Central Guatemala. Guatemala faces many of the social problems seen in the developing world and is among the 10 poorest countries in Latin America. The country is filled with rugged terrain and struggles with many natural disasters such as earthquakes, volcano eruptions, and hurricanes. Guatemala has two distinct seasons, the rainy and the dry season. During the dry season many people do not have the facilities to store and even treat their water. Their low-income and lack of education prevent the proper construction of such facilities.

In the village of Xevitz outside Nebaj, Guatemala, access to running water is available by means of a gravity fed distribution system fed by two local springs. The source springs are shared with other communities and private entities. Since the distribution of homes within the village is draped along a steep mountainside, water pressure and availability throughout the system can be sporadic. The high usage period of the day is mid morning, when the children are off the school and the men are away from the home, this is the time most of the washing and cleaning is done. With such a high demand early in the day, the current storage in the system does not have a chance to recover to meet the demands of the community for the remainder of the day.

The homes are cinder block or wood walls, corrugated tin roofs, dirt or concrete floors, with no heat except for the wood-fueled cooking stove. Homes & out-buildings are situated around a central patio (packed earth), bordered by the main dwelling, perhaps an out-building, planting or livestock shelters, and crude sauna (temascal) for bathing. Open stoves fill the entire dwelling with smoke which contributes to respiratory illnesses ranking high on the mortality / morbidity ratings for these villagers.

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Lying about 7,000-8,000 feet above sea level, days are typically bright, in the lower 80's °F, while nights cool to the mid 40's. It is located north of the Pan American Highway off Highway 3 and contains roughly 80 homes

4.2 Community and Partnering Organization/NGO Resources and Constraints

EWB-USA Jacksonville Professionals will continue to work with Lynn Roberts of APS for this project. APS has been working in the Nebaj regions for many years and has good relationships with the villages in the area. APS staff make regular visits to the surrounding villages, including Xevitz, and have a good understanding of the community function and regularly discuss the communities needs.

4.3 Community Relations

The villagers speak Myan and some males speak Spanish. For communicating, EWB members spoke English to Jackie who then spoke Spanish to Diego who then translated into Myan for the villagers. During the assessment, the villagers and members of the water board provided information regarding the existing water distribution system, and the potential locations they have already identified for additional storage tank placement.

4.4 Community Priorities

The community's top priority at this time is to ensure that the entire village has adequate access to the water supply. They have spent a great deal of time determining potential sites for additional water storage tanks. This preparation and planning by the community illustrates their commitment to resolving the water supply issue.

5.0 DATA COLLECTION AND ANALYSIS

5.1 Summary of Data

Water Quality data was taken at each of the two spring locations that provide water for the existing system. The spring box at the lower spring could not be accessed, so no flow rate data was taken at this location. The keys that the Water Board member had with him did not include the key for the lock on the spring box at this location. Flow rate was measured from the upper spring location by using a measured water pitcher and timing the amount of time to fill the pitcher. The average of three measurements was recorded.

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Parameter	Lower Spring	Upper Spring
Flow rate	Not taken	1.1 L/S
pH	7.5	6.5
Alkalinity	240	240
Chlorine	0	0
Hardness	200	120
Iron	0	0.1
Copper	0	0
Nitrate	0	0
Nitrite	0	0
Bacteria	Few colonies	Few colonies

Soil strength measurements were taken at two potential locations for additional water storage tanks that were identified by the community. The measurements were made using a pocket penetrometer.

	Site 1 (upper location near existing lower spring)	Site 2 (corn field located down gradient of the existing lower spring location)
Test 1	0.5 tsf	1.0 tsf
Test 2	0.7 tsf	1.0 tsf
Test 3	0.7 tsf	0.75 tsf
Test 4	0.7 tsf	n/a

5.2 Mapping

Preliminary GPS survey of the existing water distribution system was performed during this assessment trip. Pipe sizes were provided by the members of the Water Board, and were not verified by the project team. Data is included in Appendix B. This preliminary data can be used to begin planning the study. A detailed survey will be required to continue with the design process. APS will perform a detailed survey of all components of the existing system, and the potential locations for new system components such as storage tanks.

6.0 MONITORING

Xevitz School Sanitation Improvements Project

The travel team traveled to Xevitz and inspected the project implemented the prior year. The septic tank was operating as designed. A few of the flushing toilets were not operating at 100%.

<i>Project Discipline</i>	<i>Date of Completion (month/day/year)</i>	<i>Functionality (enter one range per project)</i>			<i>Enhancement (yes or no)</i>	<i>Duplication (yes or no)</i>
		<i>0-50%</i>	<i>50-75%</i>	<i>75-100%</i>		
Latrine	May 8, 2010	75%			No	No
Black Water System	May 8, 2010	100%			No	No

7.0 COMMUNITY AGREEMENT/CONTRACT

EWB-JAX has been working with APS for over two years now and understands the importance of having agreement between all parties before embarking on new projects. EWB-JAX has an agreement in place with APS. EWB-JAX provides the design and funding for projects, and APS provides the in country coordination with the community and hires the masons that will build the critical portions of the project. Agreements that EWB-JAX and APS have had with other communities in the Nebaj region include the understanding that the community will provide labor and participate in the installation of the system, and that they will agree to maintain the new system. These types of agreements have been successful on previous projects.

8.0 PHOTO DOCUMENTATION

Photos from the assessment trip can be found in the Daily Site Logs in Appendix A

9.0 PROJECT FEASIBILITY

The water distribution and study is a feasible project for the EWB-JAX Chapter, particularly with a two step approach. Providing an additional water storage tank will allow greater flexibility for providing adequate water to all members of the community during peak flow demand. Additional storage in the system will allow the system as a whole to meet the demands

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of the entire village during both high and low demand periods of the day (afternoons and evenings). The ability to study the existing system and examine usage patterns and outcomes will provide relevant information to determine what additional needs of the system and the community are at this time.

10.0 LESSONS LEARNED

Working on solutions to an existing system can sometimes be more complex than installing a brand new system. The community has their own understanding and opinions about what they feel needs to happen to address their concerns. In addition to listening to the community express their thoughts and concerns regarding their needs, make sure to also take an unbiased scientific approach to the issue, and collect a complete set of data to have a more complete understanding of the issues.

11.0 PROJECT STATUS

EWB-JAX is ready to begin design on this project. The preliminary data is in already in hand, and plans to receive additional data needed are already in place. The project teams will be assigned in the next 2-3 weeks. Once the project team is formed, they will first review the data gathered to date and determine what the additional data needs are and work with Lynn Roberts and the APS staff to obtain the needed data items.

12.0 MENTOR ASSESSMENT

12.1 Professional Mentor/Technical Lead Name (who wrote the assessment)

Rich Roberts

12.2 Professional Mentor/Technical Lead Affirmation

I, Rich Roberts, acknowledge my involvement as Technical Lead as accept responsibility for the course the project is taking.

APPENDIX A

Field Notes/Photo Log



DAILY SITE LOGS

Project Name: Future Project Scouting: Xevitz
Project Location: Nebaj, Guatemala

Date: 6/21/2011

NGO: Agua Para la Salud
NGO Associates: Lynn Roberts and Jackie Powell
EWB Associates: Rich Roberts, Crystal Markley

Temp: °F Max
 °F Min

Weather: partly cloudy,
then rain

NGO Staff	Title	Task
<u>Lynn</u>	<u>Director</u>	<u>Assign Tasks</u>
<u>Jackie</u>	<u>APS Staff</u>	<u>Participate with as built survey</u>
<u>Diego</u>	<u>Field Manager</u>	<u>Facilitate discussion with community leaders</u>
<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>
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Work Performed and Notes:

Visited sites for potential new projects

School in Nebaj

- Rich and Crystal Joined Lynn to visit a nearby school in Nebaj with a recently installed rainwater cathment system. The rain is collected from the metal roof by a PVC pipe that is slit longways and attached to the edge of the roof. The water runs down the PVC pipe into a storage tank located in a pump house. The pump moves the rainwater from the storage tank to an existing handwashing station and latrines on the school property.*

Status of potential projects

- Two potential projects are not available. Guatemala National Hospital Nebaj- rights to the spring have not been acquired. Sumo a Grande Clinic and School Sanitation- another group has already committed to this project*

Xevitz water system

- Water Board at Xevitz is requesting a new water storage tank for their existing system to ensure all residents can have adequate supply. Rich, Crystal, Diego and Jackie performed a GPS survey of the mainline of the existing conduction line and took water samples at each of the two existing springs. The GPS survey was performed in two parts.*

2. *The community consists of 115 faucets at 80 houses. There is an average of 7 persons per house, or 560 people served by the system. Water data was taken at the upper and lower existing spring.*
3. *Upper existing spring feeds into a 20,000L storage tank. Flowrate at this spring was measured at 1.1 L/s (65.8 Lpm) pH= 6.5, Alkalinity = 240, Chlorine = 0, Hardness = 120, Iron = 0.1, Copper = 0, Nitrate = 0, Nitrite = 0, Coliform = , Bacteria = few colonies.*
4. *Lower existing spring feeds directly into the distribution line. Flowrate at this spring could not be measured, due to lack of access to the box. pH= 7.5, Alkalinity = 240, Chlorine = 0, Hardness = 200, Iron = 0, Copper = 0, Nitrate = 0, Nitrite = 0 , Bacteria = few colonies. The 2 in outflow pipe is full with water flowing into the overflow pipe through two 0.5 inch diameter holes drilled into the pipe about 60 cm up from the base of the box. The box is about 1.8 m by 2 m and about 0.8 m deep. The spring box is filled with rock then a small window allows the water to spill from the spring box into the distribution box where the outflow pipe is located.*

5

First potential location for new storage tank is just off the road, at the edge of a corn field. This is a sloped area, slope stability will need to be considered. Soil strength was measured at this location using a pocket penetrometer. Four tests were taken, 0.5, 0.7, 0.7 and 0.7 tsf

6 *Second potential location of new storage tank is in a corn field owned by Don Pedro, who has indicated he will donate the land to the community for this purpose. Soil strength was measured at this location using a pocket penetrometer. Three tests were taken, 1.0, 1.0 and 0.75 tsf. Estimated need for 10m of tubing to get from the existing distribution line to the tank at this location.*

7 *After returning from the site visit, discussed this potential project with Lynn. It is not clear if water quantity (storage) is really the issue. Some of the faucets are broken and leaking. Water may appear to "run out" in the morning due to many users turning on the faucets at nearly the same time for morning laundry/cleaning. Lynn suggested that perhaps a study of the system would be prudent, to determine what is actually happening. Leaky faucets should be repaired and meters installed at each home. By monitoring the data over time, this information would be beneficial in determining what the system actually needs, and potentially, the existing infrastructure may be adequate, with some adjustments to the maintenance program and education of the villagers. Other discussion included capping off the piping below the 12 houses that are serviced by the existing tank and constructing a new 10,000L tank below the lower spring (this new tank would be fed by both springs). The new tank would service the remaining downstream homes, and would be equipped with a float valve such that the old tank would fill up after the new tank becomes full.*

8 *Potential project at Xevitz, in addition to studying water usage of the entire system: Construct new 10,000L storage tank, cap off existing line from existing tank to new tank, may need to modify or replace the piping below the new tank to service the remaining houses.*



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PHOTO LOGS

Project Name: Future Project Scouting: Xevitz
Project Location: Nebaj, Guatemala

Date: 6/21/2011



Pablo and Diego measuring flow in the upper spring



View inside the spring box, upper spring



Measuring water quality at the lower spring. Open box with piping on the right is a private spring box system.



Existing 20,000L tank



Overflow in distribution box at lower spring box location



Soil testing at first potential tank location near side of road. Note land slopes away from the road.



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PHOTO LOGS

Project Name: Future Project Scouting: Xevitz
Project Location: Nebaj, Guatemala

Date: 6/21/2011



Taking GPS location of the road crossing where the pipe from the existing lower spring location joins the main distribution line (right just off the road)



Looking towards the road crossing from just downstream of the lower spring location



Drainage way/pathway in the lower part of the village (looking downstream), waterline runs to the right of this area



Pressure break box in the lower portion of the water distribution system.



Looking towards the road from the lower portion of the water distribution system



Soil strength testing at the second potential storage tank location, on a villagers corn field property

APPENDIX B

GPS Survey Data and Sketches



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DAILY SITE LOGS

Project Name: Future Project Scouting: Xevitz
Project Location: Nebaj, Guatemala

Date: 6/21/2011

NGO: Agua Para la Salud
NGO Associates: Lynn Roberts and Jackie Powell
EWB Associates: Rich Roberts, Crystal Markley

Temp: °F Max
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Weather: partly cloudy,
then rain

NGO Staff	Title	Task
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Work Performed and Notes:

*Performed GPS survey of existing water distribution system and visited two potential locations for an additional storage tank.
See GPS survey data and sketches*



June 21, 2011 Xevitz water system GPS study

POINT ELEVATION NORTHING WESTING DESCRIPTION

1	7443	15 22.987	91 06.665	Potential tank site 1, across road from spring. This is where the pipe from the lower spring box joins the distribution line from the upper spring box
2	7451	15 22.987	91 06.656	Middle of road crossing
3	7511	15 22.960	91 06.610	Lower spring box
4	7501	15 23.053	91 06.693	Location where 1.5in line changes to 0.25in line off road from bus stop
5	7429	15 23.172	91 06.777	Location where 1.25in line changes to 2in line going towards pressure break box
6	7240	15 23.151	91 06.780	Pressure box (2in line continues from here to the school)
7	7246	15 23.140	91 06.782	Retake of point 05
8	7239	15 23.174	91 06.868	At Xevitz school, this point is located ~20ft from where the 2in line changes to 1.5in line
9	7196	15 23.222	91 07.015	Location of two pressure boxes (in series). The 1.5in line becomes 1.25in at this location.
10	7177	15 23.200	91 07.155	Location where 1.25in line changes to 1in line.
11	6974	15 23.209	91 07.152	Location where two 1.25in pipes come together into a 0.75in pipe. There are ~11 more houses downstream from here.
12	6967	15 23.297	91 07.358	End of the 0.75in line. Last two houses are off this location
80	7607	15 23.033	91 06.455	Upper spring location
81	7604	15 23.026	91 06.489	Along piping
82	7617	15 23.019	91 06.516	
83	7604	15 22.978	91 06.517	
84	7608	15 22.956	91 06.530	
85	7586	15 22.917	91 06.557	At fenceline
86	7570	15 22.880	91 06.590	
87	7578	15 22.846	91 06.594	At culvert on roadway
88	7564	15 22.822	91 06.624	At existing tank
89	7536	15 22.844	91 06.657	
90	7521	15 22.922	91 06.627	
91	7475	15 22.987	91 06.667	Road crossing at beginning, beside proposed tank location



June 21, 2011 Xevitz water system GPS study

