Document 901B
PROGRAM IMPACT MONITORING REPORT

CHAPTER: Worcester Polytechnic Institute
COUNTRY: Guatemala
COMMUNITY: Guachtuq

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ENGINEERS WITHOUT BORDERS-USA
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1.0 INTRODUCTION

1.1 Contact Information and Reporting History

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Program Title	Guachtuq Water Supply
Community	Guachtuq
Country	Guatemala
Date of 502 Approval	2010
# of Months Since Last Site Visit	5
Date of Baseline Study Report (901)	July 20, 2014
Date of This Program Impact Monitoring Report (901B)	May 25, 2015

1.2 Program Summary

The Engineers Without Borders chapter at Worcester Polytechnic Institute aims to provide the community of Guachtuq, Guatemala with a sustainable, year round water security: adequate quantity, quality, and access to water to meet drinking and cooking needs. Guachtuq is located in the Alta Verapaz region of Guatemala and is home to approximately 200 people in 34 families. Of the many problems they face daily, the absence of clean drinking water is the greatest concern. In the Guachtuq Water Supply project. EWB-USA WPI focuses directly on the water problem, and works with the community to learn more about environmental and social issues that affect their health and water security.

Currently, EWB-USA WPI maintains excellent contact with El Centro Communitario Educativo Pokomchi (CeCEP) an NGO that works to preserve and educate the Pokomchi community in the region and improve the quality of life for those in need. Sucely Ical Lem (Sucy) and CeCEP volunteers help coordinate travel and homestay logistics, translators, and monitoring. Alvaro Cal Lopez, one of the volunteers, is employed by EWB-USA WPI to visit families in Guachtuq on a monthly basis and collect monitoring data, even when the club is not

in country. Through CeCEP, EWB-USA WPI has also made connections with the San Cristobal Municipality, who has supported the project with transportation of materials to Guachtuq and thinks highly of the work the team is doing.

Current PMEL Lead Evelyn Grainger underwent PMEL training online through a webinar on June 3, 2015. She is majoring in Civil Engineering and International Studies. Evelyn also worked closely this trip with Faculty Advisor Laureen Elgert, Ph. D., to learn about social science research and evaluation methods, indicators, and interviewing practices. Grainger and Elgert spearheaded community interviews in May, 2015, gathering information to identify indicators of project success.

Past PMEL Lead and current Chapter President Katie Picchione underwent PMEL training at the Northeast Regional Conference in November 2013. Picchione is a rising senior, double majoring in Mechanical Engineering and Society, Technology, and Policy. She has been on three past EWB-USA WPI trips to Guachtuq and was heavily involved in interviews. She has further experience evaluating program impacts through her course work and an academic project she did in Costa Rica. She worked closely with Grainger and Elgert, contributing past knowledge to this program evaluation.

2.0 PROGRAM IMPACT MONITORING

2.1 Update on Current Community Context

- Many men in the community are employed as woodcutters, farmers, and security guards. Many jobs require men to work five hours away in Guatemala City, often for a week or two at a time.
- Community elections in the past year, and the President of the COCODE is now Emilio Chen Gualim, House 25. The Vice President is Elidia Yuja, House 26. It is interesting that a woman is now in leadership of the town government, since this was not the case in the past.
- Cristobal Cojoc, House 8, President of the Water Committee, is not an active resource for families seeking help with their systems. He did not participate in the implementation. Roberto Chocoj, House 26, Vice President of the Water Committee, is instead the go-to man when community members have questions or problems about rainwater harvesting systems. He was an active and helpful community member during the trip with the implementation.
- There are no other projects currently going on in the community. However, the team has been approached a number of times by individuals of other communities, asking if similar projects could take place in their communities.

2.2 Update on Community-Identified Problems to Address

- There was no mention of political or social tensions at the finca. As a direct result of the past systems built in Guachtuq through this project, fewer families are depending on water from the finca. This is particularly noticeable during the dry season when it provides insufficient water for the entire community.
- No new water sources have become available to the community.
- No community-wide changes have taken place to improve indoor air pollution from open cooking fires, though some families have obtained "estufas mejoradas," literally *better stoves.*

2.3 Update on Change Areas

Change Area	**Update on Changes from Baseline Study or Last Program Impact Monitoring Report** (please read report guidelines on how to complete this section)
Change in public health	*Interviews have reported very few changes in public health. This year, the flu spread among the community but was reported to be unrelated to water since other surrounding communities were impacted as well. There has not been a significant change in health due to the implementation. Water quality tests show that the tank systems EWB-USA WPI implements have less harmful bacteria.*
	N/A
	N/A
	Community members boil water from both the finca and from the tanks. Boiling water kills E. coli and other pathogens. Sickness reported by families was followed by reporting that they failed to boil water. Multiple people in separate interviews told the team that illness was just as likely to be caused by water from the finca as from the tanks, but whether they boiled it or not made a difference. Although they did not notice a difference in health, many people said they trust the water from the tanks more than the water from the finca because the water comes directly

	from the sky and they are able to individually care for and control the cleanliness of their systems. Some families complained about pollution at the finca, which is not a problem for tank water.
Change in environmental health	*There have been no changes in environmental health.*
	N/A
	N/A
	There is no change to environmental health because these systems are designed to have minimal impact on the surrounding environment
Change in behavior	*Community members have become concerned about the cleanliness of their filters. They want to be able to purchase new filters when they break and are too filthy to clean anymore.*
	The importance of this change is that community members are indicating that they understand the importance of cleaning the system to maintain safe drinking water. They understand the function of the filter and how by having a dirty or torn filter the water is not being purified. This shows that community members are willing to have a financial commitment to the maintenance of their systems.
	The education booklet and training stressed to families that it is important to clean the filters with chlorine. Families remembered the training and wanted to be able to maintain the cleanliness of the system but the filters were becoming stained from age. Some filters are four years old and have still not been replaced, though the families clean them regularly and take care to wash them gently.
	n/a
Change in access to services (water)	*Families that have received EWB-USA WPI systems have greater access to water that is located close to their home. Families with systems no longer have to walk long distances to get water from the finca located at the bottom of the community. For some families this will reduce an hour long round trip to get a single container of water.*
	Not having to walk to the finca saves time for women and children, who are primarily responsible for obtaining water for the family (often, the men are away working). Extra time has allowed women to find small jobs that earn their family additional income. Women also have more time to spend raising their children and caring for the home. Women who used to pay for someone else to collect water for them now

	save money as well. Children who do not have to walk to the finca have more time to attend school and study. Not having to walk to the finca multiple times per day gives children the opportunity to pursue other activities during the day.
	The EWB-USA WPI systems have contributed to increased access to water services, bringing water closer to community members.
	n/a
Changes in technical knowledge related to projects	*There were approximately 30 men who were able to help with the construction of the systems. Knowledge transfer occurred throughout the entire construction process, as men who had previously worked on systems helped and taught the May 2015 beneficiaries how to build them. The EWB-USA WPI team held system construction learning sessions, where experienced men demonstrated how to build systems. Although the EWB-USA WPI team led the construction sessions and teams, experienced community members helped communicate and teach the new recipients how to assemble the systems.*
	This change signifies that men who have systems and have previously built system understand how the system is put together. This is significant because if the men can construct the systems, they can maintain and repair them. Now, a significant number of community members have worked on systems. Community members can now consult their neighbors for advice on system maintenance and repair. Without the knowledge and communication skills of the men who had previously built systems, it would have been impossible to construct all of the systems.
	Men who had already completed construction on systems, especially men who had systems for multiple years were instrumental in contributing to the transfer of technical knowledge of the project from the EWB-USA WPI team to the new men. There was retained knowledge transfer and involvement of community members during previous implementations, enabling the community members to teach others.
	n/a
Change in community organization	*There were not significant changes to the community organization. The COCODE maintained the same elected structure as the previous January trip. There was also no*

	change in Water Committee leadership, though Cristobal Cojoc, the President of the Water Committee, continues to be uninvolved.
	N/A
	N/A
	There was not a significant amount of time between the two trips so a change was not expected.
Change in community self-advocacy	*Many families employed younger community members or relatives from other communities as a representative to provide labor during implementation.*
	This change in community representation means that knowledge about system design and function was, in some cases, directly instilled in the younger generations. In some cases, however, no family members were directly involved in implementation. While a relative or friend of theirs knows how the system is build, for some families, there are no people living in the home who participated in construction.
	The change occurred because a number of the community men were unable to take time off from work to assist with the construction. Therefore, they asked or hired sons, friends, or relatives to provide labor instead.
	n/a

1.3 Previously Identified Barriers to Program Success

1.) **Materials Transport:** The materials transport was a larger barrier than expected. One large delivery was delayed for multiple days, putting the construction behind schedule. As a result, there was less time at the end of the project to carefully inspect each completed system. Some materials were never delivered, requiring the team to purchase additional parts and tools at stores in the area.

2.) **Community Involvement:** The EWB-USA WPI team and community members collaborated well throughout construction. Unfortunately, some family representatives stopped coming to work every day, causing discontent amount representatives who were always present. The EWB-USA WPI team had no way to enforce the requirement that men work every day and encouraged community members to settle disputes without the team's intervention. Regardless, each team had enough manpower to continue work as planned.

1.4 Previously Identified Facilitators of Program Success

1.) **CeCEP:** CeCEP continues to be an invaluable partner. Throughout the May 2015 Implementation Trip, CeCEP provided well qualified, hard working translators who facilitated communications between the team and community members and also helped with construction. Sucy Ical Lem, the director of CeCEP, helped the team communicate with material suppliers when there were delays or misunderstandings and arranged materials transport with the local municipality. CeCEP also organized logistics for transportation and lodging for the EWB-USA WPI travelers. Furthermore, CeCEP continues to monitor the project while the team is not in-country. Alvaro, a volunteer at CeCEP has maintained a positive presence in the community, visiting the families several times each month and inspecting systems. Alvaro also facilitated pre-trip materials purchases and placed rders before the team arrived in country. Finally, he regularly drove team members to and from Guachtuq and Coban, where most of the materials suppliers were located.

2.) **Community:** Community members were extremely involved during construction. Without the dedicated help of community members the completion of the implementation would not have been possible. As a pleasant surprise, some past beneficiaries who had already fulfilled the requirement to help with neighboring systems generously volunteered their time almost every day. The community members showed that they were knowledgeable about the construction of the systems, often continuing to work in the evening after the EWB-USA WPI team had left the community.

3.) **Cooperation of Municipality and Don Julio:** The Municipality of San Cristobal continued to support to the project, volunteering trucks to transport water (needed to construct the concrete bases) and materials. In contrast to past trips, no trucks needed to pass through the *Finca la Primavera* farm (the property from which the water that fills the finca basin originates), since the Municipality completed constructing the road that goes to Guachtuq. Don Julio, the manager of the *Finca la Primavera*, was neither a facilitator nor barrier to project success.

1.5 Potential Barriers to Program Success

1.) **Community access to replacement parts:** As of right now, the EWB-USA WPI team has not officially given the community members information on where to purchase replacement parts for the system.

Many materials are available in local hardware stores, but pieces like the Rotoplas filters and “Italy valves” (1-1/2in steel ball valves) can be difficult to find. If community members don't have access to replacement parts—or the financial

2.) **Individual responsibility and knowledge to maintain and repair systems:** Families need to be willing and able to take responsibility for their systems if the project is to be sustainable. This includes regularly cleaning the gutters, tanks, and filter, replacing mosquito netting regularly, repairing broken components. The EWB-USA WPI team has spent time teaching members of each family how to maintain the systems. If this information was misunderstood or is not heeded, the sustainability of the project is at risk.
3.) **Design flaws:** A number of families expressed concerns about technical aspects of the systems. One recurring concern for systems with multiple tanks is that, in order to clean the tanks, they must be completely disconnected and the water must be discarded. Multiple families have requested a design modification that would allow them to clean one tank at a time. This way they can store water in one tank while cleaning the other, thereby preserving water.

    A second issues that has arisen multiple times is that the first flushes often “fall down” when they are full. Some connections are intentionally left un-glued to allow the family to clean inside the first flush. However, a number of families have reported that, when full of water, the first flush spontaneously disconnects at these unglued joints.

    It was also found that many of the filters on the systems were dirty, stained, and/or torn. A concern arose that water that stagnates in the filters may cause additional health hazards.

1.6 Potential Facilitators of Program Success

1.) **Proper individual maintenance of systems:** If community members care for their systems, clean them regularly and properly, replace mosquito netting and broken parts, and keep the systems “closed” with covers on the tanks, the EWB-USA WPI systems may continue to serve the families and provide them with a higher quality of water for years. The quality of water in the tank is dependent on the level of care the families have for the systems.

2.) **Transfer of knowledge about maintenance and repair:** Some community members have become local experts in rainwater harvesting system design, maintenance, and repair. An example is Roberto Chocoj (House 26), who has helped other community members solve problems with their systems. As more people become

knowledgeable about the systems, they will be able to provide technical support to their neighbors for long-term sustainability. The team also needs to expand that knowledge of how to fix leaking pipes, broken mosquito netting, and other common problems with the systems so people can maintain their own systems and do not have to depend on the few knowledgeable community members.

3.) **CeCEP:** CeCEP enables the team to maintain a year round presence in the community and to continue monitoring system function. They also arrange logistics for EWB-USA WPI, including homestays, in-country ground transportation, a workspace, and translators.

Analysis of Current Results

Analysis Question	Current Results
To what extent is the program achieving and influencing the planned changes or stated community goals?	Results indicate that the program is achieving the community goal, improving water security for families in the community. Access is improved for all families by providing them with on-site water. Water storage capacity has increased for many families. For others, systems have been reconfigured to make the best use of existing tanks. Several past beneficiaries have reported that they only go to the finca to wash clothes during the dry season, that they never need to drink water from the finca anymore. Many community members have a new perspective on water and their systems. They now see the value in fully-functioning systems, not just as "tanks," and know that caring for the roof, piping, mosquito netting, and gutters is as important as caring for the tanks. Through interviews, many families have reciprocally told US the importance of maintaining a clean, closed system. As of the May 2015 Implementation Trip, all families that are part of the program have received systems.
Where is the program failing to influence the planned changes or stated community goals, and why?	Although the project has provided adequate storage capacity for all families, EWB-USA WPI does not have significant data to show

	improvement in water quality. Some water quality tests indicate that the water in *some* EWB-USA WPI systems has fewer contaminants than other water sources. However, a trend in improved water quality has yet to be seen across the community.
Are there any negative and or unexpected changes that have resulted from the program implementation? If so, what are they and why did they happen?	EWB-USA WPI has identified two potentially-negative impacts of the Guachtuq Rainwater Harvesting Project. The first is *dependence*, a phenomenon sometimes associated with "voluntourism." Over the past two trips, the travel teams have noticed an increased sense of *dependence* in the way the community relies on the EWB-USA WPI team. During the May 2015 Implementation Trip, a number of beneficiary families approached the team members asking if systems could be modified to give them more tanks or if the team could do other projects in the community. Because of the individual nature of this project, a concern has been raised that some families may view the project agreements as personal agreements with EWB-USA WPI, not as a community-wide commitment. The second negative change concerns community dynamics. The EWB-USA WPI team has very little information about what community dynamics (person to person and family to family) were like before the project began. However, tensions may have arisen between some families because of the "number of tanks" received by each family. Some families still view the project as a "tank" project, not as a "system" project. This could cause issues for sustainability as well. Additionally, during implementation, some of the representatives working on construction stopped coming to work. EWB-USA WPI team members were approached multiple times with

	"tattle tale" complaints. Once this project enters the Monitoring and Evaluation phase, team members should carefully evaluate whether these tensions are long-lasting or whether they were transitive.
Considering all parties involved in the program, how would you describe your chapter's contribution to the planned/unexpected changes? (Very significant, quite significant, not significant)	EWB-USA WPI's involvement in both the planned and unexpected changes is very significant. The EWB-USA WPI team has been responsible for preparing preliminary system designs, all trip plans, and leading implementation. The community members have been involved in individualizing systems for their homes and was an enabling workforce during the May 2015 Implementation Trip. However, due to the individualized nature of this project, the EWB-USA WPI team has been driving it. .

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Analysis Question	Current Results
What can your team and EWB-USA headquarters learn from these findings?	Working on a project at an individual level brings out more commitment by the community, but also brings out unique social complications. As seen in the larger scale implementation of this trip, families are tempted to work on only their own system so that they didn't need to take as much time off of work. At one large community center, it would be easier to take roll call and establish those who were missing. Another important lesson is that community involvement and commitment to the project makes all of the difference. The community cared enough about the project on the previous trip to work smarter, not harder, and adapt to changing situations and new roadblocks. When looking to expand the scale of an implementation, be sure to find a supplier that can handle the quantity of the order. This trip

	saw multiple delays due to miscommunications and unforeseen shortcomings with the main materials supplier.
How should the program adapt as a result of the current findings?	As this past trip closed out the implementation phase of the project, the club is moving in a new direction, but it is important to keep in mind the lessons learned regarding community involvement, and make sure that it is properly utilized as the team moves into the monitoring phase of the project.

3.0 APPENDIX A – PROGRAM LOGICAL FRAMEWORK (Document 905)

Program summary	Objectively verifiable indicators	Means of verification	Assumptions
Overall Goal: Achieve and spread sustainable water security	Measures (direct or indirect) the program's contribution to the goal Number of people or families who rely on the finca	Sources of information and methods used to show your contribution to meeting the goal Interviews Census Surveys	Important events, conditions or decisions beyond the program's control, which are necessary for maintaining progress towards the goal Development of local skills Existence of entrepreneurial spirit Water committee leader present in the community Community members understand importance of entire system maintenance
Specific Objective: what the team intends to change during the program period (Outcome) Change the way community members use, perceive, and obtain water.	Measures (direct or indirect) that the intended change has occurred and is sustainable Observed method of community members handling and transportation of water, as well as the storage of water. Existence of broken components Observed evidence of routine maintenance on the system done accurately without EWB-USA WPI.	Sources of information and methods used to show that change has occurred Interviews Monitoring surveys Photo documentation Water quality tests Monitoring of system maintenance through observation by Alvaro and the travelers	Assumptions about *external factors* that need to be in place if the program is to contribute to the overall goal Educational materials are effective Each component must be in full working order for the system to function properly Families have the financial ability to maintain systems Community member's jobs are stable to provide the income necessary to maintain the systems. Community values the technology the they receive
Expected Results: the results which should be within the control of the program (Outputs) Increase amount of water available to each family Improve each family's control over water and therefore their access to it	Measures (direct or indirect) that the expected results of the program have been achieved Quantity of water available to each household during dry and wet seasons. Time to collect water (amount of trips needed to be taken to the finca basin)	Sources of information and methods used to periodically review results Alvaro's monitoring trips to the community Interviews Surveys	Assumptions about *external factors* that might affect whether the specific objective/outcome is achieved Each component of the system (first flush, overflow, etc.) effectively improves water quality and quantity as designed. Guatemalan climate can support year-round rainwater harvesting systems. The families in the community want to receive systems.