Community Water System Assessment

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"Improving Access to Water, Sanitation, and Hygiene in the Rural Highlands of Guatemala

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Curamericas Global

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GLOSSARY:

Aboneras /oyos/ Siegos/fosas	Pits and compostable latrines
Aldea	Community, small village
Barril	55 gallon blue drum for water storage with a wide mouth open top
Botes Grandes	Large jars with narrow mouths, typically plastic
Casa Materna	Birthing house, sponsored by Curamericas Global in coordination with Curamericas Guatemala for a safe, clean, and culturally appropriate location for women to give birth, owned by the community
Centro de Convergencia	Community Center for meeting, a school or house
Comadrona	Traditional birth attendant/midwife
Chorro, llave	Faucet, often at a pila
Deposito, poso	Pit latrine
Dry Season	March, April, May
Jabón	Soap, often used for washing clothes
Leña	Firewood
Nacimiento	Spring, water birth place (typically with a concrete box)
Pila	Sink, 3 sectioned wash basin
Pozo	Water well
Sanitario	Flushable toilet inside the home
Tanque	Water storage tank, typically concrete
Tinaja	Large Clay or plastic pot used for water storage
Toneles/Tambos	Barrels for water storage, typically plastic
Tubo	PVC pipe, tubing
Valvula	Manual valve, on a tank or in piping

Executive Summary

The UMCOR Water and Sanitation Community Assessment was completed in 15 different communities in the rural highlands of Guatemala. The purpose of the assessment is to understand the current water system in place and to identify the needs and next steps for improving equitable access to safe water for consumption. In conjunction with a USAID funded Child Survival Project, the assessment and accompanying education will inform future projects to allow for focused interventions to have the highest impact based on community-generated data.

Guatemala's health statistics register among the worst in Latin America. Particularly hard-hit is the indigenous Mayan population in the northwestern highlands. In the three municipalities where our partners work, sixty-five percent (65%) of U5 children suffer from chronic malnutrition, and one in four are enduring an episode of diarrhea in any given two week period — making diarrheal disease the leading cause of child mortality after neonatal causes.[1] There is both a demonstrated need and qualitative data from community members themselves requesting support for improving the water and sanitation situation. Currently in all communities evaluated, many households have running water at some point during the year. There is a water system in place, including springs, wells, tanks, distribution boxes, kilometers of piping, and household sinks and faucets. While a system exists, access to water is inconsistent and many people are without any access at all. Furthermore, having running water does not mean the water is potable. An additional strength of the communities is their organization; all 15 communities have a Water Committee made up of volunteers elected by the community. Both the community and the leaders recognize the importance of access to clean water and have committed to invest in their community.

A primary challenge for all communities is surrounding education on the importance of clean water, how to clean and keep clean water before consumption, and education surrounding their own water system. In previous projects, education on how to household water treatment and storage has been focused on women in the community, many of the leaders (exclusively male) did not know the four critical times to wash your hands. Community Water Committee members also did not know details about their own community nor the specific data on their water systems such as the size of the tank or the number of households without access to water. In conjunction with the existing health projects of Curamericas Guatemala, water and sanitation education and outreach can easily be integrated into current project activities. With the strong desire of both community members and leaders to improve the water and sanitation situation for their own communities, future projects should be easily accepted.

The assessment provides information on where future resources should be concentrated to have the most impact and help those in greatest need. Specific recommendations for all communities are to provide education to the community leaders regarding community mobilization and organization to improve Community Water Committee efficiency and coordination. Additional assessments should be completed in the remaining 33 communities of the municipality and additional 146 communities that the Child Survival Project is being implemented into in order to leverage funding and education opportunities to determine the specific needs of each community and introduce high impact activities.

[1] MPHSW et al. 2009. Preliminary Report: Guatemala National Health Survey 2008-09

I. INTRODUCTION

1. Community Background

Guatemala's health statistics register among the worst in Latin America. Particularly hard-hit is the indigenous Mayan population in the northwestern highlands. Despite the signing of the 1996 Peace Accord ending the 30-year civil war, the indigenous population still faces pervasive marginalization and poor access to health and social services.

Based on a recent needs assessment by Curamericas Global (Curamericas) and our in-country partner Curamericas/Guatemala (C/G), poor water, sanitation, and hygiene are leading factors of the high child mortality and malnutrition rates. With the fourth highest child mortality rate in the Americas (56 deaths per 1,000 live births), this area is commonly known as the "Triangle of Death." An appalling number of children needlessly die every year due to preventable nutritional deficiencies and diarrheal diseases. Sixty-five percent (65%) of U5 children suffer from chronic malnutrition, and one in four are enduring an episode of diarrhea in any given two week period — making diarrheal disease the leading cause of child mortality after neonatal causes.[2] These devastating trends are due to severely limited access to water supply and a lack of proper sanitation and hygiene education. Forty percent (40%) of households in the proposed project area must travel long, treacherous distances to collect rainwater. Only 30% have access to an artesian well or spring, and they spend large sums of money for access to or maintenance of this water system, which is controlled by a few who may restrict access at will. Human waste disposal is limited to latrines, the majority of which are in very poor condition. Even more, one-fourth (25%) of households lack access to any latrine facilities and must resort to open defecation.[3] Thus communities are strewn with sewage and waste, and contaminated water is frequently given to children—perpetuating cycles of diarrhea and malnutrition. Only 40% of people have access to soap and report occasionally washing their hands. Local health committees of San Sebastián Coatán have established water and sanitation as leading priorities to address these health concerns.

The Community Water Assessment was implemented in the Department of Huehuetenango of the isolated remote northwestern Cuchumatanes Mountains, where over 90% of the population is indigenous and live in poverty. The region is characterized by diverse microclimates, ranging from 500-3,300 meters above sea level, with high levels of seasonal rainfall and pronounced slopes that are subject to severe erosion—causing irreversible damage from soil loss, negative agricultural implications, and damage to water piping, and alteration to the water cycle. The Assessment targeted 15 communities in the municipality of San Sebastian Coatán.

2. Purpose of Assessment

While Curamericas Global and Curamericas Guatemala have been working in this area for over seven years, the focus of the community outreach and mobilization has been on Maternal and Child Health. No formal assessments regarding the needs and current status of the water systems in San Sebastian Coatán have been made. The purpose of this assessment is to understand the specific needs of the communities involved, regarding access to clean water at a

[2] MPHSW et al. 2009. Preliminary Report: Guatemala National Health Survey 2008-09
[3] Valdez, M. 2009. Diagnostic Data of San Sebastián Coatán. Curamericas/Guatemala.

sustainable level. The assessment will also provide details on the current water systems in place, including elevation, number, and location of water tanks, and testing for the presence of bacteria, the pH level, and the amount of Nitrates, Nitrites and Ammonia in the water, in spring boxes, at tanks, and in homes.

With detailed information in hand, Community Water Committees will be able to solicit support from the government and Curamericas Global will also be able to seek additional funding to address the needs of the communities, based on accurate community-generated data.

3. People involved

In addition to the staff of Curamericas Global and Curamericas Guatemala, two students from Boston University spent seven weeks at the project site in Guatemala. Claribel Marmol and Michael Parks both completed their practicum requirements for the Masters of Public Health program at Boston University through their support of the Curamericas Guatemala health projects and spent significant time providing education on hand-washing and meeting with the local water committees to administer the Water and Sanitation Questionnaire (Annex D) and lay the ground work for the water testing and assessment.

David Heiser, an Environmental Engineer from CDM Smith, Inc. spent two weeks at the project site to visit each community, meet with the Water Committee and other leaders from the community, to record locations and elevations of all relevant water system facilities using a portable GPS system, and to take samples of the water. Dave has lived across the globe and worked as a Environmental engineer for over 37 years and his cultural sensitivity and experience as a water engineer with Engineers Without Borders and Fuquay-Varina United Methodist Church in the developing world, including Nicaragua, the Democratic Republic of the Congo, and numerous other countries, was invaluable to the success of the assessment, (see Annex C for his C/V).

Without the hard work of key staff at Curamericas Guatemala, none of this assessment could be possible. Dr. Mario Valdéz provided important leadership as Alma Dominguez, Ambulatory Nurse for Curamericas Guatemala, and Odilon Velasquez, Water Technician for Curamericas Guatemala, worked as key staff for the UMCOR project, “Improving Access to Water, Sanitation, and Hygiene in the Rural Western Highlands of Guatemala”.

4. Methodology and Tools Used

The first step of the assessment was to take a baseline sample of water in the 15 communities and send the tests for a Coliform count to the Health Center Clinic Laboratory in Soloma, Huehuetenango, Guatemala. On April 24 and June 27, 2012, Dr. Valdéz, Alma Dominguez, and Odilon Velasquez, completed the necessary paperwork and labeled the testing bags obtained from the San Sebastian Coatán Municipal Government to prepare for testing the 15 communities. The next day, each staff member visited various communities to acquire samples and then gathered that afternoon to store the samples in a Cold-Chain Thermos used for vaccinations by the Curamericas Guatemala health teams. Dr. Valdéz then transported the samples to the Laboratory in Soloma, which then provided the results found in Annex B

The second step was to meet with the Water Committees and complete the questionnaire (Annex D) in order to determine what the current system and needs were. In addition to

gathering information from the questionnaire from Community Water Committees, Ms. Marmol and Mr. Parks also requested that Community Development Committee and Community Mayor also join the meetings. The meeting was scheduled 2-4 days in advance by Mr. Velasquez and the leaders of the community would gather in a central meeting spot of the community, typically a school or "*Centro de Convergencia"* used by the community for meetings. Talking together, the community would describe as best as possible, the current system, the functionality of the Committees, and the water, sanitation, and education needs as identified by the community.

The final step was for Mr. Heiser to again meet with the local committees and spend ½ day per community visiting the different Water Tanks, springs, and households in order to take water tests, as well as to record the locations and elevations of all these facilities using a sub-meter hand-held GPS device. The latitude and longitude readings (to 0.1 second accuracy), as well as elevations to the nearest foot, were obtained using a Garmin GPS 60 instrument (See Annex E, GPS Table, for all results). Measurements of the tanks in each community were made using a Stanley 8m/26ft steel tape measure. The presence or absence of pathogenic bacteria was analyzed using the Hach PathoScreen Field Kit (Method 10032) and all 20 milliliter vials were allowed to incubate for a full 48 hours prior to recording the results. These tests only monitor for the presence or absence of bacteria, and do <u>not</u> produce colony counts, pathogen MPN, or level of bacterial contamination in the ssamples that show positivie results from the 48-hour tests. pH readings were obtained using pH0-14 "colorpHas" indicator strips by Hach. Nitrate, Nitrite, and Ammonia levels were determined using AquaCheck water quality test strips by Hach (See the Water Quality Tests Results Log in Appendix F for details).

5. <u>Limitations</u>

Working in rural Guatemala inevitably presents challenges to the populations, the Curamericas Guatemala staff, and the evaluating team. While communicating with Community Water Committees, there was always the need for interpretation from Spanish to the Mayan language and native tongue, Chuj and at times a third layer of interpretation was needed from English to Spanish. With this constant need to interpret, misunderstanding could have happened, especially when asking technical or historical questions related to the community water system. The water testing of springs, tanks, and households was a challenge due to their remote location, often requiring a 1 – 2 hour hike on single track paths accompanied by a community member who knew the best way. The walk was further complicated during the rainy season. Not all water sources could be tested and was especially the case during the first water testing completed in April 2012. At times, due to the number of water sources, we did not have the appropriate number of testing materials and therefore could not test certain indicators.

A positive aspect of the 15 communities we worked with is their cooperation and investment in their access to safe water. Not only did the communities express a desire for all members in each community to have equal access, they required ample time to discuss and agree upon the needs of the community and action items to be taken by the Community Water Committee such as building hand-washing stations, replacing any piping, or cleaning tanks with chlorine. With the time lag in each step of the assessment prevented any follow-up on questionnaire results, such as understanding more thoroughly the lack of water for certain households and the access to water for others in a community. Also, the evaluating team would have liked an opportunity to

further investigate the sanitation situation in each community as the access to latrines was not clearly understood; though many communities did request assistance in building new or refurbishing existing latrines. More information is necessary before implementing a wide-spread comprehensive latrine construction or rehabilitation project.

II. COMMUNITY EVALUATIONS

1. **Community:** Biltac

Population:	367
Water Committee:	
Number of Households:	85
Number of Households with hand washing station:	
Number of Households with soap:	
Number of Households with basic Latrine:	
Community Water System in place?	
Daily running water, if not how is water accessed for the community?	
Daily running water for all households. If not, number of households with daily running water.	

Testing 08.2012:

	Tank 1.1	Church Pila	Tank 1.2	Tank 1.3	Pila near Rio
Bacteria	NEG	NEG	POS	NEG	NEG
pH	6.0	6.5	6.0	6.0	6.5
Nitrite	0	0	0	0	0
Nitrate	0.5	0	0	0	0
Ammonia	0	0	0	0	0
Tank Dimensions					
Coliform Count 4.2012	N/A	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

2. **Community:** Cajbaquil

Population:	437
Water Committee:	1 Member: Julio Marcos Jose Telephone: 45809878
Number of Households:	32
Number of Households with hand	0 houses have hand washing stations, nearly all

washing station:	have *pila*s (sinks) where hands can be washed
Number of Households with soap:	Soap is available, but expensive and thus many people wash only with water
Number of Households with basic Latrine:	Most all have a basic *deposito* (basic latrine)
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes
Daily running water for all households. If not, number of households with daily running water.	No. Approximately 12 – 15 houses without water.

Testing 08.2012:

	Tank 14.1	Tank 14.2	Tank 14.3	Pila near lower Tank
Bacteria				
pH	5.1	5.1	5.2	5.1
Nitrite	-	-	0	-
Nitrate	-	-	0	-
Ammonia	0	-	-	-
Dimensions				N/A
Coliform Count 4.2012	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Cajbaquil is a small community that is serviced by three different water tanks, one for each of its three sectors. The sectors vary in number of households and population. The largest tank is located up the hill from the *Centro de Convergencia*, a newly modeled blue building, and is approximately 6m x 4m x 2m. This tank serves as the water source for 28-30 households in sector 2. The next largest tank which is up around the corner from the cantina and services sector 1, around 36-54 houses, is approximately 5m x 3.5m x 2m. The way the total number of houses is figured for this tank is as follows: there are 18 pipes coming out from the tank that each serves 2-3 houses. Tank number 3 serves approximately 10 houses more or less and is said to be significantly smaller. The tank itself was not visited at this time. The main spring source for the tanks are *pozos* of which at least one is located in Yalanchkek' about 1km from Cajbaquil. The community does not pay for their water system.

Most families are said to have a sufficient amount of water most of the year, except for 12 who live up the mountain from the largest tank. The total number of persons affected by the lack of water is around 40-45. However, during the dry season (March - May) water is very scarce for the whole community. The community desires more water to satisfy daily use. All the houses are said to have *chorro*s. For the most part all houses store water in a combination of *pila*s, barrels, and buckets. Some families are aware of the importance of proper storage such as covering their water in barrels, but others are not or simply do not practice covering their water receptacles. The community definition of potable water means water from the river, and from *tubos.*

Water treatment for consumption is done via boiling the water for 15-30 minutes. The community does not use chlorine/Clorox and neither does the community have access to it. Many families can't afford buying Clorox. The water committee does not use Clorox to clean the tank as they do not have access to it. The committee maintains the tanks every two months by scrubbing the tanks with a broom and flushing with running water. Neither soap nor Clorox is used in the process.

Most houses have a basic *deposito* for human waste, but this is not sufficient according to the committee. The committees expressed that if one were to include toilet use (they do not have toilets with water) that water would not be sufficient on a daily basis in their community. Lack of proper latrines is a primary concern for the committee. A proper latrine is defined by the community as a bowl to receive the waste and water to flush it away. Due to the lack of sufficient water, no houses have a water-using toilet. Diarrhea is a current issue and identified as a past problem as well.

The committee expressed that the community would be very open to have stations designated to washing their hands. However, the people do not have money to afford such a station nor have money to allocate for soap. They said even if they had the hand washing station the people would still not wash properly with soap. People use the *pila* water to wash cloths and dishes. The committee believes that the community members do not drink the water without boiling it for 15-20 minutes.

3. **Community: Calhuitz**

Population:	1207
Water Committee:	6 members; Tomas Bartolome Telephone: 57837617
Number of Households:	320
Number of Households with hand washing station:	None of the houses have a hand washing station designated.
Number of Households with soap:	The community does have access to soap
Number of Households with basic Latrine:	-
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	No water enters alternate days according to sector and appears only for duration of 30 minutes to 2 hours.
Daily running water for all households. If not, number of households with daily running water.	

Testing 08.2012:

	Tank 6.1	Tank 6.3	Tank 6.4	*Casa Materna*	*Rio Yolaktanak*
Bacteria	NEG	NEG	NEG	NEG	NEG
pH	6,5	-	-	6.0	6.0
Nitrite	0	-	-	0	0
Nitrate	0	-	-	0	0
Ammonia	0	-	-	0	-
Dimensions	N/A	N/A	N/A	N/A	N/A
Coliform Count 4.2012		0/100ml	0/100ml		

Results of the Questionnaire

Calhuitz is a larger community of 1,207 people, composed of four sectors. There are five community members who serve on the committee each year. The water for Calhuitz originates from the White River, specifically in the Village of San Mateo. San Mateo is very poor and has claimed ownership of water. In Calhuitz each person must pay 212 *Quetzals* or $27USD per year for access to water. Leaders of San Mateo say ' you feed us, and we give water." There is a challenge with access to drinking water in this community. Given the size of the population, there is not enough water; additional water is needed to meet the daily needs of all community members. The water is received every two days, two sectors per day (1, then 2, 3, 4). However there is only running water for about 30 minute each day.
Fortunately, the *Casa Materna* has daily access to water due to negotiation with the community as part of the support for the birthing house. The *Casa Materna* has tubes directly from the tank and a valve to control flow. This was an agreement made by the community for years, but now there are some tensions around this decision, other institutions such as the church and schools have also demanded to have water every day. Also 30 homes have *chorros*; however some of these people have been sanctioned for failing to provide labor for the construction of the water system. Therefore, it is up to the community if these people can be provided with a source of water and hand washing stations as they must pay Q9.500 *Quetzals* fine.

The Calhuitz distribution tank has a size of approximately 25m x 25m x 10m. There is also a smaller tank in the village of Pok which receives water directly from the Rio Blanco, which is then distributed to the tanks in three communities (Calhuitz, Jolomtenam 1 and Jolomtenam 2).

The community understands the importance of hand washing, water treatment and adequate water storage. Therefore, the most outstanding is secure sources of water and to get more water to the community. From now only maintain their water tanks cleaned every 3 months with soap and water. However, they have shown interest in the disinfection of water tanks with Clorox. They would like to have an educational session on the art of tank cleaning with Clorox.

4. Community: Ixtenam-Ixquin

Population:	162
Water Committee:	Juan Sebastián Miguel Baltazar Telephone: 51977560
Households:	29
Households with hand washing station:	0; all have *pila*s
Number of Households with soap:	Unknown; all have access to soap
Households with basic Latrine:	Unknown; most have a basic latrine
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes; consistent and sufficient year round
Daily running water for all households. If not, number of households with daily running water.	Yes

Testing 08.2012:

	Spring 9.A	Spring 9.B (not used)	Tank 9.1	School Pila
Bacteria	NEG	NEG	NEG	NEG
pH	6.0	6.0	6.3	6.0
Nitrite	0	0	0	0
Nitrate	0	0	0	0
Ammonia	0	0	0	0
Dimensions				
Coliform Count 4.2012	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES:

Ixtenam-Ixquin is a small community North West from Calhuitz approximately 25 minutes by vehicle. Given the small population it has a relatively large tank which results in the community being able to have a sufficient amount of water to meet all daily water needs throughout the year. According to the committee, the spring of the water source begins in the ground in the community of (San Jose) and flows from there to the tank.

The water committee reported cleaning the tank every two months with water and soap. The committee understands the added benefit that chlorine would have in purifying the water, but was unsure how the community would feel towards using it to clean the tank and to treat the water. Current household water treatment method is to boil water 10-15 minutes after the water begins to bubble on the surface. The people also have sufficient amount of wood to meet their stove usage and boiling needs. Current water storage methods are the *pila* for which this water is used only for washing clothes, dishes, and hands. The *pila* is not used for drinking. However, while the *pila* is used for washing hands the committee felt as if the people would be open and would desire a hand washing station.

The people in Ixtenam-Ixquin have access to soap for hand-washing and chlorine. However, one, it is unknown the number of houses that actually use soap to wash hands; two, the use of chlorine is only used to clean and wash clothes. Every house has a *deposito* that deposits waste directly into/onto the ground. They do not have a plumbing system in place for household toilets. Only the school according to the committee had flushing toilets. While the committee expressed that diarrhea is not a problem, latrines may deposit waste directly onto the ground, contaminating water for other communities at lower elevations including the springs that supply Joom and Julutz.

5. **Community: Jolombojop**

Population:	178
Water Committee:	2 Members: Santiago Bartolome Juan Telephone: 48337764, Julio Nicolas Ignacio
Number of households/families:	38
Number of Households with hand washing station:	0; Almost all have *pila*s
Number of Households with soap:	Most
Number of Households with basic Latrine:	Few
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes. Except during the dry season (March – May)
Daily running water for all households. If not, number of households with daily running water.	Yes

Testing 08.2012:

	Spring 3.C	**Spring 4.A**	**Tank 4.1**
Bacteria	POS	POS	POS
pH	6.0	6.5	6.5
Nitrite	-	0	0.5
Nitrate	-	0.5	1.5
Ammonia	-	0	0
Dimensions			
Coliform Count 4.2012			0/100ml

RESULTS FROM QUESTIONNAIRES

Jolombojop is a small community located South East from Lolbatzam. The water committee rotates every year; there are currently only two members on the committee. The committee was not sure of its population size or how many people had sufficient water because they said each person maintains their water differently. They guessed that only a few do not have sufficient water during May-Oct when water is most abundant. During the rainy season, the

committee removes certain tubes from spring box 3.B so that they do not get washed away by mudslides. This community receives water every day. They have two water sources one in Ucachoj and one at the end of Jolomtenam II. The tank measures 6m squared. When a technician comes from the municipal government (less than 1 time per year), their tank is cleaned with Clorox. Household water is stored in tanks, the *pila,* and *barriles*. This water is used for drinking, cooking and to wash clothes. Water treatment is boiling water however they only do so for 10 minutes until hot and few bring the water to a boil. Others do not treat their water and drink from the c*horro.* There are very few with latrines, the committee mentioned people use "*aboneras, oyos siegos o fosas*" which are pits and compostable latrines.

People in the community know about the importance of washing their hands with soap and have access to soap. However the committee was not sure if people knew about the importance of boiling their water, it was said that maybe only some knew. Clorox is accessible at the stores. Some do not have sufficient *w*ood to boil their water because they do not have animals to help them carry the wood. People do not know the importance or the technique of proper water storage. Receptacles to store water are also not easily accessible. People in their community do have a desire for hand washing stations. However they do not know how much money they would be able to contribute for its construction.

6. **Community: Jolomtenam I**

Population:	114
Water Committee:	5 Members: changes every 2 years Main Contact: Miguel Mateo; Telephone: 46538877
Number of households/families:	35
Number of Households with hand washing station:	0 ; Almost all have *pila*s
Number of Households with soap:	Unknown; Most houses use soap but must purchase from San Jose
Number of Households with basic Latrine:	Most have a basic *deposito*, some have a *deposito* with water to wash away waste
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes

Testing 08.2012:

	Tank 7.2	**School Chorro**
Bacteria	NEG	NEG
pH	6.5	6.5
Nitrite	0	0
Nitrate	0	0
Ammonia	0	0
Dimensions	N/A	N/A
Coliform Count 4.2012	0/100ml	

RESULTS FROM QUESTIONNAIRES

Jolomtenam I is a small community where all houses have access to water throughout the year except for the months of March and April. All houses are reported to have a working *chorro*. Water is accessible every day. Jolomtenam I is part of the same water project as Calhuitz and Jolomtenam II and so the piping is not more than five years old. In addition, their main water source is piped from San Mateo which is about a two hour car ride from Jolomtenam I. The committee expressed that while they do not need to pay for the water that is provided to them, they must pay for the tubing, valves, and other materials which is approximately Q.25-30 per faucet *(chorro)*. The water that is piped from San Mateo is stored in a community tank that sits in the lower part of the community. However, it can be difficult to get this water to the central part of the community due to lack of a pump to bring the water up. The community has another water source that sits up above the community but this is often dry and for this reason does not always provide enough water.

Tank maintenance is done every 4-6 months and the tank is cleaned with powder chlorine/Clorox. They do not treat the water with Clorox. The water that is then piped from the tank in Jolomtenam I to the houses is stored in *pila*s and *barriles*. The water in the *pila*s is used solely for washing dishes and cleaning clothes. The water that is stored in the commonly seen blue or green barrels is only used for cooking and drinking. The water in the barrels is always covered. It is reported that not all members of the community have access to such proper storage barrels. The committee seemed very aware as to why it is important to cover the water they use to cook and drink. The stored water is often purified through the process of boiling the water for a period of 15-30 minutes after the water begins to bubble. All houses either have a *deposito* located in or outside of the house. Some of the latrines have water piping hooked up to them which allows for a stream of water to come in and flush the waste away. The community did report an issue with diarrhea in the past 2-3 months in both adults and children.

The community has access and is reported to use soap but this must be purchased in San Jose as soap is not sold in Jolomtenam I. The committee reported that the community does have knowledge of the four critical moments when hands should be washed. However, the committee itself could only name 2 of the moments. Nevertheless, they did mention other time periods that are not part of the four critical moments that have been taught that are of equal importance. Two additional periods that were mentioned was upon waking up and after working in the fields etc. The community does have access to chlorine but it is only used to wash clothes. This chlorine like the soap must be purchased in San Jose as it is not readily available in Jolomtenam

7. **Community: Jolomtenam II**

Population:	203
Water Committee:	5 Members. Rogelio Domingo Telephone 40668691
Number of households/families:	43
Number of Households with hand washing station:	0 with hand washing station, All have chorros, but most do not have *pila*s
Number of Households with soap:	Most do have soap.
Number of Households with basic Latrine:	Most all have a basic *deposito*
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes, Except during the dry season
Daily running water for all households. If not, number of households with daily running water.	Yes

Testing 08.2012:

	Tank 8.1	**Tank 8.2**	**Chorro in a home**
Bacteria	N/A	NEG	NEG
pH	N/A	6.3	6.3
Nitrite	N/A	0	N/A
Nitrate	N/A	0	N/A
Ammonia	N/A	0	N/A
Coliform Count 4.2012	0	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Jolomtenam II, is a small community of 203 people. As part of the Water Project with Calhuitz and Jolomtenam I their water source comes from the river Rio Blanco located approximately 11 Km away in the community of San Mateo. There is a yearly charge of 14,500 Quetzales for this water source. Each person in the community must contribute 150-250 Quetzales for this payment and for maintenance. Their capture tank where water is received and distributed is 6m x 6m x 3m. Each month the tank is cleaned by the committee with Clorox, soap and water.

According to the committee, the entire community has sufficient water, except during the dry season. All houses have *chorros*, however approximately 30 households do not have p*ilas*. They receive water every day in their community. It was said that people store water in their households in *toneles, botes grandes, pila*s, and *barriles,* used for inside the house meaning cooking and drinking. The water that is stored in *pila*s is used for washing dishes and clothes. They believe that the water that is stored is potable, which is water from the c*horro*. Only about 50% of the people of this community understood the importance of water storage and correctly stored their water.

Household treatment of water is to boil water for 15 minutes before cooking. However it

was stated that only some boil their water, some people do not and drink the water from the *chorro*. People that do not boil the water do not have the knowledge. Due to its close proximity to San Jose essentials such as soap, Clorox and containers for storage are easily accessible. However the committee believes that not everyone in their community believes that their health is important hence some do not wash their hands with soap.

The community uses a combination of basic latrines that deposits waste directly into/onto the ground as well as toilets. There have been cases of diarrhea in the children of this community; they said "a few children here and there get sick."

They believe that people in the community would be interested in hand washing stations as none currently have a designated place for hand washing. The committee believes that some poor families won't be able to contribute anything while others might be able to contribute all the materials for a hand washing station.

8. **Community:** Joom

Population:	123
Water Committee:	Ricardo Felipe Diego; Telephone: 51868490
Number of Households:	30
Number of Households with hand washing station:	0
Number of Households with soap:	Unknown
Number of Households with basic Latrine:	Unknown.
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes, scarce in May
Daily running water for all households. If not, number of households with daily running water.	Yes, almost all have water access

Testing 08.2012:

	Spring 11.A	**Spring 10.B**	**Tank 11.1**	**Pila in Town**
Bacteria	NEG	NEG	POS	POS
pH	6.3	6.8	7.0	6.8
Nitrite	0.1	0	N/A	0
Nitrate	0.5	0.5	N/A	0.75
Ammonia	0	0	N/A	N/A
Dimensions				
Coliform Count 4.2012	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Joom is a small community that has consistent daily access to water. The exact number of inhabitants, families, and homes was unknown to the committee. The current committee is new and will hold the position for a time period of two years. The available water is enough to fulfill their daily needs of drinking, washing, cooking, and bathing throughout the year. However, the committee did mention that water can become scarce in the month of May.

The new committee has yet to clean the tanks but said that soap and water are used to clean the tank. August 25, 2012 a routine cleaning of the tank is to take place. However, instead of doing it with soap and water the committee will be given a training session on how to clean the tank with Clorox. The household treatment method for water is boiling. The people of Jom do have access to soap and chlorine, however, it is unknown the number of houses that practice washing their hands with soap and water. The committee did mention that one of their goals is for the people not to waste the 'potable' water available to them and that they would like to buy more receptacles to conserve the 'potable' water.

9. **Community:** Julutz

Population:	463
Water Committee:	Andrés Lopez (59057427)
Number of Households:	50
Number of Households with hand washing station:	0 hand washing stations, but have *pila*s and *tinajas* for water storage and to wash hands.
Number of Households with soap:	Unknown
Number of Households with basic Latrine:	Unknown
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes
Daily running water for all households. If not, number of households with daily running water.	Yes

Testing 08.2012:

	Spring 10.A	**Spring 10.B**	**Tank 10.1**	**Pila in Town**
Bacteria	NEG	NEG	NEG	NEG
pH	6.5	6.8	6.5	6.2
Nitrite	0	0	N/A	0
Nitrate	0.75	0.5	N/A	0.75
Ammonia	0	0	N/A	0.1
Dimensions				
Coliform Count 4.2012	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Julutz is a medium sized community of 463 people. Their committee rotates every two years and their current goal is to change their tubing, amplify them or clean them because little water runs through them. These tubes have also not been changed or cleaned in 23 years. Water is received every day and is most abundant during the months of May-December. Their source of water comes from two springs near Ixtenam-Ixquin and each spring has a Spring box. One of the water tanks is shared with the community of Joom. One tank measures 6m x 6m x 2m and the smaller one measures 4m x 4m x 2m. Their maintenance consists of cleaning their tank with water, soap and coal. However the community has accepted the idea of disinfecting their water tanks with Clorox and so this August 21, 2012 a routine cleaning of the tank is to take place. However, instead of doing it with soap and water the committee will be given a training session on how to clean the tank with Clorox.

The water that is used for drinking is stored in *tinajas*. Water for other household needs is stored in the *pila*. About 8 households do not have a *pila* but all do have c*horros.* The people in the community do not have access to containers to store their water and soap; they must travel to San Jose or Nentón to buy them. While soap is accessible, only some could afford to buy it. There are some parts where it is also difficult for people to obtain *leña*. The people do not know the importance of storing their water, and while people know the importance of boiling water, it is usually not done properly.

There is a problem with diarrhea in this community. It was said that most children had gotten diarrhea in the past month. The committee expressed a stronger concern for the latrine situation. Most of the houses do not have toilets. Most have a *deposito* on the ground. It was said that approximately 80 households need toilets. They would like to have information of organizations that could help better this situation.

10. **Community:** Lolbatzam

Population:	389
Water Committee:	5 members Domingo Sebastian -Telephone: 59911136
Number of Households:	63
Number of Households with hand washing station:	Almost all have faucets
Number of Households with soap:	Yes
Number of Households with basic Latrine:	Majority have latrines, few have toilets, and few go out in the open by the woods
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes
Daily running water for all households. If not, number of households with daily running water.	Yes except the (5) houses over the tank. Also sometimes the tubes are clogged very little water is received.

Testing 08.2012:

	Tank 5.1	Tank 5.2
Bacteria	Positive	Positive
pH	7.0	7.0
Nitrite	0	0.1
Nitrate	0.5	1.0
Ammonia	0	0
Dimensions		
Coliform Count 4.2012	N/A	0/100ml

RESULTS FROM QUESTIONNAIRES

Lolbatzam is a small community of 389 people, in close proximity to Calhuitz. There are five members on the water committee and they rotate every two years. The current problem presented by the water committee is that the tubes are buried and have not been changed in 26 years. Water can be scarce when tubes are clogged. Their water source comes from a peak with a spring. It is located in Jolomtenam I (5 *aldeas* use these springs including Ucachoj, Timacap, Jolombojop, Lolbatzam and Tikeen). Their water tank is cleaned with soap and water every 3 months. Water is stored in big plastic *tambos/toneles*. The *pila* is also used for storage. Water that is stored is for daily use such as drinking, cooking, washing clothes and bathing. Water treatment utilized is boiling; the common practice is to heat water for 5-8 minutes.

Most have latrines that deposit waste onto/into the ground. Very few have toilets and about 10-12 households do not have a basic latrine, hence they defecate out in the woods. It was said that 8 months ago there was an outbreak of diarrhea among the community.

The people have access to soap, wood, receptacles and Clorox. However a few were said to not have the money to buy wood and lacked animals to help carry wood. Receptacles can be purchased in San Jose or Nentón. The people in the community know about the importance of washing their hands, treating and storing their water. While they believe people do desire to have hand washing stations the water pressure is weak and there won't be much water coming out the faucet. They believe everyone in the community should get a hand washing station not only a few people. The people would be able to contribute about 10 Quetzales per hand washing station. Furthermore they desire to change their tubing which cost about 300 quetzales each, and approx. 1,000 tubes will be needed. They also wish to better the latrine situation.

11. **Community: Nuevo Progreso**

Population:	187
Community Water Committee:	Yes, Five members change every two years. Primary Contact - Diego Miguel Pascual Telephone: 48796062
Number of households/families:	55
Number of Households with hand washing station:	0; all have sinks
Number of Households with soap:	People do have access to and use soap.

Number of Households with basic Latrine:	Most all have flush toilets (*Sanitarios)* that are connected to tubes, but there is no water piped to flush/clean waste.
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes, scarce March – May
Daily running water for all households. If not, number of households with daily running water.	No. Approximately 10-15 houses do not have faucets.
Recommendations:	Hand washing education. Water committee tank cleaning with Clorox capacity building. Look into how additional water can be secured for the wet and dry months. Ground to surface water pump loan scheme. Multi-community pump investment.

Testing 08.2012:

	Tank 15.1	**Tank 15.2**	**Tank 15.3**
Bacteria			
pH	5.2	5.8	5.8
Nitrite	N/A	0	N/A
Nitrate	N/A	0	N/A
Ammonia	N/A	N/A	0
Dimensions			
Coliform Count 4.2012	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Nuevo Progreso is a small community with a population of 187 people who occupy 55 households. There are approximately 10-15 houses that do not have a c*horro*. The homes without *chorros* homes are in close proximity to the faucet of a family member which gives them access to water. When there is water, every faucet receives it all hours of the day and every day. For some households the water is not sufficient to meet daily cooking, drinking, and bathing needs. Water becomes most scarce in the months of March – May meaning that water is scarce for the entire community during these months due to insufficient rainfall. The scarcity of water results in not all the houses having access everyday during these months as the water is then rationed to the community. For example, on Monday the houses at the top of the community will get water while the houses at the bottom will not have any. Then on Tuesday it would switch and water would be provided to the houses at the bottom and not to the houses at the top.

The main spring of the community's water source is located in Yalan Tocalap, which is about a 1.5 hour walk from Nuevo Progreso. The community does not pay for the water that is piped from Yalan Tocalap, but they do have to pay for materials such as tubes and faucets that are to be used to deliver and provide each house with water. The water that comes from Yalan Tocalap is stored in three community tanks. Two smaller tanks that are approximately 1.5 meters x 4 and a larger distribution tank that is approximately 2.5 meters x 4. These tanks are maintained every three months but are only cleaned with water and a broom. Neither soap nor

chlorine is used to disinfect the tanks. From the tanks the water is then piped to each household faucet. The households then store the water that they receive in a combination of *pila*s and barrels. Some houses do not have sufficient receptacles to store water due to lack of money. This becomes critical in times of scarce water as receptacles are needed to store much needed water. The water that is stored in the *pila*s is only used for cleaning things such as cloths, dishes etc. Water that is kept in the barrels is used for cooking and drinking. Most everyone in Nuevo Progreso boils his or her water for which there is sufficient wood. Those who boil their water boil it for about 20-25 minutes after bubbles begin to appear on the water surface.

The committee was not aware of the four critical hand washing times. They did mention that they wash hands prior to eating and that the mothers do so prior to cooking. They report that soap is used but it is not known how many households practice using soap for hand washing. Some houses do have access to Clorox but it is only used for cleaning clothes. Most houses have a *sanitario* that is connected to plumbing tubes but there is no piped water that is used to clean/flush them. The community does not report a current or recent past case of diarrhea.

The community is unsure of whom and if the community would desire hand washing stations as were proposed. The committee is going to set up a community meeting to talk about the hand washing station that was proposed and see what the community thinks. One of the committee's concerns as of now is to secure more water for their community. There is another source available in (Bolontoj) but they lack the necessary funds to secure it.

12. **Community:** Taaj

Population:	237
Water Committee:	
Number of Households:	54
Number of Households with hand washing station:	
Number of Households with soap:	
Number of Households with basic Latrine:	
Community Water System in place?	
Daily running water, if not how is water accessed for the community?	
Daily running water for all households. If not, number of households with daily running water.	

Testing 08.2012:

	Tank 12.1	**Tank 12.5**	**Spring 12.C**	**Pila in Town**
Bacteria	NEG	NEG	NEG	NEG
pH	5.8	5.5	5.5	5.5
Nitrite	N/A	N/A	0	0
Nitrate	N/A	N/A	0	0
Ammonia	N/A	0	N/A	0
Dimensions			N/A	N/A
Coliform Count 4.2012	N/A	0/100ml	N/A	N/A

RESULTS FROM QUESTIONNAIRES

13. **Community:** Timacap

Population:	110
Water Committee:	8 members; Primary contact: Nicolas Francisco Hernandez Telephone: 53295421
Number of households/families:	25
Number of Households with hand washing station:	0; Almost all have *pila*s.
Number of Households with soap:	Most houses
Number of Households with basic Latrine:	Most have a basic *deposito*
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes; Scarce from January – May
Daily running water for all households. If not, number of households with daily running water.	Yes

Testing 08.2012:

	Tank 2.1	**Spring 2.A**	**Pila in Town**
Bacteria	NEG	NEG	NEG
pH	6.0	6.0	6.0
Nitrite	0	0	0
Nitrate	0.8	0.9	0.8
Ammonia	0	0	N/A
Dimensions		N/A	N/A
Coliform Count 4.2012	0/100ml	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Timacap is a small community of 32 households and has a sizeable water committee of eight members to maintain the community water system. The committee members' serve for a period of two years and start every February. The source of water for the community's two water tanks is a spring that is located up the mountain from Timacap. The community is comprised of one sector. The tanks are maintained every two months and are washed with soap and water. Each community member must pay Q.8.40 per month for water. The community has sufficient water to meet its daily needs except during the dry season.

For the majority of households water storage is done through a combination of *pila* and barrel usage. The water stored in the *pila* is used only for washing cloths and hands. Water that is stored in barrels is covered and used only for cooking and drinking. However, the water is boiled before is considered drinkable. The majority of people do not drink solely water but rather consume boiled water after making it into coffee.

Families often heat water for 15-20 minutes. The committee was unsure if all houses wait until it reaches a rolling boil to count the time. Households do have sufficient wood to boil their water and fulfill cooking needs as they need not travel far to get it. Boiling is the only treatment method used to treat water as chlorine is not used. The people know of chlorine but it is only used for washing clothes. Those who do have access but do not use chlorine cannot afford it. Families are more or less split when it comes to washing hands. Some practice washing hands but only with water while others use soap. Some families do not practice washing hands at all. Most families have soap but this soap is used primarily for washing clothes. There seem to have been little to no issues of diarrhea currently or in the recent past either for adults or children. The basic latrine (*deposito*) system in place does not use water. The feces are deposited directly into the ground and not on top of the ground.

14. **Community: Ucachoj**

Population:	193
Water Committee:	2 Members: Gerardo Diego Tomas - Telephone: 31215075; Jaime Hernandez is a key contact as well
Number of households/families:	35
Number of Households with hand washing station:	0; Most have *pilas*
Number of Households with soap:	Not sure. However, houses have access to soap and most can afford it.
Number of Households with basic Latrine:	Some have a basic latrine while others have a *sanitario*
Community Water System in place?	Yes
Daily running water, if not how is water accessed for the community?	Yes, scarce from March – April.
Daily running water for all households. If not, number of households with daily running water.	No, 2 households must fetch their water on a daily basis

Testing 08.2012:

	Spring 3.B	**Spring 3.C**	**Tank 3.2**	**Pila in Town**
Bacteria	POS	POS	POS	POS
pH	6.8	6.0	6.5	6.5
Nitrite	0	N/A	0	N/A
Nitrate	0.8	N/A	0.8	N/A
Ammonia	0	N/A	0	0
Dimensions				
Coliform Count 4.2012	N/A	N/A	0/100ml	N/A

RESULTS FROM QUESTIONNAIRES

Ucachoj is a small community with 125 inhabitants. Aside from two families, everyone has daily access to water which is supplied by the community water system. The community water system is constructed of three tanks, two of which (one larger, one smaller) are directly in Ucachoj and another located in Jolomtenam-I. The tank in Jolomtenam-I is shared by the communities of Ucachoj and Jolomtenam-I. The source of the water is springs located about 2km away in Jolomtenam-I. The tanks used to be cleaned every two months with Clorox, but this Clorox was given to them by an outside organization and when it ran out it was never replenished. Thus, they proceeded to maintain the tanks every two months but with soap, water and a broom. The community does not pay for their water system.

Most of the households store their water in *Tinajas* or blue/green barrels, which can be seen in the pictures of Ucachoj. Most houses know the importance of covering their water storage containers. The water kept in these containers is used for bathing, drinking, cleaning dishes, cooking and even washing hands. The majority of families understands the importance of boiling their water and does so for 15-20 minutes after rolling boil; however, some will simply take the water from the storage tank or tap and drink it as such. Two reasons were given for this behavior. Some people do not like the taste of the boiled water and refuse to consume it by itself once it's been boiled and if one is outside working or kids at school playing they will drink directly from the tap. The community considers potable water is water from the river, and *tubos.*

All the houses are equipped with at least a basic pit latrine. However, some houses do have *Sanitario*. The community reported not having a present or recent past (meaning past 2-3 years) continuous issue of diarrhea in either children or adults. There was one incident in the past 2-3 months where a lot of the kids and the adults had diarrhea. However, after a short time it passed. There is a need and desire to secure more water for daily needs. After explaining a potential hand washing stations design the committee said that they would feel that all the houses would want one. They mentioned an issue that I will call 'the full sink/*pila* syndrome'. This means the sink is full of dishes and thus where one would normally use the sink to wash one's hands one forgoes this action in the presence of a full sink. They expressed that often times one side of the *pila* may be full with clothes and the other side with dishes. Thus, the women will say that they cannot wash their hands with a full *pila*. Depending on the family the committee felt that each family could put Q. 10-25 towards a hand washing station.

15. **Community: Yuchan**

Population:	189
Water Committee:	Five members change every two years. Primary Contact: Francisco Baltazar Sebastian Telephone – 53423963
Number of households/families:	49
Number of Households with hand washing station:	0; Almost all have Pilas
Number of Households with soap:	Unknown; Most have access via San Jose.
Number of Households with basic Latrine:	Most all have a basic pozo which deposits below the ground.
Community Water System in place?	Yes

Daily running water, if not how is water accessed for the community?	Yes, however not sufficient to meet daily needs especially from February to April
Daily running water for all households. If not, number of households with daily running water.	Yes, all households have a *chorro* with running water.

Testing 08.2012:

	Tank 13.1	Pila from 13.1	Tank 13.2	Pila from 13.2
Bacteria	NEG	NEG	NEG	NEG
pH	5.2	5.2	5.1	5.1
Nitrite	N/A	N/A	N/A	N/A
Nitrate	N/A	N/A	N/A	N/A
Ammonia	0	N/A	N/A	0
Dimensions				
Coliform Count 4.2012	N/A	N/A	N/A	N/A

RESULTS FROM QUESTIONNAIRES

Yuchan is a small community of 189 inhabitants who occupy 49 households. All of the houses are reported to have a c*horro*. When there is water every family receives it all hours of the day and every day. However, the water is not sufficient to meet daily cooking, drinking, and bathing needs. Water becomes most scarce in the months of February – April.

The main spring of the community's water source is a spring that is located in Yalan Chacec, which is about a one hour walk from Yuchan. The community does not pay for the water that is piped from Yalan Chacec, but they do have to pay for materials such as pipes and *chorros* that are to be used to deliver and provide each house with water. The water that comes from Yalan Chacec is stored in two community tanks of which the dimensions are unknown. These tanks are maintained every month but are only cleaned with water and a broom. Neither soap nor chlorine is used to disinfect the tank. From the tanks the water is then piped to each household c*horro*. The households then store the water that they receive in a combination of *pila*s, jugs and barrels. Some houses do not have sufficient receptacles to store water due to lack of money. This becomes critical in times of scarce water as receptacles are needed to store much needed water.

The water that is stored in the *pila*s is only used for cleaning clothes and dishes. Water that is kept in the jugs and barrels is water that is used for cooking and drinking. Not everyone in the community of Yuchan boils water which is not a result of insufficient wood as they have plenty. It was reported that those who do boil their water boil it for about 5 minutes after bubbles begin to appear on the water surface. However, coupled with the high altitude and poor tank cleaning five minutes seems insufficient to kill most all bacteria.

The sanitation situation is that all houses have a pozo either in or outside of the home that deposits waste below the ground as opposed to on top of the ground. The community has been plagued with issues of diarrhea in the past and currently has issues with diarrhea with their children. There was a *comadrona* present to confirm the community's issue with diarrhea.

III. Recommendations and Next Steps

1. Common Themes

Throughout the multiple visits with each community water committee, it became very clear that one need is to build the capacity and Support the water committee members. When asked questions regarding the specific information of their community, many members were unsure. For example, how many households in your community do not have access to water? Or how many people in your community treat their water before consumption and how do they treat their water? A positive aspect of the water committees were their dedication to their job and motivation to get work done. All committee members are volunteers with full time jobs, typically outside of the community farming and family responsibilities. When asked to identify specific information, they promptly sought out the details from their community and provided accurate information. Training of committee members will provide support, motivation, and the capacity to do more. Specific training should include: 1) Water, Sanitation, and Hygiene topics such as the four critical times for hand washing, household water treatment and storage, and water tank maintenance; and 2) Community Mobilization and organization to understand the role and responsibility of the community water committee, the interactions of the water committee with the other community committees, working with neighboring community water committees to petition the local government for training and material support, and knowledge transfer to new committee members to prevent loss of information each year or two when new committee members work together. Each committee member will typically be asked to serve on other community committees (depending on the size of the community other committees may include: Electricity, Education, Health, Road, and/or Development) after their time on the water committee. Any training provided to the water committee members, and potentially open to all of the leaders of each community, will provide support and capacity to other important committees and projects. Providing training materials in conjunction with the training and a plan for the dissemination of the information community wide, will allow for participants to share themes with other members of the community during meetings supporting the health of all members of the community. Training sessions can include multiple communities at one time in a central location to encourage collaboration and sharing of knowledge.

We also recommend education on water conservation and grey water use as communities can take advantage of available water in a more efficient way. \

2. Community Specific Recommendations

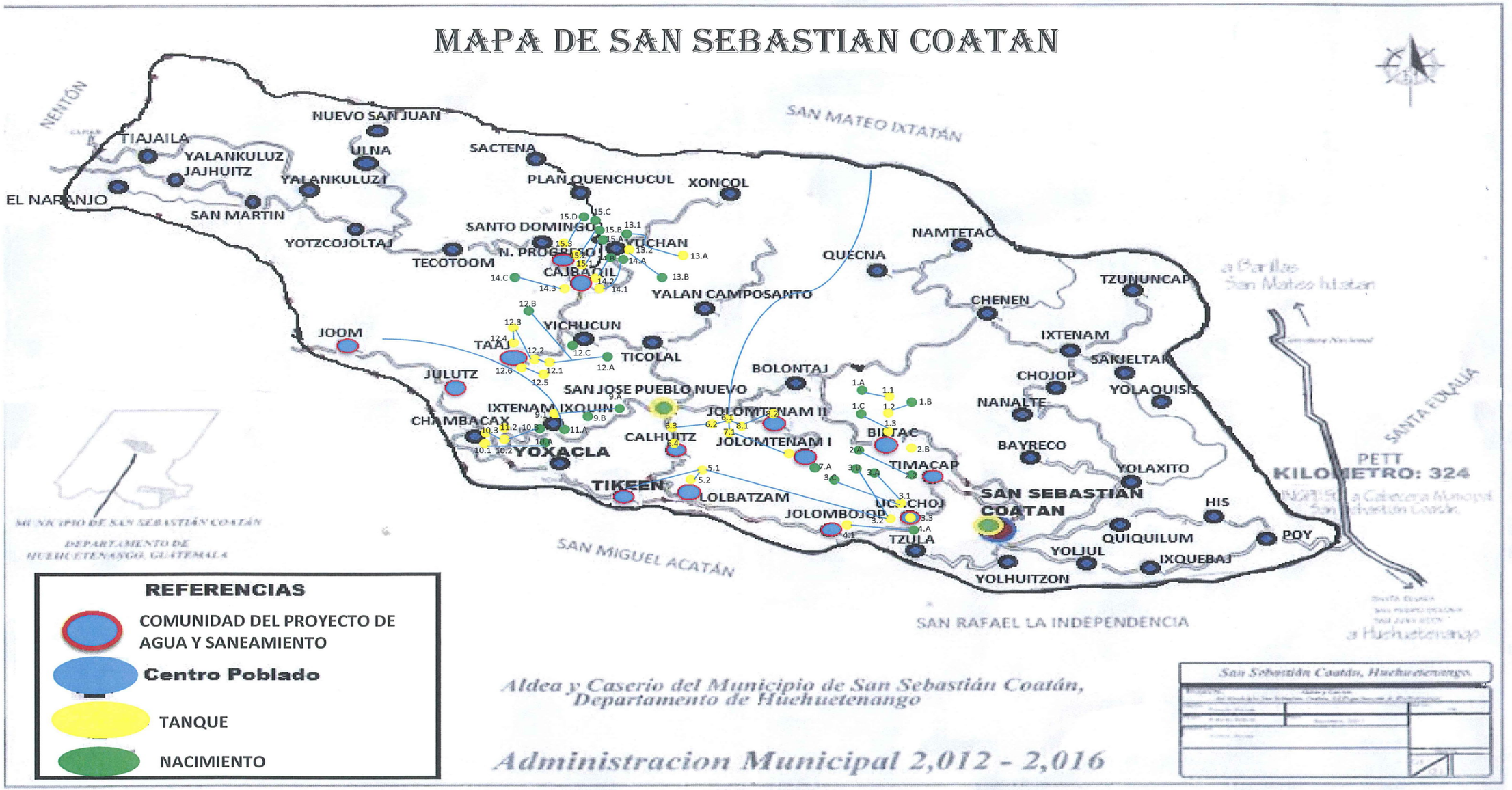
We recommend a concentrated effort on education and the cleaning of water sources in the communities with a positive bacteria reading, including Biltac, Jolombojop, Joom, Lolbatzam, and Ucachoj. While these five communities showed positive readings, the percentage of communities with bacteria presence was 33%, indicating the likeliness of other communities nearby who also have bacteria in their water. Educational campaigns on proper water treatment, storage, tank cleaning and hand-washing will help to reduce the effect of the non-potable water. In addition to education, access to supplies for cleaning water systems should be provided by the local government, requiring community mobilization to request the appropriate training on tank cleaning and then the chlorine, free of charge. These five communities should be tested for bacteria again in six months.

Communities also expressed interest in training to create wells for more consistent access to water year round.

3. Expansion of coverage of the Assessment

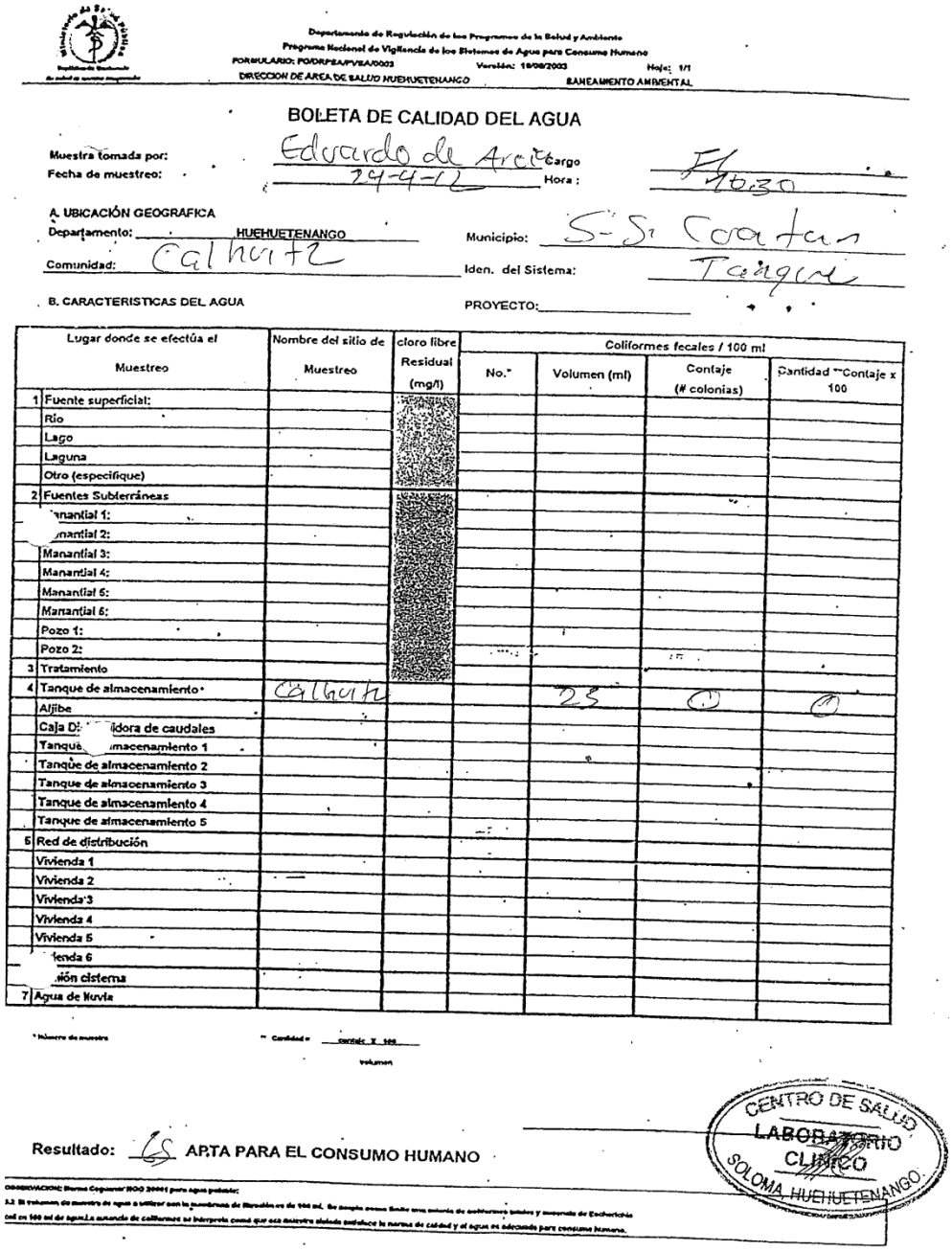
A major lesson from this assessment is that each community is unique, and while many communities have similar cultural and demographic traits, each community also has its own Water Committee, system with challenges and advantages unique to location and size of the community. Before moving forward with any major projects, an assessment should be completed to understand the true needs of the community and focus efforts and resources on the needs, identified by the community and in coordination with the local government. This assessment has proven successful in identifying what currently exists and what perceived and real needs are of each community. Future projects in these five communities will be able to use this assessment as a guide to advance quickly in providing the most appropriate and high impact development projects, small or large.

Annex A: Mapa del Sistema de Agua Comunitaria



Annex B: Bacteria Samples from April 2012

Calhuitz 6.3



Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRSA/PVSA/0003 Versión: 19/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arce Cargo Fiscal
Fecha de muestreo: 24-4-12 Hora: 8:30

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. S. Coatan
Comunidad: Calhuitz Iden. del Sistema: Tanque

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Contaje (# colonias)	Cantidad **Contaje x 100
1	Fuente superficial:						
	Río						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento	Calhuitz			23	0	0
	Aljibe						
	Caja D: dora de caudales						
	Tanque macenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	lenda 6						
	ión cisterna						
7	Agua de lluvia						

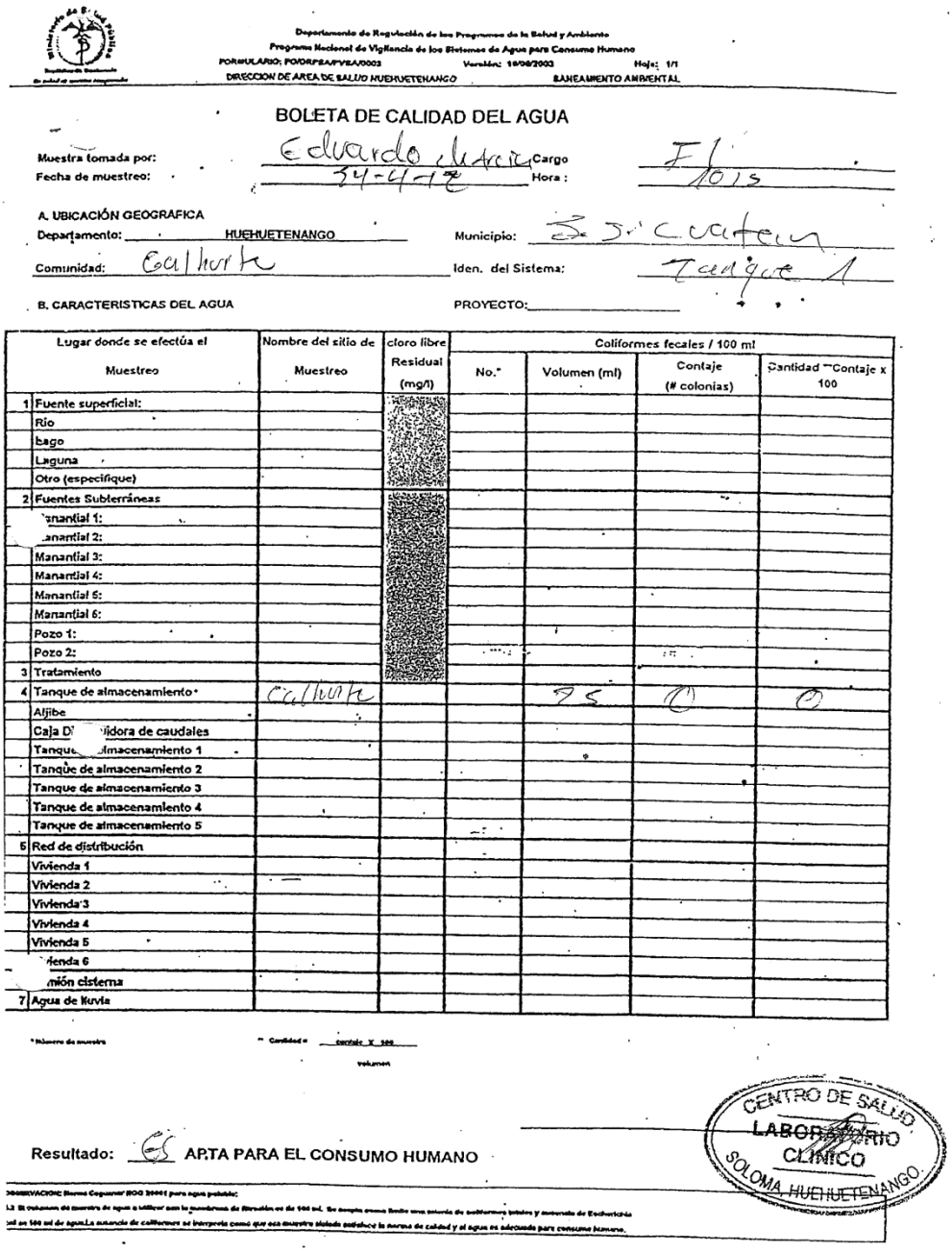
* Número de muestra
** Cantidad = contaje X 100 / volumen

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO

Resultado: APTA PARA EL CONSUMO HUMANO

OBSERVACIONES: Norma Coguanor NOG 29001 para agua potable:
2.2 El volumen de muestra de agua a sembrar con la membrana de filtración es de 100 ml. Se acepta como límite una colonia de coliformes totales y ninguna de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra analizada satisface la norma de calidad y el agua es adecuada para consumo humano.

Calhuitz Tank 6.4



Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: FO/DRPSA/PVSA/0003 Versión: 18/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo Garcia Cargo F
Fecha de muestreo: 24-4-18 Hora: 10:15

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. J. Cuatem
Comunidad: Calhuitz Iden. del Sistema: Tanque 1

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Contaje (# colonias)	Cantidad **Contaje x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento*	Calhuitz			25	0	0
	Aljibe						
	Caja Dividora de caudales						
	Tanque de almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
	Camión cisterna						
7	Agua de lluvia						

* Número de muestra
** Cantidad = contaje X 100 / volumen

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO

Resultado: ES APTA PARA EL CONSUMO HUMANO

OBSERVACIONES: Norma Guatemalteca COG 29001 para agua potable:
1.) El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se cuenta como límite una colonia de coliformes totales y ausencia de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra misma cumple la norma de calidad y el agua es adecuada para consumo humano.

Jolombojop 4.1

Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRPSA/PVSA/0003 Versión: 19/06/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arca Cargo: 51
Fecha de muestreo: 24-4-12 Hora: 9:14

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. S. Coatan
Comunidad: Jolombojop Iden. del Sistema: Tanque

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml			
				No.*	Volumen (ml)	Contaje (# colonias)	Cantidad ** Contaje x 100
1	Fuente superficial:						
	Río						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento	Jolombajop			25	0	0
	Aljibe						
	Caja Distribuidora de caudales						
	Tanque almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
6	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
	Camión cisterna						
7	Agua de lluvia						

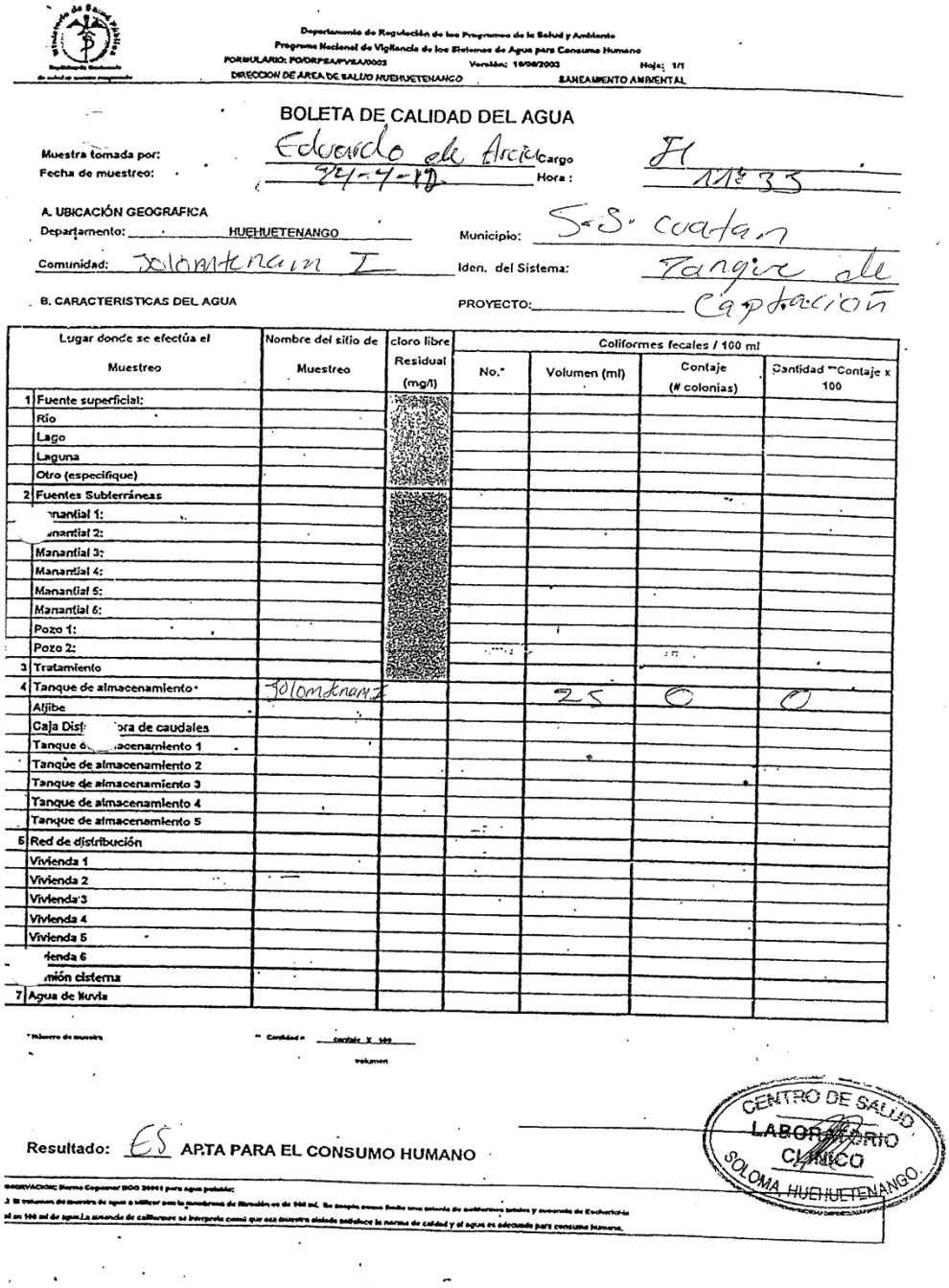
* Número de muestra ** Cantidad = contaje X 100 / volumen

Resultado: SÍ APTA PARA EL CONSUMO HUMANO

CENTRO DE SALUD LABORATORIO CLÍNICO SOLOMA, HUEHUETENANGO.

OBSERVACION: Norma Coguanor NGO 29001 para agua potable:
[illegible]

Jolomtenam I Tank 7.2



Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRPSA/PVSA/0003 Versión: 19/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arcia Cargo: FI
Fecha de muestreo: 22-4-10 Hora: 11:33

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S.S. Cuchan
Comunidad: Jolomtenam I Iden. del Sistema: Tanque de Captacion

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml			
				No.*	Volumen (ml)	Contaje (# colonias)	Cantidad **Contaje x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento	Jolomtenam I			25	0	0
	Aljibe						
	Caja Dist[illegible]ora de caudales						
	Tanque d[illegible]acenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	[illegible]lenda 6						
	[illegible]mión cisterna						
7	Agua de lluvia						

* Número de muestra ** Cantidad = contaje X 100 / volumen

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO.

Resultado: ES APTA PARA EL CONSUMO HUMANO

OBSERVACIONES: Norma Coguanor NOG 29001 para agua potable:
2. El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como fecha una ausencia de coliformes totales y ausencia de Escherichia [illegible] en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra alcanza satisface la norma de calidad y el agua es adecuada para consumo humano.

Jolomtenam II Tank 8.1

Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRPSA/PVSA/0003 Versión: 10/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arcia Cargo: FI
Fecha de muestreo: 24-4-12 Hora: 10:48

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. S. Coatan
Comunidad: Jolomtenam II Idén. del Sistema: Tanque de captación

B. CARACTERISTICAS DEL AGUA PROYECTO: ____

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Conteo (# colonias)	Cantidad **Conteo x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento	Jolomtenam II			23	0	0
	Aljibe						
	Caja Distribuidora de caudales						
	Tanque de almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
	Unión cisterna						
7	Agua de lluvia						

* Número de muestra ** Cantidad = conteo X 100 / volumen

Resultado: ES APTA PARA EL CONSUMO HUMANO

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO

OBSERVACION: Norma Coguanor NGO 29001 para agua potable:
5.2 El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como límite una colonia de coliformes totales y ausencia de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra aislada satisface la norma de calidad y el agua es adecuada para consumo humano.

Lolbatzam Tank 5.2

Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRPSA/PVSA/0003 Versión: 10/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arcia Cargo: F1
Fecha de muestreo: 24-8-12 Hora: 9:48

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S.S. Cuatan
Comunidad: Lolbatam Iden. del Sistema: Tanque de captación

B. CARACTERISTICAS DEL AGUA PROYECTO:

Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml			
			No.*	Volumen (ml)	Contaje (# colonias)	Cantidad ** Contaje x 100
1 Fuente superficial:						
Río						
Lago						
Laguna						
Otro (especifique)						
2 Fuentes Subterráneas						
Manantial 1:						
Manantial 2:						
Manantial 3:						
Manantial 4:						
Manantial 5:						
Manantial 6:						
Pozo 1:						
Pozo 2:						
3 Tratamiento						
4 Tanque de almacenamiento	Lolbatan			25	0	0
Aljibe						
Caja Distribuidora de caudales						
Tanque de almacenamiento 1						
Tanque de almacenamiento 2						
Tanque de almacenamiento 3						
Tanque de almacenamiento 4						
Tanque de almacenamiento 5						
5 Red de distribución						
Vivienda 1						
Vivienda 2						
Vivienda 3						
Vivienda 4						
Vivienda 5						
Vivienda 6						
Camión cisterna						
7 Agua de lluvia						

* Número de muestra

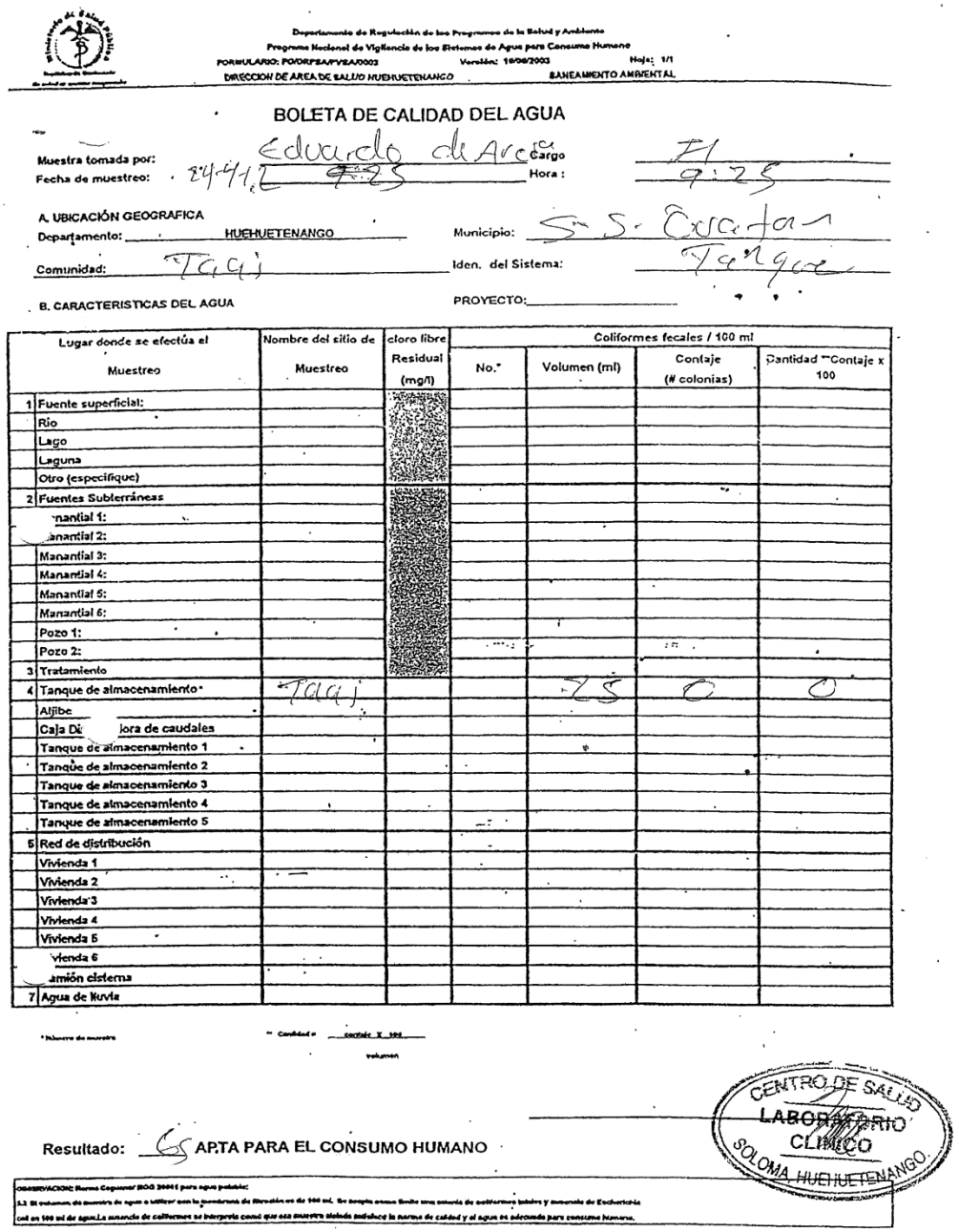
** Cantidad = contaje X 100 / volumen

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO.

Resultado: GS APTA PARA EL CONSUMO HUMANO

OBSERVACION: Norma Coguanor NGO 29001 para agua potable:
[illegible] El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como límite una colonia de coliformes totales y ausencia de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra aislada satisface la norma de calidad y el agua es adecuada para consumo humano.

Taaj Tank 12.5



Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: FOVDRPSA/PVSA/0003 Versión: 19/06/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arce Cargo: El
Fecha de muestreo: 24-4-12 Hora: 9:25

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. S. Cuchan
Comunidad: Taaj Iden. del Sistema: Tanque

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Contaje (# colonias)	Cantidad **Contaje x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento*	Taaj			25	0	0
	Aljibe						
	Caja Di[illegible]lora de caudales						
	Tanque de almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
	Camión cisterna						
7	Agua de lluvia						

* Número de muestra
** Cantidad = contaje X 100 / volumen

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO.

Resultado: 65 APTA PARA EL CONSUMO HUMANO

OBSERVACIONES: Norma Coguanor NOG 29001 para agua potable:
5.2. El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como límite una cantidad de coliformes totales y cantidad de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra analizada satisface la norma de calidad y el agua es adecuada para consumo humano.

Timacap Tank 2.1

Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: FO/DRPSA/PVSA/0003 Versión: 19/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arcia Cargo: EI
Fecha de muestreo: 24-4-12 Hora: 7:37

A. UBICACIÓN GEOGRAFICA
Departamento: HUEHUETENANGO Municipio: S. S. Coatan
Comunidad: Tinacap Iden. del Sistema: Tanque

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Conteo (# colonias)	Cantidad ** Conteo x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento	Tinacap		-	25	0	0
	Aljibe						
	Caja Distribuidora de caudales						
	Tanque de almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
6	Camión cisterna						
7	Agua de lluvia						

* Número de muestra ** Cantidad = conteo X 100 / volumen

Resultado: ES APTA PARA EL CONSUMO HUMANO

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO.

OBSERVACION: Norma Coguanor NGO 29001 para agua potable:
2. El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como límite una colonia de coliformes totales y ausencia de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra aislada satisface la norma de calidad y el agua es adecuada para consumo humano.

UCACHO Tank 3.2

Departamento de Regulación de los Programas de la Salud y Ambiente
Programa Nacional de Vigilancia de los Sistemas de Agua para Consumo Humano
FORMULARIO: PO/DRPSA/PVSA/0003 Versión: 19/08/2003 Hoja: 1/1
DIRECCION DE AREA DE SALUD HUEHUETENANGO SANEAMIENTO AMBIENTAL

BOLETA DE CALIDAD DEL AGUA

Muestra tomada por: Eduardo de Arcia Cargo: E1
Fecha de muestreo: 24-4-12 Hora: 8:33

A. UBICACIÓN GEOGRAFICA

Departamento: HUEHUETENANGO Municipio: S. S. Coatan
Comunidad: Ucadros Iden. del Sistema: Tanque

B. CARACTERISTICAS DEL AGUA PROYECTO:

	Lugar donde se efectúa el Muestreo	Nombre del sitio de Muestreo	cloro libre Residual (mg/l)	Coliformes fecales / 100 ml No.*	Volumen (ml)	Contaje (# colonias)	Cantidad ** Contaje x 100
1	Fuente superficial:						
	Rio						
	Lago						
	Laguna						
	Otro (especifique)						
2	Fuentes Subterráneas						
	Manantial 1:						
	Manantial 2:						
	Manantial 3:						
	Manantial 4:						
	Manantial 5:						
	Manantial 6:						
	Pozo 1:						
	Pozo 2:						
3	Tratamiento						
4	Tanque de almacenamiento*	Ucadros			28	0	0
	Aljibe						
	Caja Distribuidora de caudales						
	Tanque de almacenamiento 1						
	Tanque de almacenamiento 2						
	Tanque de almacenamiento 3						
	Tanque de almacenamiento 4						
	Tanque de almacenamiento 5						
5	Red de distribución						
	Vivienda 1						
	Vivienda 2						
	Vivienda 3						
	Vivienda 4						
	Vivienda 5						
	Vivienda 6						
	[illegible]ión cisterna						
7	Agua de lluvia						

* Número de muestra ** Cantidad = contaje X 100 / volumen

Resultado: GS APTA PARA EL CONSUMO HUMANO

CENTRO DE SALUD LABORATORIO CLINICO SOLOMA, HUEHUETENANGO

OBSERVACION: Norma Coguanor NGO 29001 para agua potable:
2 El volumen de muestra de agua a utilizar con la membrana de filtración es de 100 ml. Se acepta como límite una colonia de coliformes totales y ausencia de Escherichia coli en 100 ml de agua. La ausencia de coliformes se interpreta como que esa muestra aislada satisface la norma de calidad y el agua es adecuada para consumo humano.

Annex C: Abbreviated Curriculum Vitae of David Heiser, Water Engineer

David M. Heiser, PE, BCEE
Mr. Heiser is a Senior Environmental Engineer with CDM Smith, an environmental engineering firm with over 90 offices world-wide. He has over 37 years of experience in the planning, design, construction, and operation, of water, wastewater, landfill leachate, and air emissions treatment facilities. Much of his design and construction experience has included drinking water storage, pumping, and distribution systems, as well as wastewater collection and pumping facilities. These systems have been for municipal, private, and military installations, both urban and rural, and have ranged from very small to very large systems, both in the USA and Hong Kong.

Mr. Heiser grew up in several countries in south Asia, traveled worldwide in the US Air Force, and has more recently been involved with mission work in several countries in Africa and Central America, as well as in several states in the USA> He was instrumental in 2010 working with World Vision in the DRC Congo to get three drinking water wells drilled, in an impoverished suburb of Lubumbashi (Kasumgami), and in March 2012 was the technical advisor on an Engineers Without Borders work team to Nicaragua to repair electric and rope pumps for the wells in a Miskitu community near Wampum. He has been very active with his church all his life, has been on multiple mission trips with the church both in the USA and overseas, and in October 2009 trained by the United Methodist Church to be an Individual Volunteer in Mission. He continues to work with UMCOR in the DRC Congo with their Sustainabile Agriculture and Development program staff to provide agricultural training to the residents of Kasumgami..

Annex D: Water Committee Questionnaire

Water Committee Questionnaire

The purpose of this questionnaire is to assess whether the committees understand the water situation in the communities they represent. In addition, the questionnaire will be used to assess the need for and availability of water and the desire of people wanting to hand washing stations in your community and home.

Location: _____ Questionnaire #: _____ Date: ____/____/_____
Water Committee Member Names:
_____;_____;
_____; _____.
Primary Contact Telephone Number: _____
Language of Primary Contact: Native: _____ Secondary: _____
What are the goals or problems that your committee has identified this year in your community?
_____
_____
_____

Questions about the committee's knowledge about their community:

1) Do you know how many people and families live in the village that you represent?

Yes_____; If, yes, How many people? Families? #_____, No_____

2) How many households are in your community #_____, Unsure: _____.

3) How many of these people and / or families do not have enough water for bathing, cooking, washing hands, washing clothes etc. every day?#_____, Unsure_____, Few _____, Many_____, Almost all_____

4) Does your community have access to water throughout the year? Yes_____; Yes, if what time / s of year or month / s water is Scarce?_____, No _____.

5) If you have a tank, how many days does the community receive water from the tank? _____

6) If your community has access to water, what is the source of water? Please mark all that apply: river____; spring____; well____; rain____; other source_____.

7) Does the community pay for water? Yes_____; If yes, ¿How much does the community pay per person or in total per year/month? Quetzals._____ No_____; Unsure_____.

8) Where does your community store water? Please mark all that apply: Tank_____; Pitcher_____; Cube_____; Barrel_____. And how is water stored in the home? Please mark all that apply: Tank_____; Pitcher_____; Cube_____; Barrel_____.

9) Do you know if the stored water is potable water? Yes, it is safe _____; No it is not

safe_____; Unsure_____.

10) When the water is tested in your community is notified of the results? Yes_____, No_____. When was the last time you were notified?_____

11) If proven results say "NOT FOR HUMAN CONSUMPTION," are the people of the community informed? Yes _____, No_____.

12) How is water purified for household and community use? Clorox_____; Boil_____; No Treatment _____.

Knowledge of people about the importance of hand washing, proper storage and treatment of water:

12) Do people in the community know about the importance of washing hands with soap at the 4 critical times?: 1. after using the bathroom, 2. before eating, 3. before preparing food, 4. after changing the baby? Yes____, No____, Unsure_____.

13) Does the community have access to soap? Yes_____, No_____.

14) Do the people of the community know the importance of treating your water with chlorine or boiling? Yes____, No____, Unsure_____.

15) Does the community have Access to chlorine? Yes____, No____, Unsure_____.

16) Does the community have sufficient firewood to boil water? Yes____, No____, Unsure_____.

17) Do people in the community know the importance of proper and adequate storage of water? Yes____, No____, Unsure_____.

18) Do people in your community have access to containers that to store your water right? Yes____, No____, Unsure_____.

The need and desire among the people for more community drinking water and hand washing stations:

19) Is there a need in the community for more drinking water to meet daily living? Yes____, No____, Unsure_____.

20) Do you know if the people of the community want hand washing stations at home? Yes____, No____, Unsure_____.

21) How much money can each house on average provide to build a park to wash hands? Q._____.

Do you have any other concerns or comments you would like to communicate?

ANNEX E: GPS POINT LOCATION LOG

San Sebastian Coatan, Huehuetenango, Guatemala
GPS Point Location Log (August 2012)
By Dave Heiser, PE

DATE	TIME	COMMUNITY	LATITUDE	LONGITUDE	ELEVATION (ft)	NOTES/LOCATION
8/19/2012	1400	Calhuitz	N15°45'26.0"	W91°37'33.8"	7634	Casa Materna (CM)
	1820		N15°45'19.8"	W91°37'7.0"	8200	Top of primary water tank 6.3
	1845		N15°45'20.7"	W91°37'16.8"	7913	Top of secondary water tank 6.4 (for sectors 3 & 4)
8/20/2012	1000	Lolbatzam	N15°44'24.7"	W91°37'9.0"	6961	Ground next to main tank 5.1
	1135		N15°44'30.1"	W91°37'31.8"	6914	Top of smaller tank 5.2
	1200		N15°44'24.2	W91°37'30.1"	6818	Top of additional small tank 5.3 (to 24 houses)
	1230		N15°44'25.3"	W91°37'32.5"	6794	Open "well" 5.A (5m+/- deep) - source during dry season
	1500	Jolombojop	N15°44'43.5"	W91°36'4.6"	6550	Summer spring box 4.A (Nov-May only)
	1600		N15°44'27.7"	W91°36'32.0"	6516	Top of large tank 4.1 (on road), water from Ucachoj
8/21/2012	945	Joom/Julutz	N15°45'59.7"	W91°38'45.8"	6510	Spring box 11.A for Joom located near Ixtenam
	1100		N15°45'5.5"	W91°39'14.8"	6202	Small spring 10.A for Joom & Julutz (2 spring boxes)
	1100		N15°46'4.3"	W91°39'16.2"	6188	Large spring 10.B for Joom & Julutz
	1200		N15°46'13.6"	W91°40'4.7"	5968	Large tank 10.1 to Julutz (3.9x3.9x1.8m)
	1230		N15°46'12.7"	W91°40'4.2"	6010	Large tank 10.3 to Julutz (5.6x4.85x1.9m)
	1315		N15°46'45.0"	W91°40'51.2	5723	Tank 11.2 to Joom (only) - built 6/26/05 (4.6x4.6x2.1m)
	1350		N15°46'59.7"	W91°41'4.4"	5361	Home in Joom (see GPS) outdoor pila
8/22/2012	1015	Jolomtenam I	N15°45'28.6"	W91°36'15.7"	7434	School in Jolomtenam I
	1110		N15°45'26.9"	W91°35'59.1"	7172	2nd source/springbox 7.A - downhill
	1145		N15°45'18.9"	W91°36'16.5"	7759	Large tank 7.2 (full-overflowing)
	1430	Pok	N15°45'39.0"	W91°36'45.2"	8559	3-way distr tank 6.1 (2.3x2.5x1.0m)
	1530	Jolomtenam II	N15°45'56.6"	W91°36'8.7"	8352	Main tank 8.2 (3.7x3.7x1.94m)
	1600		N15°46'5.2"	W91°36'18.3"	8114	House at lower end
8/23/2012	1000	Ixtenam	N15°45'59.6'	W91°38'52.9"	6429	School (low end of distribution system)
	1100		N15°45'58.7"	W91°38'38.9"	6670	Main tank 9.1 - full/overflowing
	1130		N15°46'3.9"	W91°38'18.0"	6619	2nd spring (9.B), just purchased 3 yrs ago for Q60,000
	1150		N15°46'9.9"	W91°38'14.0"	6696	Main spring 9.A

DATE	TIME	COMMUNITY	LATITUDE	LONGITUDE	ELEVATION (ft)	NOTES/LOCATION
	1515	Biltac	N15°45'31.0"	W91°35'15.6"	5882	Tank 1.3 (3.9x2.9x1.8m) - lowest of 3 tanks
	1540		N15°45'31.6"	W91°35'8.2"	5670	Lowest home on lowest tank
	1615		N15°45'55.4"	W91°35'31.5"	6928	Middle tank 1.2 (3.8x3.8x1.45m) 1/2 full
	1700		N15°45'49.3"	W91°35'41.1"	7295	Highest tank 1.1 (4.4x4.4x1.45m)
	1710		N15°45'54.7"	W91°35'41.3"	7245	Chorro at Catholic church
8/25/2012	1045	Timacap	N15°45'20.6"	W91°35'56.3"	7036	Main spring 2.A
	1115		N15°45'20.5"	W91°35'57.0"	7067	3 springs to 4 communities (springbox 3.A to Ucachoj ; springbox 3.B NOT clean; springbox 3.C is main supply)
	1150		N15°45'14.8"	W91°35'46.5"	6955	Upper tank 2.1 (2.4x2.4x1.43m)
	1210		N15°45'11.1"	W91°35'41.6"	6799	Distribution tank 2.2
	1240		N15°45'13.5"	W91°35'36.5"	6598	Pila at house at low end
	1500	Ucachoj	N15°44'52.7"	W91°36'2.4"	7022	Upper tank 3.2 from springboxes 3.B & 3.C-tank splits water to Jolombojop, Ucachoj & Lolbatzam
	1520		N15°44'51.9"	W91°36'2.3"	6996	Tank 3.1 from springbox 3.A (3.0x3.0x1.8m)
	1540		N15°44'43.6"	W91°36'16.7"	6908	Lower small tank 3.3 (1.2x1.5x1.1m)
8/26/2012	1030	Calhuitz	N15°47'30.8"	W91°34'20.5"	7652 ±	One of 3 springboxes on Jolaktanak Rio (too much foilage to get a good reading) [6.A]
	1115		N15°47'22.5"	W91°34'19.4"	7524	Where Yolaktanak crosses road
	1130				7070	Low point in road from Yolaktanak to Calhuitz
	1200				5.5 miles	Dist. on road from Yolak. Rd crossing to CM tank in Calhuitz
	1200		N15°45'7.5"	W91°36'38.0"	7966	Aux. spring 6.B at bottom of a "bowl" on top of mountain
	1220		N15°45'11.6"	W91°36'44.3"	8157	Top of ridge on side of "bowl" w/aux. spring 6.B
8/27/2012	1050	Taaj	N15°47'3.1"	W91°39'18.8"	5666	Pila at house at low end (from 2 small springs)
	1125		N15°46'55.0"	W91°38'54.2"	5849	3 distr. tanks near church (largest tank 12.5 = 4.65x4.65m)
	1140		N15°46'53.7"	W91°38'39.3"	6046	3 main tanks [12.1, 12.2, 12.3] from 2 springs (all full)
	1230		N15°47'2.6"	W91°37'53.0"	6560	Large springbox 12.C (creek water goes directly into box)
	1510	Yuchan	N15°48'23.9"	W91°37'30.2"	6334	Small D-box 13.1 from small spring 13.A (3/4" influent line)
	1530		N15°48'23.7"	W91°37'33.3"	6217	Pila at house - sector 1 - from small tank
	1550		N15°48'33.6"	W91°37'37.3"	6251	Tank 13.2 from larger spring 13.B - sector 2
	1600		N15°48'37.6"	W91°37'44.0"	6098	Pila at house - sector 2

DATE	TIME	COMMUNITY	LATITUDE	LONGITUDE	ELEVATION (ft)	NOTES/LOCATION
8/28/2012	1005	Nuevo Progreso	N15°47'42.3"	W91°38'4.7"	6534	Approx. 40m above spring 15.A for school
	1020		N15°47'39.4"	W91°38'5.8"	6554	Approx. 80m below spring 15.B (1/2" dia.); 1" from spring 15.C tees into 1/2" tubo here
	1100		N15°47'50.6"	W91°38'27.7"	6432	Large tank 15.3 from large spring 15.D after D-box 15.3a
	1125		N15°47'53.2"	W91°38'34.7"	6353	Small tank 15.1 to school from small spring 15.A
	1335	Cajbaquil	N15°47'49.0	W91°38'5.6"	6525	30m above spring box (14.B?)
	1430		N15°48'25.7"	W91°38'33.1"	6288	Lowest small tank 14.3 (2.46x2.46x1.65m)
	1520		N15°48'18.7"	W91°38'34.8"	6396	Middle tank 14.2 (1/3 full)
	1535		N15°48'12.2"	W91°38'30.5"	6481	Upper tank 14.1 (1/2 full) (18-20 pipes w/valves exiting)

ANNEX F: Water Quality Tests Results Log

San Sebastian Coatán, Huehuetenango, Guatemala

Water Quality Test Results Log (August 2012)

Field Technician: Dave Heiser, PE

Date	Time	Vial #	Bact.	pH	Nitrite	Nitrate	Ammonia	Notes/Location
8/19/2012	1830	1	Neg					Calhuitz - primary (large) uphill tank 6.3
	1900	2	Neg					Calhuitz - secondary (small) tank 6.4
8/20/2012	1000	3	**POS**	7.0	0.0	0.5	0.0	Main tank 5.1 for Lolbatzam (Two 3" PVC to town)
	1130	4	**POS**	7.0	0.1	1.0	0.0	Smaller tank 5.2 in Lolbatzam
	1518	5	**POS**	6.5	0.0	0.5	0.0	Summer spring box 4.A in Jolombojop
	1600	6	**POS**	6.5	0.5	1.5	0.0	Large tank 4.1 in Jolombojop; water is from Ucachoj/Timacap
8/21/2012	0930	7	Neg	6.3	0.1	0.5	0.0	Spring 11.A for Joom (located in Ixtenam)
	1015	8	Neg	6.5	0.0	0.8	0.0	2 springs 10.A for Julutz (located in Ixtenam)
	1115	9	Neg	6.8	0.0	0.5	0.0	Large spring 10.B to Joom & Julutz
	1200	10	Neg	6.5				Large tank 10.1 to Julutz (only) directly from spring 10.A
	1230	11	Neg	6.2	0.0	0.8	0.1	Outdoor pila in Julutz next to home
	1315	12	**POS**	7.0				Large tank 11.2 to Joom (built 6/26/05)
	1345	14	**POS**	6.8	0.0	0.8		Outdoor pila in Joom
8/22/2012	1020	13	Neg	6.5	0.0	0.0	0.0	Chorro at school in Jolomtenam I
	1150	15	Neg	6.5	0.0	0.0	0.0	Large tank 7.2 to Jolomtenam I (3.6x3.6x1.95m) - very full
	1440	1	Neg	6.5	0.0	0.0	0.0	Pok distribution tank 6.1 (Influent line is from San Mateo)
	1530	2	Neg	6.3	0.0	0.0	0.0	Main tank 8.2 for Jolomtenam II (very full)
	1600	3	Neg	6.3				Chorro at house at lower end of Jolomtenam II
8/23/2012	0700	4	Neg	6.0	0.0	0.0	0.0	Bathroom faucet at Casa Materna
	1000	5	Neg	6.0	0.0	0.0	0.0	School in Ixtenam - at low end of distribution system

Date	Time	Vial #	Bact.	pH	Nitrite	Nitrate	Ammonia	Notes/Location
	1100	6	Neg	6.3	0.0	0.0	0.0	Main tank 9.1 for Ixtenam (5.5x5.5x2.0m)
	1130	7	Neg	6.0	0.0	0.0	0.0	Ixtenam 2nd spring 9.B (not used) purchased 3 years ago from San Jose
	1150	8	Neg	6.0	0.0	0.0	0.0	Main spring 9.A for Ixtenam
	1525	9	Neg	6.0	0.0	0.0	0.0	Tank 1.3 = lowest of 3 tanks for Biltac
	1540	10	Neg	6.5	0.0	0.0	0.0	Chorro at home from lowest tank in Biltac
	1620	11	**POS**	6.0	0.0	0.0	0.0	Mid-level Biltac tank 1.2; 1/2 full; sediment on invert; 2" pipe in ; 2" out
	1700	12	Neg	6.0	0.0	0.5	0.0	Highest tank 1.1 in Biltac (full) (cleaned last week)
	1710	14	Neg	6.5	0.0	0.0	0.0	Chorro at Catholic church in Biltac - from highest tank
8/25/2012	1045	13	Neg	6.0	0.0	0.9	0.0	Spring box 2.A to Timacap (2.4x2.4x0.9m) - surface runoff (O/F's from tanks above) possibly going into this tank, which was overflowing [Spring box 3.A is almost dry-goes to Ucachoj]
	1115	15	**POS**	6.0				Spring box 3.C above Timacap - built 23 yrs ago - supply for 4 communities - sampled from (2) 8" O/F's
	1130	1	**POS**	6.8	0.0	0.8	0.0	Spring box 3.B above Timacap - not well maintained, very dirty on top, floating debris on water in box - very hard to sample.
	1150	2	Neg	6.0	0.0	0.8	0.0	Upper tank 2.1 for Timacap
	1240	3	Neg	6.0	0.0	0.8	0.0	Pila at house at low end of Timacap
	1510	4	**POS**	6.5	0.0	0.8	0.0	Upper tank 3.2 for Ucachoj - from springboxes 3.B & 3.C (same dim's as main tank for Lolbatzam)
	1520		No Results					Upper tank 3.1 for Ucachoj - from spring box 3.A (less than 1/2" water in spring box, so could not sample)
	1610	5	**POS**	6.5			0.0	Pila on distribution system from lower (small) tank directly in Ucachoj
8/26/2012	1000	9	Neg	6.0	0.0	0.0		Spring box 6.A = lowest of 3 on Yolaktanak Rio (Calhuitz' future source)
8/27/2012	1120	6	Neg	5.5	0.0	0.0	0.0	Pila at low end home (from 2 smaller springs) in Taaj
	1140	8	Neg	5.5			0.0	Large main tank 12.5 for Taaj (full)(6.75x6.15x1.66m) - from spring 12.C

Date	Time	Vial #	Bact.	pH	Nitrite	Nitrate	Ammonia	Notes/Location
	1145	7	Neg	5.8				Upper small tank 12.1 for Taaj (full) - from smaller 2 springs 12.A & 12.B
	1230	10	Neg	5.5	0.0	0.0		Large springbox 12.C for Taaj on Yalan Tocalap creek
	1510	11	Neg	5.2			0.0	Smaller tank 13.1 from small spring 13.A for Yuchan with 3/4" influent pipe going into access hatch (not underground) in sector 1
	1530	12	Neg	5.2				Pila at house in Yuchan from small tank in sector 1
	1545	13	Neg	5.1				Tank 13.2 for Yuchan from large spring 13.B in sector 2
	1600	14	Neg	5.1			0.0	Pila at house in Yuchan in sector 2
8/28/2012	1100	9	Neg	5.8			0.0	Large tank 15.3 to Nuevo Progreso from large common spring 15.D w/Santo Domingo - full and clear water
	1100	15	Neg	5.8	0.0	0.0		Small tank 15.2 to Nuevo Progreso (from 2 springs) - full and clear water
	1120	1	Neg	5.2				Small tank 15.1 to Nuevo Progreso school (from additional small spring; water line above bottom of top slab; no observed flow in or out) - sampled from faucet on side of tank
	1435	2	Neg	5.2	0.0	0.0		Small (lowest) tank 14.3 in Cajbaquil - full/clear (to 11 homes)
	1440	3	Neg	5.1				Pila at low house on other tank (near lowest tank) in Cajbaquil
	1520	4	Neg	5.1				Middle tank 14.2 in Cajbaquil (5.56x2.45x3.50x1.5m) - samples from inflow from spring, for which we got approx. GPS reading (see above, under Nuevo Progreso)
	1540	5	Neg	5.1			0.0	Upper tank 14.1 in Cajbaquil (1/2 full; 18-20 pipes w/valves going out invert of tank)

ANNEX G: Field Photos

Photo 1 - A typical nacimiento

Photo 2 - A well for summer use only

Photo 3 - A typical community water tank

Photo 4 - A typical community water tank

Photo 5 - Distribution box

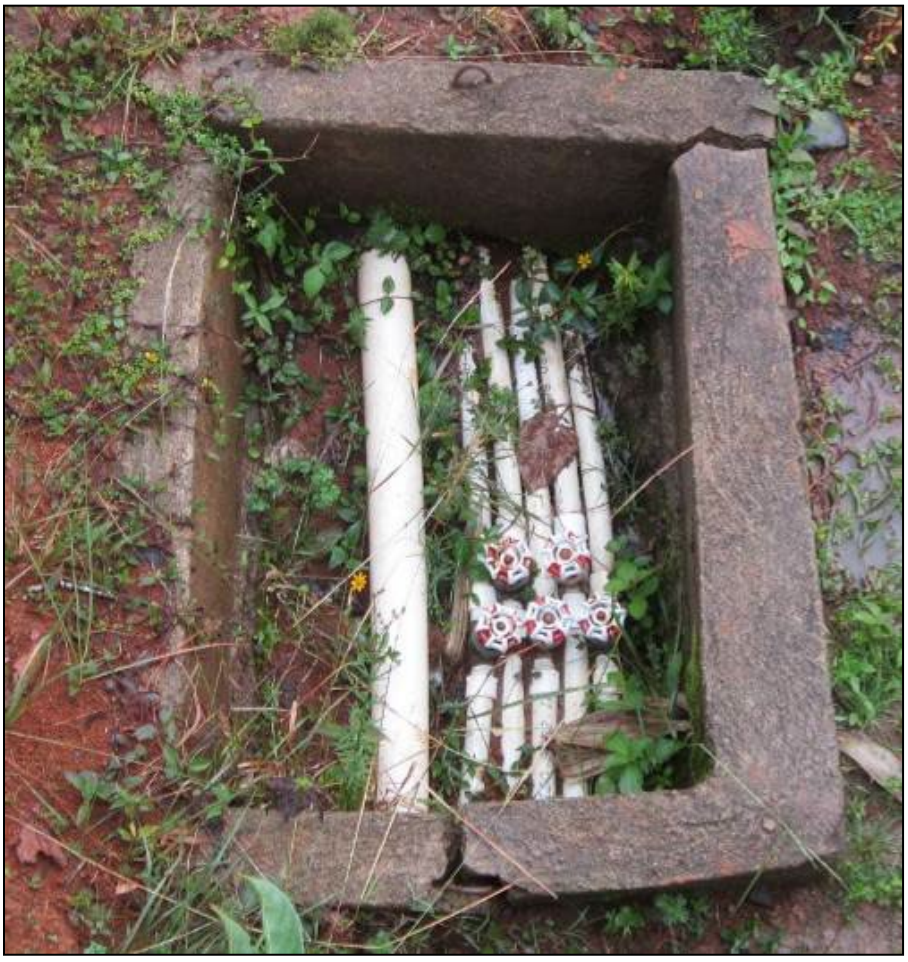


Photo 6 - *Valvulas* on *tubos* from a *tanque*

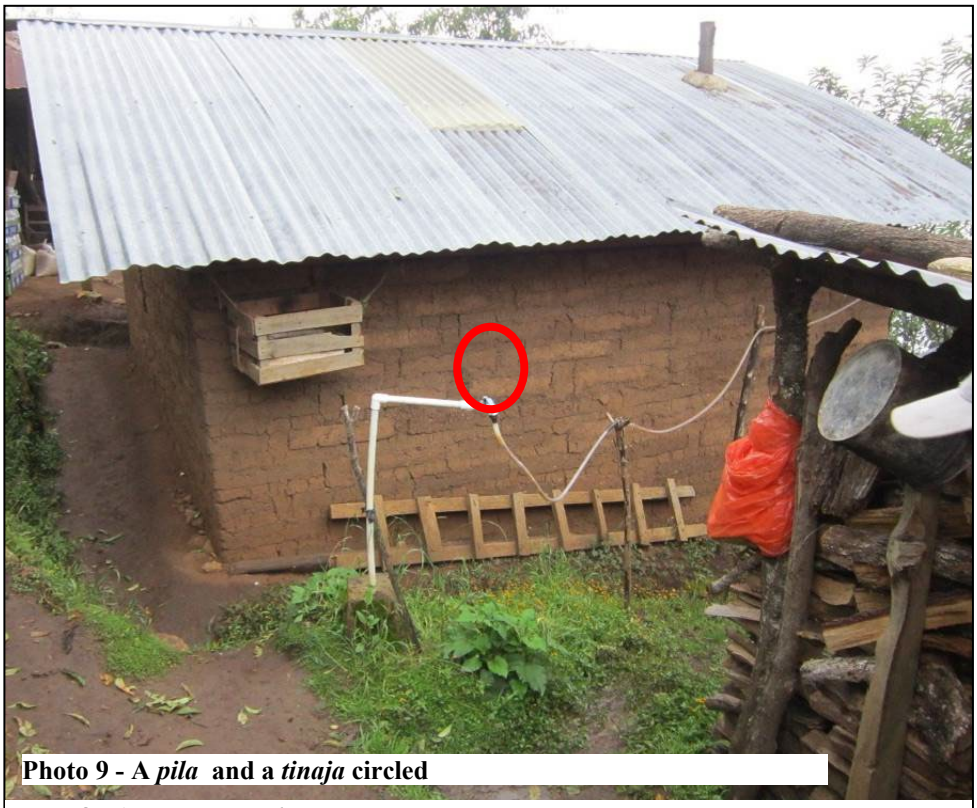


Photo 9 - A *pila* and a *tinaja* circled

Photo 8 - A household *chorro*

Photo 7 - A typical *pila* center, and *chorro* left

Photo 10 - Two *depositos*

Photo 11 - A typical *sanitario*