

WEFTA SPONSORED TRIP TO BOLIVIA



UMA – WATER – AGUA

EL ALTIPLANO, BOLIVIA

TRIP REPORT

Related to Site Visit made by WEFTA VOLUNTEERS
to El Altiplano, Bolivia
July 7 – July 17, 2017

The **Altiplano** (Spanish for “high plain”), Collao Andean Plateau or Bolivian Plateau, in west-central South America, is the area where the Andes are the widest. It is the most extensive area of high plateau on Earth outside of Tibet. The bulk of the **Altiplano** lies in Bolivia, but the remaining parts lie in Peru, Chile and Argentina.

La Paz and El Alto with over one-million inhabitants are the largest combined cities in Latin America inhabited by indigenous Americans and the highest major metropolis in the world.

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WEFTA SPONSORED PROJECTS El Altiplano, Bolivia

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Kamisaraki (Aymara Greeting)

On July 7, 2017 a small group of nine WEFTA volunteers traveled from the arid southwest United States to El Altiplano of Bolivia. The nine volunteers comprised of Jason Gehrig, Water Engineer, Justin Logan, Wastewater Engineer, José Ortiz and Sara Mason, Engineers in Training (EIT)s, Richard Mulliken, Surveyor, Ramón Lucero, Water Resource Project Managers and Dolores Mulliken, and Liz and Brook Login collectively from New Mexico, Utah and Texas traveled to El Alto/La Paz Bolivia with the following four goals.

- Visits previous WEFTA projects;
- Review existing and develop new wastewater treatment designs;
- Provide training on the Total Station Survey Equipment; and
- Obtain GPS points for previous WEFTA project locations.

Upon arriving at El Alto airport which is located at an altitude of 13,325 feet above mean sea level, the highest international airport in the world, we were greeted by our long-term Bolivian

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Partner, Suma Jayma. Suma Jayma, a non-profit, non-governmental organization (NGO) comprised of Braulio and Jaime Rojas and their families who are dedicated to serving marginal rural, semi-urban and urban areas of Bolivia who are most in need. Suma Jayma employees are of Aymara indigenous persons from the Bolivian Andean High Plains, "Altiplano" who know first-hand the difficult situations faced by their people and, for this reason, are moved to help them in meeting their most basic needs.

After approximately ten days, on July 17, 2017 the WEFTA volunteers said their farewells to Braulio and Jaime Rojas and their families (Suma Jayma) with the following collective accomplishments.

- Document the condition and functionality of previous WEFTA/Suma Jayma water system improvement projects. Documentation include impacts to health and overall well-being of community members, community demographics, GPS of the water source and water storage tank locations, and recommendations for on-going operation and maintenance of the water system.
- Meet with the municipalities of Viacha and El Alto public work employees and municipality engineers to review existing and new wastewater system designs. These meetings included trainings to improve the operation and maintenance procedures for the existing and future wastewater treatment facilities.
- Provide technical training to Suma Jayma staff on the Total Station Survey Equipment. This survey equipment and additional operations information will be utilized by Suma Jayma when they're designing new projects.

Bolivian Expressions

Liquido Primordial	Primordial Liquid (from the beginning of time)
Sin agua no hay salud	Without water we are not healthy
Sin agua no hay educación	Without water we have no education
Sin agua no hay vida	Without water there is no life
Uma (Water) es Vida	Water is life
Seguir adelante con un espíritu juvenil	Continue living life with a youthful spirit



SITE VISIT BOLIVIA 2017

JULY 7TH TO 16TH

AGENDA

Group 1: Jason Gehrig, Justin Logan, Richard Mulliken

Group 2: Ramón Lucero, José Ortiz, Sara Mason

Friday, July 7th: leaving from the U.S.

Saturday, July 8th: Arriving in Bolivia, resting

Sunday, July 9th: Both groups. Site visit to the municipality of Calamarca, community of Hichuraya

Monday, July 10th: Both groups. Visit to the municipality of Comanche, communities of Huacallaya, Comanche Chico, Palcoma Baja

Tuesday, July 11th: Group 1 site visit to Viacha, waste water projects. Meeting with engineers from municipality

Group 2 site visit to the municipality of Comanche, communities of Villa El Carmen, Tuli, Salviani Parco

Wednesday, July 12th and Thursday, July 13th: Both groups. Site visit to the municipality of Viacha, communities of Calaguma, and Choconcoro. Thursday evening meeting with Suma Jayma.

Friday, July 14th: Jason and Justin leave Friday morning.

Rest of Group site visit to the municipality of Viacha, communities of Hichuraya, Chacoma Irpa Grande, and Villa Santa Chacoma.

Saturday, July 15th: Site visit to Suma Jayma workshop.

Sunday, July 16th: Return to the USA

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Jason, Liz and Brook handout books to the Hichuraya children

Justin Login and Jason Gehrig Report Highlights

Justin Login - Report Highlights

➤ Viacha Wastewater Design

Day 4, Tuesday July 11th

For my group, this day would prove to be a little different from the previous days, mainly because we would be spending the day in Viacha. It began with a wastewater treatment training session focused on key operating concerns of an activated sludge treatment plant. We spent about two (2) hours reviewing design approaches and key operational considerations of

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their future treatment plant, based on a review of the design plans they have prepared for their facility. This was an interesting experience in Spanish, since my technical vocabulary is a bit lacking in Spanish. Jason was kind enough to sit in and assist me with words and explanations as we moved through the presentation. There were a couple of people attending from the Viacha sanitary department and it appeared to be beneficial for them as they asked good questions and were very attentive.

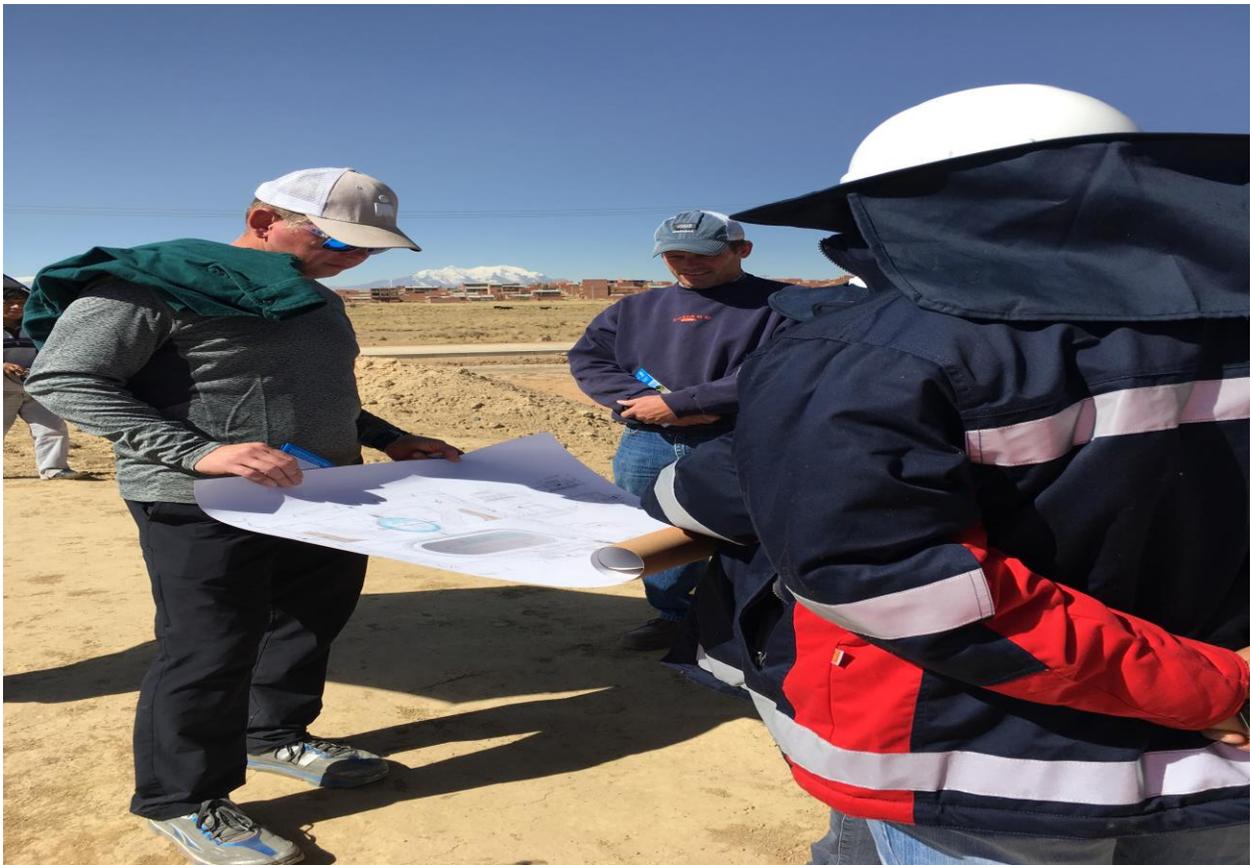


About five people from the Viacha sanitary department joined us for lunch in a local restaurant. After lunch, we drove over to the site of the future wastewater plant and viewed the grading work that has taken place as well as the adjacent, dirty river where the treatment plant will discharge. Including a raw sewage pipe discharging to the river. The Viacha representatives pulled out a plan of their treatment plant and explained how they understood the plant would

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work. We spent some time discussing the plant layout and we provided a few suggestions for their consideration, with the main two as follows:

- Secondary clarifier – their current design includes a single secondary clarifier (like 115' in diameter). We suggested that they consider building two smaller clarifiers, like 2-80 ft diameter units, to provide some redundancy for equipment being offline for maintenance or repair. They seemed to think they could stop discharging to the clarifier while maintenance was completed. We discussed this in detail and I will follow up with some written discussion regarding this concern.
- Drying beds – There is currently one other treatment plant in the area, El Alto, that is having significant odor issues and as such residents are concerned about odors from this proposed plant. The solids plan is to pump waste solids from the clarifiers to drying beds. Being that it is aerobic sludge, I expressed some concern that they could have significant odor issues. To mitigate the odor potential, we suggested using a tiller device, like a Brown Bear, attachment for a tractor to keep the solids aerobic and turned regularly. I will provide additional information to them on this option. Additionally, I will be looking at the size of the drying beds to verify the size is large enough for the treatment plant.



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➤ Viacha Maximum Security Prison Lagoon Treatment System

The facility currently discharges its sewage outside of the facility where it flows down and around both sides of one of the City's water wells. The simple lagoon system would alleviate the potential risk to the water well and provide a much-needed service. It is great to see the proactive approach the City of Viacha is taking to try and treat wastewater within its boundaries. Most wastewater in El Alto and La Paz, combined population over 2.3 million, just goes into ditches and into the rivers.

We did learn of a multi-district/city/nation agreement to clean up discharges into the rivers that flow into Lake Titicaca. It would be beneficial to learn more about this agreement and to see if any help can be given to these communities that are participating in this effort.



➤ El Alto Wastewater System

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The day finished with us trying to visit the only treatment plant in the area, which treats approximately half of the wastewater from the city of El Alto. The system appears to be a large lagoon facility with some trickling filters and polishing ponds. We were not allowed to visit the facility but the operators at the gate said a visit could be arranged through the proper channels.

Conclusion Wastewater Project

There is very little in the way of wastewater treatment occurring in this area of Bolivia. This one treatment plant appears to be overloaded and only treats about half of the wastewater in El Alto. The City of La Paz has no wastewater treatment. The City of Viacha is trying to implement some treatment as are a few other communities in the area. I believe through WEFTA, we can offer some review and technical input to these communities to help them according to their desires. We need to start with the City of Viacha, where we have some contacts and are starting to build a relationship with the local sanitary people. Perhaps from there, we can branch out and help others in the area.

Moving Forward With Water Projects in the Rural Areas

It appeared to me that there are still many needs in the areas we visited with respect to getting water to houses in these communities. Perhaps Jason knows more of the details, but I would like to identify these areas and the potential houses that are in need, along with potential water sources that could be developed to serve them. If we can outline these projects and the estimated costs to complete them, I am confident we can raise funds to purchase the materials to do the projects. I propose that we do the following:

1. Identify people/areas that can be served
2. Lay out rough project details and costs
3. Do a fundraising campaign, project specific, to raise funds for materials and other costs
4. Set up a way for people to donate to a specific project automatically, like with Venmo or something they can do without giving me a check. Maybe this is already in place and I just need to understand how it works.
5. Provide donors the opportunity to travel to Bolivia at the completion of the project to work side-by-side with the community and experience first-hand their need, humility, gratitude, and happiness. This will help with future projects and provide a meaningful experience to many who are seeking a way to help but don't know how to do it.

I would also like to see if we can put together a summary of how much (\$) previous projects in the area have cost and what the cost was per household. My guess is the cost is small, but it

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would help people with the means and desire quantify how far their donation will go. I suspect it will help to see the benefit of donating to WEFTA's projects and how their donation will provide water to specific families.

Jason's Trip Recommendations

Follow-up comments/Ideas from Justin's trip report:

Suma Jayma has sent up a list of project priorities for community water systems and/or family hand pumps. Karen or Lou, could you send that out to us so that we could identify a specific project coming down the pipeline for fundraising with friends? Also, multiple community solicitations for zones without safe water to their homes were received during our visits, which with time will become project proposals. I'd like us to be able to provide the info Justin is requesting so that project-specific fundraising efforts can be made.

I would be glad to work with WEFTA and Suma Jayma folks to get a comprehensive list of projects completed together, including contributions from all entities (wefta, municipalities, families, in some cases other external sources/ngo's) as well a # of benefiting families. I have pretty good numbers in place from the Suma Jayma's start in 2000 through 2010 but have dropped the ball since. These could also be tied to a georeferenced map someday. I believe WEFTA has all projects it has funded available on the SMA server so that will be a great resource as well.

It appears WEFTA doesn't have a means available for electronic donations. Is there a good 3rd party service out there that doesn't scrape 10 or 20% off the top? Justin mentioned venmo.com which looks to be a low/free cost service provided by paypal. Could we arrange for that service to be available on the front page of the wefta website/facebook page in some kind of cybersecure manner?

My follow-up notes/suggestions from the Bolivia trip:

1. Help Suma Jayma convert hand level design to one with GPS points and contours using Autocad for community near Viacha (work with Jaime on this)
2. Key contacts with Viacha
 - a. Deybith Charles Mamani Rios, 591-772133314, edifacarte7@hotmail.com (arquitect on basic sanitation team of Viacha with tremendous interest and advanced study in water, specifically hydrogeology)
 - b. Richard Nina Escobar, 591-70568514, riconies@hotmail.com (participant in Justin's talk, member of Viacha basic sanitation team)

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- c. Marco Antonio Cussi Mamani, Antonio.lionblack@gmail.com (participant in Justin's talk, member of Viacha basic sanitation team)
 - d. Claudia (?), engineer and lead for Viacha basic sanitation team (most familiar with their wwtp)
 - e. Arquitecto Naldo – this is Suma Jayma's primary contact with Viacha; he's in charge of all rural public works projects for Viacha
3. Follow-up with Deybirth (and Jaime) on sending him info on:
 - a. NASA Grace – aquifer tracking/drought impact - https://www.nasa.gov/mission_pages/Grace/index.html
 - b. NASA SMAP – soil moisture tracking - <https://smap.jpl.nasa.gov/>
 - c. Get from them the Bolivian government Lake Titicaca watershed contamination mitigation plan
4. Follow-up on critical equipment for well refurbishing/drilling (sent out by separate email)
5. Justin's input on Viacha's WWTP (already discussed in his report) – a big hit that Viacha officials will very much appreciate!
6. Justin's / WEFTA's input on proposed Lake Titicaca watershed contamination mitigation plan (in addition to WWTP's which could be a great improvement, there is apparently a move by the govt to channelize the rivers. Viacha is positioned to incorporate some of these proposed river "improvements," though not sure how much will really help – see pix below of what's been installed in some parts of El Alto, similar to what was being described by Deybirth of the City of Viacha: basically installing rigid vertical walls with gabion like structures across the channels with vertical drops of a couple feet(?) Appeared very questionable as to how much actual waer quality benefit this would provide; again this could be another area where WEFTA could provide perhaps alternative approaches, recommendations that could have tremendous benefit.

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Substantial funds have been authorized by the Bolivian and Peruvian governments to protect the Lake Titicaca watershed in early 2016, with plans to implement different phases by 2020 and 2025:

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Bolivia y Perú firman un acuerdo para proteger el lago Titicaca

Publicado: 8 ene 2016 04:55 GMT



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Los ministros de Medio Ambiente de Bolivia y de Perú firmaron un acuerdo entre ambas naciones para poner fin a la contaminación del lago Titicaca. Los dos países que comparten el lago asignaron una inversión de unos 117 millones de dólares hasta 2020 y unos 400 millones de dólares para el 2025 destinados a la recuperación y protección del Titicaca, [escribió](#) este jueves la Agencia Boliviana de Información.

El Titicaca es el lago navegable más alto del mundo. Está ubicado entre el altiplano peruano-boliviano a unos 3.812 metros sobre el nivel del mar y tiene una superficie 8.372 kilómetros cuadrados.

7. Follow-up efforts to provide training by WEFTA for improved water well rehabilitation services (Scott Mckitrick is leading contacts with drillers in New Mexico)
8. First key steps for supporting Suma Jayma
 - a. See if WEFTA can fund another hand pumps project, partially funded by Spirit of Christ
 - b. See if WEFTA can financially support/round up donations for requested major equipment
 - c. Richard's work to see if we can get total station of suma Jayma capability for digital download
9. Other follow-ups
 - a. Work with Suma Jayma to develop gameplan for following up with rural zones soliciting additional drinking water projects identified during the visits
 - b. On visits to past systems, though I didn't make all the day's trips, the one system that I heard was having problems was in Palcoma Baja, where the tank level was near empty at all times. According to local officials, flow from spring into the tank was measured at 5 liters filled in 17 seconds, which equates to around 25,000 liters per day, which if providing 50 liters per person (and assuming 5 person per household (conservative in this dry area where many young have left for the city – 250 liters/day/family), these should be adequate for 100 families conservatively. Being that the number of beneficiaries is less than that, there is adequate supply. Either a leak exists, or as we've seen in the past in Karhuiza,

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there's a handful of users who are overconsuming (in Karuiza's case, they were filling small lagoons for their dairy cattle at night). This was pointed out to the community leaders of Palcoma Baja, and given that a couple communities are connected to the same source here, they seemed to acknowledge there was probably some folks using to water some of their fields. Would be good for SJ to follow up in the coming months with Comanche municipal officials to see if resolved.

- c. Continue autocad drawing in 3d of treatment lagoons. (for use in Pucarani, Chonchocoro jail). Also see how we can lend a hand with lift station and force main design for CalUma (Jaime will perform topo survey).
10. Other ideas
- a. WEFTA WWTP YOUTUBE VIDEOS!!
Listening to Justin talk with the lead sanitation engineer for Viacha, it only reinforced what would be expected. In an area where very little wastewater treatment exists, it's understandable that there is very limited knowledge of how various types of wwtp's function and should be operated.

I think a tremendous service that WEFTA could provide would be to develop a series of wastewater treatment alternative YOUTUBE videos, that could explain in Spanish basic concepts while video is playing in the background, with intermingled ppt slides (similar to the ones Justin prepared for the training session in Bolivia) providing additional key considerations. Perhaps we could identify a half dozen topic areas and provide this service, making it available on the WEFTA website. A huge need for improved understanding of wwtp's exists throughout Latin America. Would love to discuss further. In the meantime, search up oxidation ditch on youtube, and then think how we could adjust something like these to be of use for folks in Latin America!!

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July 2017 WEFTA Bolivia Country Brief
Report Prepared by
Richard Mulliken, LS
Field Notes Recorded by Dolores Mulliken

We, my wife and I, arrived in El Alto/La Paz, Bolivia on July 8, 2017 and were met by our hosts Braulio Rojas and Basilica Choque of Suma Jayma. Others in our group were, Justin, Liz and Brooke Logan, Jason Gehrig, Ramon Lucero, Sara Mason, and Jose Ortiz. We spent four of our eight days visiting previous water project sites in dozens of communities of the Altiplano and were given a thorough tour of Suma Jayma workshop and drilling rig in El Alto, Bolivia.

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When visiting the communities water project sites, Dolores and I, began to mark the GPS locations of Spring Catchments, Pumps, Faucets, Storage Tanks, and Wells. The best part of marking the GPS locations was walking about the communities. We would start out with a group meeting at the Community well site, where each man would talk about how the well had improved their lives. Then we would walk to each water project faucet near individual homes.



While taking our shots we fell behind, however, it is here that we witnessed the direct impact of the water projects and the real life of the community. The villagers at the meetings had gone back to their homes to continue their work for the day. As we went to mark a faucet by their home, they would talk to us very animated and very proud of their farms. They could not say enough wonderful things about WEFTA and Suma Jayma and how happy they were to have clean water for drinking, cooking and bathing near their homes. Before the faucets, some had to walk far to get water or animals would die in the water source. The day we set out to visit Comanche, we picked up the Authorities, Juan and Isabel Mammani. They were most impressive in their traditional dress that showed their official

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status to make decisions and justice for their communities. The meeting took place at the school where both the men and women gave testimony. Juan said, "Agua es Vida."

One afternoon, we were given a tour by Jorge of Suma Jayma of their workshop including a demonstration of their hand pumps. We saw lots of innovation here. They have established a machine shop because getting parts and tools is a challenge in Bolivia, so Jorge, Jaime and Braulio make the parts themselves. There are several considerations of equipment need regarding the drilling operations of Suma Jayma, but in this report I will focus on the surveying aspects.



Suma Jayma was given a Topcon surveying instrument. We set it up, I proceeded with training, and made an assessment of its condition. The instrument requires the following: I brought back the battery to re-cell, the HP calculator screen is damaged and they need a new calculator, the data cards need research to ensure the right cards are functional and useful, they need a cable from the calculator to the Topcon and from the calculator to the computer to dump the notes stored in the HP, and they need a spreadsheet to calculate coordinates should the calculator go down.

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The motivations of our trip to Bolivia should be appealing to funders in several unique ways. The strength of will of the people of the communities telling us how they want to make their lives better, not us telling them. The work of Suma Jayma a local company owned by Bolivians who know the culture, the territory, the officials and authorities, and most important the need, that can coordinate and work water projects. We left a Garmen GPS (including a training overview and will send repaired Topcon equipment) and strongly recommend Suma Jayma be considered by WEFTA for mapping water project sites in Bolivia. The GPS data we collected will be posted on the WEFTA website and anyone interested in the water project works of WEFTA can easily access the locations and photos of successful water projects throughout Bolivia.

Sara Mason Report

Visits to previous projects/communities

During this trip we visited many communities where water distribution projects had been completed ten years prior. Such communities included Hichuaya in Calamarca, Hacallaya in the municipality of Comanche, Palcoma Baja, Comanche Chico, Tuli, and Kantullo. Most of the distribution projects for these communities included construction of reliable sources, such as infiltration galleries, as well as conveyance from these directly to the homes of the residents in the form of spigots.



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Overall, the residents were very thankful for the impact these projects have had on general health, convenience, and quality of life within these communities. Often when we gathered around the meeting place the authorities would tell us stories of such improvements, such as transitioning from having to drink from the same pond as their animals to having fresh, clean water at their fingertips. (Regrettably, I could not speak the language so I cannot provide anything more specific.) Every community we visited was nothing but welcoming; every resident personally welcomed us, every household brought food to share in a large communal pile, and even shared cocoa leaves and soda with us.



The communities we visited were made up of mainly middle-aged and elderly persons, with several children present at some, but not many present at others. There were very few young adult persons present at any community gathering we visited.

Wastewater design and operations

Justin, Jason, and Richard travelled to Viacha? To give a presentation on wastewater treatment. The day after, we visited the treatment plant for Viacha? As Braulio explained the poor

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condition of the plant which resulted in the general populace gaining some resentment for the concept of new wastewater treatment plants in the area. We saw a large overland conveyance pipe for wastewater, and Braulio explained the problems such a system experiences, such as freezing in the winter.

Total station training

While Jason and I travelled to the new lagoon construction to shoot GPS points, Richard briefly instructed the Suda Jaima crew on the operation of the total station.

GPS previous project locations

At each community we visited, Richard would take GPS shots using the GARMEN unit of the village center, project water sources, and any spigots we were able to visit. On the day Richard was attending the presentation, he lent me the GARMEN to take shots of the communities Ramon, Jose, and I visited. I was able to get some shots of the village center and some spigots of the Kantullo community. The day after, while Richard was giving the briefing on using the total station, Jason and I travelled to the newly-constructed lagoon for the La Paz? Treatment plant. There, I took a shot of the northeast corner of the berm and the previously captured control point. We searched for a second control point on that side of the lagoon, but were unable to find one.



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Observations about Bolivia:

One of the most impactful observations I was able to make about Bolivia as a country was the incredible prevalence of technology such as wi-fi, smart phones, and the gondola commuter system, where other technology such as proper wastewater treatment, central heating, and water heating, were absent. You could go to any given indigenous community and see residents on their smart phones, then visit La Paz and see the canal of raw sewage that flows directly to Lake Titicaca. The amount of funding the government has available to oversee construction of facilities that would be crucial in the US, such as roads and treatment plants, is insufficient to provide these.

Another facet of life in Bolivia that struck me as interesting was the ability of every citizen to start their own business. Due to the lack of supermarkets and the high-density population of La Paz and El Alto, absolutely anybody could purchase or make products to sell, from Coca-Cola to homemade tea. People who have large vans can start up a taxi-like service, transporting other citizens across the sprawling, dense city. Neither of these really requires much effort, compared to what you would have to go through in the US. Civilian-owned stores do need to be registered, but from what I understand the process does not require nearly as much paperwork. Therefore, in some places you can't walk a block without seeing a shop built into a residence or a food cart.

José Ortiz Trip Report

During our time in Bolivia, and briefly before our departure there, the group discussed four goals that would try to be achieved during our visit. Those goals were:

- 1) Visits to previous projects/communities
- 2) Wastewater design and operations
- 3) Total Station training
- 4) GPS locations of previous projects

I personally thought that Goal 1) was a huge success in the fact that during our time here, we visited more than a dozen communities in which previous projects from Suma Jayma and WEFTA had been completed, or were near completion. I think this was an important goal to have because it was a great way to show the commitment that Suma Jayma & WEFTA has for supporting the well-being of these communities. It is invaluable to show these people that they are still important to us, and their needs matter, even years after a water project has been completed. This was clearly expressed by these people, in the way they welcomed us into their communities, the appreciation they showed, and the words they spoke. Even at times when I could not

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understand the words they were saying, I clearly understood their body language. That body language was a message of love, gratitude, and hospitality. In some cases, the project was finished ten years prior; and this had been the first time the system had been checked on and made sure no unanticipated issues had arisen over all that time. Even after many years, the community members were beyond excited to have us visit and catch up and see how their lives have changed as a result of these projects (and in every case, their quality of life had drastically improved). For example, many times we heard stories of how the community members would get their drinking water from stagnant pools; the same pools of water their animals would drink from. Or they would have to walk long distances with the hopes that they would find any fresh water at all. Now it is as easy as turning a handle or lifting a lever to operate the hand pump; and they don't have to worry about having a clean, reliable source of water. Of course, there is still lots of work to be done. Many people are still left without clean reliable sources of drinking water; not just in Bolivia, but many countries all over the world. My hope is that Suma Jayma will grow and prosper over the years, and that they will inspire other organizations to establish and seek the same goals.



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Goal 2) was equally as important of a goal to have, considering La Paz, El Alto, and the surrounding rural communities are in desperate need of improving their watershed. Unfortunately, I was not present when Justin Logan gave his presentation on wastewater treatment design and maintenance, but from what I understood it was very informative and provided valuable insight to engineers and architects in the municipality of Viacha and others. Hopefully the information that Justin provided will help lead to a well-designed wastewater treatment system for Viacha and other communities in the very near future. Wastewater treatment may not show immediate changes in health for the people like drinking water improvements would, but it is just as important. For example, the raw wastewater that flows in those canals eventually make it downstream into a river that people will eventually use to drink or bathe or wash clothes. These waters also seep into the soil and make their way to the groundwater table, which will eventually be tapped into for a drinking water source. We saw a perfect example of this when visiting the high-security prison. The raw wastewater stream coming from the prison was flowing downhill and right through a small community just a few hundred meters away; and we could even see a drinking water well that was very close to the waste stream. There is no doubt in my mind that the wastewater will eventually contaminate that well. Seeing this with my own eyes humbled me, and made me realize how fortunate those of us who live in more developed nations are. Another thing that surprised me on this trip was seeing how prominent it was to see so many Bolivians, young and old, have access to the internet through their smartphones. This was surprising to me because I realized we now live in a world where it is more attainable to have a computer with internet access that fits in your pocket, than it is to have access to a clean drinking water source, or have waste properly disposed of. That being said, I think there was a good effort made on our part to convey information to those in a position to make something happen in improving the wastewater treatment efforts of those communities. Also, I think it was extremely important for me to see these conditions, so that I can do my best to spread awareness and hopefully inspire more people to help in any way possible.

Goal 3) was a valuable exercise to go through, and I thought it would have been great to put more emphasis on this goal. We were fortunate enough to have such a skilled surveyor like Richard to accompany us on the trip so he can pass some of his knowledge to Jaime. I think that the training Jaime received invoked confidence for him to use the Total Station on future designs. I think this piece of equipment will help Suma Jayma on future projects by making their data collection more efficient, and designing water systems more effectively. The key is to use it more, so that it becomes easier to use.

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Goal 4) I think a great effort was put forth in gathering the GPS data points on as much water infrastructure as possible; especially by Richard, Dolores, and Sara. The information collected will be an excellent way to help show others the extent of these Suma Jayma projects in a tangible way. It is one thing to tell others about these water resource projects that are being done in these remote locations, but when you can actually show someone an exact location on a map, it makes that project more appreciable and objective. And I think eventually inputting the data into a .kmz file will be the perfect way to document these projects in a way that any person can appreciate. Of course this will have to be an ongoing effort; as more projects are constructed, more data points will need to be taken.

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In conclusion, I think all four goals were achieved in excellent measures. Furthermore, I think this trip was an invaluable personal experience, and I am very grateful I was given the opportunity to be part of this trip. I am also very honored to have been able to represent an organization such as WEFTA, and personally interact with the Family that is Suma Jayma. Even with my small contribution, I know I am making a positive difference in the lives of those who are less fortunate.

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Attachment A
Comanche Chico Program

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Attachment B
Chacoma Irpa Grande Program

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Attachment C
Chacoma Irpa Grande Solicitation