EWB PROJECT:
DESIGN REPORT

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1.0 INTRODUCTION

1.1 Project Description

The goal of this project is to create adequate accessibility of groundwater for two communities in the Dominican Republic. Current demand is too great on the single working hand pump the communities rely on, and its location is far from ideal. Installation of multiple pumps and storage tanks will provide the communities with needed water supply. Using government provided power and involving the communities in the processes of decision making, construction, and upkeep, EWB-UT hopes this project will be a reliable, sustainable alternative to the present conditions.

1.2 Background of Project

Los Cerros De Aminilla and Barrigon are located in the northwest Dominican Republic, near the Haitian border. The primary occupation of the communities is farming of yucca, rice, sugar cane, beans, platanos, and dairy cattle. Other community members travel to the city to work in factories or at service jobs such as maids. The inhabitants of Los Cerros De Aminilla and Barrigon are mainly Evangelical Christians of Haitian and Dominican descent. The average monthly income of the villagers is about $2000 Dominican pesos with most incomes falling between $900 and $3000 pesos. This is the equivalent of a monthly income of $20-$63 U.S. dollars and an annual income of $240-$756 U.S. dollars.

The communities each possess three wells. Two of the three hand pump wells in Los Cerros De Aminilla have ceased producing usable amounts of water. The two hand pump wells and one a wind turbine well in Barrigon all have ceased producing usable amounts of water. Both communities, about one half mile apart from each other, now depend on the one working well in Los Cerros De Aminilla. The communities have contacted the government requesting help with their water shortage, but the government has declined financial assistance.

Engineers Without Borders (EWB-USA) approved this project in 2005 after the application process was completed by Edith Yoo. Edith Yoo is an American citizen who visited the area as a volunteer in an organization titled Amigos De Las Americas in 2003. At that time she became acquainted with the people of the community and the surrounding areas and has since revisited the area.

1.3 Contacts

1.3.1 Chapter Contacts

Position	Name	Phone	Email
EWB-UTK Faculty Advisor	Dr. John Schwartz	865-974-7721	jschwart@utk.edu
Project Leader	Jordan Mynatt	865-922-1858	jmynatt@utk.edu
Health Point Person	Andy Dodson	423-825-1708	adodson@uk.edu
EWB-UTK President	Tom Zimmerman	865-250-9898	gzimmer1@utk.edu
Technical Advisor	Daniel Carter	865-414-6799	dcater@utk.edu
Translator	Peter Arant	423-624-5741	parant@utk.edu

1.3.2 Community Contacts

Position	Name	Phone	Email
Initial Investigator	Edith Yoo	303-680-7721	eddie899086276@aol.com

1.4 Professional/Student Chapters Involved

The EWB Chapter at the University of Tennessee is the only chapter involved.

1.5 Overview of Previous Trip's Dates & Accomplishments

Table 1-1: Previous Trips

Dates of Travel	Type (Assessment/ Implementation)	Location	Brief Description of Accomplishments
3/21/06 – 3/26/06	Assessment	Los Cerros, Dominican Republic	Determination of community's needs for obtaining clean water, discussion of different possible methods and locations with community, surveying and water table measurements, locations for wells determined

2.0 SITE ASSESSMENT TRIP

2.1 Overview of Trip

The assessment trip occurred during the third week of March which coincided with UT's spring break. At that time, four EWB-UTK students and the faculty advisor to EWB-UTK traveled to the area to interview the communities and gather various data to help in the design phase. Primary objectives for the trip were to assess the existing wells for cause of water scarcity, determine available materials, labor, and the associated costs in the region, gather more exact GPS data for use in location of future wells as well as water table location estimate, gather land use data of the area surrounding the wells, investigate the community's hygiene practices, and finally to administer a health survey to the community to be used for initiation of statistics for identifying primary health concerns of the community. At the conclusion of this trip, the project entered the design phase.

Several important accomplishments happened during the assessment trip. Surveys of the communities were completed, and the results of the Los Cerros De Aminilla survey can be seen in Appendix A.1. One of the defunct hand pumped wells in Barrigon was disassembled, and the assessment team feels that adjustment of the plunger height would likely allow the well to once again produce water in significant quantities. Also the depth of the water table was

measured during the disassembly. One of the other hand pumped wells Barrigon was determined to be a likely candidate for being fixed in the same manner.

Town meetings in both communities were held to engage the townspeople and collect their ideas about the project, and their roles in the project were defined at this time. Individual interviews were also used to help create a sense of the area with regard to everything from the town's water and health needs to the local political scene. Availability of supplies was determined, and the travel team left with contact information for several local suppliers. Contact and partnership with SINDICO, a local government organization, was another accomplishment, and EWB-UTK showed the preferred sites for new wells to the SINDICO official. SINDICO agreed to drill new wells if EWB-UTK could come back and outfit the wells with pumps. The travel team was successful in establishing an amicable relationship and partnership with both communities. The following maps show the region for the two communities we visited.

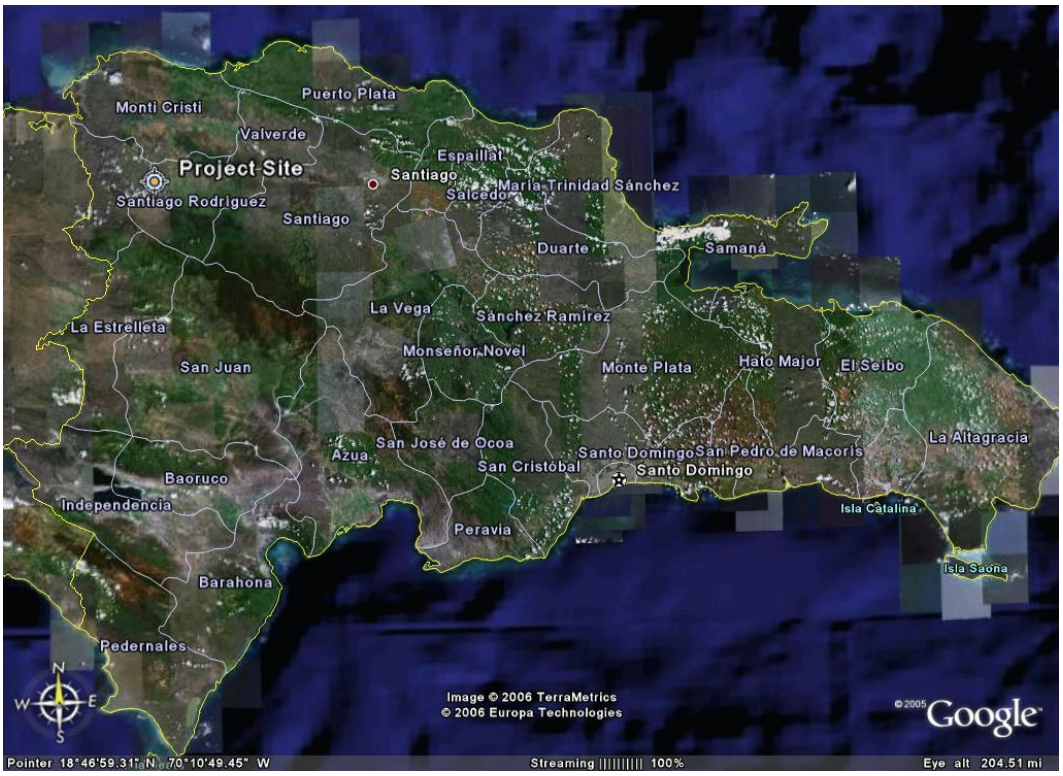

Figure 2-1.1 Vicinity Map

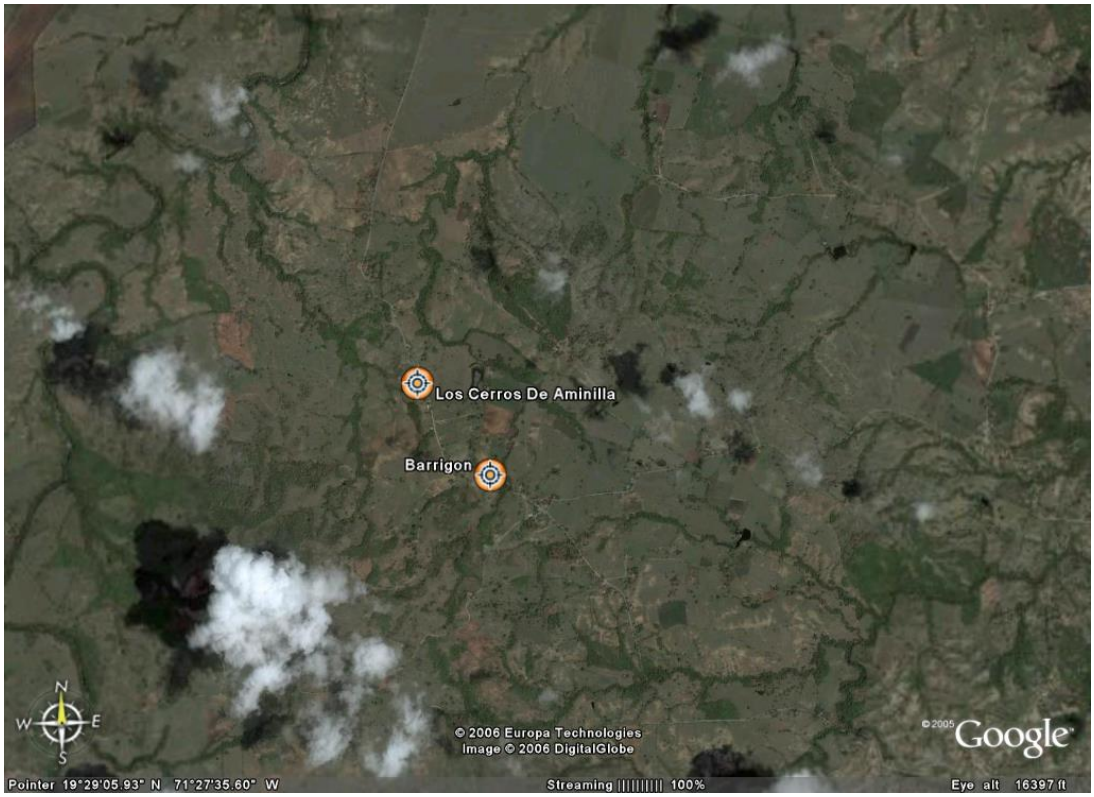

Figure 2-1.2 Vicinity Map

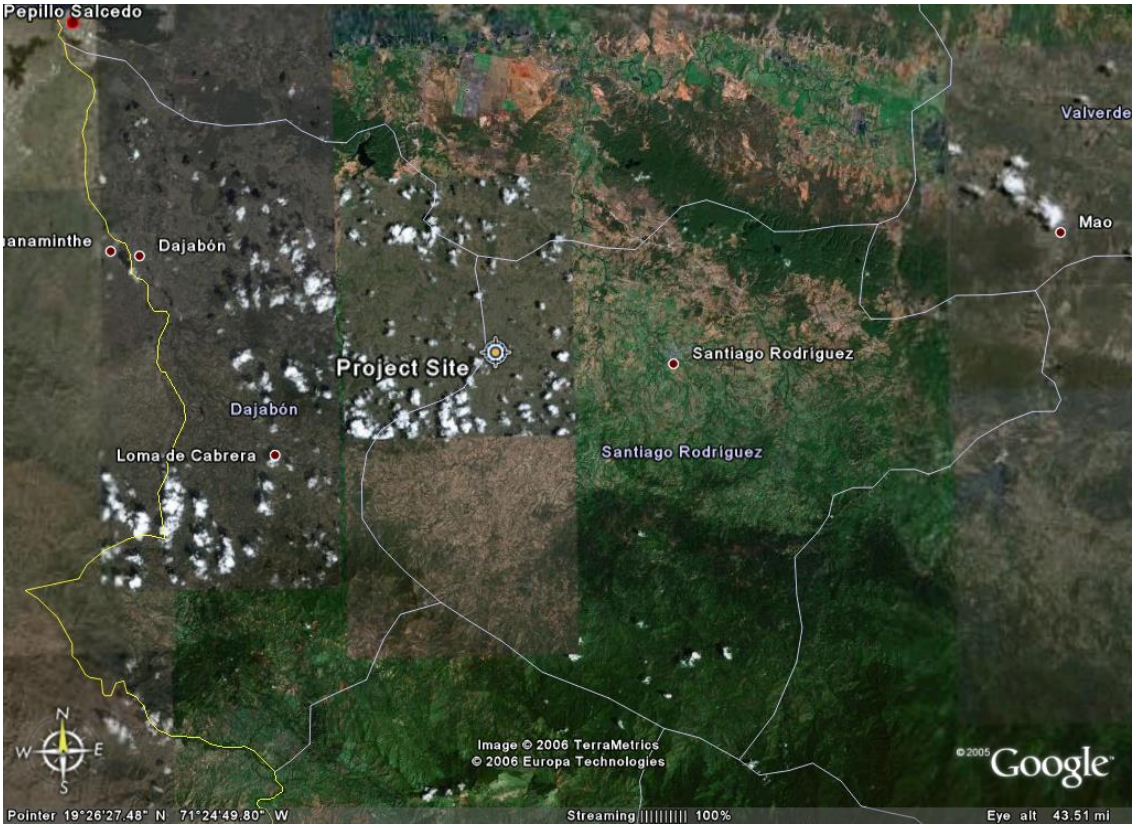

Figure 2-1.3 Vicinity Map

2.2 Travel, Lodging, and Project Contacts

Position	Name/company	Phone	Email
SINDICO Contact	Ramón Lamtigua	809-270-1454	
Los Cerros Contact	Andres Saint Hibire	809-840-8415	
Host	Virginia	809-491-6093	
Host	Lupita	809-768-1742	
Barringon Contact	Romona	809-458-3929	
Transport	Luis	809-471-0497	

2.3 Problem Statement

The sources of water in the communities of Los Cerros and Barrigon are inadequate to support the needs of the population. Currently, the one working well does not produce enough water for the 300 people living there. The citizens must make compromises when it comes to this essential element of life. In addition, the distance and location of the well make it difficult for many of those looking for relief to find reprieve. This is not an acceptable situation for these communities. Therefore, providing these people with sustainable, more accessible and better producing wells comprise the goals for our chapter.

2.4 Project Goals

1.) EWB-UTK would like to outfit two new wells and place new storage tanks in Los Cerros.
2.) EWB-UTK would like to outfit one well and retrofit an existing water storage tank.
3.) EWB-UTK would like to repair at least one defunct hand pump well in Barrigon.

2.5 Engineering Components Considered

1.) For the wells, pump options were weighed by evaluating pros and cons through analysis and discussion. The possibility of a solar powered submersible pump in each community was evaluated. This would be a similar setup to one seen in a neighboring community, Babozo. Babozo had a product called a Solar Pedalflo©, and this product pumped groundwater through a combination of solar power and human power (bicycle). The community members were excited with this setup and expressed a desire for one similar. Advantages of a solar powered system include: the sustainability and renewable status of solar power both in global and local terms; the townspeople would take on a large role giving them more of a feeling of ownership of the project by being tasked with security of the solar panels; and finally, many of the villagers are familiar with solar power. Still, this is an extremely expensive option and currently the funds are not available to provide this technology on the scale needed by the communities.

   A second option considered is a slightly more simplistic electric pump. The area has just received updated, free electrical service that the government and

residents are very excited about. In installing this type of well, EWB-UTK could tap the wires at the pumping stations to provide electricity. The obstacle to over come by using this type of system is the parameter of a "rolling" power supply. The electrical service in the communities is provided only a few hours at night and on occasional days. The communities also report nights the power fails to come on. Despite the unpredictability of this power supply, it is a resource the community depends on and trusts. This option is less expensive and a good improvement to what the community currently possesses.

2.) Storage tanks will be needed to overcome the rolling power source and also provide a means in which to distribute water to more accessible locations without digging another well. A water source is needed at the north end of Los Cerros, however gain in elevation and rocky soil will not permit the digging of a well. Distribution from the centrally located well in Los Cerros will be necessary to provide a water source for this location.

3.) In addition to electric powered water pumps, two hand pumped wells in Barrigon are to be repaired.

3.0 HEALTH ASSESSMENT

3.1 Overview of Community

Los Cerros de Aminilla is comprised of approximately two hundred individuals. According to our research, there are a total of fifty-two families. There are approximately one hundred adult men (16 years or older), one hundred adult women (16 years old or older), seven senior citizens, and twenty six children and adolescents.

This is an agriculturally based community located in the semi-arid foothills of the Cordillera Central, in the northwestern part of the country. The majority of families are engaged in subsistence agriculture, though they also rely heavily upon other community members for a variety of goods and services.

For one of the most life-threatening health issues, diabetes, the inability to purchase the proper medicine can have lethal consequences. They are heavy consumers of sugar, but the community believes that the cause of diabetes in an individual is purely hereditary.

In terms of medical supplies and treatment, most everyone goes to once-a-year government health screenings held near the community. There, the children can also be immunized (most all children are properly immunized here). If illnesses are not severe, they are treated in the home or by a community leader named Mami. For more serious cases, individuals seek medical attention in Santiago Rodriguez. Though there are free clinics run by the government, they are of bad quality and wait-times are often long. Although many times community leaders go to the government clinics, they are usually forced to pay for their prescription drugs

Parasites do prove to be a moderate problem within the community. Bad water is thought to be the cause, so boiling water is an everyday practice.

There are no violent deaths to speak of; however, a high cause of death in the region is traffic accidents, mostly involving motorcycles. HIV/AIDS is not prevalent here. Recreational drug use is relatively low, and "heavy" drugs like heroin and cocaine seem to be almost nonexistent.

3.2 Breakdown of Health Assessment Information (from #509)

Date of survey: March 2006
Location: Homes
Source of Information: Mami; Community Leader

Section 1: Regional Demographics

How many people will benefit from this project?
Approximately 250 people

Population Data:
Number of families: 52
Number of adult men (16 years or older): 100
Number of adult women (16 years or older): 100
Number of children ages:
< 1 year: 6
1-4 years: 5
5-15 years: 15
Number of elders greater than 50 years: 7
Ethnic groups or tribes in the area that will be served by the project and the approximate size of each group:
All those who live in and around the village (250)
Average age that women start to have children: 18
Average number of children per woman of childbearing age: 2
Number of disabled persons in the community (mental and physical):
2 children

Section 2: Community Illness / Injury Information

5 most important illnesses/injuries affecting people in the community

1. Illness or injury: Diabetes
   - Estimate of the number/percentage with problem every year
     - children: 0
     - younger adults: few
     - older adults: 10
   - Not a gender specific illness/injury

- What do people think is the cause of this illnesses/injury or condition in the community? Most of the people in the community believe that the disease is inherited (hereditary) and has no relation to diet.
- How is it treated? By whom? Where? Medicamento (pastilla). Treatment is available in Santiago Rodriguez, but insulin is very expensive.

2. Illness or injury: High blood pressure
    - Estimate the number/percentage of children 0 younger adults 0 older adults 8 w/ this problem every year.
    - Is this illness/injury gender specific? If so, does it affect more men or women? Women
    - What do people think is the cause of this illnesses/injury or condition in the community? – Don't Know
    - How is it treated? By whom? Where? Santiago Rodriguez

3. Illness or injury: La piel (Cabiaza, some sort of parasite)
    - Estimate the number/percentage of children 6 younger adults 5 older adults 5 w/ this problem every year.
    - Is this illness/injury gender specific? If so, does it affect more men or women? No
    - What do people think is the cause of this illnesses/injury or condition in the community?-Bad water.
    - How is it treated? By whom? Where? Boil water for clothes, creams, pastilla. Treatment available in Santiago Rodriguez.

4. Illness or injury: Headaches, migraines

    - Estimate the number/percentage of children 8 younger adults 8 older adults 8 w/ this problem every year.
    - Is this illness/injury gender specific? If so, does it affect more men or women? no
    - What do people think is the cause of this illnesses/injury or condition in the community?
    - The sun and heat.
    - How is it treated? By whom? Where? Water, shade. In house.

5. Illness or injury: Poor vision
6. Illness or injury: Los rinones (kidney stones), very painful.
    - Affects about 10 people per year. Women and men equally.
7. Illness or injury: La gripe (the flu)
8. Illness or injury: Prostate Cancer

Is there a difference between the overall health of women and the health of men? No

Is malaria considered a problem in the community? No

Is HIV/AIDS considered a problem in the community? no

Is tuberculosis (TB) considered a problem in the community? no

Section 3: Morbidity / Mortality Information

What is the average life span of women? men? Not determined

Total number of births in the community each year 1 or 2

Total number of deaths in the community each year 2 or 3

Section 4: Daily living information

Water

Where do people get water (streams, springs, household taps, community taps, rainwater, wells)?

For drinking: wells or nearby streams
For cooking: same
For bathing: same
For hand-washing: same
For animals: ponds or streams
For irrigation: ponds

On average, how far do people have to travel to get to their drinking water source? 0.5 miles

Is there enough water during all times of the year? If not, during which season(s) is there not enough? No, the wells often go dry during parts of the year. The dry season is the northern hemisphere's winter months.

If wells are used, how many are there? 2

Where is the water sources located? One near the center of town, one on the outskirts

What are the methods of water purification used in the area? Straight chlorine and boiling

Food

Describe a typical meal. Yucca and eggs

Is there enough food for everyone during all times of the year? Not always

Is malnutrition a problem? Yes What are the problems? Poor eating habits, limited sources of food

Where and how do people get food? What ways are used to acquire food (e.g. grazing, hunting, farming, brought into local market from outside the community,

etc.)? Food can be bought in Santiago Rodriguez (30 minute drive). Most of the food is grown or produced in and around the village.

How many meals a day do people eat? 2 or 3

How does a child's diet differ from an adult? It doesn't

How does a woman's diet differ from a man's? It doesn't

Does this change when the woman is pregnant? no

What, if any foods are considered taboo? none

What percentage of women breastfeed their children? 100%

Sanitation

What do people use for bathroom facilities and what is the approximate percentage of each?

Flush toilet 0
Pit latrines 100%
Neighboring fields occasionally

How do people dispose of their garbage? There are large bins on the streets, but many remain full most of the time. Much of the trash is burned or strewn about the streets and fields.

What percentages of homes have bathroom facilities (either indoors or outdoors)? 90% of the homes have outhouses

Are there community bathroom facilities? How many and where are they? no

Are bathroom facilities of some sort available to all community members? yes

Are there community garbage dumps? If so, where are they located? The ground is a sort of community dump

Section 5: Community Health Resources

What is the nearest health facility? Is this an in-patient facility (people spend the night like in a U.S. hospital) or outpatient only? Santiago Rodriguez

Who staffs this facility? (physician, nurse, health aide, traditional healer) Physician

Does the health facility have constant, reliable electricity (24/7)? usually

How do most people get to this facility? Car or motorcycle

What types of traditional health care providers are in the community? No physicians in community. Some of the local mothers (~2) act as health care providers

What percentage of children in the community is immunized? 100%

What public health programs are functioning in the community? There are yearly visits by some organization

Section 6: Education / Health Education

Is there a school(s) in the community? (how many and what types and how many students in each)

Primary
# of schools 1 # of students in each 18
Secondary
# of schools 0
There is one in the nearby town of Aminilla
University / Technical college / Vocational
# of schools 0
There is one in Santiago Rodriguez

What is the literacy rate in the region?
No one over the age of 30 can read or write with any proficiency
To whom does the community turn for health information / education? (family, village nurse, traditional healers, teachers, radio, TV)
Mami (community mother and leader)

Section 7: Transportation / Communication

Does public transportation go into the community? no

How many households have, or have regular, unlimited access to:

radio 10%
television 10%
a telephone 5 cell phones exist in the community
access to a newspaper few

a vehicle most families have access to or own a motor scooter or motorcycle

Section 8: Goals of EWB Project
How do you think this project will benefit the community?

This project will bring more water to a community that suffers from a lack of good drinking water. They will have water closer to the places that they need it. They will not have to go to questionable surface water sources. They will generally have a higher quality of life.

How will you measure the impact of your project?

The impact of the project will be measured by means of another, similar survey. A good impact will result in fewer cases of parasites, headaches and kidney stones.

Who will measure it and how will you get the data?

The data will be acquired through a return visit to the community after an undetermined amount of time by EWBUT.

3.3 Potential Impact of Project on Community's Health

The main health risk associated with the water in Los Cerros and Barrigon occurs when their well runs dry. In this case, they often turn to surface water sources to obtain water. These surface sources indeed pose a major health risk. From talking to the community, a dry well is not uncommon, given the number of people using the single well. On the assessment trip, one such case of resorting to surface water for nourishment was witnessed. A nine-year-old female collected buckets of water for her family from a nearby creek, which was in close proximity with cow pastures. The community revealed that in the dry season (December-March) there are no other options than to resort to these questionable sources. The installation of new wells and storage vessels will reduce the need to obtain water from unsanitary sites, likely reducing the occurrence of parasite health problems.

4.0 PART 1 OF PROJECT: NEW WELLS

4.1 Component Description

The existing hand pump in the middle of Los Cerros de Aminilla will remain in service. This pump works good in low demand periods and serves as a back up in case something goes wrong with the new pump system.

Upon arrival, the new well dug in the central part of town had to be abandoned after inspection. The well was only drilled to a depth 70 feet, at which depth auger refusal was encountered due to bedrock. The bedrock was impenetrable and the SINDICO crew ceased drilling on this well. Unfortunately, this well was not able to become operational.
The second well on the southern end of town, near an existing hand pump, was successfully drilled and cased with a six inch casing to a depth of 120 ft. Thus, future operations were focused on developing this well as the only operational well and distributing from it throughout the town.

In Barrigon, the community had already repaired one of the hand pumps while the EWB group was gone. This pump was functional when we arrived. A new well was drilled near the existing windmill to a depth of 130 ft with a six inch casing. This well will be used to provide the majority of the town's water supply. The following figures are the result of the survey our group took while on the assessment trip. They show the locations of the existing wells and the sites of the new wells.

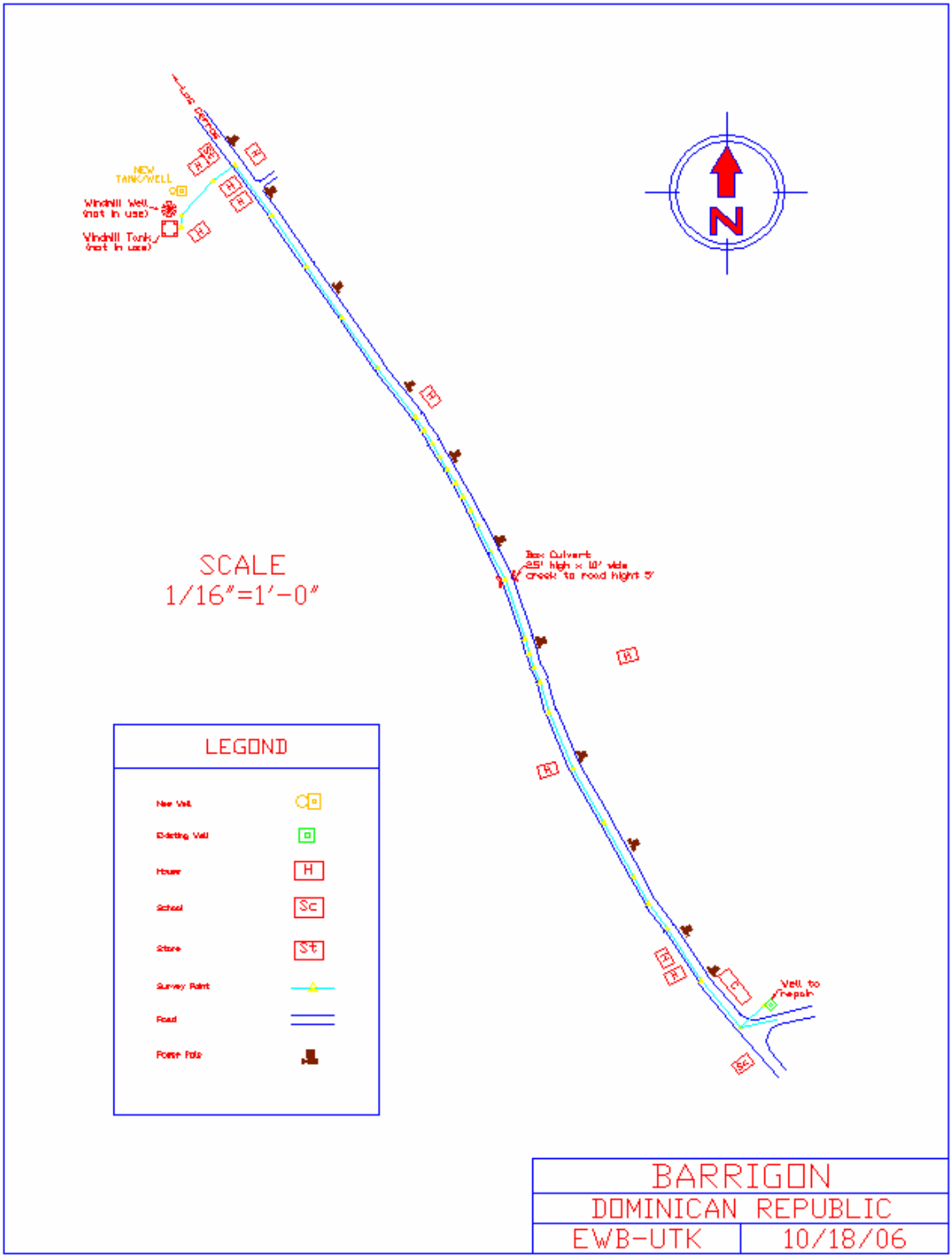

Figure 4-1.1 Barrigon Survey

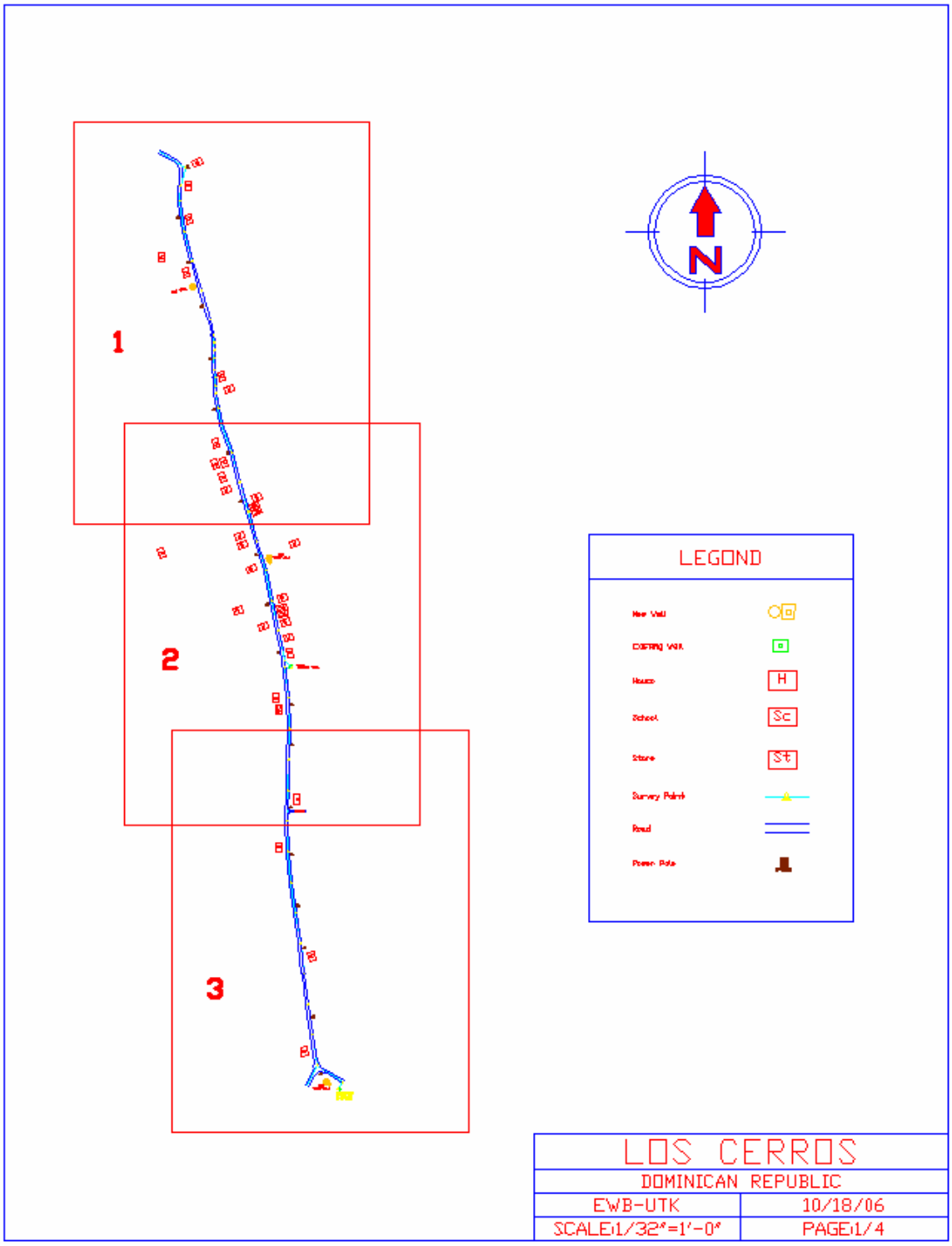

Figure 4-1.2 Los Cerros Survey

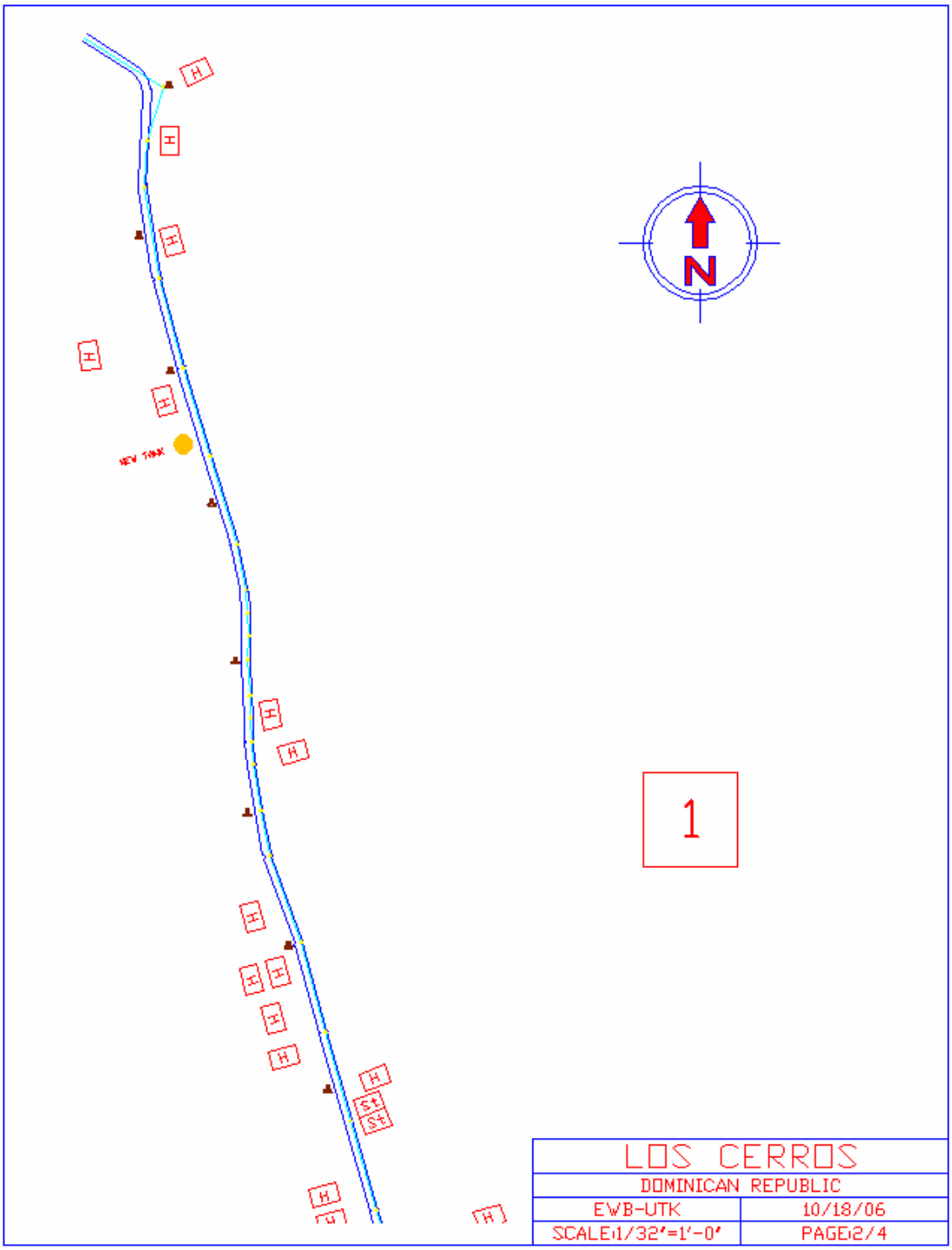

Figure 4-1.3 Los Cerros Survey Sec. 1

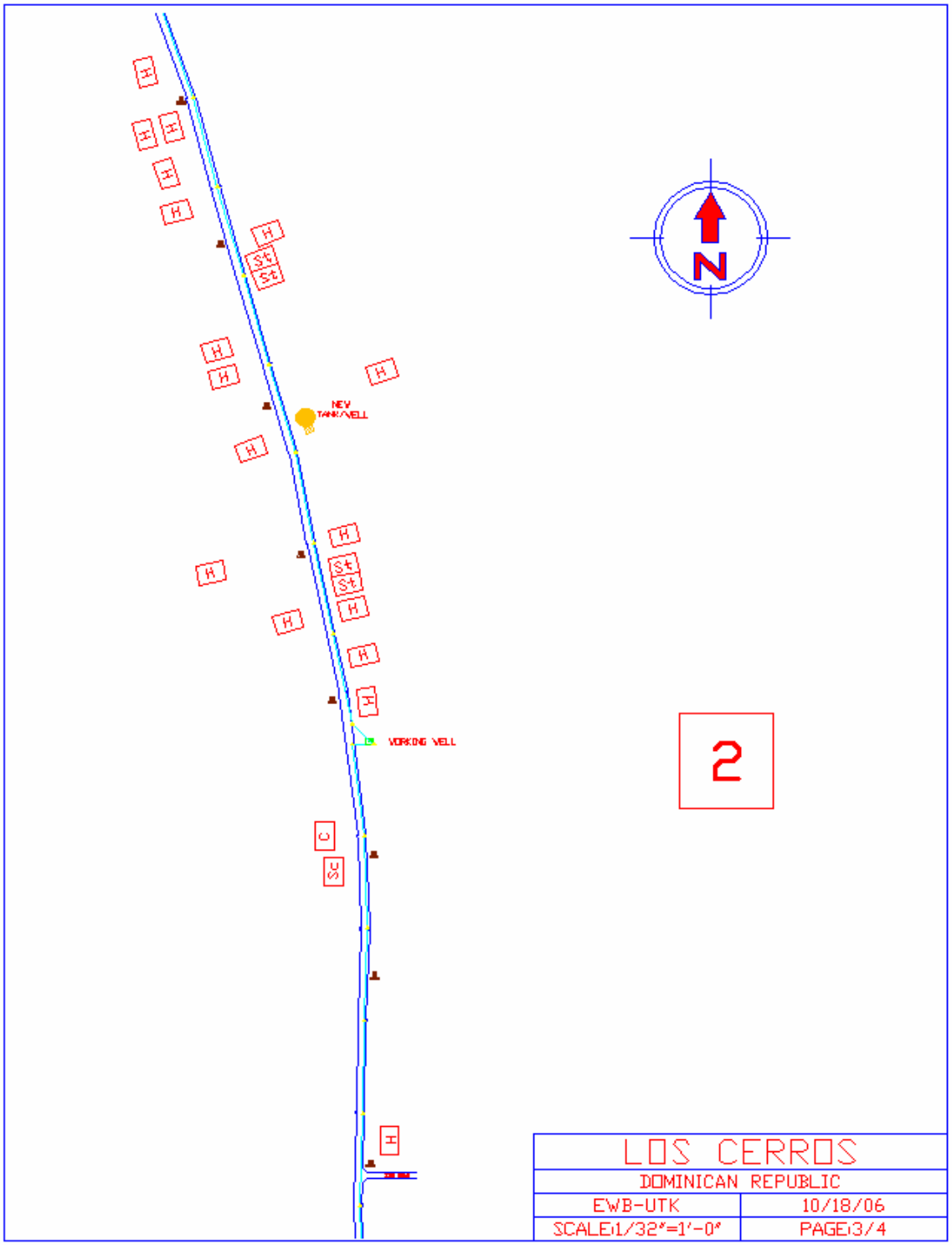

Figure 4-1.4 Los Cerros Survey Sec. 2

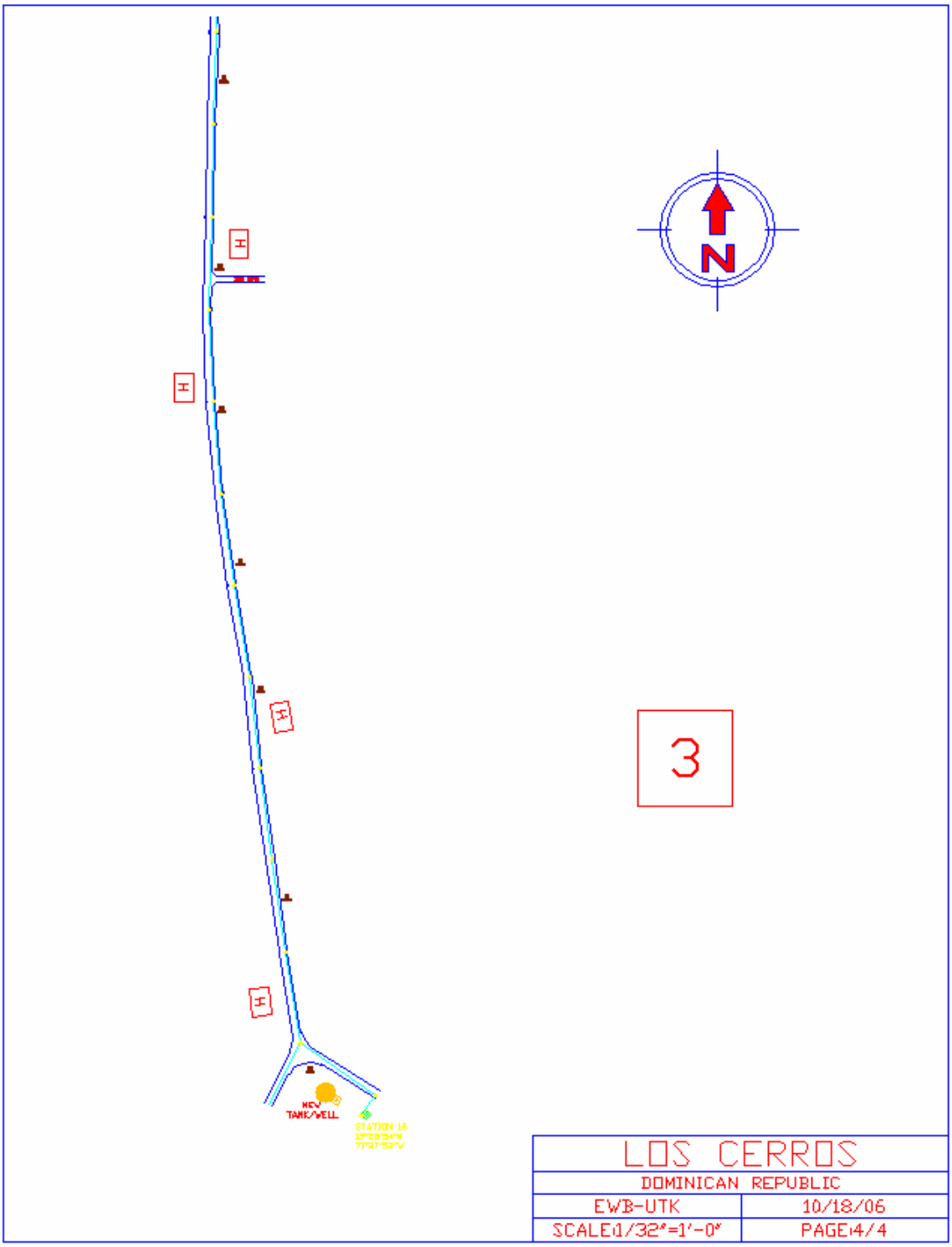

Figure 4-1.5 Los Cerros Survey Sec. 3

4.2 Materials and Logistics

No materials need to be provided by our group for the wells themselves. SINDICO has dug each well and provided the casing. The wells were capped, to prevent debris from falling into the well, until we arrived for the implementation trip.

4.3 Plans for Village Participation and Sustainability

The whole community agreed upon the location and use of the new well. Any repairs needed to the wells in the future would be organized by community leaders and be the responsibility of the entire community. A good relationship existed between the town leaders and SINDICO. Also, a connection was made on the implementation trip with a local engineer.

5.0 PART 2 OF PROJECT: STORAGE AND DISTRIBUTION

5.1 Component Description

The distribution system for Los Cerros begins with four inch electric submersible pump that is placed at the bottom of the well, suspended by quarter inch cable. The pump size requirements were determined by a pump test performed by a local engineer. He recommended the pump size for the project. The pump operates from a control box, supplied with power via three-way wire connected to the power lines, which will shut off the pump when water is not present to prevent pump burn up. Water is pumped through inch and a half HDPE pipe into storage tanks. The main storage tank is approximately 8 ft. x 68 ft. x 8ft 4000 gallon masonry tank. Water is pumped into this storage tank and then gravity fed through inch and a half PVC pipe through the community and into a 1,000 gallon plastic tank, setting on a 8 ft. x 8 ft. concrete slab on the other end of town. The inch and a half PVC distribution piping stretches 2700 feet one foot deep trench. The change in elevation between the storage tanks and the town center is approximately 38 ft. Six needle valves were placed above ground, spaced throughout the system to accommodate the community with access points for water. Float valves were added at each tank relaying to the control box to shut off the pump when capacity is reached.

The well in Barrigon will operate using a one and half horse power pumps. The tanks will be connected with the same system as in Los Cerros. However, Barrigon does not require a distribution scheme. The system in Barrigon will only consist of the new well, pump, controls and storage tank. A tap will be present at the tank for water access. Pump test by a local engineer, system curves and available pump curves were used to determining needed horsepower. Also, the EWB team met with a local engineer and discussed our project and pump alternatives. A local electrician was available to connect the pump to the power lines and help wire the control panel. The following figures represent the elevation change in each community and were used in designing the system.

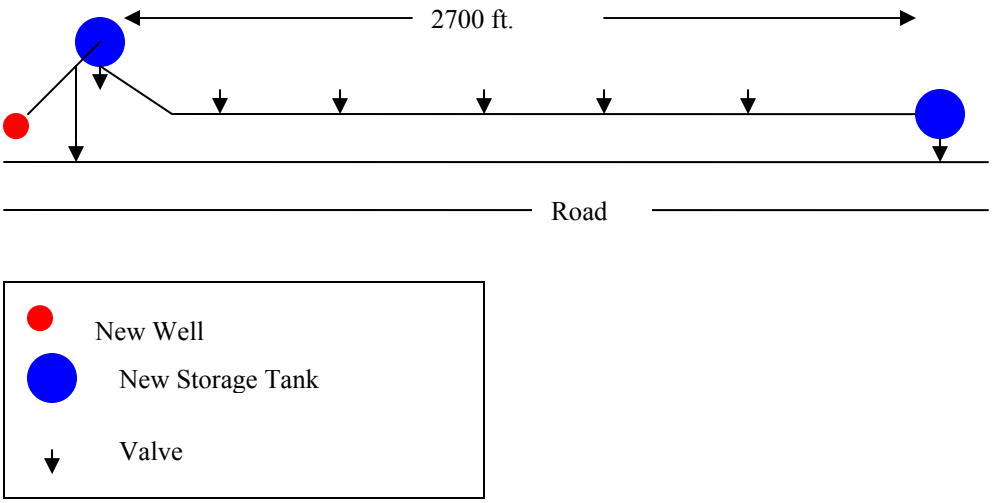

Figure 5-1.1: Overall Distribution System Sketch in Los Cerros

Figure 5-1.2 Main Masonry Storage Tank in Los Cerros

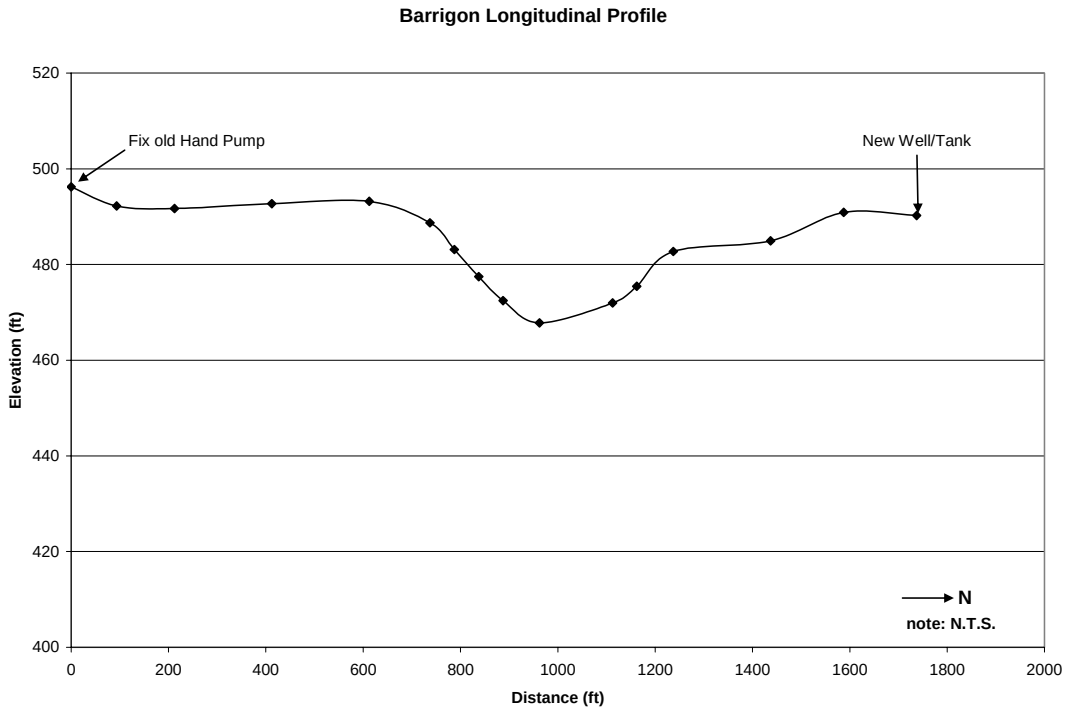

Figure 5-1.3 Elevation Profile Barrigon

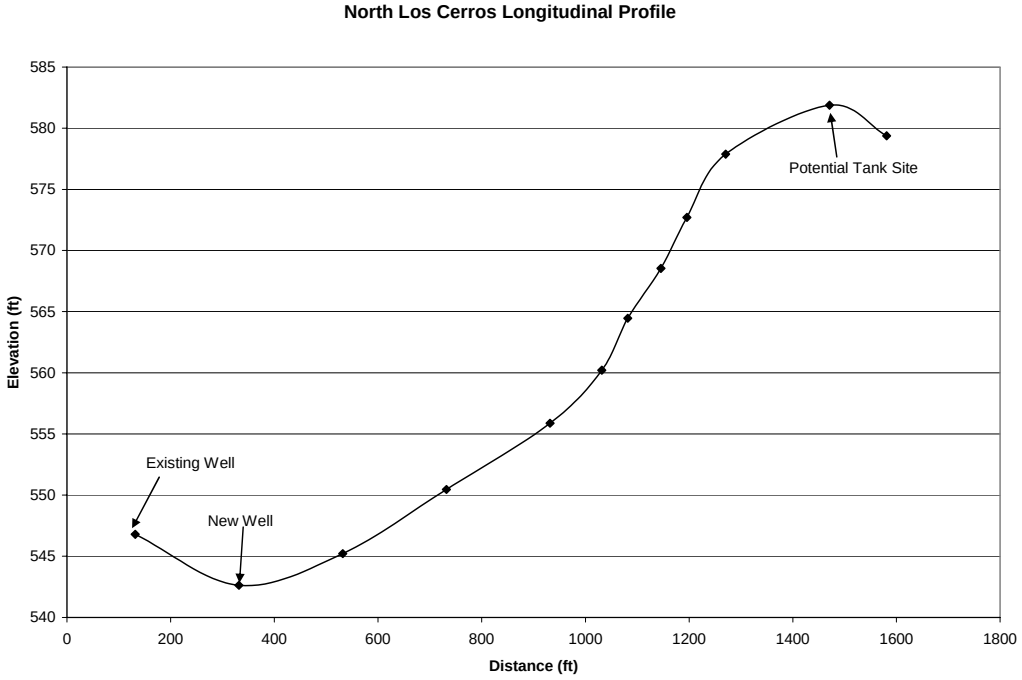

Figure 5-1.4 Elevation Profile North Los Cerros

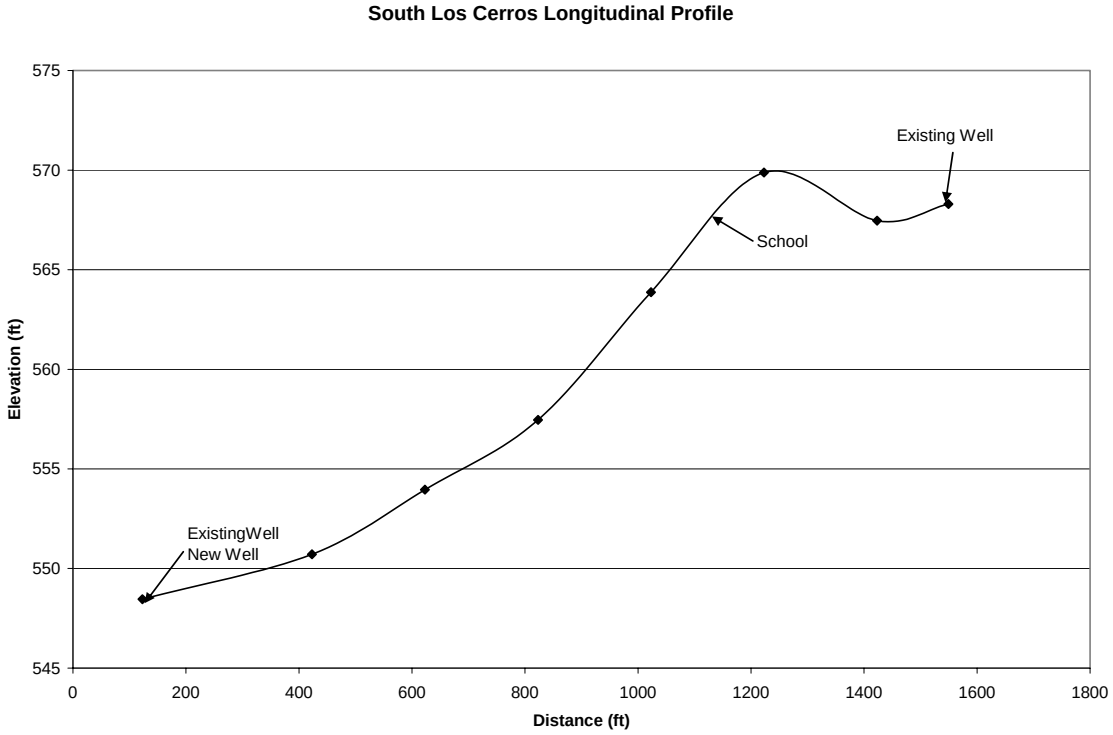

Figure 5-1.5 Elevation Profile South Los Cerros

5.2 Materials and Logistics

All materials were purchased at OchoA hardware store in Santiago. Delivery was provided by the store.

5.3 Plans for Village Participation and Sustainability

The community of Los Cerros was a huge help in the success of this project. They expressed concern and opinions throughout the whole implementation. All the able men in the town volunteered their time and tools to dig the 2700 feet long trench for the distribution pipe. Land owners donated land for the placement of storage tanks and allowed the digging of the trench for the distribution pipe. A few local masons laid the concrete pad and block the masonry storage tank. A man in the community allowed us to use his truck to haul river sand from the nearby river to use in the concrete. Several men helped in hauling the sand, and sifting and mixing the concrete. The systems operations were explained to the community so they had a working understanding of the project. Also, a contact with a local engineer was made in the case of a problem that was out the community's realm. Upon departure the system was operating successfully.

Similar community involvement was shown in Barrigon. The community had already repaired the one hand pump. They also volunteered to repair the existing storage tank next to the new well to use for storage from the new well and pump.

Supplies were left with the community and they agreed to work with a local engineer to install the materials. Follow up has shown the community was able to accomplish installation of all supplies, and the local engineer has agreed to help the community with maintenance of the system.

Figure 5-3.1 Community Members Building Storage Tank

Figure 5-3.2 Men in Community Digging Trench

Figure 5-3.3 The System Works!

7.0 BUDGET & FUNDING

7.1 Budget

- Materials Budget (Table 7-1)

Materials Bought in the Domincan Republic

Item	Cost (Dominican Pesos)	Number	Total
1/2" PVC Female Adaptor	2.311	12	27.73
2" PVC Female Adaptor	13.02	1	13.02
1" PVC Female Adaptor	5.113	4	20.45
500 mm x 2" PP Male Adaptor	143.37	1	143.37
1" PVC Male Adaptor	4.173	2	8.35
PVC Cement	829.18	1	829.18
1 1/2" 90 Degree PVC Elbow	13.147	25	328.68
1" 90 Degree PVC Elbow	6.975	10	69.75
2" 90 Degree PVC Elbow	21.138	4	84.55
1/2" 90 Degree PVC Elbow	2.966	24	71.18
1 1/2" 45 Degree PVC Elbow	33.587	12	403.04
1/2" 45 Degree PVC Elbow	10.432	4	41.73
2" 45 Degree PVC Elbow	43.75	2	87.50
1" 45 Degree PVC Elbow	19.164	4	76.66
1/2" Ball Faucet	56.052	8	448.42
1" Ball Faucet	106.733	1	106.73
1 1/2" Ball Faucet	180.664	4	722.66
2" Ball Faucet	317.21	1	317.21
1" Cradle Faucet	146.65	1	146.65
Faucet Hose	102.949	8	823.59
Galvanized Nipple	24.94	1	24.94
PVC Surface Preparer	234.9	1	234.90
1" x 1/2" PVC Reduction Bushing	4.08	1	4.08
2" x 1 1/2" PVC Reduction Bushing	7.888	4	31.55
1 1/2" x 1" PVC Reduction Bushing	16.863	4	67.45
2" x 1" PVC Reduction Bushing	28.06	1	28.06

Black Iron Cup Reduction	26	1	26.00
Inverted Spray Mark	110.845	1	110.85
1 1/2" Cup Adaptor	5.569	5	27.85
1 1/2" Tee	17.44	3	52.32
Reduction Tee	33.044	12	396.53
1" Coupling	3.949	15	59.24
1/2" Coupling	1.854	20	37.08
1 1/2" Coupling	6.975	180	1255.50
2" Coupling	10.457	2	20.91
1/2" PVC Pipe	77.595	12	931.14
6" PVC Pipe	1166.91	1	1166.91
Cistern Valve	236.544	1	236.54
Water Level Sensor	311.078	2	622.16
Freight	2155.17	1	2155.17
Overload 9-13A	620.802	1	620.80
Rubber Tape	329.647	1	329.65
Vinyl Tape	102.9	1	102.90
Black Tank	14717.5	1	14717.50
2 1/2" Galvanized Pipe	3464.854	2	6929.71
1 1/2" 50 mm Polyethlyene Pipe	41.457	145	6011.27
280 PSI PVC Pipe	343.414	2	686.83
430 PSI PVC Pipe	248.207	180	44677.26
450 PSI PVC Pipe	158.863	15	2382.95
50 mm x 2" Male Adaptor	143.371	1	143.37
White Braided Wire	2.414	145	350.03
Red Braided Wire	2.414	145	350.03
Vinyl Stranded Wire	16.561	250	4140.25
Vinyl Stranded Wire	38.863	145	5635.14
Submersible Pump	10084.36	1	10084.36
Double Breaker Plug	247.23	1	247.23
Plastic Register Box	478.73	1	478.73
Contactor 3F	529.225	1	529.23
Automatic Water Level Controller	4568.569	1	4568.57
1" PVC Male Adaptor	4.35	1	4.35
PVC Cement	511.7	1	511.70
PVC Primer	69.888	1	69.89
Teflon	3.34	1	3.34
Plastic Covered Wire	10.164	46	467.54
Circuit Breaker Box	78.49	1	78.49
Cable Clamp	5.742	4	22.97
50 mm 1 1/2" Coupling	276.638	3	829.91
Pump Control Box	1680.13	1	1680.13
1 1/2" PVC Female Adaptor	9.949	4	39.80

3/4" PVC Female Adaptor	3.16	1	3.16
1/2" PVC Male Adaptor	2.061	14	28.85
1 1/2" PVC Male Adaptor	8.975	4	35.90
Duplex Wire	4.595	6	27.57
3/8 Flat Washer	1.285	4	5.14
20 GPM Pump Motor	6478.785	1	6478.79
3/4" x 1/2" PVC Bushing Reduction	1.242	2	2.48
1 1/2" x 3/4" PVC Bushing Reduction	16.44	3	49.32
Bimetal Saw	21.475	2	42.95
Aluminum Cistern Lid	1867.6	1	1867.60
Hexagonal Screw	9.664	4	38.66
480 PSI PVC Pipe	5.811	5	29.06
Hexagonal Bolt	3.035	4	12.14
Cistern Valve	174.11	1	174.11
Blocks	16	160	2560.00
Cement	195	45	8775.00
Reinforcing Wire	123	40	4920.00
Galvanized Wire	35	4	140.00
Nails	40	1	40.00
Galvanized Nails	25	1	25.00
Delivered Blocks	14	300	4200.00
1 1/2" PVC Elbow	13.95	4	55.80
Cable Clamp	12.5	1	12.50
Hexagonal Screw	5.587	4	22.35
3/8 Bolt	4.819	4	19.28
		Subtotal =	148519.17
		Tax =	23763.07
		Total =	172282.24
		U.S. Dollars =	5383.82

U.S. Bought Materials

Item	Cost	Number	Total
Hacksaw	4.99	1	4.99
Pipe	9.49	1	9.49
Hammer	8.49	1	8.49
Flashlight	9.99	1	9.99
Socket Set	9.99	1	9.99
Adjustable Wrench	7.99	1	7.99
Electrical Tape	0.64	1	0.64
Hex Key	2.99	1	2.99
4" HT Shrink Tub. 3/8	1.95	2	3.90
4" HT Shrink Tub. 1/4	1.95	2	3.90

Butt Splice	5.98	1	5.98
Cup Leathers	3.9	3	11.70
7/16 Couplings	0.9	3	2.70
		Subtotal =	82.75
		Tax =	7.86
		Total =	90.61

Miscellaneous Cost	U.S. Dollars	Total
Labor (Electrician, Mason, Drill Rig)		335.96
Pump Test		30.53
Sand		36.64
Phone Service		27.79
Money Transfer		50.00
	Total =	480.92

Total Material/Labor Cost =	$5,955.35

- Transportation Budget (Table 7-2)

Item	People	Unit	Price	Total
Assessment				
Flights	4	Person	643.42	$2573.68
Implementation				
Flights	7	Person	692.57	$4438.00
Fees				$230.00
Translator/Facilitator Flight Reimbursement				$200.00
Ground Transportation				$42.48
Food				$202.24
Hotel				$43.66
				$7703.06

- Budget Overview (Table 7-3)

Materials/Labor	5,955.35
Transportation/Food	7703.06
Total Project Cost	$13,658.41

- 7.2 Donated Hours (Table 7-4)

	Number of Weeks	Hours Per Week	Total Hours
Mentors	50	2	100
Student Lead	50	3	150
Student Team Members	50	12	600
Faculty	50	3	150
Total			**1000**

7.3 Funding Sources

The following sources have donated a total of $12,265.00.

- Pro2serve
- The Preservation Pub
- UT-Battelle
- The Ann Campana Judge Foundation ($5,000)
- National Ground Water Research and Educational Foundation ($5,000)

8.0 Travel Plans

EWB-UT hopes to return to the Dominican Republic in the future to follow up on this project. No specific dates have been determined but regular contact with the communities has been made.