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Project: Final Report - Kyabirakawa Convent/Farm Water Pump Replacement

Executive Summary:

The water pumping system that provided water to the Kyabirakawa Convent and Farm, Uganda, Insiro Province for over 40 year has been completely replaced with a Grundfos SP in-line water pump. The pump was installed together with a one piece water pipe extending the entire length from the new pump itself to the water storage tanks, a distance of approximately 200 meters. The Grundfos water pumping system is capable of supplying 84,000 l/da, over 4 1/2 times the volume of water the old pump supplied.

The well pump-down test uncovered a previously unknown vast supply of water at the wellhead, more 84,000 l/day. This volume vastly exceeds the existing consumption of water (18,000 l/day). The total daily volume of water that is currently consumed at Kyabirakawa can be pumped by the updated system in less than 1½ hrs.

Due to the discovery of the large supply of water at the existing wellhead and the installation of a large Grundfos pump capable of pumping a large volume of water at a high rate there was no need to drill a second well at the Health Care Facility as originally proposed. Rather, a better option was to increase the volume of water distributed to the Health Care Facility through the existing distribution pipe between the well/Grundfos pump and the Health Care Facilities. The cost savings are considerable. Total Project cost for this project was only $15,000, considerably less than that originally proposed $24,000. Savings are accrued due to elimination of the requirement to drill the second well at the Health Care Facility.

The project was jointly being funded by the Hilton Foundation, the Donald D. Lynch Foundation and Engineers Without Borders International, Shepherdstown, WV, USA.

Program Manager: Kyabirakawa Convent/Farm; Technical Project Manager; Engineers Without Borders Int.; Primary “Drilling Contractor: Draco (U) Ltd, Kampala, Uganda.

Discussion: Existing Water Consumption

Kyabirakawa Convent/Farm is made up of four primary interconnected groups that are totally dependent on the new water pumping system. The water consumption of the combined group is approximately 18,000 l/day. Realistic projections of actual existing water consumption include the Convent (Mother House and Novitiate w/animal (hog) production – 1500 l/day), the Health Care Facilities including projections for the 22 bed Maternity Ward that is under construction (1,668 l/day), two schools, Primary and Secondary (12,620 l/day - total) and the Dairy Farm Animals (2,212 l/day). Additionally, there is a vocational school on the premise that is approximately 1 1/2 to 2 miles from the well that is not connected to the well.

Well Parameters:
Total well depth – 99 meters
Water depth – 61.8 meters
Ground surface to water level – 37.2 meters

Pump Down Well Test:
depth – 66 meters. - Test was conducted continually for 24 hrs. There was no noticeable change in water level during testing at 7,000 liters/hr (12 hrs@7,000 l/hr = 84,000 liters per 12 hr. day).

Water Distribution System:
The water is routed from the well directly to two storage tanks (3m x 6m each) having a total capacity of approximately 35 cu meters, and is gravity fed to the Farm, Health Care Facilities and Convent. A separate imbedded distribution line connected prior to the storage tanks feeds the storage tanks at the schools, which in-turn gravity-feeds the schools.

The distribution water pipe to the Health Care Facilities includes a debris and rust trapping system with a clean-out that was corroded and leaking badly. It was replaced with a similar custom-built system.

General Work:
Draco (U) Ltd, an Italian Well Drilling Ltd based in Kampala had been selected by Sister Claudia and EWBI as a result of telephone and other correspondence prior to the Technical Project Manager's (my) arrival. Correspondence involved Sister Clauda, Roger Ethier (Technical Project Manager) and Dr. Flavio Pasqualto, Managing Director of Draco. Draco was selected based on their international experience and references that Draco supplied relating to similar work they had recently accomplished inside Uganda. All references were thoroughly checked out and validated by Mr Ethier (EWBI) prior to Draco selection. Therefore, immediately after his arrival from the US Mr Ethier was able to accompany the initial Draco team on the six hour trip from Kampala to Kyabirakawa.

Removal of the existing antiquated 40 year old pump required not only disconnecting and moving the pump but removal of ten 1 ½in x 6 m rods and ten 4 in x 6 m steel well casing pipes imbedded vertically in the ground extending to the underground water. Cranes were needed to pull each rod and pipe which required precise, slow removal in order not to fracture the pipes. However, prior to pulling the pipes with a crane the building that housed the pumps/well was

completely dissembled to allow room for lifting the pipes with the crane.

After removal of the rods, pipes and the one-way water valve located at the bottom of the pipes, the 24 hour pump-down test determined the availability of water in the well. During the pump-down, Draco used the largest pump available on their truck which pumped at a maximum rate of 84,000 liters per 12 hr day (7,000 l/hr.). After 24 hours of continual testing there was no significant change in the surface level of the water. It was therefore determined that availability of water at the wellhead is at least 84,000 liters/12 hour day, which is a vast supply of available water for potable and other uses.

The second Draco team arrived a few days after the initial team had departed and installed the new pumping system which included a Grundfos SP in-line pump and one-piece 200 meters long vinyl high pressure potable water grade pipe designed especially for pressurized water distribution. The new piping was laid in a 200 meter long, 1 meter deep trench recently dug that paralleled the existing corroded distribution pipe to the storage tanks. The Grundfos pump is generally considered the best and most reliable pump available anywhere by most engineers and well specialist, including this technical specialist. The overall effort was greatly enhanced and facilitated by an entire team from Kyabirakawa who chipped in digging the trench, removing the cumbersome old water pump, and handling and laying the pipe. The team included men and boys from the farm, and a few sisters including the farm manager who seemed to have only secondary concerns for getting hands dirty, and shoes and cloths soiled.

A number of tasks need to be completed after installation of the water pumping system. They include:

- Removal and replacement of the oil-soaked soil above the well in the area where the old pump had been located.
- After removal and replacement of the oil soaked soil a cement surface tilting slightly away from the well needs to be fabricated to prevent well contamination from surface water. The cement should extend completely around the well to a radius of approximately 2 meters from the well head.
- A boxed, dust- tight enclosure needs to be installed around the controller, with a door to allow accessibility. Since the controller location needs both weather and security protection it was located in an adjoining building that is normally locked. However, a grain grinding mill is also located there, thus the need for dust-free protection.
- A small shed over the well that extends to the adjoining building in which the controller is installed should be constructed. This will insure additional protection of the entire well head and electrical system.

Summary:
The overall objective of the project was to provide a reliable and adequate supply of water to the entire Kyabirakawa Complex which includes the Convent, Farm, Schools, and Health Care Facilities. Prior to the well pump-down test it was thought that a second well needed to be drilled at the Health Care Facilities. However the well pump-down test uncovered a vast supply of water within the existing well, more than five times the current consumption within all of Kyabirakawa. Therefore it was decided to design the water pump to allow immediate availability

of the maximum volume of water, and to merely increase the supply of water to the Health Care Facilities while using the existing water distribution system. One section of the Health Care water distribution system, a debris clean-out section was badly corroded and leaking so it was removed and replaced with a similar custom-made section. Expectations are that the newly renovated water system can easily supply all the current and foreseeable future needs of Kyabirakawa including the Health Care Facilities.

Other Critical Applications at Kyabirakawa:.

- With the discovery of the large supply of underground water also comes the responsibility to protect the water source from contamination. Since physical parameters for the underground water are nearly impossible to know the best management policy is to assume a large aquifer or underground stream and target the area surrounding the well for agricultural use or similar non soil invasive uses. One possible existing source of contamination in the area is the pit toilets (22) that are part of the secondary (girls) school. Although these toilets are located some distance away from the well (approximately 600 meters) they are up-hill from the well and over time may become a source of e-coli water contamination. Very serious consideration should be given to upgrading the pit toilets at this school to compost toilets with disposal bins, or water flush toilets that utilize natural sedimentation ponds or leaching fields to handle the waste. This appears a critical need and likely should also involve upgrading the pit toilets at the primary school as well. Preliminary estimated costs for upgrading both schools are from $16,000 to $30,000 (US), depending upon the method of waste disposal used. EWBI is more than willing to provide on-site conceptual designs and technical oversight for this project and also will develop cut-rates for professional services for on-site support as part of our contribution to the project.
- Another critical need at Kyabirakawa is to upgrade the milk parlor and barn. Over the years constant use and the weather have badly eroded the entire structure including the concrete floors that are no longer level and are badly pitted and worn. Sister Goretti, the Farm Manager has received an on-site estimate by a local contractor to completely upgrade the edifice for approximately $80,000 (US). This requirement is also critical since there are now 70 dairy cows with projections to 150, and fresh milk is a major source of income for the convent/farm. Likewise, EWBI is willing to provide on-site technical oversight and expertise for this project at substaintially lower professional rates.
- The only facilities at Kyabirakawa that do not have water are the new Vocational Schools that are 1 to 2 miles away. These schools are operational. It appears that a very acceptable option to supply water to the Vocational Schools is to design a water distribution system extending from the existing well to a new water storage tank near the schools. There is more than sufficient land both for the distribution water pipes and for the water storage tanks where water can then be gravity-fed to the schools.

In conclusion, I wish to express my sincere and heart-centered gratitude to the Sisters of Kyabirakawa particularly Sisters Claudia, Cleophas, Gretchin and Elizabeth, as well as all the many other individuals I worked with at Kyabirakawa, Also, my thanks to the highly competent individuals of both teams from Draco, LTD, and Dr. Flavio Pasqualato, Managing Director. Guiding me during my departure from Kyabirakawa to return home was Sister Elizabeth who graciously accompanied me through the maze of transports via motor scooters and taxis to the

bus terminal at Marbara, all with total acceptance, persistence, laughter, and kindness.

Respectfully,

Roger Ethier, Technical Director *engnerswobord@hotmail.com*
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