

A critical need

GROUNDWATER EXPLORATION IN NORD OUEST DEPARTMENT - HAITI

By: Stuart Dykstra and James Adamson



Robert Ulysse has a vision, a passion, to change the course of his impoverished homeland, Haiti. Key to the dream is clean water, both for his development project and for the people of the area.

In May, we found that water - clear, clean and plentiful - and it was accomplished in spite of many who doubted it could be done. Now this discovery is inching Ulysse closer to his vision of breathing economic life into his native land.

Haiti shares the island of Hispaniola in the center of the Caribbean Sea with its much larger neighbor to the east, the Dominican Republic. It was once considered the jewel of the Caribbean, but now many consider it a hopeless case. With little in the way of commerce, its economic health, like that of its people, is poor. Disease is rampant. Infant mortality is high. Modern sanitation is nearly non-existent. Clean water is at a premium, especially in the remote western reaches of the northern peninsula, the place Ulysse calls home.

We first met Ulysse in the fall of 2006 when we were brought in to discuss the possibilities of finding water

to supply his dream, Nouveau Kiskeya, an innovative mixed use land-development project underway on the northern coast. Targeted at Haitian expatriates who want to come home and others who want to be part of a new Haiti, it would be the cornerstone of Ulysse's long-range plan. Backed by several Christian business people, Nouveau Kiskeya would help lay the foundation of a new economy for the region and a model of sustainability for Haiti.

Ulysse needed our help because without water, the project could not move ahead. Going into that first meeting, we expected a routine investigation that would take us to an interesting part of the world. The real challenge, we believed, would be the logistics of drilling and delivering the water to the development. Robert painted a different picture.

Looking at an aerial photograph of the region, we pointed to areas that held potential. An alluvial valley south of the development and the porous, coral coastal mountains both looked promising. Ulysse, however, kept directing our gaze further south towards the interior mountains. The areas we first thought were promising



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had already been tried and the results had always been poor. He told us of a belief, handed down through generations, of a deep and unlimited subterranean lake under Bamboo Mountain to the south.

Later, we were to hear variations of this story from a number of people as we walked the hills and mountains

of the area. The farmers of the region believed water was there based on what they had seen. Like their counterparts around the world, Haiti's farmers are careful observers of the natural world around them. Springs flow from the face of the mountain at similar elevations, lush vegetation fills some of

its valleys, and bamboo grows from the side of the mountain. All are indicators of a good subsurface water supply.

The story also told of the belief that outsiders would one day come, release the water and it would bring local acclaim and prosperity.

POVERTY AND PESSIMISM

Haiti has major problems, many of which are connected to a serious lack of freshwater. The importance of the Nouveau Kiskeya project to the future of the country left no option but to be successful in the search for a clean, reliable source. Even in the developed world this would be a challenging project. In Haiti, the difficulties were multiplied.

Everywhere in the country water is scarce and often contaminated, but especially in the rural Northwestern region. It is one of the driest areas in a dry country. Its

parched reputation is a point of disparagement among Haitians. Those who live there are looked down upon as being from the wrong side of the tracks. Clean water can be kilometers away. Obtaining it consumes a major portion of the day for the men, women and children who have to walk or ride donkeys over the hills and mountains every day to bring a supply home.

The reports we read were rife with the horrors the people of this impoverished nation faced every day. Heartbreaking statistics on infant mortality, rampant disease and premature death were interwoven with stories of the sick and dying children and their mothers. The numbers were unfathomable. They made the country sound awful - not much better than a cesspool with a hopeless outlook and a dispirited people.

In decades past, others had gone to the valley to drill. They found poor quality water or nothing at all. They left and wrote brief, pessimistic reports with blanket conclusions about the whole area confirming what many thought. Water was not to be had.

Our initial research underscored the challenges we would face. Inquiries about the prospects of success were often met with skepticism and even cynicism by experts. Many industry professionals we contacted dismissed the idea of finding a plentiful supply of groundwater as simply impossible. One drilling company out of Port au Prince refused to even go to the area because "it was a waste of his time and our client's money." Another, who for years had drilled wells near the area, said most wells were dry or resulted in very little quantity.

As the years passed and the negative perceptions continued, the long daily treks for water continued. The people suffered.

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Robert took all this personally. This was his home. The disrespect of his fellow Haitians and the skepticism of professionals galled him. In his view, it was unfair and unfounded. As a young man he even dug holes looking for water. He never found any but he knew it was there. He had no way to prove it. But the springs that flowed from the mountains in the south and the beliefs handed down gave him hope.

DETECTIVE WORK

The investigation took months of upfront research. Very little published geologic information exists on Haiti. We traveled to the U.S. Geologic Survey (USGS) Library in Reston, Virginia to scour the stacks for information. We talked to anyone who may have had some experience in the country. This included drillers, NGOs, geologists, relief organizations, the USGS and the U.S. Army Corps of Engineers. We made transatlantic phone calls and exchanged volumes of email. We scoured the Internet and combed through book repositories. One of our best finds was a 1924 book on the geology of Haiti from Amazon.com. We obtained high resolution images of the valley by tasking a satellite to gain additional aerial views.

Geologic maps, photographed in the USGS library, were converted and downloaded into Global Positioning System receivers for use as base maps. Throughout the field work, we could stand on a surface feature and know exactly where we were relative to locations on the geologic base maps of Haiti.

In February, and again in May, when in country, we found that far from a cesspool, this impoverished land is picturesque, reminiscent of the American Southwest with the addition of a deep blue Caribbean ocean washing at its shores. But further, the people have a beauty in their countenance that is difficult to grasp when looking at their impoverished conditions. They were open and welcoming and gave us complete

freedom to wander their land with a crew that often exceeded 20 persons. Grasping what we were trying to do, they appeared to be truly honored to be part of the search.

We launched into nearly six weeks of field work in a geologic survey area that encompassed more than 200 square kilometers. We observed and measured springs, rock outcrops, fault lines, recharge areas, and stream cuts. Transportation limitations meant hiking a total of 150 kilometers, much of it on the incline as we hauled our research gear up and down hundreds of meters of elevation.

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People everywhere helped us whenever they could. On more than one occasion, a farmer working in his field would drop his tools and walk kilometers with us to show features he knew. The people were eager to help and our field assistants showed stamina in very rough terrain as they carried heavy equipment. Transportation from area to area was provided in the back of pickup trucks, sometimes with up to 12 other helpers crammed in.

We were hungry for as much information as we could get before we drilled, because drilling is expensive and very difficult to execute in such remote areas. As a result we performed, with the help of a specialist, a week-long Controlled Source Audio Magnetotellurics/ Magnetotellurics (CSAMT/MT) geophysical survey.



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This aided our field observations and will be invaluable in the future for well-field development and further exploration.

THE SENSE OF ACCOMPLISHMENT WAS BEYOND BELIEF WHEN THE GUSHER - COLD, CLEAN WATER IN A DRY LAND - BURST FROM THE WELL HEAD.

THE WELL

Nothing trumped the importance of finding groundwater. For the investigation team, it was intensely gratifying to be part of this story because we found water – lots of it. The sense of accomplishment was beyond belief when the gusher--cold, clean water in a dry land--burst from the well head.

Our decision on where to drill was based almost solely upon where we felt we had the highest likelihood of success. Not in the valley. Not in the coral coastal mountains. Our site was over 10 km inland, on the shoulder of Bamboo Mountain like Ulysse and the area's farmers said it would be. The field investigation bore them out.

The water is elusive, hidden by a complex geology. Though not an underground lake as the legend says, the aquifer is limestone. Tapping it had much more to do with figuring out the puzzle of the tilted rocks, overlying

clays, and the fractures of the prehistoric tectonic shifts. Once the site was chosen, the team set out to make it happen.

Within days of selecting the site we went about purchasing the property, a quiet and dignified process with the owner's son-in-law conducting the proceedings in the pasture under a tree. A few locals observed sitting a respectful 100 feet away. After 45 minutes of discussion, where the topic of sale was not brought up until the very end, the deal was struck for 1.2 acres. Local community liaisons helped negotiate right-of-way, lodging for the drillers and other issues. All was done with decorum and grace.

Through contacts we found the perfect well driller for the work. Haiti Outreach is a can-do organization that sees every challenge as an opportunity and every unknown as a way to learn. Led by Neil Van Dine, the organization owns a quality drill rig with skillful and dedicated Haitian nationals to operate it. The non-profit, non-governmental organization's goal is to help communities develop clean and available water systems. Its mission, "To empower the people of Haiti so they're able to improve their quality of life, strengthen their families and become self-sufficient."

A one km road was built. It took 3 days to get the rig to the site, and 3 days to drill. Every day attracted a crowd of 50 to 100 people. Enterprising women set up a food vending area where they made and sold coffee, fried bananas, bread and a spicy peanut-brittle.



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Our depth was controlled by how much drill stem Haiti Outreach owned (100 meters).

In May, the drill point hit the aquifer. The crowd could not believe it was groundwater. Some thought it was just water we had used during drilling coming back up...but it kept coming and coming. Rivulets gathered to form a small stream that flowed into the field around the well. The celebration was on.

Women danced and chanted in Creole, people clapped while others watched in awe as the water shot from the well. The drilling-team director, a 20-year veteran of such work in his country, said it was the best well he had drilled. Turning to a V3 geologist he said, "We have changed Northwest Haiti forever."

People stood transfixed for hours, watching the water flow. They never got bored with it. Within minutes farmers were out with shovels and hoes digging irrigation trenches to their fields. It was clear that the celebration was about more than the promise of a better way of life. There was a deep sense of pride. Water was found in their area. The jubilation was like winning a pennant.

Afraid to believe his own eyes, Ulysse nearly giggled. He asked several times if it was indeed groundwater. Finally convinced, he beamed with a broad, happy smile. A part of his dream was coming true.

The following day a large crowd gathered even though

the work was a low-flow test. By comparison to the day before, it would be boring. But they stayed and helped to install a temporary submersible pump. When water flowed again people stood and just watched.

As the water cleared, we could no longer keep the crowd back. People brought jugs and jars and buckets of every sort and carried them home and then returned.

People, including V3's geologists, drank from the well and some washed their heads under the hose. One man in the crowd said, "Everybody should be drinking even if they are not thirsty!" One boy filled his water bottle seven times and drank and drank.

The news went out within minutes to people all over Haiti and the U.S.

HOPE

The groundwater investigation was an intensive 8-month process that will continue in the coming years.

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V3 and the driller, Haiti Outreach, installed a relatively small diameter test well in only the very upper portion of a fractured limestone aquifer. It yielded 620 gallons per minute (gpm) during development. With the exception of a few shallow wells within unconsolidated river alluvium, this test well shows a potential yield greater than any other well known to us in Northwest Haiti. The test well came to represent much more as the project proceeded. Even though it was intended to be exploratory, it required significant investment and risk to complete. It became a verdict of whether V3 had done its job.

The work is just beginning. We need to complete the pump installation and then plan and construct additional wells in the area. The aquifer must be carefully studied to determine its level of sustainability. A community water utility will need to be organized and locals need to take leadership in managing and maintaining the system. A 15-km pipeline needs to be constructed to deliver the water to Nouveau Kiskeya as well as the other communities along the way. And the list goes on.

Nouveau Kiskeya has large hurdles ahead but the promise of changing Haiti is there and it couldn't be done without a local-born Haitian man and a group of dedicated business people working with him who share a vision and passion for his homeland. Water plays an essential part in this development and in the lives of people in the region. The farmers and Robert knew God had put water there. It was up to us to find it.



About the authors

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