Assessment – Post-Trip Report

Community:	Simwatachela Chiefdom
Country:	Zambia
Chapter:	Mississippi State University
Submittal Date:	December 2016
Dates Traveled:	07/29/16-08/14/16
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Scope of Assessment (100 words)	This post-trip assessment provided an overview of the fourth trip made on our southern Zambia water supply project. It provides information on well location and data on four wells installed on this trip, water quality for the new wells and assessment of water quality of previously installed wells associated with this project, and supporting documentation on the project.

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1.0 Assessment Description

This report provides an overview of a trip made by a group of student members, the faculty advisor, and a practitioner advisor of the Mississippi State University Chapter of Engineers Without Borders. This team traveled to the Simwatachela Chiefdom, in southern Zambia, for the third implementation trip of our water supply project in this rural area. While we have supported elementary education, sports education, animal husbandry, cottage industry development, and hygiene programs through our in-country NGO partner (Simwatachela Sustainable Agriculture and Arts Program, SSAAP), our primary activities are focused on the location and installation of small-diameter hand-pump potable water wells. This year's trip was from July 29 to August 14, 2016.

The first two days after arriving in Lusaka, the team gathered supplies and traveled to the Kalomo. The team met with the SRR Drilling Company, an in-country drilling company, in Kalomo (a smaller city near Simwatachela) to lead them into the village. On July 31st the team and SRR traveled Simwatachela. Upon arriving at the village where SSAAP operations headquarters is located, our team set up camp. This is where the team would stay for the next eight days as they traveled to and from project sites.

During the following days, the team and contractor attempted to install wells at five community locations, were successful at installing four wells at four communities, and performed water quality tests all wells installed to date. Unlike prior years where all of the project sites had been identified during a previous trip, only two of the four sites were defined prior to our arrival. Therefore, our implementation process begins by first selecting additional communities that:

- Demonstrated a significant need for a potable water source,
- Could provide the labor for installation of the well and pump,
- Had the organization in place for a borehole committee that would be responsible for the maintenance of the well,
- Had the financial resources required to install and maintain the well, and
- Was in a location that would serve a significant population of the community.

Sites that were located near schools are given addition priority as locating a needed well near a school greatly increases the chances for the Zambian government to locate a state-supported teacher at the facility.

Once a specific community had been chosen per the above guidelines, an evaluation of the location for the well was undertaken. Parameters of interest include estimation of the subsurface geological conditions and the potential for aquifers to exits and be recharged during the rainy season. The proximity to the population within the community was considered such that wells should not be considered the property of any family in the community and it should be located in place that is equally accessible to everyone within a two kilometer radius of the site. Unfortunately, there is no data repository for geo-hydrologic or geomorphology in southern Zambia. So, the team had to rely on incidental and hear-say information for the areas as collected from satellite maps, previous wells installed and attempted, topography, geological outcrops, and proximity of continuous and ephemeral surface water sources.

The depth of the well depends upon the depth of the water table. However, the well is drilled to at least 20 meters below the prevailing free water surface, and often deeper if the aquifer depth and boring conditions merited it, to ensure the maximum volume of water is available for the well throughout the year. After the drilling, the well screen and casing is installed. We install 20-30 meters of screen at the bottom (depending on the depth of the aquifer drilled) and then provide casing that will be in the top of the screen to the surface where it will be inserted in to the pump stand.

Gravel is backfilled into the annulus between the outer walls of the casing and the inner walls of the borehole. The gravel in the bottom screened area serves as a primary filter before the water reaches the screens. It also serves to stabilize the soil and casing above the screen to provide structural strength and minimize soil falling into the screened area. The top of this area is then sealed with concrete holding the top 2-3 meters of the casing in place and securing the top in the pump stand.

The pump is placed in the bottom of the cased well and the riser main and extends the total depth of the casing. The hand-pump and outlet pipe are installed on the stand and the concrete base is poured to seal the gravel and protect the borehole from contaminants. Once the well has been completed, the community is tasked with gathering the materials for and building a fence around the well. The fence protects the well from disturbance by livestock or other large animals.

A “Project Activity Summary” listing all wells installed over the implementation trips is attached to this document. The activity summary includes the name of the community where the well is installed, the committee contact, and the coordinates of the well.

The first well installed this year, Site Number 4, was in the Sikalele community. This well was originally planned for completion during the last implementation trip, but was not

completed due to equipment failure; during the drilling process, a layer of rock collapsed on the drill bit and forced the drilling crew to halt drilling. During this trip, we returned to the community to install a well with a larger, more powerful rig. The original site produced a dry well, so the team chose a new site and a well was installed on the second attempt. Since the team was only in Simwatachela for eight days the team divided into assessment and implementation teams. The assessment team traveled to the Sianjina community to access the location for implementation of Site Number 7, while the implementation team stayed with the SRR drillers to complete Site Number 4.

The second well for this year's trip was installed for the Sianjina community. This well was installed on the first attempt. The implementation team stayed with the Sianjina community members, while the assessment team traveled to the Munyangwa School to access the sight for the implementation of Well #8.

The third well for this year's trip was installed for the Munyangwa community near their school, Site Number 8. The government had previously failed to implement wells for the community. After interviewing the community, the team decided to drill for a well in a valley on the other side of the community, in a location in which the government had not yet tried to install a well. The team evaluated the geological features and chose a site which best indicated water beneath the surface. The first attempt was dry. After relocating to a different location closer to the school and at a lower elevation, a well was successfully installed. This was labeled as Well #8. Water was collected to conduct a water quality test to ensure the water is safe for the community.

The fourth well location was in the Chibwe community, Site Number 10. The two attempts were unsuccessful; on both attempts the drill rig hit nothing but rock for over 50 meters. The first attempt was located near a small canyon with steep rock walls. This indicated that all the water may be flowing around the community in the wet season, and the community was on top of a deep layer of rock. The team made the decision to try again in another location (two attempts are built into the drilling contract); however, the second attempt was unsuccessful. The team had to leave the community with no successful well.

The fifth site, what turned into our fourth well installation was Site Number 9. This well was installed for the Syulikwa community. The community was using a hand dug well that had collected water at the bottom of a creek bed during the wet season. After the sight was assessed and a location was chosen, then the implementation began on the same day. The first attempt was successful.

For the remaining few days in the village the team conducted water quality test on the wells implemented to date. Water quality testing was completed for all implement wells except for Site Number 2, in the community of Simoono (Jackson's well). The well was not functioning; it appeared that the chain was no longer attached to the pump. The team informed the community that it was the community's responsibility alone to repair the well; the community was reminded any repairs must be made using the well committee's fund. The team was notified Site Number 2 was working a few days after they left Simwatachela but the team was unable to check before leaving due to time restrictions.

During the visits to wells implemented during previous trips, the team noticed that most of the communities were utilizing the wells to their fullest potential. One of the wells had community vegetable gardens surrounding the well, and most had created areas for the livestock to water themselves by placing rocks outside of the protective fence for excess water to flow out into and gather water. All wells had fences in place to protect from the livestock and other animals.

2.0 Go/No Go Decision

The team returned to Zambia in July/August of 2016 as planned. The team successfully completed the well located at the community of Sikalele (Site Number 4) after the failure to complete the well in 2015 due to insufficient equipment. The team also installed three other additional wells and attempted a fifth well. The well "Tenson" at Site Number 7 was successfully installed in the densely populated area and provided a great assistance to the community. The team next decided to drill a well at Munyangwa and succeeded on the second attempt. The well located at Chibwe (Site Number 10) was unfortunately not installed successfully after two drill attempts without reaching water. The team decided to focus its money and resources in an area where striking water was more feasible, and finished the implementation phase by drilling a well at Site Number 9. The first attempt was successful. The community has continued to demonstrate their support and appreciation for the wells by demonstrating gratitude and providing meals for the team.

3.0 Data Collection and Analysis

3.1 Well Locations

During the third implementation trip in July-August to Simwatachela, Zambia, Africa the Mississippi State University chapter of Engineers without Borders installed four small-diameter, hand pumped wells. Out of the five locations assessed, four managed to reach groundwater (Well #4, #7, #8, and #9) and had successful pump tests. For this implementation trip, the Mississippi State Chapter worked alongside with the

Simwatachela Agricultural and Arts Program (SSAPP) as well as SSR Drilling Company to evaluate the locations for these wells. The table below describes the GPS coordinates of the wells installed during this trip. .

Table 1. Well GPS Coordinates

Site Number	Community	Latitude	Longitude	Located at School
4	Sikalele	-17.4808	26.6778	No
7	Sianjina	-17.5808	26.7014	No
8	Munyangwa	-17.5028	26.5408	Yes
9	Syulikwa	-17.4333	26.5483	No
10	Chibwe	-17.4385	26.5501	No

Attachment 1 provided a summary of information for all of the wells installed to date by this project.

3.2 Drilling Logs

During the drilling process, the students created drilling logs for each layer of sediment the drill rig encountered. For each pipe that was placed into the ground, a sample of sediment was placed aside. The students recorded the type of sediment associated with each layer; this information was later used to create the borehole logs. These are attached to this report as Attachment 2.)

3.3 Water Quality Results

The team took water samples from all wells installed, except for the one well which was not functioning upon arrival. (This well was verified as repaired the day after we departed the country. A part had to be ordered and this delayed the repair.) The results of the analyses performed on the samples is included in Attachment 3. In summary, it was found that all of the wells tested produced drinking water of a quality that can be deemed safe for human consumption.

4.0 Photo Documentation

To augment this report, we have included a number of photographs. These illustrate the various activities of the team while on this trip. These are included below:

Signing contract for possible drill site.

Engraving the first completed well of fourth trip.

Students assisting drillers in installing the casing.

Student successfully tests out well for the first time.

Successful monitoring of previously drilled well.

Water divinization being used to find next well site.

Head of SSR Drilling with advisor, Dr. Truax, monitoring drilling.

5.0 List of Locally Available Material Costs

The costs incurred each year are established through negotiation with the drilling contractor employed. This year, our original contractor, Overland Mission, was unable to drill any wells. Therefore, we went with the alternative contractor using in the past. This was acceptable as they have a larger crew, bigger equipment, and more experience in the area. The table below summarized the costs we incurred, including the contractors costs.

Table 2. Materials Cost to Install Four (4) Wells This Year

Material	Cost	
	USD ($)	Kwacha (K)
Casing and Well Screen	2,200	23,540
Mark II Hand-Operated Pump	6800	72,760
Fuel	2,500	26,750
Cement and Well Head Protection	625	6,688
Drilling support, rig transportation, crew	15,000	160,500
Total	27,125	290,238

6.0 Summary

During the first installation trip, equipment failures and personnel delays prevented up from installing wells at the four sites we have identified during our initial assessment trip. Only two

were eventually installed. In year 2, the drilling bit for the Overland Mission rig got stuck when karst rock collapsed in the hole we were drilling. As a result, only three wells were installed. This year we hoped to install four wells, and we succeeded. Even when we failed at Chibwe, after drilling through thirty to fifty meters of granite, we were able to quickly identify a fourth site, secure that additional fuel and supplies needed, and install our fourth well. In this regard, we feel were had a successful trip.

Furthermore, even though one of the five previous wells could not have water samples tested due to it being broken, the sustainability model we designed at the outset proved to work, as the community was able to secure the needed part and help to replace the failed pump seal. The primary delay was the availability of the seal, which had to be bused in from Lusaka.

Lastly, all of the wells tested to have appropriate water quality to support human consumption. We did find one well which was limited in supply. We discovered that more people than anticipated were using the well #5 (Petros). Even in this situation, and given the area had experienced the least amount of rain during the rainy season in recent history, this well was recharging quickly and support between 4 and 6 liters per minute of water being pumped out. This is about one-third of what typically would be pumped, but would be sufficient for the community, the adjacent school, and those coming from outside of the community to have water.

7.0 Attachments

Two sets of attachments are provided below as part of this report. Attachment 1 provides information on the wells location and related data. It also includes a map of the area. Attachment 2 compiles the data from the water quality analyses.

Attachment 1

Well Information

Mississippi State University Student Chapter
Box 9546, Mississippi State, MS 39762-9546

Simwatachela Water Project
Simwatachela, Zambia

Project Activity Summary									
Site Number	Community	Well Committee Contact	Project Year	Attempts	Well Installed	Well Data			School
						Latitude	Longitude	Elevation (feet above MSL)	
1	Siamabwe	Leonard Siaakumbale	2014	2	Yes	-17.4994	26.68549	4178	No
2	Simoono	Jackson	2014	1	Yes	-17.4687	26.7248	4178	No
3	Siankope	Bright Nyanga	2015	1	Yes	-17.5685	26.84267	3622	Yes
4	Sikalele	Tomas Mandonda	2015 & 2016	3	Yes	-17.4808	26.6778	4257	No
5	Siloonda	Petros Tambo	2015	1	Yes	-17.5612	26.616	4044	Yes
6	Sileu	Chief Simwatachela	2015	2	Yes	-17.5966	26.5460	3922	No
7	Sianjina	Tenson Mukonka	2016	1	Yes	-17.5808	26.7014	4295	No
8	Munyangwa	Raphael & Gilbert Chibele	2016	2	Yes	-17.5028	26.5408	4414	Yes
9	Syulikwa	John & Dotina Siandwa-Siamwanja and Pythias & Belitha Munguza	2016	1	Yes	-17.4333	26.5483	4118	No
10	Chibwe	Mosley Silanzingwi Kumbo	2016	2	No	-17.4385	26.5501	n/a	No
11	Sibooli-C	Gibson Sinan'gombe/Dreya Siamafumba	2015	N/A	Repair	-17.5243	26.7072	n/a	No
12	Sibooli-A /Sibooli Cikolo (School)	Hezah Kalulu	2015	N/A	Repair	-17.5255	26.7009	n/a	Yes

Graphic Illustration of Well Locations

Attachment 2

Boring Logs for All Project Wells

Project: Simwatachela, Zambia
Project Location: "Leonard Siaakumbale" - Siamabwe Community
Project Number: Well No. 1

Date Drilled: August 2014
Drilling Rig: Overland Mission
"David's" 10 Ton Rig

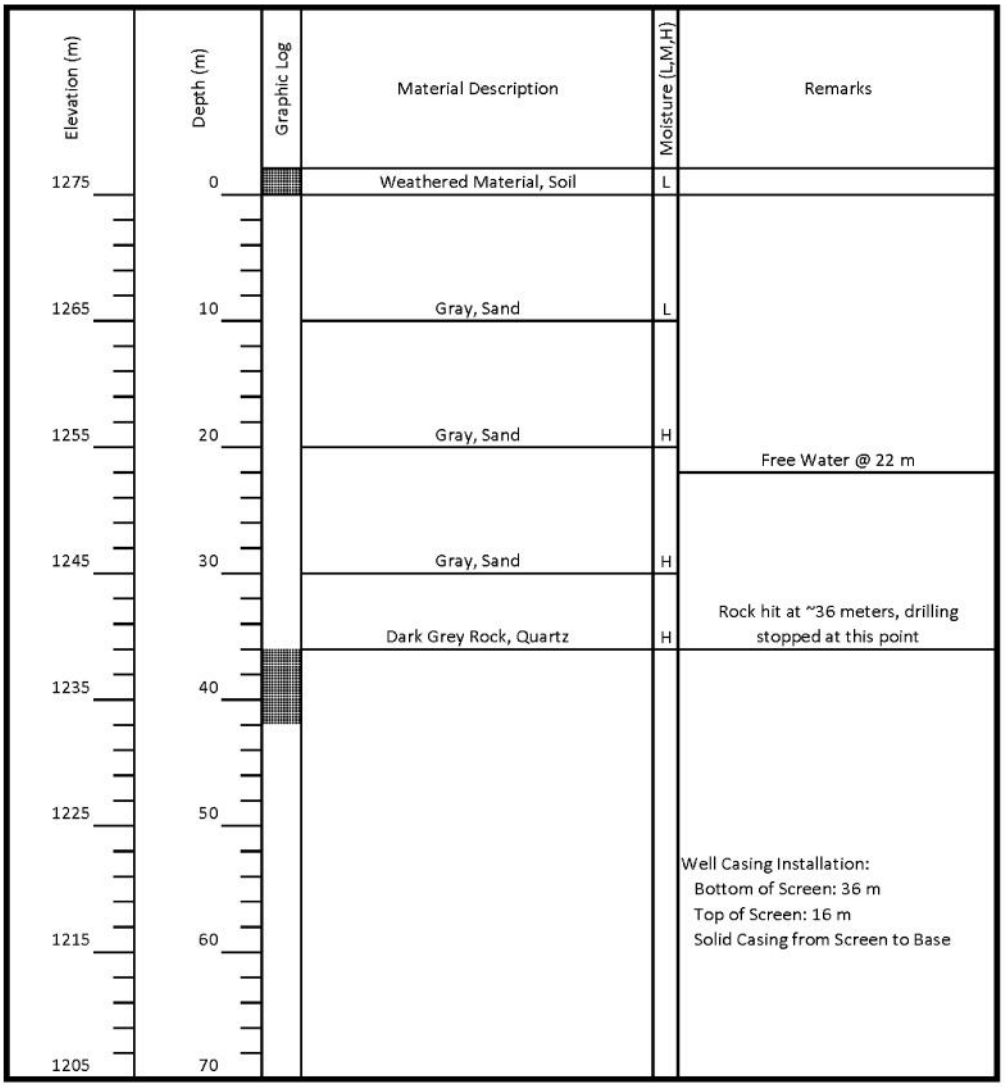
Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)

Elevation (m)	Depth (m)	Graphic Log	Material Description	Moisture (L,M,H)	Remarks
1270	0		Weathered Material, Soil	L	
1260	10		White, Sand	L	
1250	20		White, Sand	M	
					Free Water @ 25 m
1240	30		White, Sand	H	
1230	40		White, Sand	H	
			Black Grey Rock, Quartz	H	Rock hit at ~48 meters, drilling stopped at this point
1220	50				Well Casing Installation: Bottom of Screen: 48 m Top of Screen: 28 m Solid Casing from Screen to Base
1210	60				
1200	70				

Project: Simwatachela, Zambia
Project Location: "Jackson" - Simoono Community
Project Number: Well No. 2

Date Drilled: August 2014
Drilling Rig: Overland Mission
"David's" 10 Ton Rig

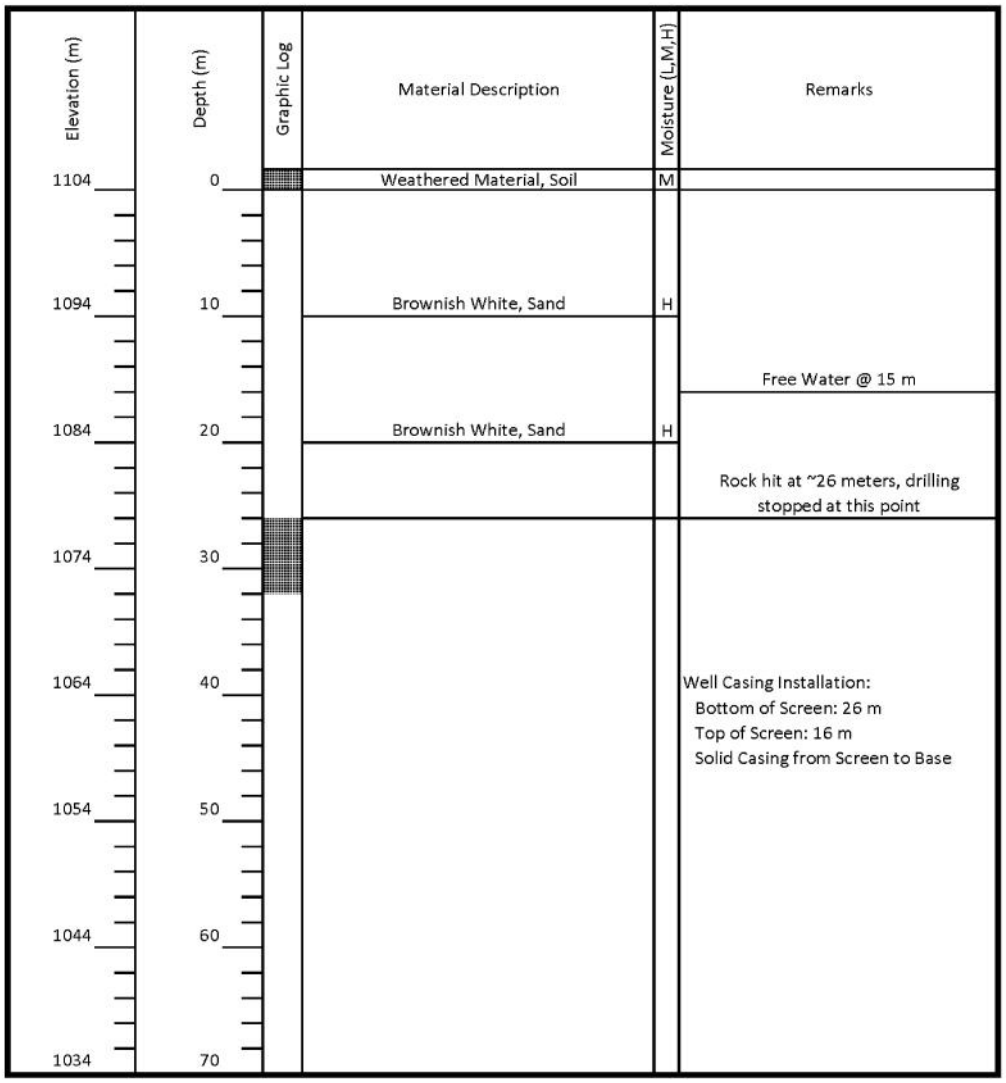
Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)



Project: Simwatachela, Zambia
Project Location: "Bright Nyanga" - Siankope Community
Project Number: Well No. 3

Date Drilled: August 2015
Drilling Rig: Overland Mission "Joe's" 5 Ton Rig

Sample Type: Drill Tailings
Taken after stem fully inserted (10 m intervals)



Project: Simwatachela, Zambia
Project Location: "Tomas Mandonda" - Sikalele Community
Project Number: Well No. 4

Date Drilled: August 2016
Drilling Rig: SRR - 10 Ton Rig

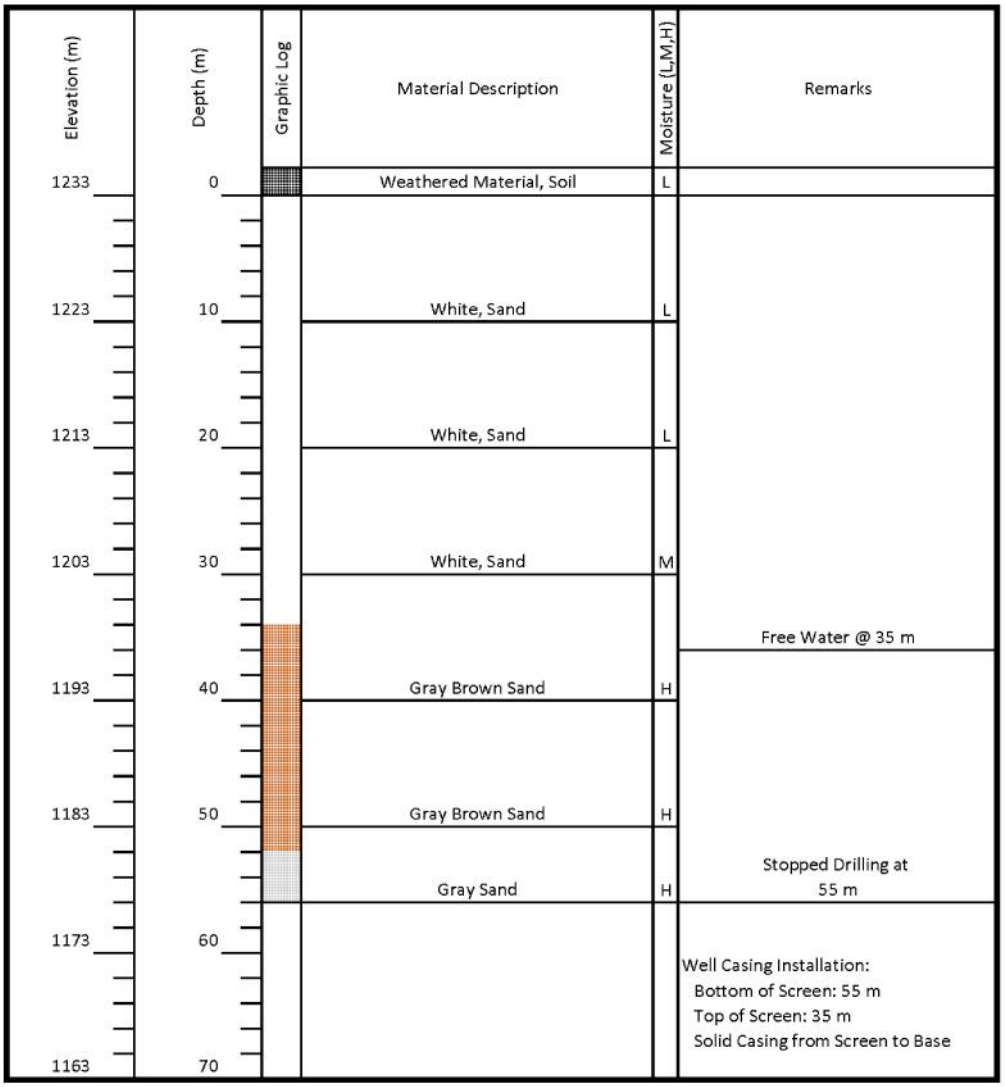
Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)

Elevation (m)	Depth (m)	Graphic Log	Material Description	Moisture (L,M,H)	Remarks
1298	0		Weathered Material, Soil	L	
1288	10		Light Brown-Gray, Fine Sand and Mica	L	
1278	20		Light Brown-Gray, Fine Sand and Mica	L	
1268	30		Light Brown-Gray, Fine Sand and Mica	L	
1258	40		Light Brown-Gray, Fine Sand and Mica	L	
			Dark Gray Brown, Course Sand	M	
1248	50		Dark Gray Brown, Course Sand	H	
			Dark Gray Brown, Course Sand	H	Free Water @ 55 m
1238	60		Dark Gray Brown, Course Sand	H	
					Well Casing Installation: Bottom of Screen: 80 m Top of Screen: 50 m Solid Casing from Screen to Base
1228	70		Dark Gray Brown, Course Sand	H	
1218	80		Dark Gray Brown, Course Sand	H	Stopped Drilling at 80 m

Project: Simwatachela, Zambia
Project Location: "Petros" (a.k.a. Victor-Shadrack)
Project Number: Well No. 5

Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)

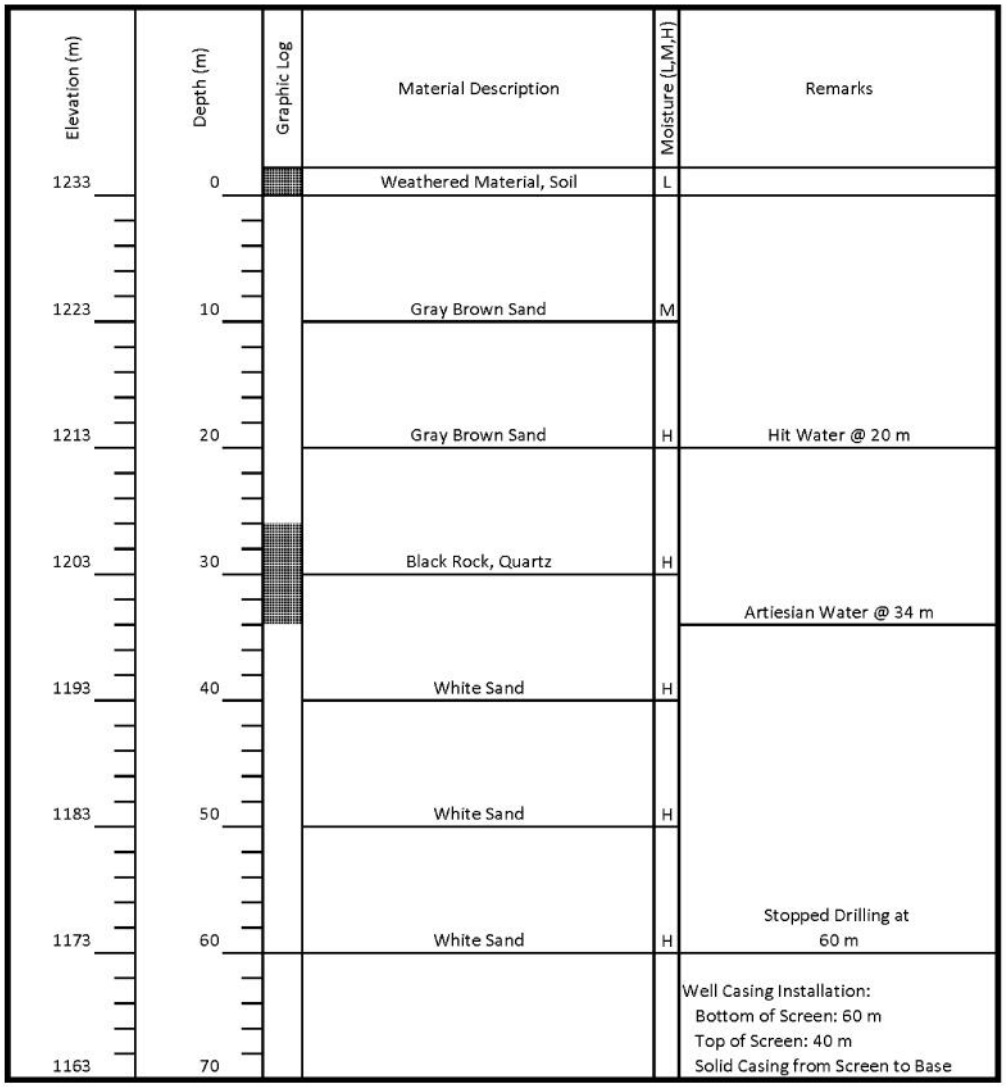
Date Drilled: August 2015
Drilling Rig: SRR - 10 Ton Rig



Project: Simwatachela, Zambia
Project Location: "Chief Simwatachela's Village" - Sileu Community
Project Number: Well No. 6

Date Drilled: August 2015
Drilling Rig: SRR - 10 Ton Rig

Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)



Project: Simwatachela, Zambia
Project Location: "Tenson Mukonka" - Sianjina Community
Project Number: Well No. 7

Date Drilled: August 2016
Drilling Rig: SRR - 10 Ton Rig

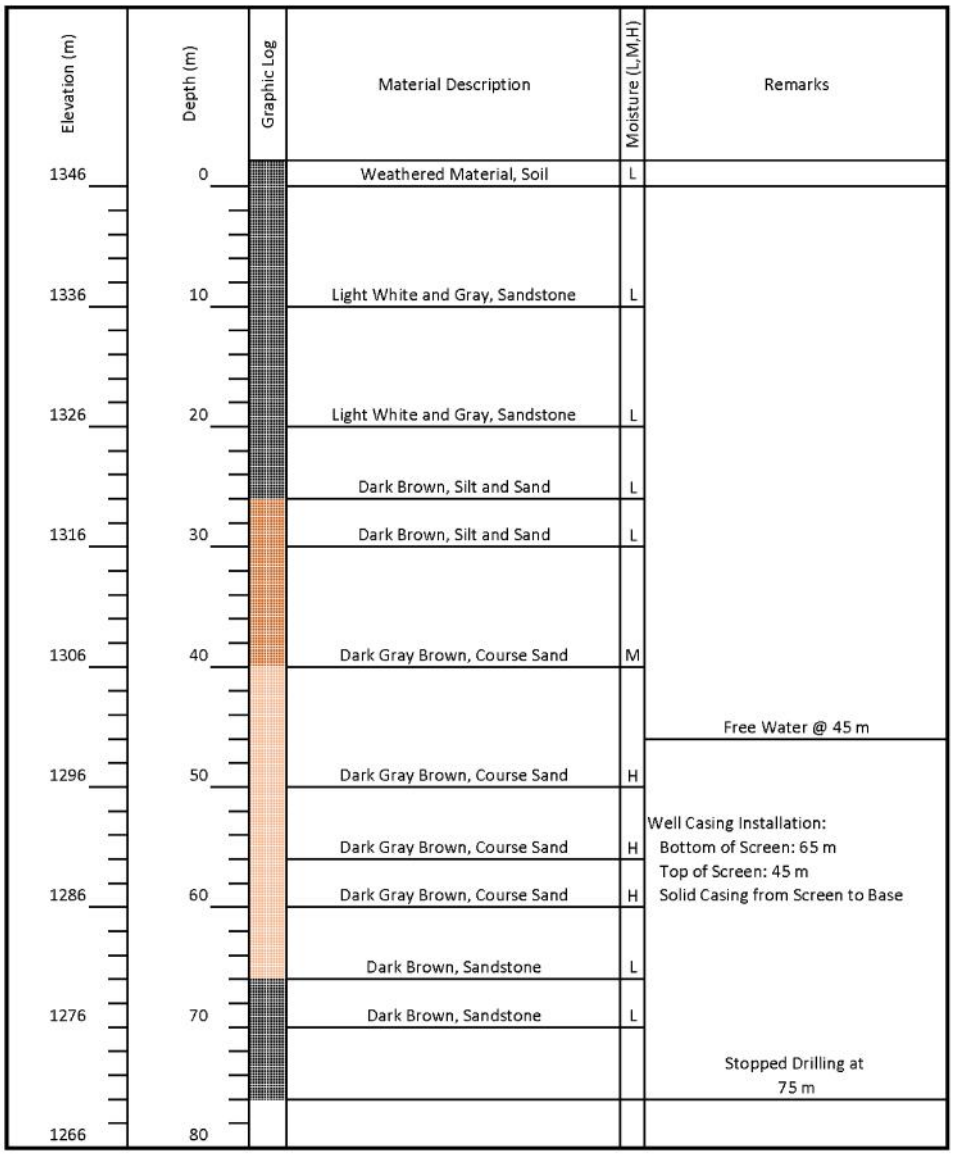
Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)

Elevation (m)	Depth (m)	Graphic Log	Material Description	Moisture (L,M,H)	Remarks
1309	0		Weathered Material, Soil	L	
1299	10		Gray, Course Sand	L	
1289	20		Gray, Course Sand	L	
1279	30		Gray, Course Sand	L	
1269	40		Dark Gray, Course Sand	M	
1259	50		Dark Gray, Course Sand	M	
			Dark Gray Brown, Course Sand	M	
1249	60		Dark Gray Brown, Course Sand	H	Free Water @ 60 m
1239	70		Dark Gray Brown, Course Sand	H	Well Casing Installation: Bottom of Screen: 80 m Top of Screen: 50 m Solid Casing from Screen to Base
1229	80		Dark Gray Brown, Course Sand	H	Stopped Drilling at 80 m

Project: Simwatachela, Zambia
Project Location: "Raphael & Gilbert" - Munyangwa Community
Project Number: Well No. 8

Date Drilled: August 2016
Drilling Rig: SRR - 10 Ton Rig

Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)



Project: Simwatachela, Zambia
Project Location: "Belitha Munguza - Penetron" - Syulikwa Community
Project Number: Well No. 9

Date Drilled: August 2016
Drilling Rig: SRR - 10 Ton Rig

Sample Type: Drill Tailings
Taken after stem fully inserted
(10 m intervals)

Elevation (m)	Depth (m)	Graphic Log	Material Description	Moisture (L,M,H)	Remarks
1255	0		Weathered Material, Soil	M	
1245	10		Light Brown, Sand	M	
1235	20		Light Brown, Sand	H	
1225	30		Dark Tan, Clay Sand	H	
					Artiesian Water Rose to 35 m from 40 m
1215	40		Tan, Medium Sand	H	Hit Water @ 40 m
1205	50		Tan, Medium Sand	H	
1195	60		Tan, Medium Sand	H	Stopped Drilling at 60 m
1185	70				Well Casing Installation: Bottom of Screen: 60 m Top of Screen: 40 m Solid Casing from Screen to Base

Attachment 3

Water Quality Information

Well:	1	"Leonard"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0.05	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0	mg/L
Iron	0.025	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	240	mg/L
Total Chlorine	0.2	mg/L
Total Hardness	120	mg/L
Sulfate	0	mg/L
pH	6.5	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	negative	
RAD	0.003	mR/hr
Fluoride	N/A	mg/L
Turbidity	5.62	NTU

Well:	2	"Jackson"
Parameter	Result	Units
Chloride	N/A	mg/L
Copper	N/A	mg/L
Free Chlorine	N/A	mg/L
Hydrogen Sulfide	N/A	mg/L
Iron	N/A	mg/L
Total Nitrate	N/A	mg/L
Total Nitrite	N/A	mg/L
Total Alkalinity	N/A	mg/L
Total Chlorine	N/A	mg/L
Total Hardness	N/A	mg/L
Sulfate	N/A	mg/L
pH	N/A	S.U.
Lead	N/A	
Bacteria	N/A	
Pesticide	N/A	
RAD	N/A	mR/hr
Fluoride	N/A	mg/L
Turbidity	N/A	NTU

Well:	3	"Bright"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0	mg/L
Free Chlorine	0.1	mg/L
Hydrogen Sulfide	0.3	mg/L
Iron	1	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	180	mg/L
Total Chlorine	0	mg/L
Total Hardness	85	mg/L
Sulfate	0	mg/L
pH	5	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	negative	
RAD	0	mR/hr
Fluoride	1.25	mg/L
Turbidity	0.39	NTU

Well:	4	"Tomas"
Parameter	Result	Units
Chloride	375	mg/L
Copper	0.1	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0.1	mg/L
Iron	0	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0.2	mg/L
Total Alkalinity	370	mg/L
Total Chlorine	0	mg/L
Total Hardness	185	mg/L
Sulfate	125	mg/L
pH	6.5	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	inconclusive	
RAD	0.004	mR/hr
Fluoride	1.35	mg/L
Turbidity	4.01	NTU

Well:	5	"Petros"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0.1	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0.3	mg/L
Iron	0	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	500	mg/L
Total Chlorine	0	mg/L
Total Hardness	185	mg/L
Sulfate	125	mg/L
pH	6.5	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	negative	
RAD	0.003	mR/hr
Fluoride	1.04	mg/L
Turbidity	6.71	NTU

Well:	6	"Sileu"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0	mg/L
Iron	0	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	500	mg/L
Total Chlorine	0	mg/L
Total Hardness	25	mg/L
Sulfate	125	mg/L
pH	6.5	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	inconclusive	
RAD	0.004	mR/hr
Fluoride	1.68	mg/L
Turbidity	0.97	NTU

Well:	7	"Tenson"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0.5	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0	mg/L
Iron	0.025	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	370	mg/L
Total Chlorine	0	mg/L
Total Hardness	85	mg/L
Sulfate	0	mg/L
pH	7.0	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	negative	
RAD	0.002	mR/hr
Fluoride	0.08	mg/L
Turbidity	14.19	NTU

Well:	8	"Munyanwa"
Parameter	Result	Units
Chloride	500	mg/L
Copper	0	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0	mg/L
Iron	0	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	500	mg/L
Total Chlorine	0	mg/L
Total Hardness	125	mg/L
Sulfate	0	mg/L
pH	6.5	S.U.
Lead	negative	
Bacteria	Negative	
Pesticide	negative	
RAD	0	mR/hr
Fluoride	0.13	mg/L
Turbidity	33.4	NTU

Well:	9	"Syulikwa"
Parameter	Result	Units
Chloride	125	mg/L
Copper	0	mg/L
Free Chlorine	0	mg/L
Hydrogen Sulfide	0.3	mg/L
Iron	0	mg/L
Total Nitrate	0	mg/L
Total Nitrite	0	mg/L
Total Alkalinity	180	mg/L
Total Chlorine	0	mg/L
Total Hardness	25	mg/L
Sulfate	125	mg/L
pH	7.0	S.U.
Lead	negative	
Bacteria	negative	
Pesticide	negative	
RAD	0	mR/hr
Fluoride	0	mg/L
Turbidity	18.91	NTU