

## **Water and Sanitation Conditions Report**

### **Chevreau du Lombard, Haiti**

**Contributed by** Dr. Bruce Sharfstein of The Good Shepherd Foundation

#### **General Observations**

Chevreau du Lombard and the surrounding villages appear to be primarily dependent on rice farming at small paddy scale for their sustenance. The area is relatively low lying, with what appear to be primarily alluvial soils and the landscape is dominated by the Artibonite River and associated man-made canals. Hydrologically, the area appears to have a shallow freshwater lens lying on top of a deeper saline layer so that shallow wells produce freshwater, while deeper wells produce water with conductivities like seawater. At Chevreau du Lombard, the river is within about 10 miles of its mouth in the Gulf of Gonaives and near the end of its approximately 200-mile length. In this reach, it is a low gradient slow moving stream with many oxbows, although in its higher reaches, it has been dammed for hydroelectric generation. The Artibonite River was the main conduit for the dispersal of Cholera brought to Haiti by the United Nation's Nepalese Peace Keepers. This region of the Artibonite valley is also near the location of the disposal of the toxic incinerator ash left on Haiti by the Khian Sea.

Field observations and local anecdotal reports indicate that most individuals obtain their drinking, cooking, and washing water directly from the river or from its canals (Figures 1 and 2) although there are also several hand-dug, open shallow wells distributed throughout the community (Figure 3). There are also 3 United Nations sponsored package potable water treatment plants (Figure 4), another small potable water package plant installed at the local Roman Catholic Church by [www.watermissions.org](http://www.watermissions.org), and a smaller packaged water plant installed by [www.lifegivingforce.com](http://www.lifegivingforce.com), at the local Caritas clinic. There is also a gasoline pump powered package treatment system located at the local public school. None of these systems are currently functional due to a combination of lack of maintenance and/or lack of available replacement parts. There are at least several other examples of defunct pumped wells or small potable water package plants along the road that parallels the Artibonite River and connects National Route 1 with the town of Grande Saline, at the mouth of the river.

Another issue closely tied to contaminated water is the lack of even the most basic sanitary facilities (pit latrines) in the area. Most residents have no choice but to defecate in the open which leads to the spread of diseases resulting from direct contact with human feces (hookworm, for example, is endemic in the area) or from feces washing into canals and open wells whenever it rains.



**Figure 1: Bathing in the Artibonite River. Note how green and turbid the water appears.**



**Figure 2: One of the canals in Chevreau used for drinking, washing and bathing.**





**Figure 3: Typical open shallow well in Chevreau du Lombarde**





**Figure 4: One of the currently non-working U.N. sponsored drinking water plants.**

#### **Water Quality**

Water samples were collected and tested from the Artibonite River, an open uncased well on the property where we currently hold our clinics, and the water treatment plant at the church. As noted above, none of the other package treatment plants or pumped wells are operational. All the water tested showed contamination from fecal coliform bacteria; generally considered an indicator of contamination by excreta, though the test used was unable to distinguish whether the source of the contamination was human or animal. It was not unusual that the untreated river water and the open well tested positive for fecal coliforms. However, it was somewhat surprising that the treated water at the church did although the language barrier between the plant operator and the author prevented the author from determining whether the water sample collected for testing was pre or post chlorination. In contrast to the river water which was highly turbid both the well and church water treatment samples had low turbidity and undetectable total suspended solids (on 24 hours settling). The river water, in contrast, was quite turbid although particles were mostly small and flocculent and did not readily settle out on standing. The river water also had high in vivo fluorescence indicative of elevated algal concentrations; a conclusion which was reinforced by the water's appearance (Figure 1).

Although no specific tests were run, it is probable that given the downstream location of Chevreau and the surrounding villages that come to our clinic for treatment, river and canal waters in this vicinity are further contaminated by pesticides, herbicides, and various industrial chemicals from upstream uses.

### **Logistics of Local Water Supply and Sanitation**

Observing the water supply situation in Chevreau du Lombarde and environs, several issues present themselves:

- It is immediately apparent that raw, untreated river or canal water cannot be used for any human purpose. An analysis of 200 patient records from The Good Shepherd Foundation clinic indicated that more than 60% of patients who presented themselves for treatment were there because of diseases related to contaminated water, and/or lack of basic sanitary facilities. Our doctors' monthly summary reports further bear this out with much of their effort being directed toward the treatment of a range of parasitic infections, acute diarrhea, acute gastroenteritis, bacterial and fungal dermatitis and dermatosis, other integumentary diseases, UTIs and other genital problems (Figure 5).

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**Figure 5: This is what living with dirty water and lack of sanitation looks like.**

- Since most local transportation is by foot or by donkey or horse, and water is heavy, water treatment plants of the type installed by the U.N. or, Water Missions have limited impact since there is no functional distribution network. Thus, while people may be inclined to transport water for drinking and cooking, it may be impractical for them to transport water for washing

and bathing; which is the cause of many health problems when done with available contaminated water sources. The availability and maintenance of clean containers in which to transport water may also be a problem.

- High technology water treatment plants require repairs and regular maintenance which may not always be available locally. For example, none of the U.N. plants, which were installed in 2011 are working. From our observations, one plant has a broken intake pipe and foot valve and a burnt-out voltage controller (and possibly other issues) while another of the U.N. plants needs, at a minimum, new batteries. The Caritas plant was similarly not working because of bad, or missing batteries. Operation of the U.N. plants was delegated to local committees of villagers supported by the state water agency DINEPA. However, neither of these entities appear competent or solvent enough to service and maintain the plants. All the other local plants require additional maintenance or repair in one form or another and there is little evidence that any maintenance is occurring on a routine basis.
- Local cash income is extremely limited, and charging for water, as the U.N. plant does, is probably not a viable approach.
- The source water for the currently installed local plants comes from the Artibonite River or its associated canals. This water has a high organic and algal load. Consequently, by relying on chlorination for sanitation these plants may inadvertently be producing water contaminated with tri-halo methanes, known carcinogens. There is also the possibility that all the local treatment plants may be causing the release of cyanotoxins from cyanobacteria in the source water; a class of compounds that has neurotoxic or hepato-toxic effects. Further testing would be required to confirm these concerns.
- From a health perspective, any solution that does not include making widespread basic sanitation available to the residents of the area will be only partially successful; particularly given the close link between out door defecation and the contamination of surface water sources.

## **Solutions**

Based on our understanding of local conditions, low tech. solutions probably have the best likelihood of successfully providing clean drinking water and basic sanitation for the people of Chevreau du Lombarde and other neighboring communities. We believe that Shallow cased, curbed and capped wells, distributed throughout the community would provide the best option for supplying clean water for drinking, cooking and bathing, while simple latrines with sealed concrete block vaults would probably be the best approach to providing needed sanitary facilities; even though at present, there is no pump out service available in the area.

To explore these options The Good Shepherd Foundation built 2 demonstration wells (Figure 6) and a demonstration latrine (Figure 7) in Chevreau du Lombarde using local materials and craftsmen. We have also undertaken a geographic study to determine how many wells (newly dug and refurbished) and how many latrines would be needed to provide adequate services to the entire community (Figure 8). When we ran the numbers, we were surprised to discover that the actual cost of providing easy access to a clean well and a latrine for every member in the community of Chevreau du Lombarde worked out to be about \$32 U.S. per capita.





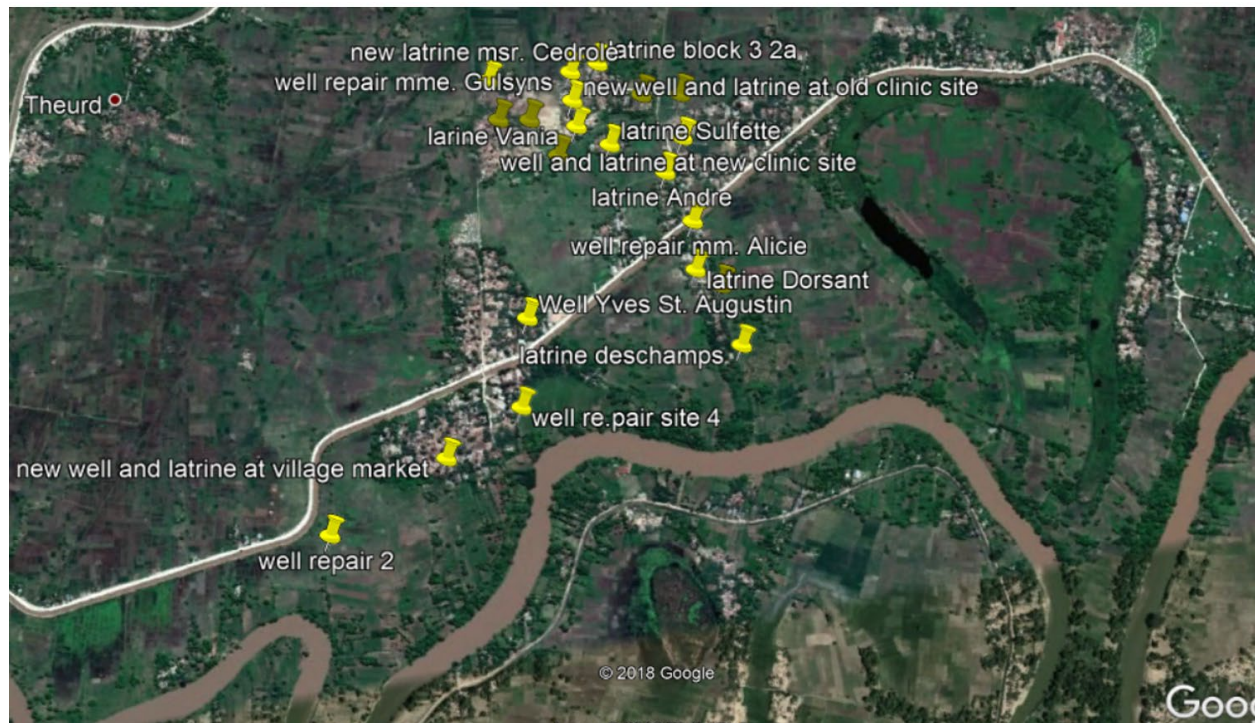
**Figure 6: One of our demonstration wells.**







**Figure 7: Our demonstration latrine.**



**Figure 8: Proposed locations for wells and latrines in Chevreau du Lombarde.**

Currently, we are pursuing a Rotary International Grant with the cooperation of the Kings Bay Florida Rotary Club and the **Gonaïves** Memorial Rotary Club in Haiti. We hope to have enough donations in place by summer 2019 to meet the criteria for Rotary District and International matching funds to make this project a reality.

#### *About the Author*

Dr. Sharfstein received his Ph.D. in Biological Oceanography from the City University of New York in 1976. For much of the next 25 years, he worked in the developing world in The Caribbean and Latin America where he pursued various projects, many of which had a water supply component based on their remoteness and lack of access to public infrastructure. In 1995, he began working for an agency of the state of Florida where he was responsible for projects relating to water resource management and environmental quality. Dr. Sharfstein retired from state government in 2016 and currently works on an on-call basis for an international environmental consulting firm while devoting most of his effort to resolving the clean water and sanitation problems of the rural communities in Haiti served by The Good Shepherd Foundation.