



For Immediate Release:  
Jan. 19, 2012

Contact:  
Mark Ray, (540) 667-5705  
mark.c.ray@usace.army.mil

## Water for a thirsty city

### *Afghanistan District South develops water master plan for Kandahar City*

*Water is life's mater and matrix, mother and medium. There is no life without water.* — Albert Szent-Gyorgyi, Hungarian biochemist, winner, 1937 Nobel Prize for Medicine

Water — its supply, treatment and distribution, as well as the collection and treatment of wastewater — is fundamental to a healthy and productive society. Kandahar City and its environs are desperately deficient in these fundamental requirements.

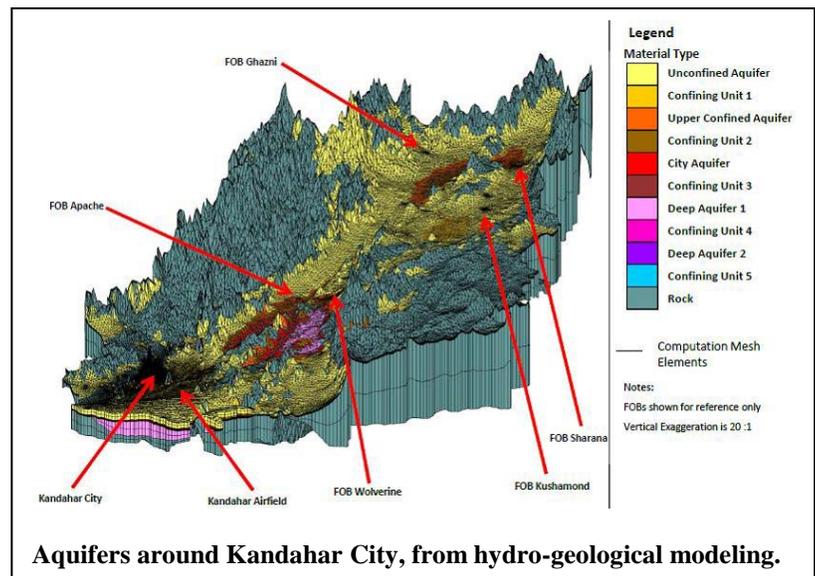
As a first step to remedy the deficiency, the U.S. Army Corps of Engineers Afghanistan Engineer District-South has developed a water and wastewater master plan for Kandahar City that will guide Afghan-led efforts to supply critically-needed safe drinking water and to safely dispose of wastewater in Afghanistan's second largest city.

“The plan provides a comprehensive set of documents that describe the situation through 2030, along with a phased approach to improve water supply and distribution, as well as wastewater collection and treatment,” said Dr. Reniere “Ed” Majano, project manager for the master plan. Majano deployed to Afghanistan from Houston, Texas.

### Analysis

An important element of the plan is an analysis of the current population of Kandahar City and its expected growth through 2030, Majano explained. “You have to know the population you are trying to serve to determine how much water is actually required.”

There has not been an accurate census of the Kandahar City population for many years, so the team assembled as much existing data as they could find and conducted a rigorous statistical analysis to come up with a reliable estimate of the population and its likely growth. The team found that the city has slight more than 675,000 residents now, and will grow to a population of over 1.1 million by 2030.



The team also assessed the current water supply and distribution system. What they found was sobering. The Afghan Urban Water Supply and Sewerage Corporation, a state-owned utility that is responsible for water supply and wastewater collection and treatment in Kandahar City, has 15 wells in the city, but only nine are operational. Most of the wells are tied directly into distribution systems.

“What that means is that system is only pressurized when the well pumps are working,” Majano explained. “If there is a fuel shortage or an electrical outage, the pumps stop working and the system loses pressure. This situation allows contaminants to infiltrate the system—a situation made worse by a distribution system in which an estimated 70 percent of the pipes leak, and the complete lack of a wastewater collection system, which almost guarantees sewage and other contaminants will get into an unpressurized potable water distribution network.”

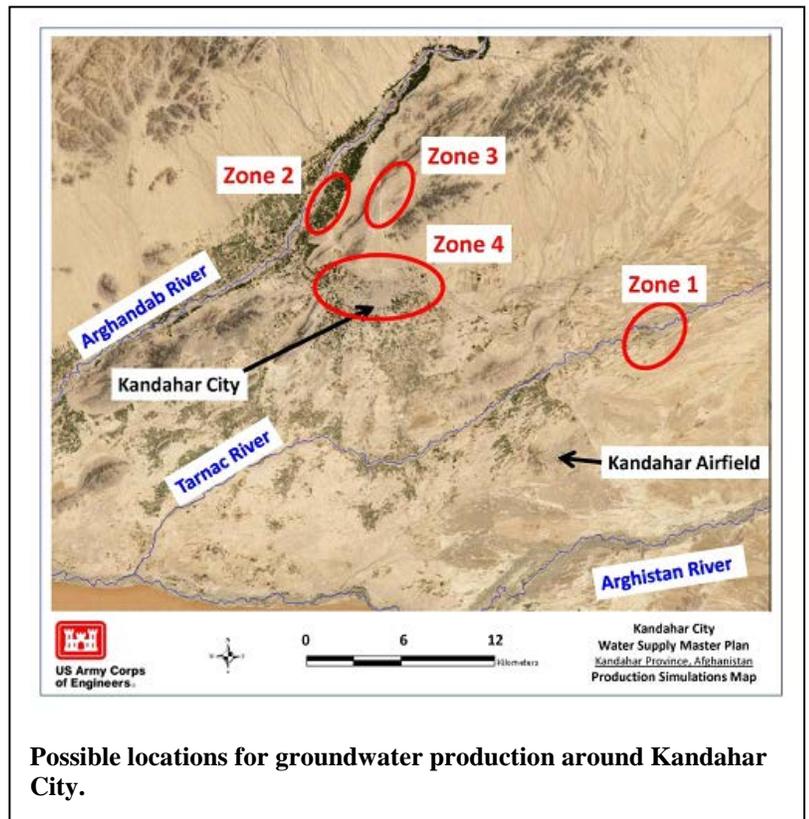
Numerous private wells and septic tanks, many undocumented, further contribute to the risk of contamination. In addition, the distribution system only reaches a small part of the city’s current population. “In the best case, Kandahar City is only producing less than a third of the water needed to adequately supply its population, and the distribution system only reaches about 20 percent of the people,” Majano said. “Without relief, the problem will get much worse as the population continues to grow.”

### Looking for solutions

To determine ways to improve the situation, the team conducted a comprehensive survey of possible sources of water. They developed a hydro-geological model to evaluate the groundwater available from aquifers in the region, according to Majano. “There are actually three aquifers at different depths from which most of the population draws water. The first, and uppermost, is unconfined, which means that it is not isolated by rock from the surface. This water is highly contaminated.”

The model also examines:

- a second mid aquifer, deeper than the first,
- the so-called “city aquifer,” which is still deeper and the source of the water for the existing municipal wells,
- The model indicates a possible fourth aquifer, at an even greater depth, more than 500 m. However, test drilling so far has not indicated that this aquifer will meet the city’s water needs.



“At best, groundwater can only provide the needs of about 40 percent of Kandahar’s current population,” Majano said. “Much of this water is contaminated.

And pumping water out of the ground at multiple locations is an energy intensive effort. The bottom line of our study is that ground water — water produced from wells — cannot adequately meet the needs of the city now, and certainly not in the future.”

Fortunately, surface water, flowing down the Arghandab River from the mountains to the north of Kandahar, is an alternate source. The quality of the surface water is much better than that of the available groundwater, Majano said. An analysis of historic flow rates over a 27-year period shows that the supply of surface water is more than adequate to meet Kandahar City’s needs —both for irrigation and for potable water — now and in the future.



**The Dahla Dam reservoir offers the best long-term solution for water in Kandahar City. (USACE photo/Sue Fox)**

Using this water would require a number of major improvements to Dahla Dam, north of the city, and construction of treatment, storage and distribution infrastructure, will provide a long-term solution, Majano said.

### **The way ahead for water**

With the data and analysis in hand, the team developed a phased set of projects. The first priority is to upgrade the current system of wells to stabilize the current system. Refurbishing pumps, ensuring the pumps have an adequate and dependable supply of electricity and creating treatment infrastructure will ensure the water delivered is safe. “The current system also needs elevated storage tanks installed, so the system stays pressurized and free from contaminant infiltration,” Majano said.

The recommended mid- to long-term solution includes increasing the storage capacity of Dahla Dam reservoir so that it can hold adequate amounts of water for irrigation and potable water supply throughout the year, a pipeline from the dam to a centralized treatment facility, then building out a distribution system to provide the water to the city.

“The phased approach is critical,” Majano said. “I have seen cases where cities built distribution systems without first having the water available to distribute—that just creates expectations among the populace that cannot be met.”

Using surface water stored at Dahla Dam would also permit the use of a single large treatment facility, rather than multiple, smaller treatment systems that a groundwater solution relying on wells would require. “It is easier to manage a single treatment facility than to manage many treatment facilities,” Majano said. “You only have to provide reliable power at the single location, and you can focus your personnel and other resources on operating and maintaining the single facility, rather than having to track and manage operations at multiple locations. Most importantly, the quality of the water can be controlled.”

The master plan examined distribution, calling first for a series of standpipes, or common distribution points, throughout Kandahar City where residents could obtain water. Initially, distribution would probably rely on water trucks to deliver water from the treatment plant to storage tanks connected to the standpipes. Later projects could install water mains from the treatment plant directly to the standpipes. Eventually, the plan provides the concept design for a system that distributes water to each house in the city. “Your ultimate goal is always to provide safe water into the house, which is the best way to ensure quality and supply, and to minimize the health concerns” Majano said. “However, that is a distant goal in Kandahar.”

## Wastewater

The master plan also addresses the collection and treatment of wastewater in the city, critical to preventing contamination of the potable water system and outbreaks of waterborne disease. As with the potable water distribution system, the plan for the wastewater system breaks implementation into phases.

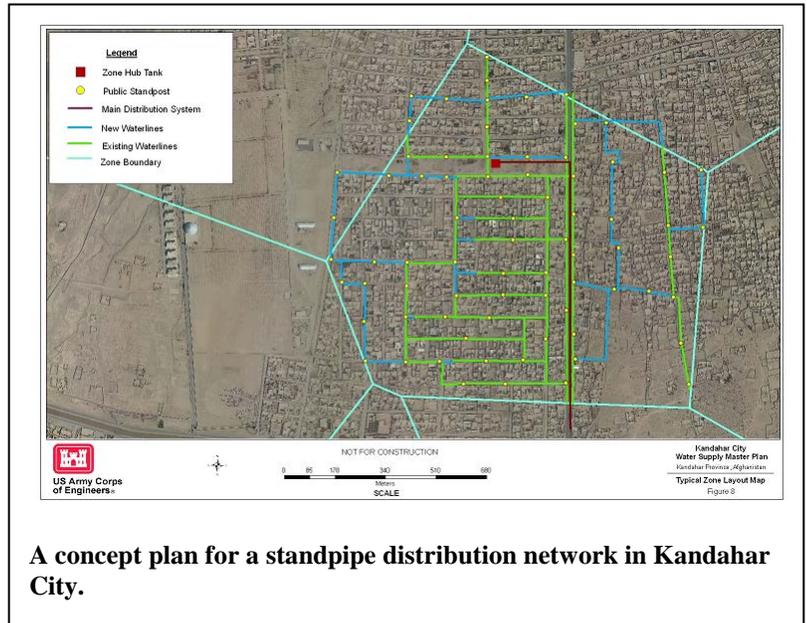
“Building a treatment facility is the first step in dealing with wastewater,” Majano said. “We are proposing a treatment that requires minimal energy and technology. The drawback is that it requires significant amounts of land, but we believe it is the best solution and first step for the austere environment of Afghanistan.”

The phased approach breaks the overall effort up into a series of smaller projects that are more likely to appeal to donors and the Islamic Government of Afghanistan for funding, Majano said. The master plan includes conceptual designs for the various phases of the project, which Afghan government officials can use for their own planning and to request support for projects from donors.

“It will take many years and a great deal of money to completely modernize water supply and wastewater collection and treatment in Kandahar — the master plan provides the way to ensure a holistic approach that keeps moving toward the goal, while not trying to solve the entire problem at once, which would be financially and logistically impossible,” Majano said.

## Next steps

The first step in executing the plan is to train Afghan engineers to use and maintain the hydro-geological and the distribution network computer models. “For the models to continue to be useful, they have to be maintained — updated every couple of years,” Majano said. “We developed a training program for and in conjunction with the Afghan government officials and the engineering faculty at Kandahar University, so we can transfer the models to them. From the outset, we recognized that the Afghans will execute this plan, so part of our effort has been to develop



their capacity. The leadership at Kandahar University is very much behind this aspect—they want to be the center of excellence for water and wastewater engineering in Afghanistan.”

Developing the master plan drew on expertise from across the Corps of Engineers, Majano said. “We developed the parts of the plan that deal with potable water using strictly in-house resources, and contracted for the wastewater sections. The Omaha, New England, Philadelphia and Mobile Districts all played important roles, as did the Engineer Research and Development Center. The South District, working with the Omaha District, had responsibility for the overall document. And throughout the process, we have coordinated with the engineering faculty at Kandahar University and the Afghan Water Supply and Sewerage Corporation. In the end, it will be their plan to execute.”

“The master plan for water and wastewater has the potential to have an enormous positive effect on the quality of life and economic prosperity of the Kandahar City region,” Majano said. “I came here specifically to work on this project. I will leave with the hope that we have produced something that will make a difference in lives of the people of this region, and of Afghanistan as a whole.”

-30-

USACE’s Afghanistan Engineer District-South provides design and construction services throughout southern Afghanistan to support the International Security Assistance Force and U.S. Forces-Afghanistan. The work is carried out in Regional Commands South, Southwest and West with the goal of achieving counterinsurgency effects and bolstering the Afghan Government’s services to its people.

You can find more news and features about the district on our [homepage](#) and follow us on [Facebook](#). For more pictures of the foot patrol in Helmand, and other interesting photos about the district, check out our [Flickr page](#).