

Abu Dhabi prepares strategic water reservoir

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At a secret location amid the sharp curves of the rust-streaked cappuccino dunes of the Empty Quarter, a German company is preparing to drill more than 300 wells in three great spirals that resemble the fossilised ammonite shells sometimes found in these parts.

The wells will not pump oil. Rather, they will pump sweet water from coarse sands beneath the wind-blown desert in the event of a crisis that knocks out Abu Dhabi's supply of drinking water.

This arid inland site, some distance from Liwa Oasis, crowns the apex of one of just two natural underground sweet-water reservoirs in the emirate. The other is in the foothills of the Hajar Mountains near Al Ain, the other major Abu Dhabi oasis. But the Liwa region's buried treasure is severely depleted, "looted" to water traditional livestock such as camels and the farms that grow their fodder.

It rains here about once every five years, usually in downpours, says Georg Kozirowski, the chief hydrologist at the German government-owned GTZ International Services, which has conducted field research in the area for more than two decades. In past centuries, that was sufficient to recharge the aquifer. Not any more.

That is why GTZ-Dornier Consulting, a venture between GTZ and the German private-sector company Dornier Consulting, is planning to pipe expensive desalinated water from the coast to feed into "summit tanks" atop the highest point of the dome-shaped underground aquifer. From the tanks, the water will drain out through a system of semi-perforated underground pipes to recharge the aquifer using only gravity as a driving force.

"The recharge of groundwater with large volumes of desalinated seawater is a new approach, and to our knowledge nowhere else conducted on an industrial scale at present," GTZ-Dornier said.

"The project offers the unique opportunity to develop a reliable and sustainable large-scale fresh groundwater reservoir in a desert region utilisable whenever needed," it said. "It is considered a milestone for securing the water supply of the emirate of Abu Dhabi for the indefinite future. Once implemented, this project will represent a benchmark for water management in desert regions, capable [of redefining] international standards."

The project has been more than a decade in the making. In 1997, GTZ-Dornier suggested to the Government that it use the depleting aquifer to store what was then an intermittent excess of freshwater output from Abu Dhabi's desalination plants.

Those plants were entirely powered by the heat thrown off by the emirate's gas and oil-fired power plants. So when electricity output increased because of rising demand, so did the supply of drinking water, whether or not it was needed.

A more pressing consideration has emerged in recent years as rapid population growth and industrialisation in Abu Dhabi and other Gulf states, coupled with inter-regional political tension, have heightened government concerns about the security of coastal desalination plants.

In 2001 "on special request" of Sheikh Mansour bin Zayed, Minister of Presidential Affairs, GTZ-Dornier started a feasibility study "to investigate the possibility of storing large quantities of desalinated seawater in the underground by artificially recharging existing fresh groundwater resources in the Liwa area. The feasibility study was completed and presented in March 2002", the company said.

It was successful and led to successive pilot projects that demonstrated that the desalinated water, once placed in the dune reservoir, stayed more or less in place and did not, as Sheikh Mansour had feared, migrate across Abu Dhabi's border into Saudi Arabia. The studies also showed that water withdrawn from the reservoir remained suitable for drinking.

The biggest worry in the sparsely populated region was contamination of the aquifer by large animals such as roving camels. But those are easily excluded from what is now the UAE's first "groundwater protection area" by locally made palm-frond fences.

The next stage is the construction of the first full-scale strategic water project of its kind in the world. When finished, it will store a 90-day freshwater supply for the emirate, far more than the water reserves of less than three days currently available.

If conventional municipal steel water-storage tanks were built to hold that volume of water, more than 10,000 would be needed, said Peter Menche, GTZ International's director of projects in the Gulf states and Saudi Arabia.

The US\$500 million (Dh1.83 billion) price of the Abu Dhabi project includes drilling costs and construction of a system of water pipelines. It does not include the cost of the water that will be used to recharge the aquifer, as the Government does not make its desalination costs public.

One detail, drawing on Germany's expertise in renewable energy, is the use of solar panels to power monitoring instrumentation at well heads, which provides real-time information on the best way to drain the reservoir and which specific wells should pump. By day, the solar panels also recharge batteries to provide a nocturnal power source.

"We did not invent the system. Similar systems are being used in the US to treat waste water. But using desalinated water at scale - this is a first worldwide," Mr Menche said.