



Water

Water Resources

Client

Palestinian Water Authority

Location

West Bank, Palestine Territories

"Cost control of the engineering and construction management contract has been excellent... The team has been responsive and aggressive in pursuing fair and reasonable settlements to the changes in the contract."

*Contractor Performance System
evaluation,
September 30, 2002*

"There are no quality issues, and [CH2M HILL] has substantially exceeded the contract performance requirements without commensurate additional costs to the Government."

*Contractor Performance System
Evaluation*

"CH2M HILL, under very difficult conditions caused by the unrest, has done an excellent job of performing the construction management requirements...."

*Contractor Performance System
Evaluation*

Water Resources, Phase II and III

Project Highlights

- Delivered under very difficult working conditions requiring high security measures
- Activities continue throughout ongoing political unrest in Palestine, remaining on schedule and within budget
- Involves the study and design of wells, water supply and distribution systems, and roads
- Provided preliminary design, design-build bid documentation, and construction management of design-build contracts to provide sustainable water supplies in the West Bank

Project Description

Phase II of this comprehensive program included:

- Water resource development and conveyance systems for the Palestinian Water Authority (PWA). This component supports the US Agency for International Development (USAID) mission of providing greater access to and more effective use of scarce water resources.
- A fast-track road and utilities upgrade project to accommodate the increasing numbers of tourists expected to visit Bethlehem for the millennium and the future.
- An Integrated Water Resources Management Plan to maximize the use and reuse of available water resources, improve the general water quality of the aquifers, develop water resources and construct conveyance systems, and provide long-term planning guidance for meeting the water demands in this water-scarce environment.
- Strengthening the institutions of the Palestinian water sector responsible for managing the West Bank's water resources by providing technical assistance directly to the PWA and, through them, to the utilities making up the sector.
- Continued design of water resource development and conveyance systems and construction management of facilities.

Completed Work—Phase II

The water resources program is aimed at increasing and improving water supplies to the Palestinians in the Hebron, Nablus, and Bethlehem Districts. CH2M HILL completed the study and design work for the water supply systems and supervised the construction and startup of the facilities. The Phase II project consisted of designing and managing the construction of 11 production wells and 16 monitoring wells (with average depths of 800 metres), and over 100 kilometres of transmission pipelines with associated storage and pumping facilities in the West Bank area for the



PWA. The team also designed 100 kilometres of local distribution mains in seven villages to relieve critical shortage and inefficient use of water.

CH2M HILL completed a number of individual tasks to support USAID's overall program objective. The management model considered all potential supply sources, including reuse of wastewater and capture of storm flows to determine a sustainable yield. The work included the following tasks.

Groundwater Studies—Eastern and Northeastern Basins

The groundwater program included aquifer characterization field studies; aquifer modeling and preparation of a groundwater management models; comprehensive collection and compilation of existing data; borehole geophysics; aquifer testing (pump and packer testing); and a baseline water quality monitoring program. CH2M HILL designed a set of monitoring and exploratory wells to assess sustainable yields and awarded the drilling contract for the wells. We also completed very detailed cross-sections mapping of the geology and key areas of the aquifer, as well as water quality, aquifer vulnerability, and potential contamination sources. The contamination risk analysis/vulnerability studies provided a solid foundation for Phase III.

CH2M HILL also planned and implemented water quality monitoring, aquifer testing, and geophysics programs in both the Eastern and Northeastern Basins. The team provided recommendations to make these programs more productive and cost effective. All data collected for the Basins were entered in a database (digital and hardcopy), including water levels, well logs, water quality, abstraction amounts, historic reports, geologic maps, topographic maps, and well construction data.

Groundwater Modeling

Aquifer modeling was initiated to enhance and refine the groundwater model. Modeling work also included calibrating the steady-state model and demonstrating various data inputs to the management model. CH2M HILL worked with PWA trainees on the fundamentals of conceptual modeling preparatory to numerical modeling.



Engineering Design and Procurement Documentation

Project components included monitoring and exploratory wells, bulk water supply and transmission facilities, and village water distribution systems, including all supply wells, treatment, storage, pumping, and transmission line components. We provided feasibility studies, preliminary designs, and final designs for these facilities, as well as procurement documentation.

Hebron Wastewater Monitoring

CH2M HILL developed and implemented a wastewater-monitoring program to quantify and characterize the wastewater generated from Hebron. Sampling was conducted on selected waste streams, including industrial sources from stonecutters, tanneries, slaughterhouses, and dairies.

Water Master Planning Framework



CH2M HILL updated and enhanced the Comprehensive Planning Framework for Palestinian Water Resources. Our work advanced studies, addressing Palestinian equity issues and Jordan River riparian rights and was an important technical baseline for peace process water negotiations. Past framework studies and strategic plans did not address regional water balances, but rather focused on what can be done with current allocations. This update required:

- Reviewing existing water resource management plans and reports
- Using the Eastern Aquifer model to determine maximum sustainable yields for the region
- Inventorying potential sources of water supply within the region, including the Jordan River Basin, as well as within the boundaries of the West Bank and Gaza Strip
- Evaluating potential alternative sources of supply within the Middle East
- Developing user costs for three alternatives

The update provided water resource plans in 10-year intervals to meet the projected water requirements of the Palestinian people through 2040.

Ongoing Work—Phase III

The final phase, Phase III, was completed the summer of 2004. This phase included:

- Studied and designed municipal and industrial wastewater treatment facilities in Hebron
- Planned and designed water distribution and wastewater facilities in selected villages
- Institutional capacity building for the PWA
- Groundwater aquifer modeling
- Developed an integrated water resources master plan for the West Bank
- Construction management services and implemented demonstration projects for water reuse, conservation, groundwater recharge, and aquifer protection