Development of Optimum Operational Management Strategies for the Saipan Water Distribution System

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The Government of the Commonwealth Northern Marianas Islands (CNMI), has invested a large amount of funds to improve Saipan's water distribution system, but delivery problems still exists. A stated goal of the CNMI government is to provide 24-hour water to all residents served by the Commonwealth Utility Corporation (CUC) water system. This goal will be unattainable until the CUC has a complete knowledge of their water delivery capabilities and operation.

Over the years the CUC water distribution system has grown and new wells have been added to the system. This physical expansion has been well documented but improvements in the hydraulic characteristics and delivery capabilities of the entire system have never been fully examined.

The Saipan water distribution system has been divided into 12 sub-regions. Each region is expected to operate somewhat independently. However, due to inadequate inflow to the system, system leakage, and lack of knowledge of system behavior, the system is unable to provide 24-hour water services to all customers. WERI researchers have developed computerized models of each of the 12 sub-regions of the CUC water system using the Haestad WaterCad water system modeling program. They also, developed a Source, Transmission and Storage model of the Saipan Water System. This includes a Skeleton of the existing 12-region water system models that are joined together at the boundary points. The next step needed is to examine various system operational schemes in order to find an optimum way to transfer water from sources to the customers.

The benefits expected from the project include a better understanding of the adequacy of the existing pumps and well systems, the adequacy of existing storage facilities to provide for daily fluctuating demands, the ability of the well and storage system to provide sufficient flows, and a more in depth understanding of the most efficient means to move water from water supply rich regions to those that have supply shortages in order to maintain delivery of 24 hour water to all areas in the system.

The project will be split into two phases. The first phase will be to finalize the skeleton of each Saipan's sub-water system. We will work closely with CUC Engineering staff to be sure all included components such as pipes, tanks, wells, and reservoirs are correctly modeled and match field data. The second phase will determine the optimum system operation. This phase will be accomplished in close consultation with CUC staff engineers. First the model will be operated in steady state mode and the response of the system during critical times will be examined to determine if the system can meet the required demands and if not what changes in either operation or physical make up of the system would be required to solve the problems. Next the model would be operated in extended time simulation mode to examine storage tank operations. The response of the storage tanks during critical times will be examined to determine if all of the tanks are operating in an optimal manner and if not what changes in either operation or physical make up of the system would be required to improve tank operations.