MWD
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

9-8

July 29, 1997

To: Board of Directors (Engineering and Operation Committee--Information)

From: General Manager

Submitted by: Chief Engineer

Subject: Automation of Dam Deformation Monitoring

RECOMMENDATION

For information only.

EXECUTIVE SUMMARY

Metropolitan is required by state regulations to monitor dam deformation and submit reports to the California Department of Safety of Dams (DSOD). The five jurisdictional structures (three earthen dams, detention basin and forebay) under construction at the Eastside Reservoir Project (ESRP) will substantially increase Metropolitan's monitoring workload. The Engineering Division has developed a plan to minimize the cost of this increased workload by automating dam deformation monitoring using robotic total stations. This plan will reduce operation and maintenance costs at the ESRP by approximately $1.9 million over the five-year filling period and allow dams to be monitored 24 hours-a-day, if necessary. Automation of dam deformation monitoring at other Metropolitan facilities is currently under review.

DETAILED REPORT

Metropolitan is required to monitor existing dams and provide reports to the California Department of Safety of Dams (DSOD) semi-annually. New dams, such as those at the ESRP, necessitate monthly monitoring until the reservoir has been completely filled. Metropolitan currently has 28 facilities which require monitoring. Each facility has a series of monuments placed on or adjacent to the dam which must be carefully surveyed to monitor for structural movement. Currently, there are over 3,000 monuments which must be surveyed each year. By the year 2000, the number of monuments which must be monitored each year will increase to over 7,000.

In order to minimize costs associated with the increased monitoring requirements, staff plans to install a robotic total station monitoring system at the ESRP and other sites. The system for ESRP will consist of ten permanently mounted robotic total stations protected in special glass enclosures. The total stations will be linked to a computer system that will automatically and remotely control survey measurements. Survey data will be collected periodically to meet DSOD reporting requirements, and can be gathered immediately following earthquakes to assess the condition of facilities.

The proposed robotic total station monitoring system will save money by reducing labor costs associated with the increased monitoring requirements. Although the equipment cost for the proposed robotic total station monitoring system is about $0.9 million higher than the equipment cost using conventional methods, automation of the data collection will save approximately $2.8 million in labor costs. This labor savings results from not having to hire seven full-time monitoring employees for the five-year filling period. The proposed system will yield a net savings of approximately $1.9 million during the first five years of operation. Payback for the system is approximately thirteen months.

The proposed robotic total station monitoring system will also improve Metropolitan's ability to monitor its dams and increase public confidence. The system is capable of continuous, 24-hour-a-day operation, if necessary, and can provide valuable data immediately after earthquakes to assess the condition of facilities, and assure the public that they are safe.

The proposed plan for the ESRP monitoring system has been reviewed and tested in detail by Dr. Adam Chrzanowski, a consultant and renowned expert in the field. Dr. Chrzanowski's review found the proposed plan innovative, technically sound, and economical.

Staff is currently assessing the cost and benefits of implementing similar systems or semi-automatic systems at existing facilities. In addition, staff will provide information to member agencies who have similar facilities and will assist them in implementing this new monitoring technology to meet state-mandated monitoring requirements.

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(robotic)