EFFECTIVE WATER SUPPLY PLANNING IN UNCERTAIN TIMES

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Abstract. Master planning requires both flexibility and development of firm conclusions on which future decisions can be based. This paper uses the recent Cobb County-Marietta Water Authority (CCMWA) Master Plan Update to illustrate how to satisfy both these objectives. In the CCMWA Update, this balance was particularly elusive due to uncertainties in the regional water supply arena which could have significant bearing on the CCMWA's long-term options. To achieve this balance, the Plan identified distinct short and long-term actions which would allow "mid-course corrections" as well as long-term alternatives which covered a range of possibilities.

INTRODUCTION

Brown and Caldwell (BC) recently completed the Draft Report for the CCMWA's Long-Range Water Supply Master Plan Update. This project updated the Master Plan BC prepared for the CCMWA in 1988. Since the 1988 Plan was completed, there have been significant changes in several areas and new uncertainties have developed.

Master planning should integrate flexibility and also produce firm conclusions on which future decisions can be based. This paper identifies specific elements of the recent CCMWA Master Plan Update which enabled the Plan to satisfy both of these objectives.

Georgia water planning efforts face new challenges as water resources become increasingly limited and water supply management becomes increasingly regionally based. Conclusions resulting from the Corps of Engineers (COE) Comprehensive Study and water supply allocation commitments made by the Georgia Environmental Protection Division (EPD) will determine what water supply options are available to the CCMWA and other Georgia water suppliers.

The purpose of this paper is to identify how the CCMWA incorporated the current uncertainties and developed a plan which would allow them to begin to take specific actions to guarantee adequate water supplies for the future. An effort is made to generalize the CCMWA's experience for other utilities by providing guidelines for incorporating flexibility into master planning.

BACKGROUND

Since the 1988 Plan was completed, there have been significant changes in projected future water demands, the availability of existing water supplies, and the feasibility of certain new water supplies. Additionally, several fundamental assumptions underlying the recommendations of the 1988 Plan were challenged by the 1990 lawsuit filed by Alabama and Florida and the resulting COE Comprehensive Study. Thus an update of the 1988 Plan was required.

A useful water supply plan includes several essential elements. The Plan must be:

- Comprehensive—consider all alternatives.
- Flexible—accommodate changing conditions.
- Economical—given that updating will be required every 5 to 10 years.
- Coordinated—all stakeholders and decision-makers should contribute to its development.

Examples of how these elements were incorporated in the CCMWA Update are discussed in the remainder of this paper.

INCORPORATE AREA ACTIVITIES AND ISSUES

Long-term water supply plans should reflect the demands and requirements of the utility's customers, its Regional Development Commission (RDC), the state regulatory agency, and other affected parties (e.g., the COE). Obtaining input and buy-in from these stakeholders ensures that the master plan is well-founded and that future water demand and supply projections are as accurate as possible.

In developing the CCMWA Master Plan Update, CCMWA customers, other area water suppliers, the Atlanta Regional Commission (ARC), the COE, and the EPD were interviewed regarding future water demands and water supply allocation issues. CCMWA customers were interviewed regarding their anticipated growth in order to accurately project their water demands over the 50-year planning period. Projecting demand in high growth areas such as Paulding County was particularly important in forecasting long-term future demands on the CCMWA system. Communication with other water suppliers in the area also provided valuable information on the cost, timing, and permitting of new water supply reservoirs.

Communication and coordination with the ARC was necessary to ensure the compatibility of the CCMWA plan with the regional plan, e.g., in terms of the demand forecasting methodology and the resulting population and water demand projections. As the direct or indirect manager of the CCMWA's two primary water sources, Lake Allatoona and the Chattahoochee River, the COE was also consulted. The COE allocates storage in their reservoirs, determining the quantity of water available for municipal water supply through their

operating plans, and may in the future grant withdrawal credit for wastewater discharges and discharges from proposed off-line reservoirs into COE lakes. Finally, the EPD was involved in order to make reasonable assumptions regarding the availability of water from specific sources to the CCMWA, to determine the significance of interbasin transfer, to incorporate the requirements of the new proposed 50-year permits, and to ensure consistency with the state's objectives regarding future water supply allocations.

WATER REQUIREMENTS

Water demand projections are the basis for all other water supply planning activities, yet long-term demands are difficult to estimate. In the case of the CCMWA Update, there were uncertainties associated with demands in fast-growing parts of the service area and in how demands might be reduced if the West Georgia Regional Reservoir (WGRR) were developed. An effort was made to identify and moderate optimistic growth projections while still reflecting the significant growth that could materialize. To address the uncertainty introduced by the possible development of the WGRR (a potential alternate supply for two of the CCMWA's customers, Paulding and Douglas Counties), two sets of demand projections were prepared and long-range water supply alternatives with and without the WGRR were later developed to meet each set of projections. Interconnections with other systems and how these might be used to supply peaking demands were also investigated to provide flexibility in the CCMWA system.

SURFACE WATER OPTIONS

The CCMWA and other North Georgia water utilities depend on surface water to meet their demands. Since the CCMWA Master Plan was prepared in 1988, significant uncertainty has arisen regarding the quantity available from the CCMWA's major surface water sources. Future allocations to the CCMWA from Lake Allatoona and the Chattahoochee River were uncertain when the Draft Update was prepared as negotiations with Georgia and Florida regarding downstream flow guarantees were still ongoing. New modeling to determine the sustainable yield of Lakes Lanier and Allatoona also was not yet complete. It was not clear if the CCMWA would be directed to draw largely from one or the other of these primary sources, which would affect the timing and nature of future CCMWA water withdrawal requests and treatment plant expansions. Based on discussions with the EPD and the COE, there was a strong likelihood that the CCMWA could continue to obtain water from both sources, with the greater quantity available from Lake Allatoona where demands are less than in the Chattahoochee River system. Therefore, in the alternatives evaluated in the Draft Master Plan Update, 46 million gallons per day (mgd) of additional water was assumed to be available from the Chattahoochee/Lanier system and from 8 to 64 mgd from Lake Allatoona depending on the individual alternative.

To accommodate the uncertainty associated with water allocations from the Chattahoochee River and Lake Allatoona, the Master Plan Update considered other water supply options. Off-line reservoirs to store water in low demand periods and discharge water for withdrawal from Lake Allatoona in high demand periods were considered. These reservoirs would give the CCMWA direct control on some of their water supply. Pertinent issues associated with new reservoirs include the presence of endangered fish species in many north Georgia streams, wetlands mitigation requirements, and guarantees of downstream flows as being considered by the EPD. The CCMWA Master Plan Update took advantage of recent reservoir development experience of other area water suppliers, especially regarding the cost of such projects and the studies and mitigation measures required for endangered species.

GROUNDWATER SUPPLY OPTIONS

Groundwater offers another water supply source by which suppliers can be relatively independent. Although in most cases in North Georgia groundwater can only be a secondary source, it can be an important means of meeting peak water demands. It can also be useful in irrigation applications with limited treatment. As the CCMWA's groundwater exploration and development program was still ongoing, the location and yields of groundwater production wells were not defined when the Master Plan Update was completed. This uncertainty was incorporated by assuming a conservative (5-mgd) yield from groundwater wells at unspecified locations. Preliminary data from the CCMWA's groundwater testing program was used to project groundwater production and treatment costs.

WATER CONSERVATION

Water conservation has been shown to be an effective means of controlling water demands. Furthermore, the EPD's proposed new 50-year withdrawal permit program requires that water demand projections incorporate water conservation and that these efforts be documented. As part of the Master Plan Update, the impact of the CCMWA water conservation program (implemented in 1989) was assessed. Although it is very difficult to incorporate all of the variables which affect water consumption (e.g., rainfall, temperature, demographic features, and utility water management practices), the analyses indicated a net reduction in per capita water use since the implementation of the program. Thus, water demand projections used in the Master Plan Update incorporated water demand reduction from continuing the existing water conservation program.

Quantifying water demand reductions from specific water conservation activities (plumbing codes, public education, xeriscaping, surcharges, system management, and plant

management) also is difficult, however, each of these practices should be considered in developing a water conservation program and in estimating the resulting water savings.

WASTEWATER REUSE

Wastewater reuse is a viable means of offsetting water demands for most water suppliers. Potential users of reclaimed wastewater include industries, and golf courses, residences, and office and industrial parks for landscape irrigation. Given the increasingly limited water resources in Georgia, wastewater reuse should be an integral part of every water system's master plan. Two golf courses in the CCMWA service area are currently using reclaimed water.

Wastewater reuse projects involve partnership between the municipal wastewater utility and the community (developers and/or industry); however, the water supplier can play an important role in promoting wastewater reuse within its service area and in linking potential users and wastewater utilities.

DEVELOPMENT AND ANALYSIS OF LONG-TERM ALTERNATIVES

Surface water, groundwater, water conservation, and wastewater reuse options were combined into four long-range alternatives to meet the CCMWA's projected water demands. Key objectives in developing the alternatives were to assume varying degrees of dependence on the primary surface water supplies and to identify alternatives which represented the range of possibilities. For example, long-range water supply alternatives with and without the WGRR were developed to meet the two sets of water demand projections. The long-range alternatives were evaluated on the basis of economic and noneconomic factors.

The long-range alternative that was ultimately recommended was one which was fairly economical and provided the most flexibility. This alternative incorporated short- and long-term actions which were conducive to "mid-course corrections" if EPD decisions or other developments differed from assumptions used in the Update. Alternatives in which commitments to certain courses of action were made early (i.e., initiating construction of new treatment plants or reservoirs) were less attractive given the significant uncertainties which currently exist.

In order to incorporate upcoming local and regional water supply decisions, but still have a useful Master Plan in the interim, the CCMWA Master Plan Update report was left in Final Draft form and will be finalized when the critical information becomes available.

SUMMARY AND RECOMMENDATIONS

The 1996 CCMWA Master Plan Update was conducted amid significant uncertainty in the regional water supply arena. Communication with the EPD, ARC, and the COE was essential to the development of a well-founded plan. Water supply options other than the Chattahoochee River and Lake Allatoona were investigated to offer the CCMWA more control on their raw water supply. Demand reduction through water conservation and wastewater reuse were confirmed to be valuable means of limiting water supply requirements for the CCMWA, and likely will be for other water suppliers.

A comprehensive long-range water supply plan involving several water sources provides flexibility and is favored when planning in uncertain times. Preparation of the final report to the point of a Final Draft provided the CCMWA with an updated useful document for the short term, and still allowed for later incorporation of significant regional water supply allocation decisions.

Preparing the Water Supply Master Plan Update amid numerous uncertainties leads to the following recommendations:

1. Involve all stakeholders and decision-makers early to accurately define water demands and water supply options.
2. Communicate with other water utilities to get first-hand cost data and to accurately estimate time and effort required for reservoir permitting and development.
3. Evaluate a range of water supply options including options controlled solely by the water supplier.
4. Develop varied long-term alternatives to cover the range of possibilities.
5. Favor options and long-range alternatives which offer long-term flexibility.
6. Identify and consider short- and long-term actions separately.
7. Identify critical decision points where a change in the long-term plan may be required.