



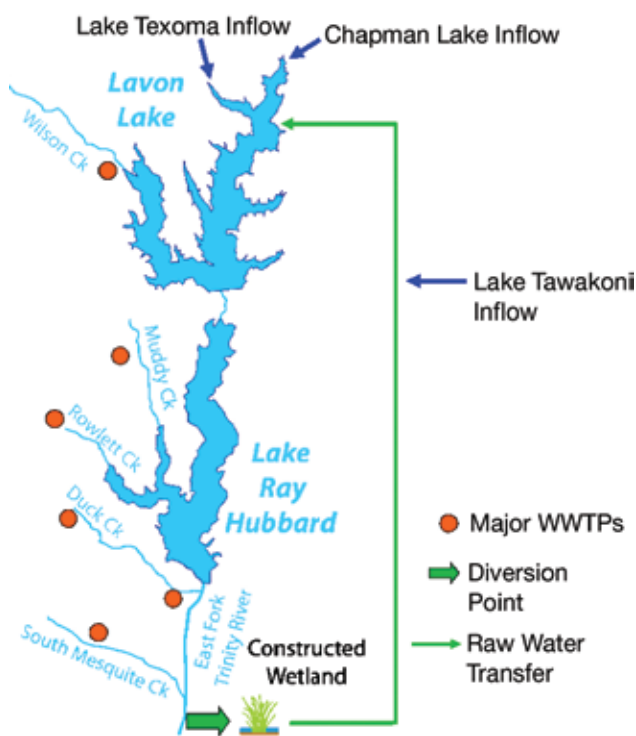
The East Fork Raw Water Supply Project is seen as an asset by environmental interest groups, the water supply community, local schools and the general public alike.

Deserving of Diversion

By Ellen T. McDonald & James M. Parks

Maximizing water resource efficiency

Figure 1. EFRWSP Schematic



ARTICLE SUMMARY

Challenge: Anticipating its service area population to more than double in the next 50 years, North Texas Municipal Water District was tasked with augmenting its water supply from Lavon Lake.

Solution: The East Fork Raw Water Supply Project was developed in 2001 to divert return flows from multiple WWTPs, treat the water through a wetland and convey it to the upper end of the lake.

Conclusion: Water delivery to Lavon Lake began in late 2008 and will eventually nearly double the yield of the lake. The project has enjoyed a positive public image.

North Texas Municipal Water District (NTMWD) currently provides potable water to a population of more than 1.6 million in a region north and east of the city of Dallas. Water is diverted for treatment from NTMWD's primary raw water supply reservoir, Lavon Lake, which is located in the Trinity River basin and has a firm yield of approximately 104,000 acre-ft per year (approximately 93 million gal per day [mgd]). This supply is supplemented with transfers to Lavon Lake from three other water supply reservoirs: one located in the Red River basin, one in the Sulphur River basin and one in the Sabine River basin. In addition to its potable water supply facilities, NTMWD owns and operates four regional wastewater treatment plants (WWTPs) and 12 smaller WWTPs within its service area.

NTMWD is located in one of the fastest-growing regions in the U.S. By 2020, the service area population is anticipated to grow by nearly 700,000 and more than double in the next 50 years. As a result of this unprecedented growth and a strong commitment to the efficient use of water resources, NTMWD developed the East Fork Raw Water Supply Project (EFRWSP) in order to further augment the water supply in Lavon Lake. This project diverts return flows from multiple NTMWD WWTPs; provides polishing treatment through a constructed wetland; and conveys the treated water to the upper end of Lavon Lake. Planning for this project was initiated in 2001, and construction was completed in 2008.

East Fork Raw Water Supply Project

Figure 1 shows a schematic representation of the EFRWSP. Treated effluent discharged from WWTPs downstream of Lavon Lake is diverted from the East Fork Trinity River into the constructed wetland for polishing prior to being pumped via a 42-mile pipeline to Lavon Lake.

With 1,840 acres of wetted surface area, the wetland is designed to remove sediments and nutrients from the water prior to delivery to Lavon Lake. The wetland includes multiple parallel trains of cells and is divided into three major sections by geographic features. The wetland trains in each section discharge to a common channel to convey flow to the downstream section. The flow is subsequently redistributed to the uppermost cells of the trains in the next section. The arrangement of cells and trains provides operational

flexibility. Deep-water zones at the inlet and outlet of each cell, as well as intermediate deep-water zones, provide distribution of flow across the cells to optimize utilization of the wetland treatment area.

The wetland was developed through a partnership with the Carolyn Hunt Trust Estate, which owns and operates the Seagoville Ranch where the wetland is located. This partnership has resulted in the construction of the largest water supply project of its kind in the U.S., as well as the development of the John Bunker Sands Wetland Center, which provides opportunities for research, education, wildlife observation and community gatherings within a modern, environmentally conscious facility and grounds. This facility honors the late Bunker Sands, a former executive director of the Carolyn Hunt Trust Estate, well known for his love of the outdoors and the environment. Outside the John Bunker Sands Wetland Center, boardwalks extend into the wetland, allowing visitors to view the wetland systems and observe wildlife.

Because water from the EFRWSP would be used to further augment the NTMWD's water supply in Lavon Lake, it was extremely important to protect water quality in the reservoir. Ecological impacts, human health impacts and regulatory issues were addressed as part of the water quality evaluation. In order to address water quality issues, a multiple-barrier approach was selected that incorporates a combination of advanced wastewater treatment, wetland treatment, the use of blending and detention time within Lavon Lake, water treatment and an ongoing monitoring program.

Based on historical experience in Texas and

regulatory guidelines in other states, a target upper limit on percent blend of reclaimed water of 30% and a target minimum reclaimed water detention time of six months were established. A water balance model was used to evaluate potential future conditions in the reservoir and determine the maximum amount of water to be delivered from the EFRWSP based on these criteria.

In addition, potential impacts of increased nutrient and total dissolved solids (TDS) loadings to the reservoir were addressed. The wetland was designed to reduce nutrient concentrations to levels sufficient to minimize further eutrophication in the reservoir. The NTMWD is addressing potential increases in TDS levels with operational and treatment strategies that seek to minimize the impacts of dissolved solids from multiple sources. Based on all of these considerations, an annual average capacity of 102,000 acre-ft per year (91 mgd) was established for the project.

Water Rights Permitting

In Texas, a water right must be secured prior to diverting or using WWTP effluent discharged to any state watercourse. Due to the urgency of acquiring additional water supplies, the NTMWD made a decision to take a significant risk and proceed with design and construction of the EFRWSP prior to securing a certificate of adjudication establishing a water right for the project. An application for the water right to divert and use return flows from NTMWD WWTPs was first submitted to the Texas Commission on Environmental Quality (TCEQ) in 2004. The permit application was protested by the cities of Dallas and Houston and by two groups representing environmental interests.

The city of Dallas primarily was interested in the permit because of the fact that several of the WWTPs named in the permit discharge into Lake Ray Hubbard, a Dallas-owned water supply reservoir. The NTMWD successfully negotiated permit language that required Dallas and the NTMWD to enter into a contractual agreement for pass-through of these return flows through Lake Ray Hubbard prior to the NTMWD being able to divert flow attributed to these particular WWTPs.

The city of Houston and the Trinity River Authority (TRA) have water rights in Lake Livingston, which is located downstream of the Dallas-Ft. Worth metroplex on the Trinity River. Houston wanted to ensure that these rights were not impaired as a result of the project. Again, the NTMWD was able to negotiate language committing that a percentage of the return flows from the NTMWD WWTPs named in the permit would be allowed to flow downstream to meet the needs of downstream water right holders.

The environmental interest groups were concerned primarily with potential reductions in in-stream flows and freshwater inflows to bays and estuaries on the Gulf of Mexico. These interest groups also recognized the inherent environmental benefits of the EFRWSP, however, such as the potential deferral of the need to construct new water supply reservoirs and the development of additional aquatic life habitat created by the wetland. Ultimately, these groups agreed to the terms of the permit ultimately proposed by the TCEQ

following negotiations with the other protestors.

The official water right for the project was issued in July 2007. By this time, construction of the \$220-million project was well underway.

Operations

The EFRWSP began delivering water to Lavon Lake in late 2008, initially only diverting return flows attributed to WWTPs downstream of Lake Ray Hubbard. When operating at its full capacity, the project will nearly double the yield of Lavon Lake while using a footprint that is less than one-tenth that of the reservoir. The project has experienced little public opposition, and overall it is seen as an asset to the area by

environmental interest groups, the water supply community, local schools and the general public. This positive image is largely attributed to the constructed wetland, which provides multiple benefits associated with water supply, aquatic life habitat enhancement and extensive educational and research opportunities. **WWD**

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