

Water Utilities Supply Chain Challenges and Case Studies:

CHLORINE AND THE TRINITY RIVER AUTHORITY

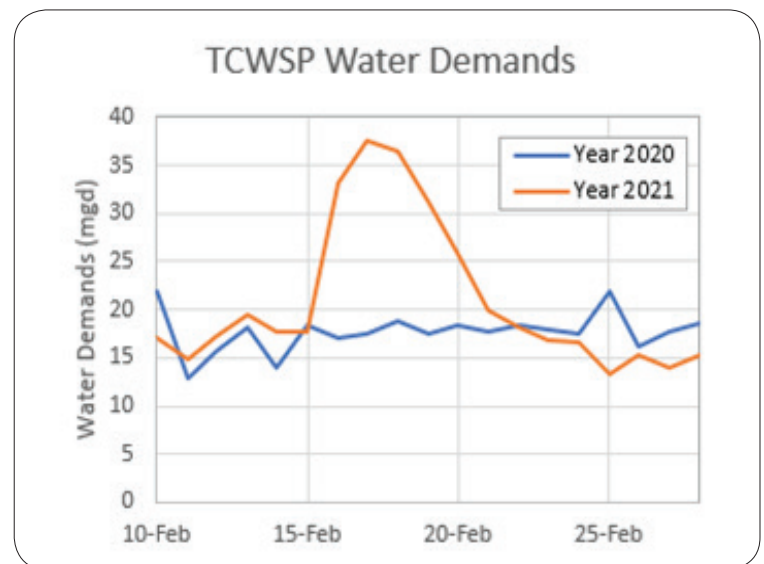
The Trinity River Authority (TRA) of Texas is a conservation and reclamation district that provides drinking water and wastewater treatment, along with recreation and reservoir facilities, within the nearly 18,000-square-mile Trinity River basin. TRA owns and operates five wastewater treatment plants (WWTPs) and four water treatment plants (WTPs). Tarrant County Water Supply Project (TCWSP) is the largest WTP operated by TRA. TCWSP is rated for 87.0 million gallons per day (mgd), and it provides drinking water to approximately 250,000 customers in 5 cities. TCWSP relies on their chemical supplier to provide various chemicals for water treatment needed to protect the environment and their customers. Chlorine plays an important role in maintaining a chlorine residual within the distribution system.

Located in the North Central region of Texas, TCWSP has worked on supply chain management practices to both optimize normal operations and withstand climate events such as drought, hurricanes, and extreme heat. However, these best practices were put to the test by Winter Storm Uri in February of 2021.



The Deep Freeze Arrives with Winter Storm Uri

During winter, outside temperatures in Texas are typically kept cool, not cold, by the relatively warm Gulf of Mexico waters. But during Uri, temperatures fell below freezing for 11 days, with a low temperature of 2°F. Water demand soared to more than two times its normal winter levels as people ran faucets to keep pipes from freezing, increasing the need for treatment chemicals like chlorine.



To prepare for Uri, TCWSP maximized water storage throughout its system and ordered additional chlorine to top off its tanks. However, the day before the chlorine delivery was due, the supplier called TCWSP and informed them that due to winter weather road conditions there would be no chlorine delivery.

Despite the chlorine shortage, TCWSP could not afford to lose its ability to treat and distribute water during the storm, especially since many customers were experiencing additional hardships such as loss of

power and no heat. This result was not acceptable to TCWSP. Staff accepted the challenge to maintain their current supply and to locate and procure additional chlorine.

Response and Mitigation

TCWSP immediately implemented a multi-pronged approach, which included the following:

- Advised wholesale customers to activate their Drought Contingency Plans. Implementation of Drought Contingency Plans reduced water demand, but it remained above typical winter demand levels.
- Located a back-up chlorine supplier. There are only two suppliers of bulk chlorine in Texas and TCWSP was under contract with one supplier. TCWSP contacted the other supplier for assistance.
- Used bleach (sodium hypochlorite) as a supplemental disinfectant. TCWSP keeps bleach on-site to provide disinfection at one of its pump stations.
- Contacted the Texas Water and Wastewater Agency Response Network (TXWARN) in hopes that a less impacted utility would be willing to share chlorine with TCWSP.
- Determined if the City of Fort Worth could provide emergency water. TCWSP has an agreement with the city to provide emergency water through an interconnect. However, in this State-wide incident, the city was impacted as well so this option was quickly removed from further consideration.

While none of the options above could manage the issue alone, TCWSP was able to adapt and combine portions of each option to arrive at an acceptable solution without compromising service. For example, although the other supplier of bulk chlorine was not able to deliver chlorine right away, it was able to obtain chlorine in Oklahoma and eventually deliver the needed amount. While TRA awaited the chlorine delivery, they were able to successfully blend bleach with the limited bulk chlorine supply on hand to successfully treat water and meet demand until the bulk chlorine arrived. TXWARN also assisted with the delivery of one-ton chlorine cylinders to supplement the bulk chlorine. Although, the cylinders were not used, they provided an additional standby supply of chlorine

Chlorine has several uses in water treatment, including primary and residual disinfection, algae control, oxidation of taste & odor compounds, and on-site generation of chlorine dioxide. But water treatment applications account for only 4% of domestic consumption. Therefore, during shortages, it can be hard for water utilities to compete with larger industrial users such as pulp and paper, pesticides, rubber, and solvent manufacturing.

in case they were needed. Also critical to success was the implementation of Drought Contingency Plans which reduced demand and allowed for further “stretching” of not only water in storage but also the limited bleach and bulk chlorine supplies.

Ultimately, the cities maintained their drought emergency status for two weeks. Blending bleach and existing chlorine supplies worked well to maintain the needed chlorine residual. TCWSP’s supplier for bulk chlorine was able to supply bleach to TCWSP during the incident, which helped TCWSP to maintain the blended disinfection process until the alternate chlorine supplier was able to deliver bulk chlorine. Chlorine was delivered three weeks after the original scheduled delivery and TCWSP was able to resume normal operations. The bleach delivery system was disassembled, excess bleach was returned to TRA’s supplier, and the unused one-ton chlorine cylinders were returned to the respective utilities that provided them under TRA’s request to TXWARN.



Lessons Learned

A combination of actions helped the utility weather the storm. The incident led to the following lessons learned for enhancing these practices:

- **Improve supplier communication.** Since the incident, TCWSP has increased communications with their bulk chlorine supplier.
- **Establish an emergency back-up supplier.** TCWSP identified and utilized a back-up supplier to secure additional bulk chlorine during the incident. TCWSP is considering establishing a contract with this supplier as an emergency vendor should another shortage occur.
- **Maintain emergency supplies for employees.** TCWSP had procured extra supplies for its employees as part of its COVID-19 planning and response. These included pre-packaged meals, cots, and bottled drinking water for field use. These supplies proved useful during Winter Storm Uri as staff spent long hours at the utility.

While TCWSP cannot predict when another Uri or similar disaster may occur, they can and are taking steps to better plan for and respond to a similar incident in the future by working with their supplier, mutual aid, and exploring sustainable changes to enhance resilience at their facilities.

Additional Resources

You can find more information on using supply chain management best practices and preparing for supply chain challenges at <https://www.epa.gov/waterutilityresponse/water-and-wastewater-sector-supply-chain-resilience>.

