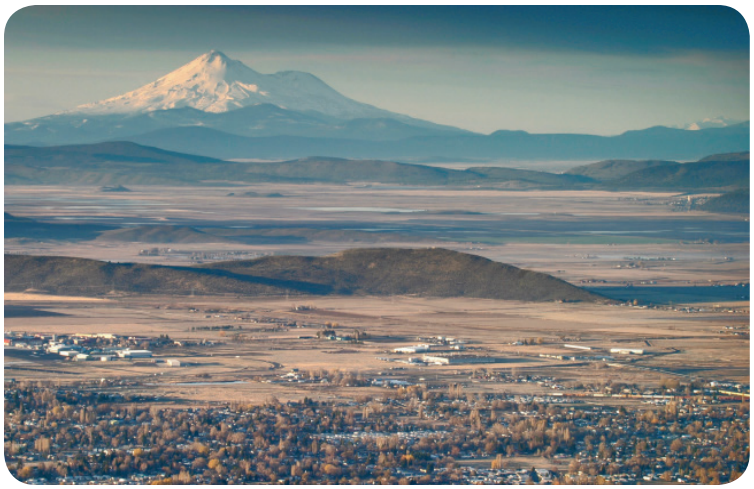
Water Utilities Supply Chain Challenges and Case Studies:

STORAGE AND THE KLAMATH FALLS WATER DEPARTMENT



The City of Klamath Falls, Oregon water system provides drinking water to approximately 40,000 residents. The water system is the largest water provider in the region, producing and delivering an average of 2.5 billion gallons annually. The city is reliant on its groundwater sources. Gaseous chlorine is used for disinfection at each of the system's 13 groundwater wells.

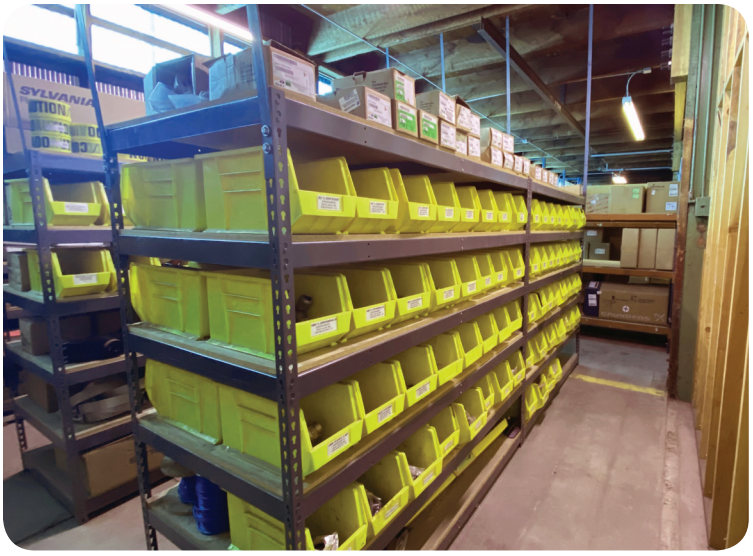
Additionally, there are no neighboring utilities for system interconnections. It is imperative that the city maintain a steady supply of gaseous chlorine and an inventory of the necessary equipment to keep producing potable water for its residents. Otherwise, water must be hauled in.

First Challenge: A Shrinking Supplier Landscape

Historically, the water department was able to purchase needed parts and equipment from local vendors. However, the vendor landscape changed over the past 12 years resulting in fewer options and longer delivery times.

The department could still place orders with their primary vendors, most located 75 miles away, but limited supply and high demand impacted delivery. Dealing with the prospect of prolonged standard delivery times and prohibitively high expedited shipping costs, the city instead decided to establish a water department warehouse to keep inventory readily available on-site.

The warehouse is a critical part of the water department's operations and contingency planning. Brass fittings, pipes of varying materials, meter boxes, and other items typically needed for routine operations can be found on the shelves. The warehouse is overseen by a fulltime warehouse coordinator, who maintains the parts and materials inventory including procurement, shipping, receiving, stocking, and computerized inventory and accounting. Stock levels vary based on each item's delivery lead time and how hard it is to find. Neighboring utilities are also able to loan or purchase parts and supplies. The City of Klamath Falls has mitigated the impact of delays and shortages with their existing inventory.

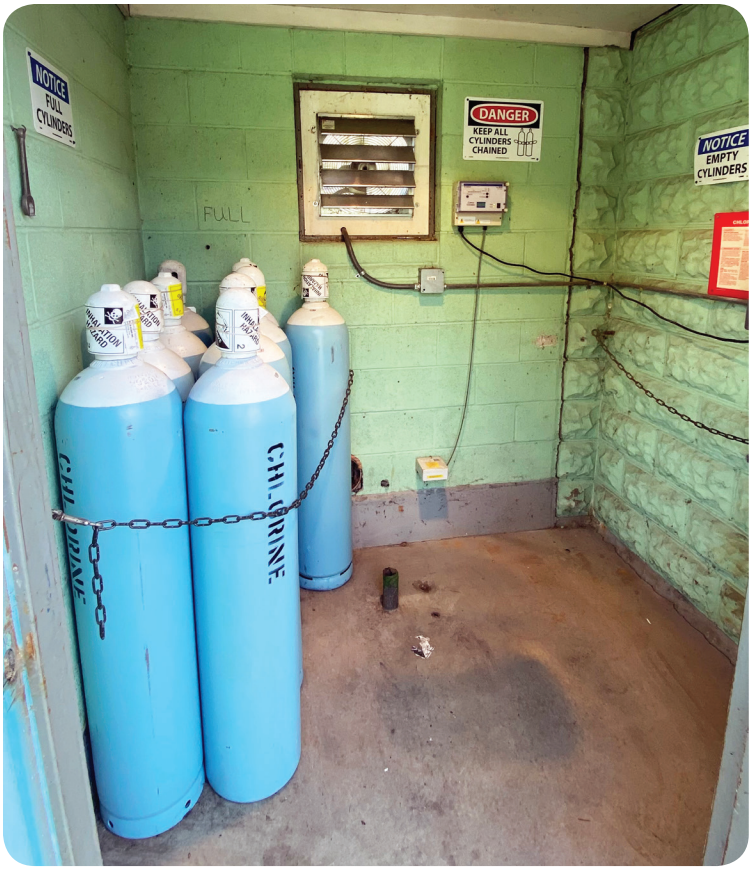


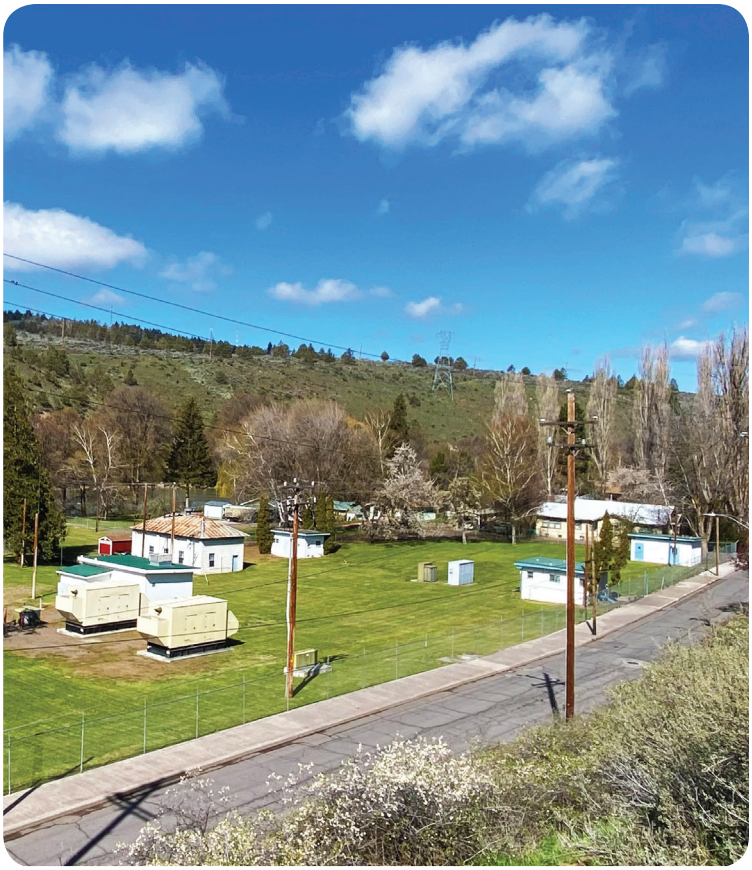
The Next Challenge: Maximizing Storage

Maximizing storage doesn't always require an increase in space or financial investment. In late spring of 2021, the *Oregon Water and Wastewater Agency Response Network* (ORWARN) notified its members, including Klamath Falls Water Department, that there was the potential for a regional chlorine shortage due to an electrical failure at a major chlorine manufacturer in Washington that serves utilities from San Diego to Seattle.

Klamath Falls decided to increase gaseous chlorine storage to ride out any impending shortage. There was no way to build new storage facilities in time, so creative thinking was needed. Each of the city's 13 wells has a chlorine storage facility capable of potentially housing two chlorine cylinders. Based on seasonal demand, each well's facility was only storing one or no cylinders. The department also maintains a centralized chlorine storage facility that acts as a staging area to replace spent cylinders at the well storage sites. Staff moved all chlorine cylinders in the central storage facility to the on-site well storage locations to ensure that each well had its maximum two cylinders. The department also called their supplier and scheduled an extra shipment of chlorine to fully replenish the centralized storage facility, in addition to the regularly scheduled monthly delivery.

Luckily, the Klamath Falls Water Department chlorine storage strategy paid off. The department did not run out of chlorine and the chlorine manufacturer was able to resume production earlier than expected.





Lessons Learned

In addition to the chlorine shortage, COVID-19 and other events (e.g., Winter Storm Uri) have occurred, making it difficult to obtain spare parts, plastic- and polymer-based products, and meter boxes. The department has noted lessons learned based on these experiences:

- **Mutual aid and assistance networks are invaluable**. The department credits ORWARN with alerting the utility to the impending shortage and giving it the time to respond effectively. After the initial announcement, ORWARN also surveyed all its members to determine who used chlorine for disinfection. The resulting list was then shared with all members so that utilities would know who they could potentially contact for extra chlorine if their supplies were running low, especially if their contracted suppliers could not fulfill orders.
- **Operational flexibility can increase redundancy**. The department is considering converting some of its wells to use liquid chlorine for disinfection in the future. Utilizing both liquid and gaseous chlorine for disinfection would give the department more response options for future chemical supply chain disruptions.
- **On-site inventory is critical**. The warehouse Klamath Falls started years ago when they lost their local parts supplier has been critical to the department's resilience. Through its warehouse operations, the department has been able to increase its stock of hard-to-get brass parts and meter boxes.

For Klamath Falls, maximizing existing storage, as well as investing in new storage space, has led to the department's ability to withstand supply chain disruptions and remain resilient for what comes next.

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*.