

Water Utilities Supply Chain Challenges and Case Studies:

SELF-RELIANCE AND THE CITY OF FORT BRAGG

The City of Fort Bragg is a small town (pop. 8,000) on the northern coast of California. Their water system relies on three surface water sources: Waterfall Gulch (tributary to Hare Creek), Newman Gulch (tributary to Noyo River), and the Noyo River itself. The two tributary sources generally provide a higher quality of raw water as they gravity-feed to the water treatment plant, whereas water from the city's Noyo River diversion must be pumped. As summer progresses and the flows in the tributary streams diminish, the Noyo River diversion is used more frequently and in greater quantities.

The Challenge

Fort Bragg is geographically isolated, and the city's utility departments often make decisions that consider reliability and resilience due to their remote location. In 2013, the drinking water utility decided to upgrade its secondary chlorination and dosing system. Staff recognized that their distance from main logistics routes meant that trucked-in commercial strength sodium hypochlorite (bleach) would not only remain expensive, but also be potentially difficult to obtain in an emergency.

However, this was not the only challenge facing the city's water supply. Rising sea levels are also changing water quality within the Noyo River, and saline conditions now extend further upstream in the river during high tide than in years past. This is problematic because in the summer the city relies on its Noyo River intake as upstream tributaries go dry due to climate change-induced drought.

To help alleviate both conditions, the city partnered with residents and local businesses on water conservation efforts to better utilize the community's water supply. Free water conservation

kits containing water capturing devices were made available. Additionally, the city provided local businesses with pre-printed, free table tents that remind visitors to conserve. One table tent is targeted to restaurant patrons and the other table tent is targeted to overnight guests. While conservation efforts have been helpful in promoting thoughtful water use in the face of water shortages and system isolation, the city knew it had to do more to increase supply chain resilience.

Combating Isolation

To end its reliance on trucked sodium hypochlorite deliveries, the city selected on-site sodium hypochlorite generation (OSHG) as its primary means of disinfection. OSHG utilizes an electrolytic process to convert a salt brine solution into a low concentration sodium hypochlorite solution (8,000 ppm). With the OSHG the utility must ensure that it has both salt and electricity on-hand to generate

"We are a remote municipality and have had issues in the past getting reliable deliveries of bulk hypochlorite. The reliability of the OSHG system has been excellent and has improved the resiliency of our department significantly."

- Heath Daniels, Operation Manager

bleach for water disinfection. Fortunately, NSF-60 approved salt is available from the local hardware store in town, and it can be stockpiled and stored for long periods. Although the city's electricity can be unreliable due to practices such as the Public Safety Power Shutoff program during wildfire season, the city purchased diesel generators for all its critical utility facilities. The OSHG system came online in 2015 and has proven to be an effective and reliable solution. The city will be transitioning its wastewater treatment plant to a similar system shortly.

Now self-reliant for disinfection at the drinking water treatment plant, the city had to face its water shortage challenges. In 2021 drought conditions meant that the utility was faced with drawing water from its emergency reservoir to bolster its supply. Instead, the city decided to install, under emergency conditions, a temporary desalination-reverse osmosis system that can treat up to 144,000 gallons per day from the Noyo River. Fort Bragg's new desalination unit is sized to release desalinated water into a raw water pond that flows into the city's existing treatment plant. Mounted on a steel skid, it can produce 200 gallons per minute of desalinated water.

John Smith, Director of Public Works, stated that *"Due to the dire water shortages facing our water customers, the city's water system is using technology and innovation to help us through this drought."*

Your state primacy agency can be your ally

The city used the state's Urgent Drinking Water Needs Program which fully funded Fort Bragg's grant request of \$691,796. This paid for the desalination unit as well as a shallow groundwater well treatment system that can produce 57,000 gallons of water a day. The city initially applied for funding in late May 2021 and start-up testing of the desalination unit began at the end of September 2021.



OSHG System



OSHG System



Water Desalination Unit

Lessons Learned

Fort Bragg has many lessons to share after years of remote operation:

- **All treatment chemicals and other needed materials (e.g., pipes) should be ordered early and storage should be maximized, being mindful of any shelf-life limits.** These efforts can mitigate supply disruptions and prolong existing supply.
- **Have a back-up to your back-up.** Fort Bragg has been approved to use a commercially available solid form of a chlorine-based disinfectant in case they cannot generate sodium hypochlorite. The city has also identified two back-up analytical laboratories for when their own lab cannot operate (as occurred recently when growth media was in very short supply).
- **If you are a combined utility, be sure all your operators are dual certified.** This is helpful if staff shortages occur due to events such as COVID-19, especially in smaller utilities with minimal staff.
- **Utilize all latent staff skills.** Many of the city's utility employees are former millwrights and industrial electricians, and their former career skills are leveraged at both the city's drinking water and wastewater utilities.
- **If you are going to impose water conservation measures, start with voluntary measures first.** This prepares customers for future mandatory restrictions and gives everyone a chance to meet reduction goals prior to any compulsory limits that could be put into place.

Preparing for and responding to supply chain challenges requires a multi-pronged approach. When it comes to shortages, ingenuity and creativity can help save the day.

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>.

