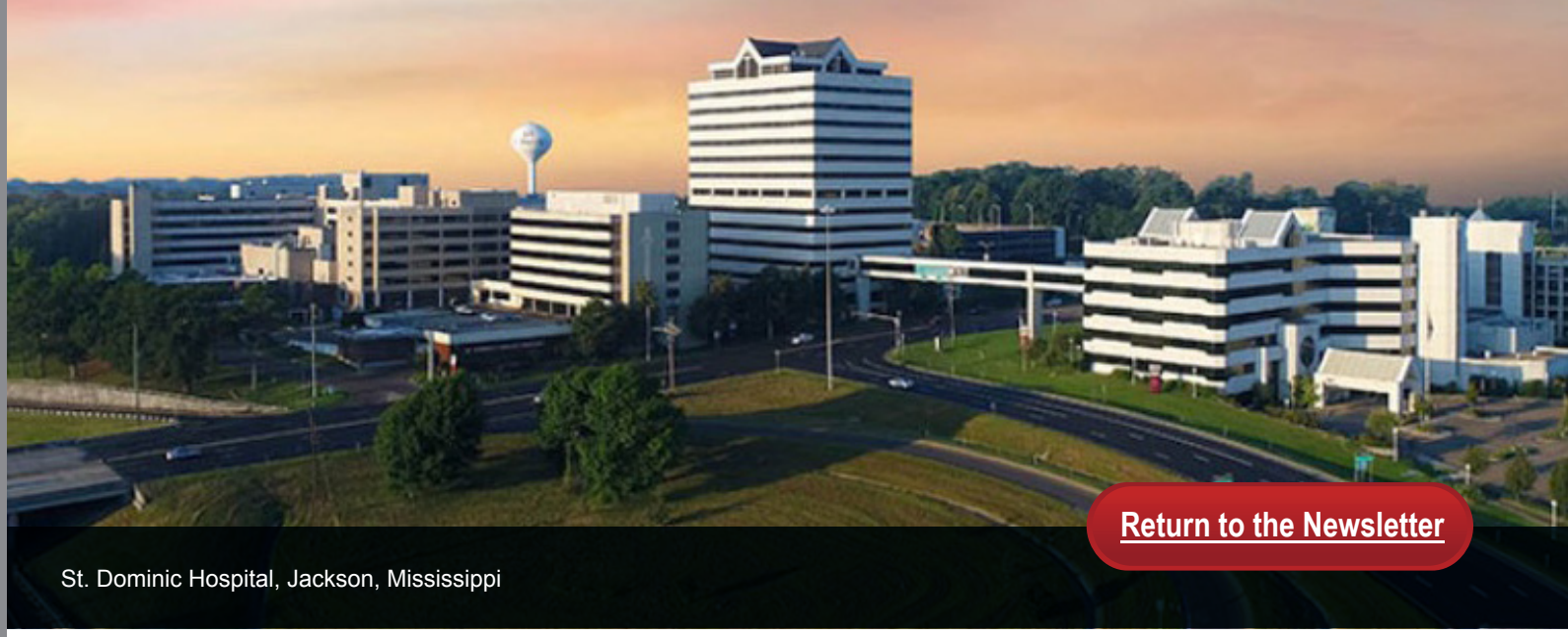


St. Dominic Hospital, Jackson, Mississippi

Return to the Newsletter

Crisis in Mississippi: The Emergency Management and Hospital Response to the City of Jackson's Water Outage

The City of Jackson, Mississippi relies on 1,000 miles of water mains, two treatment plants (the J.H. Fewell plant [built in 1914], and the O.B. Curtis plant [built in 1993]), and a system of wells to keep water flowing to residents and critical infrastructure. For a myriad of reasons, particularly in the past decade, the supply has been challenged by line breaks, shut-offs, boil-water advisories, water turbidity, and the presence of toxic lead and bacteria. In February 2021, freezing temperatures slowed water pressure and affected water production and 50,000 residents were under a precautionary boil-water advisory. In August 2022, multiple raw water intake pumps failed at the O.B. Curtis Water Treatment Plant, impacting its ability to produce drinking water. In the same month, heavy rains and flash flooding exacerbated the problem by disturbing the water treatment process, clogging the filters, and preventing the plant from producing *any* drinking water, leading to a lack of running water for approximately 160,000 Jacksonians and affecting several hospitals and other healthcare facilities.

The U.S. Department of Health and Human Services' (HHS) Administration for Strategic Preparedness and Response (ASPR) Technical Resources, Assistance Center, and Information Exchange (TRACIE) featured Jim Craig, a Senior Deputy at the Mississippi State Department of Health and Incident Commander for the Jackson Water Crisis Response, and Dr. Damon A. Darsey, an Acute Care Consultant at the Franciscan Missionaries of Our Lady Health System in a speaker series recording, where they discussed the preparedness and response efforts from their intertwined fields which helped sustain hospital operations during the extended period without running water.

Background and Emergency Response (Jim Craig)

The J.H. Fewell Water Treatment Plant is fed by the Pearl River, authorized to provide 20 million gallons per day, and has some on-site storage capability; it has the potential to flex up to about 30 million gallons per day utilizing on-site storage capability. O.B. Curtis Water Treatment Plant is fed by the Ross Barnett Reservoir (which is also fed by the Pearl River) and comprised of conventional and membrane treatment plants each authorized for 25 million gallons per day of water production. The City of Jackson's consumption needs are about 30 million gallons per day. Optimally, if the O.B. Curtis Water Treatment Plant is running at full, authorized capacity, it would be able to treat 50 million gallons of water per day. In total, Jackson's water treatment plants were able to generate about 70 million gallons of water per day if operating optimally.

The Emergency Response: August 2022

In August 2022, Jackson experienced several bouts of heavy rainfall, which caused the Pearl River to crest at more than seven feet above flood stage. Rainwater entered the reservoir, creating a chemistry imbalance, resulting in the need to

adjust the treatment process and significantly reduce the amount of outgoing water (and pressure) city-wide. The state health officer issued a public drinking water emergency at the end of August; this was lifted 180 days later on February 24, 2023.

Unified Command Morning Operations Briefing, O.B. Curtis Water Treatment Plant, Jackson, Mississippi

The governor of Mississippi declared a state of emergency and requested and received a limited Stafford Act declaration (which ended on the 28th of November). More than 40 responders from the state's health department served on the incident command team, including environmental health team members and public water engineers to assist the city with restoration of pressure, plant maintenance, and related actions.

We established a unified command under Emergency Support Function #3 (public works and engineering). Our command included representatives from the City of Jackson, Hinds County (where the city of Jackson is located), the state health department, Mississippi Emergency Management Agency, the Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers. This unified approach illustrated how well federal, state, local, and mutual aid teams could come together and restore pressure and services back into the city, but overall, bringing mutual aid folks from around the country and other state and federal agencies together to support the maintenance teams at the water treatment plants and teams to locate and resolve leaks required a great deal of communication.

We brought in colleagues from the Mississippi Rural Water Association and leveraged the Emergency Management Assistance Compact (EMAC) to provide resources and experts who operate water treatment plants from around the U.S. to help. They provided maintenance and operations assistance in getting the water treatment plants back to pressure and providing clean and safe water throughout the city of Jackson.

I would be remiss if I didn't recognize the other significant part of this response: the city, National Guard, social service agencies, volunteers, and others who passed out (and in some cases, delivered) bottled and non-potable water during the event. Using a similar model as our medical countermeasure points of dispensing (POD) plans and National Guard commodity distribution plans, we set up seven water POD sites throughout the city, where the National Guard provided 13.8 million bottles of water to residents, which translates to hundreds of truckloads. We also had water tankers onsite at the PODS, providing residents the opportunity to gather buckets of water to take home so they could flush their toilets. Getting water to those who were unable to travel to these PODs required significant effort and logistics on behalf of the Guard, the City of Jackson, area churches, civic organizations, and the healthcare industry.

There are certain things in life that we just assume are going to work and flushing a toilet is one of them. When that doesn't happen for an extended amount of time—when you can't wash clothes, when you have to boil water (if you have water at all) to do even the simplest functions every day—it changes the whole rhythm of your family and your work life. City restaurants and other facilities that many people depend on were also closed and/or had to boil water or use bottled water. Some schools went to remote learning, as they were unable to provide food services. Every part of the city was impacted by this crisis.

Related Resources

How Jackson, Mississippi, Ran Out of Water

Jackson Water Failure Impacts Ability of State's Largest Hospital to Fight Fires

Related ASPR TRACIE Resources

Going with No Flow: Coping with Hospital Water Supply Issues

City of Jackson Water Crisis Response (Recording)

Sudden Water Loss and Actionable Considerations

Utility Failures Topic Collection

Our emergency order and unified command ended 180 days later, on the 24th of February (it took approximately a week for water pressure to be restored, but it took close to seven weeks for the boil-water advisory to be lifted). An international company well known for its wastewater operations and maintenance now oversees operations and maintenance for the city's water system. There are also dedicated teams throughout the city working to properly position valves and repair leaks to improve water pressure.

The Healthcare Response (Damon Darsey)

Before 2005, as an emergency physician, I never thought that a municipal water failure would even be on our radar screens when it came to hospital operations. Since Hurricane Katrina, however, most of the hospitals in the central Mississippi area have developed their own water systems and many have independent water wells. Our 500-bed tertiary care hospital (St. Dominic's) is part of the Franciscan Missionaries of Our Lady Health System, based out of Baton Rouge, Louisiana. It's an extensive system, and our main campus in Jackson includes a well water tower. Our Jackson facility serves the entire state of Mississippi. We have a primary service area of about 500,000 patients, and our secondary service area is about 1.1 million. Our hospital has an adult-only non-trauma center and the most adult intensive care unit beds in the region; just like everybody else in healthcare right now, they stay at 100% capacity almost every day, sometimes over capacity.

Water failures have plagued us nearly annually and mainly during the winter months since the late 2000s and 2010s. Most people don't realize that Hurricane Katrina knocked out about a third of Mississippi's healthcare infrastructure overnight. As a result, we began the process of developing our own system and water tower in 2009, and in 2015, we installed our own water well that supplies 600 gallons per minute.

When the flooding triggered the water crisis in the City of Jackson, we were prepared for loss of water on our main campus because we have these redundancies in place for outages that last a few days. But a total, long-term municipal water failure was not included in our emergency action plan. The event that Jim discussed was a catastrophic failure across an entire urban city and included consequences for the healthcare systems.

Most large municipal hospitals in the city have an elevated water tank and most of them now have one or two wells. Some did not and had to truck water in at a very large expense and effort (e.g., establishing external hook ups and pumps). One hospital had to close in the middle of the water crisis, and we absorbed those patients. The biggest takeaway for us and others is that municipal water failure is a real possibility. A hospital needs to be prepared for it because the consequences it imposes on hospitals that care for extremely sick patients are dramatic. From our experience, there were many considerations we never dreamt of, and we learned many lessons.

Fortunately, after Hurricane Katrina, we invested in the Mississippi Wireless Information Network (MSWIN) to boost incident response in the state of Mississippi. MSWIN is a statewide interoperable communication platform, and they supplied additional portable radios to support interoperable communications between City, State, Federal and mutual aid teams.

--Jim Craig

From a hospital perspective, most may not consider radios as integral, but they have been. MSWIN has been the greatest invention and the greatest investment since Katrina and has saved more lives and allowed more people to do emergency work than any other thing we've done in this state. It has dramatically changed how we operate.

--Damon Darsey

"The devastation was greatest in the coastal counties of Hancock, Harrison, and Jackson, where public infrastructure (e.g., electric power, communications networks, roads, sanitation systems, and water treatment plants) was severely disrupted. Multiple hospitals, health clinics, and public health facilities were either destroyed or nonfunctioning immediately after the hurricane."

--Surveillance for Illness and Injury After Hurricane Katrina --- Three Counties, Mississippi, September 5--October 11, 2005

Lessons Learned

1. **Plan for the effects an incident like this will have on staff.** One of the things that we learned kind of by happenstance was that the vast majority of our direct employees were affected by this water outage. About 800 of our 1,300 staff lived within impacted Jackson ZIP codes.
2. **Ensure your plans include off-campus and support buildings.** The impact was dramatic for our off-campus operations, specifically those that housed our call center and daycare center.
3. **Include clinics in your plans.** Clinics in many of Jackson's most vulnerable areas that had no water pressure could not sustain operations. Non-potable water was one of our biggest challenges; not being able to flush commodes became a significant issue.
4. **Work with dialysis centers and skilled nursing facilities (SNF) to maintain patient care.** Without water, dialysis centers lack the ability to provide acute hemodialysis. Because of this, patients will present to the emergency department looking for a way to get their dialysis or enter volume overload and need more dialysis going forward. A dialysis patient is very difficult to transition out of a hospital from acute care to a non-acute care setting. It was nearly impossible to transfer those patients back into the community to get a chair at a dialysis center in the Jackson metro area. Even though dialysis centers had redundancy thanks to being able to connect to our well, they were as worried as we were that they would lose that redundancy. We also had to work with our SNFs who felt pressure to transfer several patients to the emergency department for non-emergency visits.
5. **Plan for prolonged outages.** The biggest challenge for us was non-potable water. It is easy to run power redundancies from two different circuits from two different points. It is easy to run internet and fiber from two different points, but when you deal with water, as we've learned, pressure matters system wide.
6. **Include fire suppression, supplemental water sources, and hazardous materials responses (and account for extreme outdoor temperatures) in your emergency plans.**
    a. **Sprinkler systems.** Many of our buildings are built to international code which requires sprinkler systems for fire suppression. These systems require a certain level of water pressure which could not be attained during a long-term municipal outage. Many hospitals learned that many of their buildings were older and had been grandfathered into the code; they did not have sprinklers.
    b. **Drafting water.** Drafting, where fire departments pull water from a lake, swimming pool, or portable tank is routine in rural America. Water is then pumped into the fire engine and into either the standpipes or the fire sprinkler system in your hospital. While this sounds like an easy solution, many municipal partners simply don't have this capability because they have relied on the municipal well water system. This is a challenge across the U.S. that I never thought healthcare would have to address.
    c. **Using fire trucks and National Guard tankers to supply utilities with water.** Most of our large heating and air conditioning units run on water, so we became good at understanding how to get a fire truck to pump into the water system to keep it going. It was also important to adjust for when the National Guard shows up with a water tanker designed to serve bases overseas; how do you take that water and put it inside your hospital to be able to flush the toilets or other things you need to do?

We set up a drinking water POD distribution system for our staff, using ZIP codes to determine where they lived, how much water we needed to get to them, and where we needed to station it. This method revealed that many of the city's areas that were getting water pressure later than others happened to be where a higher number of our lower-income employees lived. How do we then give that water to them? How do we estimate how much they need? How do we have a communication channel and a feedback loop to the distribution system?

We've all talked about it and trained for it forever, but when we actually used the POD plans for water distribution, we better understood our POD system, and we have learned from some of the challenges we experienced.

--Damon Darsey

d. Preventing/planning for the release of hazardous materials. Water treatment plants contain a lot of hazardous material, including chlorine and other chemicals. Planning for the accidental release of these chemicals and the effect that might have on nearby neighborhoods is critical.

7. **Incorporate temporary restroom facilities into your plan.** It is important to understand the difference between porta-johns and luxury restroom trailers, determine when they should be used, and ensure they align with your infection control processes. It is also important to reach an agreement with vendors ahead of time; portable restrooms were a hot commodity in our town for a long period of time. It is also critical to have plans for transporting wheelchair-dependent and bed bound patients (e.g., from SNFs) to temporary restroom facilities, particularly if they are not handicap accessible.
8. **Ensure internal redundancy in well operations.** During the extended operations of loss of water, the backup plan for a primary well failure (i.e., the City of Jackson) was gone and thus we began the process for seeking internal well water redundancy. Having more than one well (on a separate site) and/or backup and updated pumps is important.

In some of our larger healthcare centers, we have 15 or 20 fires a year on campus. These are mainly from microwaves, medical equipment, or plugs, and they pose a real threat. Firewalls are great, but they are designed around fire protection from sprinkler systems. In August, we put people on fire watch throughout the hospital, 24 hours a day, in areas that did not have sprinklers.

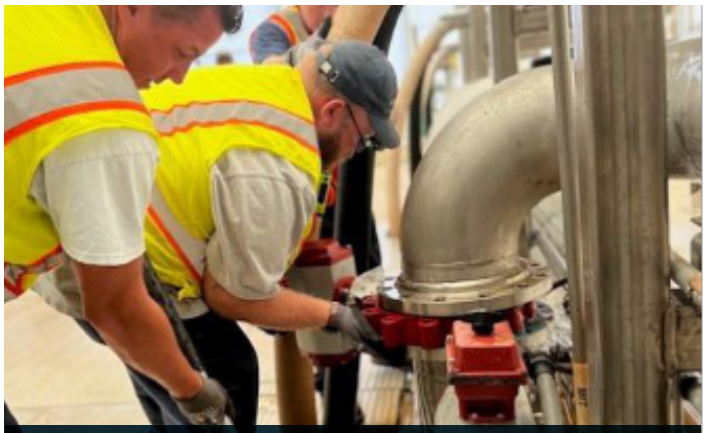
We also had to close our Level 1 helipad, since any helipad on an elevated structure must have fire suppression. When we didn't have water, helicopters had to land at the local airport, which was anywhere from 10 to 15 minutes away, negatively impacting patient care.

-- Damon Darsey

Conclusion

Damon Darsey

Looking at redundancy and future incidents, we must ask some hard questions. How do you create a resilient municipal water supply? We are incredibly lucky we had a well for water and forward-thinking staff. Most healthcare systems right now are at 100% capacity and have very little way to take on additional patients, specifically those that have chronic health conditions. How do you do that? Do you drill a well? How does that work with your health department agencies and other stakeholders? When you switch from well water back to city water, how does that affect the campus? Does it affect the dialysis machines? Does it affect the other things that are relying on the chemistry of the water? The biggest takeaway from an event like this is you must think about and plan for the unthinkable.



EMAC teams from Maryland make repairs to the membrane water treatment plant at O.B. Curtis in Jackson.

Jim Craig

This event challenged what most hospital plans throughout the state and throughout the country contemplate. You expect you may be without water for hours, maybe even a day or two. We went 7-10 days without drinking or potable water in parts of the city and needed to maintain operations at the hospitals in the city. Our hospitals are key to the survivability of folks in the state of Mississippi. They're really, really important. We are currently incorporating the lessons from this event into our hazard vulnerability assessment, plans, and exercises.

Editor's note

Having external connections (i.e., "dairy lines") to bring in water from external sources as well as a means to pump into the system to supply your floors is a key planning component, particularly if you do not have a well. Also, flooding and other changes to the raw water supply may require changes in chemical treatment. In some cases, when this has not been communicated to dialysis providers, this has caused increased hemolysis (breakdown of red blood cells) in patients. Good communication between the community water suppliers and healthcare is critical to managing changes in treatment, supply, and potability.