

## **The City of Jackson Water Crisis: A Conversation with Jim Craig and Dr. Damon Darsey**

The U.S. Department of Health and Human Services' (HHS) Office of the Administration for Strategic Preparedness and Response (ASPR) Technical Resources, Assistance Center, and Information Exchange (TRACIE) spoke with Jim Craig, a Senior Deputy at the Mississippi State Department of Health and Dr. Damon A. Darsey, an Acute Care Consultant at the Franciscan Missionaries of Our Lady Health System. In this article, they discuss the water crisis in Jackson, Mississippi, which began when heavy rains and flash flooding in August, 2022 disrupted operations at the city's water treatment plant, leading to a lack of running water for approximately 160,000 Jacksonians. Several hospitals were affected, including Dr. Darsey's facility. Mr. Craig and Dr. Darsey present on the preparedness and response efforts which sustained hospital operations during the period without running water.

Audrey Mazurek (AM)

Welcome to the ASPR TRACIE Speaker Series Healthcare System Preparedness Considerations. This collection of brief presentations highlights emerging clinical, operational, and logistical practices among healthcare facilities across the country. View the other presentations in the speaker series linked on the first slide of this presentation. In this video, we will hear from Jim Craig with the Mississippi State Department of Health and Dr. Damon Darsey with the Franciscan Missionaries of Our Lady Health System discussing their response to the city of Jackson water crisis. Jim, over to you.

Jim Craig (JC)

Thank you for the opportunity to share information today about our water crisis response in the city of Jackson. Jackson is the capital of the state of Mississippi and home to approximately 160,000 Jacksonians as of late August 2022. Torrential rains, flash flooding, and other flooding impacted the city and affected the water chemistry of the source water for one of the city's surface water treatment plants. This chemistry adjustment caused the plant to lose the ability to pump and treat water for the city.

Due to a history of leaks in their system, without steady production at the water treatment plant, pressures and overhead storage capacity were quickly reduced throughout the city. This led to a lack of sufficient pressure in some areas to sustain the flushing of toilets.

The Mississippi State Department of Health serves as the primary agency to ensure safe drinking water and is the agency which liaises with EPA. The EPA had met with the city to improve compliance with the Safe Drinking Water Act, citing in part that the surface water treatment plants lack enough Class A water plant operators and maintenance staff.

As background, the city of Jackson receives public drinking water from two surface water treatment plants and a well system. The crisis response focused on the restoration of water pressure, potable, and non-potable water for the 160,000 or so Jacksonians. The two plants are the O.B. Curtis Water Treatment Plant and the J.H. Fewell Water Treatment Plant.

O.B. Curtis is a conventional treatment plant authorized for 25 million gallons per day of water production, but it also has a second plant on the same campus. It's a membrane treatment plant, which is also authorized for 25 million gallons per day. The city of Jackson's consumption needs are about 30 million gallons per day. So optimally, if the plant is running at full, authorized capacity, it would be able to treat 50 million gallons of water per day to supply the city of Jackson. The Ross Barnett Reservoir is a

33,000-acre lake and reservoir that is the primary water source for the O.B. Curtis plant. Flooding caused rainwater to come into this reservoir, creating a chemistry imbalance, resulting in the water system losing pressure.

Also, there is an older plant, as you can see from the placard in the picture from 1914. This is the J.H. Fewell Plant that provides conventional water treatment. It's authorized for 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. In total, the city of Jackson's water treatment plants were set up to be able to generate about 70 million gallons of water per day if operating optimally. They also have some well system components, especially in areas where the city has annexed over time and those rural systems became part of the city's water treatment system as well.

At the end of August 2022, the O.B. Curtis plant failed very quickly. The tanks with overhead margin drained as well. The plant was leaking prior to this event and continued to leak as we attempted to restore pressure. The state health officer issued a public drinking water emergency at the end of August. That emergency stayed in place until midnight of 24 February of 2023, so a 180-day response.

The governor, hours later, declared a state of emergency, and that order ended on the 22nd of November, 2022. He also petitioned the president for a federal declaration; a limited Stafford Act declaration was provided to the state of Mississippi, which ended on the 28th of November.

The Health Department had 42 health department responders on this emergency. The majority were the incident command team, but also water engineers and others to assist the city with technical assistance, restoration of pressure, and maintenance of the plant.

As always in the state of Mississippi, we established a unified command and this was an Emergency Support Function (ESF) #3 response versus an ESF #8 response, which is normally what the health department and our healthcare facilities are used to. Because it was an ESF #3 response, the unified command was Hinds County, where the city of Jackson is located as well as the health department and Mississippi Emergency Management Agency, EPA, FEMA, and the U.S. Army Corps of Engineers.

This was certainly the best approach for this event and showed just how well the teams could come together and restore pressure and services back into the city.

We leveraged the Emergency Mutual Aid Compact (EMAC) to bring in resources from around the United States. We had individuals from all over the country who operate water treatment plants helping out during the response.

They provided maintenance as well as operations assistance in getting the plant back to pressure and providing clean and safe water throughout the city of Jackson. That included a lot of our friends from the Mississippi Rural Water Association, which has members throughout the state of Mississippi providing water.

I would be remiss if I didn't recognize that there was another part of this response which was huge: passing out bottled water and non-potable water throughout the city during that time period when the plant was trying to regain pressure.

Finally, we managed to restore water pressure. The precautionary boil water notice which had been issued by the state was lifted. U.S. District Judge Henry Wingate at the Health Department at the EPA's request approved an interim stipulated order on the 29th of November and appointed an interim third party manager.

Who has the full power and authority to operate, maintain, manage, and control the city of Jackson Water system? Our Emergency Order and unified command, as I said, ended on the 24th of February after 180 days. At the plant, there's now new operations and maintenance for all of the water system in the city of Jackson. It's an international company that is well known for its water and wastewater operations and maintenance. There are also dedicated teams throughout the city. Jackson is working to properly position valves and repair leaks to improve water pressure throughout the city.

With that, I am going to turn it over for the healthcare perspective from my good friend Dr. Damon Darsey.

Damon Darsey (DD)

Thanks, Jim.

I am an emergency doctor, and in reality, I never thought pre-2005 that a municipal water failure would be even on our radar screens when we consider how we operate a hospital. The hospital that we are representing today was about a 500-bed tertiary care hospital in Jackson with a referral network. It's extensive and our main campus includes a pretty nice well water tower. Most of the hospitals in the central Mississippi area since 2005 and Hurricane Katrina have developed our own water systems.

As Jim mentioned, there have been some leaking valves and water for about 10 years here in the city. As with many large cities, most of our infrastructure is older. This is true not only of Jackson, but of many of our larger cities and some of our smaller cities which have infrastructure that has been unfinished or unkept up throughout the country.

Our facility covers the population of the entire state of Mississippi. We have a primary service area of about 500,000 patients in our area. Our secondary service area is about 1.1 million. We are about a 500-bed hospital with an adult only non-trauma center. We have the most ICU beds in the region and just like everybody else in healthcare right now, they stay at 100% capacity almost every day, sometimes over capacity.

We've had this annual event of water failure mainly during the winter months since the late 2000s and 2010s. We began the process of developing our own system in 2009. The water tower installation was a direct result of lessons learned during Hurricane Katrina. Most people don't realize that Hurricane Katrina knocked out about 1/3 of our healthcare infrastructure in the state overnight. Jim and his team did an amazing job then and we have learned a lot from that event. In 2015, we installed our own water well supplying 600 gallons per minute on campus to deal with some of these annual water issues.

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. But I want to ask the viewer, have you thought about municipal water failure in your emergency action plan? Because, candidly, prior to Hurricane Katrina, we really did not, and this new event that Jim discussed was a catastrophic failure across an entire urban city, including consequences for the healthcare systems.

So when you look at your Hazard Vulnerability Analysis (HVA), what does it look like if there are changes to municipal water? We could have redundancy, but it's difficult to have redundancy in water from the municipal system, because the pressure as Jim just mentioned is all connected.

Learning how to have redundancy in water for your main campus was a big lesson learned for us. The second lesson learned for this specific event from a one- or two-day outage because of freezing temperatures and pipe ruptures in the peripheral water system. We can manage those, but the impact was dramatic for our off-campus operations. Support buildings had no water, specifically those that housed our call center and daycare center. They were not on the main campus. They happened to be in a lower area of the city, so they maintained water pressure a little longer than normal, but they lost it eventually, too.

We also had clinics that were inside the city of Jackson in many of our most vulnerable areas that had no water pressure and could not sustain operations. As I'm sure Jim will talk about, non-potable water is our biggest challenge. We can get water bottles to people, but being able to flush commodes became a significant issue.

Regarding dialysis centers, we were incredibly lucky. I heard that some of our partners up in the north part of the state and the neighboring large city, Memphis, recently had a water outage. They began to experience dialysis center changes. When dialysis centers lose water, they lack the ability to provide acute hemodialysis. Because of this, what we found in the late 2010s and again during this event was that dialysis patients were presenting to the emergency department looking for a way to get their dialysis or they were in volume overload and needed dialysis going forward.

Friends from other parts of the country have been calling, wondering about some of these national companies' redundancy plans in Mississippi. We've lived with this water redundancy challenge for a long time. The biggest challenge that we have is that we are usually one or two days without water. This was a prolonged emergency, though thankfully short thanks to Jim and his team's work.

Again, it was a prolonged outage of an entire city, and 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.

One of the largest challenges we dealt with as a city beginning a few years ago is what do we do about water in case of fire?

Many of our buildings are built to international code, which depends on the sprinkler system. There is a certain PSI required. We began to learn those numbers as our emergency medicine training went on. We needed a certain PSI at the fire pump to be able to turn it on and provide water for fire suppression throughout the system. One of the things we learned was many of our buildings were not built or were grandfathered into the code and so they didn't have sprinklers.

I am not sure about your healthcare centers, but in some of the larger ones we have 15 or 20 fires a year on campus. These are mainly from microwaves, medical equipment, or plugs, but they are a real threat. Firewalls are great, but firewalls are designed around fire protection from sprinkler systems. And one of the things we learned early in the process, which I would challenge you to consider, is drafting.

Drafting is routine and common in rural America, where fire departments must go to a lake or go to a pump tank and drop off water out of the swimming pool or a portable tank. They then pump it into the fire engine and into either the standpipes or the fire sprinkler system in your hospital. That sounds easy; however many municipal partners simply don't have those because they've relied on the municipal well water system. For so long the fire codes revolved around a robust municipal water supply. When you lose access to that, what happens in your fire suppression?

People don't realize how much of an impact this has on a hospital. This most recent event closed our Level 1 helipad. When we didn't have water, helicopters had to land at the local airport, which was anywhere from 10 to 15 minutes away. It impacted patient care for sure. Any helipad on the elevated structure must have fire suppression. Any operative areas that do not have sprinklers, we put people on fire watch all over the hospital, 24 hours a day.

We developed a fire plan revolving around the use of volunteer firefighters and water tankers to pump into our municipal department. We've got a low fire class department which is great here. They do a great job, but they simply didn't have the equipment. And if you look at all our cities across the country, you will see a similar challenge with their fire service. When you lose municipal water, what do you do? This is a question I never thought we'd be asking in healthcare.

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. If this happens in the wintertime, it would be a challenge. In this case it happened in the summertime, so there were some challenges with our external buildings off the main campus.

There's also this consideration of porta-johns and understanding difference in porta-johns and luxury restroom trailers. How does it fit into your infection control processes? What does it take to get the contract for them, when they were a hot commodity in our town for a long period of time? How do we manage that?

Finally, looking at redundancy, how do you create a resilient municipal water supply? We are incredibly lucky we had a well for water and forward-thinking staff. One of the best decisions we made a couple years ago was to hire some great physical facilities staff that have a fire service background and who understood some of this. Not only were they able to build a well that could support our main campus, but they were also able to connect that well to the adjacent dialysis center.

Most healthcare systems right now are at 100% capacity and have very little way to take on these 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? And the other thing we learned is that when we go off well water back to the 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 that Jim talked about before?

I never thought losing the municipal water pressure would have the impact that it did on a major medical center. It is not just Jackson. If you look at this along with other lessons we've learned from Katrina, they've played themselves out in other large cities.

AM

Thank you to Mr. Craig and Dr. Darsey for providing this backdrop of the water crisis in the city of Jackson. The lessons on how your community partners came together to respond to this prolonged and unprecedented water crisis can help other cities and health systems. I want to ask a few follow-up questions to both of you which may help emergency planners and healthcare professionals who are listening. Your insight can provide tangible steps to plan for water disruption in their facilities or community, even if it's at a smaller scale than what we heard about today.

Jim, I'm going to start with you, but Damon, I want you to chime in as well. As we heard, this is a very large multidisciplinary response with your federal, state, county, and city response agencies, including EMAC resources from around the country. Talk to us about whether there were incident command or communication issues. If so, what did that look like and how did you get past that?

JC

Incidents require complex communication and solutions. This was no different. The operations of bringing folks from around the country and from other state and federal agencies together, and facilitating their conversations at the plant to have the maintenance teams out doing what was necessary to get the water restored, to help find leaks, and to get some of those leaks resolved required a great deal of communication.

Fortunately, here in Mississippi, we invested after Hurricane Katrina in what's called Mississippi Wireless Information Network (MSWIN), and it is a godsend for incident response in the state of Mississippi. We called the Wireless Commission, which is an organization here in the state government. They brought out additional portable radios for the health facility to use.

MSWIN is a statewide interoperable communication platform, so all the state agencies that are part of the platform and local governments have interoperable communications. We leveraged that resource to assist in this response. Like I said, it was an important resource for all these folks coming in for a seamless and safe response.

Another consideration is that water treatment plants contain a lot of hazardous material. In the treatment of water things like chlorine are used, while the plant is in the vicinity of neighborhoods. There's a trailer park next to one of the plants, so having communications within the site is critically important for the safety of the folks around the plants as well.

AM

Alright, thank you, Jim. Damon, anything to add?

DD

No, I'd just echo the scenario again from a hospital perspective. Most people don't think about radios as integral, but they have been. I've said this in public forums before, 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. If your state is looking at an interoperable system from a healthcare perspective, please join and engage because it has dramatically changed how we operate.

AM

Thank you so much. It's a great recommendation for others to consider. In addition to incident

command assisting with the production of water and in the plants, what did the overall effort look like for distributing that potable and non-potable water? I know, Damon, you mentioned that the non-potable water piece was so critical here. Can you tell us a little bit about that?

DD

We all want to assess the things for which we have planned. For non-potable water, a great group of people here set up our pod distribution system. We set it up and said, OK, this is what we're going to do for our staff only, and this is how we're going to operate it.

One of the things that we learned kind of by happenstance was how many of our direct employees are affected by this water outage. The vast majority of them or a third of our total population of employees were affected. About 1300 staff lived within the Jackson ZIP code. We'd never thought about looking at ZIP codes where people live to manage a crisis, but it worked. We began to say, "This is how much water we need, and this is where we need to set it up." We found out that many of our areas that were getting water pressure later than others happened to be in areas where we had a higher number of our lower-income employees working. 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 used the water distribution plans, we began to understand our pod distribution system, and some of the challenges we have learned from. Two things were huge. First, knowing where your employees lived, since before it wasn't really that big of a deal, and second, utilizing plans for a situation you hope never happens. Using those systems like the pod distribution center worked well for us.

AM

Wow, that is amazing. Jim?

JC

Yeah, I'll just add that there's certain things in life that you 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 as well as your work life.

Also keep in mind that restaurants and other facilities that many people depend on were closed, and/or had the same problem once water was restored, at least having to boil water or use bottled water. Other services were interrupted such as being able to provide food services to schools. Every part of the city of Jackson was really impacted by this crisis. The larger part of the response was really passing out this potable and non-potable water.

The governor activated the Mississippi National Guard and those fine men and women once again stepped up. They do distribution and hurricanes and as you know, we're a state that has experienced quite a few hurricanes over the decades and they stepped in. The Guard went to seven big pod sites throughout the city and I think over 240,000 cars came through looking for water. The National Guard provided 13.8 million bottles of water. During this response. I can't remember how many truckloads that was, but it was hundreds of truckloads of water that came into the city that the guard distributed case by case to the folks in their cars. There were water tankers that were also there, to take a bucket of water and carry it back home so you could flush your toilet.

It required a large effort because it was very hard for folks to be able to do that. Then you had the elderly, you had people who couldn't get out to come get water, but you had to figure ways to get water to them. Between the logistics team, the National Guard, churches in the area, other civic organizations, the healthcare industry, a lot of folks stood up to help so that water could be made available for folks. It was a heroic effort by a large army of folks.

DD

I would agree with Jim. One of the challenges from a healthcare perspective was that once we had water from a secondary source, we lost our redundancy. We began to have to figure out what would be our next move. One of the things to think about from hospital perspective is to Jim's point, when you have a great National Guard that shows up with a great water tanker designed for deployed bases in Afghanistan, 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?

Second of all, remember that a lot of our nursing facilities are skilled nursing facilities (SNFs) and had no redundancy. Now you have people that are bed bound or using a wheelchair trying to figure out how to get them into a porta-john or luxury restroom trailer, or requiring a handicap accessible luxury trailer. I think Jim may correct me, but we had almost every restroom trailer in the country in Jackson. I'm a bit facetious, but we had almost all of them here. From a hospital perspective, how do you prevent transferring people from SNFs to the emergency department because you don't have water pressure? How do you provide that care and respond through our ESF #8 partners at the local level to say, "Hey, listen, you may want to go look at a certain nursing facility, because we've seen an uptick in transfers. Three of their patients came to us for what would normally not be an ER visit." It became a challenge.

The last piece I'll say on potable water is that 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 the Jackson metro area. Because of the water crisis, even though dialysis centers had redundancy, they were all as worried as we were that they would lose that redundancy.

Again, non-potable water for us was the challenge and something to think about. Jim and his team and the National Guard did amazing work. But from a hospital perspective, how do you receive the non-potable water? That was the challenge that we were planning to face—we luckily didn't have to.

AM

That's incredible. Great insights. Thank you. It sounds like there were some hospitals and healthcare facilities which are more prepared. St. Dominick's certainly seemed to be more prepared perhaps than others. What are some of those considerations? Why were some better prepared and what are some considerations for how hospitals and other healthcare facilities can get prepared?

DD

The healthcare system in Jackson has been prepared for a while because, again, this is a recurring theme for us over the last couple of years in the wintertime. And then after Hurricane Katrina, we realized quickly that we had to have a backup water system. Most large municipal hospitals in the city have an elevated water tank and most of them now have one or two wells. Some didn't, and had to truck water in at a very large expense, which was a challenge. Again, it was lessons learned by a lot of really smart



people over a long period of time with the help of our partners and a lot of federal grants. Many of the wells and towers were built on nonprofit or federal grants that have helped us to prevent the catastrophic infrastructure failure of a hospital.

There was one hospital that closed a lot of beds in the middle of the water crisis. We had to absorb those patients as well. 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.

JC

Our healthcare system in Mississippi is part of just about every emergency response that we have, and it was no different here. What's really telling about the facilities here in the Jackson area especially is they are our state level facilities for trauma care. The only Level 1 hospital for trauma is here in the capital city. They are the natural referral for much of Mississippi, so that the sickest of the sick come to Jackson. As Dr. Darsey said, making sure that the hospital has redundant systems is key for the entire state, not just for the city of Jackson. Over time, many of the hospitals have increased their preparedness in part through our hospital preparedness program and other federal grants that were made available, not just from a planning perspective, but also in terms of resources.

We have unfortunately had the opportunity to go through some of these responses, experience what can go wrong, and to learn to make things better. I think by and large here, especially in the city of Jackson, they've made significant headway planning for these types of events.

But there is never enough, right? When is enough enough in emergency planning? I guess the day we quit learning what we need to do next is the day that we need to find something else to do.

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 up to three days without water. We went 710 days without drinking or potable water and needed to maintain operations at the hospital. Our hospitals are key to the survivability of folks in the state of Mississippi. They're really, really important.

AM

Thank you. I have just one last follow-up question just to piggyback off that. Jim, I know that the water crisis is still fresh, but still going on during the worldwide pandemic. You all were dealing with a lot of other challenges as well.

What are some of the immediate steps that you're taking now for planning, for helping some of these facilities that didn't have some of these redundant systems in place? From the perspective of the state, the hospital system, and community partners, what are you doing right now and in the following weeks and months to start addressing and prioritizing some of some of the lessons learned?

JC

Great question. We're a learning organization and an organization of constant improvement. We are always working to make things better, including our responses. Like you said, it is fresh. We are still between the COVID-19 pandemic, Mpox, and the water crisis response.

We're in the process right now of beginning the after-action phase, since this ended on the 24th of February, 2023. We start that phase about the time we actually mobilize, when we begin collecting information for the after-action report. As far as formalizing the interviews and gathering the notes for the report, for this particular response, that just started.

We will be gathering information. We will also be working through our hospital preparedness program with healthcare facilities, like we always do. We'll update the HVA to include some of the lessons learned from this event. Our planners will focus on the Mississippi ESF #8 Healthcare Coalition of which all the hospitals in the state are part, as well as many other healthcare facilities. We have planners from the state that work with those organizations to facilitate about seven hundred healthcare plans a year. They review and meet with teams so that they can help refine plans. This will be on their list to review to make the next round of plans and exercises even better.

AM

Do you have anything else to add to that?

DD

The biggest takeaway is, "Think the unthinkable."

AM

Well, thank you both so much for taking the time to present on this very important topic. We know that this is an area where increased planning is very much needed. We appreciate your insights. ASPR TRACIE is going to continue this series for our stakeholders on utility and water disruptions. For our viewers listening today, please feel free to reach out to ASPR TRACIE with any questions for any of our speakers in this series. Thank you very much.