

Metro's Harrington WTP Back on Line in 30 Days

During the first few days of May 2010, Middle Tennessee experienced a flood of epic proportions. In two days, the Nashville International Airport recorded 13.57 inches of rainfall, a level that shattered the previous two-day rainfall record of 6.68 inches set in September 1979 during the aftermath of Hurricane Frederic. The Cumberland River reached nearly 12 feet above flood stage and crested at 51.9 feet before the waters began to recede. The historic Nashville flood displaced thousands of residents and flooded hundreds of businesses, resulting in extensive damage to area landmarks like the Grand Ole Opry, the Schermerhorn Symphony Center, and the Opryland Hotel. But what many Nashvillians did not realize was that while the most-recognized buildings were adversely impacted by floodwaters, so was much of the water and sewer infrastructure the populous relies on day to day. In particular, one vital cog of Nashville's utility system, the K.R. Harrington Water Treatment Plant (KRH), one of two water treatment facilities that provides safe drinking water to residents and businesses in Metro Nashville, was completely engulfed by the floodwaters.

Located on the Cumberland River near the confluence of the Stones River, the KRH water treatment facility began providing water to its customer base in 1978. The KRH facility is a conven-



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tional physical-chemical water treatment plant designed to produce 90 million gallons per day (MGD) of finished water. Water from the Cumberland River is withdrawn by four 30-MGD raw-water pumps. There are two parallel treatment trains composed of six flocculation/clarifiers and 18 mixed media filters. From the filters, the water flows by gravity into four clearwells, comprising a total of nine million gallons of storage capacity. KRH-WTP also has two 450 HP, 480V backwash pumps for cleaning the filters. Four 2500-horsepower constant-speed high service pumps pump the

finished water from the clearwells out to the distribution system.

But on Sunday, May 2, 2010, the usually calm Cumberland River, the area's water supply source, was unleashed by the "Perfect Storm," and it rapidly submerged KRH-WTP. Plant personnel implemented the emergency shutdown procedure that was originally developed in the event of a catastrophic failure of the Wolf Creek Dam, a Kentucky dam located upstream of Nashville. As part of the procedure, electrical power to the plant was shut down. Valves were of service as the Cumberland River had reached levels most residents thought they would never see in their lifetimes.

On May 4, 2010, the Tennessee Department of Environment and Conservation (TDEC) issued an emergency warning for Metro



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Nashville because the city was now completely dependent on the aging 90 MGD Omohundro Water Treatment Plant to maintain water supply to residents. Historical records show that water demand in Nashville typically begins exceeding 90 MGD in the month of May, making this action necessary. Without the KRH facility in operation, the water storage capacity fell to 37%, a dangerously low level for a public water supply system.

Mayor Karl Dean and Metro Water Services Director Scott Potter asked citizens and businesses to cut their water consumption as much as possible until the KRH-WTP was back in service. Irrigation meters as well as other non-essential water services were temporarily turned off to conserve as much water as possible. The city's water demand was also complemented by purchasing water from neighboring Utility Districts including West Wilson UD, Harpeth Valley UD and Madison Suburban UD. The conservation efforts and the help of the neighboring utility districts prevented failure of the distribution system and allowed the Omohundro facility to meet the city's domestic water demand.

To make up for the constraints of the emergency water conservation measures, water-bottle distribution points were established at six different locations throughout the city.


The Mayor and Metro Water Services (MWS) were committed to minimizing the adversity caused by the flood on the citizens of Nashville. One way to accomplish this was to get the KRH facility back into operation as soon as possible. The KRH facility had sustained significant damage to major equipment such as the electrical switchgear, electrical motor control centers, breaker panels, high service pumps, backwash water pumps, numerous electrically actuated valves, instrumentation and controls, chemical feed systems, and the clearwells. To achieve this enormous task, MWS commissioned a team of engineering and operational consultants from Gresham Smith and Partners and CH2M-Hill to assist their staff in assessing the damage and to develop a critical path schedule based on actual plant equipment inventory to quickly get the plant operational. The team tracked daily progress of the on-site Contractors, developed start up plans, and established protocols for testing of each piece of the treatment process to assure compliance with the state and federal drinking water standards.

Through this combined effort, water restrictions were officially lifted by Mayor Karl Dean on June 1, 2010, when the K.R. Harrington Water Treatment Plant began pumping water to the consumers less than 30 days after the flood. The success can be attributed to many intangible circumstances, but in the end it was the around the clock efforts of the Metro Water Service employees, contractors, engineering consultants and Metro Purchasing that made this happen.

The lessons learned from this experience are infinite but need to be shared with other utilities so hazard mitigation and disaster recovery planning for the hazards too expensive to mitigate can be responsive and effective. Some of the lessons learned that can be applied to any disaster response would include:

- Never underestimate the power and forces of Mother Nature
- Quickly engage regulatory agencies
- Err on the side of caution to mitigate risks
- Establish a communications protocol, and keep the public informed
- Have emergency procurement procedures in place
- Enforce health, safety, and compliance protocols
- Maintain a complete inventory of all plant equipment
- Develop and maintain a Critical Path Schedule throughout the recovery process
- Document progress daily
- Coordinate priorities with all on-site personnel and subcontractors
- Frequently update emergency response plan and standard operating procedures
- Perform annual condition assessment of equipment to establish a baseline to support mitigation measures

It is difficult to predict when an event of this magnitude will occur, but many of the lessons learned during the recovery of the KRH water treatment plant are based on pre-planning, documentation, training, communication, preparedness, and basic common sense. Nashville and the KRH facility will be better prepared in the future as hazard mitigation plans are being developed to solve some of the issues that lead to the flooding of certain critical components of the treatment process. **TPW**



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