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# FLOWING AGAIN AFTER FLORENCE

## Emergency response and recovery at ONWASA's Northwest Regional Water Reclamation Facility following North Carolina's costliest disaster to date

By Jimmy Holland, Project Manager, WK Dickson; and  
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CCTV revealed the advance of rising waters early the morning of September 15. As conditions deteriorated, two operators had to be evacuated by swift water rescue boat.



Floodwaters inside the plant reached more than seven feet above the 100-year flood elevation, causing extensive damage and leaving the plant completely inoperable.

"They say it could be another Hurricane Floyd," the locals started to murmur about Hurricane Florence early in the week after Labor Day in September 2018. While bread and bottled water steadily disappeared from grocery store shelves in southeastern North Carolina, others remained skeptical. Many still remembered the widespread flooding following the hurricane of 1999. The National Weather Service tagged Floyd a "500-year storm." What were the odds of such a disaster happening again in less than 20 years?

As the storm continued its slow march across the Atlantic, the forecast

became more certain and more ominous. Officials at the Onslow County Water and Sewer Authority (ONWASA), including Chief Executive Officer Jeffrey Hudson and the leadership team, enacted their emergency protocols to prepare and protect their utility assets from the coming wind and rain. Pre-storm efforts included securing additional supplies of treatment chemicals and spare parts, preparing and pre-staging damage assessment teams to help identify critical assets in need of repair after the storm, and preparing portable bulk tanks for the distribution of water in hard-hit areas. It was a drill they knew well. Located in coastal Onslow

County, the utility had seen its fair share of extreme weather events over the years. Founded in 2005, ONWASA provides water and sewer services to over 140,000 customers across a 445 square mile area with 149 facilities. Getting so many assets ready for a storm of this magnitude was no small feat.

In 2017, ONWASA hired WK Dickson to help evaluate and improve operations at the Northwest Regional Water Reclamation Facility (Northwest Plant) in Richlands. Completed in 2015, this facility is a sequencing batch reactor (SBR) biological nutrient removal wastewater treatment plant with a permitted treatment capacity of





Damaged motors line the yard in the week after the storm.

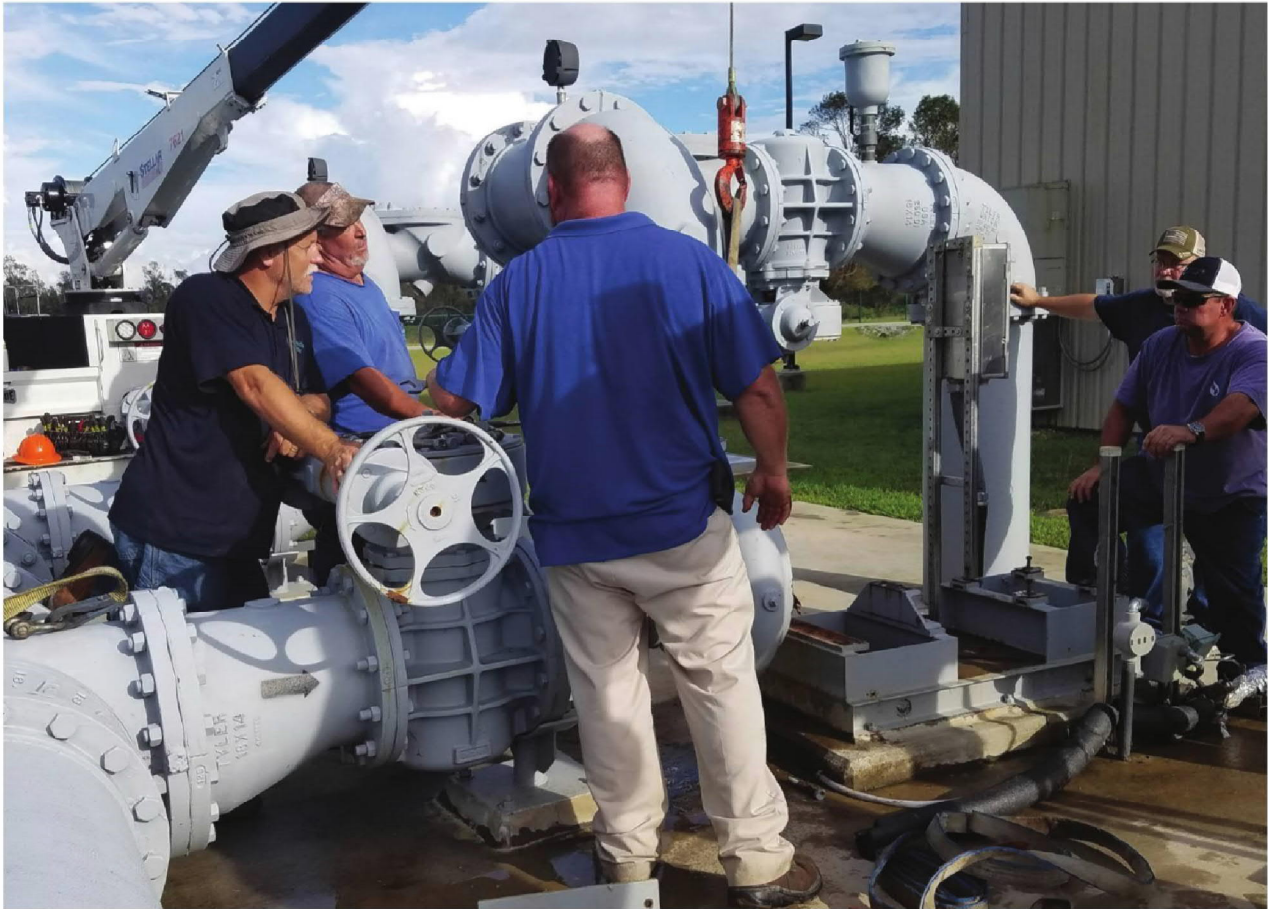
2.0 MGD and a disposal capacity of 1.0 MGD with a reclaim component. Through that project, WK Dickson's team of engineers and licensed wastewater treatment plant operators helped ONWASA streamline the plant's processes and develop a Standard Operating Procedures (SOPs) manual so it could be maintained as economically and as simply as possible. As Hurricane Florence drew ever closer, the Northwest Plant appeared to be in good position to handle a major storm event. But no one could predict the devastation to come.

**LANDFALL: SEPTEMBER 14, 2018**

Early in the morning on September 14, 2018, Hurricane Florence made landfall as a Category 1 storm in southeastern North Carolina. The worst fears of residents were confirmed as Florence took a page from Floyd's playbook. Over the next 24-hours, the storm stalled, dumping nearly 30 inches of rain over Onslow County. Closed-circuit security cameras at the plant captured the slow but steady creep of floodwaters from neighboring Cowhorn Swamp as they overtook the plant yard and swept into the buildings. As conditions continued to deteriorate Saturday, September 15, the two plant operators remaining onsite had to be evacuated by swift water rescue boat. ONWASA staff attempted to return to the site Sunday morning, but high water continued to block access to the plant. The plant remained unstaffed until the floodwaters receded, allowing staff to safely return to the site on the morning of Monday September 17.

During the storm, floodwaters reached a height of 3-4 feet in the facility's electrical distribution and control building, as well as in the filtration and disinfection process equipment building. This was more than 7 feet above the 100-year flood elevation. Although the automatic transfer switch came on and the backup generator remained operational throughout the event, electricity could not reach the equipment. Extensive damage to the pumps, motors, motor controls, and electrical equipment





Personnel from ONWASA, WK Dickson, and volunteers from the Greenville Utilities Commission activated through the NCWaterWARN program arrived and remained onsite 24-hours a day to get the plant operating again.

left the facility completely inoperable. The flooding also caused a bypass of 3.2 million gallons of partially treated wastewater into Cowhorn Swamp. Fortunately, and in large part due to the proactive measures taken by staff in the days prior to the storm, no hazardous chemicals were spilled. Because influent was able to be routed to the five-day upset ponds while the plant was offline, the public served by the plant never lost sanitary sewer service.

#### **THE AFTERMATH: ALL HANDS ON DECK**

In the week following the storm, nearly a dozen individuals including ONWASA staff, WK Dickson's contracted wastewater

operations staff, electricians, and vendors arrived and remained at the facility 24-hours a day to assess the impacts from the flooding, restart a rudimentary treatment process, and begin recovery efforts. This effort was further assisted by an assessment and repair team from Greenville Utilities Commission mobilized through the North Carolina Water and Wastewater Response Network (NCWaterWARN). NCWaterWARN is a volunteer-based network of utility systems across the state that work together to provide specialized personnel and equipment in response to emergencies that disrupt public and private drinking water and wastewater utilities through mutual aid agreements. Cots were set

up inside the Administration Building, which was the only building on site not impacted by the flooding, so that workers could catch a few hours of sleep at a time before getting back to work in the stifling, humid air that lingers behind such storms. ONWASA Central Office personnel supported these initial recovery efforts by delivering hot meals twice a day from one of the few restaurants in the area with an emergency generator, and even doing laundry for staff working at the plant.

Electricity was restored on Monday afternoon, easing some of the challenges while revealing others. Over the next several days, crews began the arduous task of pulling pumps and coordinating with contractors and equipment vendors



to determine necessary repairs and secure the needed replacement parts to bring the facility back into some semblance of operation. By the morning of Wednesday, September 19, the team was able to re-establish a rudimentary treatment process, which included one jet motive pump for the SBR, one blower for the SBR, and one post-EQ transfer pump. Prior to this, the only treatment available was chlorine for disinfection. Originally designed and built as a completely automated system, the facility's sequencing batch reactor treatment process with biological nutrient removal was relegated to an entirely manual operation. This operation included the manual transfer of wastewater from one of the SBRs being utilized as an equalization basin to the main process SBR, which was then manually operated through the various phases of the treatment process.

Rebuilding efforts continued one component at a time. Finding the necessary parts to get the plant up and running again was difficult enough – getting them to Richlands proved even more daunting. Although high water had receded from the plant site, rivers draining from far inland brought a new




A portable disk filter unit arrived 10 days after the storm and enabled tertiary filtration to be restored on a long-term basis.

surge of water to the coast that blocked and washed out highways and interstates from New Bern to Myrtle Beach. Anyone traveling to the plant had to find a new route, as rising waters made roads impassable by the minute. The first day

back on site, a local pump repair shop took some of the pumps and attempted to bake them in an oven for 4 hours to dry them out, but the drives remained inoperable, and they would not fire up. Greenville Utilities Commission staff found a vendor that was able to supply 28 replacement motors. A supplier in Atlanta was found who could provide motor drives. Aided by social media reports, employees from WK Dickson's Atlanta office picked up the drives and drove the rerouted course to reach the Northwest Plant. A vendor was able to provide a portable disk filter unit that arrived 10 days after the storm and enabled tertiary filtration to be restored on a long-term basis.

**SIX MONTHS LATER: SECURING  
RESOURCES FOR REBUILDING**

More than 6 months later, the high-water line still scars the trees throughout southeastern North Carolina, reminders of the storm that shattered Hurricane Floyd's record flooding by more than three feet. The Northwest Plant remains under manual operation and will be until October



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or November 2019. Recent modifications have allowed for the plant to be manned for only 16 hours a day, giving staff a more reasonable working schedule.

Getting the plant flowing again has not been without hiccups. As pumps and motors have been replaced, creative solutions have been needed to maintain smooth operation. WK Dickson continues to partner with ONWASA to assess the post-flood condition and operability of the plant's systems and is working with vendors to execute temporary and permanent repairs. Efforts are underway to restore the existing sequencing batch reactors and sludge digesters to full operational capacity, make modifications to the existing ultraviolet disinfection system and membrane filtration system, and rehabilitate various electrical systems, controls, and other process components.

In addition to recovery efforts, WK Dickson has also worked with ONWASA staff to develop and implement a resiliency and reliability plan to prepare for future disasters. One goal entailed establishing a procurement process to pre-select contractors who can be mobilized quickly for future recovery efforts, while ensuring compliance with state and federal contracting requirements as well as eligibility for FEMA reimbursement of associated expenses. For the Northwest Plant in particular, WK Dickson facilitated a workshop with ONWASA staff to develop resiliency goals and objectives. These were then utilized as the lens through which to evaluate several long-term mitigation improvements aimed at protecting the most critical components of the plant during future flood events. The recommended mitigation components are now being discussed with both funding and permitting agencies, as many need to be incorporated with the immediate repairs for feasibility and to reduce overall costs.

Securing the estimated \$7-8 million in funding to enable these needed repairs and mitigation/resiliency improvements to proceed as quickly as possible is also a major hurdle. Coordination between state, federal, and other agencies

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including ONWASA's insurance agency, the Federal Emergency Management Agency (FEMA), the NC Department of Public Safety (NCDPS), NC Department of Environmental Quality (NCDEQ) – Division of Water Infrastructure, the Golden LEAF Foundation, the US Economic Development Administration

(EDA), and the US Department of Agriculture (USDA) – Rural Utilities is underway to identify and maximize opportunities for reimbursement and financial aid. This is even more critical for ONWASA in this case since the Northwest Plant was only 3 years old at the time of Hurricane Florence and,

**"By including mitigation/resiliency improvements now, ONWASA is taking the extra steps necessary to prevent, as much as possible, a recurrence of this situation."**

as a result, they have existing debt service on a facility that was damaged significantly. Not to mention that their current five-year capital improvement plan of over \$74 million in needs does not account for basically rebuilding the critical components of a new treatment plant.

By including mitigation/resiliency improvements now, ONWASA is taking the extra steps necessary to prevent, as much as possible, a recurrence of this situation. Although Hurricane Florence caused unforeseen and unprecedented damage, the emergency response was led by an equally unprecedented and undaunted team. Through the concerted efforts of ONWASA staff, consultants, vendors, and neighboring utility partners, the Northwest Regional Water Reclamation Facility is finding its flow again after Hurricane Florence. Should the next 1,000-year storm happen in 2 years or 20 years, they will be ready.



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**Jimmy Holland** is a Grade 4 Biological Wastewater Operator and project manager with WK Dickson who has spent his career improving standard operating procedure, reducing costs, and increasing efficiency at wastewater treatment facilities.

**Angie Mettlen**, WK Dickson's Director of Strategic Funding and Regulatory Issues, has helped secure over \$100 million in funding for a wide-variety of infrastructure projects over the course of her 28-year career 