

An hourglass-shaped graphic with a globe inside. The top bulb is dark blue, and the bottom bulb is light blue. The globe is centered in the narrow neck of the hourglass. The top bulb has a dark blue cap. The bottom bulb has a light blue cap.

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*Hurricane-Damaged Drinking Water and Wastewater
Facilities: Impacts, Needs, and Response*

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Abstract. This report describes impacts of the storms on drinking water and wastewater treatment facilities and efforts to assess damages and needs to repair and reconstruct damaged systems. Full facility restorations in some locations may take many months, and costs of needed repairs are largely unknown.

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CRS Report for Congress

Hurricane-Damaged Drinking Water and Wastewater Facilities: Impacts, Needs, and Response

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Summary

Throughout the Gulf Coast region, high winds and water from Hurricanes Katrina and Rita in 2005 damaged a wide range of public service facilities, including drinking water supply and treatment and sewage treatment plants. Restoring those facilities is part of the overall cleanup and restoration process. This report describes impacts of the storms on drinking water and wastewater treatment facilities and efforts to assess damages and needs to repair and reconstruct damaged systems. Full facility restorations in some locations may take many months, and costs of needed repairs are largely unknown. To meet those long-term recovery needs, affected communities are likely to rely heavily on federal assistance in emergency appropriations acts, as well as traditional water infrastructure programs, principally those administered by the Environmental Protection Agency (EPA) and the U.S. Department of Agriculture. In September 2005, the Senate passed a bill intended to streamline delivery of funds through existing EPA programs to repair storm-damaged sewage treatment and drinking water plants (S. 1709). Also, legislation was introduced to provide hurricane assistance to Louisiana, including \$5 billion for water infrastructure projects (S. 1765/S. 1766, H.R. 3958). No further action occurred on any of these proposals during the 109th Congress.

Water Infrastructure Facilities Affected by the 2005 Hurricanes

Damages at many water infrastructure facilities from Hurricanes Katrina and Rita included loss of electric power to pump, process, and treat raw water supply and wastewater. Initially following the storms, some plants were able to operate temporarily on backup generators, so long as fuel was available. In addition, flooding and structural damage disabled services in a number of locations, including New Orleans. Overall, a large number of systems were affected by the two disasters. For example, within a few days after Hurricane Katrina, the Environmental Protection Agency (EPA) estimated that more than 1,220 drinking water systems (many of them very small, in terms of customers

served) and more than 200 wastewater treatment facilities in Louisiana, Mississippi, and Alabama had been affected.

As electric power was restored, many of the affected systems were able to restore needed services (especially facilities in Alabama, which was not in the center of the first storm's path). Two weeks after Hurricane Katrina, EPA reported that about 30% of the affected drinking water and 40% of the affected wastewater facilities were again operating. However, many of the inoperable drinking water and wastewater plants serve large numbers of customers. In Biloxi, for example, officials were unable to re-pressurize the drinking water system because of broken and inaccessible water mains and valves. One-third of the sewage treatment facilities in Harrison County, Mississippi (serving Biloxi, Gulfport, Long Beach, and Pass Christian) were destroyed or very severely damaged. Similarly, drinking water and sewage service for more than a million customers in New Orleans (discussed below) was severely disrupted.

EPA reported that by October 10, 2005 — following Hurricane Rita, which hit Texas and parts of Louisiana on September 24 — more than 85% of drinking water and 95% of wastewater treatment facilities in the region were operational.¹ By December, EPA reports indicated that all wastewater treatment plants in Mississippi, Alabama, and Texas were considered to be operational. In Louisiana, a small number of wastewater treatment plants were not yet operational, including three large facilities serving about 150,000 customers. Nearly all drinking water treatment plants throughout the region also had restored at least partial service, although about 5% remained under boil water advisories for bacterial contamination. After the storms, EPA staff assisted state and local officials in assessing all drinking water and wastewater plants in the region, including more than 900 facilities located in areas that were unaffected by the hurricanes.

For damaged facilities, steps involved in restoring service included drying out and cleaning engines, pumps, and lift stations; testing and repairing waterlogged electrical systems; testing for toxic chemicals and harmful bacteria that may have infiltrated pipes and plants; restoring pressure (drinking water distribution systems); activating disinfection units; restoring bacteria needed to treat wastes (sewage treatment plants); and cleaning, repairing, and flushing distribution and sewer lines.

Impacts of Hurricane Katrina on New Orleans's water and sewer system were particularly severe. In the central portion of the city, in addition to electric power, extensive damage occurred from flooding of treatment plants, drinking water distribution lines, collector and interceptor sewers, and the water system's powerplant. Even after restoration of electricity, cleanup and recovery at flooded water and sewage treatment plants is taking considerable time. The first task was to remove excess stormwater, which required extensive repair of the city's stormwater system, including levees and drainage pumps. Once floodwaters were addressed, drinking water restoration became the next priority. The largest of the city's two drinking water plants, located where the worst flooding took place, was completely underwater for nearly two weeks. It was repaired sufficiently to provide flow (i.e., for fire fighting), but may not be capable of providing

¹ For information, see EPA's website at [<http://www.epa.gov/katrina/activities.html>], including weekly activity reports provided through mid-November 2005. Periodic updated information is now available at [<http://www.epa.gov/katrina/index.html>].

potable water for some time, officials say. The issue with regard to drinking water in this area is large numbers of waterline breaks resulting from house connections that were damaged when trees fell, fire hydrants that were damaged by debris or debris cleanup efforts, and lines that were crushed or fractured by the weight of floodwaters. (An ongoing problem across the Gulf Coast region is that, as hurricane debris is cleared, fire hydrants and water meters are often torn out of the ground, causing leaks that must be repaired, sometimes more than once, forcing water lines to be shut down and flushed in order to allow the system to operate.)

For flooded areas, sewage treatment often is the last thing back on line, because plants are at the lowest point of the city, to take advantage of gravity, and thus were under the deepest water. New Orleans's two wastewater treatment plants were damaged: the larger facility, which serves 1.2 million customers, was flooded until the end of September 2005, and standing water significantly damaged pumps and electrical equipment. This plant partially restored service in October and was able to provide secondary treatment of wastes by mid-November, but numerous continuing operational problems persist even one year later, including power disruptions, leaks, and equipment difficulties. The smaller facility, located on the west bank of the Mississippi River, experienced extensive wind damage, but was judged to be fully functional three weeks after Hurricane Katrina. The city's public works officials reportedly believe that much of the sewer system had probably been damaged, and cracks, leaks, and breaks will need to be fixed by tearing up roads (although road repairs already may be required, as part of the overall cleanup effort), a potentially lengthy repair process.²

Ironically, one problem facing New Orleans and other communities is a lack of customers. Although the majority of water and sewer facilities have been able to resume operations, some are not in use, because displaced citizens have been unable to return. Some of the systems considered to be operational are serving only a small percentage of their pre-storm customers. With little or no population present for utilities to serve, there is insufficient demand for drinking water or waste flowing into wastewater treatment plants for normal operations, and utilities are unable to collect revenues needed to pay existing bills, repair or maintain their facilities, or make payments on bonds, leading to concern about possible defaults in some cases, especially by small utility systems.

Damage and Needs Assessments

Under authority of the National Response Plan,³ EPA and the U.S. Army Corps of Engineers staff have conducted assessments of water infrastructure systems, assisting state

² Much of the New Orleans water infrastructure was built more than 75 years ago. Even before the hurricane, the Sewerage and Water Board, which is responsible for providing drinking water, sewage treatment, and drainage services to more than one million customers, had a \$1 billion capital improvement program to address long-term maintenance and repair needs, including compliance with a 1998 court-ordered sewer system consent decree.

³ The National Response Plan (NRP) is the framework to coordinate emergency response activities of the federal government with those of state, local, and tribal governments and the private sector. It is organized by 15 Emergency Support Functions, such as public works and engineering, each with a designated coordinator, primary agencies, and support agencies. The text of the NRP is available at [http://www.dhs.gov/xprepresp/committees/editorial_0566.shtm].

and local government personnel to evaluate damages. Efforts continue throughout the region to determine facilities' needs for repair or rebuilding.

EPA cautions that evaluations are ongoing, and the status of some facilities is still unclear (especially small systems), even more than one year after the 2005 hurricanes. In particular, facilities determined to be operational may not be providing the required level of treatment. For example, some wastewater treatment plants in Alabama and Mississippi are operating at limited capacity or are providing only primary treatment of sewage, not full secondary or better, as required by law and to meet water quality standards. Similarly, New Orleans's wastewater treatment plants, while considered operational and in compliance with permit limits as of January, continue to face structural and other problems. Many require repair or reconstruction. Facility restorations, full or partial, are likely to take many months, and costs of needed repairs are unknown or, where available, are considered preliminary.

In September 2005, the American Water Works Association (AWWA) issued a very preliminary estimate that \$2.25 billion will be needed to repair or replace drinking water infrastructure at public water systems that were damaged by Hurricane Katrina. The estimates were presented with significant caveats, however, because of the limited information available on the extent of actual damage.⁴ The EPA Inspector General issued two reports on the status of restoring public water supplies in Louisiana and Mississippi, noting that officials estimate that about \$615 million will be needed in those two states for public water system replacements and repairs due to Hurricane Katrina.⁵

EPA and states have taken time to develop estimates of needs for reconstructing sewage treatment facilities throughout the region. As of February, Louisiana and Mississippi officials estimated that costs to repair those states' damaged wastewater infrastructure exceed \$1.3 billion, with about \$1.2 billion needed just in New Orleans.⁶ As with estimates for drinking water facilities, however, all such estimates are considered preliminary and very rough. In April, results of a study conducted by the Water Environment Federation and Black & Veatch Corp. were released. This study sought to provide a general assessment of infrastructure damage to wastewater treatment plants and collection systems in Alabama, Mississippi, and Louisiana (estimated to be \$1.2 billion), as well as an estimate of the effect on the financial stability of utilities that lost a significant portion of their rate base (another \$163 million).⁷ It noted that damages might have been worse, and costs estimates higher, but for the fact that many concrete structures withstood high winds, flooding, and storm surges better than anticipated.

⁴ American Water Works Association, "Restoring Public Water Supply Systems in the Aftermath of Hurricane Katrina: A Preliminary Cost Estimate," Sept. 23, 2005.

⁵ U.S. Environmental Protection Agency, Office of Inspector General, "Evaluation Report: EPA's and Mississippi's Efforts to Assess and Restore Public Drinking Water Supplies after Hurricane Katrina," Report No. 2006-P-00011, Feb. 14, 2006; "Evaluation Report: EPA's and Louisiana's Efforts to Assess and Restore Public Drinking Water Systems after Hurricane Katrina," Report No. 2006-P-00014, Mar. 7, 2006.

⁶ Scott Stine, U.S. EPA Region 6, and Chris Thomas, U.S. EPA Region 4, Personal communications, March 16, March 20, 2006.

⁷ Water Environment Federation, *Assessment of Reconstruction Costs and Debt Management for Wastewater Utilities Affected by Hurricane Katrina*, April 2006, 23 p.

Meeting Needs for Repair and Reconstruction

As previously noted, assessments of needed water infrastructure repairs and associated cost estimates are incomplete for now, but could be substantial for systems that were directly affected. How those communities will pay for repairs is a challenge for public officials at all levels of government. The 109th Congress considered how to assist their activities and enacted appropriations but no other specific measures.

While repairing storm-damaged facilities is the most recent funding needed by water infrastructure systems in the Gulf Coast, it is not the sole need there. Throughout the United States, wastewater and drinking water utilities face significant investment needs to meet the treatment and performance requirements of the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). According to the most recent estimates by EPA and states, the nation's public water and wastewater treatment systems need more than \$460 billion over the next 20 years to construct and upgrade facilities in order to comply with those laws and to provide safe and healthy water.⁸ The federal government is unlikely to provide 100% of that amount, and policymakers already have been debating how to meet those existing needs, which of course do not reflect additional costs to reconstruct hurricane-damaged structures.

Over the years, Congress has authorized a number of programs to assist local communities in addressing water supply, drinking water, and wastewater treatment problems. These programs generally are intended to aid communities in constructing facilities to comply with federal drinking water regulations and clean water rules in order to prevent the discharge of harmful levels of sewage wastes into surface waters. They have different types of financing mechanisms (some provide grants, others authorize loans), various administering agencies, and other differences, such as eligible community size.⁹ These programs comprise the traditional sources of federal assistance that communities use to meet their water infrastructure needs.

Congress also has authorized a number of programs that can provide *emergency* assistance to repair and restore drinking water, wastewater, and related water infrastructure systems and facilities. These include programs administered by the Federal Emergency Management Agency (FEMA), EPA, the Corps of Engineers, and the U.S. Department of Agriculture.¹⁰ Responding to the 2005 hurricane disasters, the 109th Congress provided more than \$62 billion in emergency assistance in P.L. 109-61 and P.L. 109-62. Most of this funding went to the Disaster Relief Fund, administered by FEMA. Approximately \$7.8 billion was targeted for infrastructure repair, but was not limited to

⁸ U.S. Environmental Protection Agency, *Clean Watersheds Needs Survey 2000 Report to Congress*, August 2003, EPA 832-03-001; *Drinking Water Infrastructure Needs Survey and Assessment, Third Report to Congress*, June 2005, EPA 816-R-04-001. For additional information, see CRS Report RL31116, *Water Infrastructure Needs and Investment: Review and Analysis of Key Issues*, by Claudia Copeland and Mary Tiemann.

⁹ For additional information, see CRS Report RL30478, *Federally Supported Water Supply and Wastewater Treatment Programs*.

¹⁰ For a review of federal emergency assistance programs, see CRS Report RS22248, *Federal Disaster and Emergency Assistance for Water Infrastructure Facilities and Supplies*, by Claudia Copeland, Mary Tiemann, and Nicole T. Carter.

drinking water and wastewater facilities.¹¹ Eligible work is either classified as emergency work (e.g., debris removal) or permanent work intended to restore a damaged facility to its pre-disaster design.

The affected communities are likely to rely primarily on FEMA's federal disaster grant assistance to repair and rebuild storm-damaged structures. Where emergency funds are insufficient (for example, if FEMA denies a request to pay for reconstruction beyond that needed to return to pre-disaster status), communities may turn to funding under the traditional water infrastructure aid programs, especially those administered nationally by the Department of Agriculture (loan and grant programs for water and waste disposal projects in communities of less than 10,000 persons) and by EPA. Under EPA's programs, authorized in the CWA and the SDWA, federal grants of appropriated funds are used to capitalize state revolving fund (SRF) programs. States, in turn, make loans from the SRFs to local communities for needed wastewater and drinking water projects.¹²

Other legislation was proposed in response to the 2005 hurricanes. For example, the Louisiana Katrina Reconstruction Act (S. 1765/S. 1766, H.R. 3958) sought \$1.035 billion in appropriations for EPA to provide infrastructure assistance in Louisiana, plus \$4 billion directly to the state of Louisiana for repair, reconstruction, and improvement of storm-affected wastewater and drinking water infrastructure systems. Other legislation included changes to EPA-administered funding programs, but not additional appropriations. On September 27, 2005, the Senate passed S. 1709, the Gulf Coast Emergency Water Infrastructure Assistance Act. It would have modified the revolving loan provisions of the Clean Water Act to provide favorable treatment (such as forgiveness of loan principal and extended repayment) for sewage treatment repair or rebuilding projects in Alabama, Mississippi and Louisiana. The Safe Drinking Water Act already includes similar provisions that are not restricted to emergency conditions. S. 1709 would have permitted those states to provide assistance for two years for wastewater and drinking water projects not included on a state's Intended Use Plan, since many of the systems affected by Hurricane Katrina are believed to not be included in the plans which generally are required before a project can be funded under either the CWA or SDWA. There was no further congressional action on any of these proposals during the 109th Congress.

In the immediate aftermath of Hurricane Katrina, and subsequently after Hurricane Rita, attention focused on assistance for individual victims and management of the overall response effort. In subsequent months, attention turned to long-term recovery of affected residents, housing, and essential public services. As those efforts proceed, Congress may consider other policy options and issues, including with regard to water infrastructure systems.

¹¹ U.S. Congress, Senate Budget Committee, "Informed Budgeteer, No. 5," Sept. 12, 2005.

¹² For information on public assistance for repair or replacement of disaster-damaged facilities, see [<http://www.epa.gov/katrina/waterissues/funding.html>]. On this website, see "Summary of Federal Funding for Water and Wastewater Infrastructure Damaged by Hurricanes Katrina and Rita in Louisiana," Feb. 13, 2006, and "Summary of Federal Funding for Water and Wastewater Infrastructure Damaged by Hurricane Katrina in Mississippi's Six Southern Counties," Feb. 20, 2006.