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When Hurricane Sandy barreled into the New Jersey coast five years ago today, it pushed a 12-foot storm surge from Newark Bay across the campus of the fifth largest sewage treatment plant in the country, damaging equipment and knocking out power.

As a result, some 840 million gallons of raw sewage poured untreated into the Passaic River. And during the three weeks after the storm, as the Passaic Valley Sewerage Commission's 140-acre facility struggled to get back to full service, 4.4 billion gallons of partially treated sewage were released into New York Harbor – enough to fill the Empire State Building 16 times.

Sandy's wrath showed how vulnerable New Jersey's infrastructure is to damage from severe storms.

Many key pieces of state infrastructure — from hospitals and power substations to police headquarters and even gas stations along major highways — have been improved since Sandy to withstand the onslaught from future storms.

Some town officials, especially along the Jersey coast, have been working with experts to upgrade their master plans and weigh the options to make their communities more resilient.

And the Christie administration has provided hundreds of millions of dollars in grants and low-interest loans to individual communities for storm water collection upgrades, sea walls and other projects.

For instance, at the sewerage authority, staff have rebuilt 560 motors and 171 pumps, strung 200 miles of temporary electric cables on utility poles, spent \$2 million on temporary flood walls around key structures, and completed about 95 percent of needed rebuilding.

Now, commission officials are moving forward with about \$500 million in long term projects to make the complex resilient to withstand future storms and sea level rise.

"We want this facility to be the model of resiliency in New Jersey," said Gregory Tramontozzi, the agency's executive director.

When unveiling some of those grants last year, Bob Martin, commissioner of the state Department of Environmental Protection, said the state has helped communities become more resilient "through a wide range of strategies that include construction of robust beach and dune systems, measures to protect critical water and wastewater infrastructure," and "innovative strategies to restore degraded salt marshes to absorb

storm surge.”

For example, the DEP has worked with local officials to design a proposed \$230 million federally-funded system of flood walls along the Hudson River for Hoboken and parts of Weehawken and Jersey City.

Still, some experts say that the state government, while helping communities recover from Sandy, has not yet provided them with overarching, coordinated policies to address future sea level rise in a regional way.



PSE&G's John Latka shows how high the storm surge from Sandy got at the substation in North Bergen along the Hudson River. Key equipment that had rested on the concrete pad has since been elevated far above that level to make the system more resilient in future storms. (Photo: James M. O'Neill/NorthJersey.com)

Rutgers University scientists have estimated that New Jersey will likely experience a rise of a foot to 1.8 feet by 2050, and as much as 5 feet or more by 2100.

“Overall there hasn’t been a concerted effort on the part of the state yet to address a lot of those questions,” said David Kutner, planning manager at New Jersey Future, a non-profit that advocates a balance between economic development and

environmental protection. "Climate change is still not a topic widely discussed at the state level and no path has been set, no direction has been established. There's not been a lot done to plan for the future."

Despite that, individual agencies, non-profits and municipalities have made some progress trying to plan for sea level rise and develop resiliency.

Passaic Valley Sewerage Commission

When Sandy struck, about 50 sewerage commission workers took refuge in a building at the highest elevation on the campus, which lies just 5,000 feet from Newark Bay. When they emerged after the storm, they were stunned at the devastation.

"We were completely engulfed by Sandy," said Tramontozzi.



Five years ago during Superstorm Sandy the tunnels containing electricity at the Passaic Valley Sewerage Plant in Newark were flooded leaving the plant without power. (Photo: Amy Newman/NorthJersey.com)

Pumps, motors and electrical cables were ruined, and about 200 million gallons of water filled the network of tunnels that housed key equipment.

"When I saw it I was amazed – I couldn't believe it," said John Rotolo, the facility's chief engineer. "I thought, 'How are we going to get rid of all this water?'"

The complex, which handles sewage from 1.5 million residents in 48 towns across Bergen, Passaic, Hudson and Essex counties, was knocked out of commission, and suffered \$120 million in damage.

The agency received help from the Army Corps of Engineers to pump water out of the tunnels, and operated manually for several years after Sandy until all equipment was repaired or replaced.

Now, the commission has \$500 million worth of projects planned to make the facility more resilient, taking into account how much the sea will rise over the next 60 years.

The commission plans to build a flood wall around the entire campus about 10 to 12 feet high. Since a wall would also hold rainwater in, the commission plans three pump stations and a storm water collection system.

They want to replace all the electric cables in the tunnels that had been damaged. And they want to install bulkheads in the tunnels so they can isolate any flooding.



Since the Passaic Valley Sewerage Commission plant lost electricity during Superstorm Sandy they have moved all of their electricity from underground to above ground at their Newark plant. (Photo: Amy Newman/NorthJersey.com)

Finally, they plan to build a reserve power plant on high ground.

The facility is the largest single user of electricity in New Jersey. When the treatment plant lost power during Sandy, it not only stopped treating the raw sewage coming to the plant from 48 municipalities in the area. It also couldn't treat the five or six barges and 200 to 300 truckloads of sludge that get sent to the facility each day from New York City and communities as far south as Virginia.

The Federal Emergency Management Agency will cover 90 percent of the cost of these projects.