

HOBOKEN: ADAPTING TO CLIMATE CHANGE IN ONE SQUARE MILE



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Hoboken ranks in the top 100 of National Flood Insurance Policy (NFIP) communities – all within one square mile. The federal government underwrites 9,832 insurance policies covering \$2.3 billion in assets for 60,000 people. This is approximately one of every three households. Multiple times every year, Hoboken experiences flash flooding that results in flooded streets and properties. Flood risk from both storm surge and flash flooding within Hoboken is so severe that following Hurricane Irene in 2011 and Superstorm Sandy in 2012 the community (along with utility and federal partners) invested \$700 million on flood risk reduction and climate adaptation infrastructure.



The most significant endeavor, Resist, Delay, Store, Discharge – shorthand for a \$380 million four-part water management strategy, was developed and partially funded through the Rebuild by Design Competition sponsored

by The Department of Housing and Urban Development. The strategy is inspired by the Dutch in a series of flood risk interventions that address rainfall and coastal flood risk. The strategies resist storm surge impacts (seawalls, levees, gates), delay stormwater entry into the sewer system (green roofs, downspout disconnects, rain gardens), create more storage space in the sewer system (cisterns under parks), and keep pumps running to discharge stormwater during heavy rain events against high tide (two pump stations built).

On the western side of the City, a series of parks work like sponges with green infrastructure on the surface absorbing water from rainfall events, and holding heavy rainfall in cisterns under the parks. With every new capital road project stormwater gardens are built at intersections to hold and filter rainwater (22 rain gardens constructed to date). Rebuild by Design identified 61 locations in public right-of-way for porous pavement to filter stormwater into underground cisterns. Hoboken constructed four of these locations in conjunction with the first phase of its \$33 million drinking water infrastructure improvements program. By combining stormwater infrastructure with drinking water upgrades and complete streets improvements, Hoboken employed a “one water” approach to leverage capital investment for multiple benefits. Beyond stormwater,

these green infrastructure projects benefit water quality, pedestrian safety, air quality, and public health.



The City began construction of Phase I of these investments prioritizing flooding related to rainfall. The wet weather pump stations built since 2011 have the capacity to pump over 90 million gallons of stormwater during the heaviest rainfall events. Our third wet weather pumping station is in construction now, with construction finished by the end of 2022. The pumps are complemented by our “Parks as Defense” strategy, with two resiliency parks in operation and one under construction, collectively storing up to 2.7 million gallons of water in green infrastructure or holding tanks, and removing hundreds of thousands of gallons of rainwater from flooding our city streets. While mitigating rainfall flooding, these projects also provide more than 10.5 acres of parkland in western Hoboken, ensuring every Hoboken resident lives within a 5-minute walk to a park for active and passive recreation. We are currently under design to expand one of our existing resiliency parks, and two more are planned.

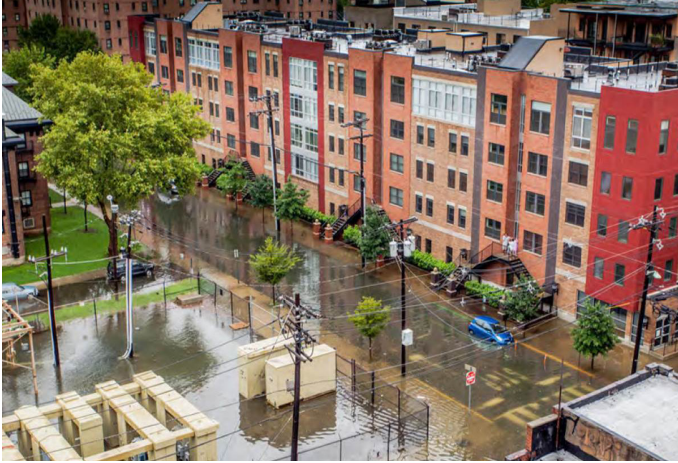


Phase II includes storm sewer modifications separating rainfall and sanitary flow, as well as implementation of an urban coastal levee. Seawalls and levees were designed to function for up to a .02% storm event, but are embedded in urban amenities that contextualize the feature to the location. These include material, lighting, signage, landscape, color, texture, and functions to integrate the flood risk reduction measure into the dense urban fabric. Construction of the entire system is expected to be complete by 2025.



During this same period of time, PSE&G invested over \$320M to floodproof the natural gas system, as well as consolidate and elevate three substations in the floodplain to two; both are no longer vulnerable to flooding.

The North Hudson Sewerage Authority estimates that Hurricane Ida dumped approximately 150 million gallons of rainwater in our mile square city over an 8 hour period. With pumps and parks operating at peak efficiency, it took us 48 hours to dewater our flooded streets.



Absent our flood risk reduction investments and substation elevations, we would have experienced rolling power outages for days due to flooded electrical substations, coupled with weeks long flooding like Hurricanes Irene and Sandy. By elevating the substations, it reduced their risk to grade level flooding, allowing us to sustain power. We were spared the worst of the storm, recording no storm-related injuries or deaths, no building failures, no substantially damaged properties. And to be fair to our impacted residents, much more is needed to address these recurrent flood events and the impacts of sea level rise on our city systems. Henri and Ida registered the two most intense and heaviest rainfalls in our recorded history, 10 days apart. The City must brace for a more relentless and intolerant climate.

Hoboken has more flood risk per capita than the City of Houston (which is 1st in NFIP policies). If insured assets are used as a proxy for risk we would have either 6x more risk per person, or 34 times more by area. What NYC might have experienced two or three times in the last few decades we experience annually. NYC is approaching adaptation with an investment of over \$20Billion – huge numbers. These two

points illustrate that our density of risk forces dramatic investments in risk management, and that these investments are keeping pace with leaders in the adaptation space.

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Even through all this investment, we have learned that we still will not ensure that our streets never flood. Policy and education have to be tools we pick up to deploy as quickly as shovels and excavators as we learn to live with the water.

To further education, we are posting permanent signs with solar lighting that simply state “this area floods” ensuring that residents and business owners understand their risk. In advance of a thunderstorm, cloudburst or tropical depression, we are looking at mobilizing semi-permanent road closed barricades to keep residents and vehicles safe. We beta tested a crowd sourced flood map so residents could report flooding in real time, giving our emergency services..... We will also issue more severe and blunt warnings. We’ll keep innovating, if the public is willing to keep listening, learning, and adapting alongside our team.