

RIPPLE EFFECTS

The State of Water Infrastructure
in New Jersey Cities and
Why it Matters



ACKNOWLEDGEMENTS

New Jersey Future is grateful to the Geraldine R. Dodge Foundation, whose support made this report possible, and to The Johnson Foundation at Wingspread for their collaboration.

Special thanks are due to the following people for their time and assistance to provide data, photographs, personal anecdotes, background information and other feedback in the preparation of this report:

Larry Bijou, David Gaber and Matthew Testa,
Bijou Properties

James Harveson, *Camden Redevelopment Agency*

Andrew Kricun, *Camden County Municipal Utilities Authority*

Thomas Chartier, *Chartier Group*

Chris Brown, Brandy Forbes and Stephen Marks,
City of Hoboken

Meishka Mitchell, *Coopers Ferry Partnership*

Manuel Delgado, *Cramer Hill Community Development Corporation*

Christopher Len and Captain Bill Sheehan,
Hackensack Riverkeeper

Zach Honoroff and Leonard Zax, *Hamilton Partnership for Paterson*

Bill Curran, Bob Foster and David Webster, *Hoboken Historical Museum*

Zabrina Stoffel, *Hoboken resident*

Erin Barnes, *iooby*

Rich Haytas and Rajiv Prakash, *Jersey City Municipal Utilities Authority*

Bob Cotter, *Jersey City Division of City Planning*

Emilio DeLia, *Jersey City resident*

Jonathan Luk, *Liberty State Park*

George McLoof, *Longstreet Development Corporation*

Jennifer Gonzalez and Niek Veraart, *Louis Berger Group, Inc.*

Darren Boch and Ilyse Goldman, *Paterson Great Falls National Historical Park*

William Wissemann, *Newport Associates Development Company*

Eddie Gonzalez, Robert Guarasci and Alan Weinberg,
New Jersey Community Development Corporation

Tim Evans, *New Jersey Future*

Maureen McCole, *NJ TRANSIT*

Fredric Pocci, *North Hudson Sewerage Authority*

Kathleen Caren, Thalya Reyes and Jason Simmons,
Passaic County Department of Planning & Economic Development

Jerry Flach, *Paterson Habitat for Humanity*

Nicholas Vancheri, *Paterson Public School No. 7*

Darlene Myers, *Paterson resident*

Michael DeFrancisci, Bridget McKenna and John Rotolo,
Passaic Valley Sewerage Commission

Jeremiah Bergstrom, Rosana Da Silva, Chris Obropta Ph.D. and Dan Van Abs Ph.D., *Rutgers, The State University of New Jersey*

Debra Italiano and Ashwani Vasishth, *Sustainable Jersey City*

Stanley Stephansen, *United State Environmental Protection Agency*

Kevin Chandler, John Dyksen, Richard Henning, John Ludington, Robert Iacullo and Chris Riat, *United Water*

In addition, we would like to thank Bob Antonicello, Frank Blesso, Barbara Lawrence, Courtenay Mercer, Mike Powell and the numerous others who took the time to provide important background information critical to the development of the case studies.

Unless otherwise noted, photos are provided courtesy of New Jersey Future.

Cover photo courtesy of the U.S. Army Corps of Engineers.

Copyright (c) 2014 New Jersey Future. All rights reserved.

RIPPLE EFFECTS



The State of Water Infrastructure
in New Jersey Cities and
Why it Matters



MAY 2014

RIPPLE EFFECTS: The State of New Jersey’s Infrastructure and Why It Matters

Table of Contents

Introduction 1

Part I: The State of Water Infrastructure in New Jersey Cities..... 2

Part II: Why Water Infrastructure Matters: Stories From Our Cities..... 11

Camden: Rising Above the Floodwaters 12

 Thinking Twice Before Going Out in the Rain 14

 “Rain Days” Stymie Camden Commuters 16

 Making a Smarter Difference, a Million Gallons at a Time 18

 Rebuilding Camden’s Infrastructure, Block by Block and Grant by Grant 20

Retrofitting Hoboken for a Watery Future 22

 When Flooding Becomes a Way of Life 24

 New Parks Provide Multiple Benefits for the Price of One 26

 Water Service Interruptions Challenge Businesses and Commuters..... 28

 Green Buildings Ease the Stress on Water and Sewer Systems 30

Growing Pains: A Burgeoning Jersey City Contends With Aging Water Infrastructure 32

 Gold Rush to the Gold Coast 34

 Making Urban Waterways an Urban Asset 36

 It Takes a Village (To Build a Rain Garden) 38

The Power of the Passaic: Paterson’s Birth and Rebirth Along the River 40

 Harnessing the Power of the Great Falls – Take Two 42

 The Minerals You Don’t Want in Your Child’s Water 44

 Greening the Streets To Give Rainwater Someplace To Go 46

About the Authors 50

INTRODUCTION

CITIES ACROSS THE country are growing, in part because of a shift in demand among young knowledge workers and aging baby boomers toward walkable downtown living. In New Jersey, this growth in cities is beginning to reverse a decades-long decline: Between 2008 and 2012, a group of 21 of the state's older cities outperformed their neighbors, attracting over a quarter of statewide population growth. Collectively, they posted a solid 2 percent growth rate for employment between 1999 and 2010, as compared to a statewide decline of 1.4 percent; the six largest boasted a 6 percent employment growth rate. These 21 cities host much of the state's airport, rail, bus and ferry infrastructure and together account for two-thirds of the state's average weekday transit boardings.

Demographers project that these urban areas will absorb one-fifth of the state's population and employment growth between now and 2040. These projections assume that infrastructure will be adequate to serve new residents and businesses. But, as documented by a Facing Our Future report,ⁱ "New Jersey has deferred investment in its utilities systems, roads and bridges, public transportation and water supply systems – and those systems have decayed." Infrastructure for drinking water, wastewater and stormwater is no exception. Most of our cities have been underinvesting in their water infrastructure systems for decades, creating vulnerabilities that were exposed further by Superstorm Sandy. Residents, businesses and investors with a choice will ultimately be deterred by sewage backups, odors and overflows, flooding and water main breaks.

Meanwhile cities like New York and Philadelphia, Lancaster and Milwaukee, are finding innovative ways to upgrade their water infrastructure that bolster economic growth, resulting in local jobs, clean waterways, new parks, trees and planted areas, resilience in the face of future storms and, over the long term, lower operating costs. Yes, the costs (in the billions dollars) of upgrading New Jersey's neglected water infrastructure can seem daunting, especially for poorer urban areas. But the combination of looming environmental mandates, pro-urban market forces, and deteriorating infrastructure demands action, ideally action that is informed by a thorough understanding of the situation.

This report explores urban water infrastructure in two ways:ⁱⁱ

Part 1: The State of Water Infrastructure in New Jersey Cities highlights key issues affecting New Jersey's urban areas and the state's 21 cities that contain combined sewer systems. The highlights were pulled from the pre-publication draft of an in-depth profile: *Water Infrastructure in New Jersey's CSO Cities: Elevating the Importance of Upgrading New Jersey's Urban Water Systems*,ⁱⁱⁱ led by Daniel J. Van Abs Ph.D., PP/AICP of Rutgers University. Readers are encouraged to view the full 150-page Van Abs report [online](#).

Part 2: Why Water Infrastructure Matters – Stories from Four Cities illustrates through real-life stories from Camden, Hoboken, Paterson and Jersey City how water infrastructure affects people directly. Some of the stories may surprise people who weren't aware of the extent of the problems, but many will inspire.



PART I

THE STATE OF WATER INFRASTRUCTURE IN NEW JERSEY CITIES

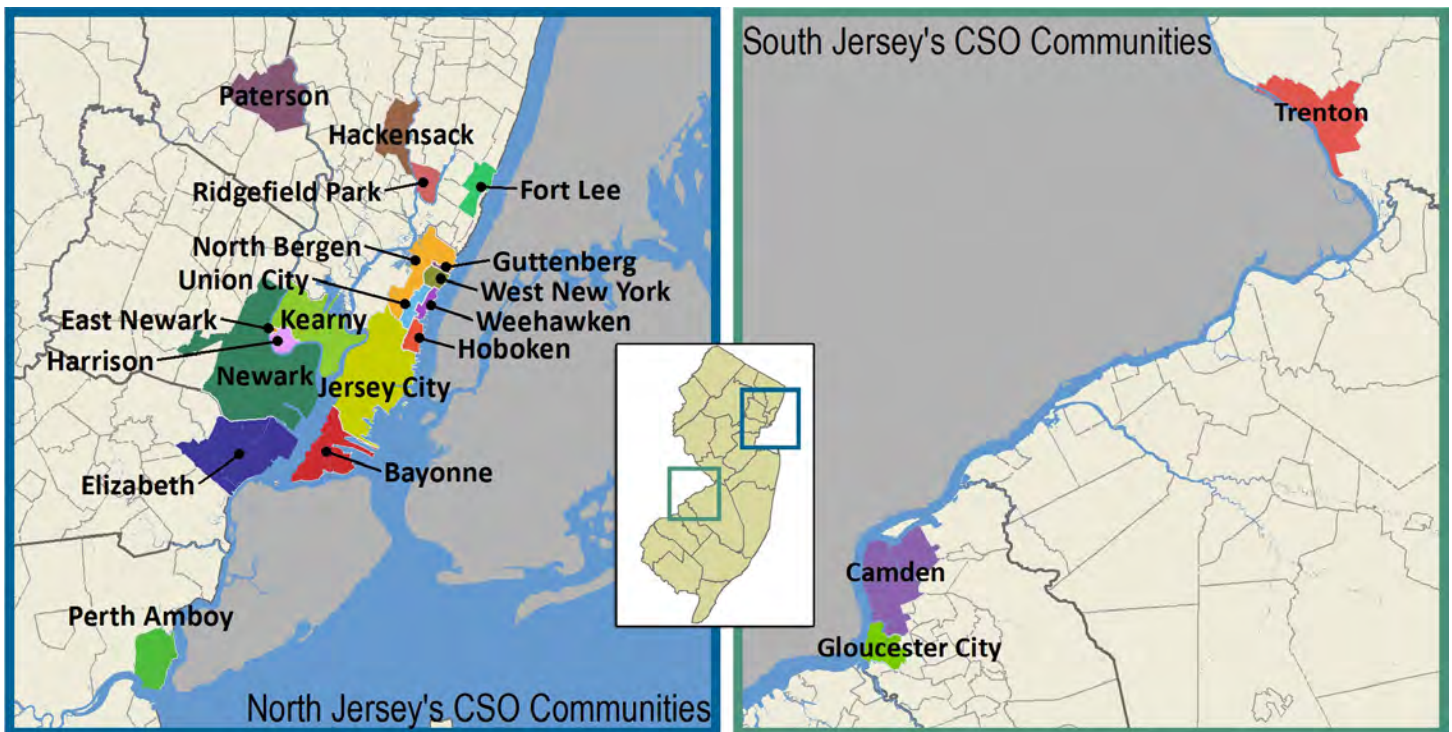
A Looming Federal Mandate for 21 Cities

All urbanized areas depend upon infrastructure to deliver clean drinking water, collect and treat wastewater and manage stormwater to avoid flooding. Many of these systems in New Jersey require major upgrades due to deferred maintenance, among other things. But the water infrastructure in 21 of New Jersey's oldest cities faces a particularly major overhaul because it includes what are known as **combined sewer systems** (CSSs), which are regulated under the federal Clean Water Act. In most rain events, these systems discharge dilute raw sewage through 217 outfalls into the New York/New Jersey harbor estuary and the Hackensack, Passaic and Delaware rivers.

Combined sewer systems were state-of-the-art solutions for the disease-ridden, flood-prone urban areas of the late 1800s and early 1900s when they were built, because they were able to remove sewage and stormwater quickly. Today, combined sewers convey sewage to a treatment plant, just as separate sewers do. However, they also carry stormwater during wet

weather events, collecting rainwater that runs off buildings and roads. When the combined volume of sewage and stormwater flows is too high for the treatment plant to handle, the system is designed, quite deliberately, to discharge them directly into nearby water bodies without treatment. Such **combined sewer overflows** (CSOs) pollute rivers and bays during rain events. CSOs threaten human health when people are exposed to sewage backups in homes, streets and waterways. They also have significant environmental impact, causing closure of beaches and shellfish beds and impairing fish and other aquatic life and their habitats, not to mention dumping plastic bottles and other litter into waterways.

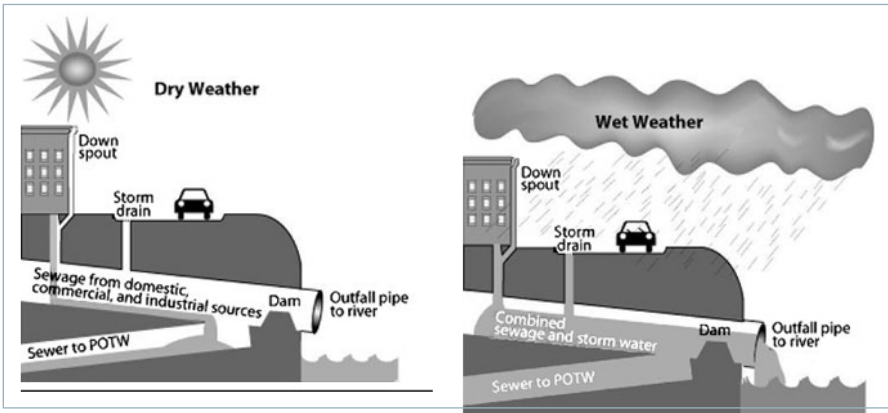
Nationwide, 859 municipalities have or have had CSOs, which, pursuant to the federal Clean Water Act, they must control to meet water quality standards. Of these communities, 775 have either upgraded their sewage systems or adopted special plans called Long Term Control Plans (LTCPs) that identify the controls and other measures necessary to meet the requirements of the federal CSO Control Program. These LTCPs are adopted



The 21 cities with CSOs have 1.5 million residents, or one-sixth of the state's population, and 530,000 employees, about one-seventh of the state's employment.

pursuant to federal or state permits or orders under which implementation can be enforced. Only 84 cities (including New Jersey's CSO cities) have yet to upgrade their CSO systems or

adopt LTCPs, though all are taking or have completed steps to collect solid and floatable materials from their discharges, as required by a New Jersey Department of Environmental Protection (NJDEP) general permit.



Combined sewer systems are designed to dump raw sewage into water bodies during rain events. Source: USEPA

But New Jersey cities are about to start catching up. In January 2014, the NJDEP finished issuing new draft individual permits for each CSO municipality that establish a tight timeframe for the adoption of Long Term Control Plans. These plans must include designs for new sewer and stormwater infrastructure that will meet Clean Water Act requirements, and must provide a schedule for funding and implementation. Once final permits are issued (expected by January 2015), the CSO cities have two to three years to develop the Long Term Control Plan and, following NJDEP approval, to begin implementation, a process that may take decades to complete. Cities that fail to meet permit requirements may face penalties or other legal action.

Ambitious CSO control plans from around the country offer helpful lessons. CSO controls are (no surprise) extremely expensive. Early CSO solutions relied primarily on traditional “gray” infrastructure like underground storage tunnels and sewer separations that reduce sewer backups and discharges, but otherwise provide little benefit. Cities have begun to add cost-effective **green infrastructure** approaches that not only reduce CSO impacts, but improve neighborhoods through the addition of green spaces, street trees and gardens, and they strengthen local economies by enhancing property values and creating local jobs. Green infrastructure approaches also allow access to new funding sources such as public park and transportation budgets and private property owners.

New Jersey's CSO Impacts by Municipality				
	Number of CSO Outfalls	Volume of CSO Discharges (MGY)	CSO Drainage Area (Acres)	Percent of land in CSO Drainage Area
Bayonne	30	930	2,002	41%
Camden City	29	683	3,900	58%
Elizabeth	28	NA	3,589	40%
Paterson	24	702	4,571	82%
Jersey City	21	NA	6,128	60%
Newark	17	2,021	NA	
Perth Amboy	16	840	1,330	40%
North Bergen SA	10	410	2,568	76%
North Hudson SA*	10	1,088	2,951	100%
Gloucester City	7	74	495	28%
Harrison	7	NA	822	
Ridgefield Park	6	64	515	42%
Kearny	5	NA	1,077	17%
Fort Lee	2	87	1,000	62%
Hackensack	2	NA	1,056	
East Newark	1	22	73	100%
Guttenberg	1	46	110	89%
Trenton	1	NA	NA	
Totals (Available Data)	217	6,968	32,187	53%

* Includes Hoboken, Union City, Weehawken and West New York.

New Jersey's CSOs discharge more than 7 billion gallons of diluted raw sewage annually, collected from a 50-square-mile area.

The Scale and Impact of New Jersey's CSOs

A review of reports prepared by New Jersey cities in the mid-2000s^{iv} as the basis for development of Long Term Control Plans provides a sense of the scale and impact of New Jersey's CSOs. Figures are lacking for a handful of municipalities, but when the available data are aggregated, they show

that New Jersey’s combined sewer systems discharge an estimated 7 billion gallons per year (from 16 cities^v) and drain from a catchment area of more than 50 square miles (in 19 cities^{vi}). The discharges go through 217 different outfalls. The reports reveal tremendous variations across municipalities. CSO drainage areas range from 17 percent to 100 percent of municipal land area, depending on the amount of land covered by separate sewer systems and/or the amount of land with no sewers at all due to open space, wetlands, etc. The number of CSO outfalls ranges from zero in Union City to one in Guttenberg, Trenton and East Newark to 30 in Bayonne. The volume of estimated CSO discharges ranges from 22 million gallons per year in East Newark to 2 billion gallons in Newark. On average, CSO drainage areas cover 53% of municipal land area.

A Complex Web of Jurisdictions for New Jersey’s CSOs

When viewed together, New Jersey’s CSO characteristics are roughly comparable to Philadelphia, which has 164 outfalls and annual discharges estimated between 10.3 and 15.8 billion gallons. But unlike the Philadelphia Water Department, which provides integrated water, wastewater and stormwater services, the water infrastructure in New Jersey’s CSO cities is located in 21 municipalities across eight counties (many of which are small; the group’s median municipal population is 60,000). Further complicating matters, this infrastructure is owned by a complex web of jurisdictions, including:

- Six municipalities that own their **water source** operations; the remaining municipalities receive their water from United Water and three regional public water agencies
- 12 municipal **water distribution** departments or utilities, one investor-owned utility (United Water) and one regional water purveyor (Passaic Valley Water Commission)
- 17 municipal departments or utilities and one regional utility that handle **sewage collection**
- Eight **wastewater treatment** utilities, seven of which serve more than one municipality.

In addition, six cities contract with an outside entity to conduct operations and maintenance (O&M) for their water distribution and/or sewage collection systems. However, there is some overlap: Eight municipalities manage both water distribution and sewer collection under one department or utility. And three small wastewater utilities own both the collection system and the wastewater treatment system.

To gain a deeper understanding of water infrastructure in CSO cities, utility managers were interviewed in six large CSO cities that account for 70 percent of all CSO outfalls (Bayonne, Camden, Elizabeth, Jersey City, Newark and Paterson).

Regional Service Areas of Wastewater Treatment Plants		
	Number of Member Municipalities with CSOs ^{viii}	Number of Other Member Municipalities
Passaic Valley Sewerage Commissioners	8	41
North Hudson Sewer Authority	4	0
Bergen County Utility Authority	3	44
Camden County Municipal Utility Authority	2	38
Joint Meeting of Essex & Union Counties	1	14
North Bergen Municipal Utility Authority	2	1
Middlesex County Utility Authority	1	34
Trenton Sewer Utility	1	0

Five of the regional wastewater treatment systems serving New Jersey’s CSO cities have large service areas that include many more municipalities with separate sewer systems. Regional coordination is possible. The Camden County Municipal Utility Authority will prepare the Long Term Control Plan for Camden City and Gloucester.

Detailed descriptions of water infrastructure in each of the six cities can be found in the Van Abs report, and selected findings are highlighted here.

Incomplete Recordkeeping for Water, Wastewater and Stormwater Infrastructure

Fixing CSO systems is just one piece of the water infrastructure puzzle. The cities not only have combined sewer and stormwater pipes, but drinking water distribution systems. They also own, or rely upon treatment plants for drinking water and wastewater. Unfortunately, little information is available regarding the state of existing water infrastructure in New Jersey municipalities, in large part because the municipalities have not fully implemented asset management planning^{vii} to track and assess their infrastructure inventory and prioritize repairs. (See chart on p. 5)

Pipeline Conditions

In interviews, utility managers raise a consistent concern: Pipelines have deteriorated to the point where their ability to handle the flow is the systems’ limiting factor, rather than

Status of Municipal Record-keeping on Water Infrastructure Pipelines

City	Pipeline Location	Pipeline Condition
Bayonne	Transferring information from paper maps to computerized inventory	Developing assessment of assets
Camden	2013 asset management report, with full inventory	Assessment done for sewers; working on water supply assets
Elizabeth	Paper maps	Known for areas with recent repairs
Jersey City	GIS database with location	Water: Known for areas with recent repairs. Sewer: Nearly complete.
Newark	Inventory on GIS, with descriptions	Assessment done for part of system.
Paterson	Transferring information from paper maps to computerized inventory system	Asset age is known. Partial information on asset materials and integrity.

Paper maps of sewer and water lines will soon be replaced with computerized asset-management inventories that describe pipeline locations and materials and treatment plant facilities. None of the six CSO cities in which utility managers were interviewed has completed a comprehensive evaluation of pipeline conditions.

the actual capacity of the drinking water and wastewater treatment plants. Combined sewers are an old technology, and the sewers themselves are in many cases over 100 years old. In many CSO municipalities, water supply lines that are a century old or more are still in use. Both water supply and sewer lines can clog, restricting flow in ways that further damage the lines. Ultimately these lines can break, causing street collapses (especially where brick sewers collapse), sewage backups into basements and streets, street flooding (especially where water mains break) and loss of service to entire blocks.

Conditions vary by municipality and there is no consistent reporting. None of the utilities or water/sewer departments publishes basic information on system performance such as the average age of pipelines, water losses from water supply distribution lines, line breaks per linear mile, or emergency repair costs. The charts on p. 6 summarize some of the key concerns about water distribution systems and combined sewer systems based on interviews with utility managers. Similar conditions are likely to be present in many of the other CSO cities.

Drinking Water and Wastewater Treatment Plants

This report addresses only two of many issues facing drinking water and wastewater treatment plants: available capacity and resiliency. The Van Abs report compares existing plant capacity to projected future demands for water and wastewater treatment. On the drinking-water side, most of the systems have adequate capacity to handle projected growth through 2040. However, capacity will be an issue for some wastewater treatment plants. One has had flows exceeding its design capacity: the North Hudson Sewerage Authority plant serving West New York. Depending on the projection

methodology used, the Middlesex County Utility Authority plant serving Perth Amboy, the Bergen County Utility Authority plant serving Fort Lee, Hackensack and Ridgefield Park, and the Joint Meeting of Essex and Union plant serving Elizabeth may also have insufficient capacity to meet demands in 2040 unless additional capacity is created.

Damage from storm surge and flooding represents a growing threat to wastewater treatment plants. These plants are historically located at low elevations where gravity can help deliver sewage flow, making them particularly susceptible to these threats. In coastal areas, sea-level rise will exacerbate this vulnerability. None of the eight wastewater treatment plants serving CSO municipalities would be within the 100-year flood areas even if sea level increases by three feet, but the Bergen County Utilities Authority facility will be in a very precarious position, with water bodies on both sides steadily encroaching onto the site. At least two facilities, the Middlesex County Utility Authority and the Passaic Valley Sewer Commission, experienced substantial damage from Superstorm Sandy, suggesting that protective measures are needed. Had sea levels been higher, the same storm would have been that much more devastating. Others may face similar issues. In addition, some CSO service areas will flood routinely at these higher sea levels, which can lead to sewage backups in addition to direct damage to neighborhoods.

These issues are particularly acute for the Passaic Valley Sewerage Commission (PVSC) plant, the nation's fifth-largest. PVSC incurred \$110 million in damages to the treatment plant from Hurricane Sandy, and needs approximately \$250 million for improved protection, such as flood walls, protection of sensitive equipment, and backup power, against both current

Capital Investment Needs for Water Distribution Systems in Select Municipalities

Camden	Some pipes need to be enlarged to provide sufficient flow to new development. Pipe cleaning and relining is ongoing. Non-revenue water, which includes water for municipal purposes, firefighting and water given to nonprofits, as well as leakage, exceeds 35%.
Jersey City	Non-revenue water of 20% or more indicates aqueduct losses. Increased demand from new users adds to flow-based stresses. Development that entails opening up streets to work on buried infrastructure leads to water main breaks due to contractor error, exposure of aging lines, etc. Clusters of breaks occur around the initial damaged areas. Total breaks are steady at roughly 100 to 150 per year. In some cases brick sewers were built around water lines, causing extensive corrosion of those lines.
Paterson	Distribution system is 100+ years old and considered in need of extensive rehabilitation or replacement. Main breaks are starting to accelerate in number and severity. PVWC is under an enforcement order to close or replace open-air reservoirs. PVWC also experiences lead levels at the tap that routinely approach or (in 2012) exceed regulatory action levels. (Note that PVWC's water treatment plant was upgraded in 2004 to state-of-the-art conditions.)

CSO cities typically have old water pipes that are increasingly vulnerable to breaks, and may need upgrades to provide sufficient water flow for new development. Other common pipe issues include water loss from leaks and leaching of contaminants like lead.

Capital Investment Needs for Sewer Collection Systems in Select Municipalities

City	Age and Condition of Pipes	Problems
Bayonne	80 to 100 years old, beyond useful life.	Sewage backs up in low areas when high tides combine with intense storms.
Camden	Built in latter half of 1800s.	Sewage backs up into homes and streets during regular storms. Flooding occurs.
Elizabeth	Built of vitrified clay and brick. Age unknown.	Infiltration (groundwater that enters pipes through cracks or leaks) is likely an issue.
Jersey City	Old. Parts of system in good shape; other parts are falling apart. City is under EPA consent decree to inspect, clean, separate, upgrade.	Sewage backs up during high tides.
Newark	Many pipes are over 100 years old. 66 miles of brick sewers.	Streets can cave in from collapsed sewers. Stormwater run-off during major storms causes flooding in low areas.
Paterson	Built between 1860s and 1920s. Many pipes are brick.	Sewage backs up infrequently during intense storms when the river is high.

Sewer pipes in combined sewer systems are typically 100 years old or older and often made of brick. In most of the large CSO cities sewage backs up under certain weather conditions. Other impacts include street cave-ins from sewer collapses, and flooding when there is too much stormwater for the system to handle.

flooding potential and future risks. These costs are in addition to the anticipated costs of improving a 30-year-old treatment facility that had a 25-year economic lifespan, and an aging interceptor line (the line that receives the sewage from trunk sewers and conveys it to the wastewater treatment plant) that was built in 1924.

Costs of Water Infrastructure Upgrades

Recent studies conducted for Newark and Camden put a big price tag on capital-investment needs for their existing drinking water and wastewater infrastructure. A 10-year strategic plan prepared for Newark estimated \$500 million in needs, about evenly split between water and sewer systems. An asset management report prepared for the City of Camden estimates a similar cost, \$400 to \$500 million, for its combined backlog of water and sewer projects. Installing CSO controls will be in addition to these expenses, though some projects may achieve dual benefits.

Upgrading water infrastructure can save money.

Water and wastewater utilities account for approximately 5.5 percent of all electricity used in the United States and can reduce their energy costs using new technologies. Here are two examples from New Jersey CSO cities:

- **Ridgewood’s wastewater treatment plant is now fueled by renewable energy using a combination of an anaerobic digester and solar installations. The system was installed at no cost to the town through a 20-year partnership with Middlesex Water Company, Natural Systems Utilities and American Refining and Biochemical.**
- **The Camden County Municipal Utilities Authority has received a \$1 million grant from Public Service Electric and Gas to use for a sewer heat recovery demonstration project that will extract heat from its sewer lines.**

The Johnson Foundation at Wingspread. *Building Resilient Utilities How Water and Electric Utilities Can Co-Create Their Futures*, Racine, Wisconsin. 2013.

Most CSO cities lack such comprehensive cost estimates for drinking water and wastewater infrastructure upgrades. However, the Long Term Control Plan reports prepared in the mid-2000s generally^{ix} include cost estimates for traditional approaches to controlling CSOs, a dominant piece of the overall water infrastructure cost puzzle. The Van Abs report highlights the cost estimates for three approaches: disinfection, off-line storage, and sewer separation.^x (Green infrastructure was not included except for Jersey City, but its potential benefits will be evaluated under the new DEP permits for CSO systems.)

Estimated costs for each approach varied tremendously across municipalities. Costs also varied across outfalls, so that a municipality might choose different solutions for different outfalls. Costs may in some cases offset one another: For example, a method like off-line storage to reduce CSO volumes would also reduce disinfection costs. Where a method would eliminate a CSO, disinfection costs would drop to zero. Finally, while sewer separation was often the most expensive approach, it might be preferable for specific areas if the existing CSO pipelines needed to be replaced anyway. It is important to note that the cost figures are total costs, not annual costs. The new NJDEP draft permits lay out a process for developing new cost estimates that must consider green-infrastructure solutions, but the estimate from the mid-2000 reports provide a sense of magnitude.

Balancing Affordability Concerns With the Need for Investment

With limited exceptions,^{xi} municipalities or their utility authorities hold the permits for their combined sewer systems, so their residents and businesses are likely to bear much of the cost of upgrading them. Although there is considerable diversity among the CSO municipalities, most are significantly poorer than the rest of the state. In fact, 36 percent of the state’s residents below the poverty line reside in CSO municipalities, even though the CSO municipalities contain only 17 percent of the state’s population overall. Only two CSO municipalities – Fort Lee and Ridgefield Park – have poverty rates that are lower than the statewide rate. Some of the cities are particularly poor: More than one-fifth of the residents of Camden, Newark, Paterson, Perth Amboy, Trenton and Union City live below the poverty line. These six cities also have median per-capita property tax bases valued at less

Water infrastructure investments grow economies.

The US Bureau of Economic Analysis estimates that for every dollar spent on water infrastructure, \$2.62 is generated in all industries in the same year, a better return than for transportation infrastructure investments.

than half that of the statewide median, indicating a limited ability to raise funds through property taxes. However, a few, such as Fort Lee and Hoboken, enjoy stronger economies.

Estimates of New Jersey CSO Total Control Costs,^{xiii} by Approach		
	Aggregate Cost for All Municipalities	Average Cost per Household
Disinfection (15 municipalities)	\$1.7 billion	\$3,978
Off-line Storage (18 municipalities)	\$4.6 billion	\$9,497
Sewer Separation (13 municipalities)	\$2.2 billion	\$7,807

The total costs to control New Jersey’s CSO problem will likely exceed \$2 billion, and must be added to the costs of needed repairs to drinking water and wastewater treatment plants and to aging pipes, as well as upgrades to serve redevelopment.

How do the estimated CSO control costs compare to residents' ability to pay? As a gauge of affordability, the EPA recommends that total annual sewer costs not exceed 1.75 percent of the household median income for the municipality or system, and that costs exceeding 2 percent be considered unaffordable. Of the six cities with the largest CSO systems, the Van Abs report shows that increased sewer rates to cover CSO control costs would still leave them at an acceptable level in three of the municipalities:^{xii} Bayonne, Elizabeth and Jersey City. But in Camden, Newark and Paterson, the CSO control costs are unlikely to be affordable. Camden in particular has extremely high financial stress: Sewer rates could only rise by \$24 and still remain below 1.75 percent of median income. Even when sewer rates do not exceed 1.75 percent of median income, households earning amounts below the median will pay a greater share of their income^{xii}, unless they live in subsidized housing that covers utility costs. Moreover, no specific information was available on whether sewer rates need to rise to cover deferred maintenance for the existing systems, but in many cases such increases will be needed. Deferred maintenance, new investment to support redevelopment, and CSO controls will all have to compete for public and political willingness to raise rates.

The disparity between water rates at investor-owned utilities and those at municipally run departments/utilities suggest

that the latter are underinvesting. The New Jersey Board of Public Utilities (BPU) has established a rate-setting system for investor-owned utilities that encourages reinvestment to offset depreciation of assets, but also discourages excessive investment or profits. Thus the larger BPU-regulated facilities provide a good point of comparison to the government owned systems that serve the CSO municipalities. The average annual household cost for drinking water in the larger BPU-regulated systems is \$424,^{xiii} but in the CSO municipalities it is only \$341.^{xiv} In this instance, the adage, "you get what you pay for" rings true. (However, as noted above, many of the cities' residents cannot afford to pay higher rates.)

Public-private partnerships offer a way to insulate politicians from rate increases. Bayonne recently entered into a public-private partnership contract with United Water and a private equity firm that locks in both annual rate increases and a \$2.5-million annual investment in capital projects for a 40-year period. The agreement has also allowed the utility authority to retire over \$100 million in debt, which improved the bond ratings of the City of Bayonne as the guarantor. While the debt service costs in such agreements are significantly higher than loans from the New Jersey Environment Infrastructure Trust, they are typically offset by reduced costs for operations and maintenance.

What makes water infrastructure "green"?

Water infrastructure typically invokes the image of a comprehensive network of pipes, pump stations and treatment plants; these items are known as "gray" infrastructure.

In contrast, "green infrastructure" techniques to manage stormwater look different. Many are literally green, like vegetated green roofs, planted strips alongside streets, street trees, and rain gardens. Others are constructed, like rain barrels, cisterns and porous pavement. But all mimic or employ natural processes to capture stormwater where it falls, enabling it to absorb into the ground or planted areas, evaporate, or be stored for reuse, instead of immediately entering the storm sewers. Stormwater management plans typically integrate both green and gray approaches depending on local conditions.



Parking lots, notorious for generating stormwater, can be "greened" with the addition of pervious pavement and vegetated swales, such as in this example from the New Jersey Department of Environmental Protection.



Newark's new waterfront park reconnects citizens with the Passaic River and provides much-needed green space in a city that is 70 percent paved. An infographic on the railing explains the combined sewer outfall located immediately below. It suggests residents can help reduce volume to the outfall by installing rain gardens and replacing pavement with plants.

Photos credit: City of Newark.

Conclusion

Our failure to invest in urban water infrastructure now will only make the price tag bigger down the road. As Daniel Van Abs states in his report, "One point is clear – with aging water infrastructure, what can go wrong will go wrong at some point, unless preemptive action is taken. Looking the other way does not make the system work any better." Ultimately a lack of action will impede economic growth in all of our cities, the very places where market forces are driving investment.

Alternatively, if we seize the day to make innovative investments in water infrastructure, all New Jerseyans can benefit from a state with healthy, first-class cities and more robust economic growth. Readers are encouraged to explore the full profile of the state's urban water infrastructure in this [report](#): *Water Infrastructure in New Jersey's CSO Cities: Elevating the Importance of Upgrading New Jersey's Urban Water Systems.*^{xvii}

Notes

- i Facing Our Future. April 2013. *Infrastructure Investments Necessary for Economic Success*. April 2013.
- ii This report does not address industrial wastewater treatment plants, but rather treatment systems that handle residential, commercial and industrial wastewater together, and in the case of combined systems also handle stormwater.
- iii Van Abs, Daniel, Alexander McClean, Ioanna Tsoulou, Yuling Gao and Tim Evans. 2014. *Water Infrastructure in New Jersey's CSO Cities: Elevating the Importance of Upgrading New Jersey's Urban Water Systems*. Rutgers-The State University of New Jersey
- iv Under the 2004 NJDEP CSO General Permits, municipalities examined and modeled their CSSs and CSOs, preparing reports on the nature, frequency and severity of CSO events during a typical rainfall year; effluent quality and loadings; and various engineering approaches for controlling the CSOs. The engineering approaches were focused on "gray" infrastructure controls.
- v Flows were not available for Elizabeth, Hackensack, Harrison, Jersey City, and Kearny.
- vi Drainage area figures were not available for Newark or Trenton.
- vii Asset management planning involves a wide range of activities, including: knowing the system (inventory); assessing the current status of the components; understanding which parts are most vulnerable and which are most critical; establishing and funding capital investment plans that keep up with system aging; employee capacity-building and retention; and tracking results against the plan.
- viii This list includes member municipalities that send combined sewer and stormwater flows to the plant for treatment. (It does not include member municipalities that only send sewage from separate sewer systems for treatment, even if they also have combined sewer and stormwater flows that are treated elsewhere.)
- ix None of these figures were found for Hackensack or Harrison. Cost figures for disinfection were not available for Gloucester, Paterson and Perth Amboy. Costs for sewer separation were not available for East Newark, Elizabeth, Jersey City, Paterson and Perth Amboy.
- x The cost estimates shown here include capital costs and, where available, operations and maintenance costs for a 20-year period, and assume that CSO events will be reduced to three per year. None of these costs should be taken as definitive, since a number of assumptions were used in the modeling process, no detailed designs were completed, and no bench or pilot project evaluations were used.
- xi These costs are not annual costs, but the total present value of capital costs and, where available 20 years' worth of operations and maintenance costs.
- xii The regional Camden County Municipal Utility Authority holds a permit for one outfall in Camden. The CSO outfalls in the PVSC service area are owned by the various municipalities but the regulators are controlled by PVSC to ensure that its interceptor line is not overloaded.
- xiii The Jersey City CSO report did not provide per-household estimates of CSO control costs, but according to the Van Abs report, it seems feasible for increased sewer rates due to CSO control costs to remain at an acceptable level based on USEPA guidelines, primarily due to the low baseline sewer rate relative to median household income.
- xiv Note that further analysis could result in either greater or lower CSO control costs; sewer rates may need to change to address needs other than CSO controls; and median income may have changed as well.
- xv This comparison is based on household water use of 60,000 gallons per year. See **Appendix C** in the Van Abs report for details.
- xvi Based on water rates in nineteen of the CSO municipalities where this information was available.
- xvii Van Abs, Daniel, Alexander McClean, Ioanna Tsoulou, Yuling Gao and Tim Evans. 2014. *Elevating the Importance of Upgrading New Jersey's Urban Water Systems: Water Infrastructure in 21 New Jersey Cities*. Rutgers-The State University of New Jersey.

PART II

WHY WATER INFRASTRUCTURE MATTERS: STORIES FROM FOUR CITIES

IN A PERFECT world, water infrastructure is “out of sight, out of mind.” It’s easy to take water systems for granted when the faucet provides clean running water, sewage disappears with a flush, and rainwater flows down the storm drain. As long as things are working as expected, elected officials have little motivation to spend money on systems that are largely buried underground, especially when faced with myriad urgent, competing demands.

But deferred maintenance, however expedient, inevitably leads to system malfunctions. What are the consequences of not maintaining or upgrading drinking water, wastewater and stormwater infrastructure? How does it affect the people and businesses in our cities? By the same token, the argument goes, investing in water infrastructure can provide tangible, visible benefits. But how? Can rebuilding water and

sewer pipes serve as a catalyst for redeveloping abandoned industrial areas? Would people take advantage of recreation opportunities on cleaned-up urban waterways? What do green buildings and green infrastructure offer residents, and are they practical?

The following section provides answers from four cities – Camden, Hoboken, Jersey City and Paterson – about why water infrastructure matters. The stories were selected to highlight issues facing New Jersey’s urban areas, rather than to describe comprehensively each city’s water infrastructure systems. We are grateful to the many citizens and officials who shared their time, their stories, and their photographs with us. Unequivocally they told us that, yes, water infrastructure matters.



CAMDEN: RISING ABOVE THE FLOODWATERS

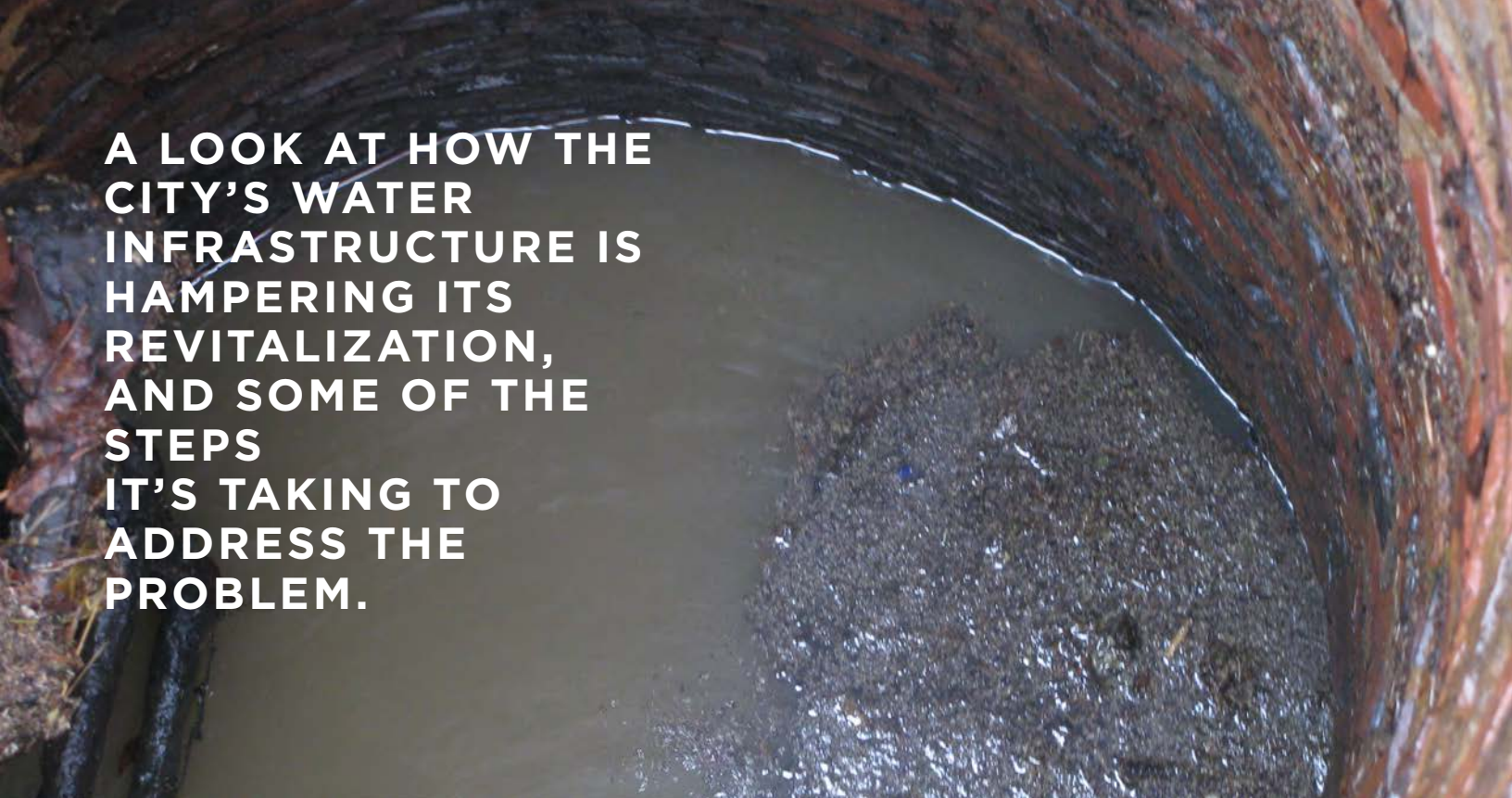


An abandoned factory once used by the RCA Corporation to make the Victrola phonograph has been redeveloped into The Victor, luxury loft apartments with ground-floor restaurants and retail.

THE CITY OF Camden, referred to by poet Walt Whitman as “a city invincible,” was once a major manufacturing and shipbuilding hub along the Delaware River. At its peak in 1950, Camden’s population stood at 125,000. Today, Camden is the 12th largest city in New Jersey at 77,000 people. The exodus of businesses and residents has strained the municipal tax base to the point where the city has difficulty providing even basic services. Neglected water and sewer systems in the city, some of which date back to the late 19th and early 20th centuries, have exacerbated the

regular problems of an old combined sewer and stormwater system. Silt and debris are accumulating in sewer lines, reducing capacity to a fraction of what it was originally and causing backups and flooding across the city. An influx of new businesses would help to generate the tax revenue necessary to maintain and upgrade these systems; however, the city faces an unfortunate catch-22 if flooding and sewer backups cause businesses to seek other locations.

Despite these challenges, the city is starting to see sparks of revitalization. The downtown waterfront has been transformed into an entertainment district, featuring a minor league ballpark, aquarium, concert venue, market-rate housing and new office buildings. Local anchor institutions Rutgers-Camden, Rowan University and the Cooper University Hospital have made tremendous efforts to revitalize the areas around their campuses. Community groups have partnered with the city to revitalize parks and neighborhoods. The former Riverfront State Prison has been demolished and neighborhood plans have outlined visions for economic revitalization and waterfront parks.



A LOOK AT HOW THE CITY'S WATER INFRASTRUCTURE IS HAMPERING ITS REVITALIZATION, AND SOME OF THE STEPS IT'S TAKING TO ADDRESS THE PROBLEM.

Brick-lined sewers from the 19th and early 20th centuries still serve the city. Photo credit: Coopers Ferry Partnership.

The following stories illustrate the ways water infrastructure affects the people and places of Camden, for both good and bad:

Thinking Twice Before Going Out in the Rain: The challenges one neighborhood faces each time it rains, and the solution community leaders are putting in place.

“Rain Days” Stymie Camden Commuters: While most in New Jersey are familiar with delays and cancellations on snow days, Camden commuters face the same issues when it rains.

Making a SMARTer Difference, a Million Gallons at a Time: How residents, businesses and government have come together to build many small green-infrastructure projects that collectively make a big difference.

“Just the Cost of Doing Business”—Rebuilding Camden’s Infrastructure, Block by Block, Grant by Grant: The steps that Camden has been taking to make development possible.

Although dysfunctional water infrastructure continues to allow flooding in Camden’s homes, streets and highways, recent upgrades go well beyond fixing underground pipes. These projects are also greening Camden’s neighborhoods with new parks and making sites shovel-ready for redevelopment.

THINKING TWICE BEFORE GOING OUT IN THE RAIN

THE CHALLENGES ONE NEIGHBORHOOD FACES EACH TIME IT RAINS, AND THE SOLUTION COMMUNITY LEADERS ARE PUTTING IN PLACE.

Meishka Mitchell, a Camden native and vice president of neighborhood initiatives with Cooper's Ferry Partnership, a non-profit redevelopment organization in Camden, gives talks across New Jersey on the state of water infrastructure in her city. Along with the photos of flooded houses, she includes a video clip² of a school bus



Manny Delgado addresses water issues in many if not most of his projects. The Cramer Hill Community Development Corporation installs rain gardens to mitigate flooding for existing residents and helps them to pump out their basements after floods.

carefully navigating its way through floodwater in the Cramer Hill neighborhood in northern Camden. After the clip has finished, she points out, "That's not just rain," alluding to the fact that flooding exacerbates problems with the city's combined sewers, which often overflow during rain events and bring raw sewage to streets, parks and neighborhoods. Her audiences grasp the gravity of this situation when they realize that students on that bus will need to walk through these waters to get home, and they will encounter a similar health hazard if they play outside afterwards.

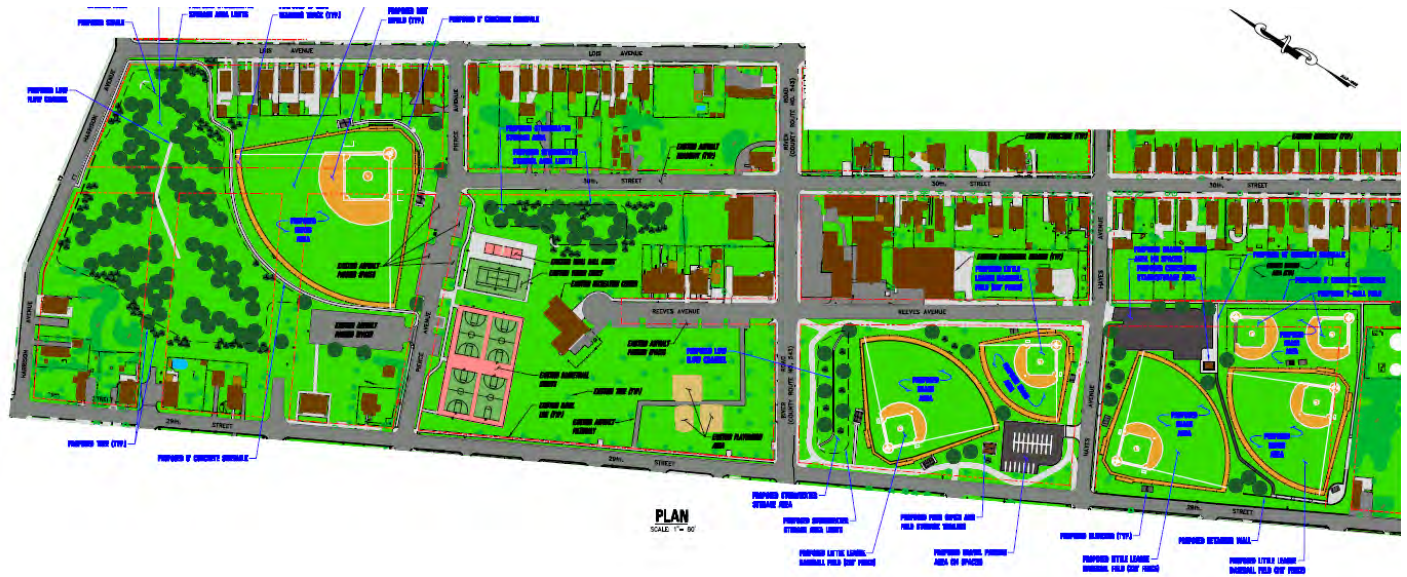
Manny Delgado echoed Meishka Mitchell's story with a phrase heard frequently when people discuss the flooding problems in Camden: "It doesn't take a lot of rain." While Manny is not a water expert by trade, he has become well versed in addressing water-related problems. As executive director of the Cramer Hill Community Development Corporation, Manny works to improve the quality of life for the residents of Cramer Hill, whether it is through the development of affordable housing, the recent development of the Salvation Army Ray and Joan Kroc Community Center, or community planning and organizing projects.

Another project takes Manny to nearby Von Neida Park, a 19-acre park with baseball fields, playgrounds, basketball courts, soccer fields, and a tennis court.

Flood "waters," the result of a combination of heavy rains, high tides and a collapsing, century-old combined sewage and stormwater system, plague the Cramer Hill neighborhood of Camden.

Photo credits: Coopers Ferry Partnership.





EXISTING SITE FEATURES	PROPOSED SITE FEATURES
2 MINOR LEAGUE FIELDS	3 MINOR LEAGUE FIELDS
2 THE BALL FIELDS	3 THE BALL FIELDS
1 SENIOR FIELD	1 SENIOR FIELD
2 PLAYGROUNDS	2 PLAYGROUNDS
4 IMPROVED TENNIS COURTS	4 IMPROVED TENNIS COURTS
1 LIGHTED TENNIS COURT	1 LIGHTED TENNIS COURT
1 HARD SURFACE PLAY AREA	1 HARD SURFACE PLAY AREA
1 HANDBALL WALL	1 HANDBALL WALL
1 BIKE PATH (0.33 MILES)	1 BIKE PATH (0.33 MILES)
1 SOCCER FIELD	1 SOCCER FIELD

**PROPOSED CONDITIONS RENDERING
VON NEDA PARK
IMPROVEMENT PROJECT 1**
CITY OF CAMDEN, CAMDEN COUNTY, NEW JERSEY
SCALE: 1"=90'
SHEET 1 OF 1
PREPARED BY:
REMINGTON & VORONIK ENGINEERS
220 HIGH STREET, SUITE 200, CAMDEN, NJ 08102
PHONE: 856.971.1111 FAX: 856.971.1112
WWW.REMINGTONVORONIK.COM

Proposed improvements to Von Neida Park include separation of underground sewage and stormwater pipes and the reopening of a buried creek, along with construction of ball fields and other facilities. The project is scheduled to begin construction in early 2014. (The reopening of Baldwin’s Run will take place to the west of the park.) Image credit: Coopers Ferry Partnership.

Over a century ago, the Baldwin’s Run creek ran through the park on its way to the Delaware River. The stagnant waters welcomed mosquitoes, prompting officials to fill in the creek, but with little understanding of how the surrounding topography caused water to drain into the area. When the pipe carrying the combined sewer and stormwater from the park and surrounding neighborhood later collapsed, untreated sewage began flooding the park and surrounding basements during heavy rainstorms. According to Manny, an inch of steady rain can cause flooding of between two and three feet in and around Von Neida Park. In one recent flood event near the park, local basements filled with between six and eight feet of water and sewage. Not only do sewage backups create a public health hazard and serious inconvenience, they are tremendously costly for homeowners who lack sump pumps and/or the resources to move their furnaces and appliances up out of harm’s way.

Municipal Utilities Authority (CCMUA) and other partners to reopen the buried creek to the west of the park and install new, separate sewer and stormwater lines using grants from the U.S. Environmental Protection Agency and the New Jersey Department of Environmental Protection Green Acres program. Restoring the natural drainage pattern of Baldwin’s Run will allow rainwater to flow out to the Delaware River and reduce the strain on the sewer system.

These problems are finally beginning to be addressed through upgrades to underground water infrastructure that will return a functioning park to its neighborhood. The Cramer Hill Community Development Corporation has teamed up with Coopers Ferry Partnership, the City of Camden, Camden County, the Camden County



This decorated utility box in Von Neida Park shows neighbors’ awareness of the need to create a healthy park.

“RAIN DAYS” STYMIE CAMDEN COMMUTERS

WHILE MOST IN NEW JERSEY ARE FAMILIAR WITH DELAYS AND CANCELLATIONS ON SNOW DAYS, CAMDEN COMMUTERS FACE THE SAME ISSUES WHEN IT RAINS.

IT'S NOT JUST the school buses that are slowed by flooding and sewage overflows. Rain events in Camden can bring transportation and commerce to a halt when aging sewer lines are unable to keep roadways clear of stormwater. U.S. Route 30, the highway that links Philadelphia, Camden and Atlantic City, follows the Cooper River through Camden. Despite a recent \$7.8-million drainage project, heavy flood events still force the closure of the road,³ causing a detour for 80,000 daily users.⁴

Adding insult to injury, high tides from the Delaware River amplify rain events, exacerbating flooding in Camden's downtown business and entertainment

Above: Heavy rain events in downtown Camden, like this one in July 2013, can bring the city to a standstill.

Photo credit: Coopers Ferry Partnership.

Left: New Jersey Transit's southernmost light rail system, the RiverLINE, connects Trenton to Camden's waterfront, as long as the tracks are not flooded. Water main breaks, rain events and other water-related events accounted for 40 percent of all RiverLINE train delays between 2011 and 2012, or 541 trips.





Floodwaters from rain events have been known to reach the top of the train platform at Camden’s Aquarium station, significantly higher than the threshold required to cancel RiverLINE service. The photo to the left shows how easily flood waters can reach the station platform, and the scale of this flooding is demonstrated by the photo to the right.

Photo credits: Coopers Ferry Partnership (left), New Jersey Future (right).

districts and leaving employers with no choice but to close or risk their employees’ being stranded. In addition, the city’s outfalls lack tidal pumps, which are needed to push the combined sewage out during a high tide.

Flood conditions also force the closure of the RiverLINE, New Jersey Transit’s light rail system in the region. Running from Trenton to Camden, the RiverLINE boasts an annual ridership of 2.8 million people, giving South Jersey access to state offices in Trenton as well as connections to New York, Atlantic City and Philadelphia. According to New Jersey Transit, in 2011 and 2012, 541 RiverLINE trips were delayed as a result of water main breaks, rain events or other water-related events, representing 40 percent of all RiverLINE train delays. When floodwaters rise above “curb height,” according to RiverLINE Superintendent Maureen McCole, New Jersey Transit suspends light rail service along the final 1.5-mile section to prevent damage to railcars that could cost hundreds of thousands of dollars.

This final stretch of the RiverLINE includes three stops that serve major destinations like the Rutgers-Camden campus; private offices such as L3 Communications and Susquehanna Bank; entertainment venues including the aquarium, baseball stadium and performing arts center; and nearby residential buildings that house RiverLINE commuters. NJ Transit can address some RiverLINE service closures with buses, but only when floodwaters still permit.

In the past year, heavier rain events have also begun to affect the Walter Rand Transit Center, the city’s downtown transit hub that offers connections among the RiverLINE, local buses, and the PATCO transit line to Philadelphia. Eventually, this station will also serve as the northernmost terminus for the proposed Glassboro-Camden light rail line. Downtown flooding threatens the functionality of the entire regional transit network.



MAKING A SMARTER DIFFERENCE, A MILLION GALLONS AT A TIME

“**W**HEN WE FIRST went into the community, it was tough to get anyone to take us seriously,” Dr. Chris Obropta of Rutgers University explains about the challenges his team faced when they decided to work in Camden. “They were used to classes of students coming in to the neighborhood for a semester-long project that would ‘fix Camden,’ only to leave once the semester was over and the grades were in.” Only after he was able to explain that Rutgers University’s Water Resources Extension Program staff would be there for the long term, and also had the money and resources to bring projects to fruition, was he taken seriously.

Dr. Obropta’s team has been working in Camden as a member of the Camden SMART (Stormwater Management And Resource Training) Team, alongside Camden County Municipal Utilities Authority (CCMUA), the City of Camden, New Jersey Department of Environmental Protection, Coopers Ferry Partnership,

HOW RESIDENTS, BUSINESSES AND GOVERNMENT HAVE COME TOGETHER TO BUILD MANY SMALL GREEN INFRASTRUCTURE PROJECTS THAT COLLECTIVELY MAKE A BIG DIFFERENCE.

and the New Jersey Tree Foundation. Camden SMART works to reduce flood events in at-risk neighborhoods through the utilization of rain gardens, rain barrels, street trees and other green infrastructure projects. Residents in affected neighborhoods play a major role in building these projects, learning about stormwater problems and solutions at the same time.

One of these projects is located in Camden’s flood-prone Waterfront South neighborhood, an area that was once an industrial hub for the city, but today is full of scrapyards and contaminated sites. To address concerns about both flooding and contamination, the Camden SMART team remediated a contaminated site that was

Above: City residents construct rain barrels with help from Rutgers Cooperative Extension’s Water Resources Program staff. Photo credit: Shahid Rana, Coopers Ferry Partnership.



Mayor Dana Redd speaks to the second annual Camden SMART Forum in January 2014, explaining that, along with schools and safety, addressing the overall environmental quality of life in Camden is critical to making the city a place in which people will want to work, live, play and invest.

Photo credit: Coopers Ferry Partnership.



Camden SMART transformed a former contaminated gas station site (top) in the Waterfront South neighborhood into a pedestrian-accessible rain garden (above) that now absorbs 470,000 gallons of stormwater annually. Sites like this feature low-cost infrastructure projects that educate and involve the community while reducing flooding and beautifying the neighborhood.

Photo credits: Frank McLaughlin (top), and Rutgers Water Resources Program (bottom).

previously used as a gas station and contained 12 underground storage tanks and over 1,800 tons of contaminated soil. Working with the community, the team transformed the site into a publicly accessible community park with a series of rain gardens that capture 470,000 gallons of stormwater annually – water that would otherwise enter the sewer system and contribute to sewer overflow events.

In the two years since the SMART Initiative began, 992 trees have been planted, 27 green-infrastructure projects have been installed, and 120 rain barrels have been distributed, allowing the city to capture and infiltrate 3.1 million gallons of stormwater each year. While this number is impressive, it represents a fraction of the 56 million gallons of stormwater and wastewater treated daily by the CCMUA. Members of the SMART Initiative recognize that their green-infrastructure initiatives will not replace the need to upgrade the city’s combined wastewater and stormwater system. But these projects eliminate many of the floods from smaller rainstorms at the same time that they beautify neighborhoods, improve air quality and create recreational space. And, by working with the community on these hands-on projects, the SMART Initiative strengthens its advocacy network to address the bigger problems plaguing the water system.

To tackle these larger problems, the CCMUA has recently received \$5.5 million from the New Jersey Environmental Infrastructure Trust to separate seven of the worst combined sewers in the city, remove 5.5 acres of pavement in the Waterfront South neighborhood, and create additional rain gardens and improvements to Von Neida Park. CCMUA is also working with surrounding suburban municipalities, whose sewage and stormwater systems are already separated, to reduce their infiltration and inflow⁵ into the county system, in order to make more room for Camden’s combined sewage during rain events. These projects will help to take the strain off of the existing system, while also making necessary repairs and improving quality of life in Camden.



Andy Kricun, CCMUA’s executive director, heads the organization responsible for treating wastewater from the City of Camden and neighboring municipalities.

CCMUA plays a leadership role in promoting green-infrastructure projects in Camden that capture stormwater where it falls – before it hits the combined storm and sewer pipes.

The less water that makes its way into the system, the less sewage CCMUA must treat, and the fewer backups, floods, and overflows Camden must endure.

Photo credit: CCMUA.



Crews replace a water main in Camden's downtown waterfront area, as part of Coopers Ferry Partnership's work to create the infrastructure necessary to spur economic development in Camden.

Photo credit: Coopers Ferry Partnership.

REBUILDING CAMDEN'S INFRASTRUCTURE, BLOCK BY BLOCK, GRANT BY GRANT

THE STEPS THAT CAMDEN HAS BEEN TAKING TO MAKE REDEVELOPMENT POSSIBLE.

FOR THE COOPERS Ferry Partnership to attract redevelopment projects in Camden, replacing and separating deteriorating water, sewer and stormwater pipes is “part of the cost of doing business.” Coopers Ferry works with the city and other local partners to make key sites viable for redevelopment by securing the funding necessary to upgrade the water, wastewater and stormwater pipes and adjacent roads. (Technically, the city requires private developers to upgrade infrastructure; however, the cost of doing so can mean the difference between attracting a business to Camden and watching it locate elsewhere.) While the process is slow and piecemeal, each of these retrofits adds stronger pipes and additional capacity to the entire system, reducing the chances of future overflows.

When the planned closure of the Riverfront State Prison was announced in 2007 and the building was demolished two years later, Camden was given an opportunity to continue the progress made in reinventing its waterfront. In 2008, a local community group, Save Our Waterfront, along with Coopers Ferry Partnership, the City of Camden and other stakeholders, developed



As part of the community visioning plan for the former Riverfront State Prison site, Coopers Poynt would be a mixed-use development with recreational amenities and green infrastructure. Image credit: Coopers Ferry Partnership.

a vision plan for the prison site that included a mix of residential and retail development, recreational amenities, green infrastructure and reconstructed wetlands.

In advance of its potential redevelopment, Coopers Ferry Partnership continues to work with the North Camden community to refine the vision for reuse of the site. In February 2014 the Camden City Council adopted the redevelopment plan for the area, the *North Camden Waterfront Study Area Redevelopment Plan*. Since the site is owned by the state of New Jersey, the next step in the process will be for the New Jersey Economic Development Authority to issue a request for proposals for its redevelopment. New Jersey’s Department of Transportation has partnered with Coopers Ferry Partnership in the past to replace and separate sewage lines as part of new road construction. Plans for road construction and sewer separations are currently being developed for the prison site, and once these plans are completed, Coopers Ferry Partnership will pursue state and federal transportation enhancement funding for the construction phase, adding modern infrastructure to yet another waterfront parcel.

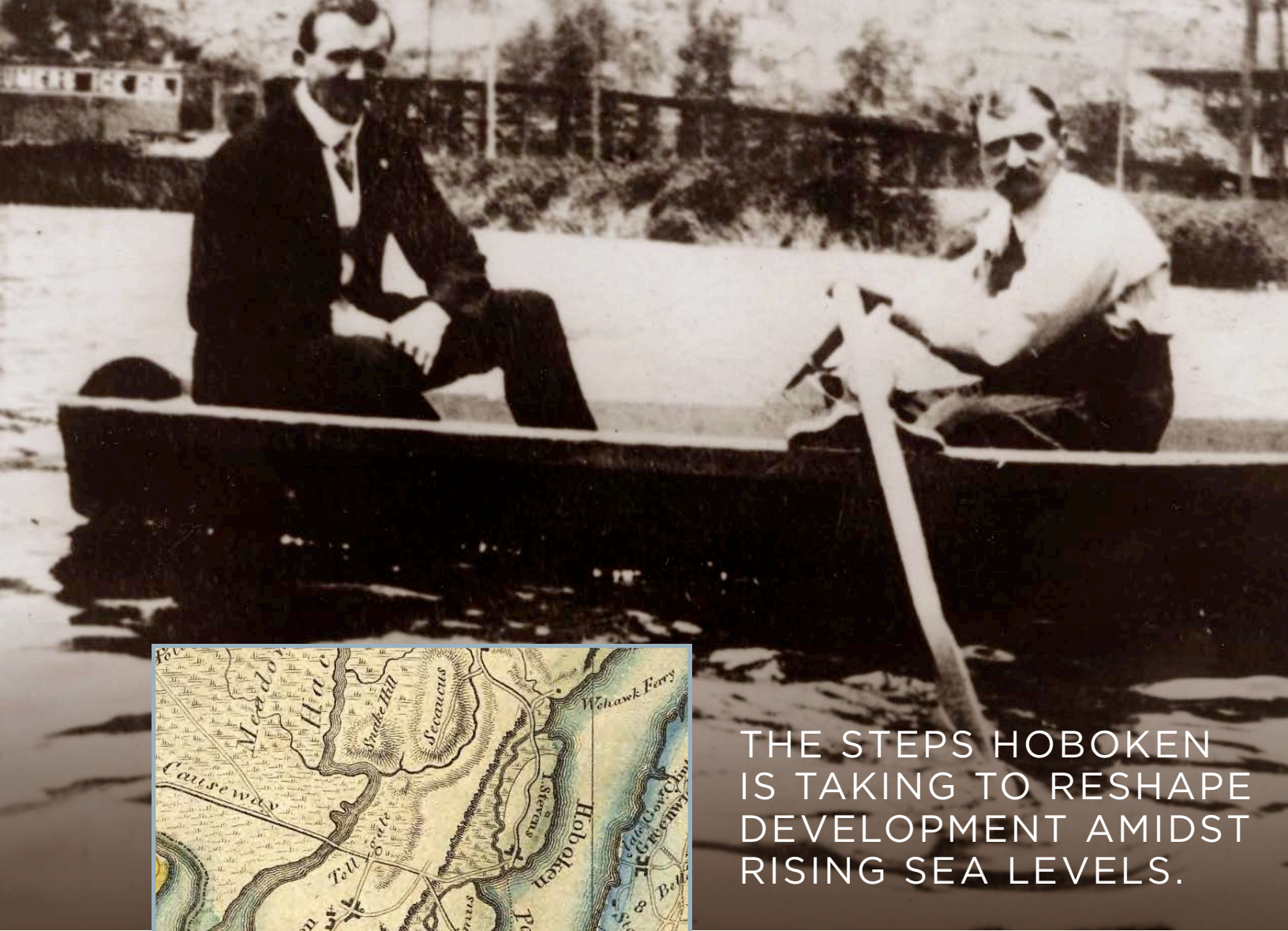


Adjacent to the Ben Franklin Bridge and Camden’s downtown business district, this vacant lot was once the site of Riverfront State Prison and is now the subject of multiple development proposals.



Meishka Mitchell of Coopers Ferry explains that replacing water infrastructure is “just the cost of doing business,” a necessity to attract private investment and revitalize Camden’s neighborhoods and downtown.

Photo credit: Coopers Ferry Partnership.



THE STEPS HOBOKEN IS TAKING TO RESHAPE DEVELOPMENT AMIDST RISING SEA LEVELS.

Flooding in Hoboken is not a recent phenomenon. In this picture from 1920, two men row through the city during a major flood. Photo credit: Hoboken Historical Museum.



In this 1811 map of the Hudson County area, early Hoboken is surrounded by marshlands. Image credit: David Rumsey Collection.

THE CITY OF Hoboken has come a long way since its early days as an island outcrop atop a tidal marsh along the Hudson River. By the end of the 19th century, and after many cubic yards of fill, Hoboken transformed itself into an industrial center and a major transportation hub for people and goods. In recent decades, after a decline in industry, the city has enjoyed a second transformation, this time from a blue-collar, industrial port town to a posh residential outpost of New York City and nearby employment centers in New Jersey. Hoboken remains well connected to New York by extensive passenger ferry, commuter rail, light rail service and bus. Population and employment surged in the 2000s and “the mile square city” today is densely occupied with 52,034 residents and 17,707 jobs.

RETROFITTING HOBOKEN FOR A WATERY FUTURE

In addition to short commutes to New York City and Jersey City, Hoboken's appeal draws from its reputation as what Walk Score⁶ calls a "walker's paradise," where the average resident can reach 21 restaurants, bars and coffee shops within a five-minute walk of his or her home. However, there are some challenges to this dynamic location; much of the present-day city is built atop reclaimed tidal marshes and two-thirds lies within FEMA flood hazard zones. Flooding from Superstorm Sandy forced many residents from their homes, but floods from regular rainstorms are also common: In the year following Sandy, Hoboken experienced four flash floods.⁷ This vulnerability will be exacerbated further by rising sea levels.

While Hoboken's water infrastructure is not the primary cause of the flooding, it makes things worse every time there is a full moon, high tide or a big rainstorm, and sometimes in between. Major upgrades and redesigns to water infrastructure are currently under way. The following stories illustrate the many ways water affects those living and working in Hoboken:

When Flooding Becomes a Way of Life: How businesses, residents and the city are responding to frequent flood events.

New Parks Provide Multiple Benefits for the Price of One: How a parking lot is being transformed to absorb rainwater, provide green space and make neighborhoods more livable.



Water Service Interruptions Challenge Businesses

and Commuters: What happens when a growing city has a drinking water system that in part predates the presidency of Abraham Lincoln?

Green Buildings Ease the Stress on Water and Sewer

Systems: How one successful developer has found a sweet spot in meeting the market demand for sustainability.

The combined threat of rising sea levels and an aging water system has the potential to diminish quality of life in Hoboken. However, the public and private sectors are responding with creative solutions that should enable the city to live, and thrive, with water.

WHEN FLOODING BECOMES A WAY OF LIFE

HOW BUSINESSES, RESIDENTS AND THE CITY ARE RESPONDING TO FREQUENT FLOOD EVENTS.

“**W**E NEVER KNEW about the extent of those floods until we started to move our office into the basement,” recalls Tom Chartier about Hurricane Irene. “Only then did we see what happens with the sewers when the water has nowhere to go.” As head of the local Hoboken Quality of Life Coalition, Tom comes into contact with many people and stories. When Hurricane Irene hit, Tom had just begun the process of framing out his basement. Following the storm and the cleanup, he was able to finish the renovation. A year later, the flooding from Sandy forced Tom to rehabilitate his basement a

second time. But he was in a better situation than many of his neighbors. Tom made sure that his utilities were located above the basement. And, as a builder, he was able to make repairs and adjustments necessary to mitigate future floods, including installing a backflow preventer to prevent sewage backups and performing the regular maintenance needed to keep it operating at full capacity.

Flooding, as it turns out, exposes many quirks of the city’s water system. One family sustained only minor flooding during Sandy, taking 24 inches of water into its storage basement. But a few weeks after the floodwaters subsided, the same family suddenly found its basement filled with 27 inches of sewage. After \$50,000 in damages (and understandable frustration), workers discovered that the sewage backup was not the result of the public sewage collection system that runs under the streets, but rather a clog between a shared residential line that links two or more houses before entering the public system, likely installed prior to the advent of modern construction codes. To add insult to injury, according to this resident, on certain days when you’re outside, “you can smell the sewage.”

As Hoboken’s housing market has heated up and placed living space at a premium, many ground-level spaces that are in fact partly below grade have been converted



Hoboken’s topography lends itself to flooding. To the left, the New Jersey Palisades serve as a barrier along Hoboken’s western border, and the Hudson River waterfront is higher than the southwestern area of the city (circled), so water tends to pool there.

Image adapted by New Jersey Future from the New Jersey Office of Information Technology (NJGIT), Office of Geographic Information Systems (OGIS).



Like those of many of his neighbors, Tom Chartier’s basement was hit hard by Hurricane Irene and Superstorm Sandy. While in Tom’s case Hurricane Irene flooded an unfinished basement in the process of renovation (as seen in the picture), the subsequent repairs and renovations were almost completely washed away by Sandy. Photo credit: Tom Chartier.

into dwelling units. These “garden-level” apartments have the propensity to flood not just during a hurricane or superstorm, but also during a heavy rain or after a water main break. Repairs and rehabilitation can be costly, and insurance coverage is limited in basement spaces. It’s no surprise that floods have started to change how people use their buildings, creating an incentive to limit basement and ground-floor spaces to uses such as storage, parking, minimally appointed lobbies, common areas and community rooms, that can withstand floodwaters without major damage.

The city is coordinating with government partners on a multi-pronged strategy to address these problems. City officials are contemplating amending the city’s zoning and

building ordinances to make it easier for property owners to add a story on top of a building and then vacate the building’s basement. The regional sewerage authority is installing flood pumps to relieve stormwater management issues in flood-prone areas. Federally-funded Sandy rebuilding efforts include a design competition, *Rebuild By Design*,⁸ that has proposed an ambitious four-part plan for Hoboken to “Resist, Delay, Store, and Discharge” water. As part of a cooperative effort between NJ Transit and the regional planning effort Together North Jersey, Hoboken has also developed a green-infrastructure strategic plan⁹ that, through the addition of more green space and permeable surfaces, will enable the city to capture more stormwater where it falls, before it flows into the city’s sewer system.

NEW PARKS PROVIDE MULTIPLE BENEFITS FOR THE PRICE OF ONE

HOW A PARKING LOT IS BEING TRANSFORMED TO ABSORB RAINWATER, PROVIDE GREEN SPACE AND MAKE NEIGHBORHOODS MORE LIVABLE.



Southwest Park will be the city's first new park designed both to provide green space and to help mitigate flooding. According to the city's green-infrastructure strategy, such investments can capture 31.4 million gallons of stormwater per year.

TODAY, THE ONLY thing green about the parking lot on Jackson Street is a vinyl banner attached to the barbed wire fence announcing that the one-acre site will soon become the cornerstone of a planned six-acre park, designed to provide green space and mitigate flooding by absorbing a 10-year storm event, in one of the most flood-prone areas of Hoboken.

Local parent Zabrina Stoffel has been following this project with interest, attending the city's community workshops to provide input on the park design. She is one of Hoboken's many newcomers, a group that includes Millennials, families and Baby Boomers who have chosen to make the city their home. Zabrina wants what is best for her children and is unwilling to settle for lower standards simply because the city is old. She has been a vocal advocate for parks and open space that will not only provide recreational opportunities for her kids, but also reduce flooding. Like many of their neighbors in the wake of Superstorm Sandy, the Stoffels have experienced firsthand the problems associated with Hoboken's aging water infrastructure.

Zabrina's desire for a park that provides recreational green space and mitigates flooding were echoed by other participants at the first community workshop the City of Hoboken conducted, in December 2013. When asked to comment on pictures of potential park features, stakeholders expressed clear preferences for a green park, effective stormwater management, play areas and safe access. "It's interesting to me, people were not just talking about needing a playground for their kids, but instead were focused on buffers and water retention projects," says Zabrina, who also founded Project Play five years ago as part of an effort to replace old and dangerous playground equipment throughout Hoboken.



The city acquired this one-acre parking lot to turn into the first section of Southwest Park, which, when completed, will expand to six acres.

Participants in the park workshop were asked to post comments on an “inspiration board” about how they felt towards different amenities. The stormwater solution was well liked, while the athletic space received the comment “NO —impervious cover.”

Photo credits: City of Hoboken.



Zabrina does not believe that green infrastructure and recreation space must be mutually exclusive; she wants to make sure that recreation space can fit into any plans that the city has for green infrastructure.

To garner further input from residents, the city has posted for comment on its website four potential designs for the park --“Wetlands Woodlands Park,” “Playfield Park,” “Neighborhood Park” and “Market Plaza.”¹⁰

While the final design for Southwest Park has yet to be selected, residents’ interest in flood mitigation matches the city’s plan to use the park as part of a larger effort to reduce the amount of rainwater entering the combined stormwater/wastewater system. The city’s Green

Infrastructure Strategic Plan evaluates the capacity of three potential parks, including Southwest Park, as well as several other techniques, to capture, store or treat a total of 31.4 million gallons of stormwater annually. According to City Assistant Business Administrator, Stephen Marks, “Green infrastructure is not a silver bullet, but it is part of a comprehensive solution.”

Construction of Southwest Park could begin as early as 2015.

WATER SERVICE INTERRUPTIONS CHALLENGE BUSINESSES AND COMMUTERS

WHAT HAPPENS WHEN A GROWING CITY HAS A DRINKING WATER SYSTEM THAT IN PART PREDATES THE PRESIDENCY OF ABRAHAM LINCOLN?

DISRUPTIONS TO THE water system create headaches for anyone who has been detoured because of a water main break, advised to boil water before using it or has taken a shower with less-than-full water pressure. But for those whose bottom line depends upon reliable water service, these service interruptions are more than just a headache. “Water is the main ingredient for everything,” says one Hoboken restaurateur. “Without it, we can’t open. It is necessary for us to make ice, cook food, serve fountain beverages and wash dishes.”

He represents just one of 278 restaurants, bars and coffee shops that Walk Score lists as being located in Hoboken, meaning that a water service interruption to his restaurant is also likely to force the closure of others nearby. In some cases, the location and severity of a water main break may be enough to prevent customers or employees from even reaching a restaurant.

Interruption of water service is also a major concern for the fire department. Hoboken is one of the most densely populated cities in the United States. Most of its building stock dates from the early 20th century through World War II and doesn’t include the most up-to-date fire suppression systems available, making them more dependent on the city’s ability to respond effectively to a fire.

Like the drinking water pipes in many New Jersey cities, Hoboken’s are old, and the records of the specific age, or condition, of all the pipes in the 41-mile system are incomplete. But United Water, which operates and



When crews repair water mains in Hoboken they record the manufacture date imprinted on the pipe and add that to their database. In addition to 1897, the dates 1857 and 1869 have been recorded. Photo credit: United Water.

maintains the system under contract to the city, updates its database whenever repairs uncover pipes with dates stamped on them. As part of the 2011 Hoboken Southwest Redevelopment Study, consultants noted that some of the pipes in that area date from 1857, 1869 and 1897, meaning that they could be anywhere from 117 to 157 years old.

Ironically, Hoboken’s revitalization has contributed to at least some of its recent water main breaks. A tangled maze of aging underground utilities, of which water is only one component, combined with the recent construction boom, has led to incidents where



Water main breaks force the closure of roads both during (top) and after (left) the event. The stresses on a water main from a service interruption and restoration are enough to trigger additional breaks along the line.

Photo credits: United Water.

contractors have inadvertently ruptured water main lines. These “strikes,” as they are called, cause a ripple effect on the surrounding system. Pipes that were already stressed as a result of their advanced age and deteriorating condition are pushed even further when the water is shut off to fix the affected line; the pressure changes resulting from the service interruption can be enough to cause additional main breaks.

It is not surprising, then, that since 2000 Hoboken has experienced an average of 20 water main breaks per year, according to United Water, the city’s water distributor. In 2013, the number reached 30, or 0.73 breaks per mile, up from an average of 0.49 breaks per mile per year. Representatives from United Water suggest this spike was the result of back-to-back main strikes in April and May that triggered a series of related breaks.

United Water views pipe age as the largest contributing factor to water main breaks in Hoboken. Under its current contract with the city, United Water invests \$350,000 per year in general maintenance, including annual cleaning and lining of pipes. However, the company is questioning the cost-effectiveness of the latter compared to replacement with new pipes, especially for smaller lines. Pipe replacement and other capital improvements are the responsibility of the city.

Hoboken’s Assistant Business Administrator, Stephen Marks understands that new residents, many of whom were raised in areas where the water infrastructure is newer and needs less intensive maintenance, bring with them raised expectations about reliability and dependability. These expectations are putting increased pressure on the city to upgrade the performance of an aging system.

GREEN BUILDINGS EASE THE STRESS ON WATER AND SEWER SYSTEMS

HOW ONE SUCCESSFUL DEVELOPER
HAS FOUND A SWEET SPOT IN MEETING
THE MARKET DEMAND FOR
SUSTAINABILITY.

*Matt Testa, construction director
for Bijou Properties, believes
that the company's tenants are
receptive to the sustainable
lifestyle its buildings offer,
which translates into lower
turnover and exceptional
care for the buildings.*

Photo credit: Bijou Properties.



The green roof atop the Garden Street Residences serves to reduce the amount of rainwater that would enter the city's combined sewer system while providing a valuable amenity for residents. Photo credit: Bijou Properties.

“**YOU START WITH** the fixtures,” says Matt Testa, construction director for Bijou Properties as he introduces his company’s portfolio. Matt is referring to the U.S. Green Building Council’s LEED green building program for the design, construction, maintenance and operations of high-performance green buildings,¹¹ in which water conservation guidelines require water-conserving fixtures to be installed before any “points” are awarded in that category. Less water used by a sink, shower or toilet means less water needed per person from the city’s water mains, and less water flowing into the city’s combined sewer system, reducing combined sewer overflows, flooding and backups.



Matt showcases the company’s efforts with a visit to the Garden Street Residences, a retrofit of a factory building once used to process coconuts for Almond Joy and Mounds candy bars. Redeveloped into 30 residences, the Garden Street Residences building incorporates enough green features to have earned LEED Gold certification. Interior water fixtures reduce water use by 23 percent compared to regular fixtures, and the building has a 6,000-sq.-ft. green roof that detains about 68,500 gallons of rainfall annually from entering the city’s sewer system while also lowering energy costs for residents. The building has been well received by customers:

Above left: Bijou’s Garden Street Residences earned LEED Gold certification from the U.S. Green Building Council’s green building program, both because residents use 23 percent less water due to low-flow fixtures and because the building’s green roof captures 68,500 gallons of stormwater to sustain plant life. Photo credit: Bijou Properties.

Despite the fact that it opened during the 2009 real estate slowdown, all 30 units were sold by 2013.

This property is just one of Bijou Properties’ growing portfolio. Three existing buildings pack in innovative features to ensure a low impact on the environment, and two more buildings are under construction. With the exception of Bijou’s first property, named the Hostess Building because it had previously been a Hostess cupcake factory, all of his buildings have received high ratings from LEED.¹²

The North Hudson Sewerage Authority requires larger-scale development projects in Hoboken to incorporate stormwater-detention capabilities as a condition of approval to connect to the system. As a result, Bijou’s projects also include underground stormwater holding tanks that collect up to one inch of rainwater at a time and release it slowly into the combined sewer system after the threat of overflows has passed.

But Bijou’s efforts do not stop at water conservation and detention. For its projects to attain a LEED rating at the Gold or Platinum level, they must incorporate many sustainable elements, such as space-saving (and air quality-improving) automated parking garages, natural and reclaimed building materials, enhanced indoor air-infiltration systems, on-site power generation plants, and renewable energy systems. Other amenities go beyond the buildings themselves: There is a weekly farmer’s market in Bijou’s Garden Street Mews; Bijou’s upcoming 900 Monroe project will have access to the adjacent light rail station and a nearby Zipcar rental.

While LEED-certified buildings may cost more to construct, Bijou’s portfolio showcases a successful business model that taps into market demand for a healthy, environmentally friendly way of life. Residents are using their wallets to show appreciation for the steps taken to ensure a safe and healthy living setting. For Hoboken, not only do more residents mean more customers to patronize local businesses, but these residents are trying to be easier on the environment by reducing their impacts on air, energy and of course the city’s aging and fickle water infrastructure.

Above right: Water fixtures in this building not only reduce the amount of water used but produce corresponding reductions in sewage flows. Photo credit: Bijou Properties.



GROWING PAINS:
A BURGEONING
JERSEY CITY
CONTENDS WITH
AGING WATER
INFRASTRUCTURE

THE INVESTMENTS JERSEY CITY NEEDS IN ORDER TO KEEP GROWING.

JERSEY CITY'S waterfront location, across the Hudson River from lower Manhattan, has fueled successive waves of economic growth. For much of the 19th and 20th centuries goods arrived in Jersey City, first via the Morris Canal and later via the many freight rail lines that terminated at the waterfront, to be transferred to ships destined for New York City and points beyond. This commercial activity helped make Jersey City the nation's 23rd largest city by 1930 with a population of 316,715. As freight transportation patterns changed over the following 50 years, the shippers and railroads abandoned the city, and by 1980 population had declined by one-third to 223,532.

But its location in the shadow of Manhattan meant the area was not inactive for long. Massive investments in the waterfront's roads and water infrastructure in the 1980s laid the groundwork for redevelopment. By the 1990s, Jersey City's excellent transit connections and comparably lower office rents than across the river proved an irresistible lure for the back-office operations of financial firms and related businesses, transforming Jersey City into "Wall Street West" and boosting employment by 14,000 jobs between 1999 and 2010. The so-called "Gold Coast" also became home to residential towers, and catalyzed an influx of young people citywide. In the first decade of the 21st century, the number of new residential building permits issued quadrupled from the previous decade, catapulting Jersey City from eighth in the state to first in issuance of such permits.

Despite this, much of the city still faces traditional urban challenges, including a combined sewer and stormwater system that pollutes water, exacerbates flooding and

causes sewer backups. At the same time, however, residents and visitors are rediscovering the city's waterways as a place for recreation. The following stories help illustrate this juxtaposition of old and new:

Gold Rush to the Gold Coast: How millions in water infrastructure investments spurred Jersey City's waterfront redevelopment.

Making Urban Waterways an Urban Asset: The interest among Jersey City residents in recreation on the rivers and how it is escalating the demand for cleaner water.

It Takes a Village (To Build a Rain Garden): How one community group is utilizing an Internet startup to connect money and local resources that will promote and develop neighborhood projects to manage stormwater.

With continued investments, Jersey City's waterways and water infrastructure can aid future redevelopment and help the city achieve its ambitious plans for growth.



Opposite: Once dominated by rail infrastructure, Jersey City's waterfront is now home to over 16,000 residential units and 16.1 million square feet of office and retail space, with nearly another 18,000 units and 2.5 million square feet of office and retail approved or under construction. Photo credit: Newport Associates Development Company.

Above right: By 1945, rail infrastructure and docks dominated the Jersey City waterfront. After reaching its peak population in 1930, Jersey City would lose a third of its residents by 1980. Photo credit: Newport Associates Development Company.

GOLD RUSH TO THE GOLD COAST:

HOW MILLIONS IN WATER INFRASTRUCTURE INVESTMENTS SPURRED JERSEY CITY'S WATERFRONT REDEVELOPMENT



This view from Liberty State Park, with the neighboring skylines of Jersey City's Gold Coast (left) and lower Manhattan (right) shows that proximity to Manhattan has played an important role in Jersey City's redevelopment. The city led the state in the number of new residential building permits issued between 2000 and 2009.

AS NEW YORK City approached financial collapse in the 1970s, Jersey City faced its own problems. It had lost 30 percent of its population, the once-bustling waterfront was abandoned, and its infrastructure was in disarray. On July 15, 1982, a 72-inch aqueduct pipe carrying water from Jersey City's reservoirs in Morris County ruptured in Secaucus, leaving the city and its residents without water for three days. Restaurants were ordered closed, the National Guard was dispatched to the area to provide bottled water to hospitals and nursing homes, and tanker trucks were set up from which residents could fill bottles, pails and buckets with water.

"The area was a mess when I started here [in the 1980s]," says Bill Wissemann, senior project engineer for Newport Associates Development Company, describing the 280-acre waterfront site that would become known as Newport. "There was mud everywhere, junkyard dogs and rats. The platform to enter the [Newport PATH] station was in the middle of nowhere, and very few

people used it. The city's combined sewer system was stuck in the 'Open' position, allowing sewage to flow into the Hudson River each day, even during dry weather."

Jersey City had recognized these problems in 1980 when it approved a revised redevelopment plan for the area. Then, in July 1982, the same month as the water-main rupture, the city applied to the federal government for a \$45 million Urban Development Action Grant (UDAG) to make the 280-acre Newport site ready for development. The city ultimately received \$40 million in UDAG funds along with a \$25-million loan guarantee and \$10 million of Community Development Block Grant floating funds to be used for the acquisition and remediation of the site, demolition of structures, relocation of residents, and development of new road, water and wastewater infrastructure. Developers Melvin Simon & Associates and the LeFrak Organization each contributed an additional \$30 million towards the initial construction, which began in 1985.

Among the improvements made with the public and private investment funds was the installation at the start of the project, rather than in stages, of infrastructure sized to accommodate the site's full build-out, something Wissemann said was more cost-effective in the long run. The six sewer outfalls that were either rusted open (serving as an open pipe into the Hudson during low tides and overwhelming the system with seawater during high tides) or rusted shut (creating sewage backups in the neighborhood) were consolidated into two new outfalls, and the site's combined sewer system was separated into stormwater and sanitary lines, thus preventing a potential 2.8 million gallons of sewage from entering the Hudson each day. A high-pressure 30-inch water line, 10 inches larger than what was required initially, was installed to serve not only the Newport site but also future development anticipated along the rest of the waterfront.

Thirty years later, the Jersey City waterfront bears no resemblance to the barren mudscape that Wiseman remembers. Sitting in his new waterfront office, 17 stories above the Hudson overlooking the New York and Jersey City skylines, Wissemann lists the elements that comprise Newport's success: 4,870 residential units, 618 hotel rooms, and 4.4 million square feet of office space across 46 buildings; 13.5 acres of parks; and 1.2 miles of the Hudson River Waterfront Walkway. According to Newport Associates Development Company, Newport's residents earn an average annual income of \$116,000. The neighborhood



The Hudson Riverfront Walkway in Jersey City provides recreational opportunities and waterfront access for residents, employees and visitors, and serves as a segment of the 2,900 mile East Coast Greenway, which is currently under development.

Photo credit: NJTPA.

provides employment to 20,000 office workers each day; the Newport PATH station, which served 600 commuters each day before the project began, now serves 16,000. And the Newport project is only 82 percent complete, with approvals in place for 21 additional buildings, including 3,420 residential units and 602,600 square feet of office space.

The Newport project is credited with catalyzing Jersey City's waterfront transformation, which now features glass-draped residential and office towers, including New Jersey's tallest, the Goldman Sachs Tower. Walkers, joggers and cyclists enjoy a paved path along the Hudson – one section of the East Coast Greenway, a pathway that will one day travel the entire Eastern Seaboard from Florida to Maine. Visible to the north is a dramatic view of the New Jersey Palisades; to the east, the Manhattan skyline; and to the south, the Statue of Liberty, Ellis Island and Liberty State Park.

What is not visible is the underlying infrastructure that made the waterfront revitalization possible, including the new water mains and separate storm and sewer lines. The multi-million-dollar public-private investment has spurred a complete transformation of the waterfront area. Wissemann is visibly proud of Newport's success: By installing infrastructure at the outset of the project, the LeFrak Organization was able not only to create an entire mixed-use community but also to provide the necessary foundation for the successful redevelopment of the entire waterfront area.



The decline of rail commerce on the Jersey City waterfront left the neighborhood that would later become known as Newport underutilized. The infusion of \$75 million in grants and financial assistance for site preparation and infrastructure replacement subsequently catalyzed redevelopment in Newport.

Photo credit: Newport Associates Development Company.

MAKING URBAN WATERWAYS AN URBAN ASSET

THE INTEREST AMONG JERSEY CITY RESIDENTS IN RECREATION ON THE RIVERS, AND HOW IT'S ESCALATING THE DEMAND FOR CLEANER WATER.

EMILIO DELIA BELIEVES that water-based recreation is a great part of the urban lifestyle in Jersey City. As a kayak enthusiast, Emilio brings neighborhood kids out onto the water to experience their community from a completely different perspective, but acknowledges that his launching a boat in certain areas of Newark Bay causes some people to do a double take. "Some people ask me, 'Is that even legal?'" he says. But DeLia and others believe that, thanks to continuing improvements in water quality, it's time to change these perceptions.

Unfortunately, although water quality has improved significantly, more improvements are needed. Sheehan recognizes when it is unsafe to venture onto the Hackensack River because of the 11 combined sewer outfalls (CSOs) on the Jersey City side. "We're very sensitive about letting people go out on the day of, and the day following, a rain event," he says. "If someone still wants to do so, we insist that they seriously wash their hands afterward or risk getting ill." To get this message out, Hackensack Riverkeeper recently produced a short video, "The Truth About CSOs,"¹³ in which Sheehan takes viewers on a tour of the Hackensack during an overflow event. In the video, Sheehan mentions that when he points out CSOs on his tours, people are dumbfounded, believing that these were done away with decades ago.

Jersey City is blessed with not only the Hackensack but also the stunning Hudson River estuary, on which Liberty State Park fronts. For the past five years, park visitors have been able to join the park's resource specialists for an interpretive two-hour kayak eco-tour to learn about the estuary's many fish, shellfish and migratory birds. According to Deputy Park Superintendent Jonathan Luk, the park hosts between 25 and 30 kayak tours each season for as many as 13 people per trip. Since they are taking people out into an urban aquatic environment, the staff acknowledges the need to check New York City's water quality monitoring stations. (New Jersey's cities do not post results of water quality testing after rain events, when combined sewer overflows may occur.) Luk mentions that in 2013, adverse water quality resulted in only one day on which conditions were unsuitable for a kayak tour.

Jersey City also enjoys a vibrant recreational fishing scene. Unfortunately, not all those who fish understand that poor water quality means that their catch may not



Capt. Bill Sheehan, the Hackensack Riverkeeper uses pontoon boats for his popular eco-cruises on the Hackensack River and New Jersey Meadowlands. He is well aware of the challenges he faces in getting people onto the river. "If you scare people away from the water, they will treat the river as if it should just be paved over. But if you get these same people onto the river and

draw attention to its natural and recreational assets, they will want to use and protect these waterways." Hackensack Riverkeeper records the number of people who visit their paddling centers as a way to emphasize to decision-makers why access to a clean, fishable and swimmable river is important.

Above: Hackensack Riverkeeper Capt. Bill Sheehan and his organization bring 10,000 people to the Hackensack River each year for recreation and to build support for improving the waterways. Photo credit: Hackensack Riverkeeper.



be safe to eat. Two local fishermen described the countless people who use the Hudson and other urban waterways for subsistence fishing. Both stressed that the water is a lot cleaner today than it once was in terms of visible pollutants, but acknowledged that quality issues still exist. One believes that one of the biggest threats comes from people flushing prescription medications down the drains and into the waterways, which interferes with the sexual development of winter flounder. The other remarks, “When you hear the warnings that pregnant women should not consume certain fish, it makes me nervous. I know that these fish are migratory and travel from the Atlantic Ocean and up the Hudson, but it must be human nature that makes me decide to keep a fish I catch on the ocean side of the Verrazano Bridge, but release the ones I catch on the other side.” In addition to these concerns, Newark Bay is part of the dioxin-contaminated Diamond Shamrock Superfund site; since dioxin in the sediment can make its way up the food chain and into the fish, its consumption by humans can become a cause for concern.

DeLia, Hackensack Riverkeeper, Luk, and others are evidence that the demand to use the waterways around Jersey City for kayaking, boating and fishing is growing. Managed correctly, access to waterways will help Jersey City and neighboring municipalities continue to attract new residents, businesses and visitors.



Top: Liberty State Park’s kayak eco-tours help visitors explore the Hudson River estuary.

Photo credit: Liberty State Park.

Above: These brightly colored signs found along the Hudson and Hackensack rivers surrounding Jersey City indicate the nearby presence of a combined sewer outfall, warning people not to use the water “During and Following Wet Weather,” because “Contact with Water May Cause Illness.”

IT TAKES A VILLAGE (TO BUILD A RAIN GARDEN)

HOW ONE COMMUNITY GROUP IS UTILIZING AN INTERNET STARTUP TO CONNECT MONEY AND LOCAL RESOURCES THAT WILL PROMOTE AND DEVELOP NEIGHBORHOOD PROJECTS TO MANAGE STORMWATER.

JERSEY CITY'S BURST in development activity may be enviable to other cities, but it is not without its challenges; more development creates a greater strain on the underlying infrastructure. Jersey City Planning Director Bob Cotter describes the city's infrastructure as a tale of two cities: the new and the old. The newly redeveloped parts of the city, such as the waterfront, were originally built on filled-in marshes reclaimed for industry. When industry left, new developments like Newport began with a complete overhaul of the underlying water infrastructure, and most new developments now have separate storm and sewer systems that function well. The city's historic districts, however, face infrastructure problems typical of older cities, such as century-old water pipes and a combined sewer and stormwater system that covers 63 percent of the city. In response, Jersey City's Municipal Utilities Authority spends millions annually in capital improvements to its infrastructure.

The daunting costs involved in such urban water and wastewater system upgrades are challenging cities to seek out alternative and innovative approaches. Many are installing green infrastructure, which mimics natural systems to capture stormwater locally before it enters the sewer system. The design of green-infrastructure elements can also help to beautify neighborhoods. Sustainable Jersey City (SJC) is promoting the use of green infrastructure in Jersey City.



Co-founder Erin Barnes's "crowd-resourcing" website ioby.org has helped communities raise \$732,011 towards 282 projects. The company notes that 58 percent of donors also end up volunteering with projects. Photo credit: ioby.



The Jersey City Municipal Utilities Authority routinely makes capital investments in the city's water collection and distribution systems ("gray" infrastructure) in addition to the investments it is making to comply with federal requirements.
Photo credit: Jersey City Municipal Utilities Authority.

SJC is partnering with the web-based platform ioby, which offers a new way to fund green infrastructure. ioby (In Our Back Yards) stands for the opposite of NIMBY (Not In My Back Yard), and was founded to bring small-scale sustainable development projects to fruition in urban neighborhoods through the use of "crowd-resourcing." According to ioby's website, "Crowd-resourcing combines the concepts of crowd-funding (the ability to pool small donations made online to a specific cause or project) and resource organizing (enlisting local activists and advocates to ensure success of a cause or project)." To date, 71 percent of ioby's projects serve some form of social justice objective.¹⁴ According to Erin Barnes, ioby's co-founder and executive director, "We might not be able to change the world, but we can at least do something on the block."

Since its start in New York City, ioby has expanded its operations to neighborhoods across the country. Most donors live within two miles of the project to which they contribute, and make an average donation of \$35. Green

infrastructure-related projects that are currently seeking funding through ioby.org are taking place in Pittsburgh (to fund a green infrastructure plan), Memphis (to plant a rain garden) and New York City (to fund a floating garden on the Gowanus Canal and a rain garden in Brooklyn).

SJC was the first organization in Jersey City to utilize ioby, through which it successfully raised \$4,598 for its “Rain Gardens +ART Campaign” in Jersey City’s Five Corners neighborhood. SJC matched the donations it received from ioby with foundation funding, and will use the money to install a rain garden demonstration project, which will include art installations around the site as a way to draw awareness to the project. SJC founder and Chairwoman Debra Italiano explains that “through our collaboration with community arts organizations, individual artists, the New Jersey Tree Foundation and our host site partners, SJC aims to show how connecting social, environmental and economic impacts can transform Jersey City into a more sustainable place to live and work.” She is planning another collaboration with ioby to develop rain gardens and a water-capture system for a local school that has been affected by flood events. For ioby’s Erin Barnes, who has a particular interest in urban water systems, “This is a great partnership for us. They are doing very interesting work.”

The screenshot shows the ioby.org project page for "SJC's Rain Gardens +ART Campaign". At the top, the ioby logo is displayed with the tagline "Now in your backyard". The project title is "SJC's Rain Gardens +ART Campaign" with a subtitle: "A citizen-led initiative to educate and engage Jersey City stakeholders about green infrastructure benefits and inspire more projects across all of our neighborhoods." The page indicates the project is "STATUS: UNDERWAY, ACCEPTING VOLUNTEERS" and "SHARED THIS PROJECT" on social media. A progress bar shows the project is "TOTAL FUNDING NEEDED: \$4,673" and "RAISED SO FAR: \$4,598", with "\$0 STILL NEEDED". A large "funded!" banner states: "This project has been fully funded and is no longer collecting donations." Below this, a "volunteers needed!" section says: "This project's leader is looking for volunteers to help out." and includes a call to action: "Sustainable JC is growing and this project needs additional hands on deck. If interested in Volunteer opportunities that include participating on Committees, at Events or joining this or one of our other Project Teams, call Debra at 917-447-9839." and a button "inquire about volunteering". A "where it's at" map shows the location in Jersey City. A video player shows a rain garden installation. The project leader is "Sustainable Jer..." at "440 Hoboken Avenue, New Jersey (Five Corners Neighborhood near Journal Square;)" with a "Thank you!" message.

SJC raised \$4,598 in small donations on ioby.org to fund its “Rain Gardens +ART Campaign.”

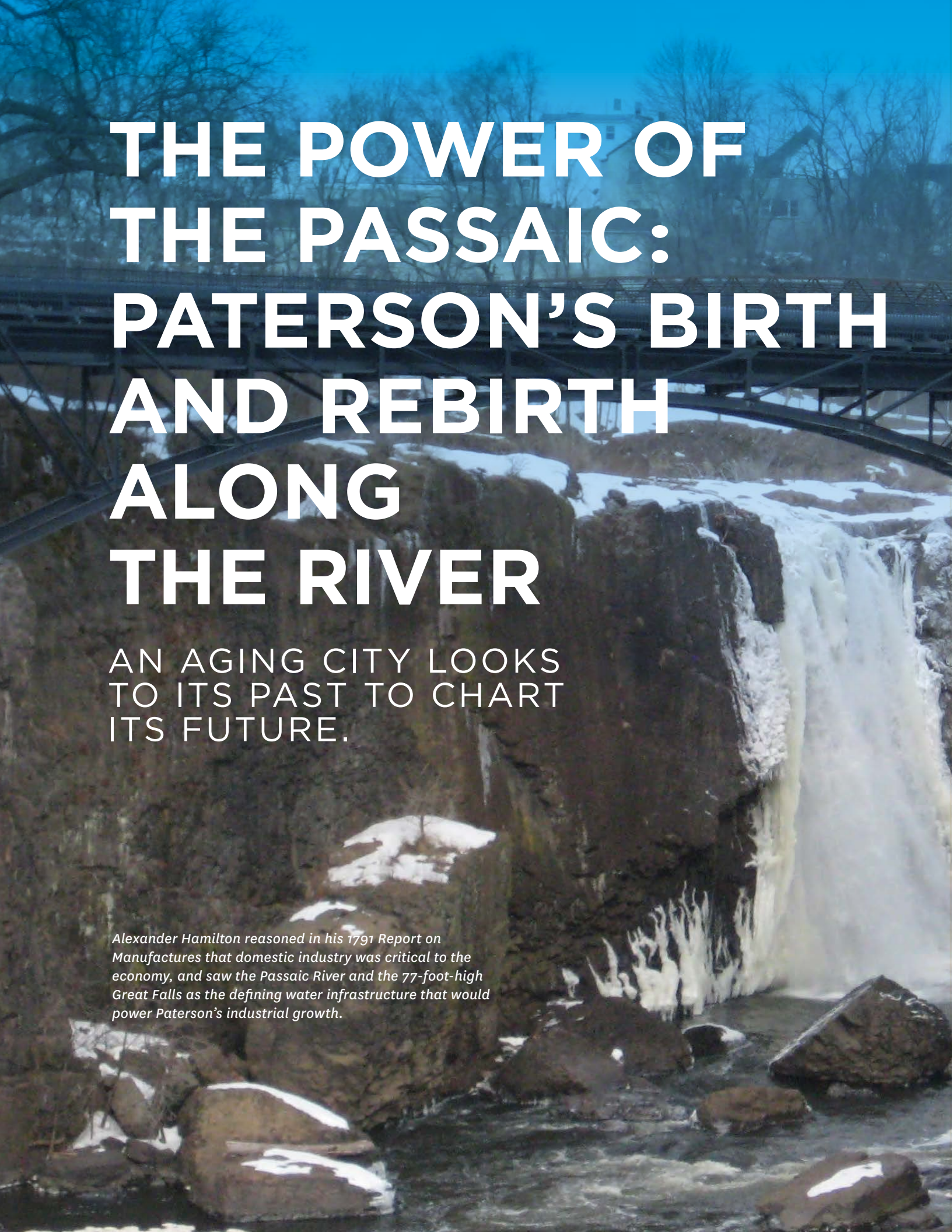
Image credit: ioby.



The grassroots organization Sustainable Jersey City (SJC) is working to highlight the importance of green infrastructure in Jersey City as a way to address stormwater locally and to beautify communities.

Photo credit: Sustainable Jersey City.





THE POWER OF THE PASSAIC: PATERSON'S BIRTH AND REBIRTH ALONG THE RIVER

AN AGING CITY LOOKS
TO ITS PAST TO CHART
ITS FUTURE.

Alexander Hamilton reasoned in his 1791 Report on Manufactures that domestic industry was critical to the economy, and saw the Passaic River and the 77-foot-high Great Falls as the defining water infrastructure that would power Paterson's industrial growth.

THE CITY OF Paterson has witnessed its fortunes rise and fall with the Passaic River. It was the Passaic River's Great Falls that Alexander Hamilton recognized as a means to fuel American industry. Hamilton envisioned a series of raceways that would one day capture water from above the falls and bring it rushing down to power the mills. The industry that arose from Hamilton's vision harnessed the power from this channeled water to produce firearms, locomotives and especially silk, earning Paterson the nickname "The Silk City."

But decades of industrial pollution took its toll on the river. Poet William Carlos Williams once referred to the Passaic River as the "vilest swillhole in Christendom."¹⁵ Referring to the dyes used in the silk manufacturing process, one anecdote describes how until the 1970s, the day of the week could be determined by the color of the Passaic. A 1972 report described the state of the river's upper basin at the time: "For a significant portion of each year, fish are unable to survive ... Much of the river is ill-smelling and unfit for recreational use or even close contact."¹⁶ While the river's quality has improved from its 1970s nadir, combined sewers in Paterson continue to dump waste into the Passaic and periodic flooding displaces residents from their homes. In addition, aging plumbing fixtures pose threats to drinking water quality.

Despite losing 8 percent of its population since 1990, Paterson remains New Jersey's third-largest city, with a population of 145,219. It is also one of its poorest. But the same river that has served as a catchment

for the city's pollution problems has the potential to restore its prosperity. In 2009, President Barack Obama signed legislation designating the Great Falls and its surrounding area as a national park. Paterson faces many of the same issues found in New Jersey's oldest urban cores, but its diverse body of residents, officials, and community groups are poised to champion a renaissance in the Silk City.

The stories that follow illustrate how water infrastructure serves to improve or impair the quality of life in Paterson:

Harnessing the Power of the Great Falls – Take Two:

A look at how America's newest national park is spurring education and community revitalization.

The Minerals You Don't Want in Your Child's Water:

Community groups understand the dangers posed by lead exposure, but struggle to find solutions.

Greening the Streets to Give Rainwater Someplace to Go:

Passaic County's newly adopted transportation plan includes the installation of green infrastructure to reduce flooding.

If the revitalization around the historic mills in Lowell, Mass.,¹⁷ is any indicator, a long-term commitment to cooperation and investment can address Paterson's water woes. The groundwork is now in place for this process to begin.

HARNESSING THE POWER OF THE GREAT FALLS - TAKE TWO

HOW AMERICA'S NEWEST NATIONAL PARK IS SPURRING EDUCATION AND COMMUNITY REVITALIZATION.

“IT IS ABOUT taking pride in your nearby community,” stresses Paterson Middle School 7 Principal Nicholas Vancheri as he describes the connections that his students and their teachers are making with the recently-dedicated Paterson Great Falls National Historical Park. He has a ready partner in Supervisory Park Ranger Ilyse Goldman, who explains, “We do not want to just serve as the go-to destination for the standard fourth-grade field trip on local history.” Instead, Ilyse and her National Park Service (NPS) colleagues are working with their adopted 2016 graduating class to understand the Great Falls in detail through a kaleidoscope of approaches: testing the quality of river water, working with a poet to express thoughts about their neighborhood, boating on the Passaic, delving into the physics behind the raceways, relating the importance of the earth sciences to the city’s development, exploring park-related careers, and connecting the text in history books with local sites. The kids and the National Park Service will share a celebration in 2016, when middle school graduation will coincide with the NPS centennial.

This effort is just the beginning for a national park that will be an outdoor classroom and, on a broader level, a place for all Americans to explore their history. The park was officially dedicated on Nov. 7, 2011. In the summer of 2014 the NPS expects to release a General Management Plan for review and comment. Then, as funding becomes available, the park plan will be implemented over the course of the next 10 to 20 years. The Hamilton Partnership for Paterson, a nonprofit parks advocacy organization, points to one state-funded vision for these improvements prepared by the landscape architecture firm James Corner Field Operations. Their plan identifies

a series of “outdoor living rooms” for people to recreate, explore history, and connect with water near the falls, the river, and the historic raceways.

The Hamilton Partnership has found many ways to enhance the park’s educational, social, and economic benefits for the city and the nation. “Mill Mile,” a self-guided audio tour app featuring the voices of New York Giants wide receiver and Paterson native Victor Cruz, Tony Award-winning director Lin Manuel-Miranda, NBC Nightly News anchor Brian Williams and Pulitzer-Prize winning author Junot Díaz, brings the falls and its gritty industrial neighborhood to life.¹⁸ Hamilton Partnership’s founder Leonard Zax explains his passion for the park: “Many citizens will find much greater meaning within Paterson’s great history and cultural diversity. It was in Paterson that Alexander Hamilton began an economy that required not slavery but freedom, that rewarded not social status but hard work, and that promised not discrimination against some but opportunity for all.” He adds that by helping citizens appreciate their past, the park can “help them define new paths for the future.”

The greater Paterson community is rediscovering Alexander Hamilton’s original vision of how the Great Falls can function as an economic dynamo for the region. It seems that all the pieces are in place: compelling history, a dramatic water feature, great ethnic restaurants, and the city’s proximity to New York City. Local real estate developer George McLoof, who stopped working in suburbs years ago because of what he saw as the perverse incentives that serve only to encourage suburban sprawl, believes that if the pieces are placed right, “the park should be a tremendous plus” for Paterson.



“Ranger Ilyse” Goldman has collaborated with students and faculty in the Paterson community to bring classroom instruction to life. According to Principal Nicholas Vancheri, “students love her cool hat.”

Photo credit: George Garbeck, graphics coordinator, communications department, Paterson Public Schools.



Rendering from a 2008 state-funded plan for the Great Falls that was developed by James Corner Field Operations to show how a park could be developed to connect people with the Passaic River, the Great Falls and its history. Field Operations is probably best known for its design of New York City’s High Line, a linear park built atop an abandoned elevated train line.

Image credit: Hamilton Partnership for Paterson.

Students venture onto the Passaic, with the help of Park Service staff and members of the Bronx-based organization Rocking the Boat.

Photo credit: National Park Service.

However, challenges certainly exist. George mentions the lack of a hotel for overnight visitors. Park Superintendent Darren Boch worries that sustained dry weather and excessive upstream water withdrawals can make the Great Falls resemble a “great trickle.” But Robert F. Guarasci, chief executive officer of the New Jersey Community Development Corporation and chairman of the Paterson Great Falls National Historical Park Federal Advisory Commission, is optimistic. “It won’t be easy, but the establishment of our nation’s newest National Park in Paterson is truly a once-in-a-generation opportunity to engage citizens and help with the revitalization of this great city,” he says. “Like Lowell,

Massachusetts, before us, we have our work cut out for us, but I believe it can be done and many people are ready to work to make it happen here in Paterson.”

Historians are quick to note that Hamilton’s vision to harness the power of the river for industry went through fits and starts before succeeding. Clearly time, philanthropy, smart investments and ultimately partnerships – including everyone from school children to federal officials – will be needed to realize the national park’s potential. But visitors need not wait to begin exploring the Great Falls Historic District. The outlines of a great destination are in place.

THE MINERALS YOU DON'T WANT IN YOUR CHILD'S WATER

COMMUNITY GROUPS UNDERSTAND THE DANGERS POSED BY LEAD EXPOSURE, BUT STRUGGLE TO FIND A SOLUTION.

“**Y**OU KNOW THOSE fliers you get with your water bill and throw away?” asks Robert F. Guarasci, chief executive officer of the New Jersey Community Development Corporation (NJCDC). “We’ve been reading them very carefully after we noticed that they warned residents may have lead in their water.” The NJCDC works to create opportunities to transform lives in the Paterson Great Falls neighborhood, with a major focus on youth. Since lead can have deleterious effects on neurological growth and development, especially in young children, Robert and his staff are very concerned that lead exposure will only increase the competitive disadvantage of Paterson’s youth compared to their suburban peers.

In the flier that was mailed out in December 2012, the Passaic Valley Water Commission (PVWC) advised residents to run their water for 30 seconds to two minutes before using it if it had not been used in several hours, and to consider the use of bottled or filtered water. The commission also suggested identifying and replacing lead fixtures and service lines. In its Consumer Confidence Report for the six months from July 1 to Dec. 31, 2012, the PVWC described the health risks associated with lead: “Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.”¹⁹

There are no easy answers to this problem. The severity of the issue varies from building to building, and there’s much uncertainty about exactly which pipes are leaching. According to Rutgers Associate Research Professor Daniel Van Abs, “In most cases, lead does not come from the treatment plant or distribution system itself, but rather from customer service pipes and plumbing. The water supplier can treat water in a way that reduces lead levels. But the only permanent fix is changing the lines.”

The PVWC report described the steps it was taking to address the problem,²⁰ which include both a public awareness and education program and a process of providing “satellite corrosion control treatment systems” and “corrosion control treatment” for the entire service area to reduce leaching of lead wherever it may occur. PVWC notes in its report that some of these actions will not begin until a reservoir improvement project mandated by the U.S. Environmental Protection Agency (EPA) is completed.²¹ Providing the corrosion control treatment to the water now will simply cause algae blooms in the open reservoirs, and not benefit customers through lead reductions. In the meantime, several community groups are working to raise awareness to the issue. NJCDC believes that more should be done today to replace lead service pipes in order to eliminate the problem. Paterson’s local chapter of Habitat for Humanity has recently partnered with Rutgers Cooperative Extension of Passaic County, Bridge Hope Community Development Corporation and the Paterson Department of Health and Human Services to submit a grant application to the EPA



Lead notices were posted above water fountains in some of Paterson's public schools in 2013, warning students not to drink from them.

Image credit: Paterson Public Schools.



IMPORTANT INFORMATION ABOUT LEAD IN YOUR DRINKING WATER

Passaic Valley Water Commission found high levels of lead in drinking water in some homes. Lead can cause serious health problems. For more information please call Passaic Valley Water Commission at 973-340-4300 or visit www.pvwc.com

Excerpt from the December 2012 PVWC flier that warned homeowners that high levels of lead had been found in the drinking water in some houses.

Almost 90 percent of housing in Paterson was built prior to 1980, when lead was still commonly found in paint, pipe solder and other products. Image credit: NJTPA.

to fund workshops on lead education and to purchase 100 home water filters for residents. The release from PVWC of lead levels for 2013 is anticipated sometime in 2014.

Before the dangers of lead exposure were known, lead was used in everything from paints, pesticides, pipes and fuel additives to ammunition and cosmetics. Ingestion of paint chips or paint dust is the most prevalent form of lead poisoning in children, but lead can also be found in soil, imported goods, and lead-based solder used to weld copper water-supply lines inside buildings, among other

places. Lead paint was banned from use in residential properties and public buildings in 1978. Plastic pipes are now frequently used for internal water-supply lines and the use of lead-based solder in water supply systems has been discontinued, so buildings constructed in recent decades are generally lead-free. Lead is not an issue in communities where the financial capacity to pay for remediation is available. Unfortunately, Paterson faces a perfect-storm combination of aging water infrastructure, old housing stock and a disadvantaged population.



GREENING THE STREETS TO GIVE RAINWATER SOMEPLACE TO GO

Over 140 properties in Paterson suffered heavy flooding from Hurricane Irene and Tropical Storm Lee in 2011.

Photo credit: Jerry Flach, Paterson Habitat for Humanity.

PASSAIC COUNTY'S NEWLY ADOPTED TRANSPORTATION PLAN INCLUDES THE INSTALLATION OF GREEN INFRASTRUCTURE TO REDUCE FLOODING.

“IT’S HARD,” SAYS Paterson resident Darlene Myers, referring to the repetitive flood events that devastated Paterson’s riverfront neighborhoods,²² the most severe of which came from Hurricane Irene in 2011. Her house suffered extensive basement damage. “I love my house. I would do anything to get it back to normal as possible.” With the assistance of Paterson Habitat for Humanity’s Home Preservation Program and other area nonprofits, Darlene recently was able to install a sump pump to keep her basement dry. To mitigate future problems, she has moved her furnace and water heater out of the basement, but she has yet to replace the basement’s flooring and insulation.

Darlene is just one of many residents who, three years after Hurricane Irene, are still seeking a return to normalcy. The City of Paterson has identified over 140 properties that were flooded as a result of Hurricane Irene and Tropical Storm Lee.²³ It is in the process of purchasing 11 properties and plans to use state and federal funding to acquire another 22. Buildings on these flood-prone properties will be demolished so the sites can be returned to a natural state that can flood safely.

Darlene recognizes that controlling major flood events are beyond the city’s ability. Flooding is a natural function of rivers, but severe flooding along the Passaic River in Paterson is exacerbated by impervious development, such as roads and buildings, in upstream communities. However, localized flooding from routine rainstorms can be addressed locally. When it rains, stormwater runs off Paterson’s impervious surfaces into its sewers, which are antiquated networks

that mix stormwater with sewage. Like all combined sewer systems, Paterson’s was deliberately designed to allow the rainwater/sewage combination to overflow directly into water bodies during heavy rain events once the volume of water exceeds a certain threshold. In the case of Paterson, 23 combined sewer outfalls empty directly into the Passaic River once the sewer reaches capacity, causing pollution and a public health hazard. When the underground system is clogged or in disrepair, excess sewage backs up through manholes, storm drains, basements and even household drainage fixtures.

Wholesale repair or replacement of Paterson’s sewer lines is cost-prohibitive, so local officials have been focusing on capturing stormwater before it runs into the combined sewer system. The Passaic County Planning Department is targeting the hard surfaces it controls – county roads – for creation of “green streets.” Green streets build on the concept of “complete streets” (designed to serve all users, including drivers, walkers and cyclists) and add planted areas and other water-absorbing features.

The county has created a new design for a five-block strip of Haledon Avenue that would transform the wide macadam corridor into a safer, leafy green street. The design puts Haledon Avenue on a “road diet” that would make it narrower by replacing some pavement

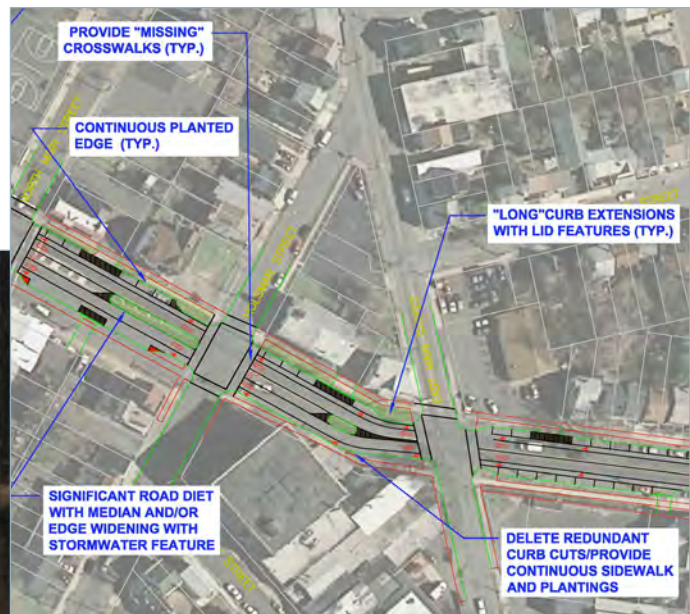
with landscaped strips. Street trees would add shade; and new sidewalks, bike lanes and crosswalks – some constructed from pervious materials – would make it safer. When combined with rain barrels attached to neighboring homes, the new design is projected to capture 40 percent of the area’s stormwater runoff.

The only thing missing at this point is money for implementation. The Haledon Avenue project is part of a comprehensive strategy outlined in *Moving Passaic County*, the Transportation Element of the county’s 2012 Master Plan²⁴. The plan outlines an iterative process to build complete green streets, beginning with public education and then moving through identification of pilot projects, inclusion of green streets in the planning and development process, and development of detailed guidance from pilot projects. The county is presently awaiting word on a grant application to the EPA to carry out the Haledon Avenue pilot project.

Meanwhile, Darlene’s neighborhood is searching for a silver lining to its water problems. Paterson Habitat for Humanity is assisting Darlene and her neighbors in developing a resident-driven neighborhood revitalization plan that will connect flood resiliency to community and economic development. The desired outcomes will help the community take steps to transform the Passaic River from a community liability into an integral asset.

The proposed improvements to Haledon Avenue in Paterson include planted medians, street trees, and pervious pavement for bicycle lanes, which will capture rainwater before it can contribute to flooding and sewage backups.

Image credit: Passaic County Planning Department.



The grating on this combined sewer outfall (CSO) helps to limit the amount of solid waste, but not the quantity of small or dissolved contaminants present in sewage, that enters the Passaic River after a rain event. Paterson has 23 CSOs.

Photo credit: US EPA.



Notes

CAMDEN

- 1 Whitman, Walt. *Leaves of Grass*. 1900.
- 2 Camden SMART. "Camden SMART 2014 Trailer." YouTube video, 2:09. Posted by "Camden Smart," January 29, 2014. <https://www.youtube.com/watch?v=rULgne7stg4>
- 3 DeNardo, Mike. "Admiral Wilson Boulevard Floods Despite Costly Drainage Project." KYW Newsradio 1060, April 19, 2011. Accessed April 9, 2014. <http://philadelphia.cbslocal.com/2011/04/19/admiral-wilson-boulevard-floods-despite-costly-drainage-project/>
- 4 Delaware Valley Regional Planning Commission. *US 30 Corridor Study: Camden County, New Jersey*. Delaware Valley Regional Planning Commission, July 2002. Accessed April 9, 2014. <http://www.dvrpc.org/reports/o2o28.pdf>
- 5 The terms infiltration and inflow refer to the unintended entry of water into a sanitary sewer line through defects in the line, and can come from rainwater that is absorbed into the soil either from above or from the water table below.

HOBOKEN

- 6 Walk Score ranks neighborhoods and municipalities on a scale of 0-100 depending upon as-the-crow-flies proximity to everyday amenities such as restaurants, grocery stores, schools and parks. Hoboken's Walk Score is 95, which puts it at the top of Walk Score's list for small cities (population 50,000-100,000). The average Walk Score of New Jersey's 61 largest municipalities is 59.
- 7 OMA, Royal HaskoningDHV, Balmori Associates and HR&A Advisors. "Resist, Delay, Store, Discharge: A Comprehensive Strategy for Hoboken." Plan presented at the Hoboken City Council Meeting as part of the Rebuild By Design initiative, March 5, 2014.
- 8 Rebuild by Design. "Resist, Delay, Store, Discharge: a comprehensive strategy for Hoboken." Accessed April 16, 2014. <http://www.rebuildbydesign.org/project/comprehensive-strategy/>
- 9 Together North Jersey. "Hoboken Green Infrastructure Strategic Plan." Accessed April 16, 2014. http://togethernorthjersey.com/wp-content/uploads/2014/04/20140404_Hoboken-Report_sm.pdf
- 10 City of Hoboken. "Southwest Park Design Concepts." Accessed April 16, 2014. <http://www.hobokennj.org/content/wp-content/uploads/2013/10/SW-Park-4-Design-Concepts.pdf>
- 11 LEED (Leadership in Energy and Environmental Design) Certification is the U.S. Green Building Council's audit-based system that awards points to green buildings based on the number of sustainable actions taken. Certifications start with Basic and move up through Silver, Gold and Platinum.
- 12 The Hostess Building is not without its share of environment-sustaining features: It boasts a 20,000-sq.-ft. green roof, the first of its kind in Hoboken.

JERSEY CITY

- 13 Hackensack Riverkeeper. "The Truth About CSOs." YouTube video, 7:26. Posted by "Hackensack Riverkeeper," November 26, 2013. <https://www.youtube.com/watch?v=wBY3idYRkbw>
- 14 ioby. "About ioby." Accessed April 8, 2014. <http://www.ioby.org/about>.

PASSAIC

- 15 Williams, William Carlos. *In the American Grain*. 1925. Reprint, New York: New Directions, 2009.
- 16 Beale, David T., Karin Platt, Robert B. Nicholas, John P. Leidy, and John Kolesar, Director. *Pollution Control on the Passaic River*. Princeton, New Jersey: Center for the Analysis of Public Issues, 1972.
- 17 National Park Service. "Lowell National Historic Park (1978-2008): 30 Years of Preservation and Innovation for Future Generations." Accessed April 11, 2014. http://www.nps.gov/lowe/parkmgmt/upload/NPS_30th%20-%20small.pdf. Similar to Paterson, Lowell was developed in the early 19th century as a planned industrial community for the production of textiles. Following a decline similar to Paterson's, parts of Lowell were declared a National Historic Park in 1978, becoming the nation's first urban national park. However, success did not happen overnight; the restoration and revitalization of Lowell has continued to the present. Thirty years later, in 2008, 3,850,000 square feet or 77 percent of the historic mills have been rehabilitated, attracting nearly 700,000 visitors annually
- 18 Hamilton Partnership for Paterson. "Mill Mile -Paterson Great Falls National Park." YouTube video, 1:35. Posted by "HamiltonPartnership," April 23, 2013. https://www.youtube.com/watch?v=owlZ_L1R-bE
- 19 Passaic Valley Water Commission. "2012 Water Quality Report." Accessed April 8, 2014. http://www.pvwc.com/water%20quality/PVWC_1605002_2013CCR_2012WQReport.pdf
- 20 The PVWC Consumer Confidence Report reads: "Lead: Passaic Valley Water Commission PWS ID NJ1605002 exceeded the lead action level during the July 1 - December 31, 2012, monitoring period. Customers were notified about this in the lead brochure that was mailed out in December 2012. Additional information is provided elsewhere in this report regarding steps you can take to reduce your exposure to lead in drinking water and how to obtain additional copies of this report and a copy of the lead brochure."
- 21 The PVWC Consumer Confidence Report details action being taken: "PVWC is moving forward with design and construction of satellite corrosion control treatment systems to reduce the potential of lead dissolving into the water. These treatment systems are being phased in as part of the reservoir improvement project where each phase will provide treatment to specific areas of the distribution system. Once the reservoir improvement project

is completed and the uncovered finished water reservoirs are replaced by covered storage tanks, the entire service area will receive corrosion control treatment. In addition, PVWC continues implementing a multi-faceted lead public awareness and education program.”

22 According to the USGS Stream Gauge in Little Falls, N.J. (immediately upstream of Paterson), of the 25 largest recorded floods in the past century, 11 occurred in the past 25 years, with nine being considered major floods (at least two feet over flood stage), and two being considered moderate floods (at least one foot over flood stage).

23 Malinconico, Joe. “Paterson ready to approve 11 buyouts on city’s north side.” Paterson Press, May 27, 2013. Accessed April 9, 2014. <http://www.northjersey.com/news/paterson-ready-to-approve-11-flood-buyouts-on-city-s-north-side-1.565713>

24 Passaic County Department of Planning and Economic Development, with assistance from Parsons Brinckerhoff. “Moving Passaic County: Transportation Element of the Passaic County Master Plan.” Accessed April 16, 2014. <http://www.passaiccountynj.org/DocumentCenter/View/126>

ABOUT NEW JERSEY FUTURE



Founded in 1987, New Jersey Future is an independent not-for-profit organization, working for better development and quality growth in the Garden State. New Jersey Future focuses on promoting smart growth and advancing implementation of the State Development and Redevelopment Plan by conducting research and analysis on key issues, building consensus for broad solutions, hosting events to educate and inform, and implementing plans on the local level to build stronger, more resilient communities.

ABOUT THE AUTHORS



Chris Sturm,
Senior Director of State Policy

Chris Sturm directs New Jersey Future's policy development and advocacy across a host of issues including state and regional planning, sustainable infrastructure, and incentives for compact, equitable development.

She spearheaded the adoption of legislation authorizing better cluster development tools, and is frequently quoted in the media. Chris is a member of the Clean Water Council of New Jersey and the New Jersey Climate Adaptation Alliance. Her career experience includes serving as the assistant director of the Capital City Redevelopment Corporation, as well as working for the MSM Regional Council (now PlanSmart NJ), the Eagleton Institute, and the Office of State Planning. She holds a master's degree in public affairs from the Woodrow Wilson School at Princeton University, where she concentrated in urban and regional planning.



Nicholas Dickerson,
Planning and Policy Analyst

Nick focuses on policy and planning initiatives ranging from research to on-the-ground implementation, focusing on issues including water and natural resources, sustainable infrastructure and ways to develop compact, livable communities.

Prior to joining New Jersey Future, he served as the community and natural resource planner for Pike County, Pennsylvania, where he monitored implementation of the county open space plan, provided planning assistance to local municipalities, coordinated the county's shale gas task force and communicated with print and televised media on planning projects. Recently Nick was selected to participate as a member of the Environmental Leadership Program's Eastern Regional Fellowship Class of 2014.