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Credit Valley Conservation inspired by nature

Harnessing Nature for Stormwater Resiliency in NYC

25 March 2025

Melissa Enoch

Assistant Commissioner, Environmental Planning & Analysis

NYC Environmental Protection

NYC Department of Environmental Protection (DEP) is the largest combined water and wastewater utility in the United States.

WATER SUPPLY

- Deliver 3.8 billion L of water to 9.6 million New Yorkers every day and maintain 11,000 km of water mains
- Protect approximately 5,000 square km of watershed, including 19 reservoirs and three controlled lakes

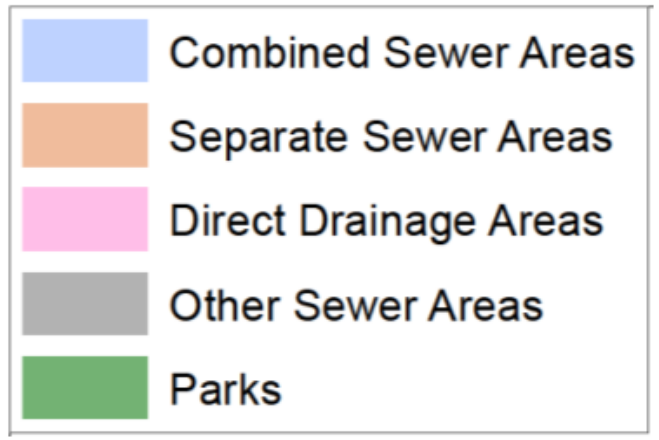
WASTEWATER TREATMENT

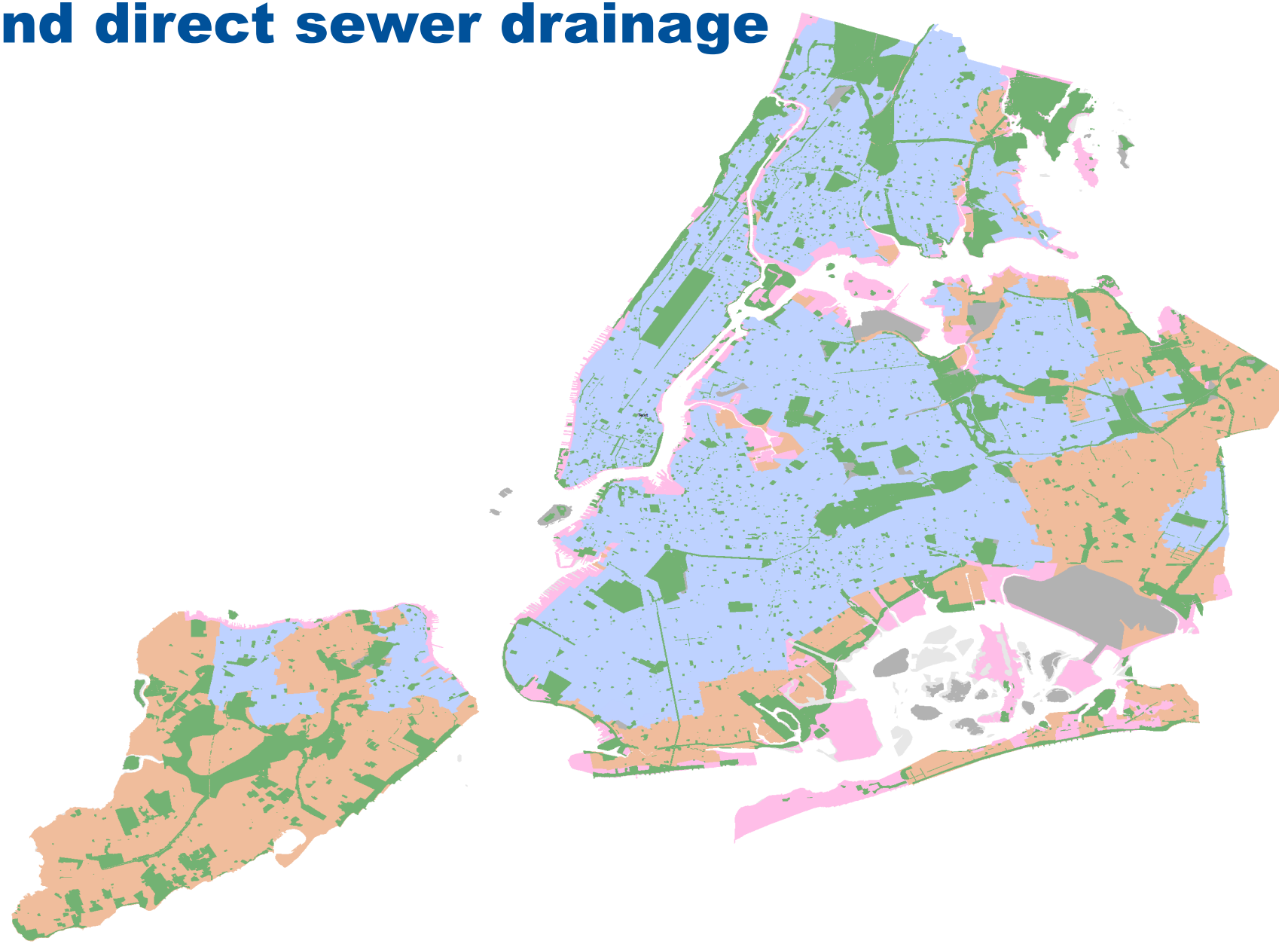
- Treat 5 billion L of wastewater each day
- Operate and maintain 14 plants, 96 pumping stations, and over 12,000 km of sewers

AIR, NOISE, AND HAZARDOUS WASTE

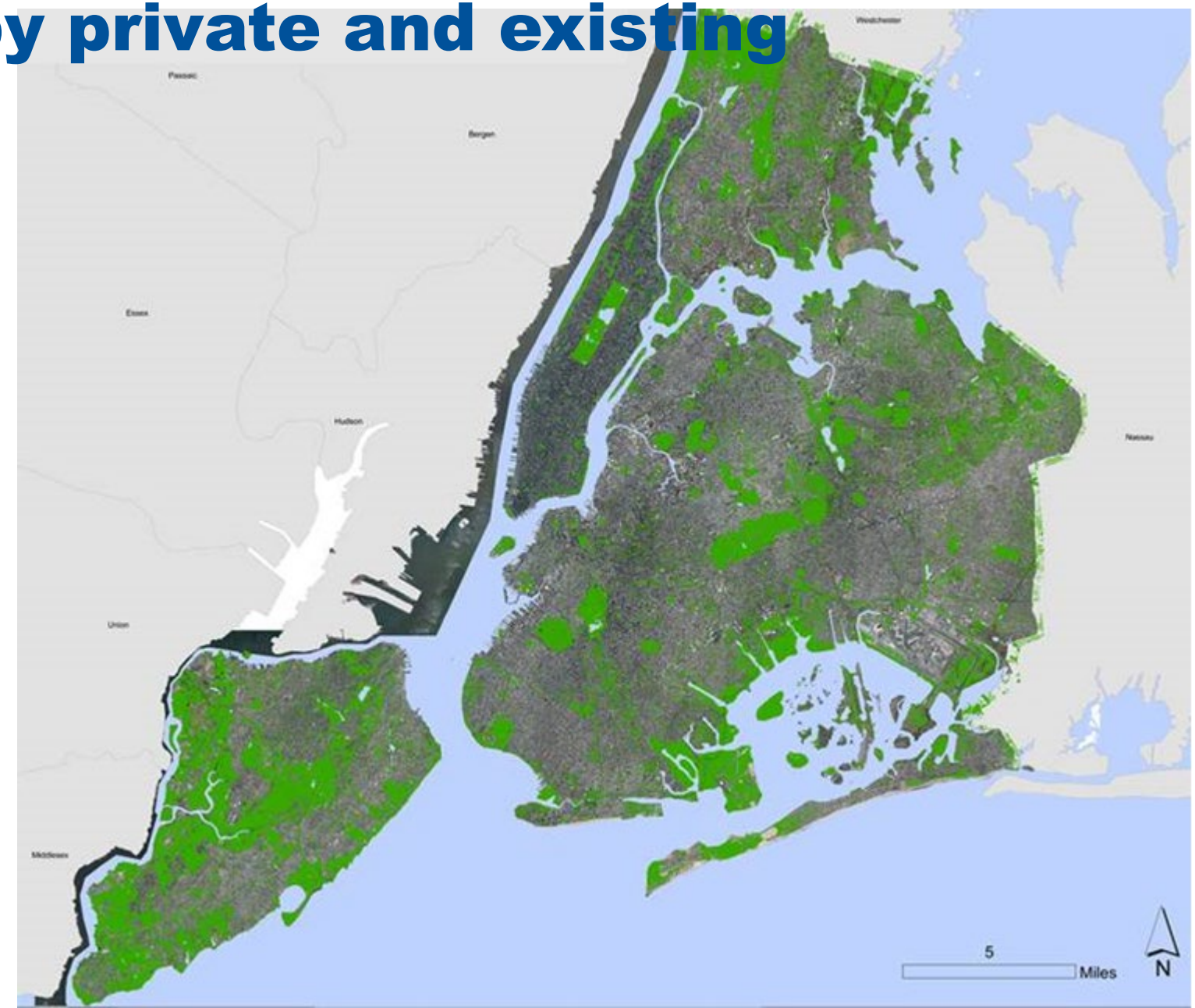
- Update and enforce the Air Code to reduce local emissions, and regulate hazardous waste and noise pollution

NYC has a combination of combined (60%), separate (30%+) and direct sewer drainage networks.





NYC is roughly 72% impervious and a large portion of our land is held by private and existing development.



In NYC, we must prepare for the full range of climate threats.

COASTAL STORMS

+50% increase in intense hurricanes by 2100

MORE FREQUENT, MORE DESTRUCTIVE HURRICANES

SEA LEVEL RISE

Up to **.76 m** SLR by 2050s

INCREASED TIDAL FLOODING + GROUNDWATER TABLE RISE

PRECIPITATION

Up to **1.5x** rain days > 25mm by 2080s

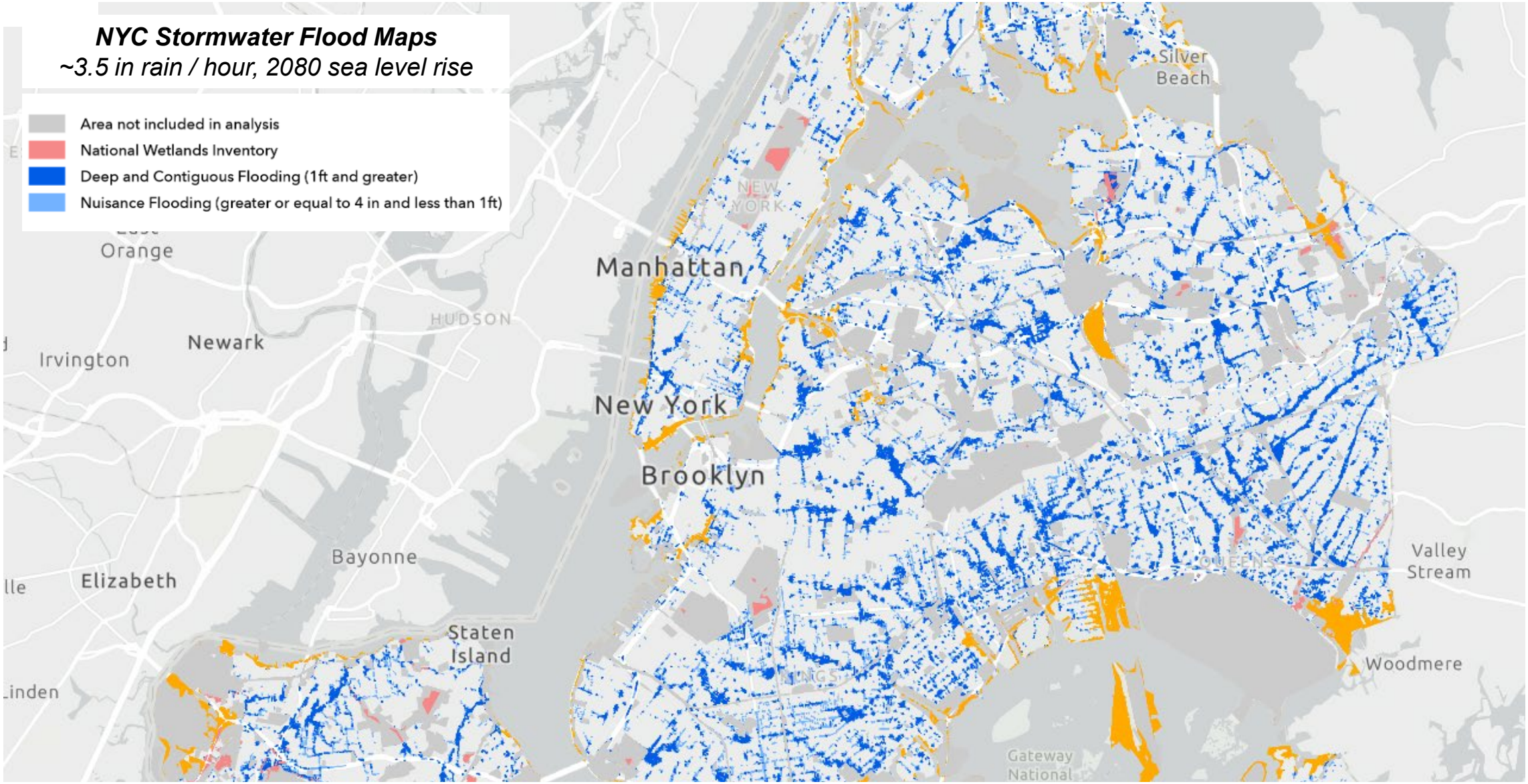
FLOODING IN NON-COASTAL AREAS

TEMPERATURE

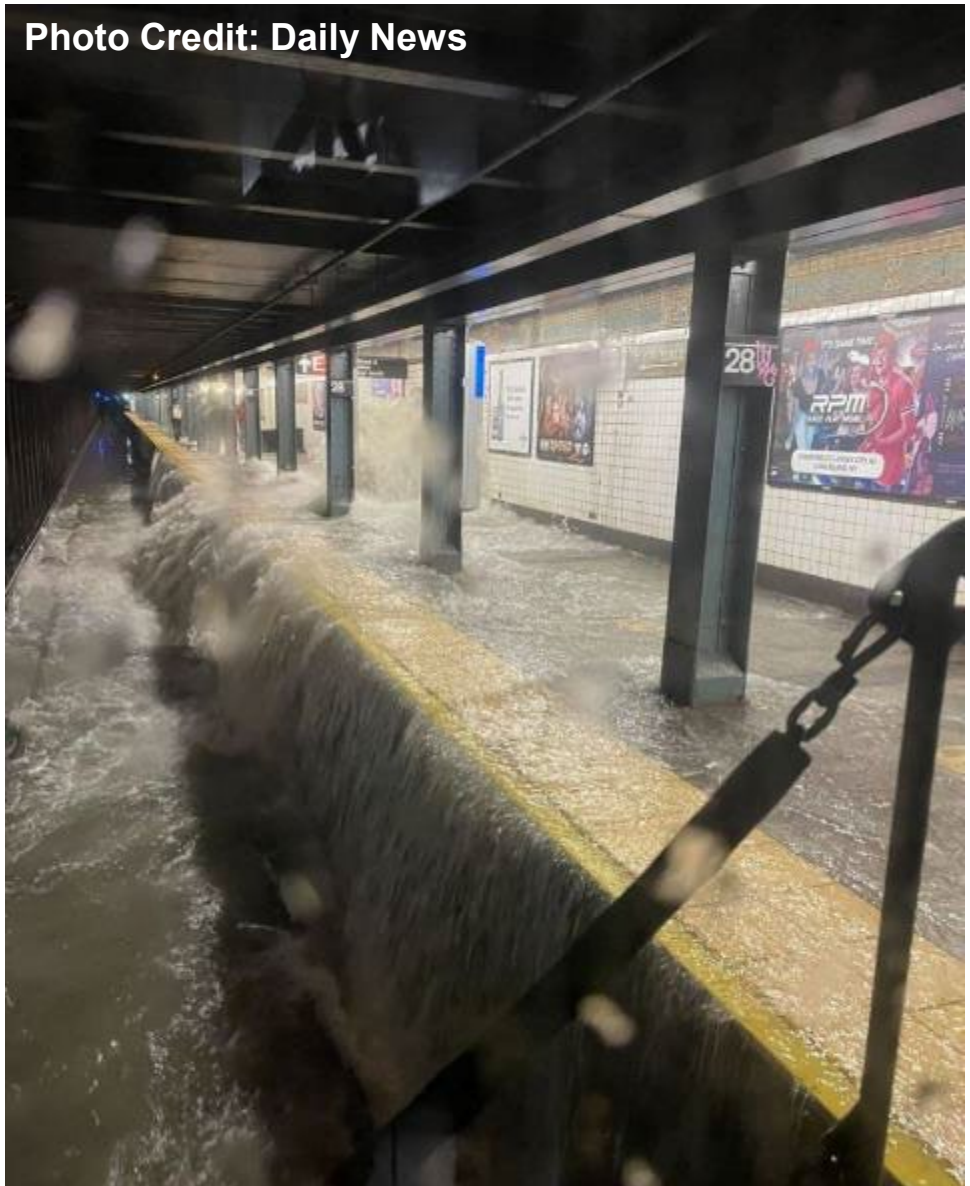
# of days above 32°C **TRIPLE** by 2050s

LONGER, MORE DANGEROUS HEAT WAVES

We've been communicating stormwater flooding risk across a variety of climate driven precipitation scenarios starting in 2021, with more recent publication of existing conditions scenarios.



Also in 2021 . . . extreme rain events overwhelm our drainage system.



Tropical Storm Elsa: July 8-9

- Max 1-hr rainfall rate: 70 to 76 mm/hr

Tropical Storm Henri: August 21-23

- Central Park reported 113 mm of rain on Aug. 21 alone, with 49 mm falling between 10 to 11pm.

Tropical Depression Ida: September 2

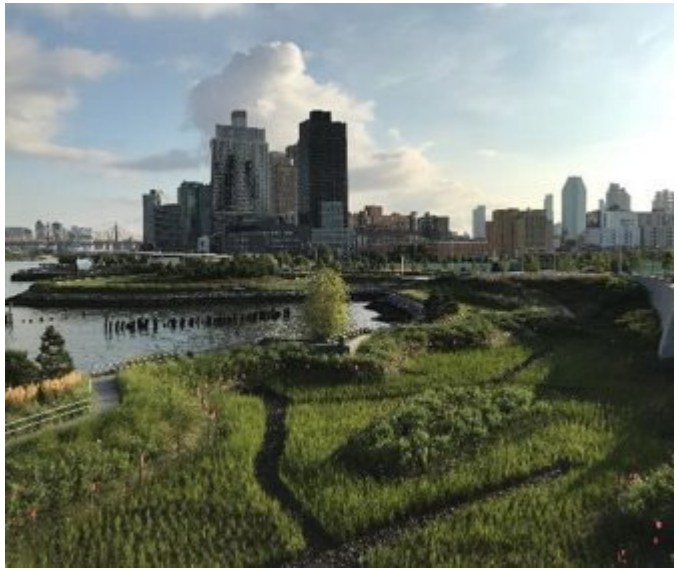
- The Central Park rain gauge set a new record for 1-hour rainfall with 80 mm (previously 49 mm from Tropical Storm Henri)

Extreme storms that have occurred in past few years have far exceeded 5 to 10 Year Design Storm intensities

September 2023
2.7 in/hr Rainfall Intensity

Hurricane Ida in 2021
3.33 in/hr Rainfall Intensity

We need to shift our approach to Water



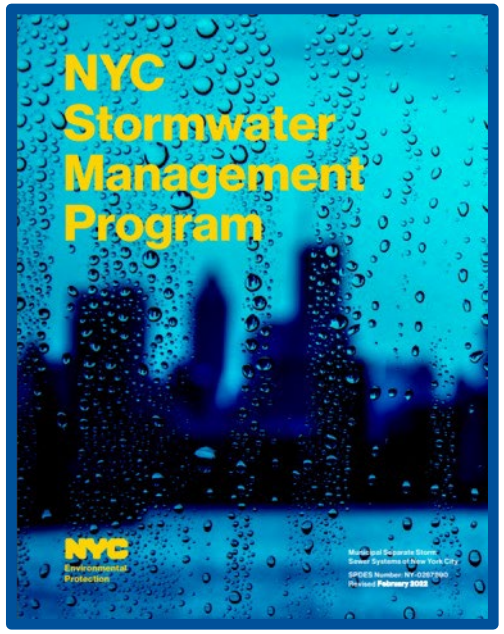
We have limited the ability of natural systems to manage heavy rainfall

Spaces that have been designed to keep water out must transform to integrate water

Natural and engineered systems must work together more seamlessly

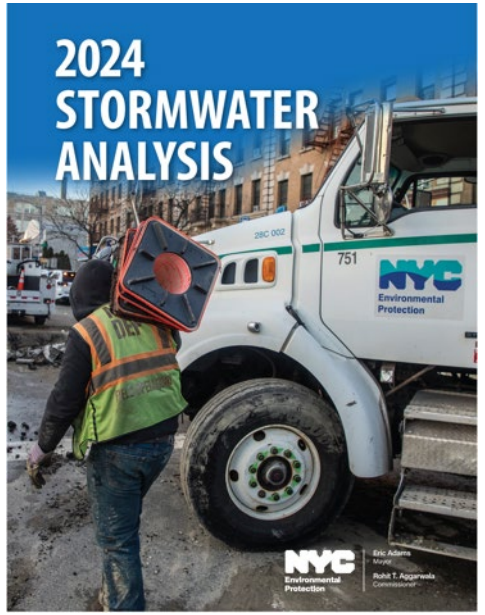
The way we think about grey and green systems is evolving.

Green where grey isn't feasible



Green for water quality

We need more focused stormwater infrastructure



We need to increase our level of service and layer our stormwater infrastructure strategies, and this is going to be costly.

The City has a toolkit for managing stormwater

DEP is using a multi-layered approach that strategically uses grey infrastructure, green infrastructure, and other solutions.

- ✓ Grey Infrastructure
- ✓ Green Infrastructure
- ✓ Blue Infrastructure
- ✓ Regulation
- ✓ Real-time Monitoring

Our Green Infrastructure Program was created to reduce CSOs.

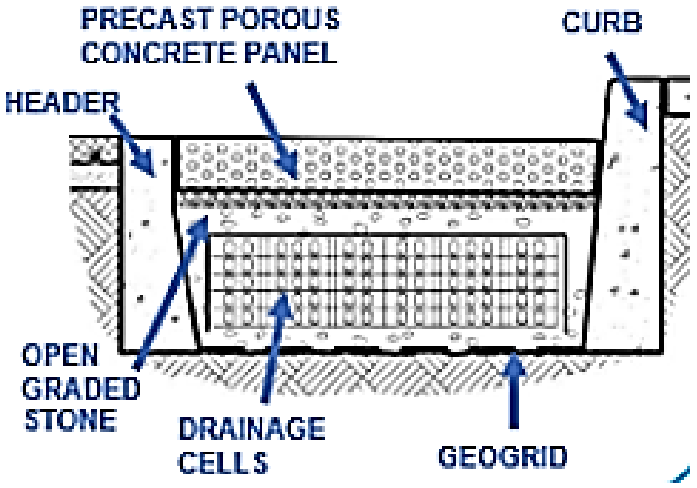
City Sidewalks

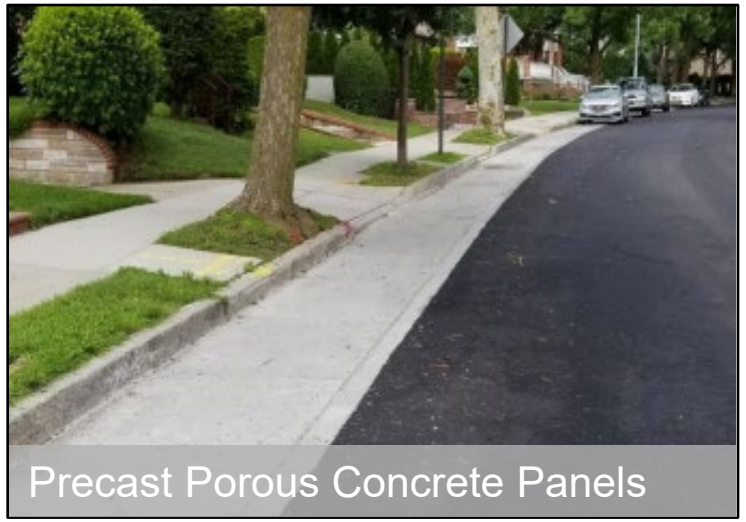
City Streets

Grant Program for Private Property Owners

Public Property Retrofits

Traditional green infrastructure in NYC




Precast Porous Concrete Panels

Precast Porous Concrete Panels


Grass Top Infiltration Basin


Concrete Top Infiltration Basin

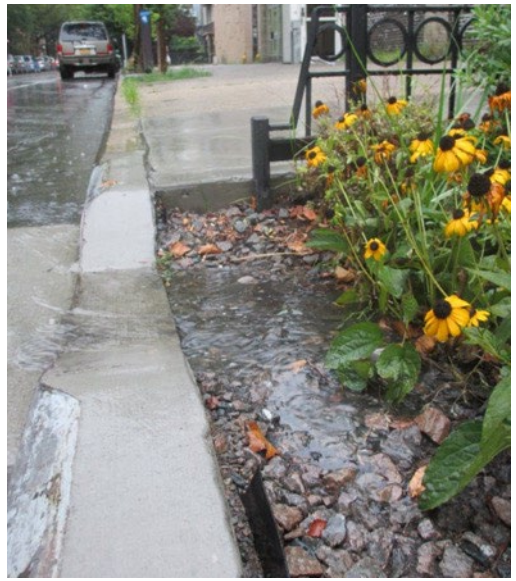

Rain Garden

Evolution of NYC green infrastructure

Present

Green Infrastructure Program

2010

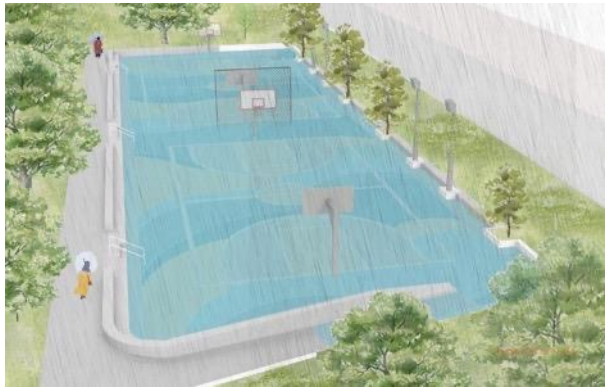


Copenhagen Partnership

2015

New York City Housing Authority Cloudburst Pilot Projects

2017

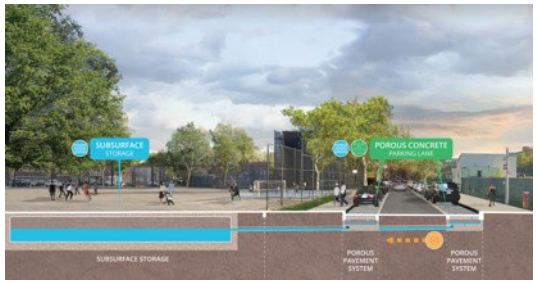


Tibbetts Brook Daylighting

2021

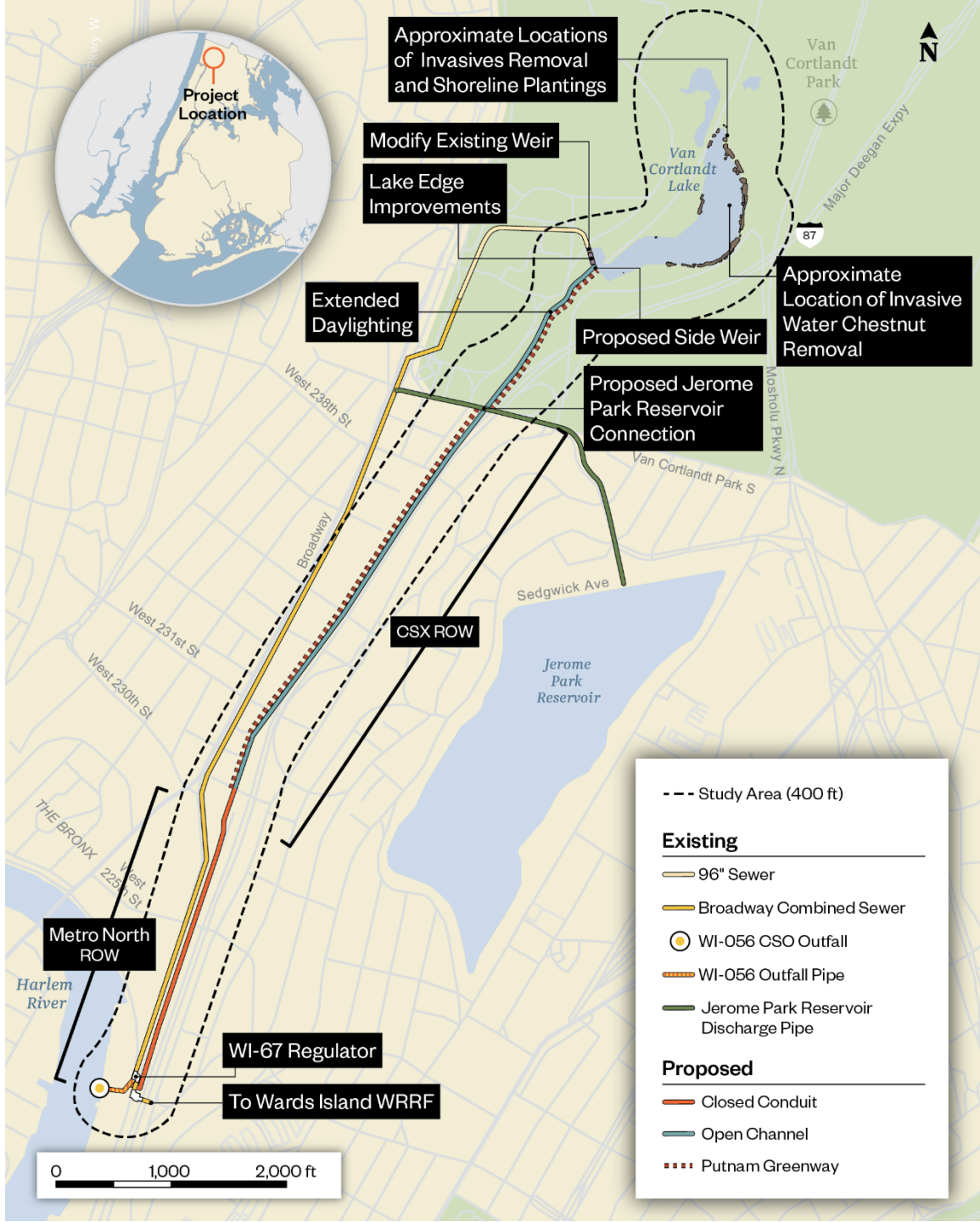
Cloudburst Hubs

2023

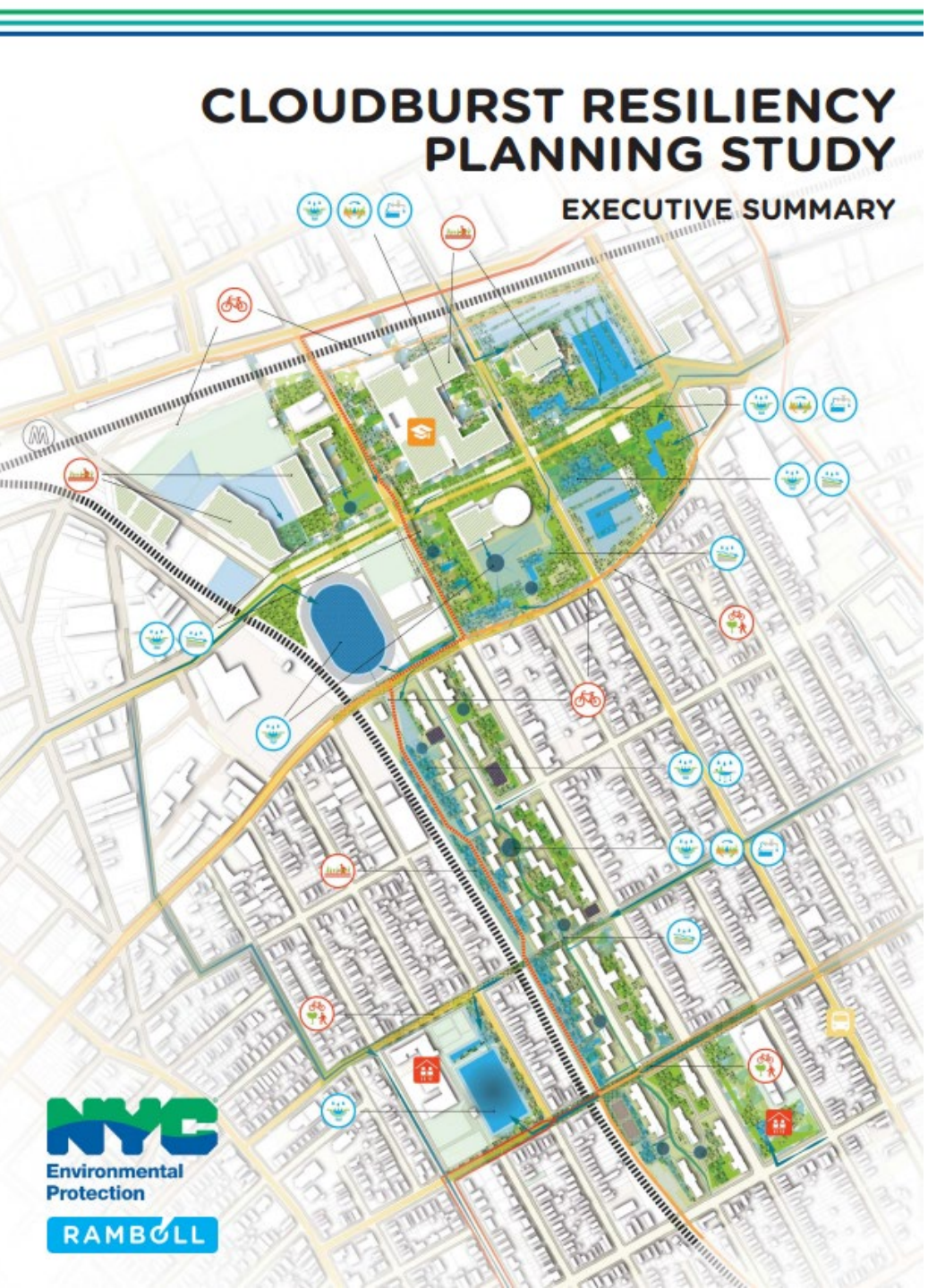


Our largest green CSO reduction project also serves as an opportunity to restore a natural waterway.

- **Tibbetts Brook Daylighting:**
  - The proposed open channel would sit above the sewer crossings and be designed for a **baseflow of 7 cfs and a maximum wet weather flow of 38 cfs**.
  - Greenway paths would run parallel to the open channel.



We have a rich history of wetland creation and restoration and now we're looking to leverage this work for water quality.



Cloudburst Study

In 2017 DEP published the Cloudburst Resiliency Planning Study based on Copenhagen's Cloudburst Management. The conceptual plan focused on Southeast Queens and featured potential solutions to manage stormwater for both everyday and extreme rain events, leveraging stormwater features to enhance outdoor spaces and neighborhood connectivity .

Elements of Cloudburst Projects

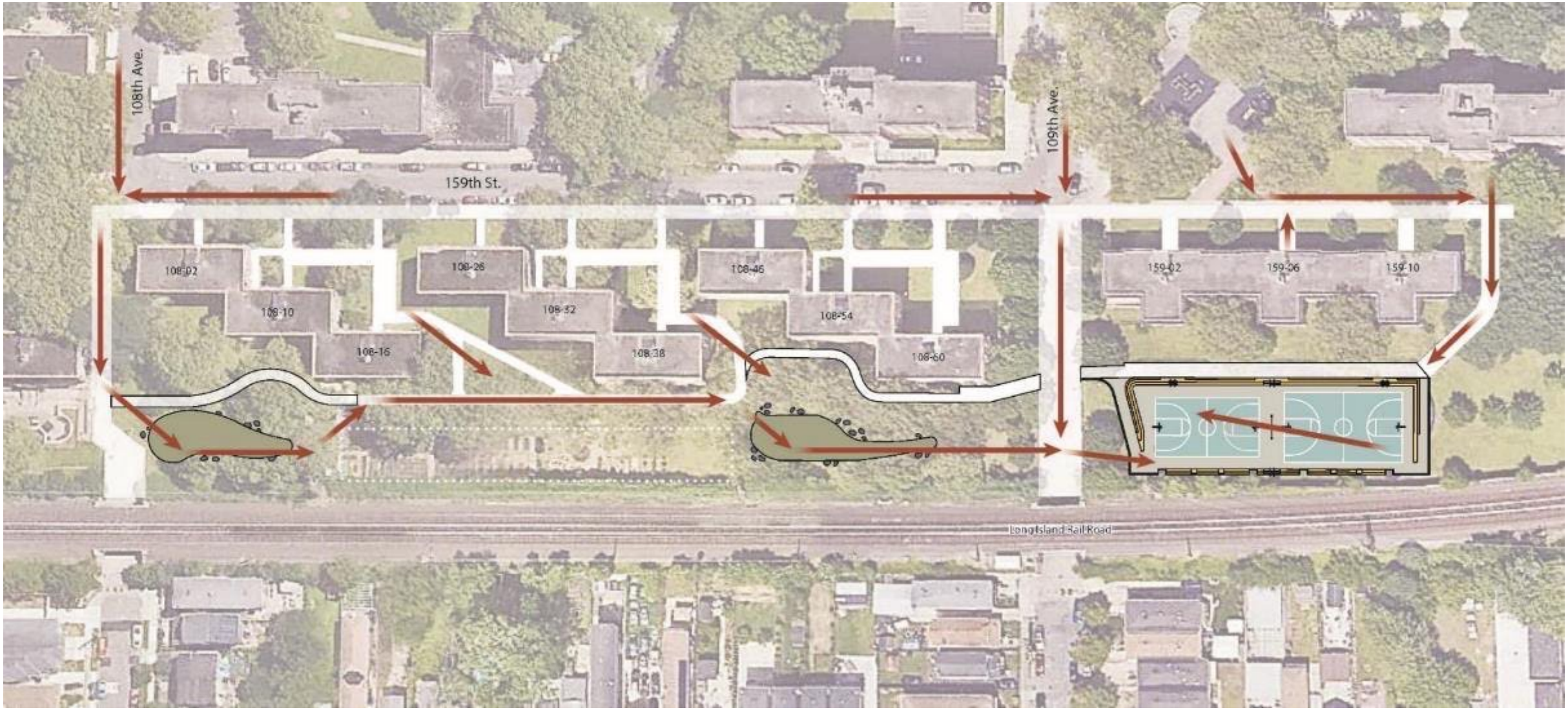
South Jamaica Houses

South Jamaica Houses includes 8 city blocks in South Jamaica, Queens and is home to around 2,600 residents. South Jamaica Houses were chosen to provide relief upstream to allow for more flow to enter the sewer system downstream and reduce flooding.

This project will maximize storm water capture for up to 58 mm of rainfall per hour. Aside from flood mitigation, this pilot shows how cloudburst infrastructure can offer many co-benefits to communities.

This project has reached 100% design and is currently in construction.

South Jamaica Houses will be NYC's first cloudburst project

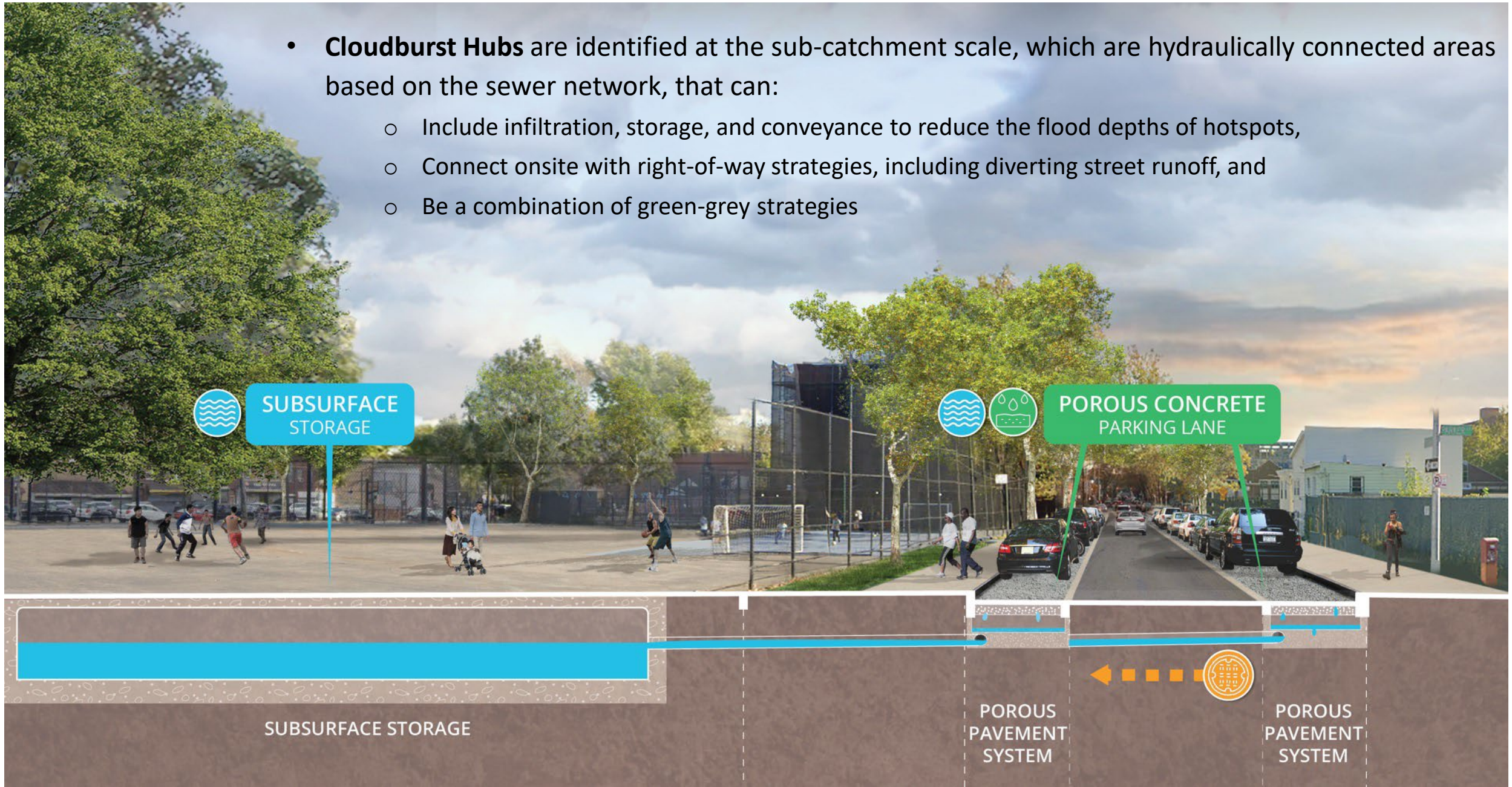


South Jamaica Houses Construction

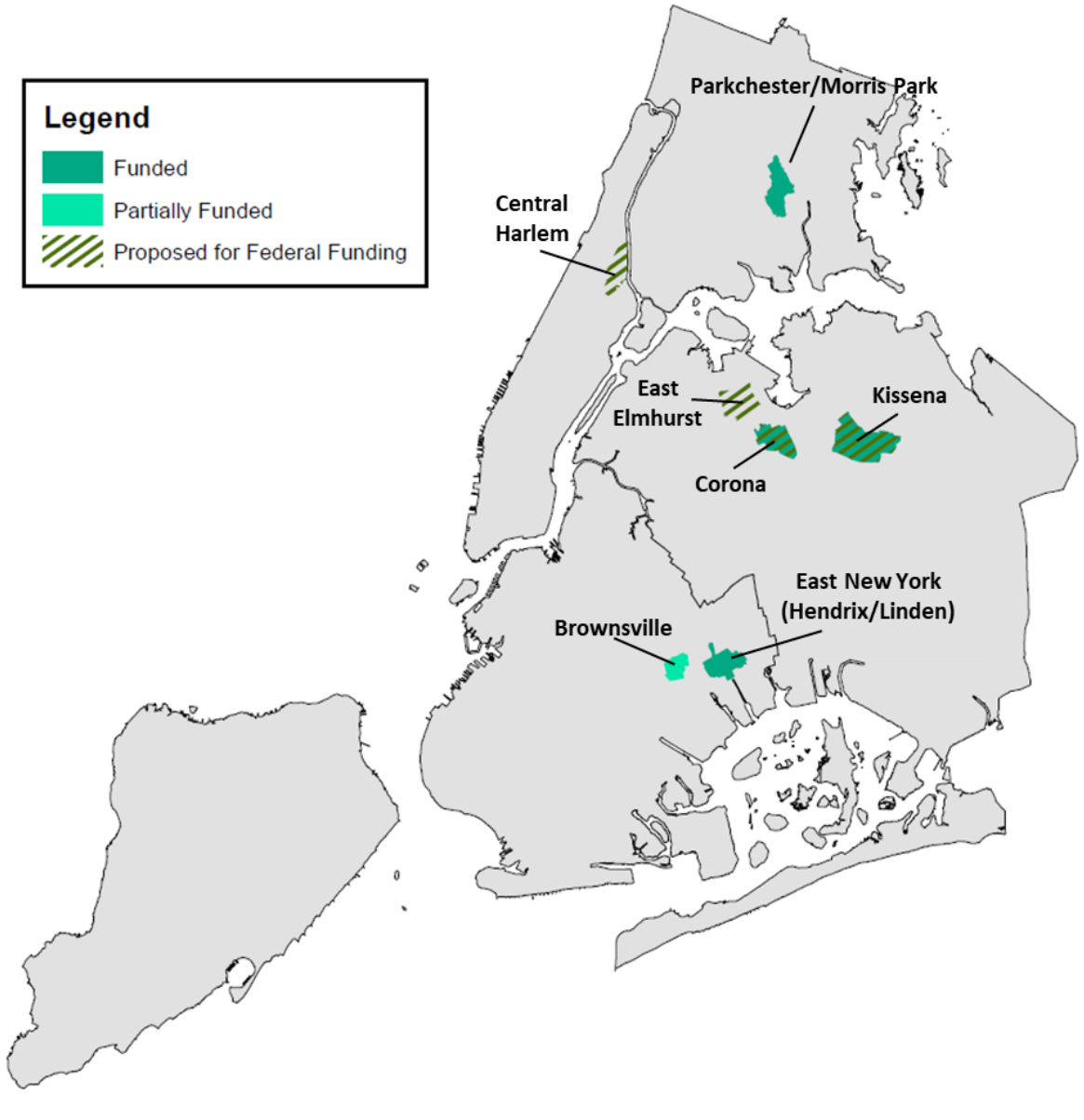
February 2025

Expanding the cloudburst program

- **Cloudburst Hubs** are identified at the sub-catchment scale, which are hydraulically connected areas based on the sewer network, that can:
  - Include infiltration, storage, and conveyance to reduce the flood depths of hotspots,
  - Connect onsite with right-of-way strategies, including diverting street runoff, and
  - Be a combination of green-grey strategies



Cloudburst Hub Implementation



$390M

City Funding Allocated

$40M

DEP Design Contracts Registered for 4 initial hubs

$224M

Additional Federal Funding Requested by DEP

Location + Context

NYC Parks

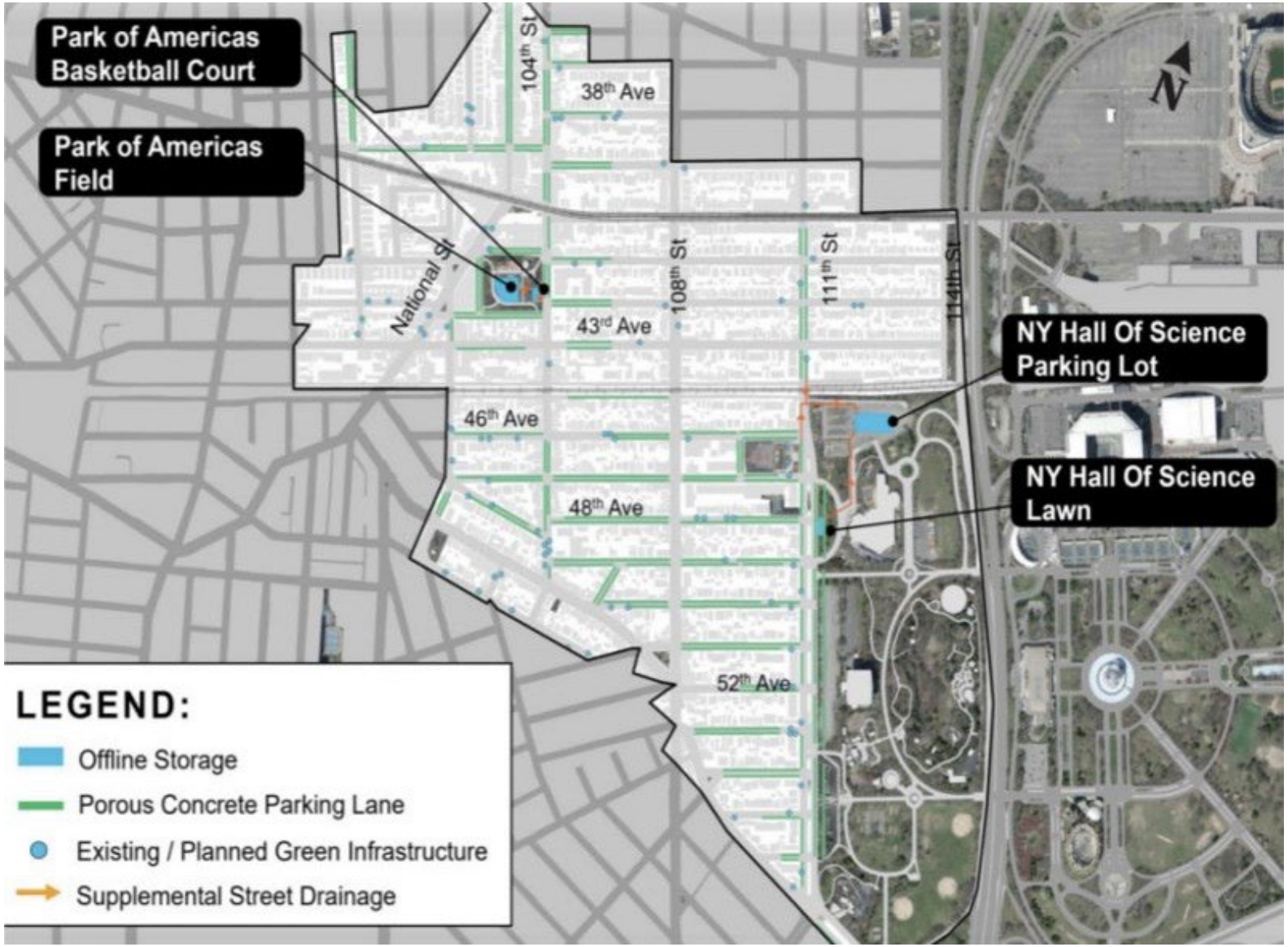
NYC Environmental Protection

Corona Cloudburst Hub

Flooding

Corona Cloudburst Hub

Boundary + Stormwater Management Interventions



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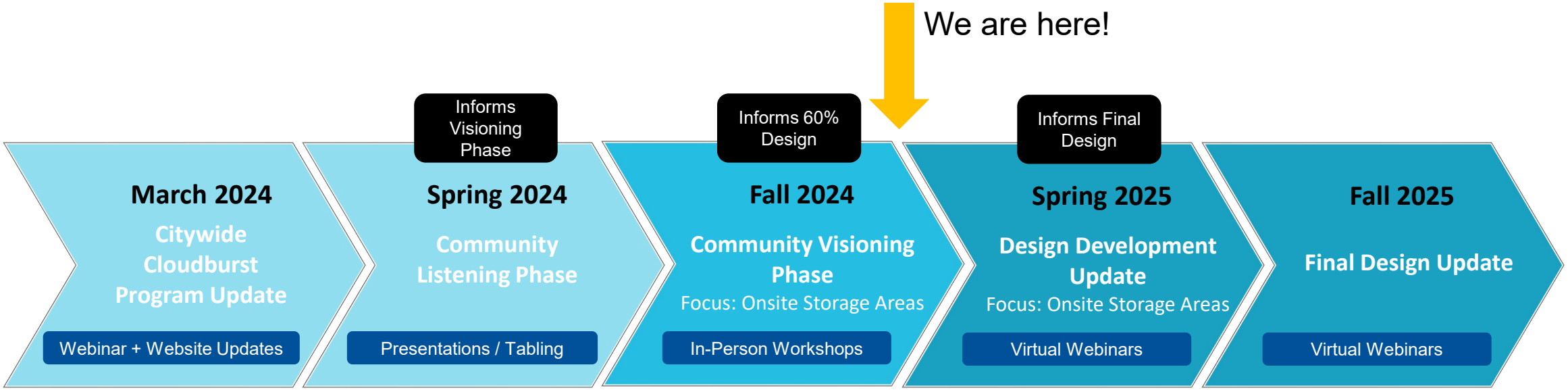
Engagement & Equity: Cloudburst Hub

Outreach Process



- Surveys
- Tabling Events
- Educational Activities
- Art Walks

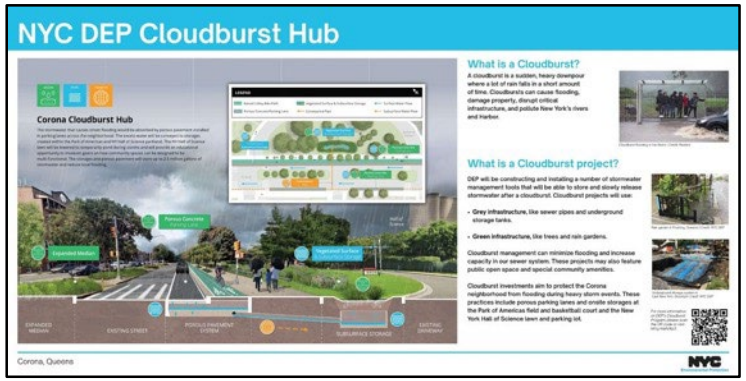
- Participatory Design Workshops
- Placemaking Options

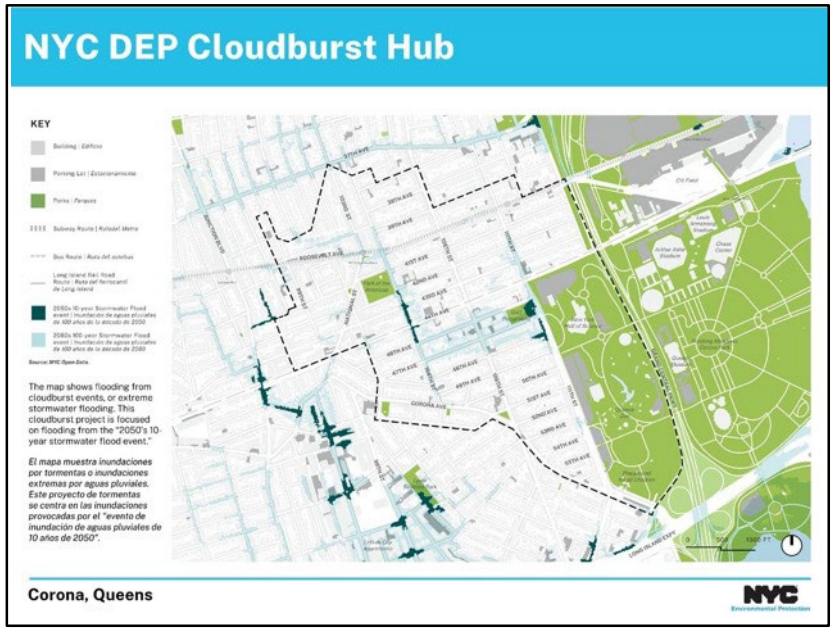
NYC Environmental Protection

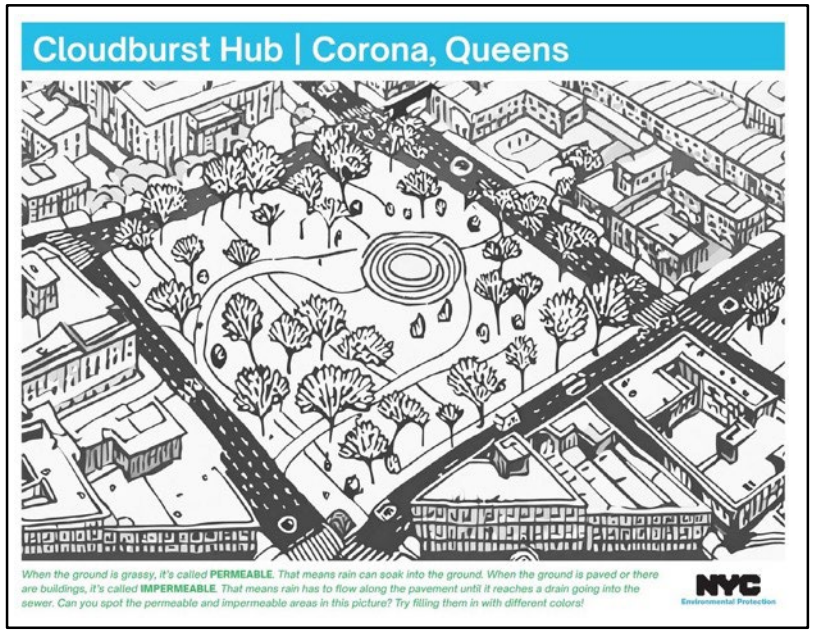
Public Engagement: Listening Phase

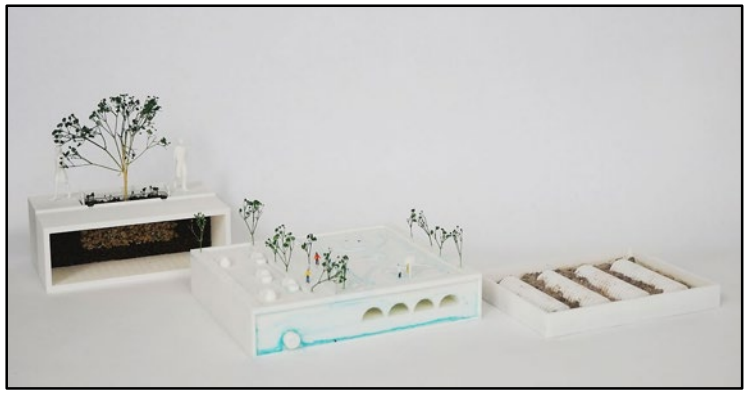
Engagement Materials

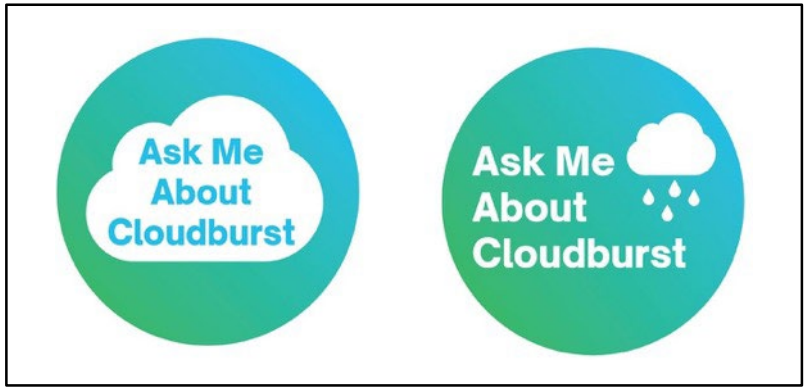
LISTENING PHASE





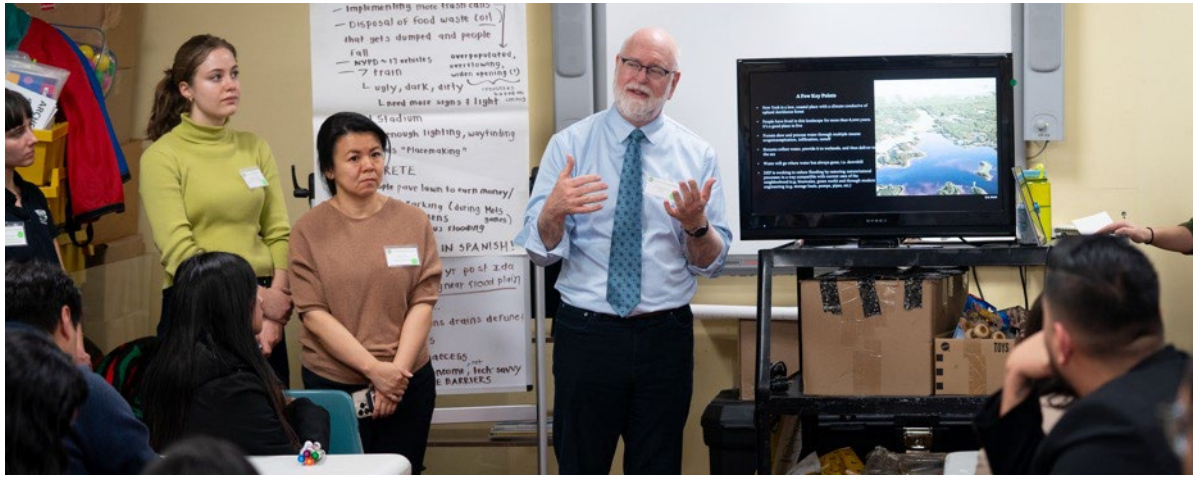






The Listening Phase utilized a variety of engagement materials in both Spanish and English: postcards, informational board, laminated map, 3D-printed sensory models, porous concrete sample, coloring pages, and “Ask Me About Cloudburst” stickers.

Community Resilience Workshop

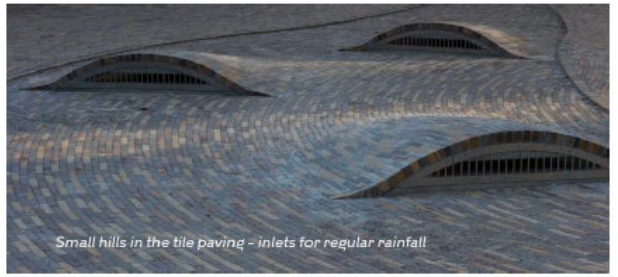


We strive to establish value through placemaking

Where we have the opportunity, we hope to enhance Cloudburst designs to include placemaking that will communicate:

- Why we experience flooding - hydrologic history and NYC realities of “living with water” now and into the future
- The benefits of invisible infrastructure
- Providing interim flood mitigation and community benefits while DEP longer term planning is underway
- Long-term engagement with communities

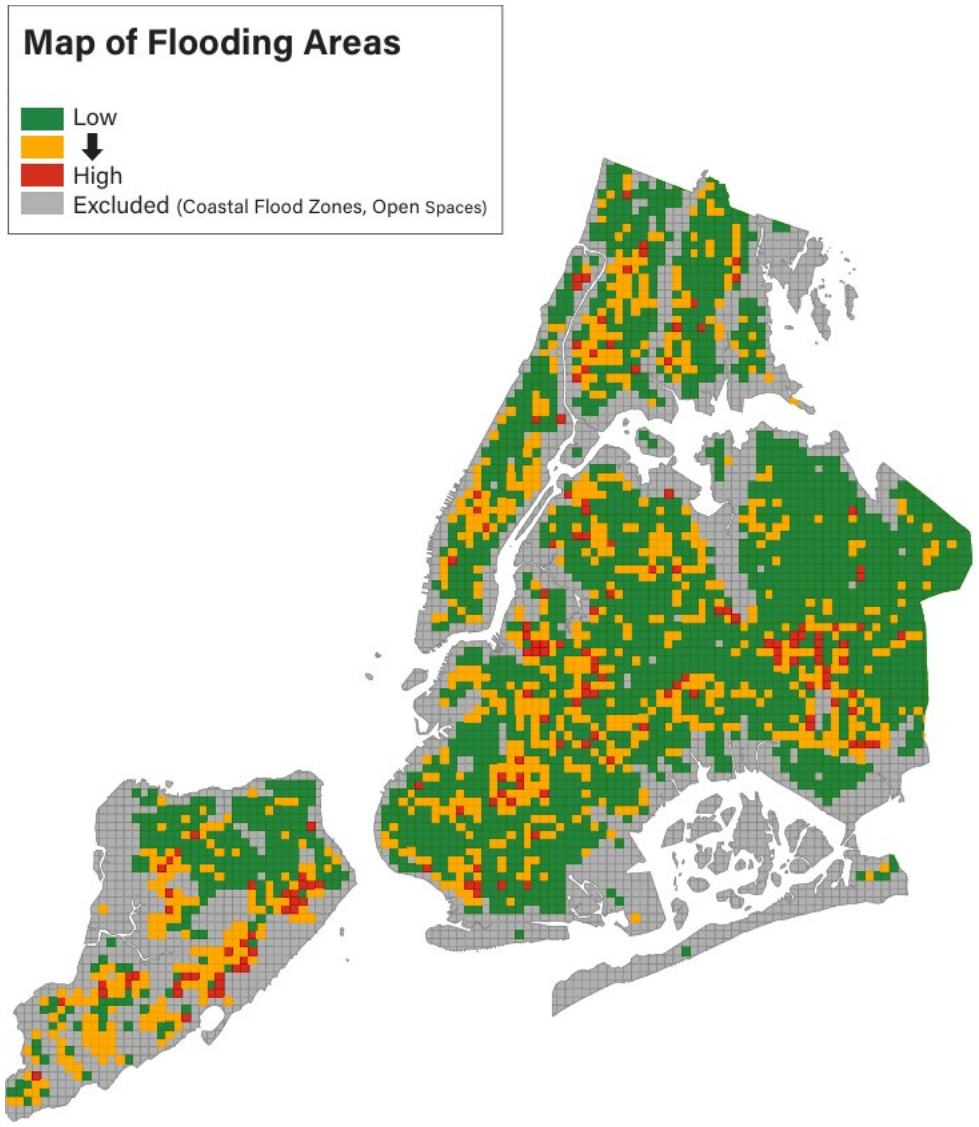
Edgewater Park in Minneapolis is designed to be sustainable, with prairie grass and native plants chosen for their low maintenance and their ability to capture storm-water. The pervious concrete fits right in. It's stained blue in places to mimic the paths of the nearby Mississippi and Minnesota rivers. Photo courtesy of Cemstone



Small hills in the tile paving - inlets for regular rainfall

What's next in NYC for stormwater resiliency

- Launching a "Stormwater Dashboard" and continuing community resilience conversations
- Complete build-out of trunk main network analyses and initiate "Smart Sewer" studies
- Recalibrate our stormwater resiliency models with new surface and in-sewer flow data
- Finalize stormwater "Level of Service" to address climate change – will likely need to consider allowance for some street flooding (<4in) and land acquisition to balance costs and risks
- Continue advancing Cloudburst Hubs
- Initiate about new grey, green, blue projects in priority areas



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