RESILIENT DANBURY

CAFM 2023

November 1, 2023

RESILIENT CONNECTICUT PHASE II

RESILIENT DANBURY

Resilient Connecticut Phase II

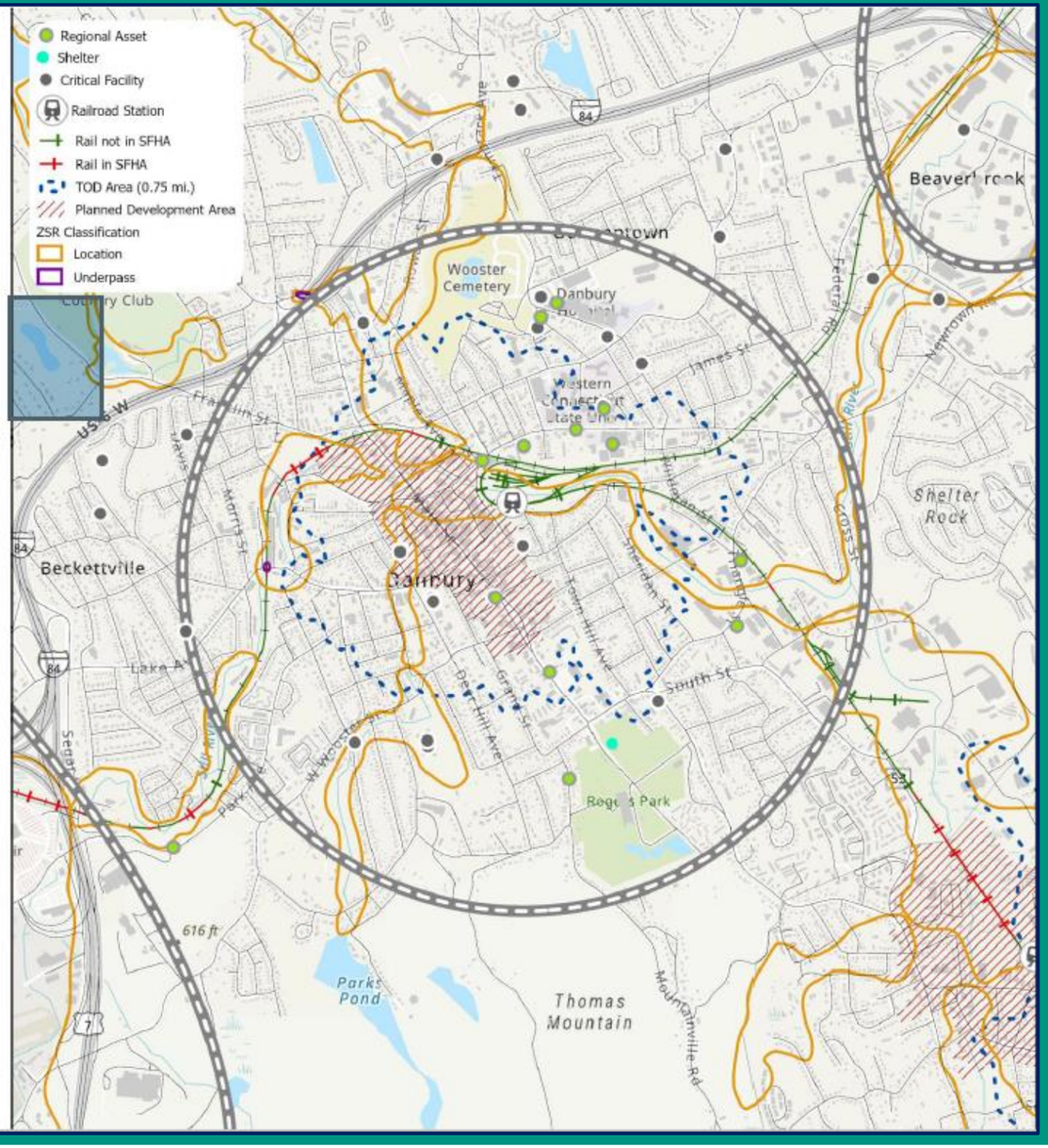
Regional Adaptation/Resilience Opportunity Areas

Name: Downtown Danbury
Location: Danbury

Considerations	Characteristics of Area
Flood Vulnerability	○ ○ ○ ● ●
Heat Vulnerability	○ ○ ○ ● ○
Social Vulnerability	○ ○ ○ ● ●

The center of Danbury is characterized by zones of shared risk associated with the confluence of Padanarum Brook, Kohanza Brook, and the Still River. Despite many flood risk reduction projects undertaken over decades, TOD and planned development areas are located in close proximity to – or within – these zones of shared risk. Numerous critical facilities, historic resources, and the terminus of the MetroNorth Danbury line are also located in the area. Downtown Danbury is a regional center for northern WestCOG.
Almost all of the downtown area is moderately vulnerable to heat, with the highest vulnerable area concentrate along route 53 commercial properties. Presenting few opportunities for shade or street trees, the area has high heat emittance. In addition, there is high social sensitivity throughout the area.

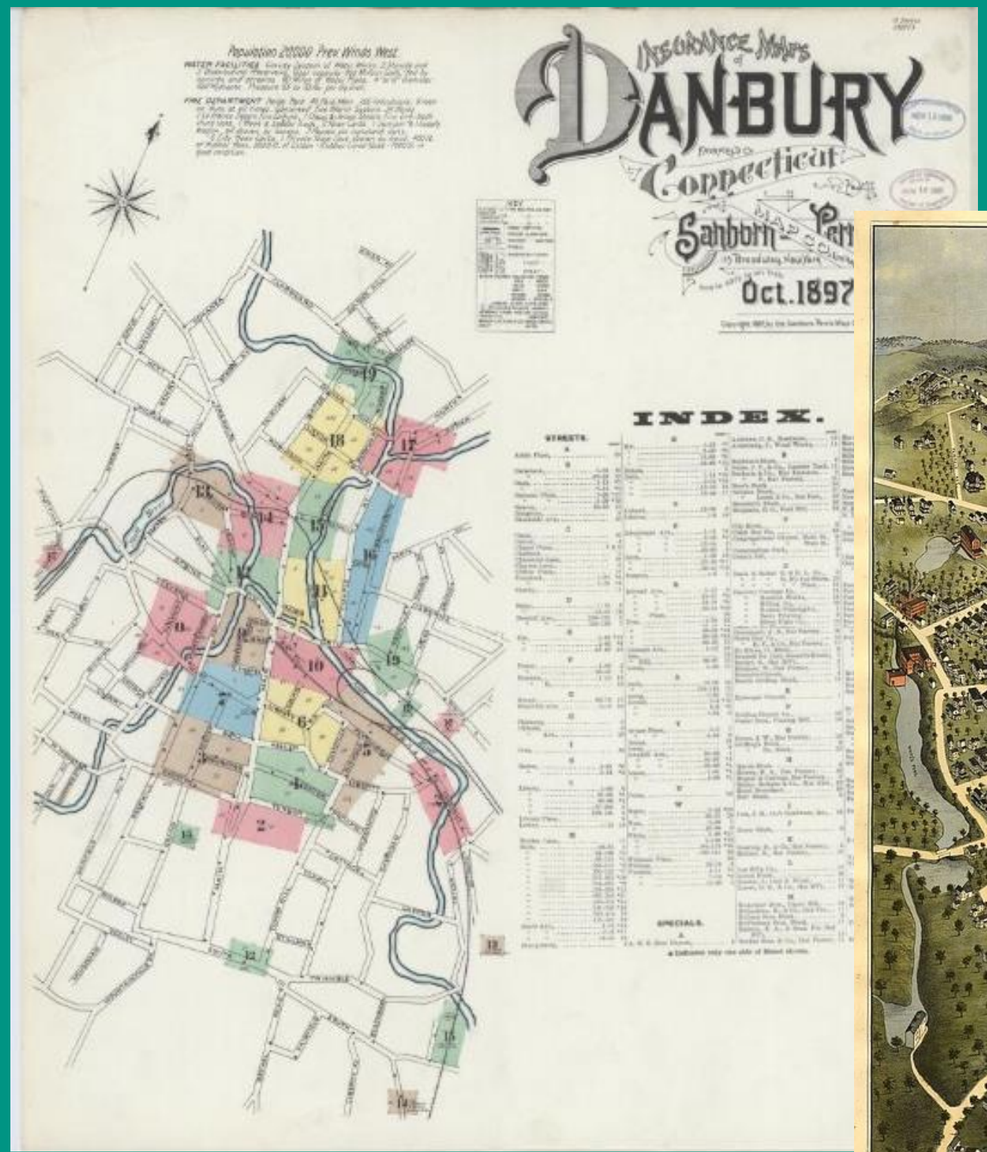
- City Hall
- Fire headquarters
- Hose Co. 5, 6, 7, and 9
- Danbury Hospital
- Danbury Health and Housing Dept.
- Western CT State College Police
- Assisted living facilities
- War Memorial
- Substation
- Power plant
- Museums

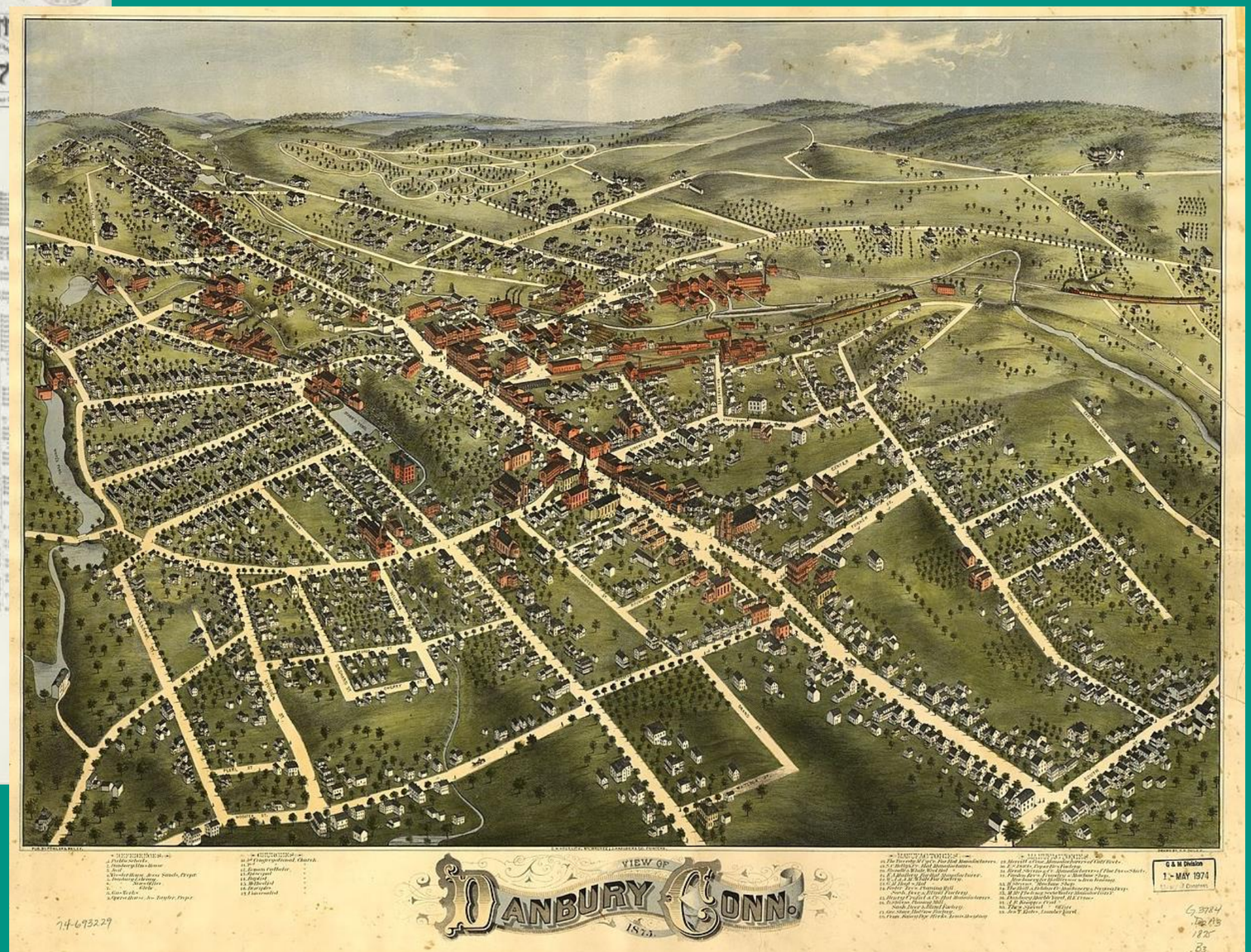


RESILIENT DANBURY

HOW WE GOT HERE

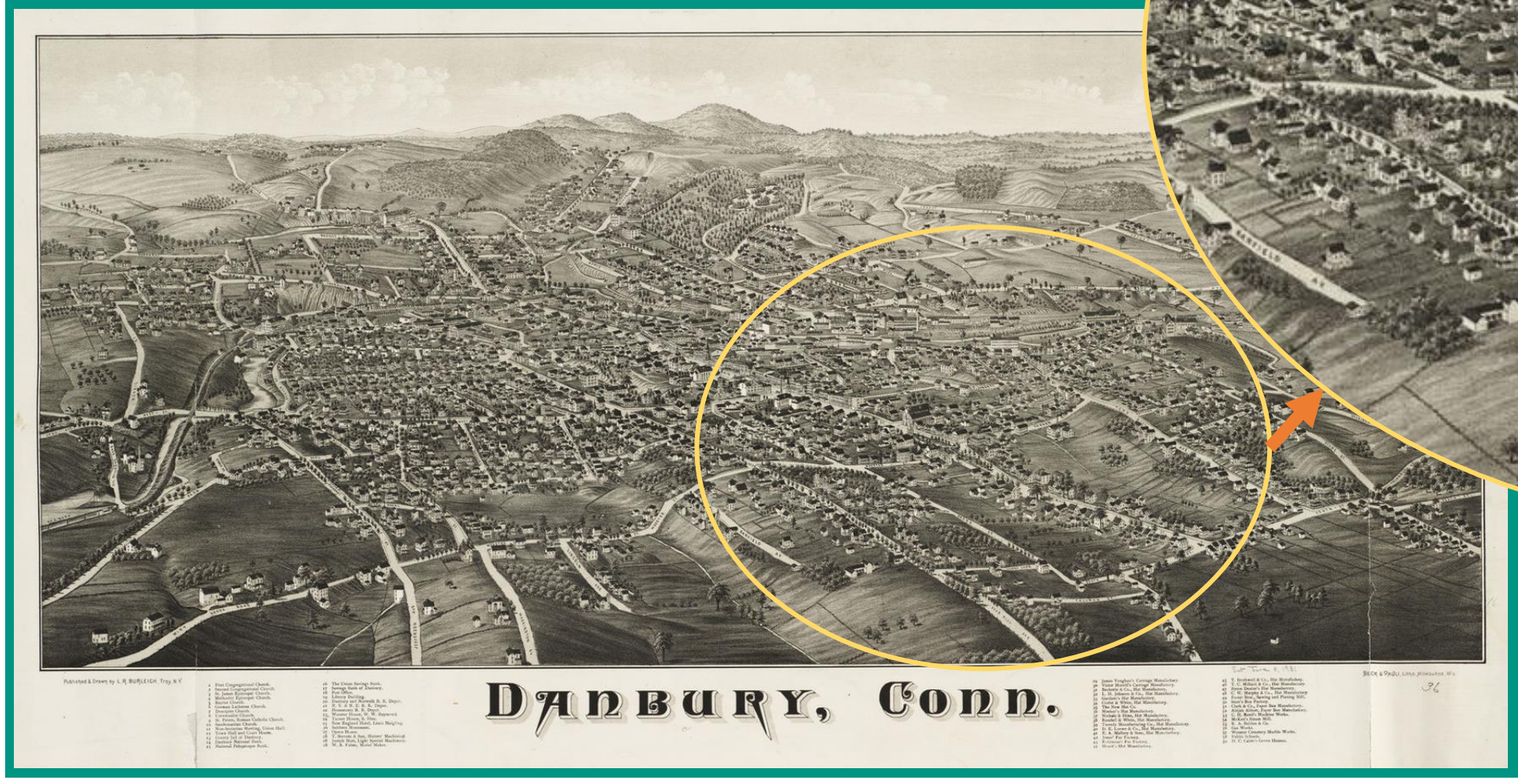
RESILIENT DANBURY





EAST DITCH FLOODING & EXTREME HEAT

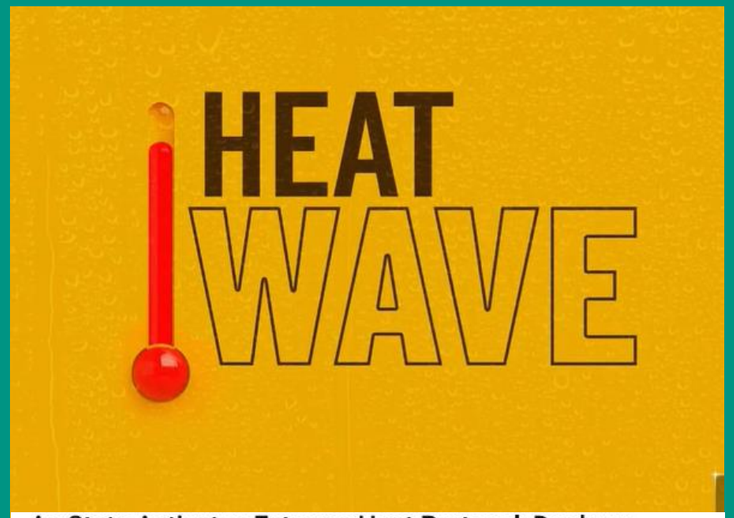
RESILIENT DANBURY



EAST DITCH FLOODING

RESILIENT DANBURY

DANBURY EXTREME HEAT



As State Activates Extreme Heat Protocol, Danbury Cooling Centers Open

With temps forecasted to soar, lasting for days, cooling centers in Danbury are open.

Rich Kirby, Patch Staff

Posted Tue, Jul 19, 2022 at 4:07 pm ET

Reply

NEWS

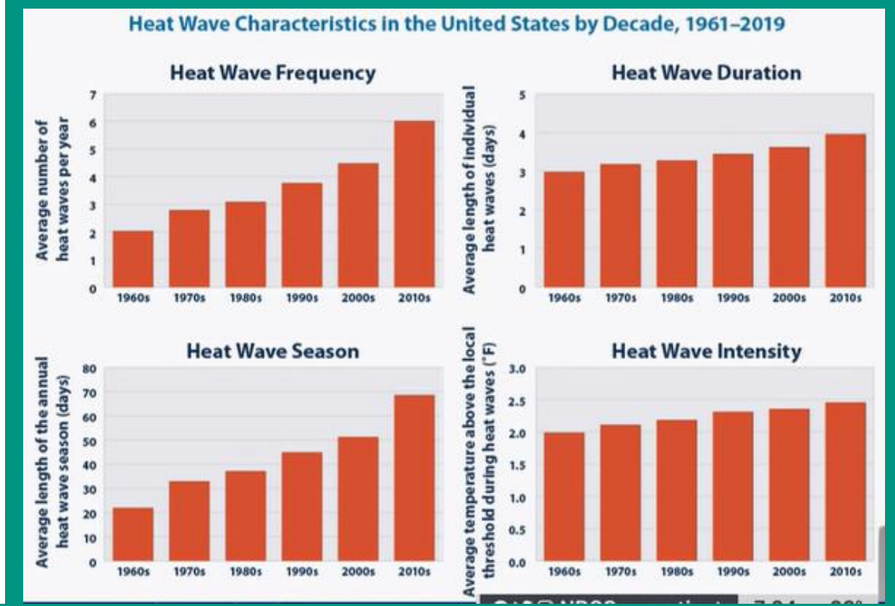
Danbury is heating up: Here's what the city is doing to prepare and help residents cope.

Doug Girardot
Aug. 7, 2022

HEAT WAVE

Lamont Activates CT's Extreme Weather Protocol Ahead of Forecasted Heat

Published August 1, 2022 • Updated on August 1, 2022 at 10:59 pm



RESILIENT DANBURY

What makes it worse?

- Widespread impervious surfaces
- Limited and disconnected green spaces/shade

What is Danbury doing?

- Developing strategies to reduce the impacts of extreme heat Danbury while enhancing quality of life

RESILIENT DANBURY

HEAT CONTRIBUTORS

RESILIENT DANBURY

WHERE WE ARE GOING

RESILIENT DANBURY PROJECT OVERVIEW

WE WILL NEVER ELIMINATE FLOODING!

We can reduce depth, duration, and extent.

PRIORITIES

1. Address Critical Transportation and Resilience Corridors
2. Reduce Flood Risk and Coordinate with Redevelopment Efforts
3. Reduce the Impacts of Extreme Heat
4. Integrate Nature-Based Solutions + Green Infrastructure with City Green and Resilience Initiatives.

Library/ Post Office/City Hall
1. UNITED STATES POST OFFICE
2. PUBLIC LIBRARY
3. CITY HALL

Religious Center
1. UNIVERSAL CHURCH
2. ALL NATION BAPTIST CHURCH
3. ST. JAMES EPISCOPAL CHURCH
4. TEMPLE BETHEL
5. STRONG GOD CHURCH
6. EMANUEL ASSEMBLY-GOD CHURCH
7. GREATER MERCY TEMPLE CHURCH
8. SACRED HEART CHURCH
9. SEVENTH DAY ADVENTIST CHURCH

Community Center
1. LEBANON-AMERICAN CLUB
2. ECUADORIAN CIVIC CENTER
3. DANBURY COMMUNITY CENTER
4. OUR LADY OF APARECIDA PARISH - BRAZILIAN COMMUNITY CENTER

Affordable Housing
1. AFFORDABLE HOUSING
2. PROPOSED AFFORDABLE HOUSING

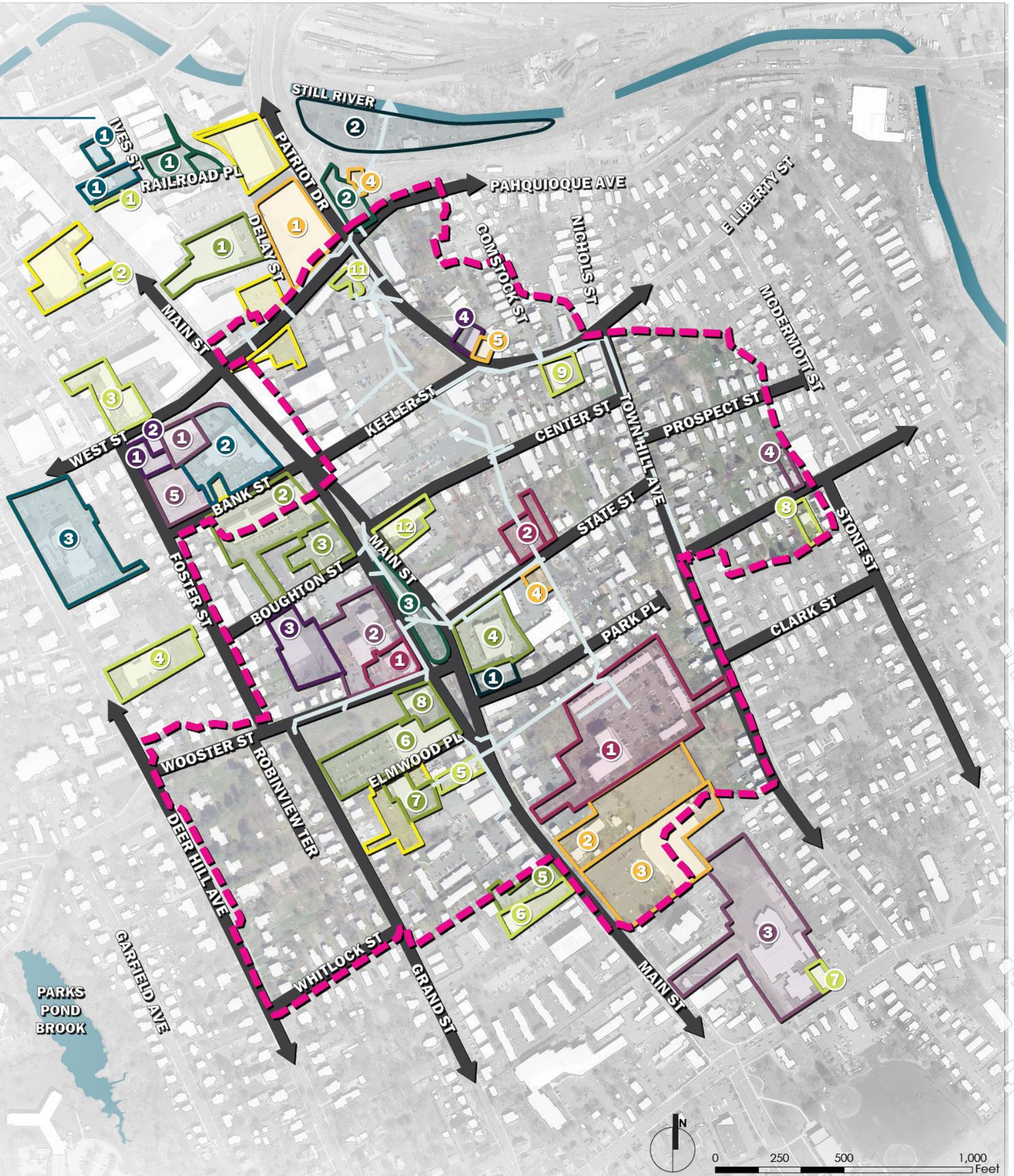
Healthcare Facility & Senior Center
1. COMMUNITY HEALTH CENTER OF DANBURY
2. PALACE VIEW SENIOR HOUSING
3. GREATER DANBURY COMMUNITY HEALTH CENTER
4. PHARMACY (WALGREENS)
5. PLANNED PARENTHOOD
6. GREATER DANBURY COMMUNITY HEALTH CENTER
7. ELMWOOD HALL SENIOR CENTER
8. DANBURY REGIONAL WIC NUTRITION PROGRAM / OLD JAIL

School/ Educational Centers
1. CENTER FOR EMPOWERMENT & EDUCATION
2. ST. PETER'S SCHOOL
3. SOUTH STREET SCHOOLS
4. SACRED HEART SCHOOL
5. HEAD START CENTER

Public Open Space
1. DANBURY CITY CENTER GREEN
2. DANBURY SKATE PARK
3. ELMWOOD PLACE

State of Connecticut
1. FAIRFIELD COUNTY COURTHOUSE
2. TRAIN STATION

Other
1. ICE RINK
2. MUSEUM AND HISTORICAL SOCIETY
3. GROCERY STORE (PRICE RITE)
4. CONNECTICUT LIGHT & POWER CO
5. BECKERIE & CO. FIRE ENGINE 9



LEGEND

- Ex. Outfalls
- Ex. Conduits
- City of Danbury Parcels
- Watershed Boundary
- Roadways

RESILIENT DANBURY

EXISTING DRAINAGE SYSTEM: FLOOD EXTENTS FOR CURRENT 100% (1-yr), 10% (10-yr) & 1% (100-yr) ANNUAL CHANCE FLOOD EVENTS

The maximum flooding extents for each recurrence interval were determined through PCSWMM modeling. The flood extents for the 100% (1-year), 10% (10-year), and 1% (100-year) annual chance of exceedance storms under current climate conditions are shown to the right.

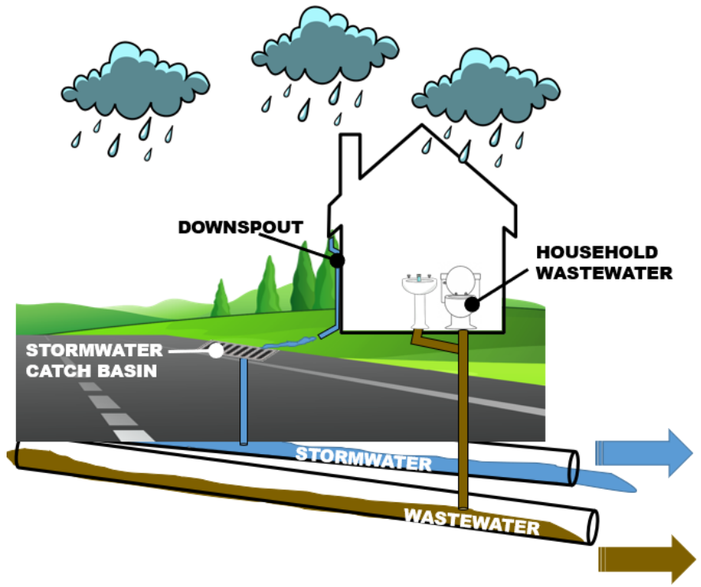
LEGEND

- Current 1% Annual Chance Flood
- Current 10% Annual Chance Flood
- Current 100% Annual Chance Flood
- Watershed Boundary
- Roadways

RESILIENT DANBURY

THE SOLUTION

WHAT IS GREEN INFRASTRUCTURE?



STORMWATER DRAINS to STREAMS, PONDS, or WETLANDS

WASTEWATER FLOWS to CITY TREATMENT PLANT for PROCESSING

Green infrastructure refers to systems and practices that **reduce** stormwater **runoff** through use of vegetation, soils, and natural processes to manage water and create healthier urban and suburban environments. These practices **capture, manage, and/or reuse rainfall** close to where it falls, reducing stormwater runoff and keeping it out of drainage systems and receiving waters.

Rain Gardens: Small, shallow sunken areas of planting that collect stormwater runoff from routes, streets, and sidewalks. Rain gardens are designed to mimic the natural flow and infiltration of stormwater.

Treebox Filters: Treebox filters are often found along sidewalks, street curbs, and car parks. The features accommodate a low volume of water.

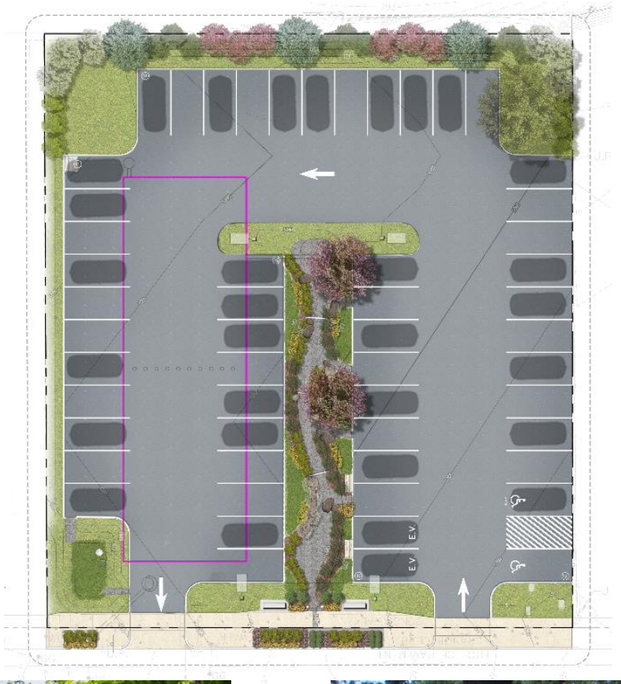
Roadside Bioswales: Bioswales are often found along road curbs and parking lots and use vegetation or mulch to slow and filter stormwater flow.

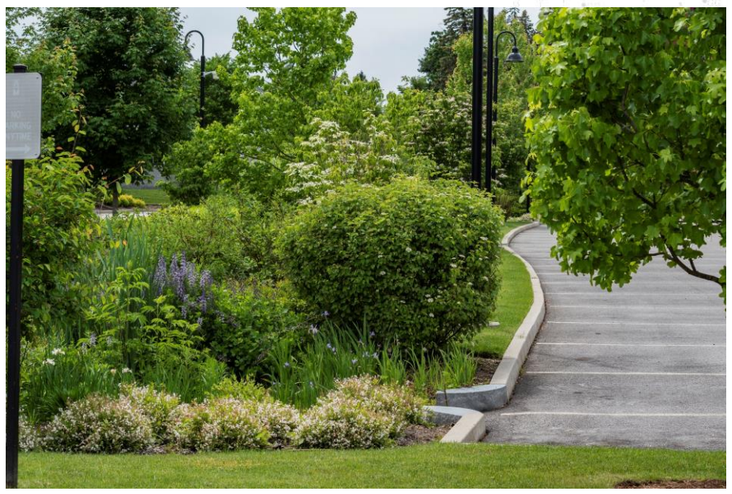
Underground Storage and Detention Systems: Underground systems are an efficient way to store, detain, and infiltrate stormwater runoff. The land above can be used for parking, parks, or other

BENEFITS OF GREEN INFRASTRUCTURE

FUSS & O'NEILL

- Increases flood resiliency
- Improves water quality
- Improves air quality
- Reduces streambank erosion
- Sequester carbon
- Adds aesthetic interest
- Contributes to overall economic vitality
- Helps reduce energy consumption
- Improves property values
- Promotes adaptation to climate change

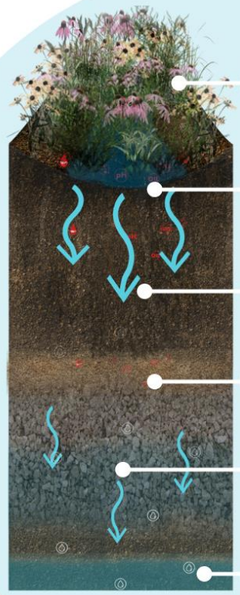




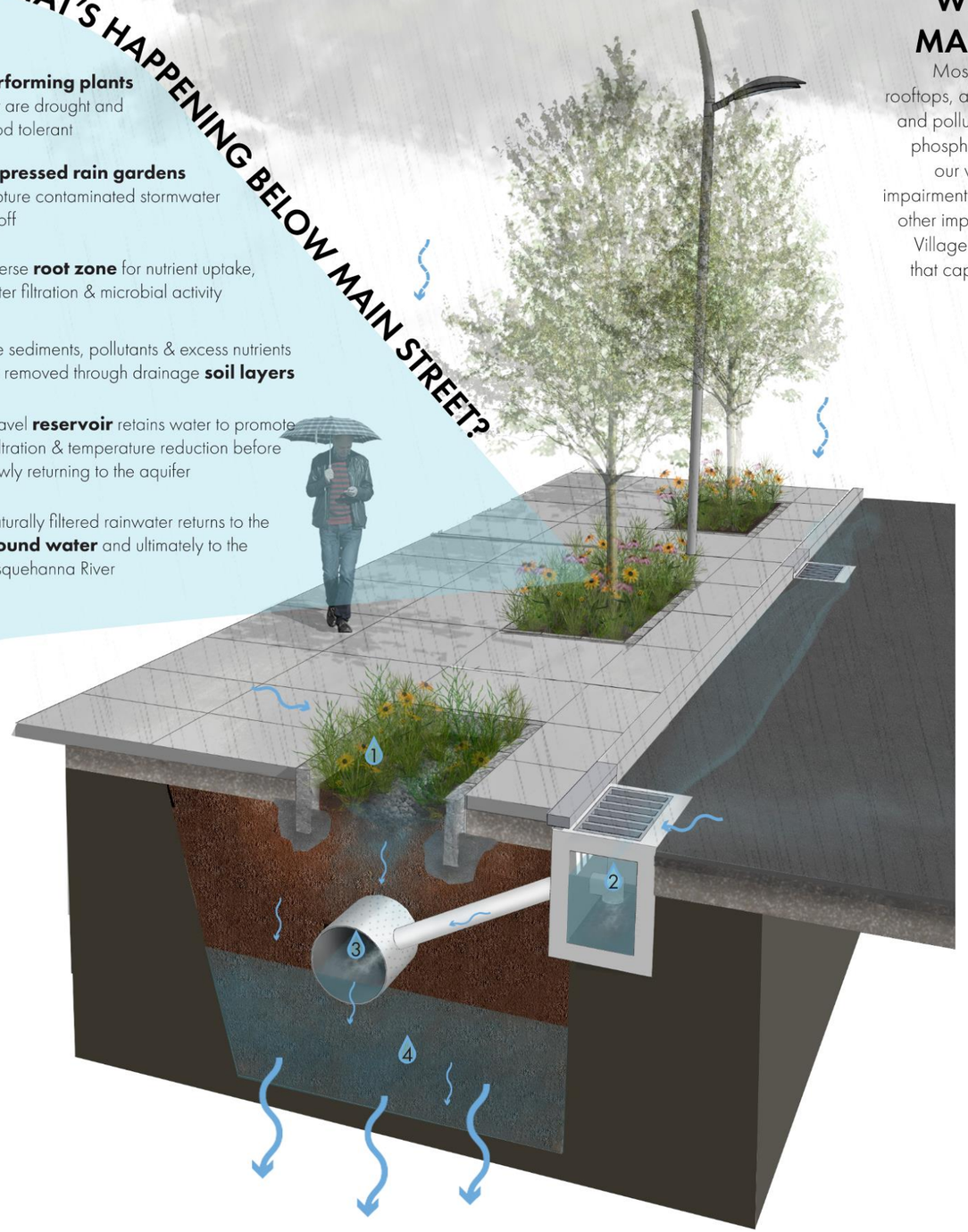
STORMWATER ON MAIN ST.

Green Infrastructure Approach to Responsible Stormwater Management

WHAT'S HAPPENING BELOW MAIN STREET?



1. **Performing plants** that are drought and flood tolerant
2. **Depressed rain gardens** capture contaminated stormwater runoff
3. Diverse **root zone** for nutrient uptake, water filtration & microbial activity
4. Fine sediments, pollutants & excess nutrients are removed through drainage **soil layers**
5. Gravel **reservoir** retains water to promote infiltration & temperature reduction before slowly returning to the aquifer
6. Naturally filtered rainwater returns to the **ground water** and ultimately to the Susquehanna River



SYSTEM DESIGN + FUNCTION

1. **Rain Gardens** are designed to collect stormwater from impervious surfaces before reaching the existing conventional stormwater drainage system.
2. **Catch Basins** will collect storm water from the road to be pretreated by removing floating and heavy sediments before entering the green infrastructure system.
3. **Perforated Pipes** collect pretreated water from the catch basins. Water percolates into the reservoir below through openings in the pipe. If the reservoir fills, the pretreated water will flow to the connected existing conventional stormwater system.
4. **The Rain Garden Reservoir** has storage capacity to hold collected water, releasing it slowly over time. Sidney's Reservoir can hold 960 cubic yards of water. That's like filling 193,895 one gallon jugs of water!

WHY IS A RESPONSIBLE STORMWATER MANAGEMENT STRATEGY IMPORTANT?

Most stormwater runoff occurs during a rainfall or snow melt. It travels off our rooftops, along our roadways, parking lots and sidewalks picking up contaminants and pollutants before outputting into **local water systems**. Sediment, nitrogen, phosphorus, bacteria, oil and grease, trash, pesticides and metals can leak into our water systems making stormwater runoff the number one cause of stream impairment in urban areas. Runoff can cause water pollution, erosion, flooding and other impacts to the environment and the **integrity of our infrastructure.** The Village of Sidney, New York has adopted a natural, green infrastructure system that captures, cleanses and reduces stormwater runoff using **plants, soils** and **microbes.**

THESE PLANTS ROOT THE SYSTEM

Stormwater Management Systems rely on vegetation to stabilize soil, filter contaminants, absorb nutrients, intercept and transpire water, and support a healthy soil biology. Diverse Root types and depths are important for performance. These species are tolerant of both wet and dry conditions!


Zelkova


Flowering Dogwood


Purple Coneflower


Dwarf Fountain Grass


Sea Holly


Black Eyed Susan

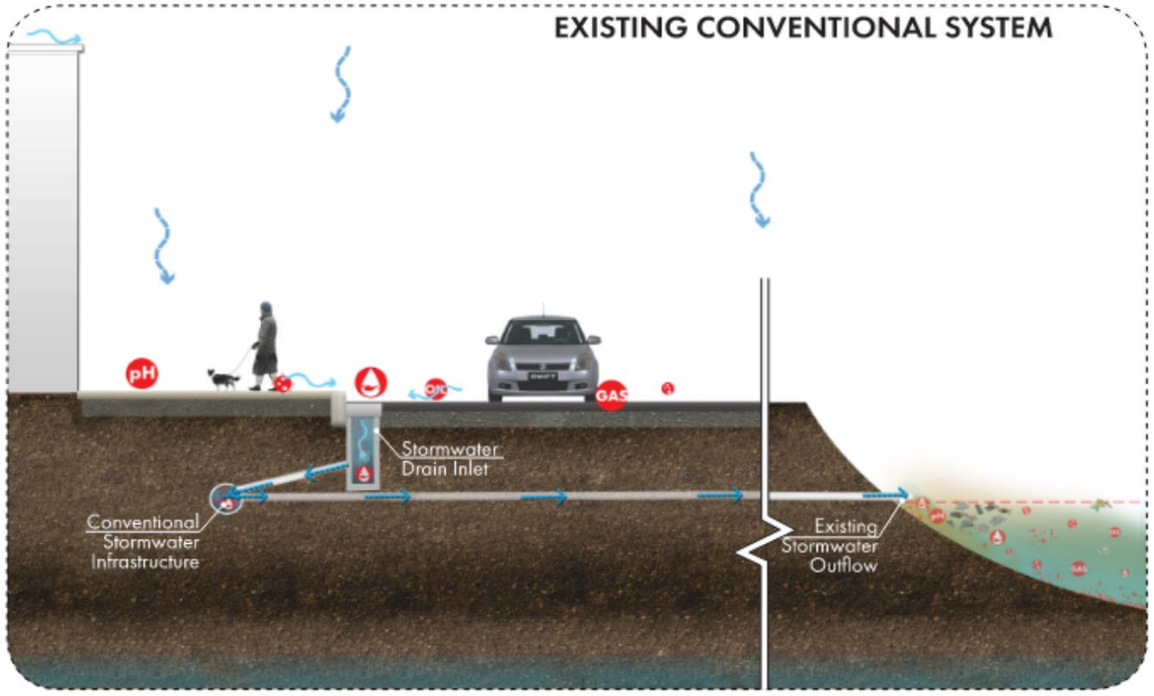

Tufted Hairgrass


May Night Salvia


Gold Coast Juniper

INFILTRATING INFRASTRUCTURE

Improving Water Quality In Danbury



URBAN RUNOFF ⟶ CONTAMINANTS ⟶ PIPE NETWORK ⟶ UNHEALTHY RIVER

1

Urban runoff collects contaminants from rooftops, roadways, parking lots, sidewalks & other impervious surfaces.

2

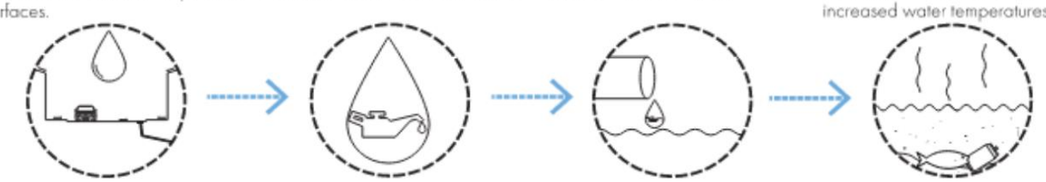
Chemical, nutrient and thermal contaminants are collected with runoff and directed to storm drains.

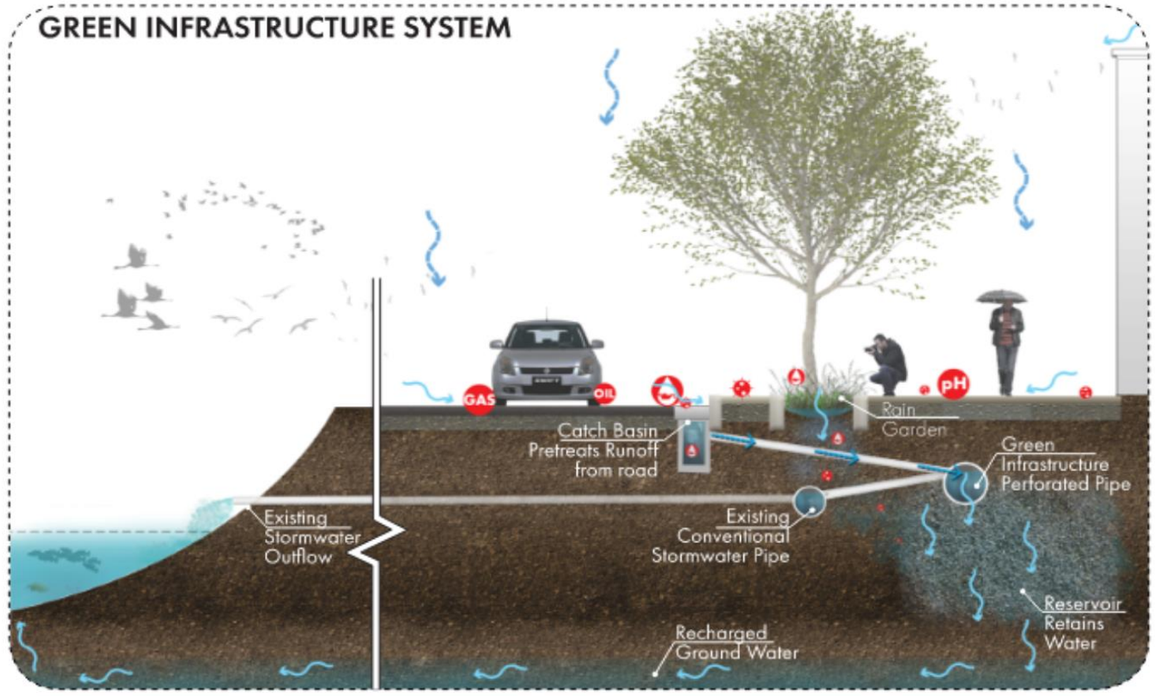
3

Contaminated runoff travels the pipe networks until it daylights into local water sources.

4

Local water bodies are polluted with heavy metals, algae inducing nutrients, sedimentation and increased water temperatures.





HEALTHY RIVER ⟵ PIPE NETWORK ⟵ CONTAMINANTS ↓ GREEN INFRASTRUCTURE ⟵ URBAN RUNOFF

5

A reduction of runoff entering the conventional system promotes good water quality and a healthy ecosystem for the Susquehanna.

4

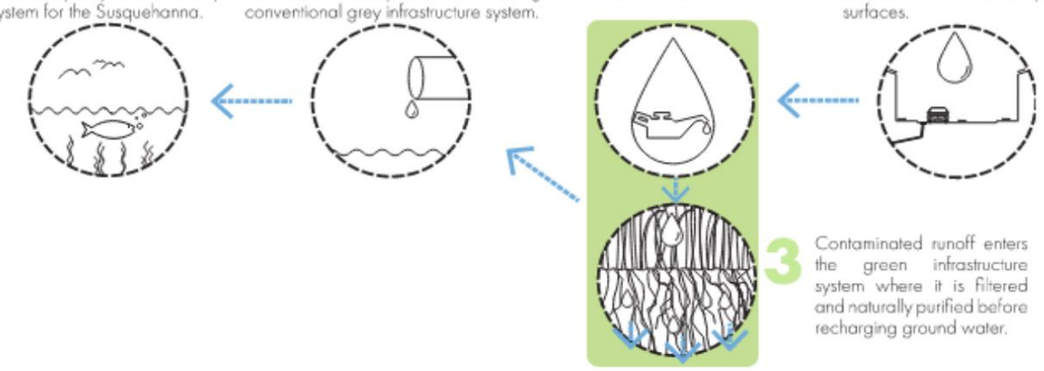
Only in heavy storm events when the reservoir has reached capacity will water backup into the existing conventional grey infrastructure system.

2

Chemical, nutrient and thermal contaminants are collected with runoff and directed to storm drains.

1

Urban runoff collects contaminants from rooftops, roadways, parking lots, sidewalks & other impervious surfaces.



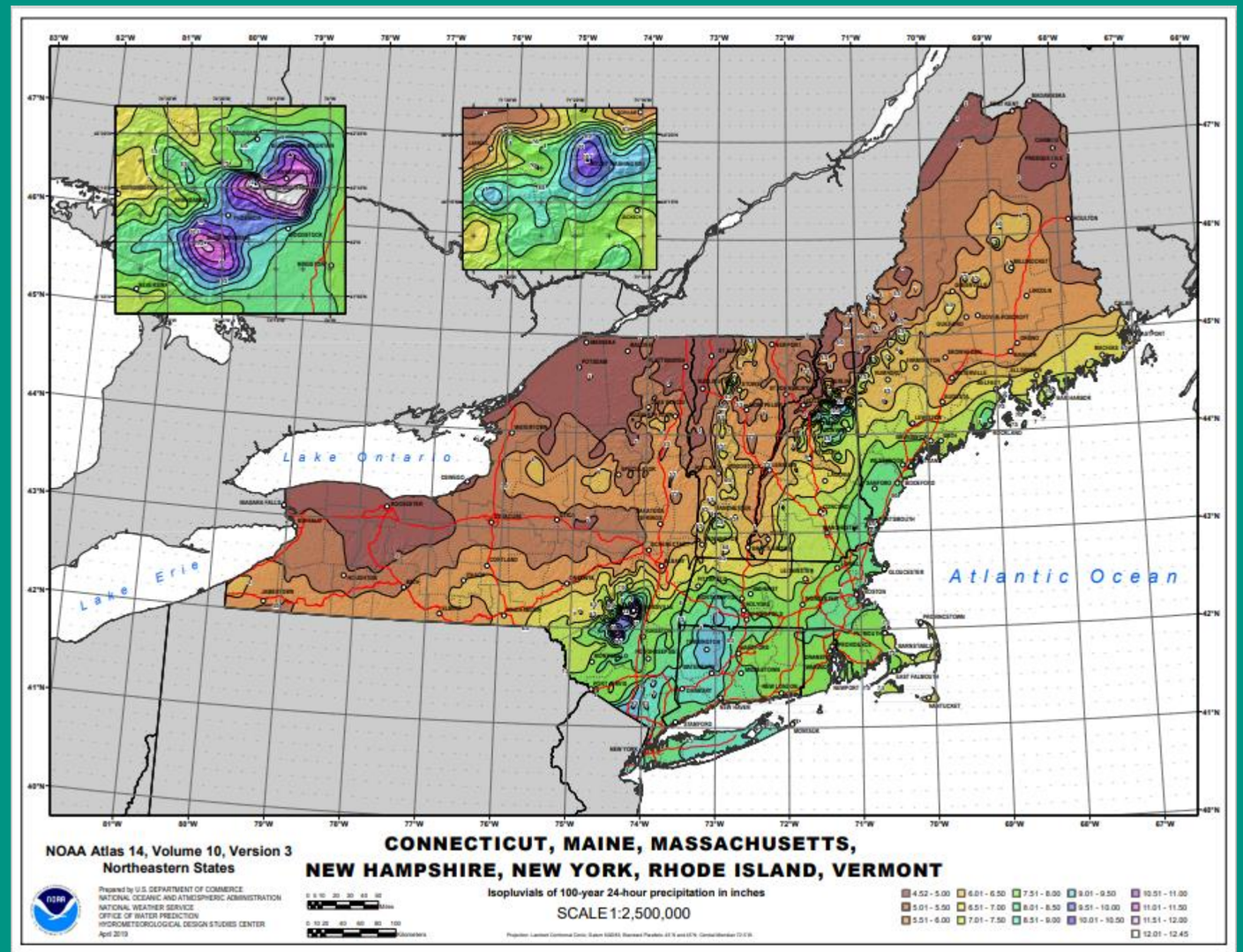
3

Contaminated runoff enters the green infrastructure system where it is filtered and naturally purified before recharging ground water.

CURRENT AND FUTURE FLOOD CONDITIONS ANALYSIS

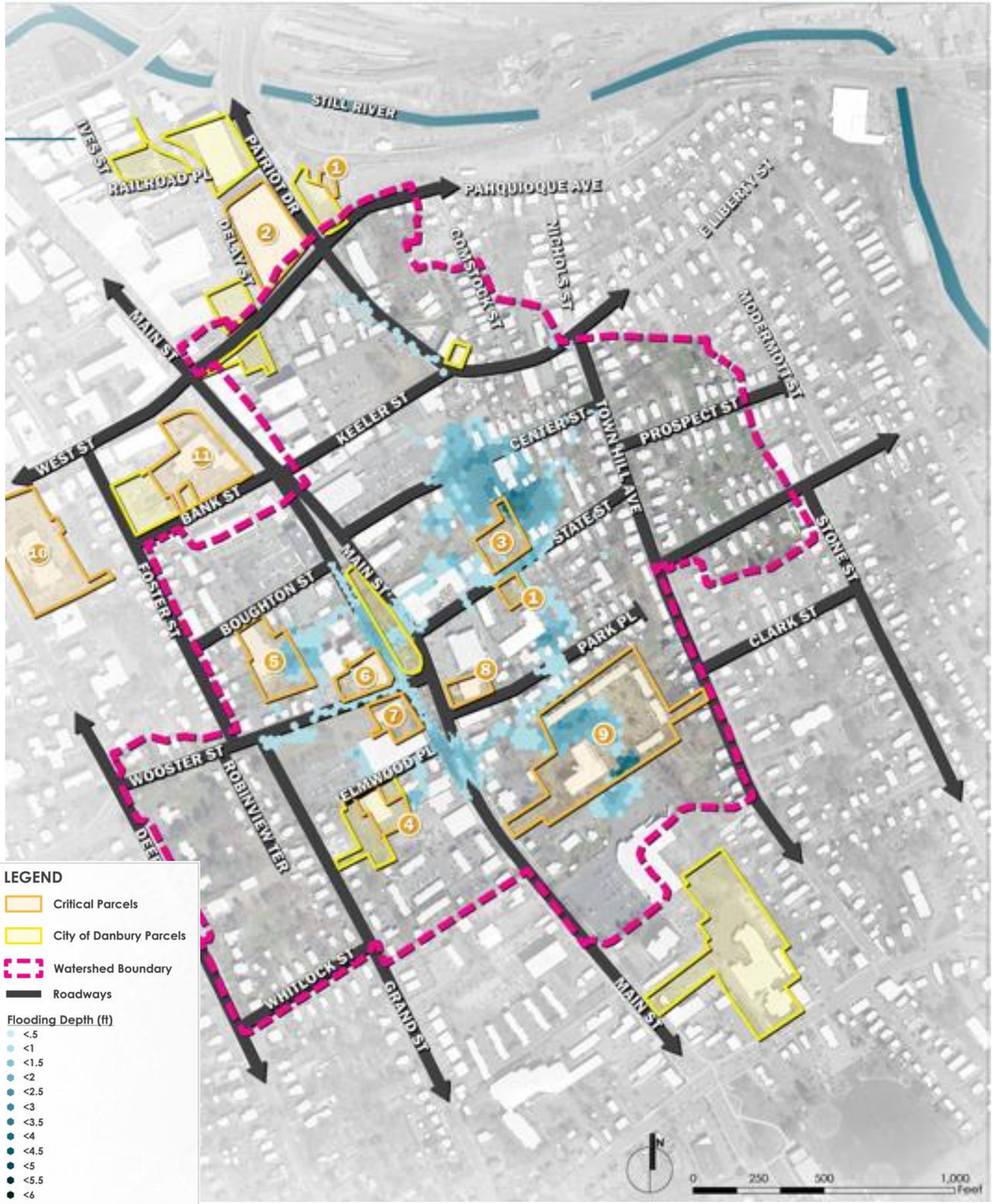
RESILIENT DANBURY

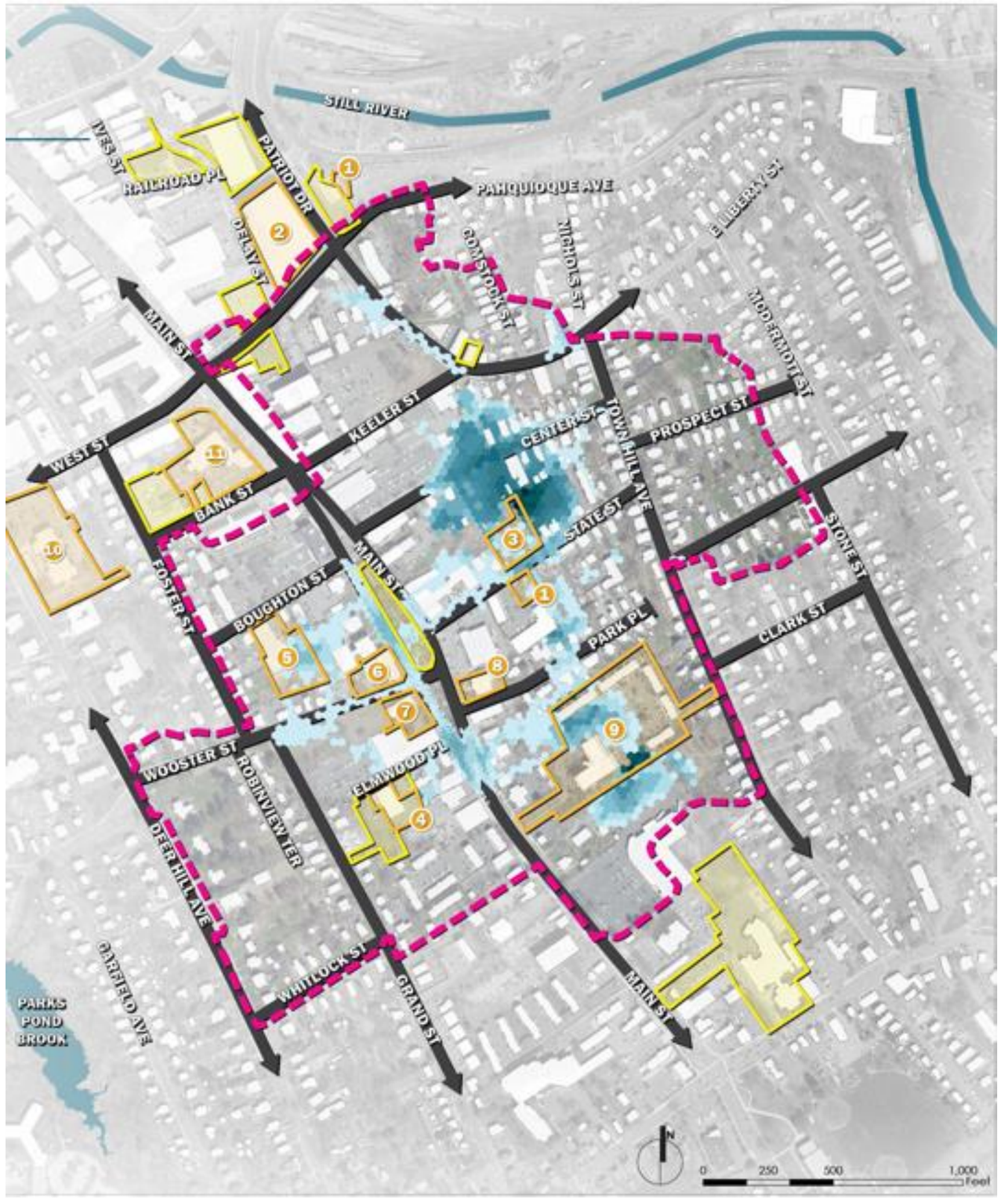
- **Data collection** – field and GIS
- **Drainage System Modeling** – PCSWMM
- **Current** Conditions = Current **measured** rainfall
  - Based on historic conditions
- **Future** Conditions = Future **predicted** rainfall
  - CIRCA Connecticut Physical Climate Science Assessment Report (PCSAR) for the mid-century planning horizon (2040-2069)
- **Model results agree with observed flooding**



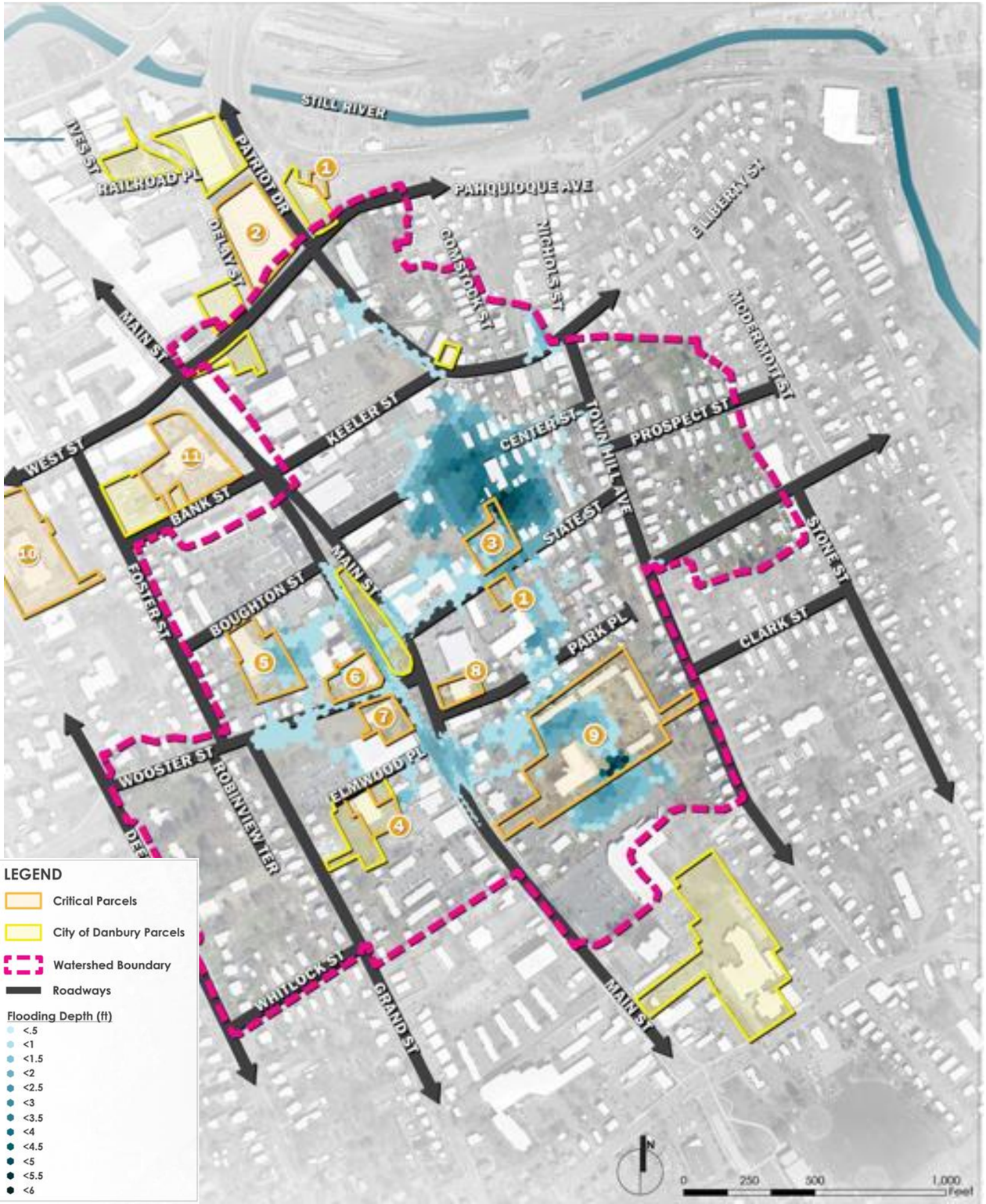

Bus Routes
Potential Green Infrastructure Parcels
Potential Cooling Centers
100ft. From Bus Route
200ft. From Bus Route
300ft. From Bus Route
400ft. From Bus Route
500ft. From Bus Route
Dewberry
0
0.2
0.3
Miles
N

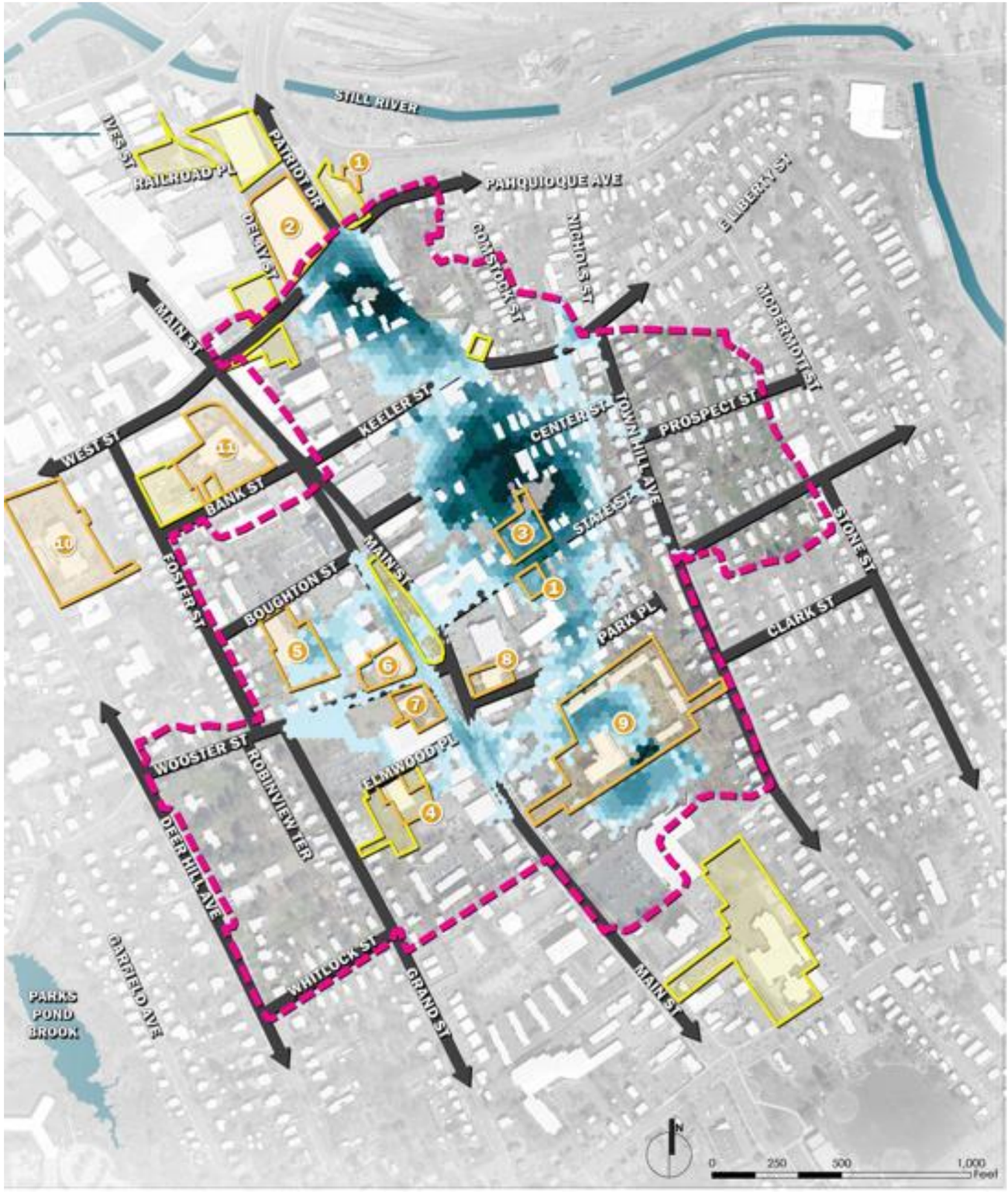
EXISTING VS. FUTURE 10% CHANCE EVENT (10-YEAR)





EXISTING VS. FUTURE 1% CHANCE EVENT (100-YEAR)





VALIDATION OF FLOOD MODELING

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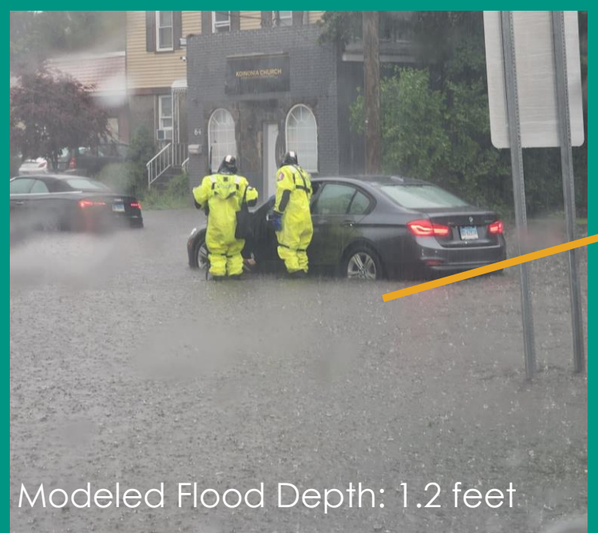
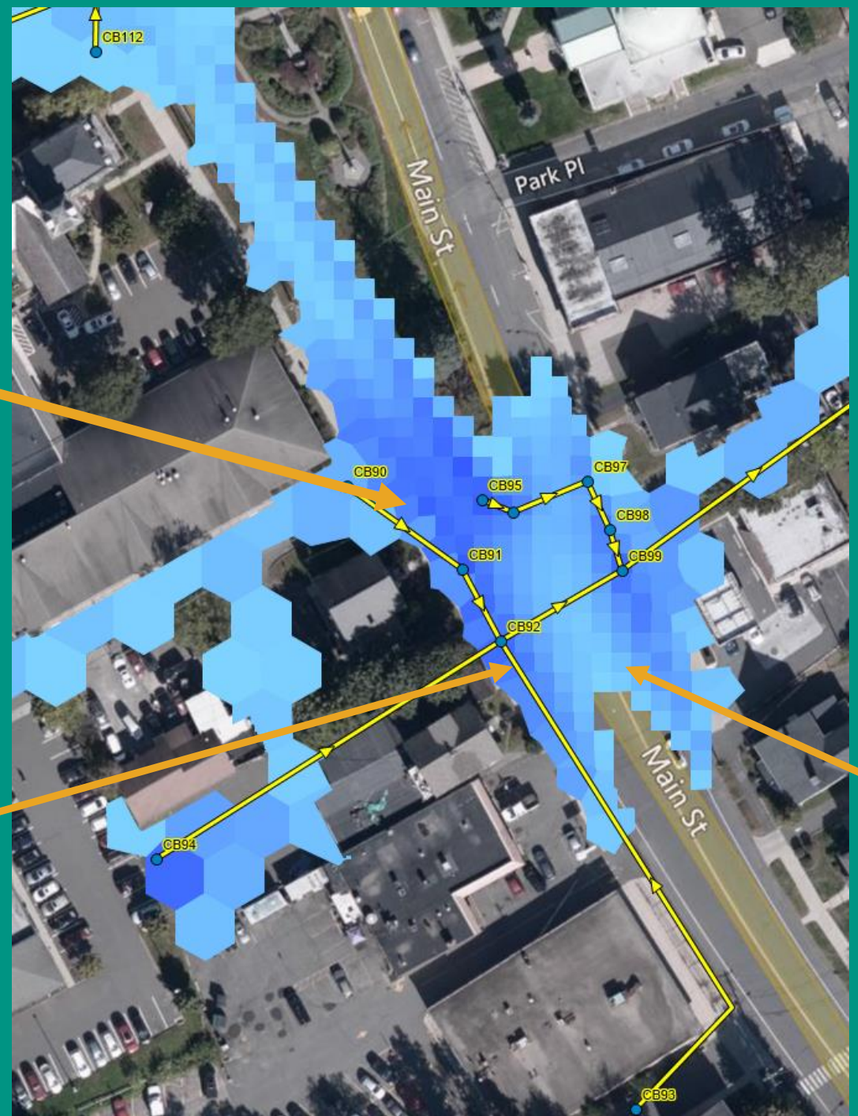


5-Year Storm (20% Chance)
Modeled Flood Extents



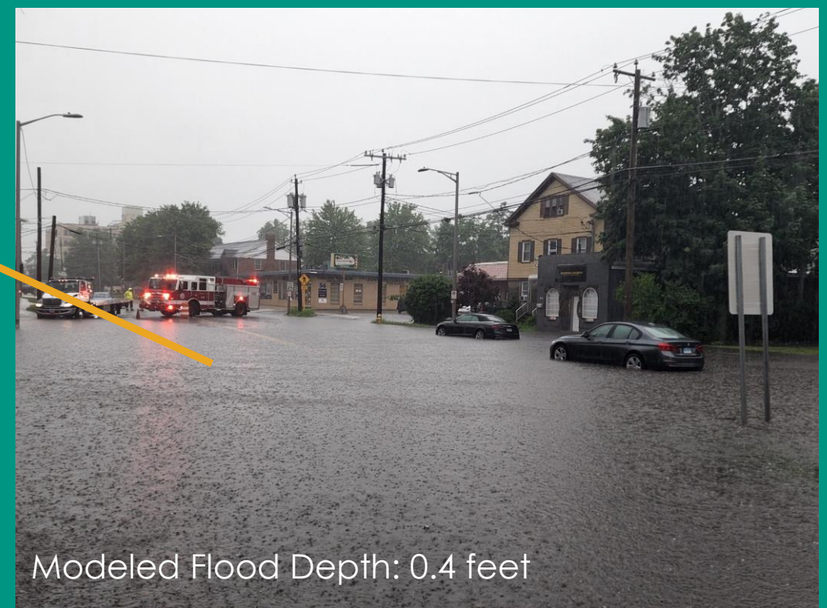
- **Flood Date**: June 2nd, 2022

2.12 inches / 2 hours

5-Year Storm

(20% chance)

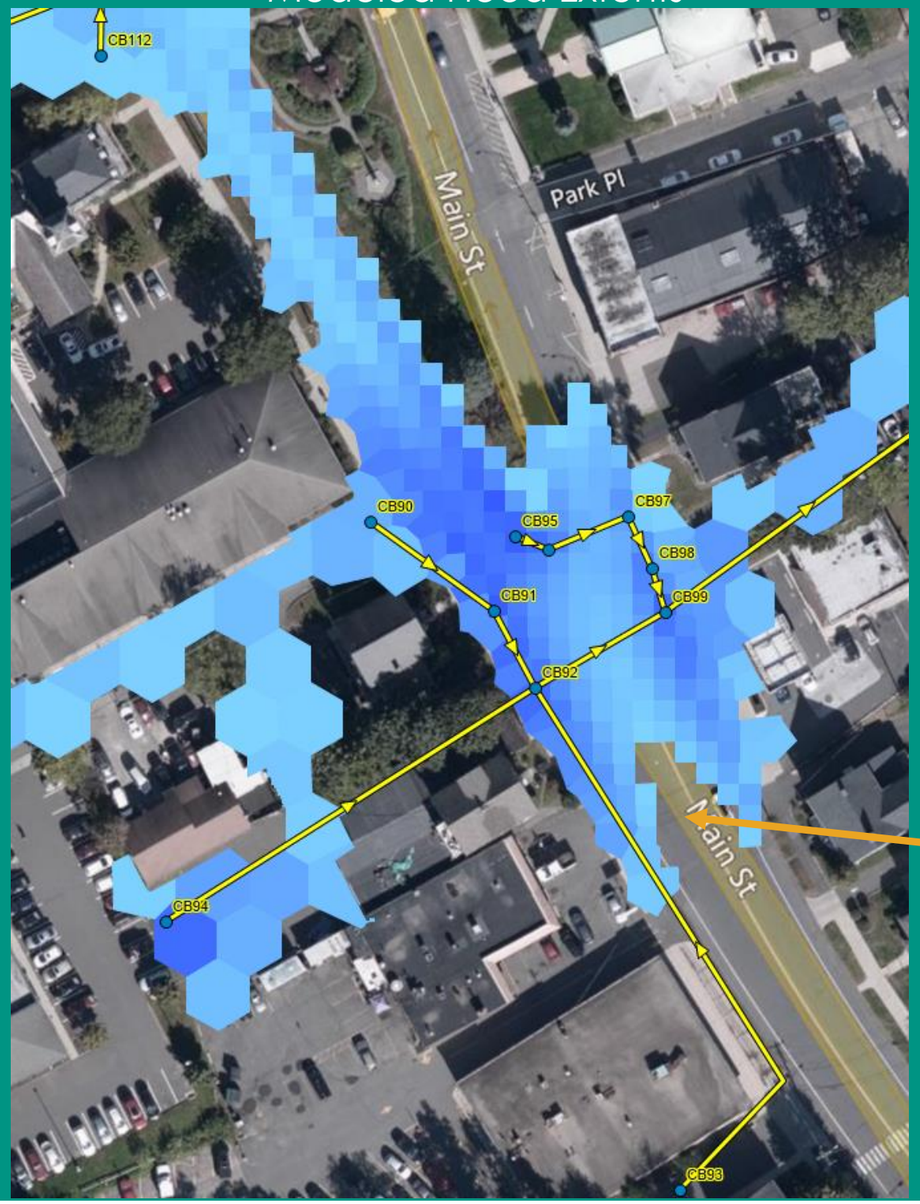
2 Hour Storm Duration



VALIDATION OF FLOOD MODELING

RESILIENT DANBURY

5-Year Storm (20% Chance)
Modeled Flood Extents



June 2nd, 2022, 5-Year Storm (20% Chance), Observed Flood Extents

RESILIENT DANBURY CONCEPT DIAGRAM

1. Drainage System Improvements
2. Median Green Park Modifications
3. Streetscape/Median Improvements
4. Cooling Stop
5. Suburban Streetscape Improvement
6. Parking Lot Facelift With Green Infrastructure & Pedestrian Connection
7. Develop Green Infrastructure Features
8. Neighborhood Pedestrian Linkages with Green Infrastructure & Cooling Stop
9. Ice Rink Cooling Center

LEGEND

- Future Development Areas
- Affordable Housing
- Community Assets
- Important Retail Locations
- Green Infrastructure Improvements
- Cooling Infrastructure Improvements
- Heat Relief Locations
- Bus Stop
- Bus Transfer Station
- Drainage System Improvements
- Improved Pedestrian Connection
- Cooling Cooridors
- Roadways
- Watershed Boundary

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1 Drainage System Improvements

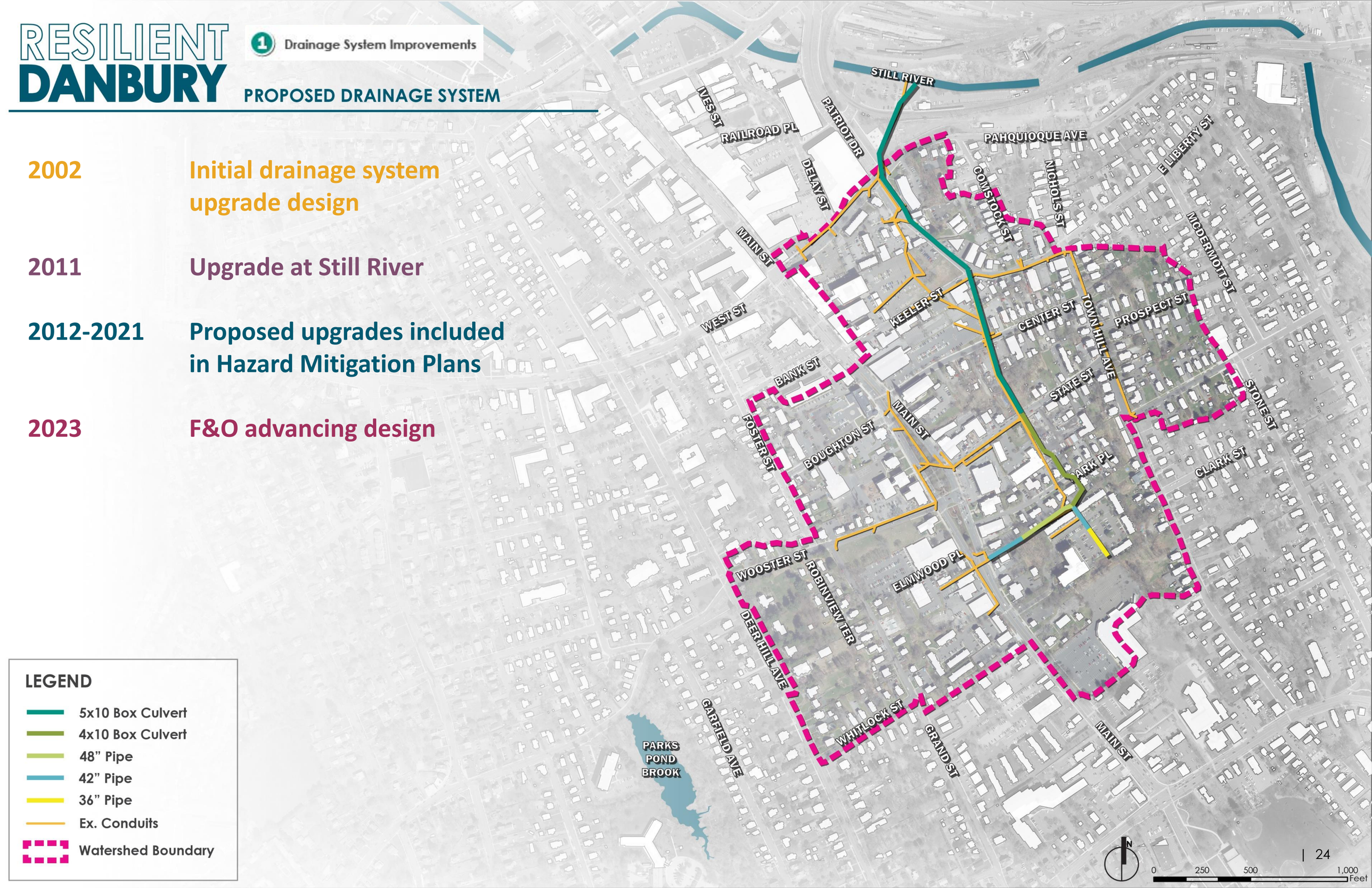
PROPOSED DRAINAGE SYSTEM

2002 — Initial drainage system upgrade design

2011 — Upgrade at Still River

2012-2021 — Proposed upgrades included in Hazard Mitigation Plans

2023 — F&O advancing design



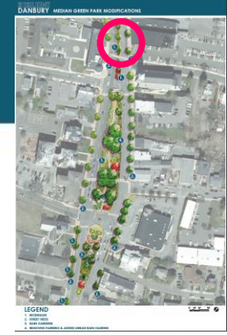
LEGEND

- 5x10 Box Culvert
- 4x10 Box Culvert
- 48” Pipe
- 42” Pipe
- 36” Pipe
- Ex. Conduits
- Watershed Boundary

RESILIENT
DANBURY

NORTH MAIN ST STREETSCAPE IMPROVEMENTS

2 Median Green Park Modifications



SIDEWALK
BUFFER
ON-STREET PARKING
DRIVE AISLE
BIOSWALE
DRIVE AISLE
ON-STREET PARKING
BUFFER
SIDEWALK

NOT TO SCALE

4 Cooling Stop

Rest and Shade

Resiliency at the Library:

- Increase rest areas with seating
- Increase shade around library
- Incorporate stormwater management throughout

LEGEND

1. LIBRARY
2. INNOVATION CENTER
3. PARKING
4. BIOSWALE WITH SHADE TREES
5. RAIN GARDEN
6. SHADED PLAZA WITH SEATING
7. SMALL RAIN GARDENS
8. BUMP OUT
9. BIOSWALE WITH TREES IN BOULEVARD

0' 15' 30' 60'

5 Suburban Streetscape Improvement

NOT TO SCALE

6 Parking Lot Facelift With Green Infrastructure & Pedestrian Connection

Reduce Impervious

- Consolidate parking lots
- Reduce impervious surface area
- Increase shaded pedestrian connections
- Incorporate stormwater management at location of underutilized back parking lot and within parking islands

LEGEND

1. PRICE RITE MARKETPLACE
2. PARKING
3. OFF SITE WET DETENTION BASIN
4. BIORETENTION AREA
5. SHADED PEDESTRIAN CONNECTION TO GROCERY STORE
6. BIOSWALE
7. PARKING ISLAND RAIN GARDENS
8. EXISTING LOADING DOCK

0' 15' 30' 60'

RESILIENT DANBURY

8 Neighborhood Pedestrian Linkages with Green Infrastructure & Cooling Stop

Cooling and Connecting

- Opportunity for neighborhood outdoor activity
- Features
  - Picnic pavilion
  - Open lawn
  - Splash pad
- Provides pedestrian connection between Grand Street and Main Street

LEGEND

1. SENIOR CENTER
2. OPEN LAWN
3. PUMP SHED
4. POP JET FOUNTAIN
5. SHADED BENCH SEATING
6. PICNIC PAVILION
7. PICNIC AREA
8. SHADED PEDESTRIAN CONNECTION TO GRAND ST
9. RAIN GARDENS

0' 10' 20' 40'

RESILIENT DANBURY

PUBLIC ENGAGEMENT

RESILIENT DANBURY

Public Workshops	Date	Focus
Public Workshop #1	**In-person** 4.10.2023 Roger's Park Middle School	Existing and Future Conditions
Public Workshop #2	**Virtual** 7.26.2023	Visioning
Public Engagement #3	**In-person** 8.25.2023 San Gennaro Festival	Analysis

Funding Awards

Springborn Dam Removal
National Fish and Wildlife Hurricane Sandy Coastal Resilience Fund

$2.8 Million Award

Easton Pond Dam Climate Resilience Study

FEMA BRIC
$170K

Meriden Harbor Brook

FEMA BRIC
$11 million Award

Pocasset River Watershed Flood Resilience Project
Natural Resource Conservation Service NRCS

$50 Million Award

NEXT PHASE FUNDING

RESILIENT DANBURY

1. CT Community Infrastructure Fund

- Funded through 2030
- Funds similar projects
- May provide full construction funding (~15 million)

2. FEMA BRIC

- Nationally competitive
- BCR > 1 difficult at today's construction costs

3. Department of Commerce (DOC) Economic Development Adminisration (EDA)

- May provide full construction funding.

WEBSITE

https://resilientconnecticut.uconn.edu/resilient-danbury/