Resilient South Norwalk

Phase III Resilient Connecticut | November 30, 2023

Delivering a better world

City of Norwalk

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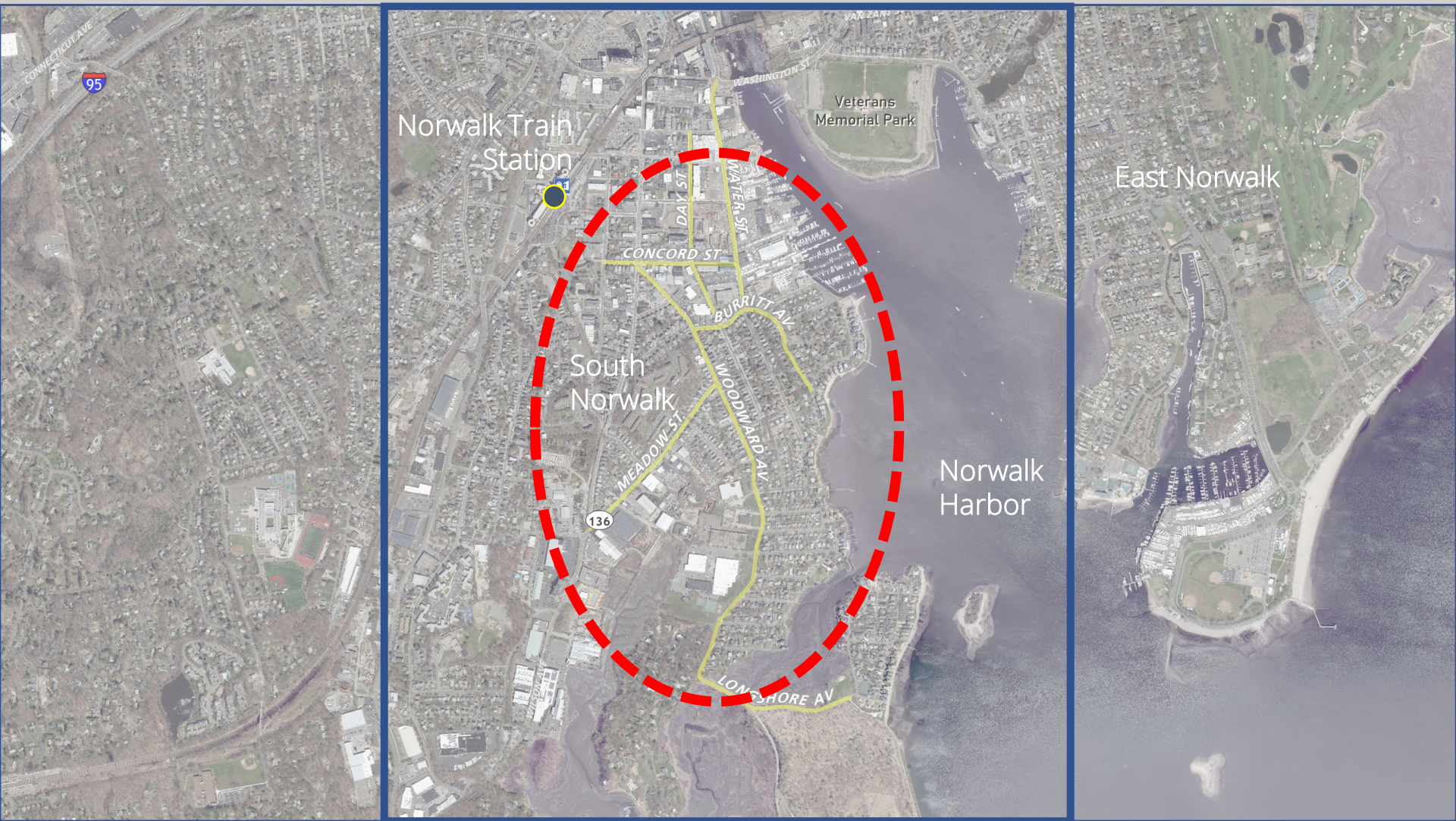
EXECUTIVE SUMMARY

Water Street , Hurricane Ida, 2021
Photo Credit, NBC Connecticut

South Norwalk Location

South Norwalk is a neighborhood within the City of Norwalk, located south of Route 95 and adjacent to the Norwalk Harbor at the mouth of the Norwalk River and Long Island Sound. The study area is a mix of single family and multi-family residential, marine-industrial and warehouse land uses.



Resilient South Norwalk

Resilient South Norwalk is one of seven selected pilot project reports for Phase III of the *Resilient Connecticut* program developed by the Connecticut Institute for Resilience and Climate Adaptations (CIRCA). This planning program is designed to establish resilient communities by analyzing options for municipalities in Connecticut to address flood and extreme heat effects due to climate change. South Norwalk, one of the initial study communities, is located along the coast in New Haven County.

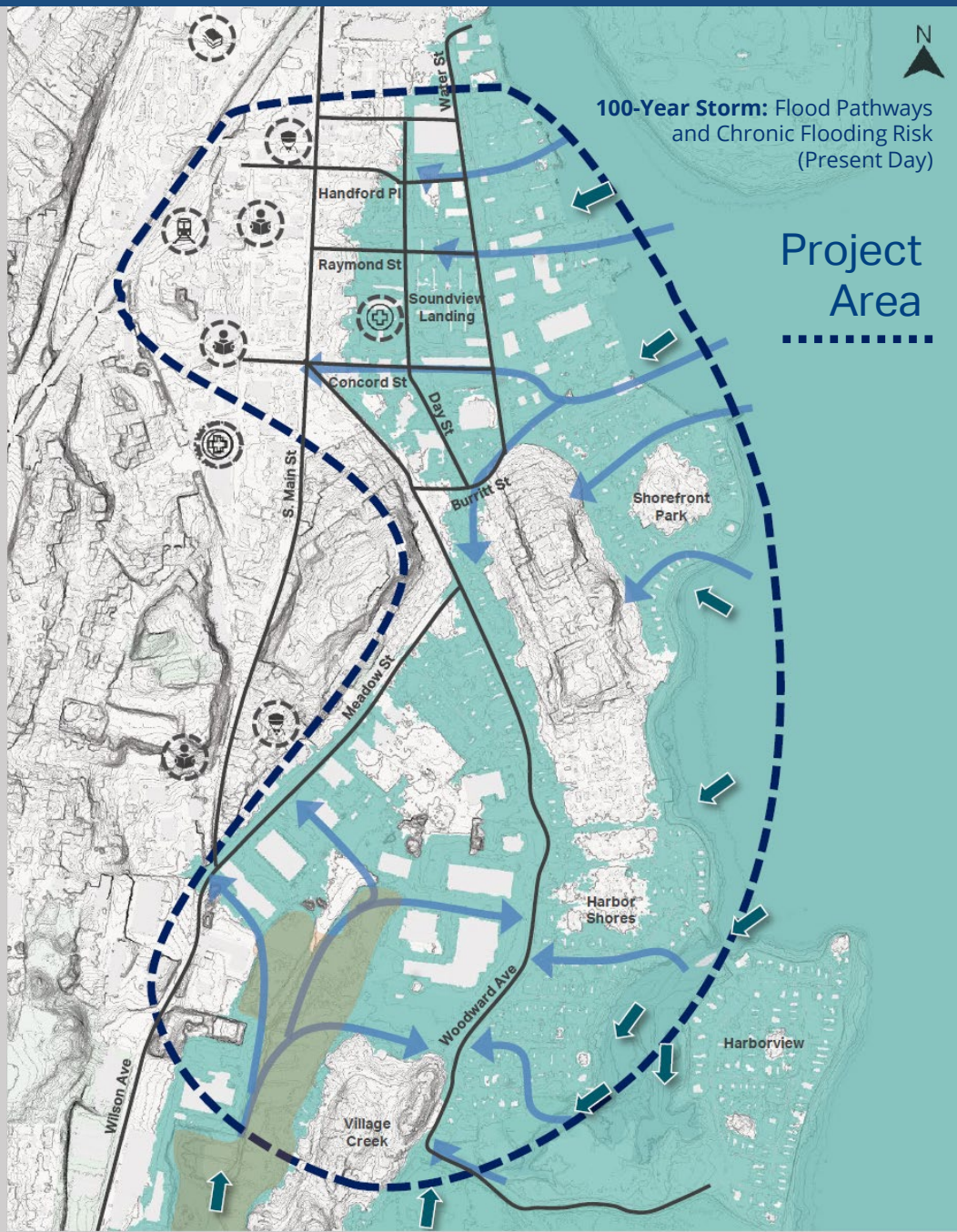
Currently, South Norwalk is experiencing flooding along the roadways within the project area. During major storm events, the project area can see about four to five feet of storm surge flooding and a more frequent 10-year storm event will experience about two to three feet of flooding. Areas of impervious pavement and lack of tree canopy has created zones subject to extreme heat.


Photo Credit 'The Hour'

Flood Elevation Table

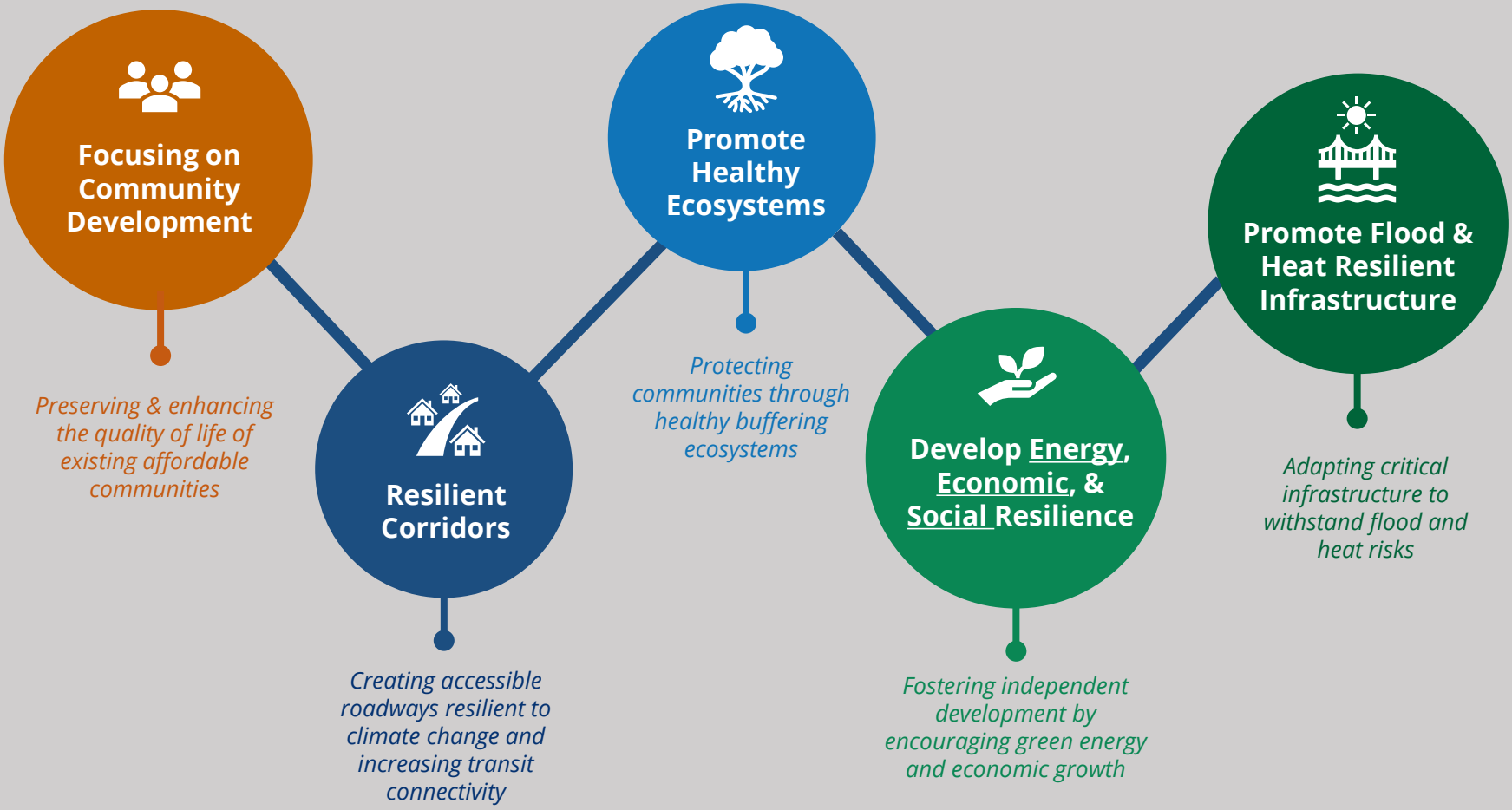
10-Year: 10% Annual Storm (Present) - Elev. 7.59 NAVD88
10-Year: 10% Annual Storm (2050)/SLR - Elev. 9.59 NAVD88
100 Year: 1% Annual Storm (Present) – Elev. 9.38 NAVD88
100-Year: 1% Annual Storm (2050)/SLR – Elev.10.88 NAVD88

MHHW (Present) – Elev. 3.48
MHHW (2050) – Elev.4.58



What is Resilient Design?

Resilient design is the process of designing structures, landscapes or community systems to mitigate the impact of future hazardous weather or other extreme events. Resilient design must be viewed wholistically and address environmental, social, and economic interests, while focusing on practical and realistic solutions. The following bullets summarize the long-term vision for establishing resilient communities developed for the Resilient Connecticut Planning Framework, 2020 (CIRCA, pg. 4), which this project has maintained to guide the design approach.



Goal

Develop feasible adaptation strategies that will help to mitigate the impacts of climate change and will develop 'Resilient Corridors' for the present and future of the community.

Resilient South Norwalk strategies are developed to meet this goal, designed to help provide connections from homes and businesses to upland areas and emergency services during excessive heat and storms events that are currently occurring and that are likely to increase in frequency, duration, and severity in the future, especially with a projected sea level rise (SLR) of 20-inches within Long Island Sound. As the climate changes continue to challenge the city, bold and creative strategies will be needed to support the livability of South Norwalk.

Current and future conditions for flooding and heat within the study limits were analyzed; existing city infrastructure systems were reviewed; previous city planning reports were examined; site visits were conducted; and meetings were held with the City of Norwalk Planning staff and Advisory Committee, comprised of members of the city government and the community.

Photo Credit 'The Hour'


Photo Credit 'The Hour'

Public Engagement

Three (3) public workshops, including a walking tour, were conducted to engage the community in the planning process, soliciting feedback to hear the concerns and needs, needed to assist the planning team in establishing the priorities for concepts.

- The first workshop, held in January 2023, introduced the project and presented the present-day and future flood and extreme heat conditions.
- The second workshop, held in June 2023, presented preliminary adaptation options, introducing the Resilient Toolkit which is a project-wide strategic concept.
- The third and last workshop was held in October 2023, included a walking tour of the Concord Street and Water Street section of the project. The preferred alternative, *Elevated Roadways at Concord Street and Woodward Avenue,* were presented to the community for discussion and comments.

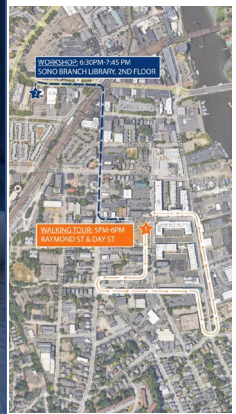
Photo Credit 'The Hour'

Resilient South Norwalk

Sea-Level Rise - Climate Change - Adaptation

*We invite you to join the Resilient South Norwalk project team for the last public workshop, to be held **in-person** at the SoNo Library. We will present and discuss adaptation concepts that address climate change impacts within the study area in South Norwalk.*

Prior to the meeting, we will conduct a short walking tour through one section of the proposed Resilient Corridor. Please see map below. After the walk, we will meet at the library for the Resilient South Norwalk Adaptation Concepts presentation and group discussion.



Join Us on Tuesday, Oct. 3rd, 2023

1 **Walking Tour: *5:00-6:00pm***
Meet at Intersection of Raymond & Day St

2 **Group Workshop: *6:30- 7:45pm***
SoNo Branch Library, 2nd Floor
10 Washington St,
Norwalk, CT 06854

To Learn More, Visit:

https://tomorrow.norwalkct.org/news/resilient-south-norwalk-project-looks-to-combat-climate-change/

NORWALK CIRCA AECOM


Photo Credit 'The Hour'


Photo Credit 'The Hour'

Public Workshops

AECOM conducted three (3) public workshops to gather input from the community.

This series of public events assisted in the understanding of priorities to be explored for the report. Issues discussed included flooding within Water Street and Woodward Avenue, concerns about hazardous materials within the flood zones, lack of street trees, increased density and development pressures, signage for education about flood zones, and increased truck traffic along Woodward Avenue and Meadow Street.

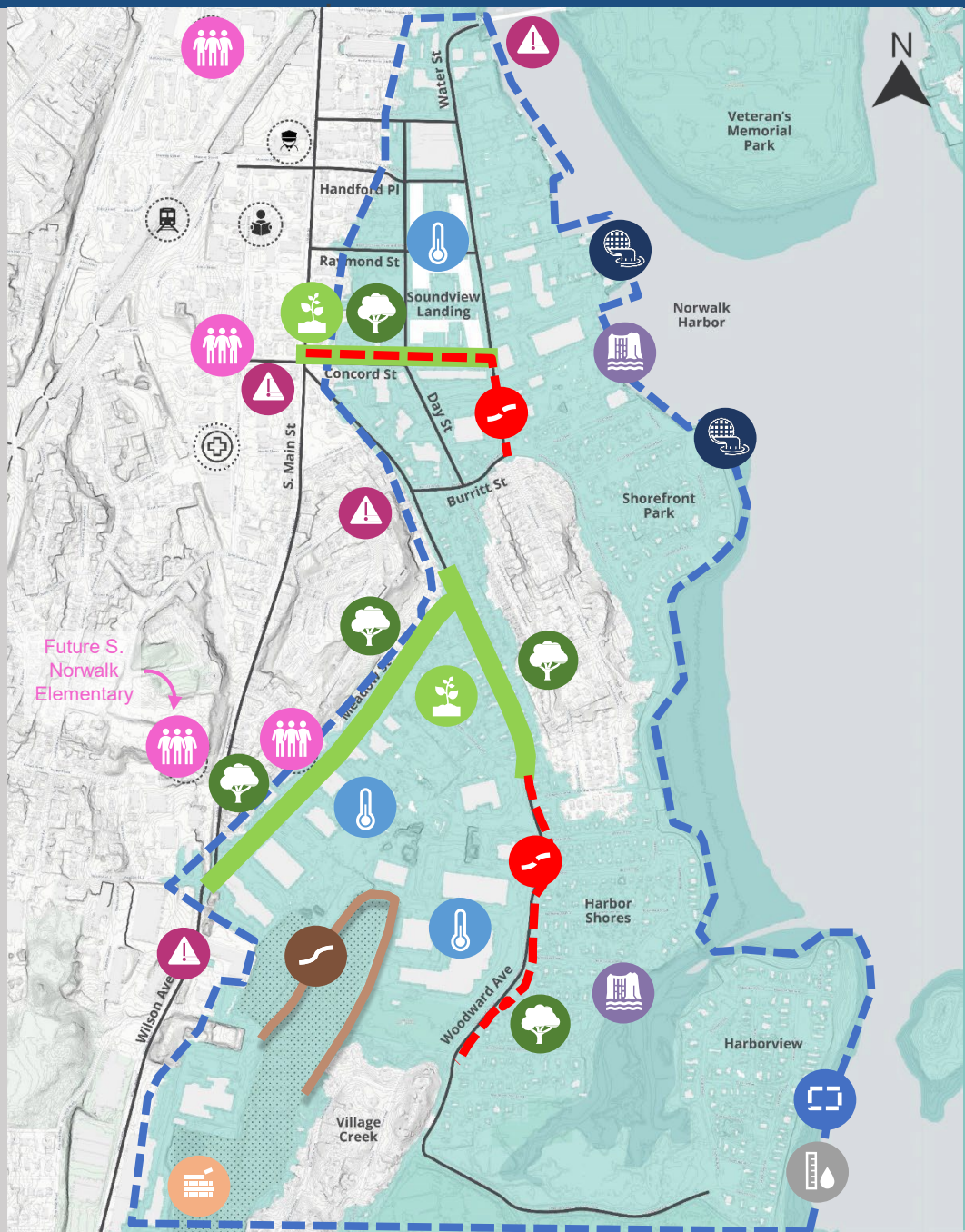
STAKEHOLDER	TIME	LOCATION	FEEDBACK
PUBLIC ENGAGEMENT Virtual Community Meeting 1 of 3	**January 12th** **6:30-8pm**	*Via Zoom*	• Resident suggest including brownfield and community clean up sites using Environment Protection Agency data and forums • Resident expresses need for flooding mitigation focused on Woodward Avenue and Water Street • Suggestion to include approved signage throughout downtown flood zone
PUBLIC ENGAGEMENT Virtual Community Meeting 2 of 3	**June 29th** **6:30-8pm** Via Zoom	*Via Zoom*	• Option to produce maps that show areas impacted by chronic flooding (monthly/semi-monthly) • Option to present phasing in smaller projects over time from north to south of study area • Resident suggested to retrieve total population of residents affected by 100-year storm • Resident shared idea about setting up resilience education station at local library to share the kit of parts with the broader public
PUBLIC ENGAGEMENT In-Person Community Meeting 3 of 3 and Site Walk	**October 6th** **5-6pm** *Walking tour*	*Concord Street and Water Street to Burritt Avenue intersection*	• A walking tour group met at the intersection of Raymond and Day Streets. • The group walked to the east end of Concord Street through to Burritt Avenue intersection via Water Street. • The projected 2050 flood elevation for the 10-year storm with Sea Level Rise (SLR) was reviewed at several locations along the route, using a marked yardstick. • Participants were generally supportive of the preferred Resilient Corridor alternatives presented along Woodward Ave. and Concord and Water Streets, including the elevated roadway and green infrastructure. • A participant shared that they thought other connections routes vs. Quintard Avenue should be reviewed. • A participant questioned why the Meadow Street area was not selected and AECOM discussed the challenges for raising a roadway within single family properties.
	6:30-7:45pm *Public Workshop*	*SoNo Branch Library, 2nd Floor 10 Washington St Norwalk, CT*	

Options Summary: Resilient Toolkit

In response to the unique challenges of increased flooding and extreme heat, the adaptation options for South Norwalk were designed under a Resiliency Toolkit Framework.

This approach of projects of varied scales, provides flexibility for prioritization and implementation for the South Norwalk study area. It also provides guidance for replication throughout other areas of the city.

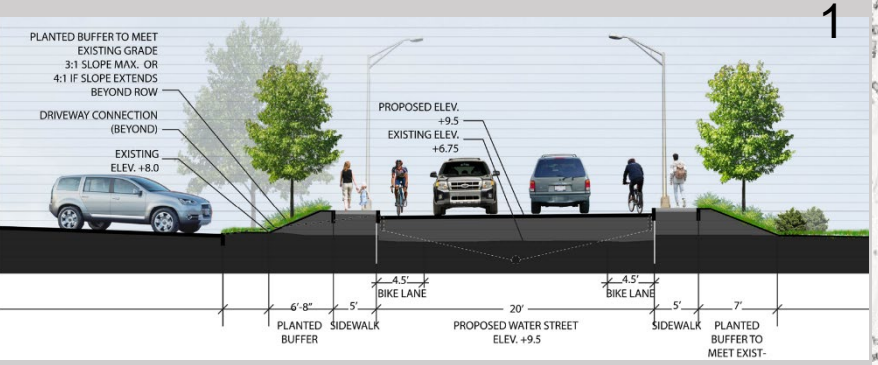
Within the Toolkit Framework and based upon input from the city, stakeholders, and public, several strategies within the Toolkit were set as priorities for Resilient South Norwalk and prioritized for recommendations for further study.



Elevated Roadways

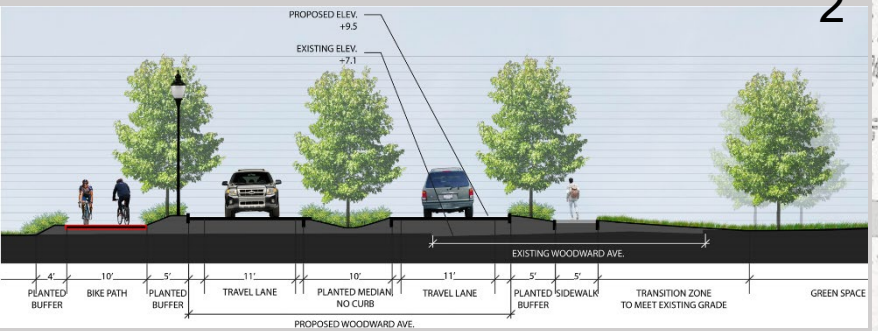
- Raising Concord Street and Water Street to the Burritt Avenue intersection at the base of the Quintard Avenue to elevation 9.5 would create a continuous Resilient Corridor above the 2050, 10-Yr. projected flood level with sea level rise. (see Area 1)

1

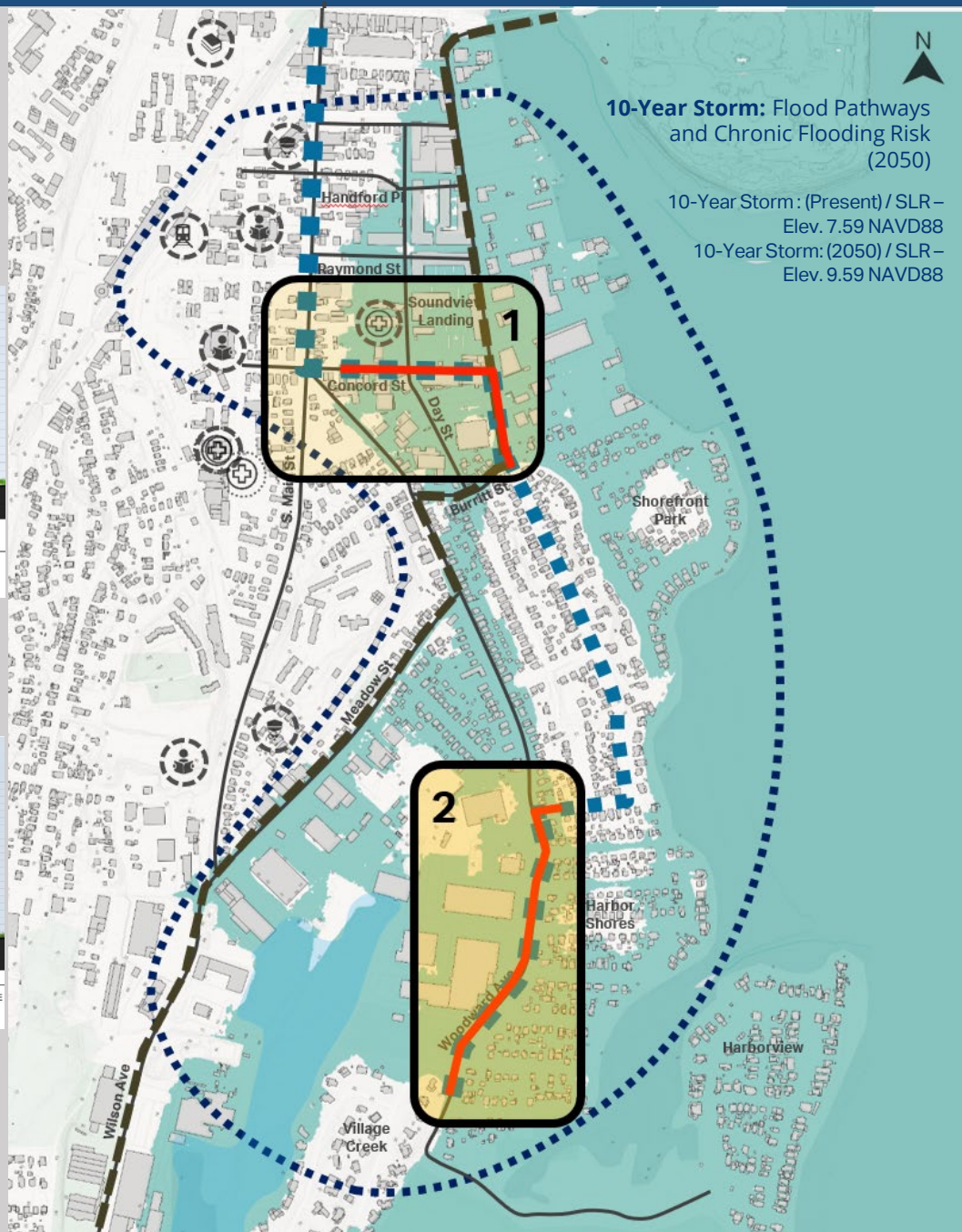


- To the south, raising Woodard Avenue from Sable Street northward to Lowndes Avenue to elevation 9.5 would create a second section of a continuous Resilient Corridor. (see Area 2)

2



- These two raised roadway sections, with an existing elevated section of roadway at Quintard Avenue, creates a Resilient Corridor from Sable Street at Harbor Shores and Village Creek neighborhoods through to the intersection of Concord Street and South Main Street, outside of the projected flood limits.




Existing
Urban Canopy Expansion
Urban Canopy Expansion
Green Infrastructure
Elevated Roadway
Proposed
Concord Street


Existing
Urban Canopy Expansion
Urban Canopy Expansion
Urban Canopy Expansion
Green Infrastructure
Green Infrastructure
Elevated Roadway
Elevated Roadway
Woodward Avenue
Proposed

Preferred Resilient Corridor Actions

In response to the unique challenges of increased flooding and extreme heat, the adaptation options for South Norwalk were designed under a Resiliency Toolkit Framework. This approach of projects of varied scales and levels of complexity, provides flexibility for prioritization and implementation for the South Norwalk study area. It also provides guidance for replication throughout other areas of the city.

Within the Toolkit framework and based upon input from the city, stakeholders, and public, several strategies within the Toolkit were set as priorities for Resilient South Norwalk. These recommended actions will need further study to determine feasibility and precise costs but have the potential to assist in protecting the community from some of the affects of climate change.

ACTION TITLE	ACTION DESCRIPTION	TIMELINE
Elevate Roadways	Maintain vehicular and emergency connections to areas within the study. The planning development of this option will need to include modeling of the flood limits.	**3-5yrs**
Update Stormwater System	Update flood modeling, to address upland flooding, pipe system backups, and restricted outfalls.	**1-2yrs**
Incorporate Green Infrastructure	Provide additional strategies to manage stormwater through permeable paving, stormwater planters, and curb extensions.	**1-2yrs**
Expand the Urban Tree Canopy	Provide comfortable corridors for pedestrians and bicyclists, providing a healthy and safe environment for the community.	**Ongoing**
Add Signage	Establish and mark limits of climate impact zones and increase the opportunities to educate the public about heat and flood.	**1-2yrs**
Expand the Resiliency Hub	Promote development of flood and heat resistant corridors to support future resilient design planning	**Ongoing**
Develop a Resilience Overlay District	Define the areas that are most impacted by flooding and provide a roadmap for future developers to consider	**3-5yrs**

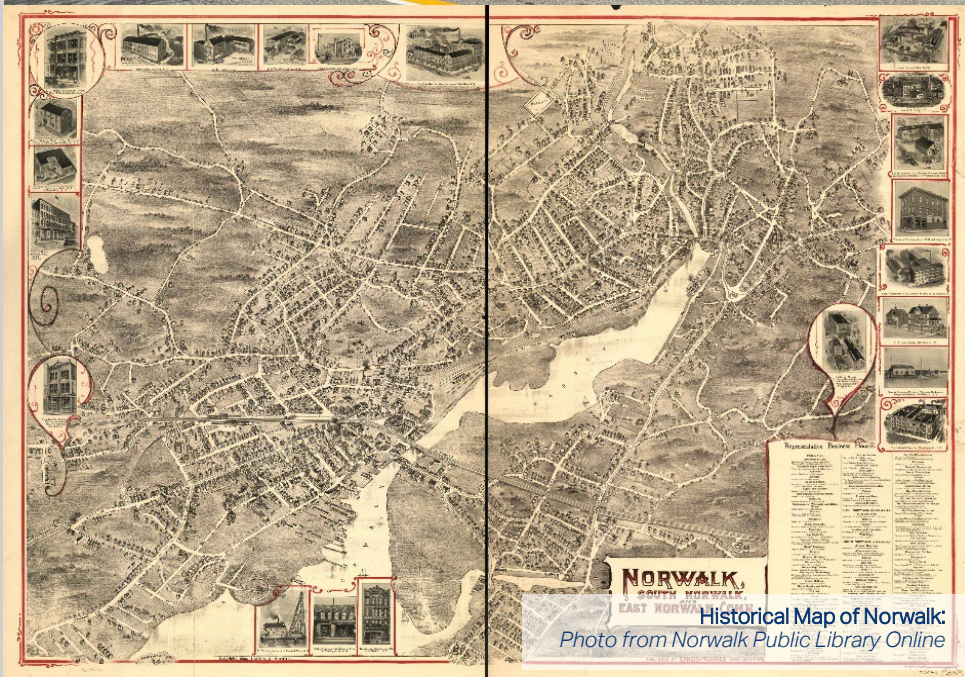
BACKGROUND & CONTEXT

South Norwalk Context

South Norwalk is a neighborhood within the City of Norwalk, located South of Route 95 and adjacent to the Norwalk Harbor at the mouth of Norwalk River and Long Island Sound. Norwalk has a long history of settlement and connection to the Norwalk River beginning in 1640. South Norwalk was originally settled as 'Old Well', was chartered in 1870, and then merged with Norwalk and incorporated in1913 as a taxing district within the larger city.

With an industrial history "manufacturing firearms, buttons, shoes, cloth and hats", South Norwalk felt the effect of the decline of manufacturing in the 1950's and has been working to bring economic recovery since that time.

Building on the convenient location of the historic South Norwalk train station, the area has expanded their housing and apartment supply within the Transit Oriented Development (TOD) district, attracting new residents and vitality into this part of Norwalk. As the city strives to grow, Norwalk was rated #29 in 2023 for 'Best Places to Live for Families" in the nation by Fortune Magazine. Together with many other development and planning efforts, South Norwalk is preparing for a vibrant future for the community.



Historical Map of Norwalk:
Photo from Norwalk Public Library Online

FIGURE 1: Woodward Ave & Lowndes Ave, Looking South:
Hurricane Irene, 2011 Photo from local resident

FIGURE 2: Burritt Ave & Day St, Looking South:
Hurricane Ida, 2021 Photo from Connecticut Post

South Norwalk Today

South Norwalk contains a blend of residential housing and industrial uses, with dense development, areas of unshaded, impervious surfaces and areas of flooding from the harbor and Sound.

With the study area's close-proximity to the Norwalk Harbor waterfront, several key roadways in the project area, such as Water Street and Woodward Avenue currently experience chronic flooding throughout the year and have been heavily inundated with water during significant storms in the past decade. Figure 1 & 2 show evidence of flooding along roadways during Hurricane Irene in 2011 and Hurricane Ida in 2021.

With climate change projected to increase the temperatures within urban environments and intensify the severity of flooding events, this study aims to assess the vulnerability of South Norwalk to future climate events and target resilient solutions that could promote climate relief in this community.

Photo Credit 'The Hour'

Role of CIRCA + Initial Project Phases

CIRCA is a multi-disciplinary research center based on collaboration between the University of Connecticut (UConn), and the State of Connecticut Department of Energy and Environmental Protection (CT DEEP) to address climate action and research within the state. Other partners involved in research and findings include the National Oceanic and Atmospheric Administration (NOAA), the Governor's Council on Climate Change (GC3), the Center for Land Use Education and Research (CLEAR), and the CT Department of Housing, among others.

CIRCA's key project is Resilient Connecticut, which is a multi-phase collaborative effort between CIRCA, state agencies, regional councils of governments (COGs), municipalities, and the public to better understand coastal flooding risk in Fairfield and New Haven Counties. Specifically, Resilient Connecticut seeks to promote coordination with different levels of government and develop implementable plans and projects to communities most in need. CIRCAS expanded list of goals are outlined in the "PERSISTS" acronym.

Resilient Connecticut Phases

Phase I

- Created an inventory and assessment of past and present resilience and adaptation efforts.

Phase II

- Assessed regional risk and vulnerability for 51 municipalities in two pilot areas of New Haven and Fairfield Counties.

Phase III *(CURRENT PHASE)*

- Phase III selected from the identified ROARs to solicit planning level studies to further evaluate and develop strategies to address identified vulnerabilities in 7 communities.

Incorporate **PERSISTS** into Design Criteria

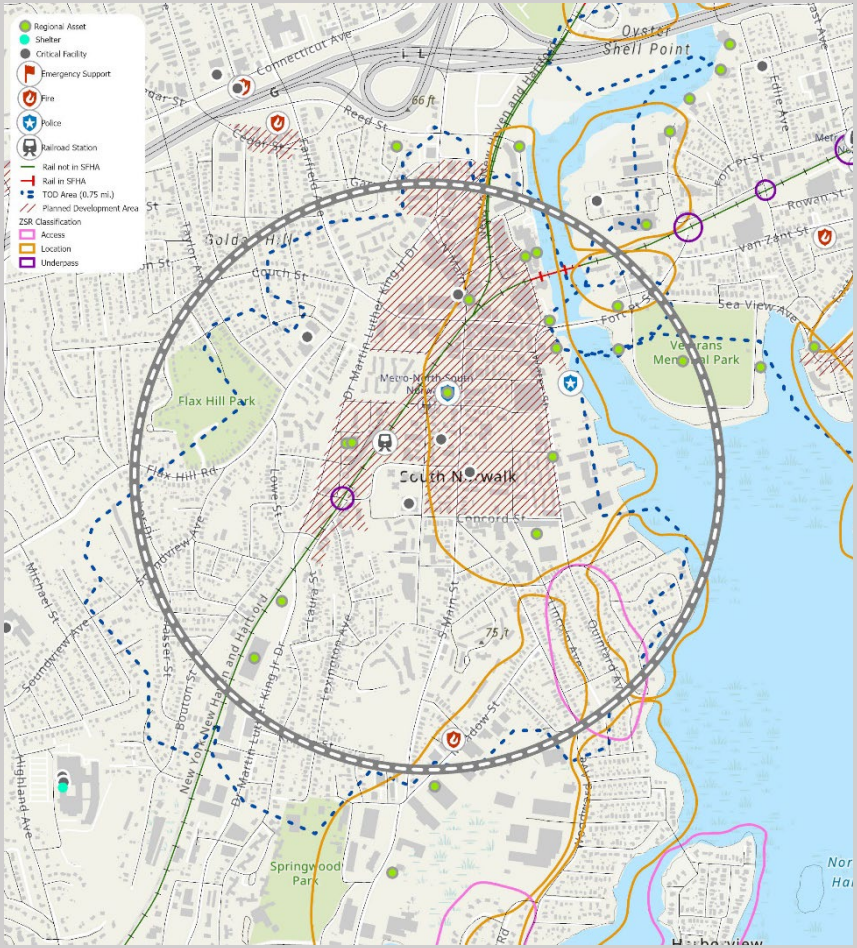
P Permittable	Can be authorized through necessary federal, state, and local permits
E Equitable	Ensures that benefits are equitable among populations
R Realistic	Can be realistically engineered and is plausibly fundable
S Safe	Reduces risks to people and infrastructure
I Innovative	Process has considered innovative options
S Scientific	Apply and improve on the best available science
T Transferrable	Can serve as model for other communities
S Sustainable	Socially, economically, & ecologically sustainable & supported by the public and leadership

Resilient Connecticut Phase II

Regional Adaptation/Resilience Opportunity Areas

Name: South Norwalk
Location: Norwalk

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



With a focus on heat, flood, and social vulnerabilities, the goal for this study in South Norwalk is to develop implementable projects and actions through stakeholder and community input, which will establish resilient corridors that lessen impacts of climate change within the study area in South Norwalk.

The Inclusion of South Norwalk in Resilient Connecticut

The partnership between CIRCA and its pilot project communities was designed to address an array of climate-related vulnerabilities, provide the communities with actionable plans, and establish a roadmap for other Connecticut communities facing similar natural hazards.

The City of Norwalk, Connecticut, located within Fairfield County, is one of seven selected Resilience Opportunity Areas (ROARs) prioritized during the Phase II Resilient Connecticut program. The South Norwalk study area, as summarized within the CIRCA Phase II report:

- Has large sectors of impervious pavement and reduced tree canopy
- Is adjacent to the shorelines of Norwalk Harbor and Long Island Sound, subject to the effects of higher tides and storm-related flooding
- Includes Environmental Justice (EJ) communities
- Is in proximity to the Norwalk Train Station and planned TOD developments
- The study limits were centered along the roadway corridors of Day Street and Water Street to the north and Meadow Street and Woodward Avenue to the south, including the neighborhoods of Harbor Shores and Village Creek further south.

PROJECT UNDERSTANDING

Village Creek
Photo Credit, AECOM

South Norwalk Study Area

The South Norwalk study area contains a blend of residential, commercial, marine and industrial uses. A large portion of the study area is concentrated with impervious surfaces and heavy commercial activity along Meadow Street and Water Street, at the marine-commercial zone adjacent to Norwalk Harbor.

Soundview Landing, located between Water Street and Day Street, recently completed the construction of several new multi-family apartments properties. The restoration of Ryan Park and the elevation of the intersection at Raymond St and Day Street were included in the efforts of this development and have set a precedent in Norwalk for future elevated roadway improvements in this area.

The southern study area includes a mix of single-family residential properties and industrial warehouse facilities. Harbor Shores and Village Creek neighborhoods are located along the waterfront to the East and South of Woodward Avenue, with warehouse/industrial properties situated to the west of Woodward Avenue along the Village Creek saltmarsh. Woodward Park, adjacent to the Village Creek saltmarsh, is the only public green space in this area and includes an existing sanitary sewer pump station within the limits of the park.

In addition, several single-family properties are located on Lawrence Street and within the northern segment of Meadow Street. To the south of this residential neighborhood, Meadow Street transitions to heavy industrial land use, which intersects the west side of the Village Creek saltmarsh. The South Norwalk fire station is located within this area, as well as the future location of a proposed elementary school for the local South Norwalk neighborhood

Visual Survey of Existing Conditions

1. Overlook of Norwalk Harbor inlet from Longshore Drive
2. Wide distance between homes and warehouses along Woodward Ave
3. Overlook of Village Creek Marshland from Meadow Street Industrial Buildings
4. Busy Neighborhood Intersection at Burritt Ave., Quintard Ave. & Water Street
5. New Housing Developments on Water and Day Streets
6. Water's edge at Norwalk Harbor along Water Street

Community Connectivity

Throughout the project limits, the roadway corridors, bus routes, sidewalks, and the train station provide a series of mobility connection links for the community. The project area is only about 1.5 miles from north to south and Route 136 bisects through the center.

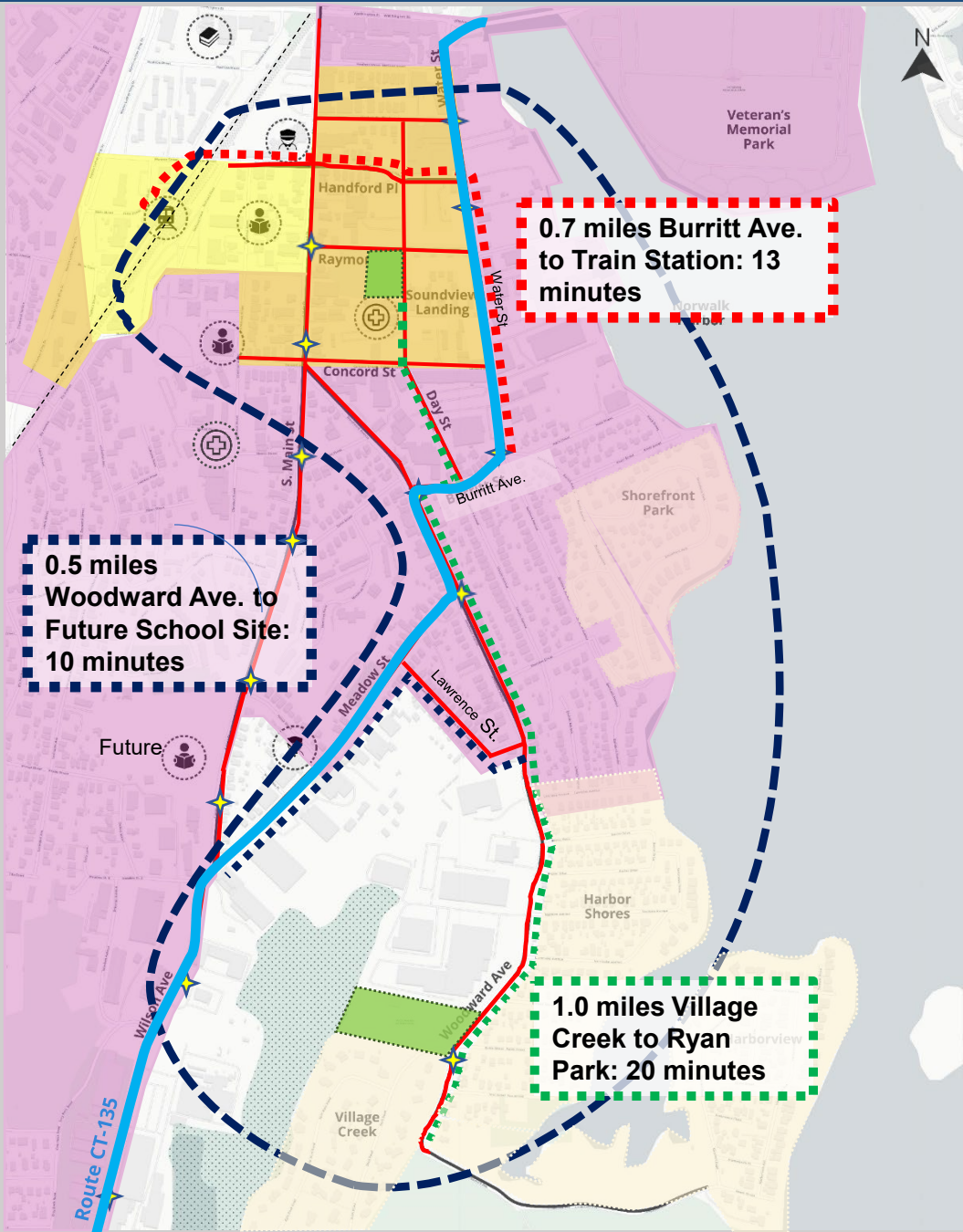
The majority of the existing emergency centers are located within the northern portion of the project area and there are only two public parks within the area, Ryan Park at the north of the study area and Village Creek Park to the south.

Map Key

- Project Area
- Study Corridors
- Route CT 136
- Example Pedestrian Route
- 'So No' Station Design District
- Neighborhood Assoc.
- Public Open Space
- Environmental Justice Community (CT DEEP EJ Home)
- Bus Stops

Emergency Centers

- **Transit:** South Norwalk Train Station
- **Public Safety:** South Norwalk Police Station & Norwalk Fire Department
- **Health Centers:** Community Center of Norwalk & Norwalk Community Health Center
- **Schools:** Side-by-Side Charter School, Columbus Magnet School, and (Future Meadow St) School Development
- **Library:** South Norwalk Public Library



Community Connectivity: Pedestrian

SOUTH NORWALK

HEALTHY FOR LIFE PROJECT
MOVE MORE. LIVE BETTER

Become a NorWALKer!

EXPLORE HISTORIC SOUTH NORWALK

This neighborhood has it all: waterfront views, shopping, dining, transit, and more!

Loop 1

Turn left out of the SoNo Square parking lot onto Water St. At the stop sign, turn right onto Burritt Ave. Right onto Woodward Ave. Follow Woodward to the stop light. Turn right on South Main St. and head past the Norwalk Police Department. Turn right onto Washington St. Right onto Water St. and return to the parking lot.

Loop 2

Turn left out of the SoNo Square parking lot onto Water St. Right on Hanford Pl. Hanford Pl. becomes Monroe St. Follow to the end, and turn right onto Doctor Martin Luther King Jr Dr. Turn right on Washington St. Walk under the railroad overpass and continue on Washington St. Right on Water St. and return to the parking lot.

Loop 3

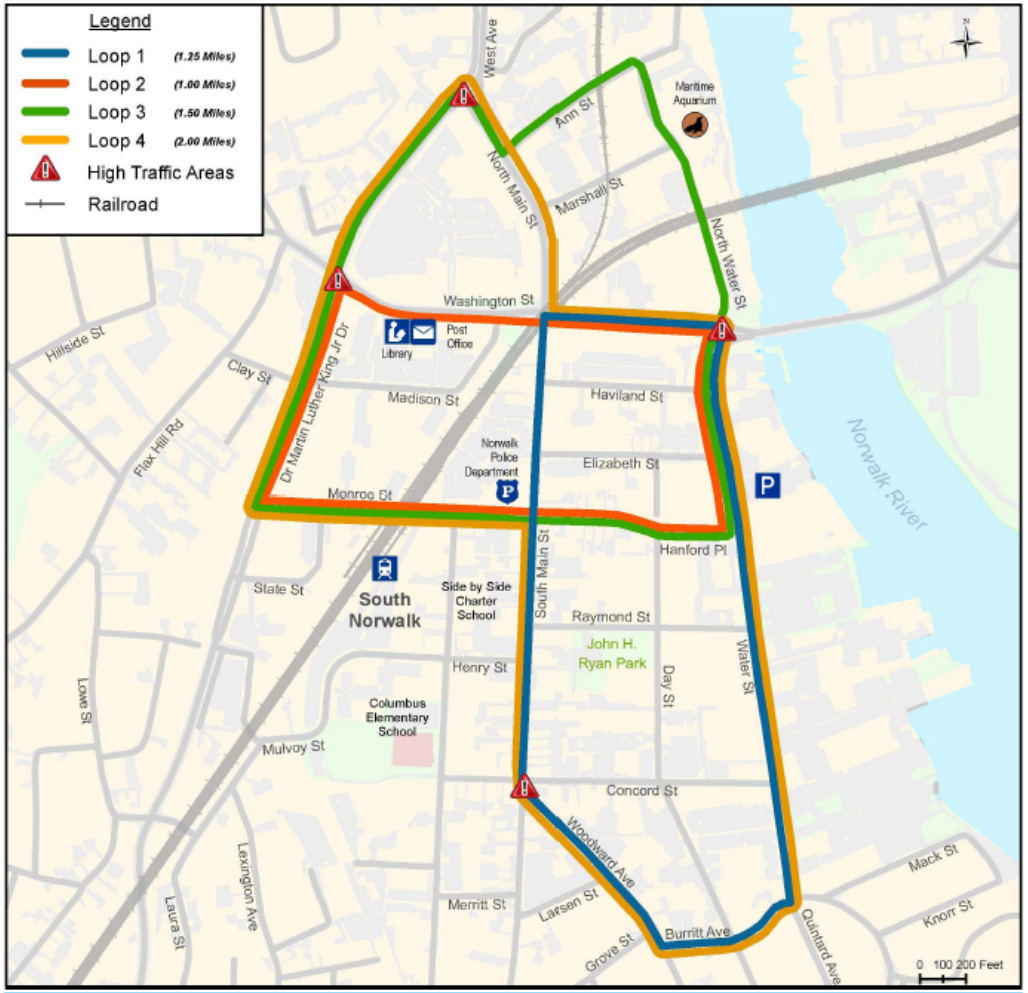
Turn left out of the SoNo Square parking lot onto Water St. Right on Hanford Pl. Hanford Pl. becomes Monroe St. Follow to the end, and turn right onto Doctor Martin Luther King Jr Dr. Continue walking past the Webster parking lot and movie theater. Turn right on North Main St. Left on Ann St. and follow the sidewalk to the stop sign by the Maritime Aquarium's parking garage. Turn right on North Water St. and pass by the Aquarium and IMAX theater. Continue straight to Water St. and return to the parking lot.

Loop 4

Turn left out of the SoNo Square parking lot onto Water St. At the stop sign, turn right onto Burritt Ave. Right onto Woodward Ave. Follow Woodward to the stop light. Turn right on South Main St. Left on Monroe St. Right on Doctor Martin Luther King Jr Dr. Right on North Main St. Left on Washington St. Right on Water St. and return to the parking lot.

SOUTH NORWALK

SOUTH NORWALK



PROCEED WITH CAUTION WHEN FOLLOWING NORWALKER ROUTES!

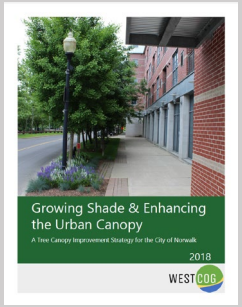
The *Healthy for Life Project* is not responsible for any injuries or accidents that may occur while following NorWALKer routes. Consult your doctor before beginning an exercise program. Use pedestrian crosswalks when available, obey all traffic laws, and if no sidewalks exist, walk against traffic. Wear proper footwear and reflective gear, and bring water with you while walking. Have fun!

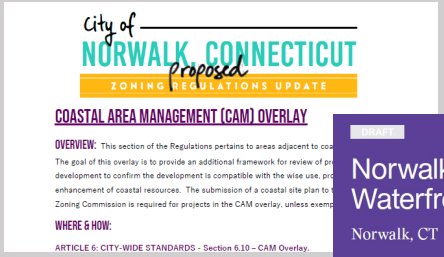
Current City Planning in Project Area

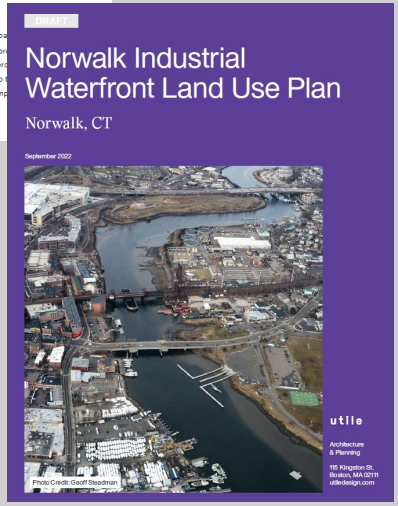
Working with the City, AECOM reviewed existing city plans associated with the study area with the goal of implementing resilient solutions that could compliment progressive projects already in motion from local government. The plans reviewed included:

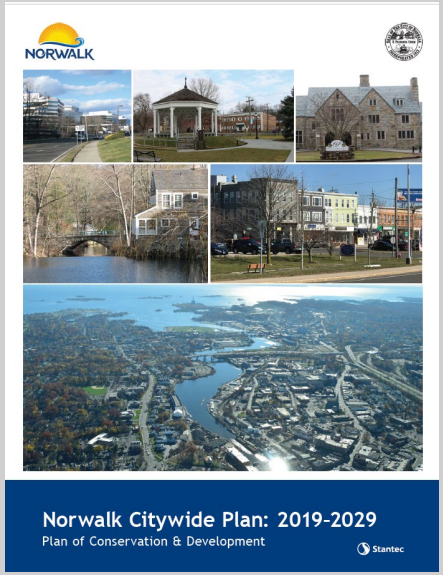
- Norwalk Harbor Management Plan (2009)
- South Norwalk TOD Redevelopment Plan (2016)
- 'Norwalk Industrial Waterfront Land Use Plan'
- New Norwalk Proposed Zoning Regulations (2023)
- The Norwalk Transportation Master Plan (2023)
- Norwalk City-wide Plan of Conservation and Development (2019)
- Ecopolitan/TNC Water Street Coastal Resiliency and Greenway Plan (2018)
- West COG Multi-Jurisdiction Hazard Mitigation Plan Update (2021)
- Norwalk Redevelopment SoNo Wharf / Harbor Loop Trail (2023)
- Norwalk Complete Streets Project (2023)

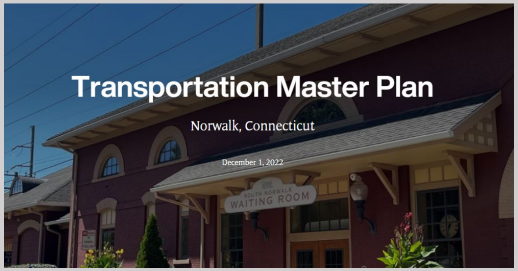
Several key planning efforts are currently underway or have recently been completed. An example of the key efforts include the Norwalk Industrial Waterfront Land Use Plan, which reviewed policy through the perspective of water-dependent land uses, economic development, and capital projects along Water Street. Also, The Norwalk Transportation Master Plan, which is being completed this year, will bring insights into the future planning of the public roadway and transit infrastructure. As part of the planning process, comments were solicited from stakeholders and the community through meetings with City of Norwalk Planning Department, the Advisory Committee meetings, and three Public Workshops.

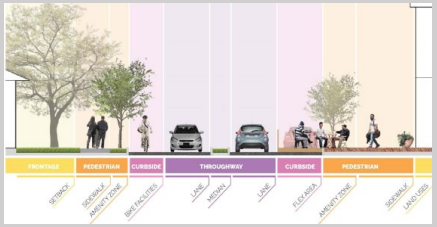


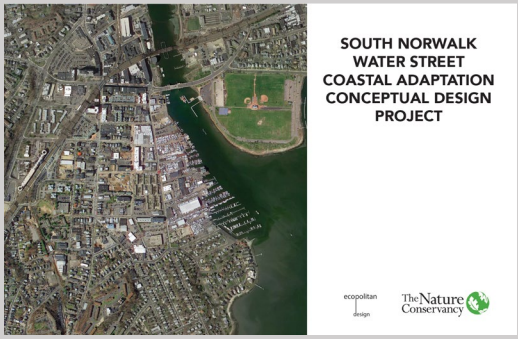








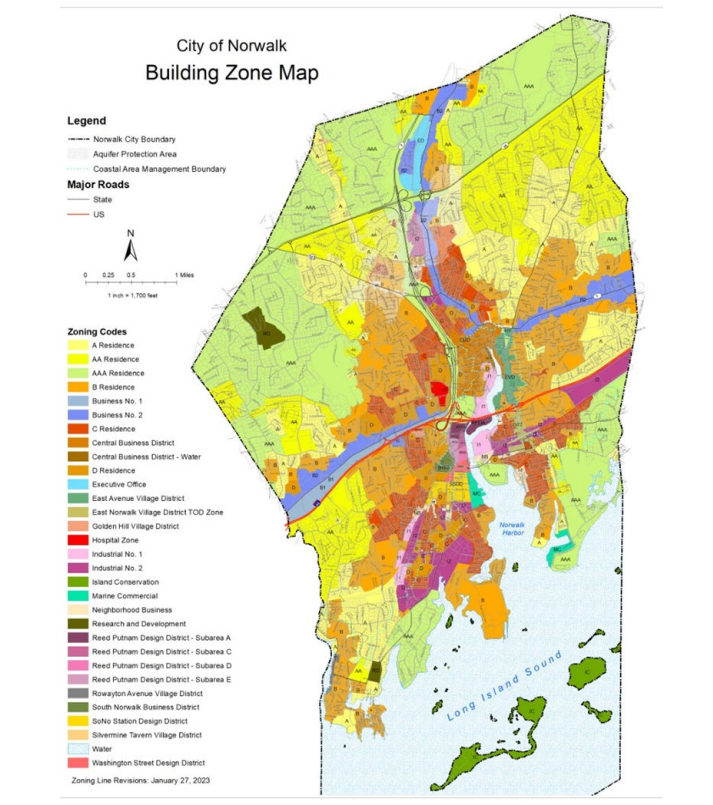


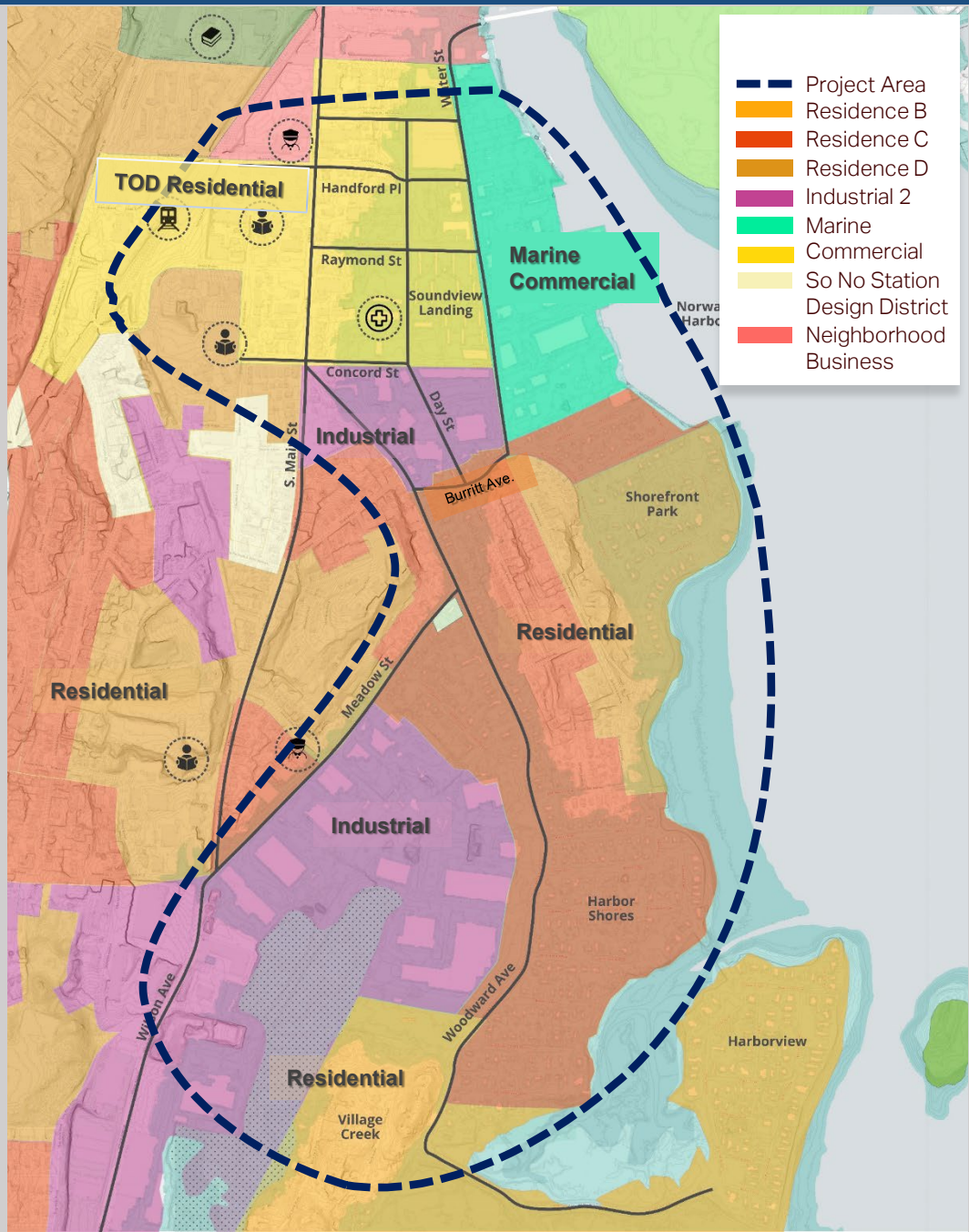


Norwalk Building Zone Map, 2023

Starting in 2019 with the release of the 2019 Citywide Plan (POCD), the City of Norwalk started to reevaluate the zoning codes for the city. Considering the rapid changes that the city has experienced in recent years, Norwalk government has started to engage the public in conversations about how to update land use codes that govern the city.

Our study area in South Norwalk is densely populated and contains a mix of residential and industrial zones along the coastline of Norwalk Harbor and Village Creek. This zoning map was released on January 27th of this year.





CURRENT & FUTURE CONDITONS

Lower Woodward Ave.
Photo Credit, AECOM

Conditions Overview

Current and future conditions for flooding and extreme heat within the study limits were reviewed and evaluated; existing city infrastructure systems were reviewed; previous city planning reports were examined; site visits were conducted; and meetings were held with the City of Norwalk Planning staff and Advisory Committee, comprised of members of the city government and the community.

Photo Credit 'The Hour'

Climate Change Vulnerability (CCVI) Heat Scoring

Tools developed by CIRCA were used to help identity heat impacts within the project area. One of these tools, the Climate Change Vulnerability Index (CCVI) is an index-based spatial model that identifies community vulnerability to flood, wind, and heat-related impacts of climate change. The CCVI characterizes areas based on an equation using sensitivity plus exposure, minus adaptive capacity. The equation can be defined as described below:

Exposure
The degree of stress that a certain aspect is going through with climate vulnerability. The includes changes such as the magnitude and frequency of extreme events.

+

Sensitivity
The degree to which a built, natural, or human system will be impacted by changes in climate conditions

-

Adaptive Capacity
The ability of a system to adjust to changes, manage damages, take advantage of opportunities, or cope with consequences.

Climate Change Vulnerability (CCVI) Heat Scoring

The combined score of the exposure, social, and adaptive capacity datums determines the overall vulnerability score.

Based on this analysis, neighborhoods that are particularly at risk within our project area are shown in darker brown, including Harbor Shores, Meadow Street, parts of Shorefront Park, and lower Water Street adjacent to Soundview Landing

Least — Most

Vulnerability Score =

Exposure + **Sensitivity** - **Adaptive Capacity**

Heat risks disproportionally affect some people and communities more than others. Examples of some populations that are more vulnerable to heat impacts, are pregnant women, children and newborns who are less able to regulate their body temperature, and older adults or people with chronic health issues. Additionally, people who take regular medications, live alone, or have limited mobility can be disproportionally at risk.

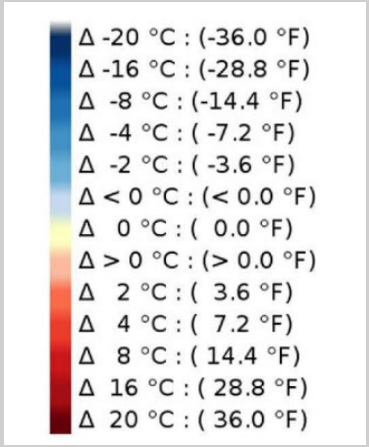
**Maps provided with CIRCA Climate Change Vulnerability Index (CCVI), https://resilientconnecticut.uconn.edu/*

Landsat-8 Thermal Infrared Sensor Data

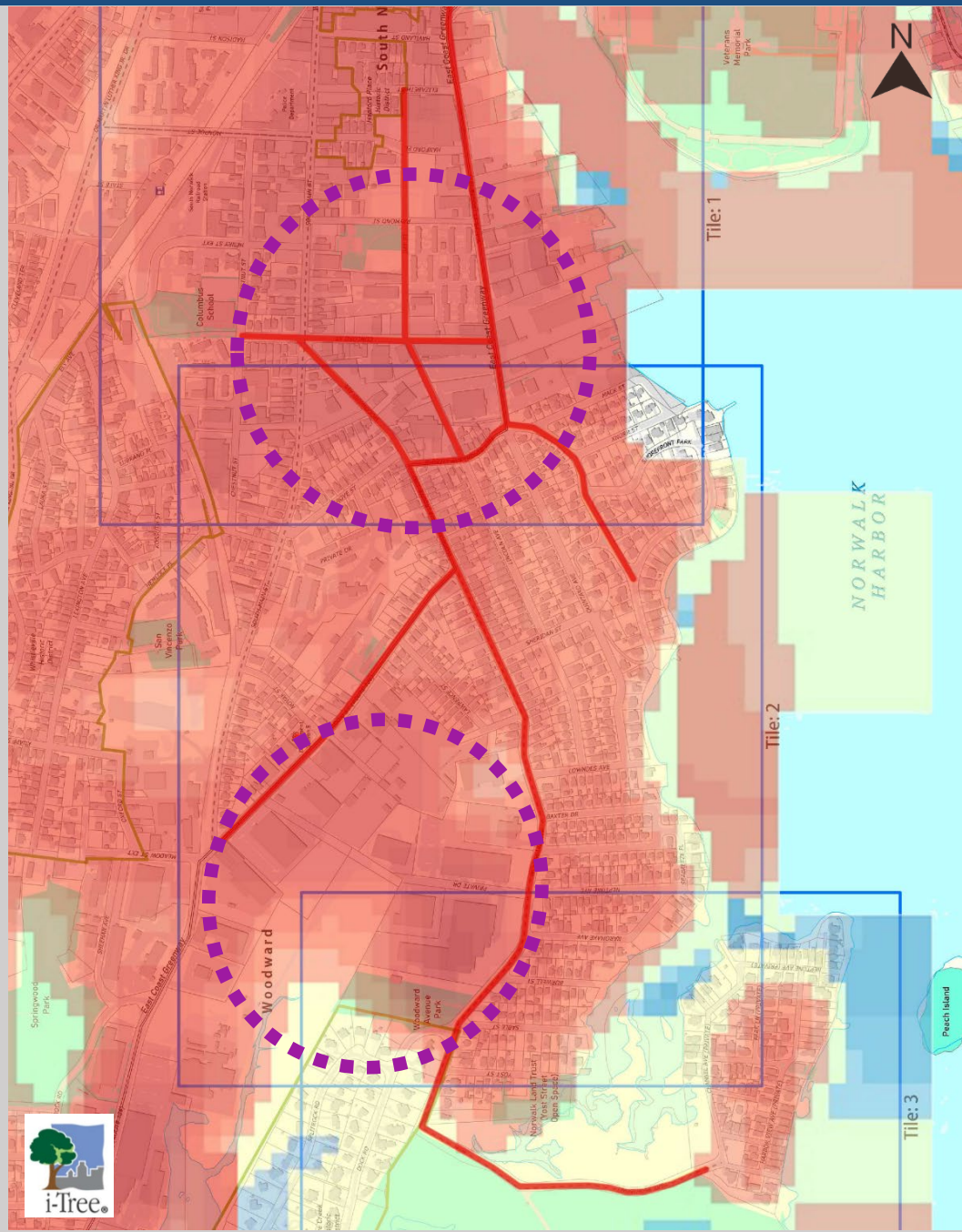
In addition to reviewing the CCVI score, our team also explored land surface temperature derived from Landsat-8 Thermal Infrared Sensor Data. This data was collected and analyzed using a public mapping software called i-Tree Landscape.

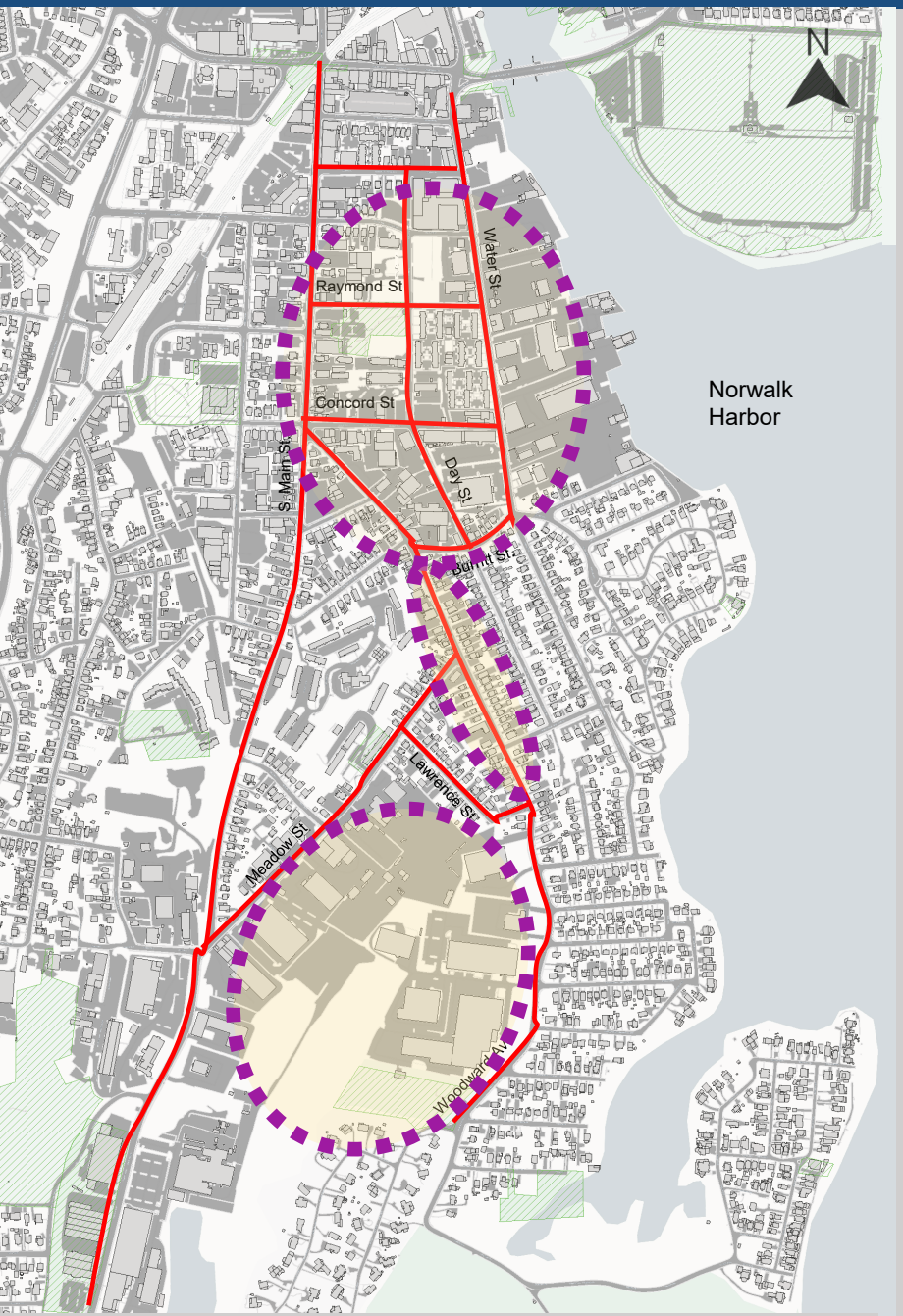
Temperature values shown on the following map demonstrate the differences between the median surface temperature for each Landsat scene. For more detailed information on how these values are calculated please see the Landsat-8 Handbook (2019).

The analysis of this data revealed more finite land surface temperature information, which allowed us to pinpoint the neighborhoods with the highest heat impact. Areas with higher industrial uses and impervious surfaces, demonstrate the highest heat impacts within the study area. These areas also coincide with lack of shade trees and green space.



Areas Impacts Most highly





Impervious Surfaces

Several areas throughout South Norwalk have larger expanses of impervious surface. This map identifies areas of highest impact.

This analysis has been used to aid in determining key focus areas to reduce the effects of excessive heat within the study area.

This data was compiled from 2016 ortho-imagery shared by the City of Norwalk.

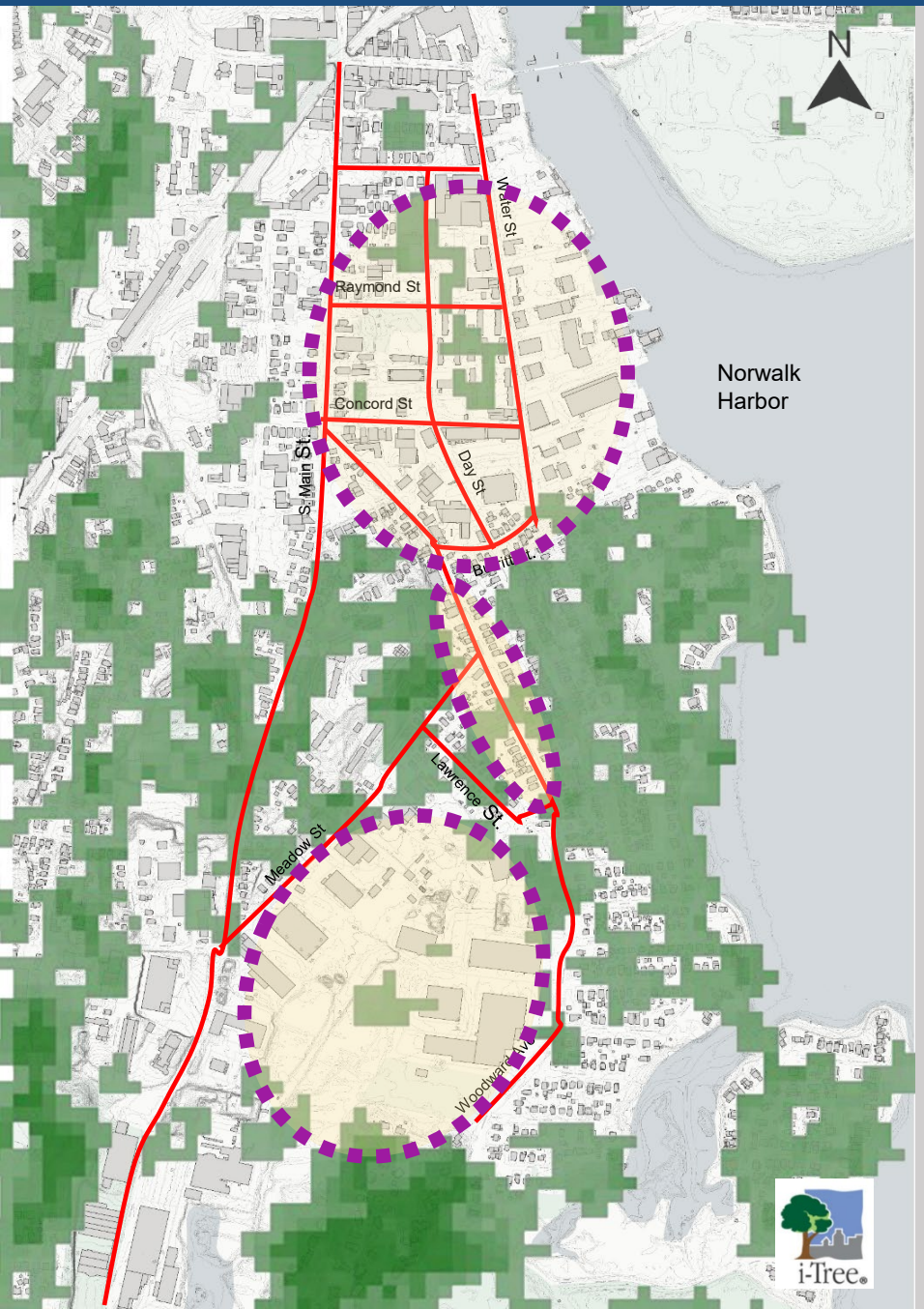
Focus Areas

Study Corridors

Impervious Surfaces

Public Green Space

**Compiled from 2016 orthoimagery from City of Norwalk GIS Data*



Tree Canopy Coverage

Urban tree canopy is a nature-based mitigation tool to reduce extreme heat by cooling the land surface. The impervious surface and high heat focus areas identified in the previous figures correlate with areas of limited tree canopy. This data was collected from the public tree canopy assessment tool, i-Tree, which calculates canopy density in 30 square meter cells.

The lack of tree canopy is evident within the two highlighted focus areas, in association with the industrial land uses within these to areas of the project site.

Focus Areas

Study Corridors

Tree Canopy

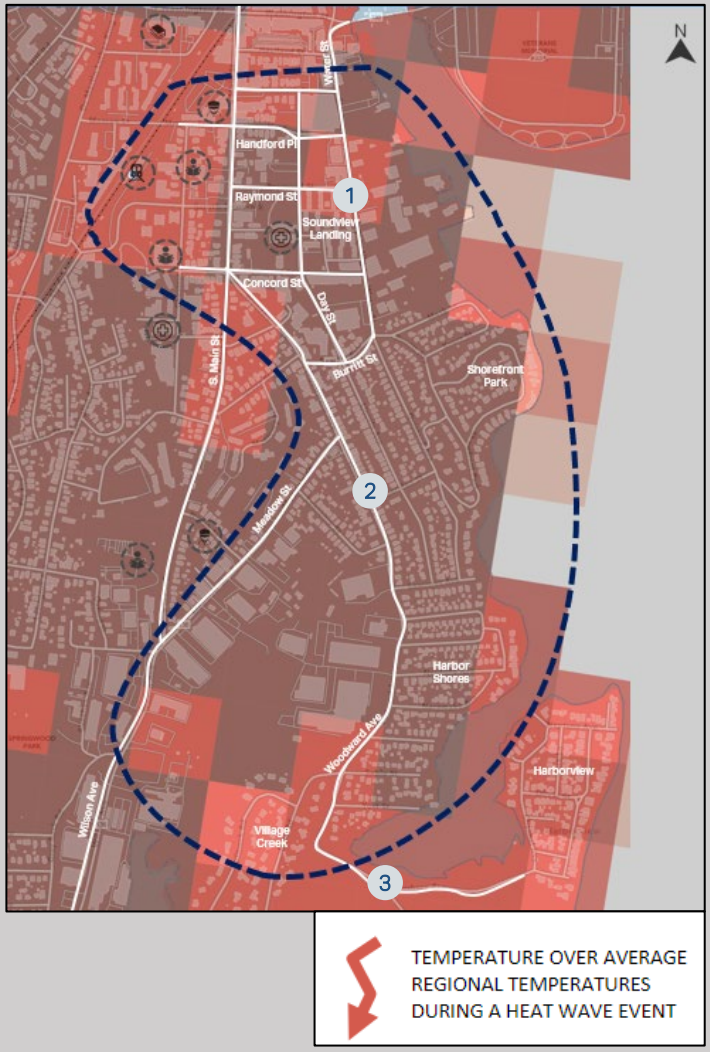
0% 100%

**Tree Canopy Percentage: calculated by 30-meter cells from itreetools.org*

Sample Heat Locations

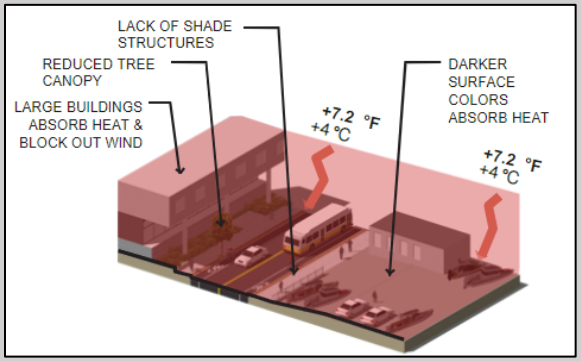
Based off the CCVI scoring and impervious surfaces data collected, environmental factors impacting heat sensitivity were compiled in three representative sample locations within South Norwalk.

The three locations include **1) Upper Water Street,** demonstrating marine-industrial impervious pavement factors contributing to heat, **2) Upper Woodward Ave**, highlighting heat vulnerability characteristic within residential and warehouse communities throughout the southern portion of our study area, and **3) Longshore Drive**, illustrating the positive impacts of wetlands and green space on heat in this location.



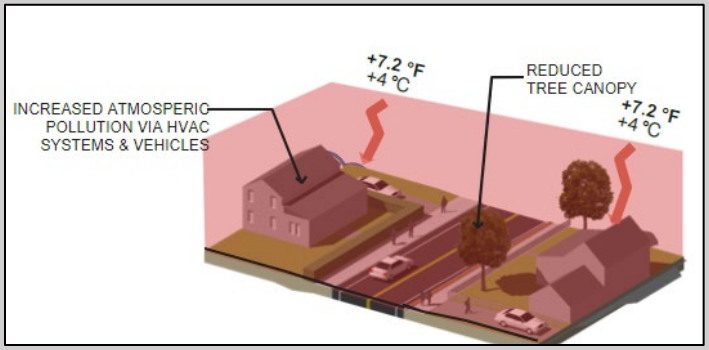
1 Upper Water Street:

Multi-family Residential and Marine/industrial land use



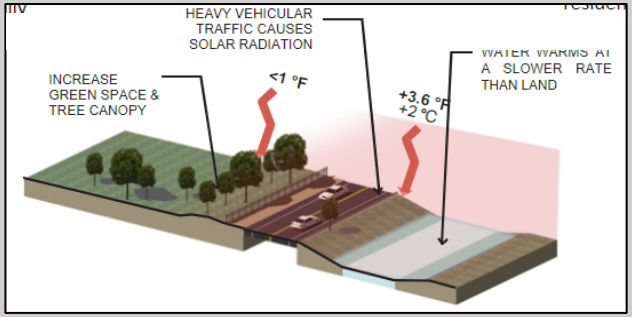
2 Upper Woodward Ave:

Single-Family Residential Neighborhood



3 Longshore Drive:

Roadway and Wetlands



- South Norwalk Branch (10 Washington Street) - Thursday: 10 AM - 5:30 PM.
- The Norwalk Police Department Community Room (1 Monroe Street). Open 24 hours a day, seven days a week.

Existing Cooling Centers

The City of Norwalk has three dedicated Cooling Centers, including two located within the study area at the South Norwalk Library Branch and the Norwalk Police Station. The city has a current program on their city website to address heat safety. (https://www.norwalkct.gov/2068/Summer-Safety)

City of Norwalk Facebook Post
Posted on July 6, 2023

"Today, July 6, 2023, Mayor Rilling announced that cooling centers are available throughout the community, as heat index values are expected to reach a high of 95 degrees today. The hot temperatures and high humidity can potentially cause heat-related illness, especially for vulnerable populations. The City encourages everyone to stay hydrated and limit strenuous exercise outdoors today.

Homes without air conditioning can be much hotter than outdoor temperatures. Anyone in need of a place to get out of the heat can go to one of the following cooling centers across Norwalk and can also call 2-1-1 to locate their nearest cooling center..."

Source of Flooding

Several factors contribute to the source of flooding in South Norwalk. The following issues are contributing factors to current and future flooding and have been considered in our study's approach:

Inland Overflow
from Tidal Waters + Storm Surge

Storm surge and higher tides from Norwalk Harbor and Long Island Sound.

The shape of the coastline affects storm surge. Water from a storm will get trapped along the coastline and travel inland to create potential flooding.

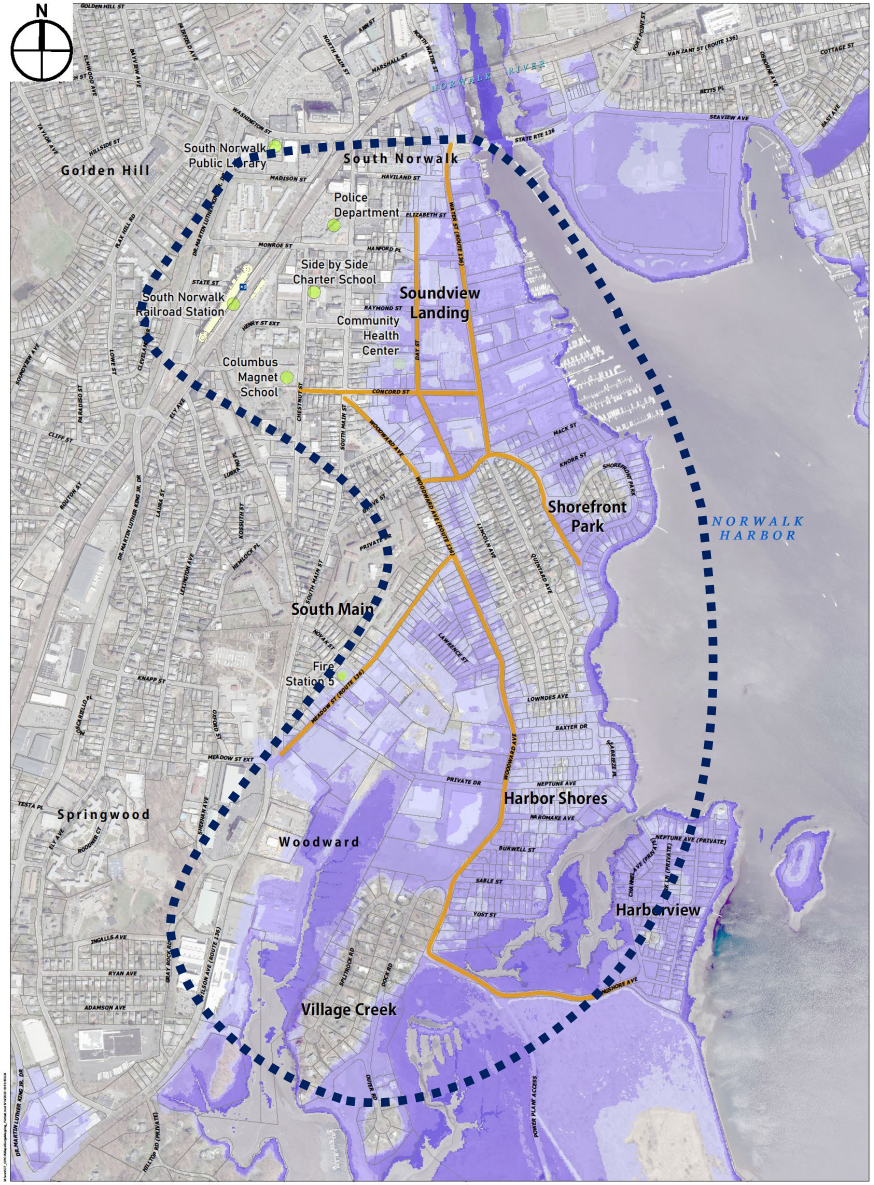
Stormwater Infrastructure

Inadequate capacity flow of the existing drainage system

Extreme Rainfall

An increase in precipitation amounts and frequency of storms.

As extreme rainfall becomes more frequent in the future, stormwater systems will need to become more robust to accommodate increased capacity.



Present Day 100-year Storm Flood Depth

This figure illustrates flood depth maps based upon the 100-year flood limits, as modeled by CIRCA. This map demonstrates the flood depth impact of a 100-year storm at high tide in the current day.

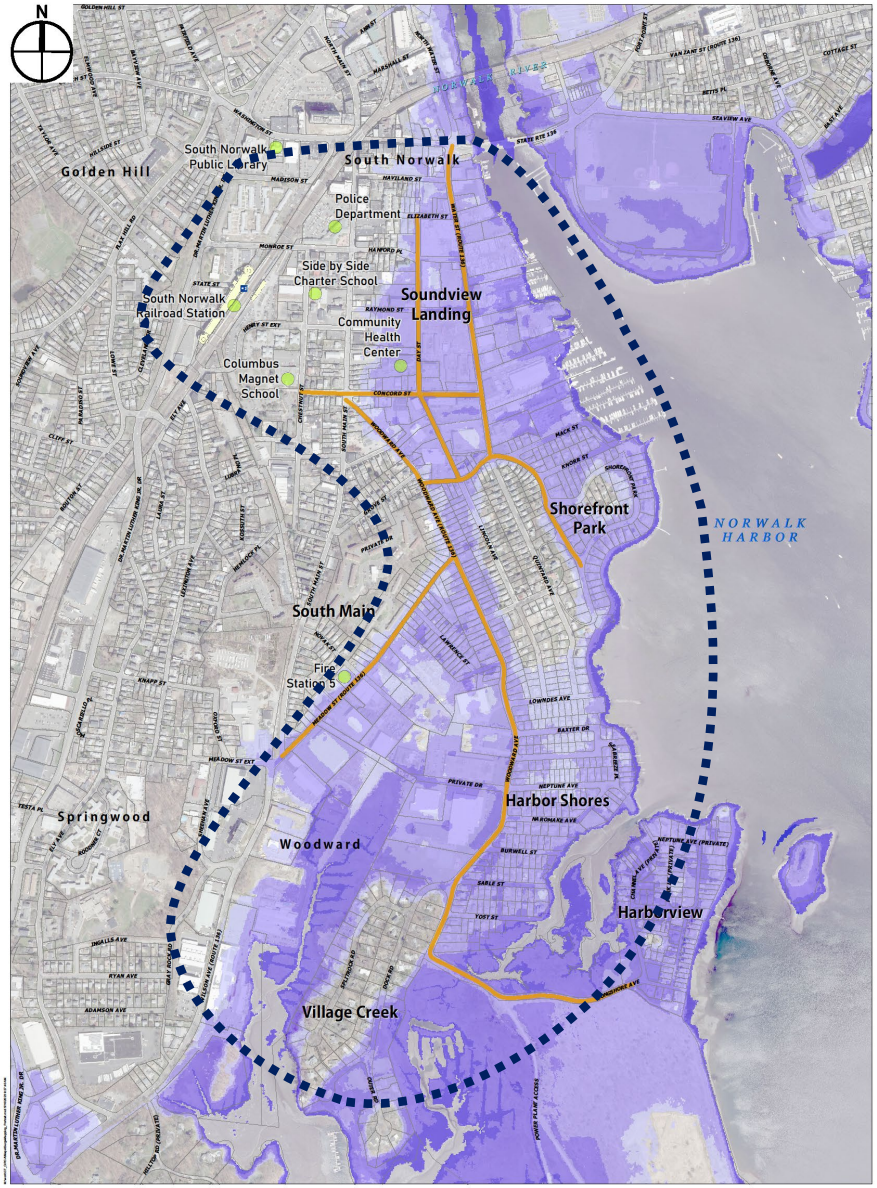
A large portion of the study area is located within the 100-year storm floodplain, although the flood maps do not reflect storm surge or flooding due to drainage infrastructure problems. *Further study is needed to confirm flood limits from upland sources.*

Present Day Flood Depth

- 1
- 2
- 3
- 4
- <4

- Project Area
- Key Corridors
- Parcel Lines

**Source: City of Norwalk, CTDEEP, CTECO | Date of Photo: 2019*



Future 2050 100-year Storm Flood Depth

This figure demonstrates the impact of a 100-year storm at high tide, as predicted for 2050 with sea level rise. During a future extreme storm event:

- Average precipitation expected to increase about 8%, or 4 inches per year
- Sea level is projected to rise by 20 inches by 2050

Future Flood Depth

1
2
3
4
<4

Project Area
Key Corridors
Parcel Lines

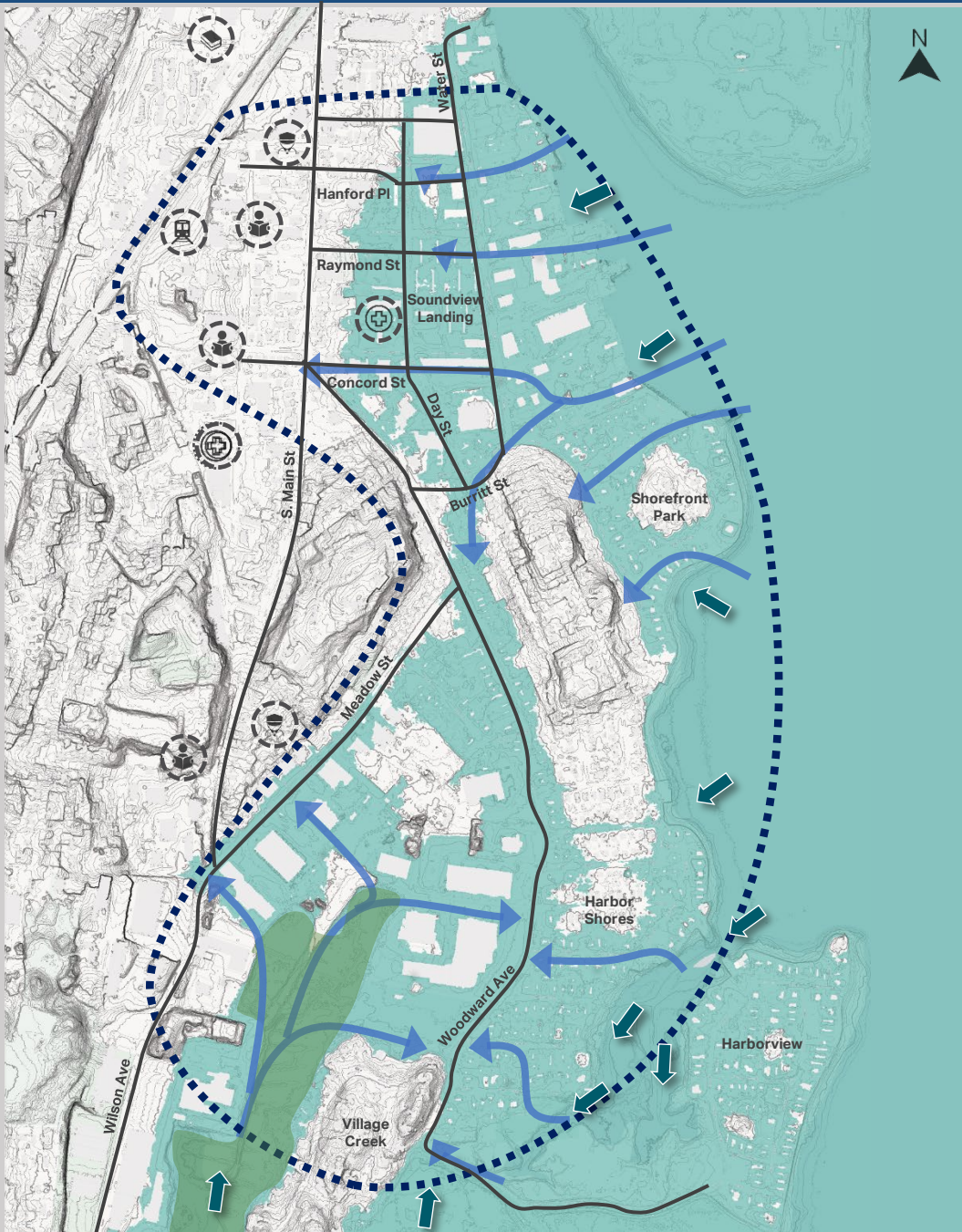
**Source: City of Norwalk, CTDEEP, CTECO | Date of Photo: 2019*

Present Day 100-year Storm Flood
Elevation & Flood Pathway Analysis

In addition to analyzing flood depth values, flood levels by storm elevation were studied throughout the project area to determine dominant flood pathways.

The adjacent graphic shows flooding to elevation 9.38 based on NAVD88 data and highlights flood pathway locations from Norwalk Harbor and the Village Creek that contribute to the present-day flooding within the study area.

Based on this information, key flood pathways for this study were identified by examining the direction of waterflow at each elevation above sea level. This study revealed that flooding primarily enters from the lower region of Woodward Ave, Norwalk Harbor, the Village Creek saltmarsh, and along the harbor east of Water Street. These flood pathways also correspond with fragments of the coastline most vulnerable to the impacts of storm surge, which may worsen flooding impacts.



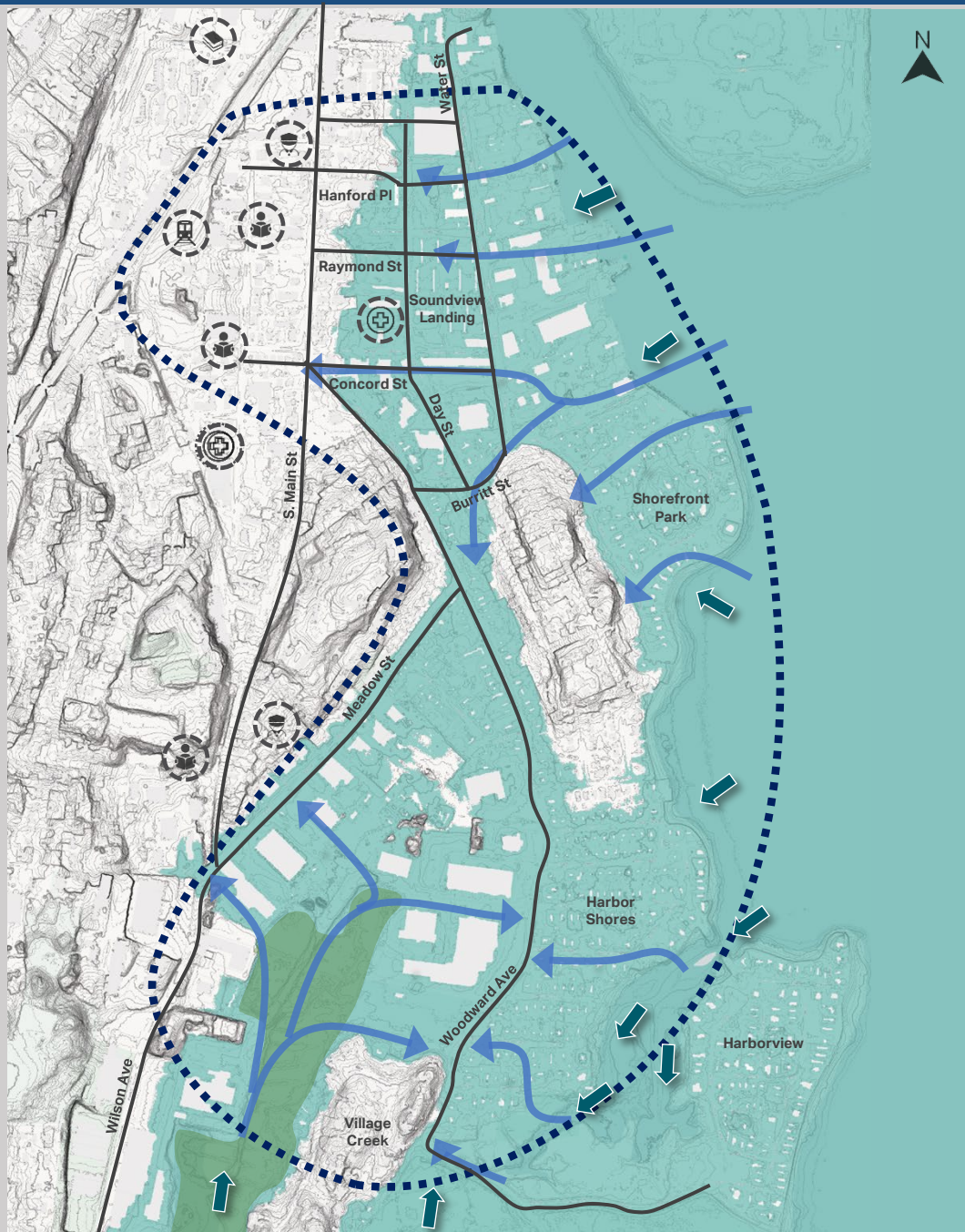
- Project Area
- Study Corridors
- Flood Pathways
- Storm Surge Direction
- Designated Marshlands
- (100 Yr.) 1% Annual Storm Present Day: Elevation 9.38 NAVD88

Future 2050 100-year Storm Flood
Elevation & Flood Pathway Analysis

During a projected major future storm event, flood pathways may extend in the south along Woodward Avenue, inundating the surrounding neighborhoods. In the northern portion of our study area, flooding may travel upland gradually towards South Main and upper Woodward Avenue, as shown on this figure.

The adjacent graphic shows flooding to elevation 10.88 based on NAVD88 data and highlights flood pathway locations from Norwalk Harbor and the Village Creek that may contribute to the future flooding within the study area.

In 2050, small changes in mean sea level will have a big impact on the frequency of flooding. We can expect chronic flooding levels to rise as the mean sea level increases.



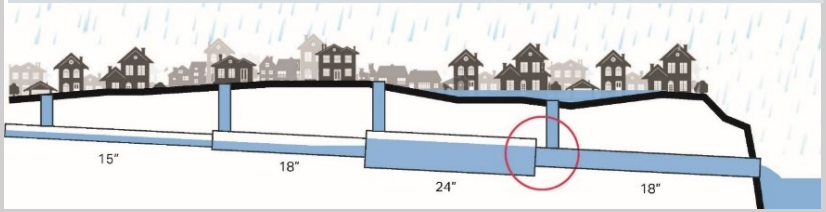
Upland Flooding & Stormwater Infrastructure Issues (Northern)

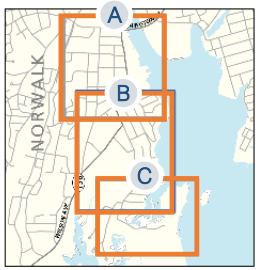
Lack of pipe capacity and undersized pipes may contribute to the pluvial flooding of South Norwalk.

From a design standpoint, each consecutive pipe in a drainage system should increase in size to drain properly. When there is not enough capacity, water can back up within the drainage pipes and the surface water isn't able to adequately drain from within the inlets. An increase in pluvial flooding may be due to backup caused by lack of pipe system space or inconsistent updates to the pipe structure.

The following map shows pipe networks within the northern section of the study area, starting from the train station and Soundview Landing to Shorefront Park. Undersized pipes have been identified at the intersection of Raymond Street and Water Street.

Pipe Capacity: The volume of water that can flow freely through a pipe





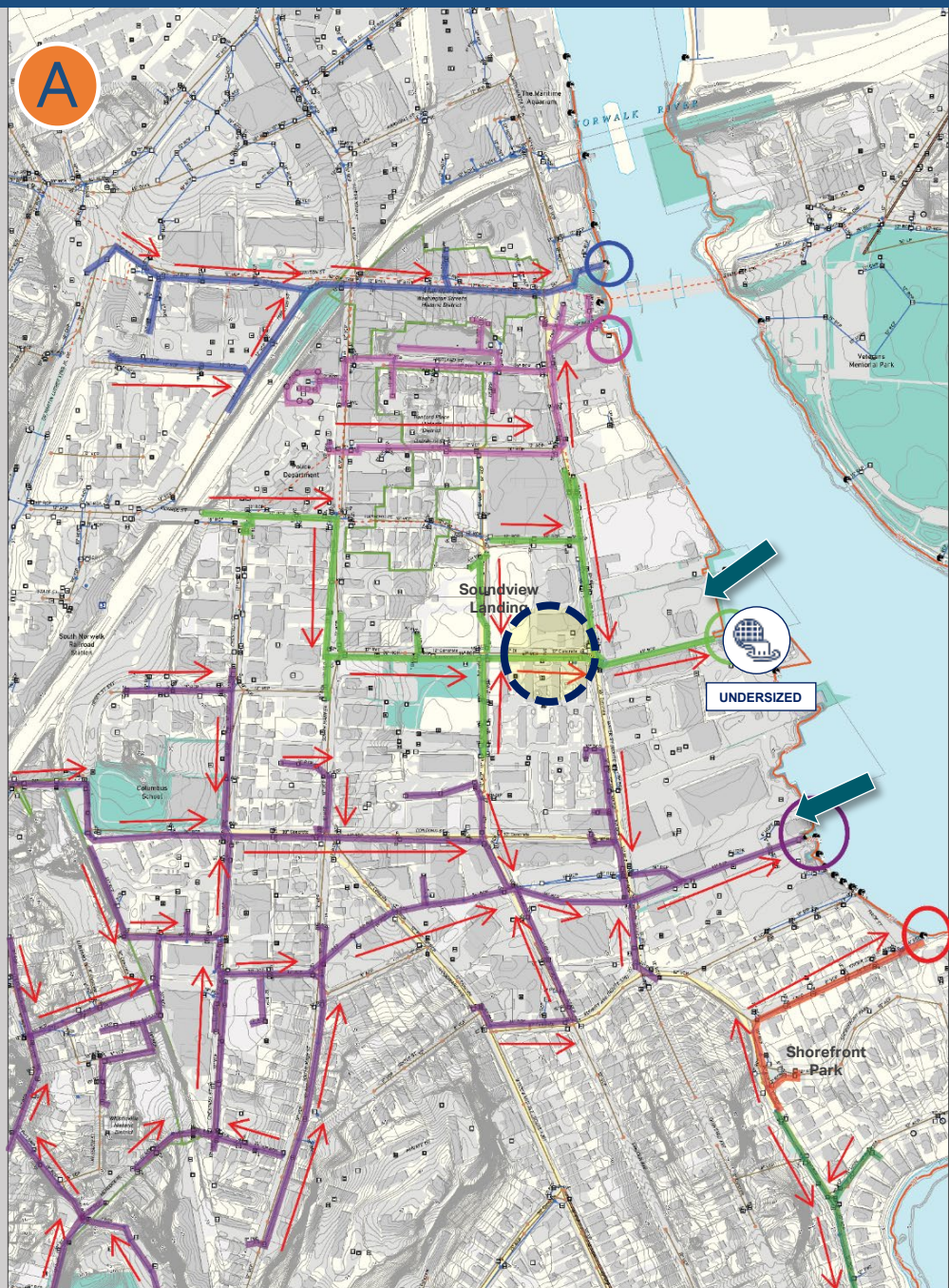
Outfalls

UNDERSIZED Undersized Pipes at Outfalls

Direction of pipe flow

Storm surge direction

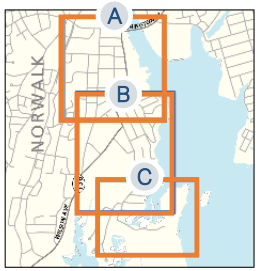
*Source: Norwalk Stormwater and Sanitary Sewer Infrastructure https://norwalk.maps.arcgis.com



Upland Flooding & Stormwater Infrastructure Issues (Central)

The map shows the existing stormwater pipe networks for the central portion of the study area from the Shorefront Park neighborhood to Harbor Shores and Meadow Street.

Undersized stormwater pipes have been identified at the outfall location at the east end of Knorr Street and Mack Street, off Burritt Avenue in Shorefront Park.



Outfalls

UNDERSIZED Undersized Pipes at Outfalls

Direction of pipe flow

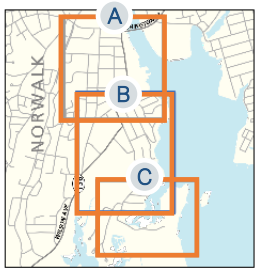
Storm surge direction

Source: Norwalk Stormwater and Sanitary Sewer Infrastructure https://norwalk.maps.arcgis.com

Upland Flooding & Stormwater Infrastructure Issues (Southern)

The following map shows stormwater pipe networks for the southern portion of the study area within Harbor Shores, Village Creek and Harborview neighborhoods.

Note: Base upon the information available from the City of Norwalk, Harborview does not have a stormwater treatment system on record; therefore, no undersized pipes were identified in this area.



Outfalls

UNDERSIZED — Undersized Pipes at Outfalls

Direction of pipe flow

Storm surge direction

Source: Norwalk Stormwater and Sanitary Sewer Infrastructure https://norwalk.maps.arcgis.com

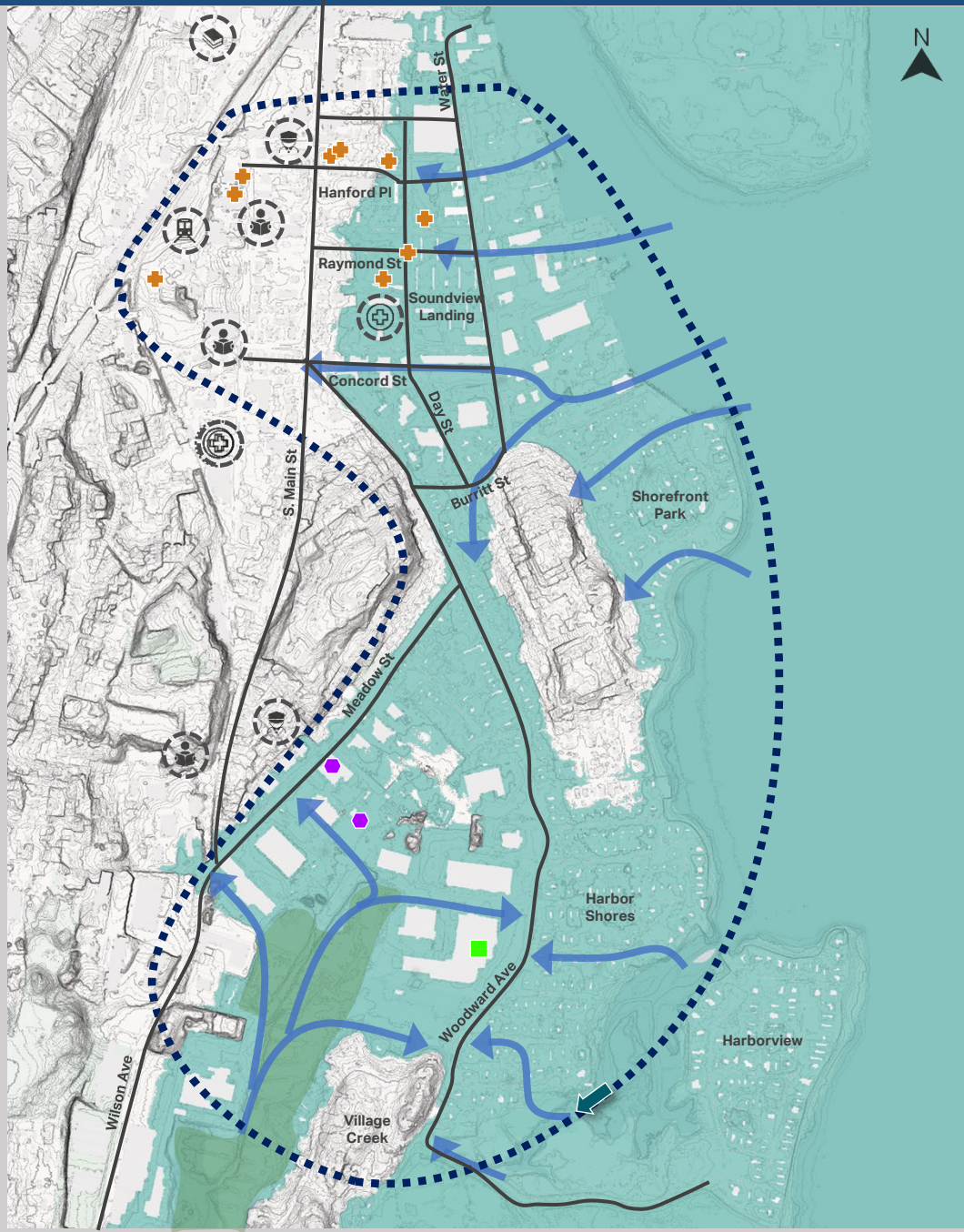
EPA Brownfield Sites within Project Limits

Environmental Protection Agency (EPA) site data was used to note areas of concern overlapping with projected 2050 flood pathways in the project area.

Several locations in the northern region of our study area are identified as EPA Brownfield Properties (✚). Additionally, there have been several recycling fires (⬢) on record in the industrial areas along Meadow street and one successful clean up corrective action (■) along lower Woodward Ave.

- Project Area
- Study Corridors
- Flood Pathways
- Storm Surge Direction
- Designated Marshlands
- (100 Yr.) 1% Annual Storm Projected for 2050 with 20" Sea Level Rise Elevation 10.88 NAVD88
- EPA Brownfields Properties
- Responses – Junkyard & Recycling Fires
- RCRA Corrective Action
  The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste

** All information referenced from the EPA "Cleanups In My Community Map" | 2023*

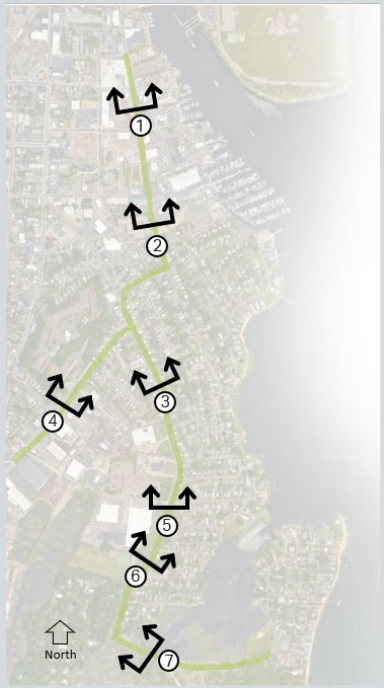


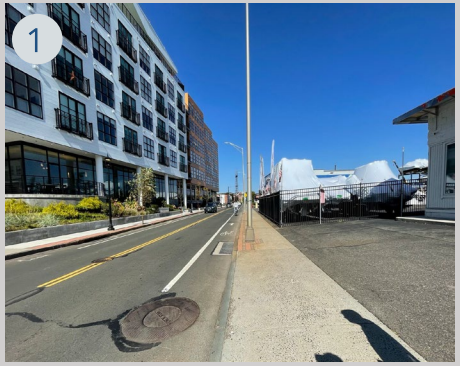
2050 Flood Scenario: Study Corridors North to South

Current and future flood limits were compared to better understand how the 100-year flood with sea level rise (SLR) could potentially impact the study area on a detailed and site-specific scale.

A series of representative locations were selected along the study area corridors. The locations represent a variation of land use conditions to assess diverse scenarios in preparation for establishing adaptation and mitigation options.

Flooding impacts are graphically presented through a series of axonometric perspective views. The sections are located along the key study corridors and are overlaid with future flood depth levels onto existing conditions.





North End of Water St: Multi-family residential and marine/industrial land use mix.

South End of Water St: Office mix with waterfront municipal/ public lots

North Woodward Ave: Single family residential neighborhood

Meadow St: Industrial land use adjacent to single family residential

South Woodward Ave: Industrial warehouse and single family residential

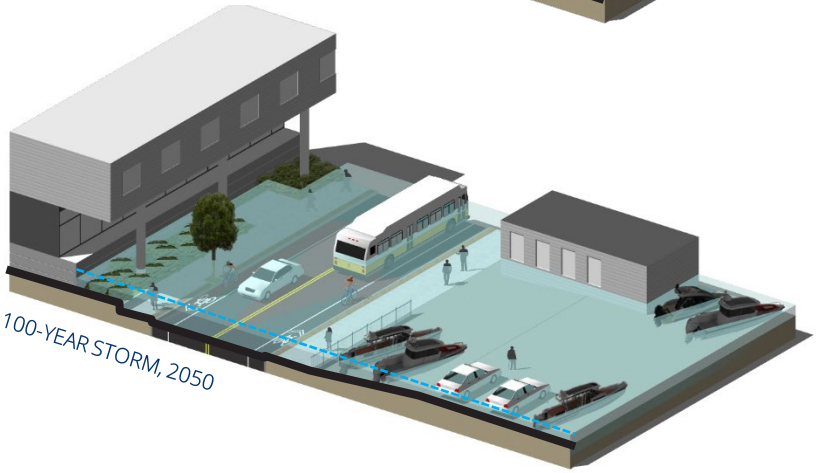
Lower Woodward Ave: Recreational open space and single family residential

Longshore Drive: Open space, marsh and single family residential.

1 2050 Flood Scenario on Upper Water Street

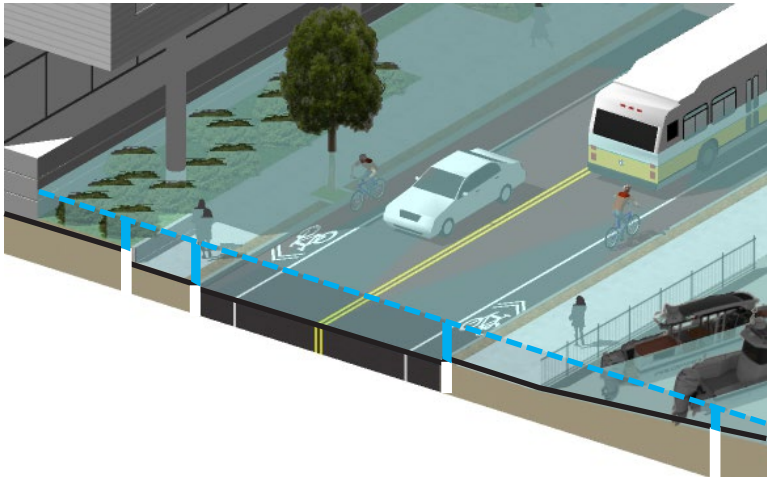
The first focus area is the intersection of Raymond Street and Water Street in the northern region of our study area. This location consists of multi-family residential and marine-industrial land uses. Water Street currently experiences frequent flooding, and with predicted future 100-year storm events, this location could experience up to 5-to-6 feet of flooding depth within the roadway.

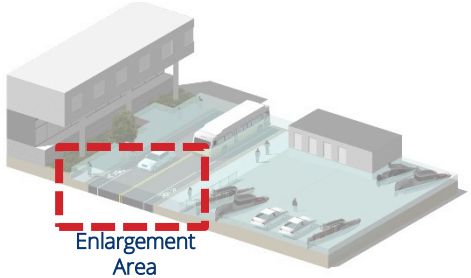
NO FLOODING



100-YEAR STORM, 2050

Approx. Road Elevation 5.0

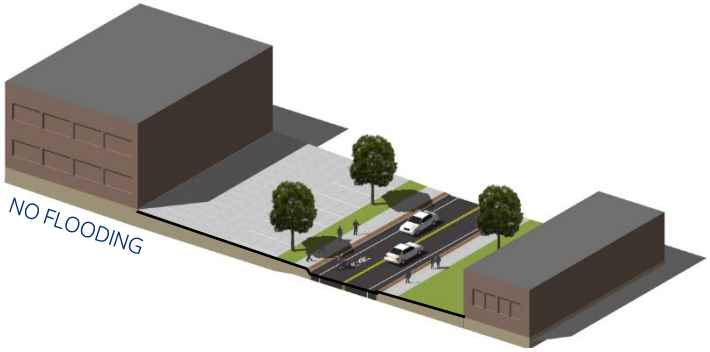


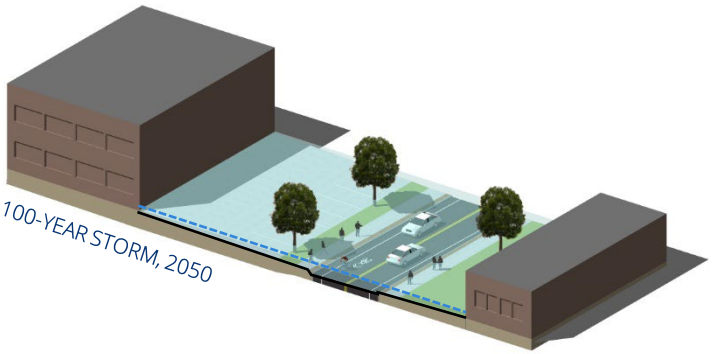


Enlargement Area

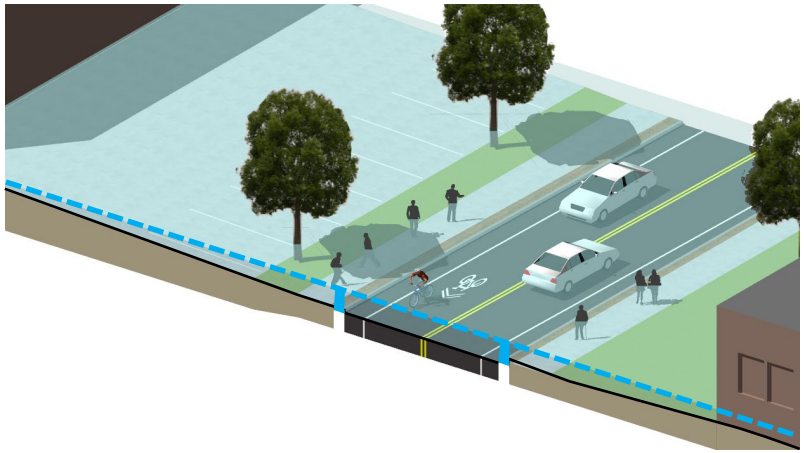
2 2050 Flood Scenario on Lower Water Street

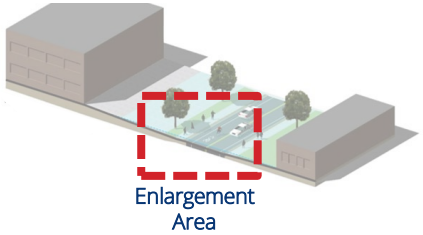
The second focus area is located along Water Street just north of the intersection with Quintard Avenue and Burritt Avenue. This location includes marine/waterfront, municipal, and commercial land uses. This section of Water Street currently experiences frequent flooding and in the case of a future 100-year storm event this location could experience up to 3-to-4 feet of flooding depth within the roadway right-of-way.





Approx. Road Elevation 7.0

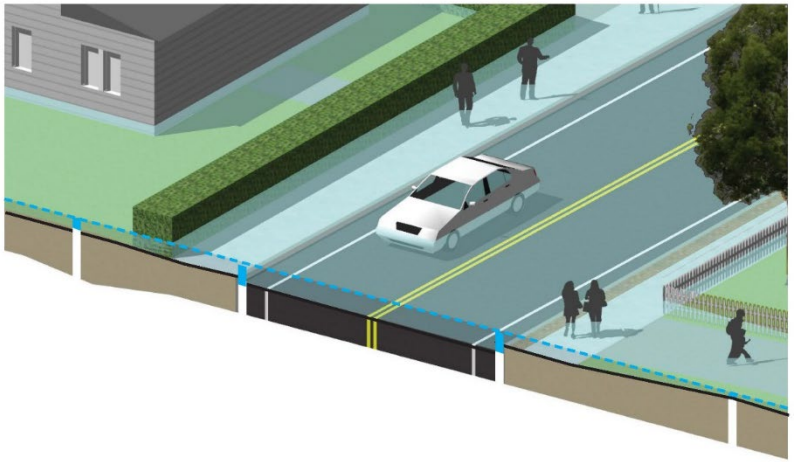


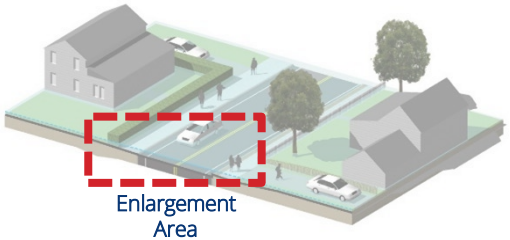


3 2050 Flood Scenario on Upper Woodward Ave

The third focus area is adjacent to the intersection of Lawrence St with upper Woodward Avenue. This location includes single-family residential land use. This roadway currently experiences frequent flooding and in the case of a future 100-year storm event this location could experience up to 2 to 3 feet of flooding depth in the roadway.

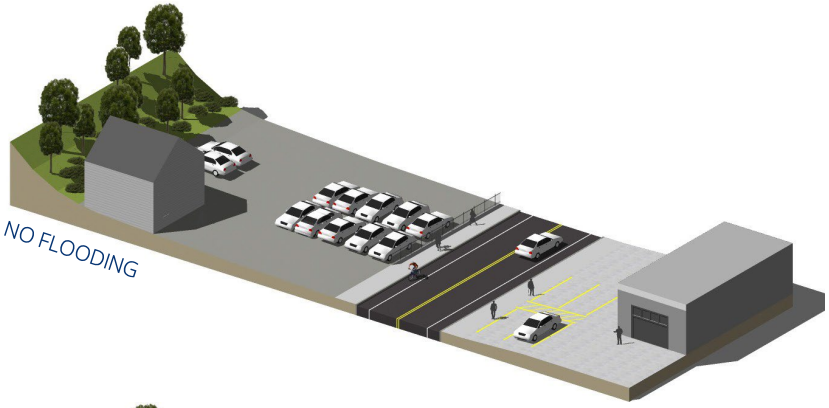
Approx. Road Elevation 8.0



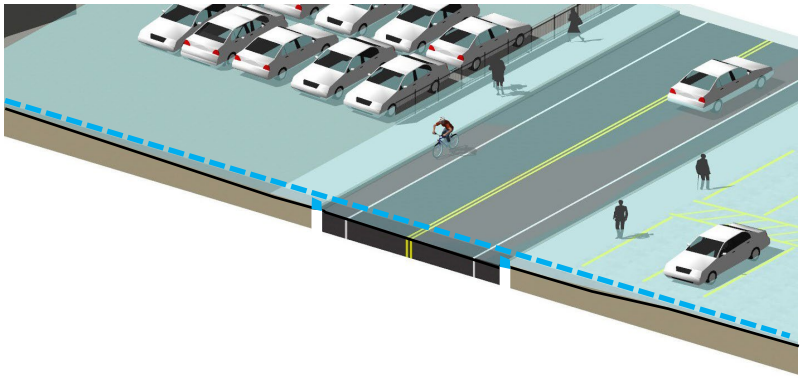


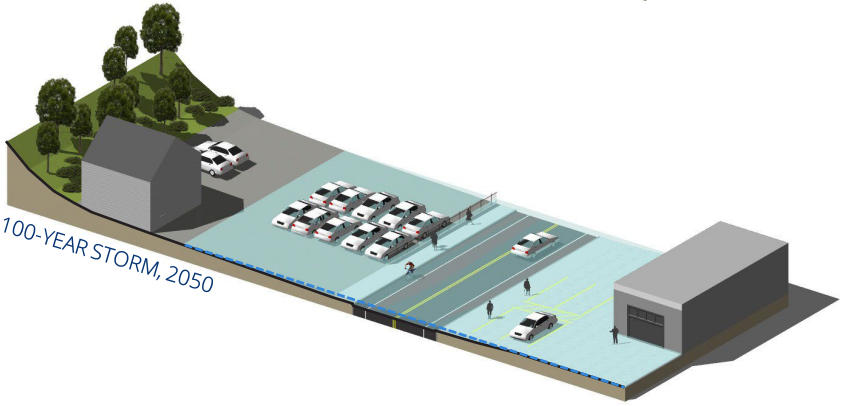
4 2050 Flood Scenario on Meadow Street

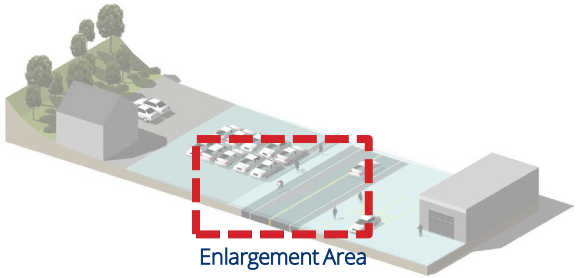
The fourth focus area was taken just before the intersection of Novak St with Meadow St. This location includes industrial land use with adjacent single-family residential. This roadway currently experiences infrequent flooding and in the case of a future 100-year storm event this location could experience up to 1 to 2 feet of flooding depth in the roadway.



Approx. Road Elevation 9.0

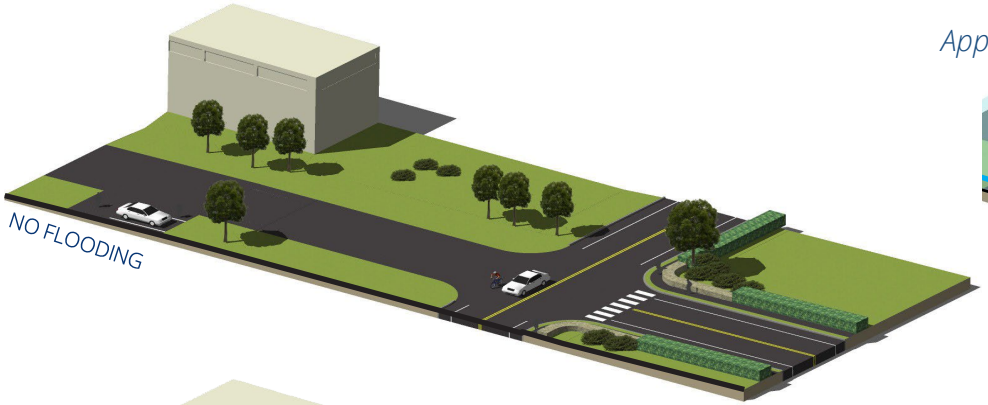


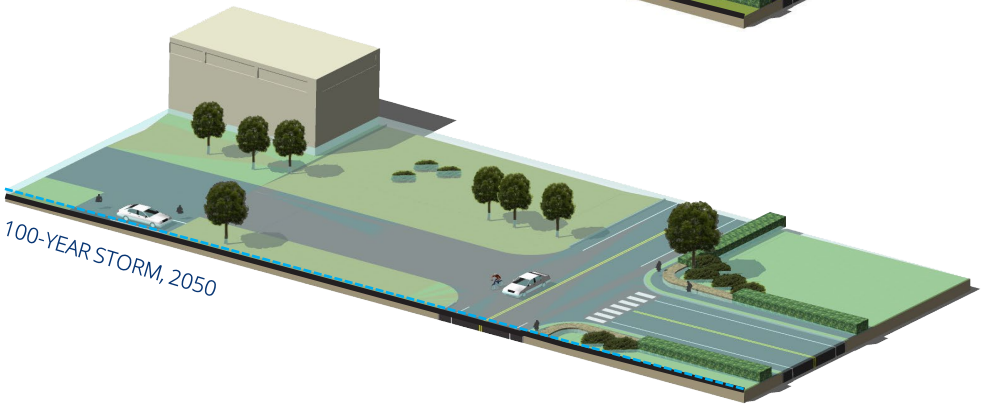




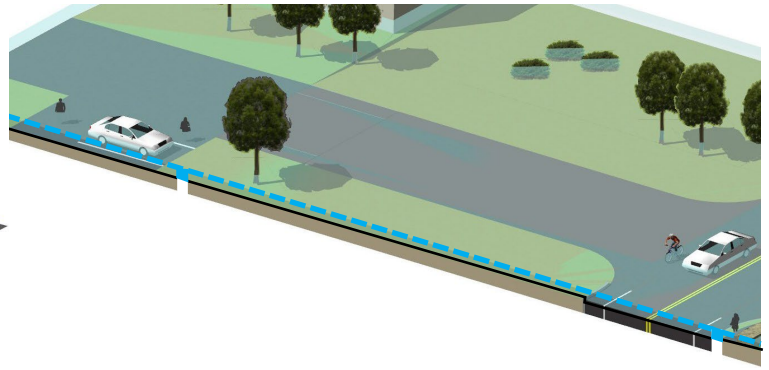
5 2050 Flood Scenario on Woodward & Neptune Street

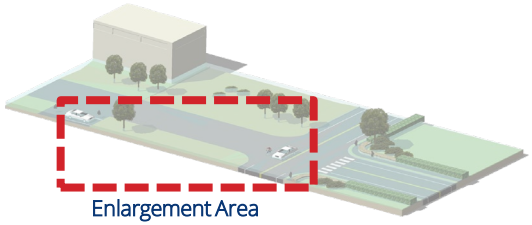
The fifth focus area was taken at the end of Neptune Avenue at Woodward Avenue. This location consists of industrial warehouse and single-family residential land uses. This roadway currently experiences frequent flooding and in the case of a future 100-year storm event this location could experience up to 3 to 4 feet of flooding depth in the roadway.





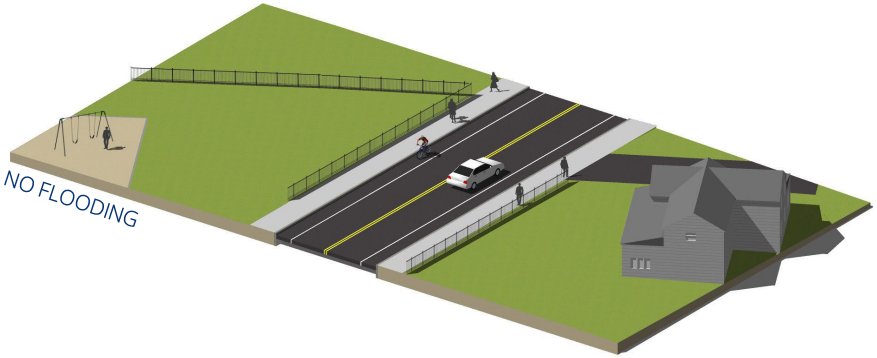
Approx. Road Elevation 7.0

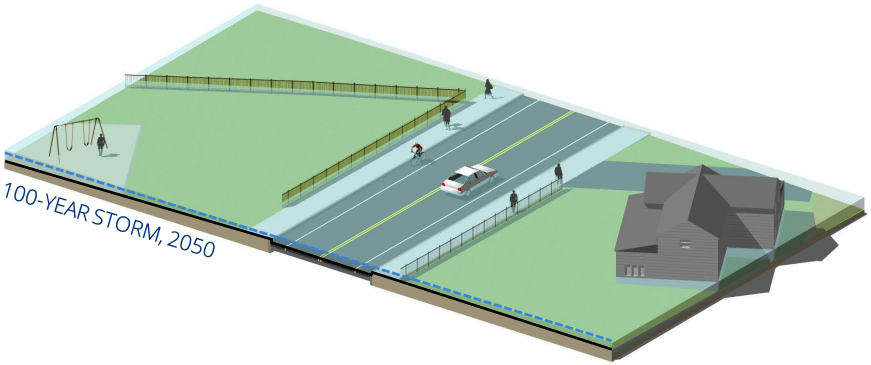




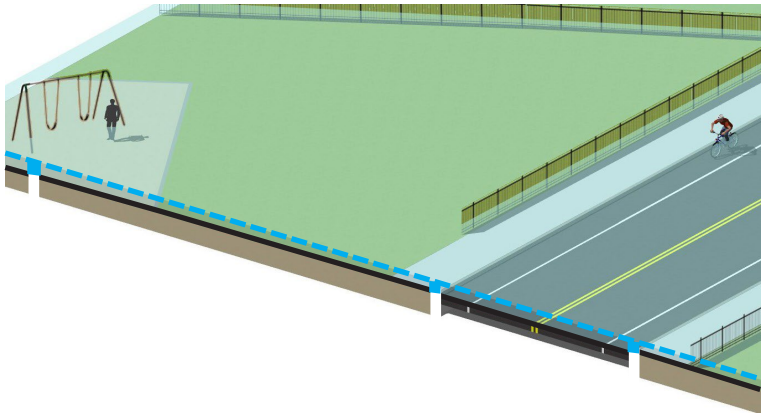
6 2050 Flood Scenario on Lower Woodward Ave

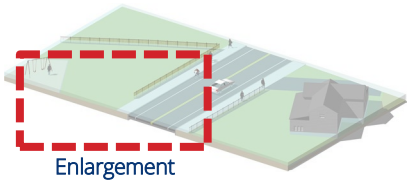
The sixth focus area is at Village Creek Park on lower Woodward Avenue. This location includes residential and recreational parkland land use. This roadway currently experiences frequent flooding and in the case of a future 100-year storm event this location could experience up to 3 to 4 feet of flooding depth in the roadway.





Approx. Road Elevation 7.0

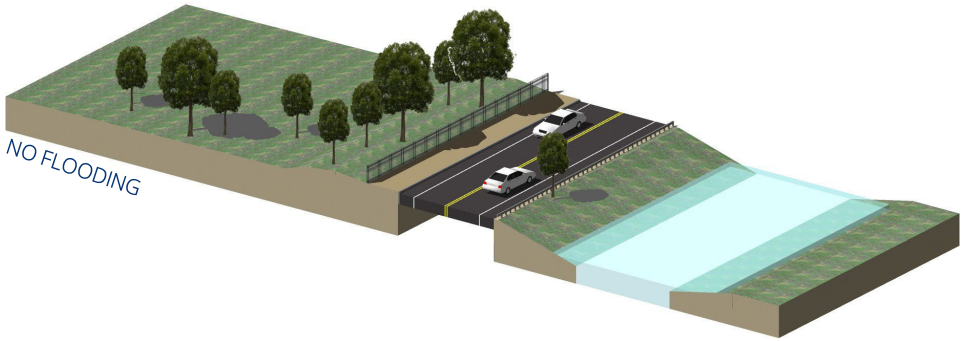


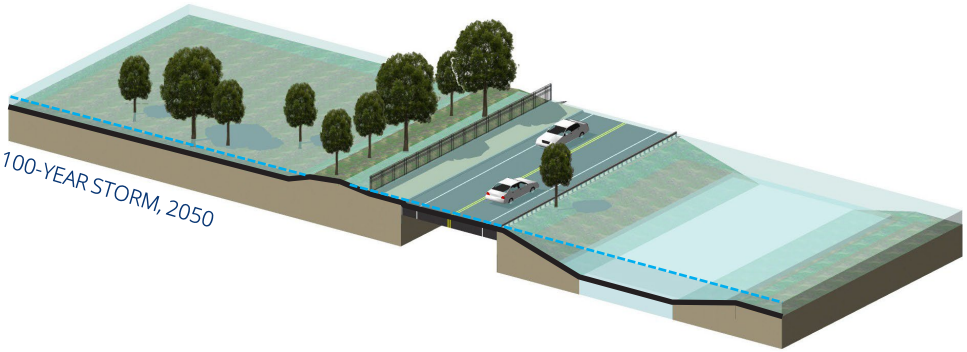


7

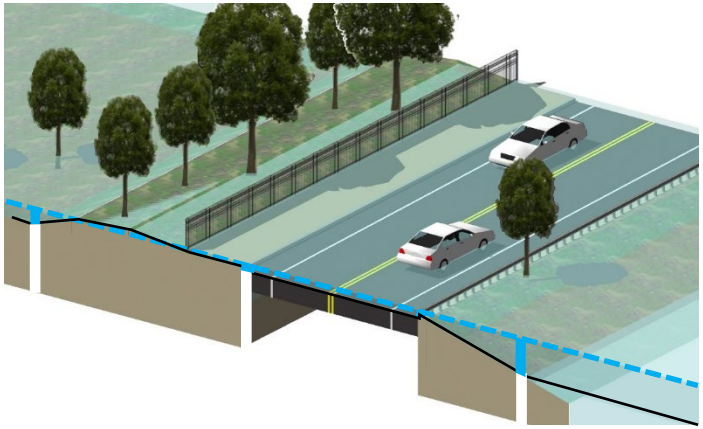
2050 Flood Scenario on Longshore Drive

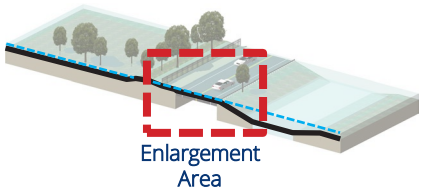
The seventh focus area was taken at along Longshore Drive heading connecting to Harborview neighborhood. This location includes open space and wetland land use. This roadway currently experiences frequent flooding and in the case of a future 100-year storm event this location could experience up to 3 to 4 feet of flooding depth in the roadway.





Approx. Road Elevation 7.0





John H. Ryan Park, South Norwalk
Photo taken by AECOM

Summary

The Resilient South Norwalk project is a unique opportunity to build climate resilience for specific locations through actionable solutions, while simultaneously developing a replicable approach for addressing heat and flood challenges throughout the City of Norwalk.

A review of the existing conditions throughout the study area and roadway corridors has confirmed the vulnerability echoed by the community. The roadway currently experiences flooding due to intense rain events, and the flooding can be further worsened when a storm system is accompanied by a storm surge, which hinders the functionality of the existing drainage network. Additionally, climate change will continue to increase the frequency with which the community experiences intense rainfall events and systems producing storm surges.

The impacts of climate change will also place a greater strain on the community's existing drainage and flood control systems and increase the difficulty for the community to maintain a flood-free roadway corridor for everyday needs and connections with emergency services.

The impacts of extreme heat are also significant for the community along the study corridors. Large areas of higher land surface temperatures are clearly located along corridors that serve as pedestrian links between destination locations, as well as pedestrian routes to bus stops and the train station.

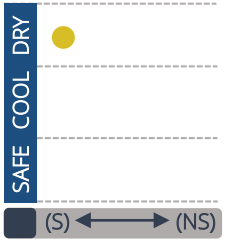
ADAPTATION OPTIONS

Village Creek Marsh
Photo Credit, AECOM

Toolkit Matrix

The "Resiliency Kit of Parts" was developed to define common mitigation strategies and visualize how they could complement and benefit one another. The matrix below organizes these strategies on a spectrum of Structural (S) to Non-Structural (NS) interventions and sorts them into three categories: Keeping Cool (heat resiliency), Keeping Dry (flood resiliency), and Keeping Safe (community adaptability & awareness). The following pages explain each of these strategies in further depth and describe how they can be combined in a design approach, highlighting applications, benefits and challenges of each tool.

Shade Structures



Pairs well with:

Application:

Shade structures offer shade and shelter from precipitation and extreme heat conditions and create opportunities for green roofs and creative placemaking. Structures could be incorporated in South Norwalk at public parks and bus stops, especially in locations with a lack of natural shade.

.

Benefits:

- Can be incrementally installed over time
- Combats both heat and site-specific flooding risk reduction.
- Can be combined with other recreational and climate educational programming and incorporated into public waiting areas

Challenges:

- Can be vulnerable to deterioration or vandalism, if not maintained
- Requires coordination with other city programs to incorporate.

Source: Maricopa Association of Governments

Source: The Wildlife Trusts and Clear Channel

Cool Roof & Pavement Colors

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

Lighter pavement colors and reflective materials are an excellent method of cooling down the land surface and building temperature by reflecting heat vs. absorbing it. Colored and permeable materials could be considered throughout the project area to complement other resilient techniques.

Benefits:

- Can be incorporated into future hardscape and parking areas
- Can be combined with other recreational programming
- Can be included in design guidelines in a resilient overlay district

Challenges:

- Can be less durable and cost efficient than traditional asphalt
- Challenge to retrofit into existing hardscape
- Can deteriorate over time if painted in vehicular locations

US Climate Resilience Toolkit, https://toolkit.climate.gov/image/3513

Green Infrastructure

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

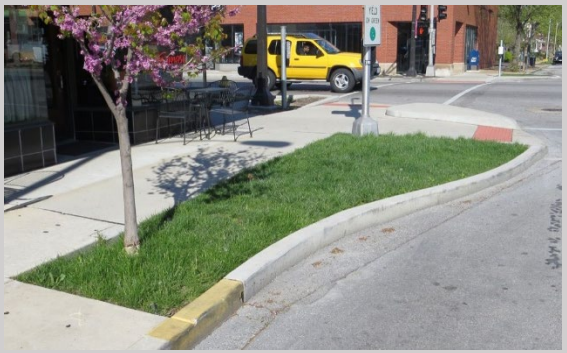
Green Infrastructure refers to a network that provides the "ingredients" for solving urban and climatic challenges. Examples, of green infrastructure applicable to South Norwalk could be the addition of permeable paving, stormwater planters, and curb extensions. Curb extensions have the added benefit of acting as an effective traffic-calming technique, location for tree planting, and feature to enhance pedestrian safety.

Benefits:

- Creates a safer pedestrian experience
- Planted areas combat heat and flooding impacts
- Provides space for additional street trees

Challenges:

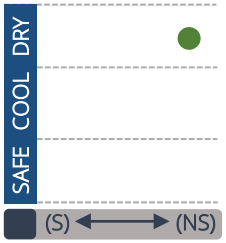
- Limits off-street parking and narrows travel lanes within roadway



Source: flowstobay.org

Source: NACTO

Expand Tree Canopy & Parks



Pairs well with:

Application:

Expanding the urban forest canopy through the increase of the tree planting in the roadway ROW's, public parks, and public lands, has the multiple benefit of naturally absorbing water runoff; providing shaded corridors and wind breaks; reducing energy costs; boosting economic benefits; improving air quality; and promoting public health and wellbeing.

.

Benefits:

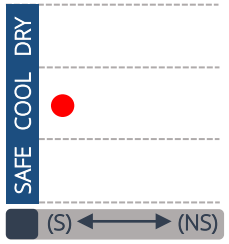
- Creates visual relief in urban areas
- Combats heat, flooding, and wind impacts
- Enhances urban ecology, air quality and public health
- Cost Effective

Challenges:

- Requires maintenance to establish trees after installation
- Reduces sidewalk width to accommodate adequate tree pit size

Source: photos by AECOM

Elevate Roadway



Pairs well with:

Application:

Elevating selected roadways for safe emergency evacuation routes: This selection could be based upon specific standards dependent upon the level of road use and existing and future adjacent land use within the neighborhood. Cost and property owner impacts are a major consideration for this adaptation option.

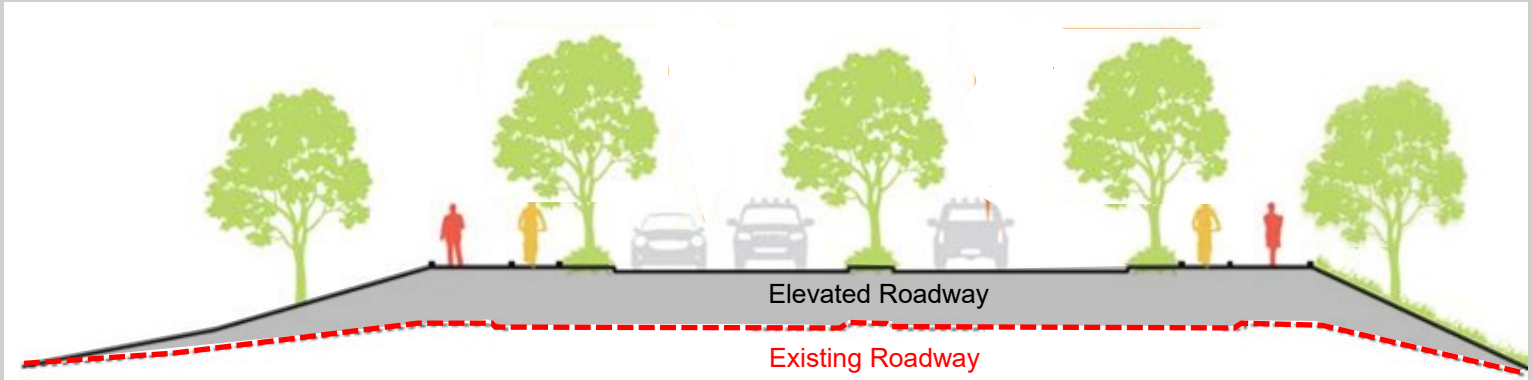
.

Benefits:

- Can be easily combined with green infrastructure improvements
- Promotes safe evacuation and more resilient neighborhoods
- Promotes climate change awareness

Challenges:

- Costly to Implement
- Requires intensive labor and heavy machinery to install



Raised New Developments along Water Street and Raymond Street, Photos by AECOM

Install Flood Barriers

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

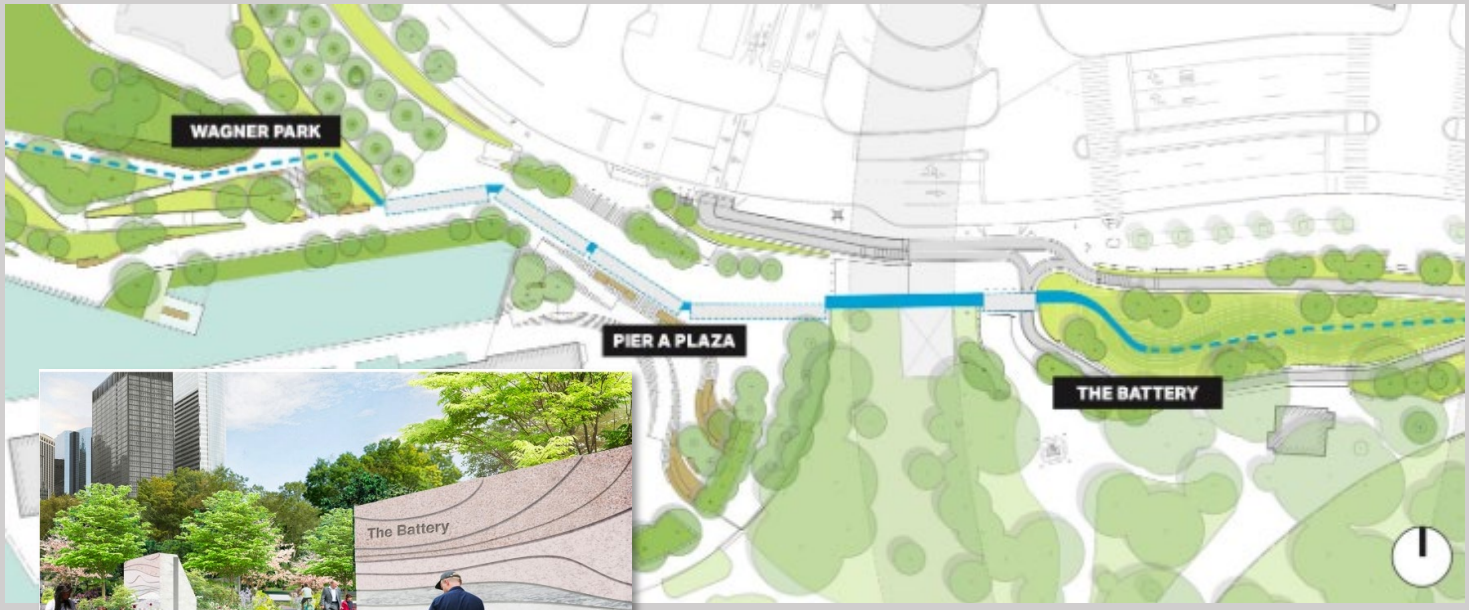
Flood barriers are designed to prevent storm surge or spring tide from flooding an entire region. They can be an appropriate solution in some scenarios but can also cause unintended environmental consequences and can be visually imposing.

Benefits:

- Effective means of protecting areas of high flood risk

Challenges:

- Requires regular maintenance
- Costly to construct
- Environmental impacts need to be reviewed prior to design development



Rendering of a concept for a flood wall clad with various types and colors of stone that represent the topography of the Hudson River Valley. Credit: Battery Park City Authority and AECOM

Battery Park Flood Wall Design Concept, AECOM

Install Tide Gates Selectively

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

A tide gate is a gate through which water flows when the tide is in one direction and that closes automatically when the tide is in the opposite direction. Tides gates could be considered selectively throughout south Norwalk to help contain water during flooding events

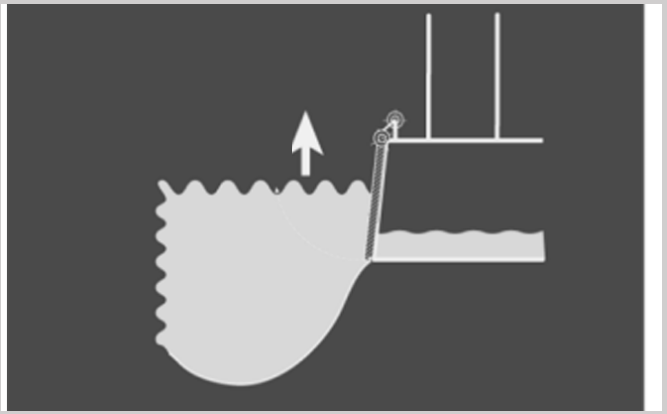
Benefits:

- Able to adjust depending on water level
- Can be implemented on a small or large scale

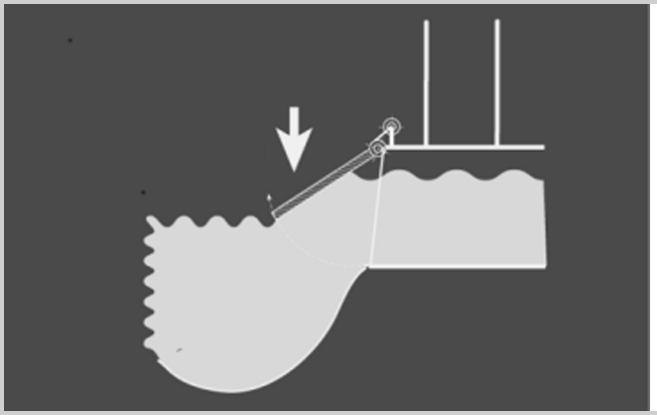
Challenges:

- Requires regular maintenance
- Requires thorough stormwater modeling prior for feasibility

Tide Gate, Waterman.com

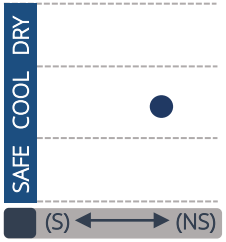


"Duckbill" Backflow Prevention, redvalve.com



Tide Gate Ecological Effects, Oregon.gov

Update Stormwater System



Pairs well with:

Application:

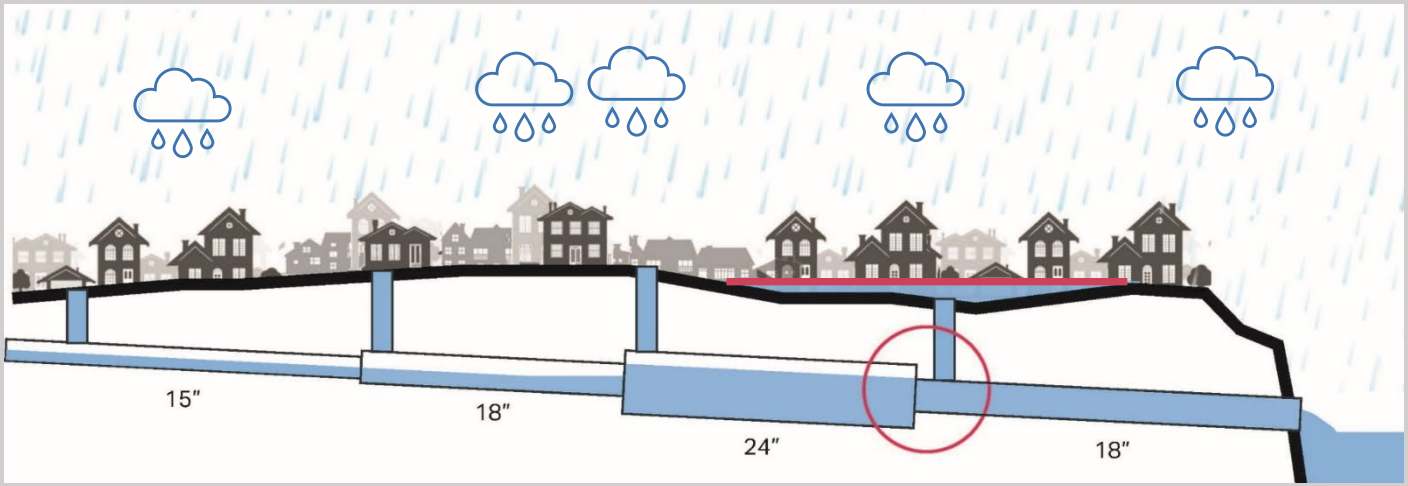
A stormwater treatment system collects excess water from the city combined sewer system and discharges to the ocean. There are several key stormwater outfall locations in South Norwalk with undersized pipes, which may be resulting in additional stormwater backup and flooding inland.

Benefits:

- Less pluvial flooding risk during a significant storm event

Challenges:

- Can be costly to update
- Sometimes there is insufficient space to update pipe sizes
- Requires thorough stormwater modeling prior for feasibility



Pipe Capacity: The volume of water that can flow freely through a pipe

Install Berms

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

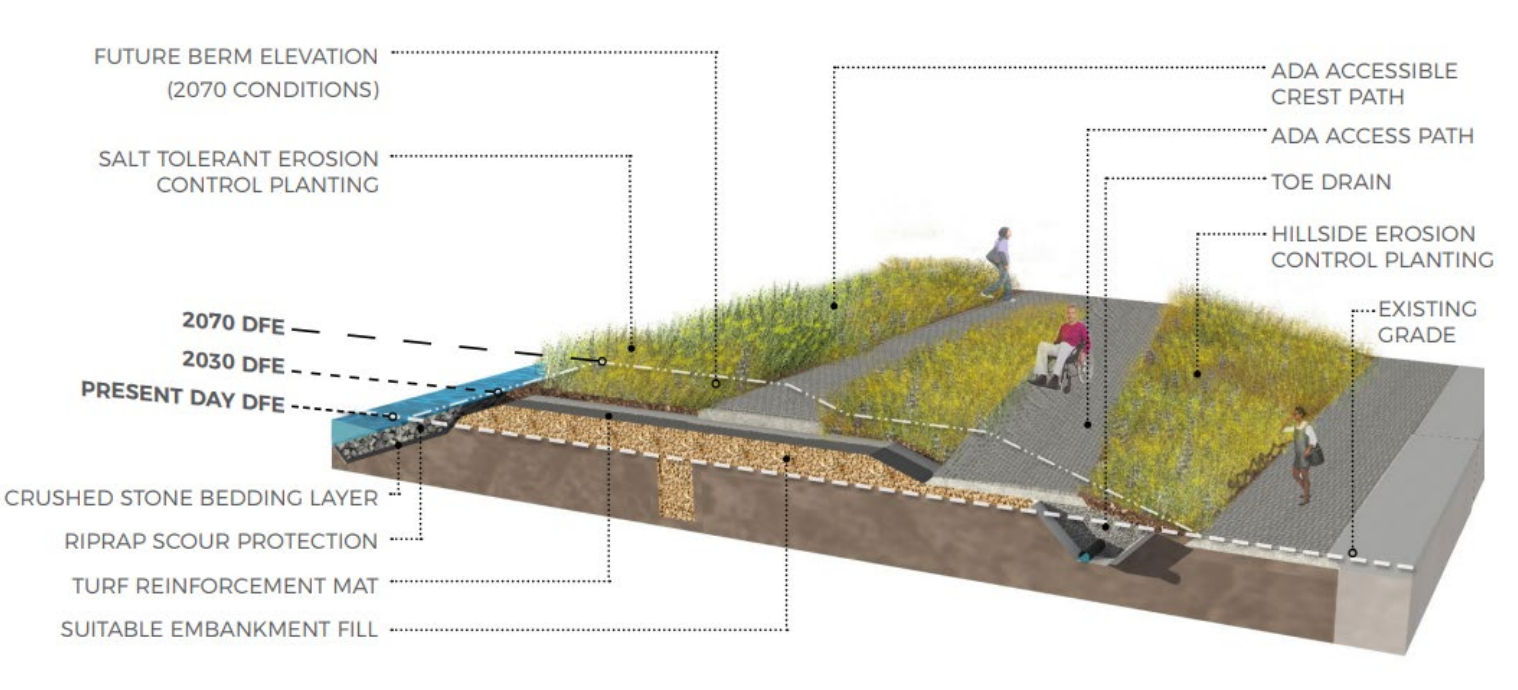
A berm is a planted mound that can act as a natural flood barrier while still providing ecological and aesthetic value.

Benefits:

- Can be incrementally added to over time
- Combats heat and flooding risk
- Can be combined with other recreational programming

Challenges:

- Can be vulnerable to erosion if not maintained
- Requires intensive labor and heavy machinery to install



'Climate Resilient Design Standards and Guidelines for Protection of Public Rights-Of-Way', Boston Public Works Department, October 17, 2018.

Add Community Resiliency Hubs

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

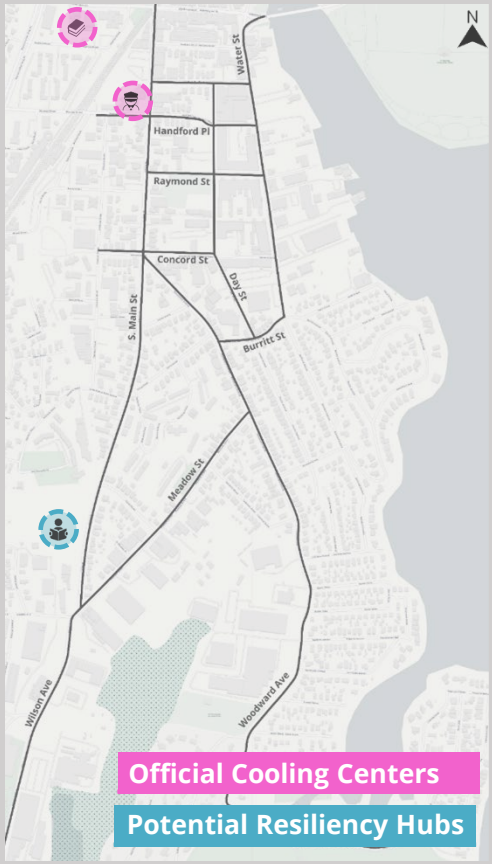
Resiliency Hubs are designated heat wave and flood emergency centers. South Norwalk currently has two official cooling centers in our project area. Other community spaces could be considered in the future to provide additional relief for this community during excessive heat and flood conditions.

Benefits:

- Creates public resource for vulnerable populations
- Creates opportunity for public outreach and education on climate change
- Can be implemented on small or large scale

Challenges:

- Must be within reasonable walking distance to public transit and have accessible accommodations
- Incorporation into public spaces, such as schools, may require additional safety requirements



Community & Emergency Centers in South Norwalk

- South Norwalk Police Station Community Room
- SoNo Branch Library
- Future South Norwalk Elementary
- South Norwalk Train Station
- Side-by-Side Charter School
- Columbus Magnet School
- Community Center of Norwalk
- Norwalk Community Health Center at Smilow
- Norwalk Fire Department

'Climate Resilient Design Standards and Guidelines for Protection of Public Rights-Of-Way', Boston Public Works Department, October 17, 2018.

Signage for Awareness

SAFE COOL DRY
(S) (NS)

Pairs well with:

Application:

Signage at limits of "impact areas" can be an important tool to increase awareness of risk to the public during extreme heat or flood events.

Benefits:

- Educates the public on flood and heat risks that may directly affect them and their community

Challenges:

- Requires some maintenance to upkeep signage relevance
- Requires public and city consensus and agreement for limits

'Flood Sign Maintenance Advisory, https://seaislenews.com/flood-sign-maintenance-advisory/
Extreme Heat Precautions, https://www.chesco.org/1871/Extreme-Heat-Precautions & https://www.weather.gov/

Brownfield Remediation

SAFE COOL DRY

(S) ⟷ (NS)

Pairs well with:

Application:

Brownfield remediation is the removal or contaminant of polluted soil so that a site may be used again without health concerns. There are hundreds of thousands of brownfields in the United States, including many prime downtown and waterfront properties.

Benefits:

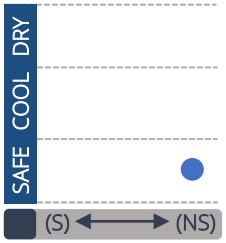
- Enhances the ecological value of the landscape
- Addresses public health concerns
- Provides development opportunities for the community

Challenges:

- Can be costly to implement
- Requires different treatment methods depending on the concern

Blackstone River Valley Heritage Center at Worcester
Worcester, MA AECOM

Develop Resilience Overlay District



Pairs well with:

Application:

A resiliency overlay helps define the areas that are most impacted by flooding and provides a roadmap for future developers to consider before moving forward with their plans. Several cities have already pursued zoning and resiliency overlays to assist climate change preparedness in their communities.

Benefits:

- Encourages consensus on environmental regulations and promotes future resiliency planning

Challenges:

- Potentially limits business and residential development opportunities

Climate Ready Boston

The Boston Planning & Development Agency (BPDA) has been working to advance the climate resilience objectives of the 2016 Climate Ready Boston plan

NORFOLK RESILIENT CITY

Rotterdam * Athens * Paris
Dakar * Juarez * Boston
Dallas * Vejle * Norfolk, Virginia
Medellín * Bangkok * Rio de
Janeiro * Barcelona * Los Angeles
Rome * Chicago * Da Nang
New Orleans * Kigali * Huangshi
Singapore * Lisbon * Mexico City

2019 Zoning Ordinance, Norfolk, VA

The Upland Resilience Overlay was drafted as a part of the 2018 Zoning Ordinance to encourage new development in certain areas of the city that have both a reduced risk of flooding and the potential to support transformational redevelopment.

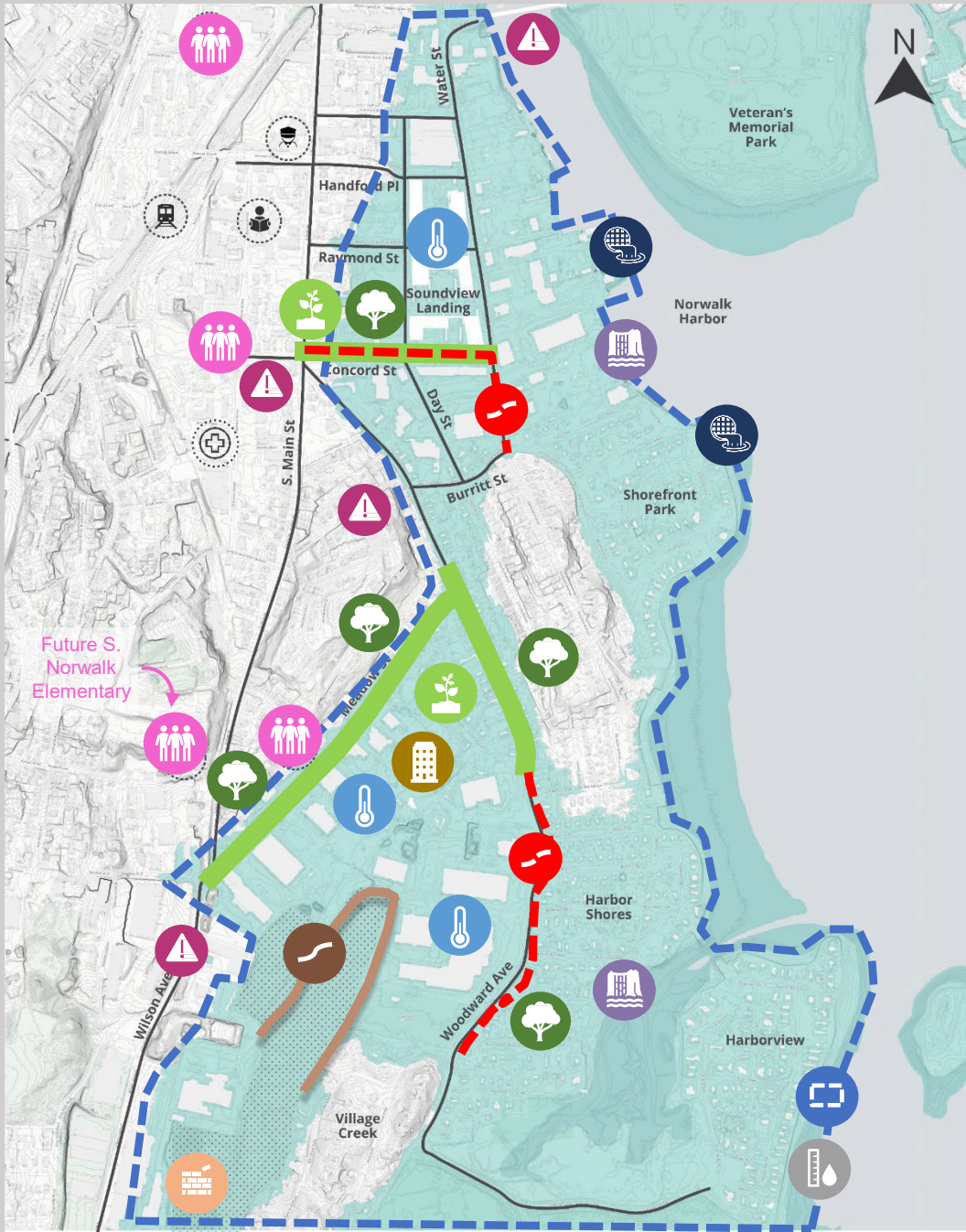
Climate Ready Boston, https://www.bostonplans.org/
2019 Zoning Ordinance Norfolk Resilient City, https://www.norfolk.gov/

Applied Resiliency Toolkit: Site-Specific vs. Site-Wide Adaption Options

The figure highlights recommended tools for the study area, specifically located base upon site review, research and input from the city and public. In many locations there are overlapping tools that can be implemented in stages or concurrently.

Example of overlapping tools:

- Increased tree canopy and other plantings, along with lighter colored surfaces, can help to reduce surface and ambient temperatures.
- Shading from trees filters sunlight and reduces the amount of the sun's energy that can reach below the canopy, reducing surface temperatures below the canopy. Evapotranspiration also cools the air, which can help to reduce peak summer air temperatures.
- Increased plantings create a more comfortable pedestrian experience, can increase stormwater management opportunities, add native plants and habitat, and serve as mitigation for urban heat effects.
- Green infrastructure and berms can reduce flooding and can provide locations for tree planting



PREFERRED CONCEPTUAL DESIGN

Water Street & Concord St Intersection

Photo Credit, AECOM

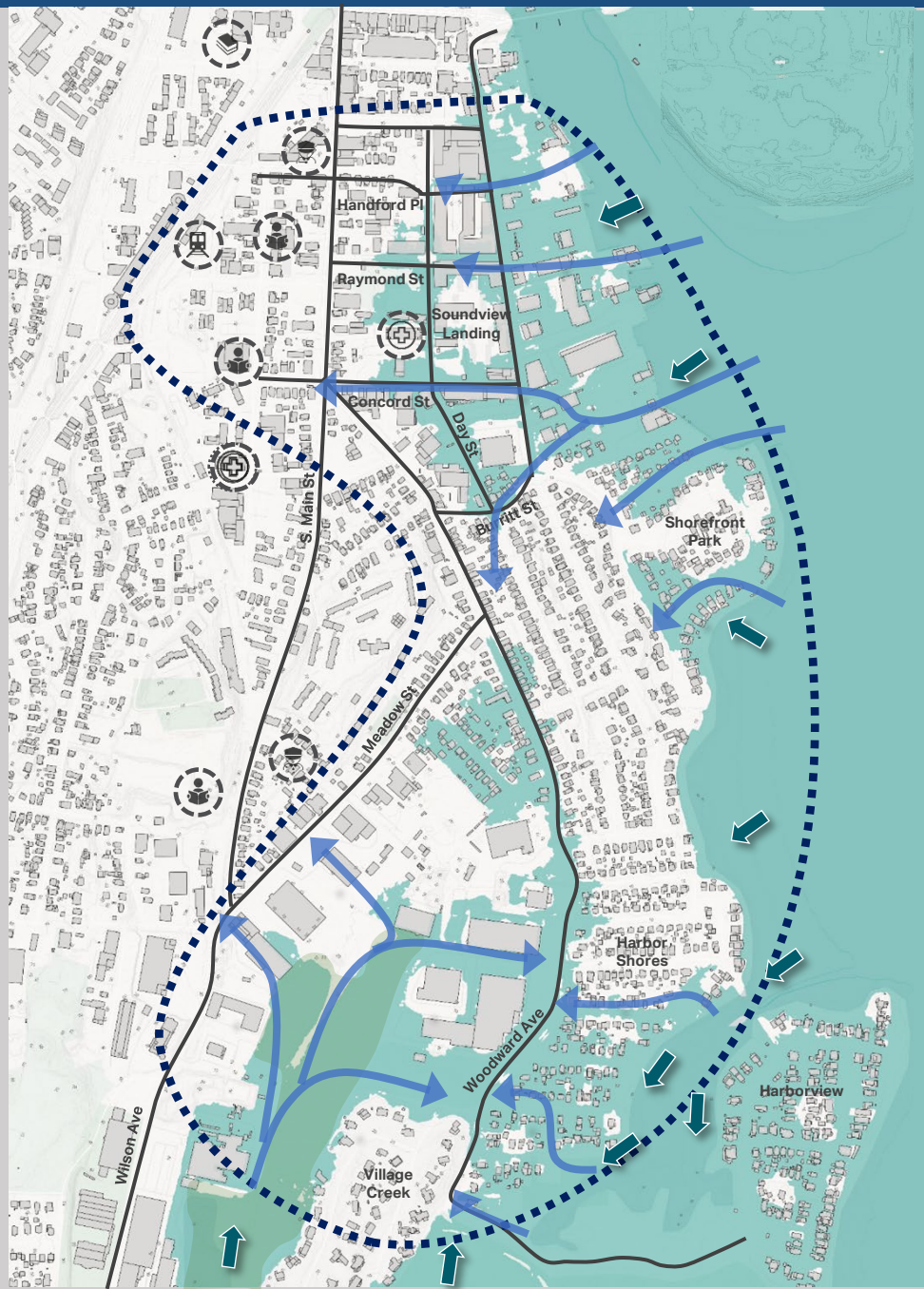
10-Year Storm: Flood Pathways and Chronic Flooding Risk (Present Day)

Flood Elevation Table

10-Year: 10% Annual Storm (Present)/SLR - Elev. 7.59 NAVD88
10-Year: 10% Annual Storm (2050)/SLR - Elev. 9.59 NAVD88
100-Year: 1% Annual Storm (2050)/SLR – Elev.10.88 NAVD88
100 Year: 1% Annual Storm (Present) – Elev. 9.38 NAVD88

MHHW (2050) – Elev.4.58
MHHW (Present) – Elev. 3.48

Project Area



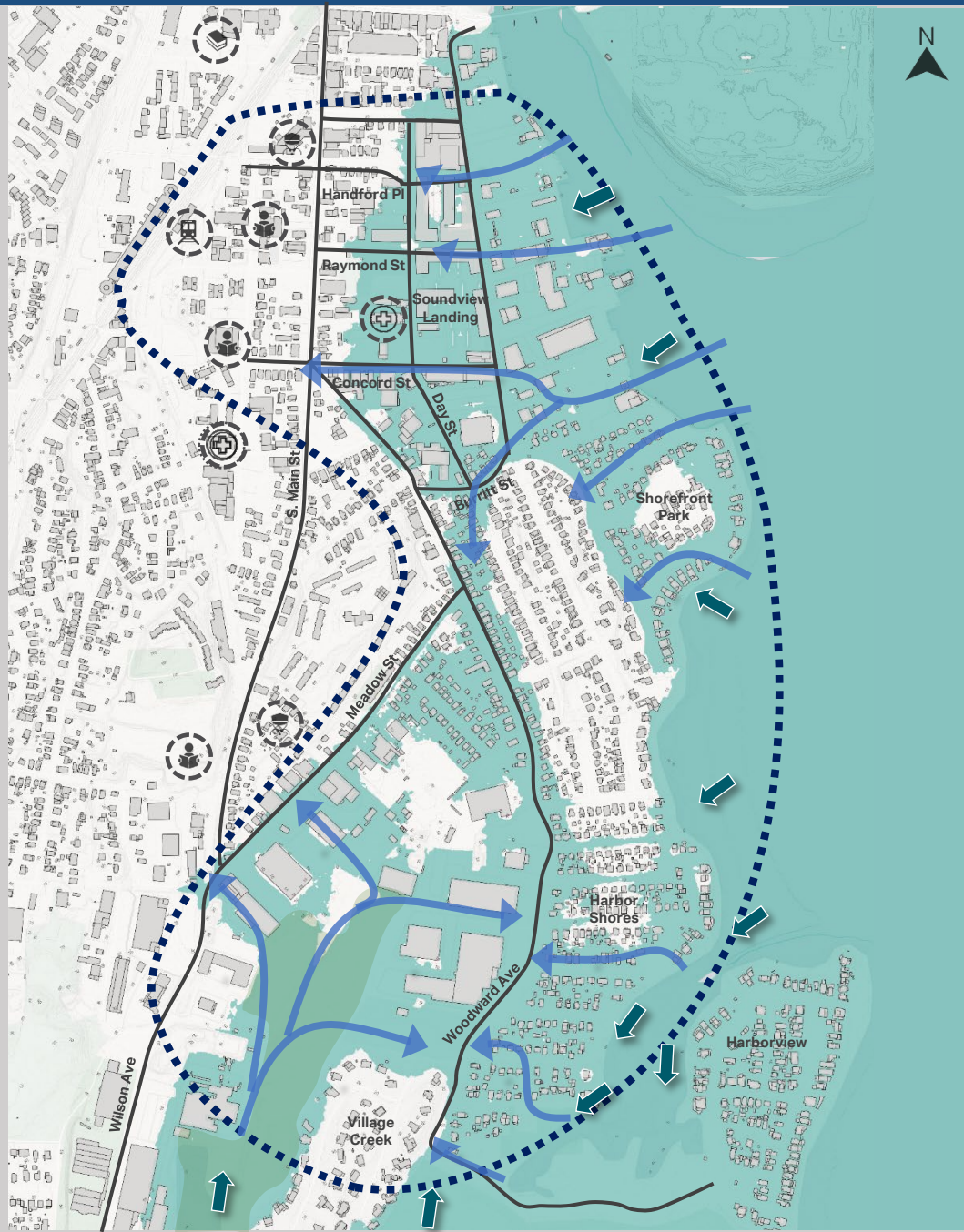
10-Year Storm: Flood Pathways and Chronic Flooding Risk (Projected for 2050)

Flood Elevation Table

10-Year: 10% Annual Storm (Present)/SLR - Elev. 7.59 NAVD88
10-Year: 10% Annual Storm (2050)/SLR - Elev. 9.59 NAVD88
100-Year: 1% Annual Storm (2050)/SLR – Elev.10.88 NAVD88
100 Year: 1% Annual Storm (Present) – Elev. 9.38 NAVD88

MHHW (2050) – Elev.4.58
MHHW (Present) – Elev. 3.48

Project Area



Priority Focus Areas for Conceptual Designs

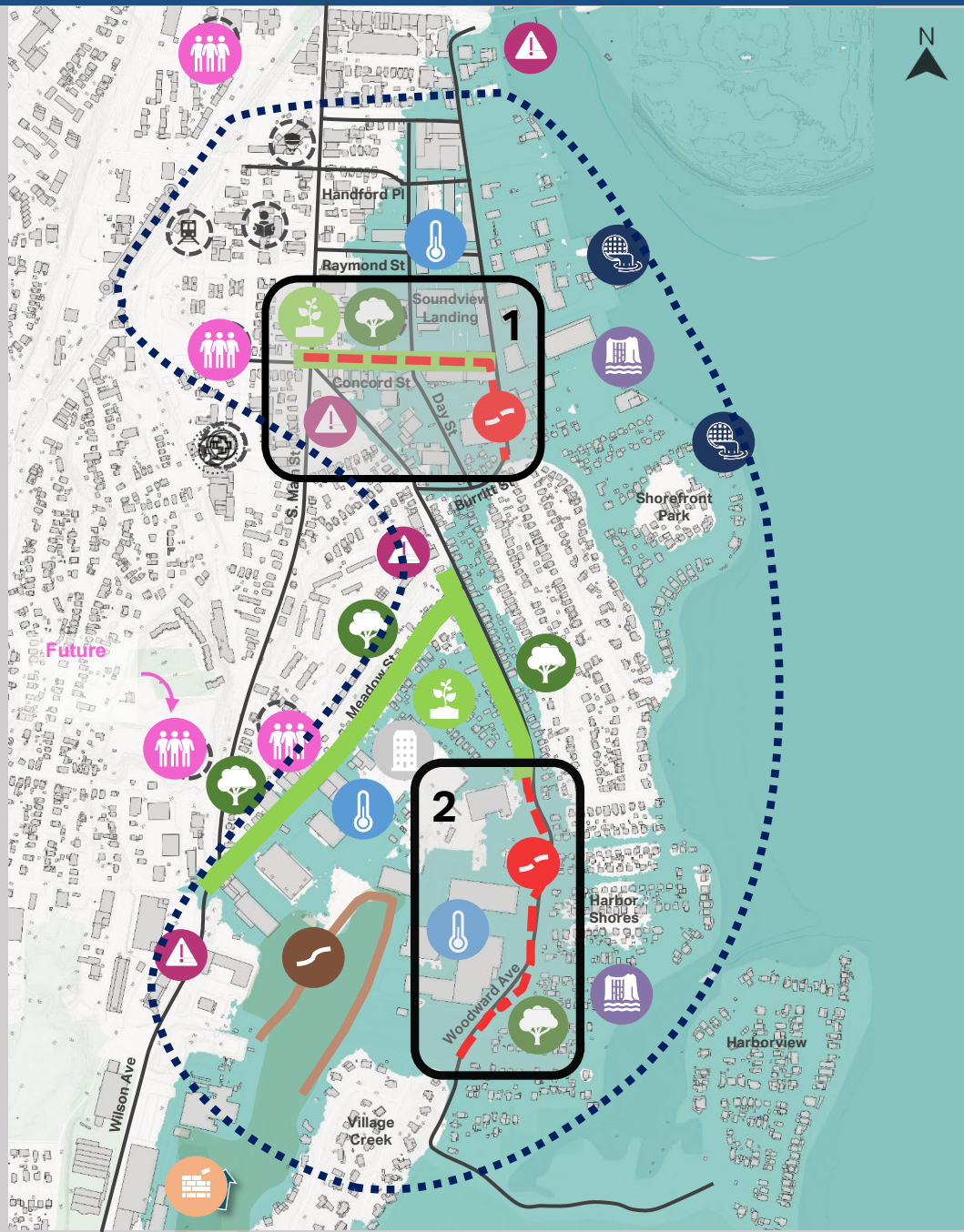
Flood Elevation Table

10-Year: 10% Annual Storm (Present)/SLR - Elev. 7.59 NAVD88
10-Year: 10% Annual Storm (2050)/SLR - Elev. 9.59 NAVD88
100-Year: 1% Annual Storm (2050)/SLR – Elev.10.88 NAVD88
100 Year: 1% Annual Storm (Present) – Elev. 9.38 NAVD88

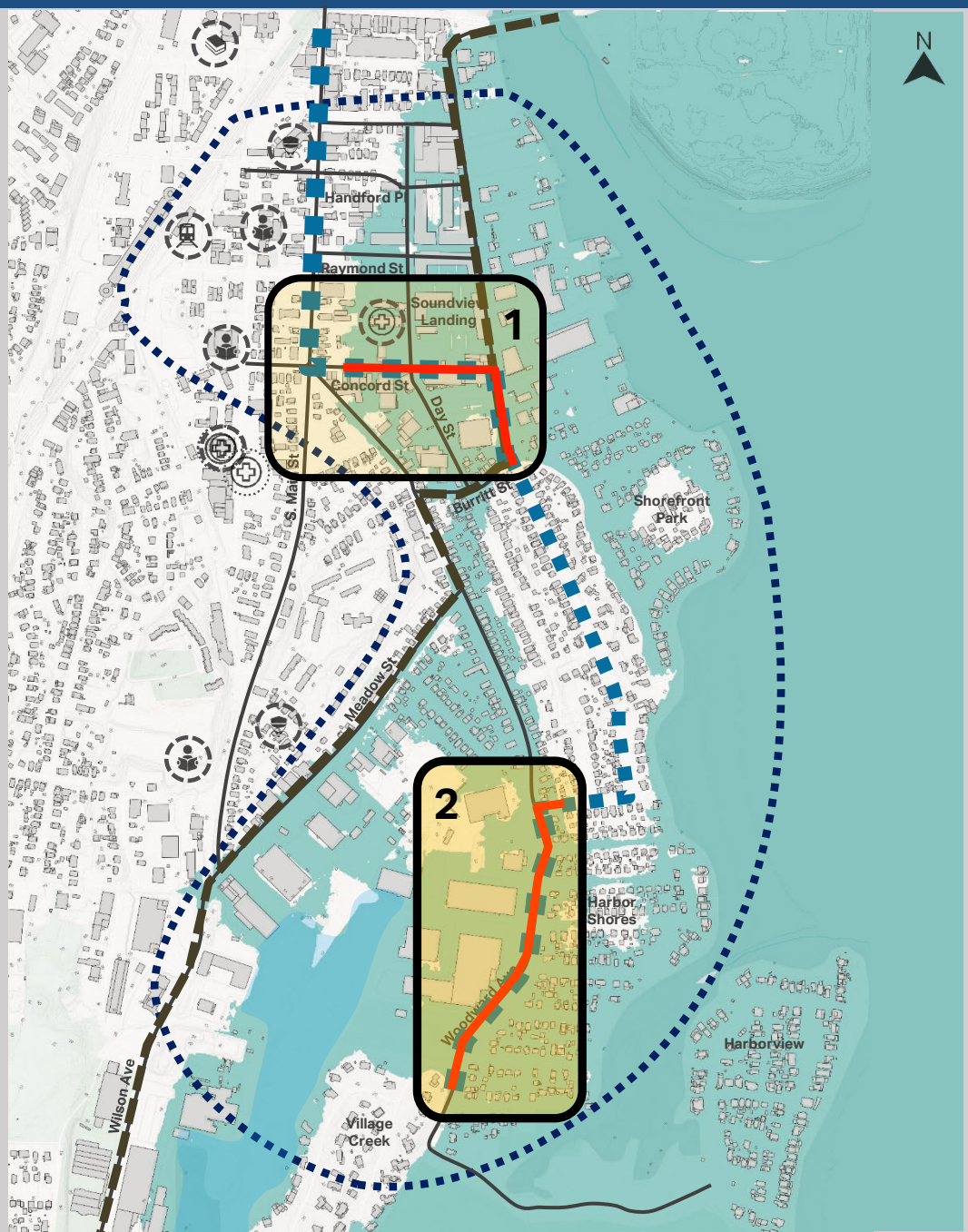
MHHW (2050) – Elev.4.58
MHHW (Present) – Elev. 3.48

Focus Area

Project Area



Resilient Corridor Selection

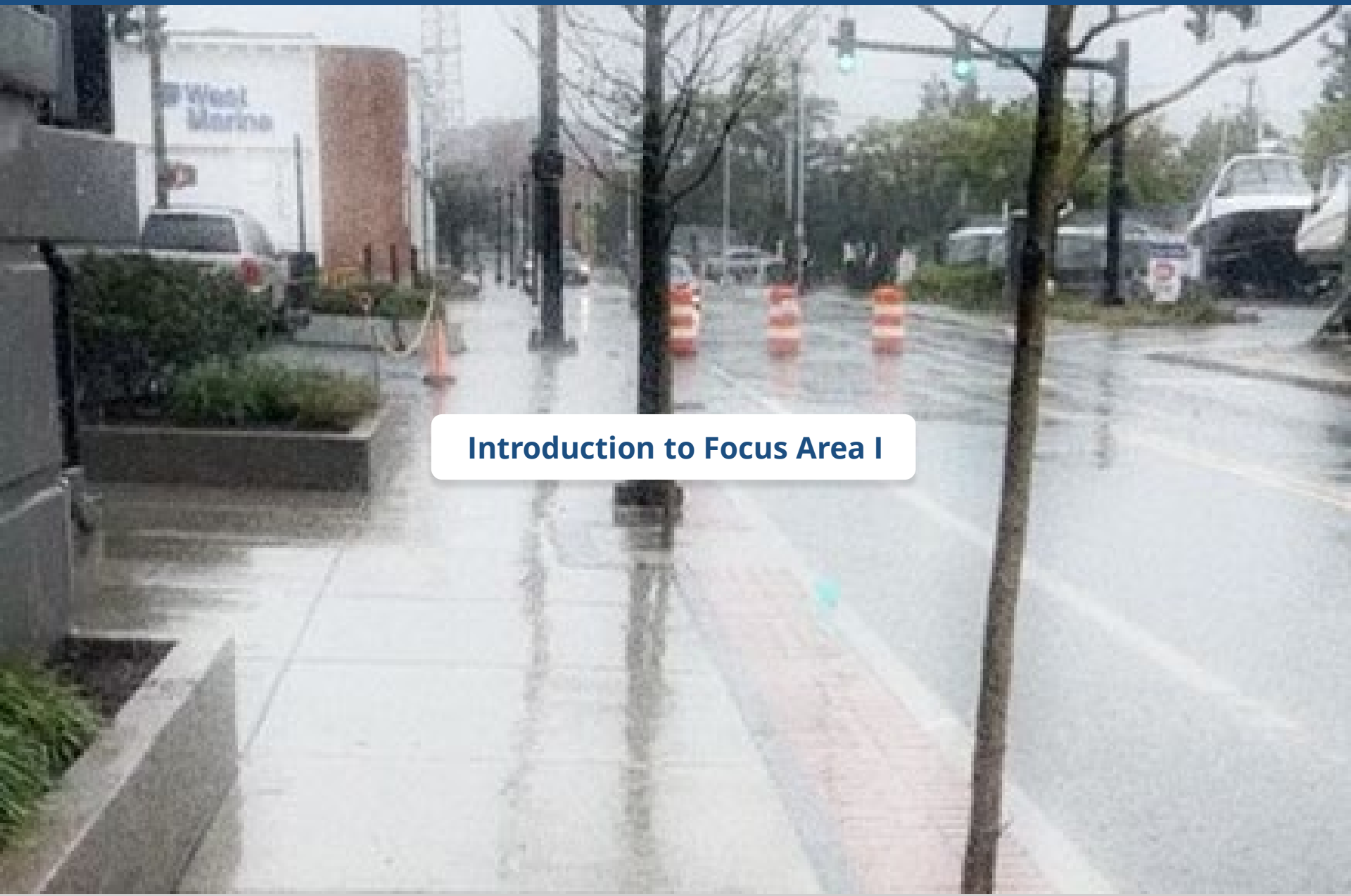


Project Area

Designated Resilient Corridor

Vulnerable Segments
Inundated by projected 2050, 10-year storm & subject to extreme heat

Connecticut Route 136



Introduction to Focus Area I

Water Street, Full Moon/High Tide October 2023
Courtesy of Norwalk Resident

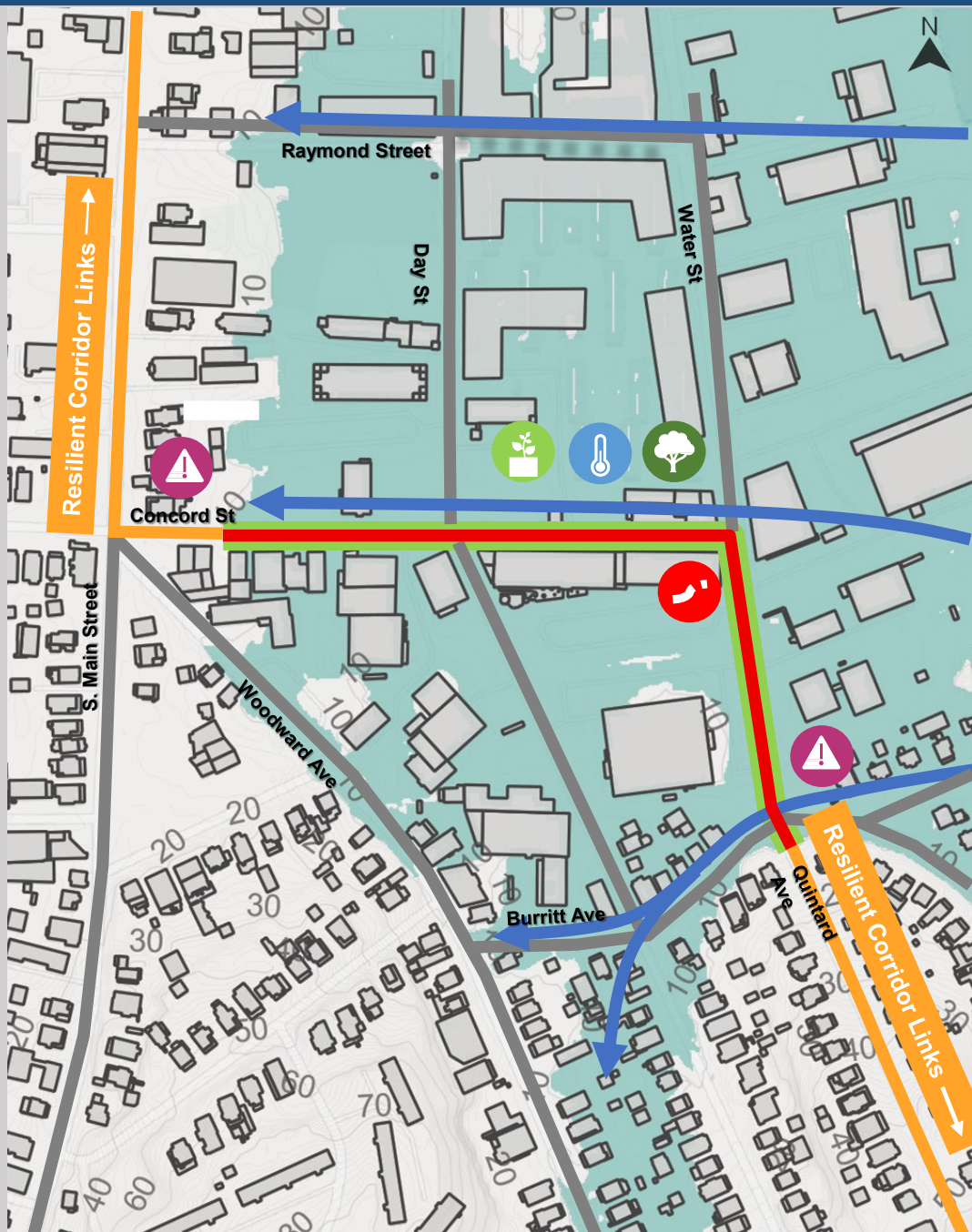
Focus Area I: Concord Street to Burritt Ave

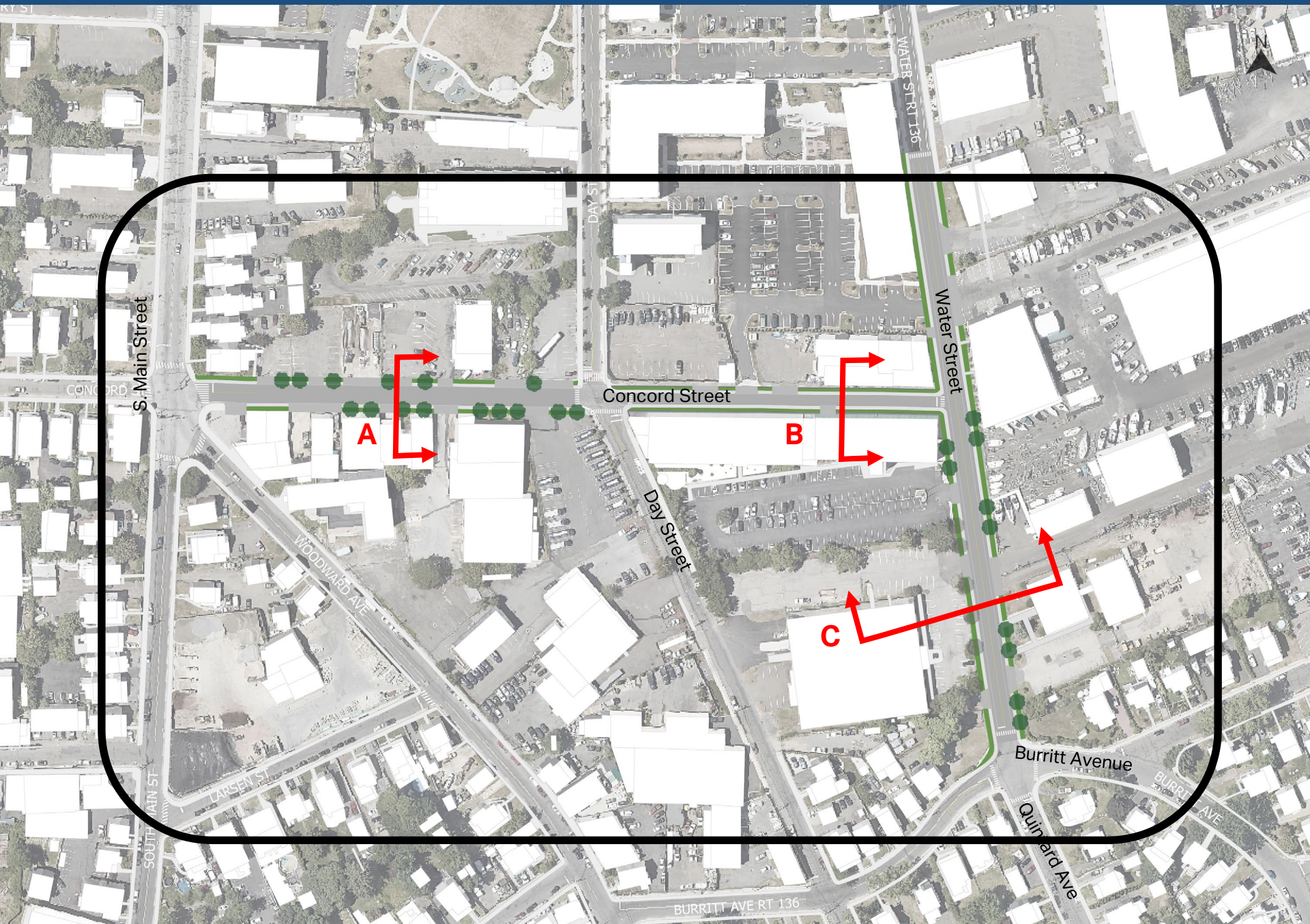
Concord Street and Water Street include elevation of the existing roadway to the projected 2050 flood elevation.

These roadway both include planted buffers along the sidewalk that allow for additional tree plantings and vegetation to provide shade for pedestrians and cooler surfaces on and adjacent to the street.

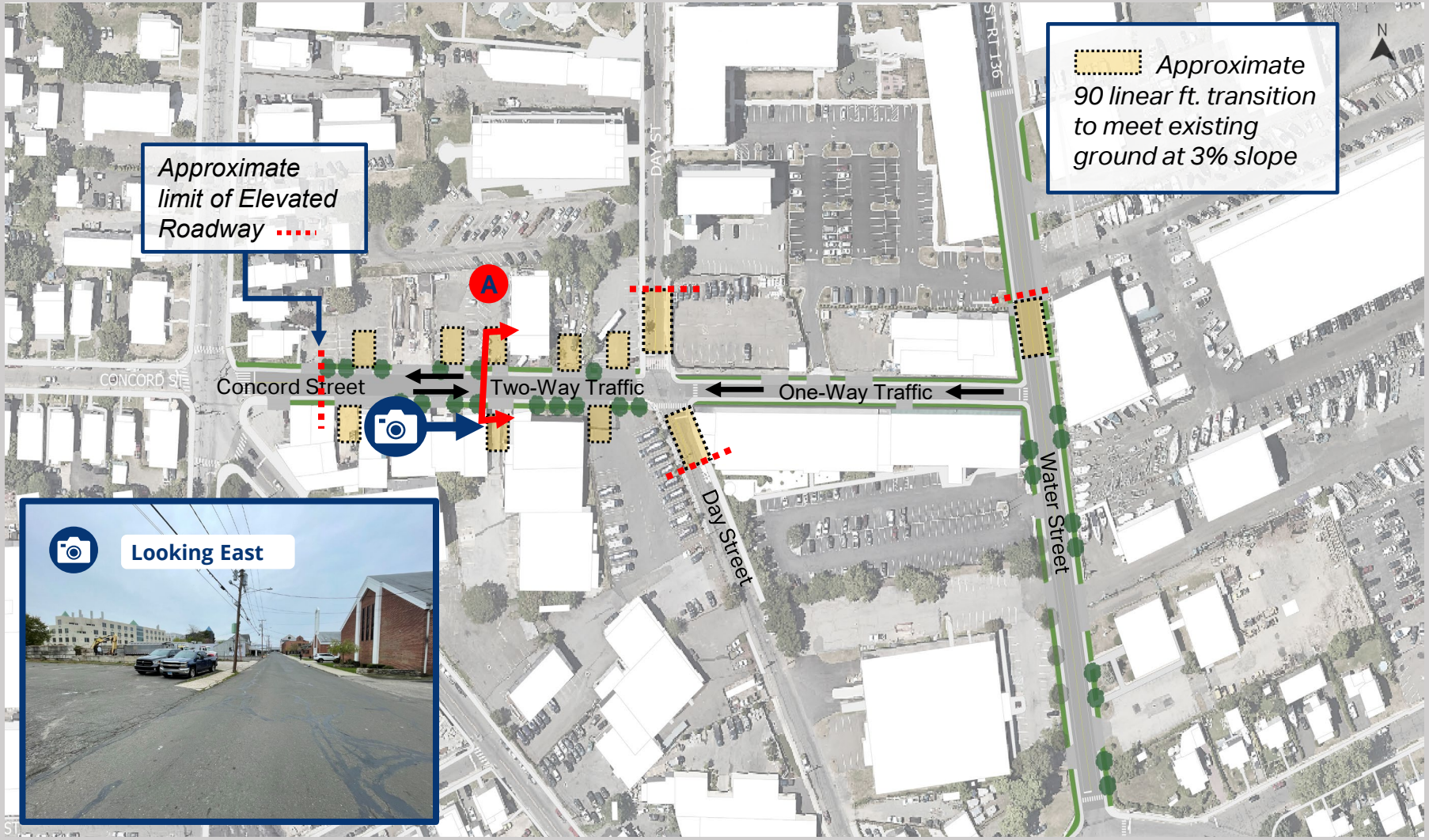
The planted buffers provide additional tree cover adjacent to the sidewalk, shading both pedestrians and the pavement below. They can be utilized for stormwater management, provide a visually interesting environment, and create a more pedestrian friendly streetscape, in addition to their contributions to reducing heat along with right-of-way.

- Elevate Roadway
- Cool Roof & Pavement Colors
- Green Infrastructure
- Expand Tree Canopy & Parks
- Signage for Awareness

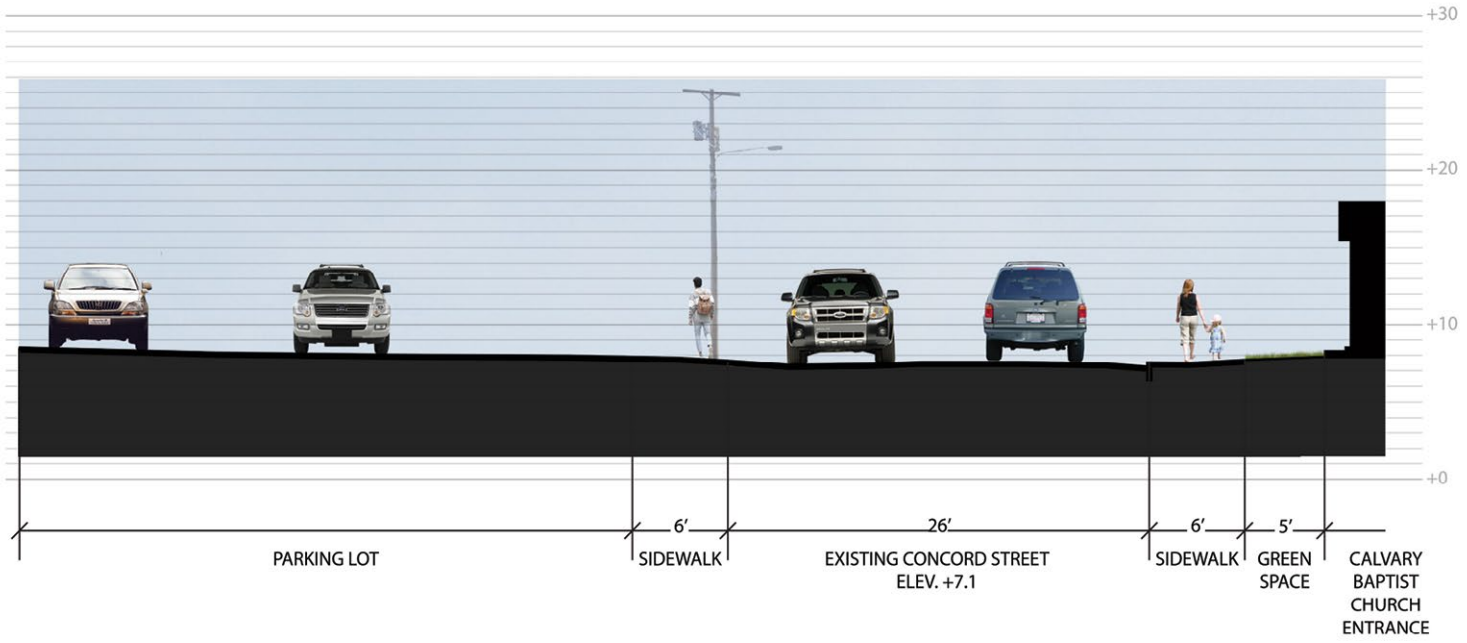



S. Main Street
Concord Street
Day Street
Water Street
Burritt Avenue
Quintard Ave
WOODWARD AVE
LARSEN ST
SOUTH MAIN ST
BURRITT AVE RT 136
WATER ST RT 136
DAY ST
A
B
C
N

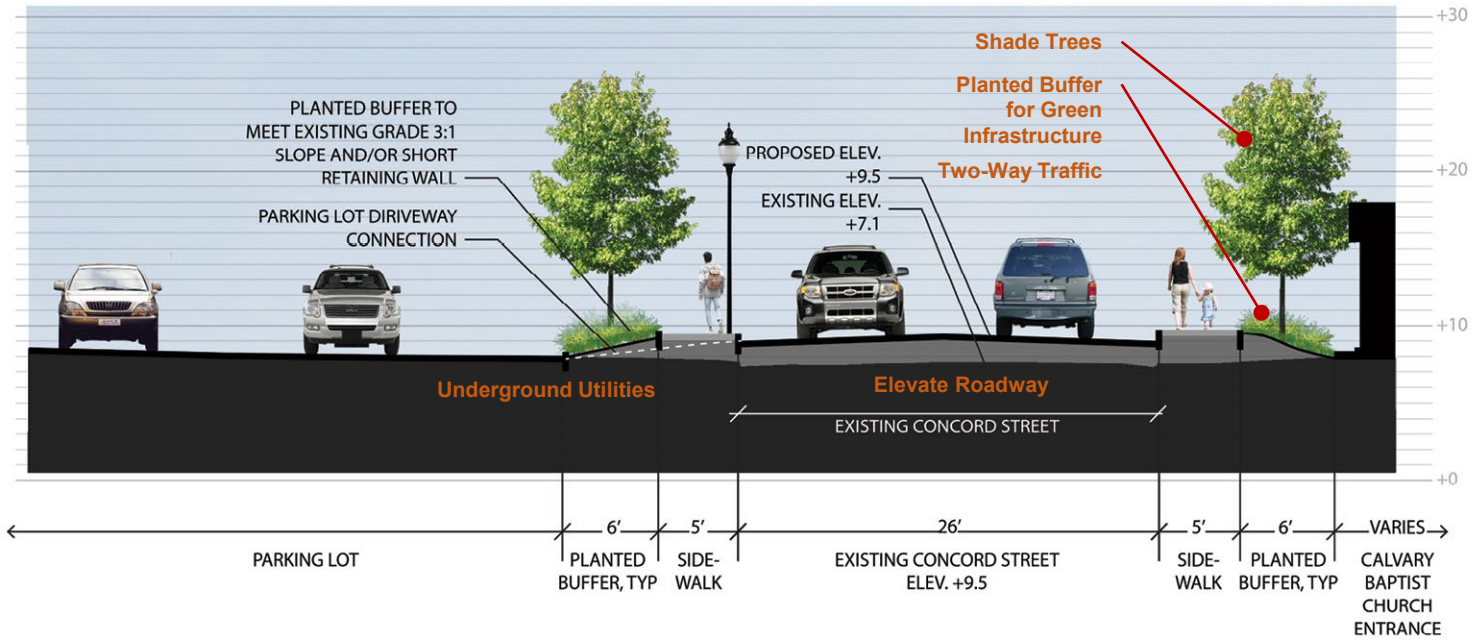
Section A: Concord Street (west) | Proposed Conceptual Design



Section A: Concord Street (West) | Current Condition

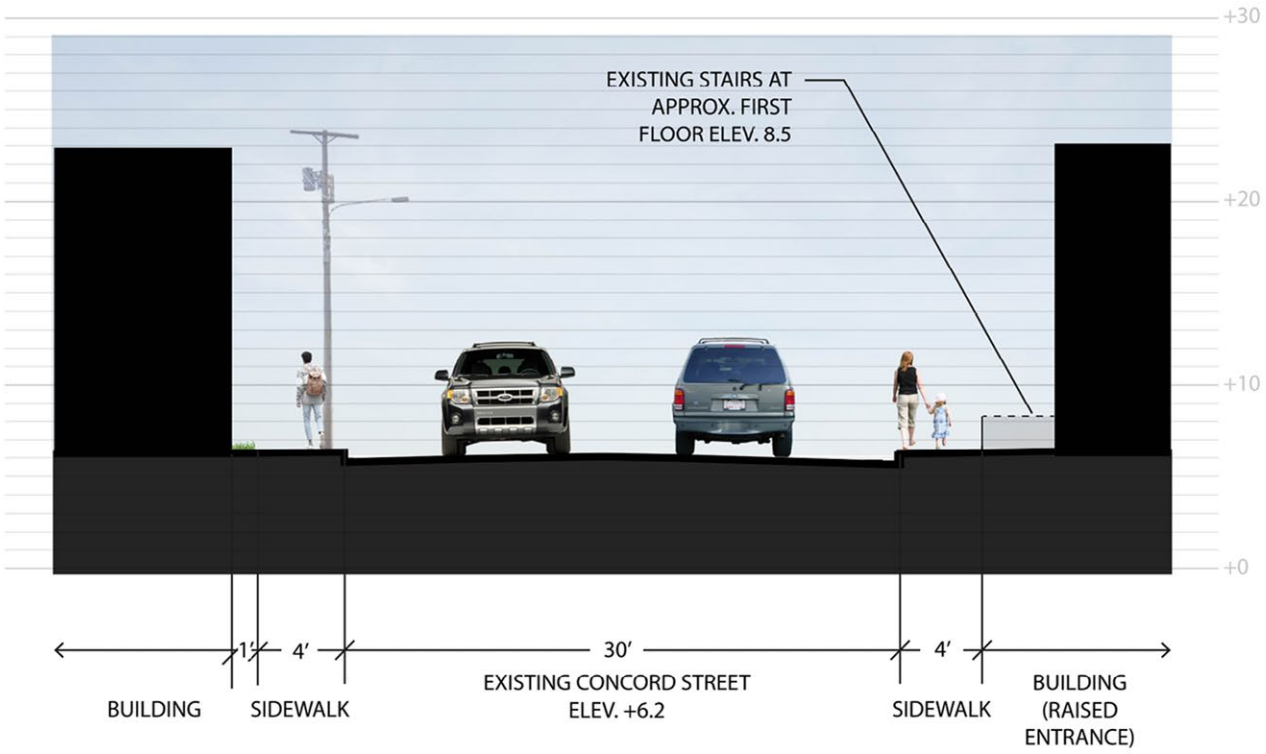


Section A: Concord Street (West) | Proposed Conceptual Design

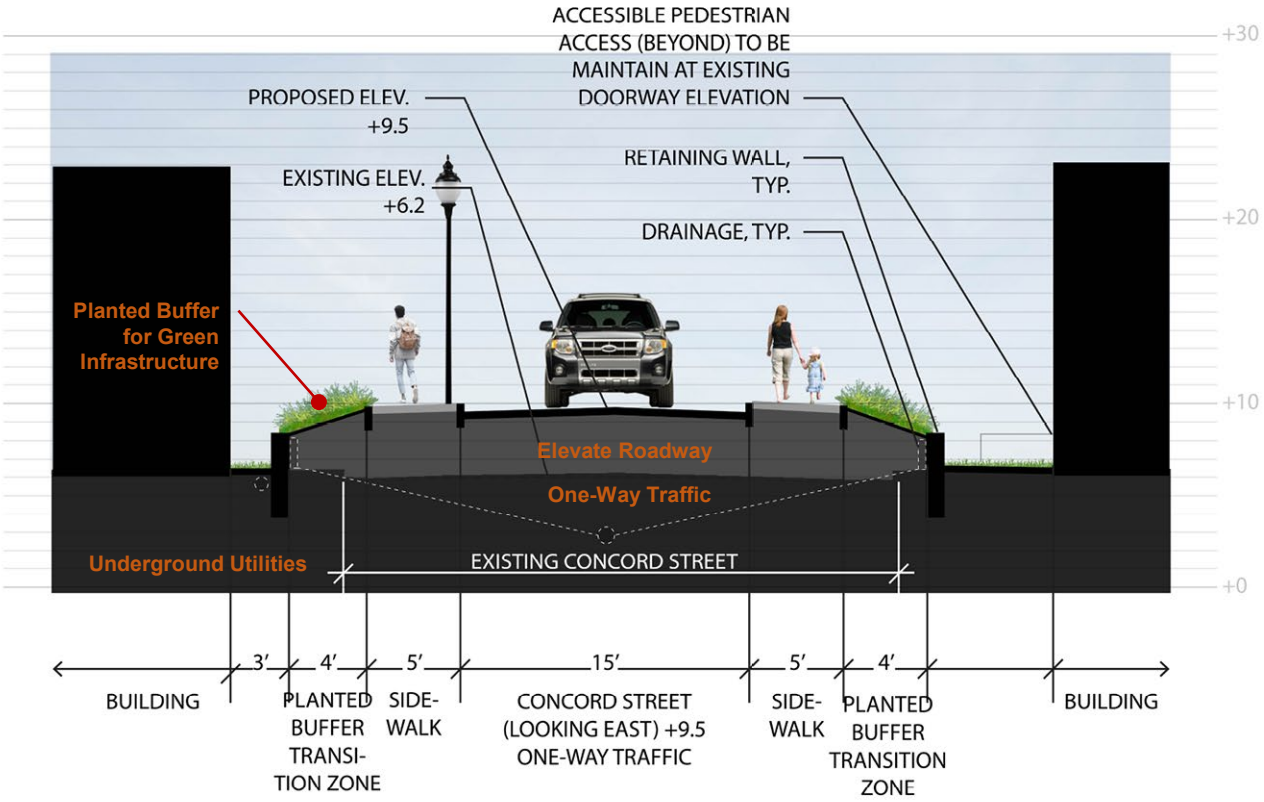


Section B: Concord Street (East) | Proposed Conceptual Design

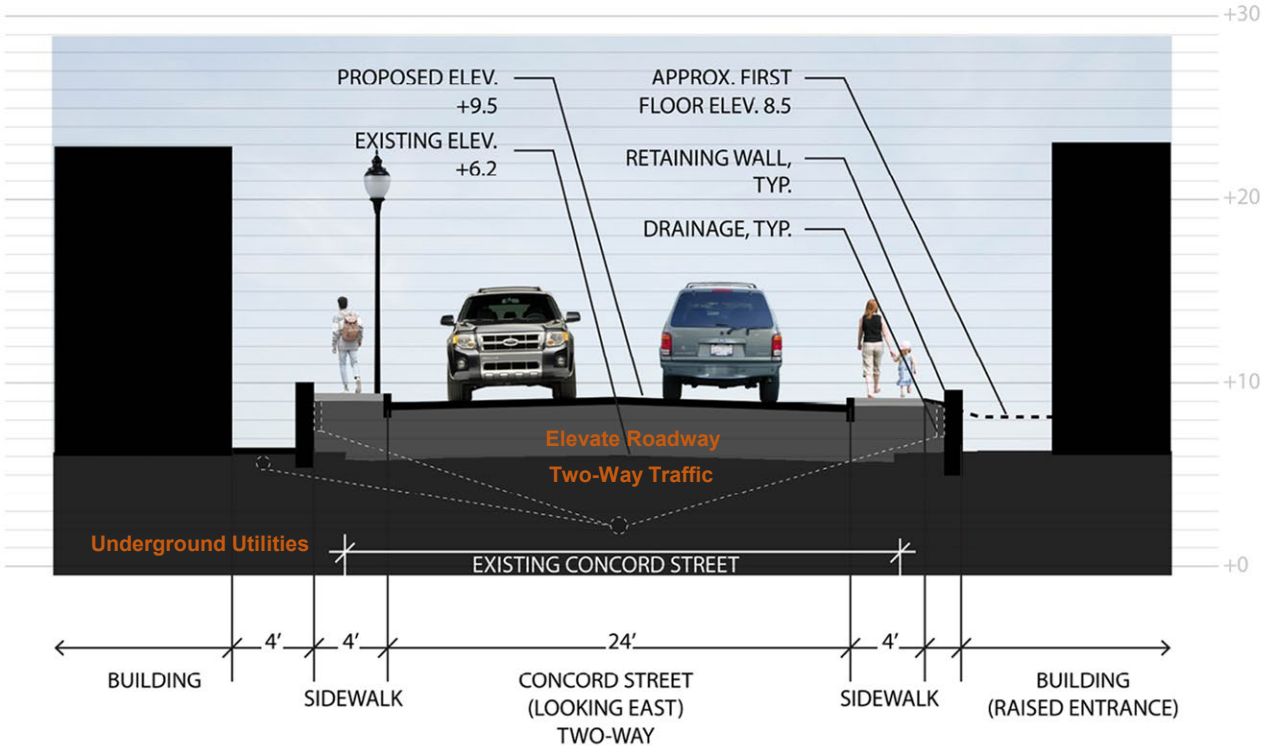
Section B: Concord Street (East) | Current Condition



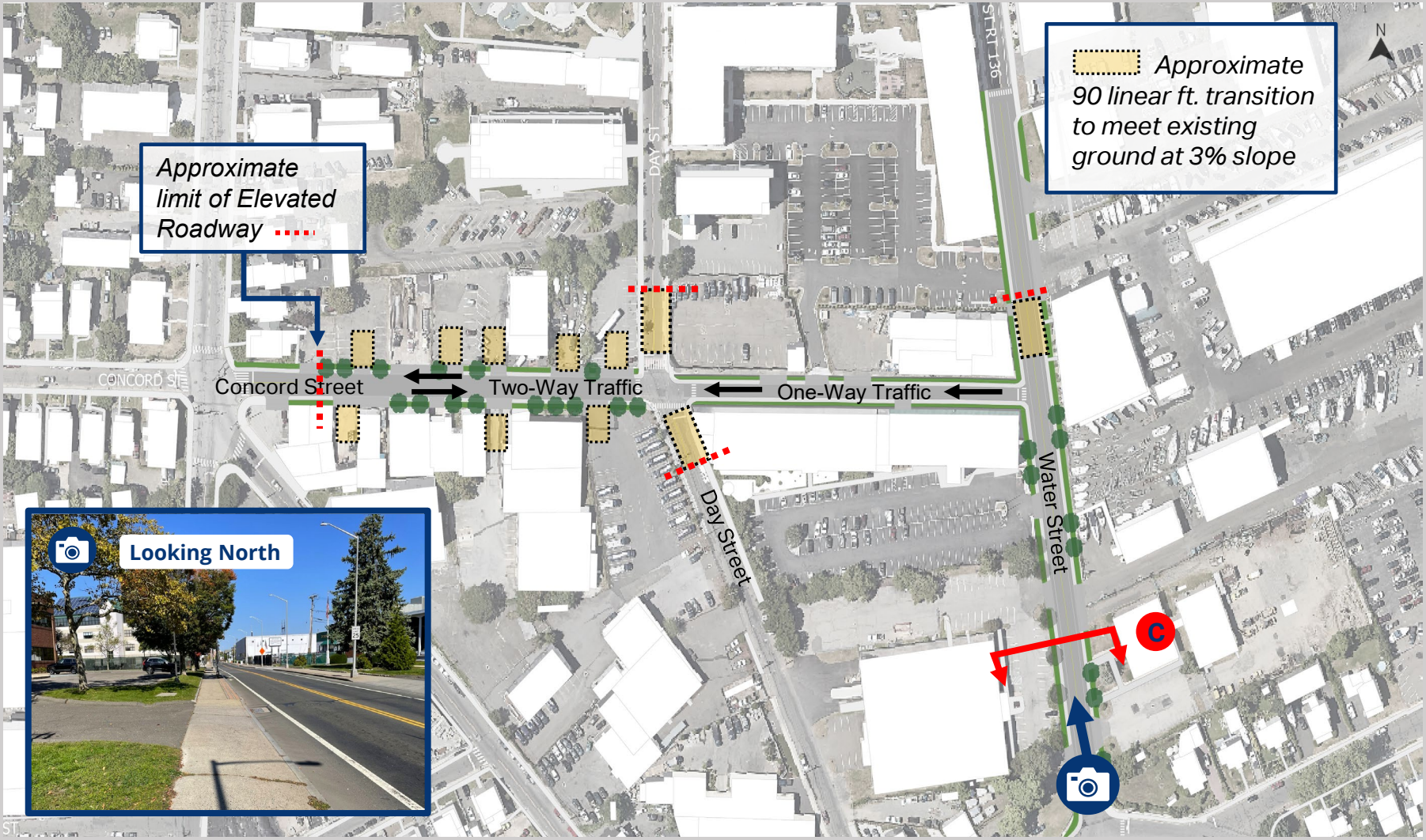
Section B: Concord Street (East) | Proposed Conceptual Design



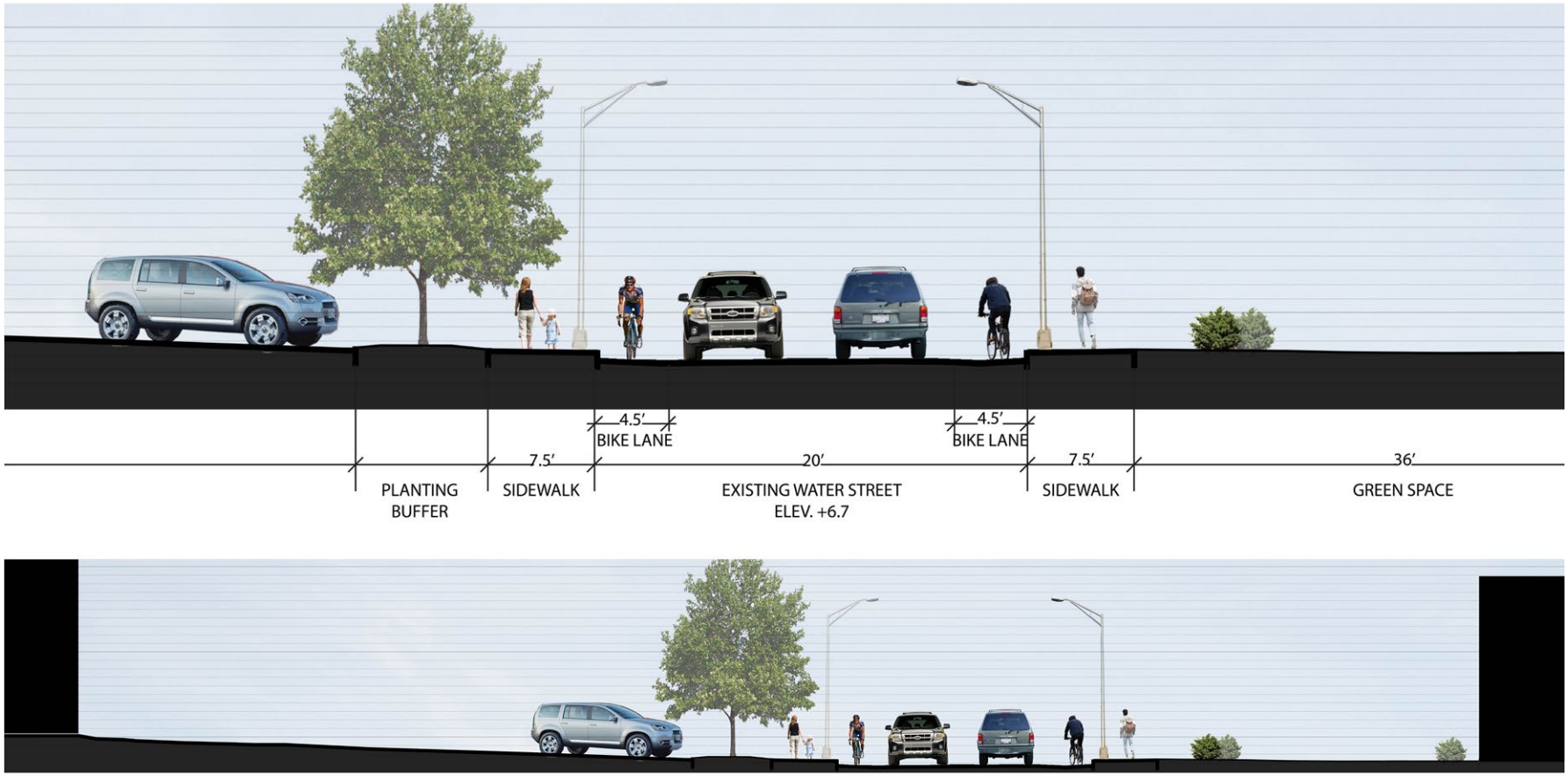
Section B: Concord Street (East) | Proposed Conceptual Design, Two-way Street Alternative



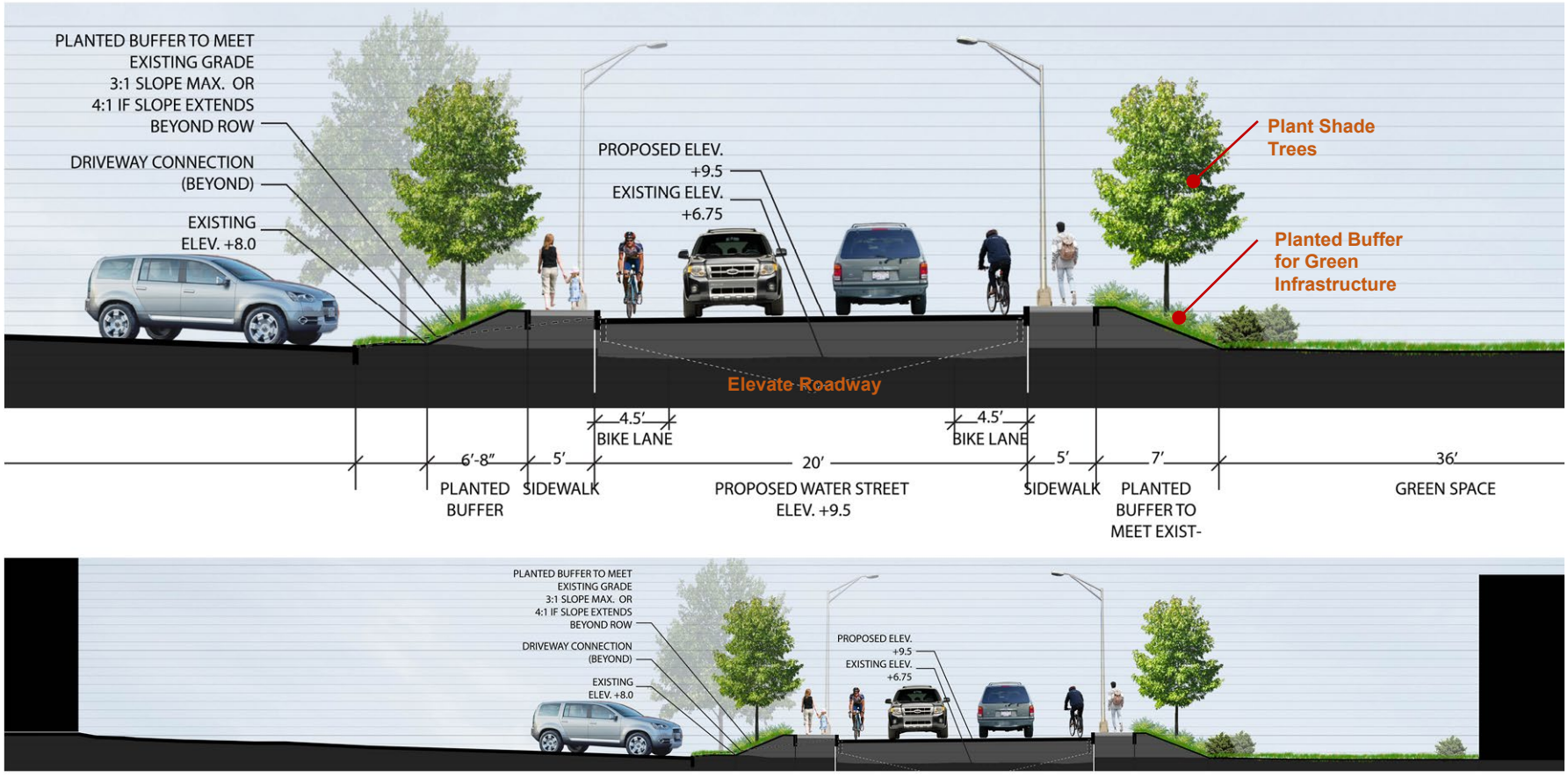
Section C: Lower Water Street | Proposed Conceptual Design



Section C: Lower Water Street | Current Condition



Section C: Lower Water Street | Proposed Conceptual Design



Conceptual Design on Concord Street | Existing

Conceptual Design on Concord Street | Proposed

Introduction to Focus Area II

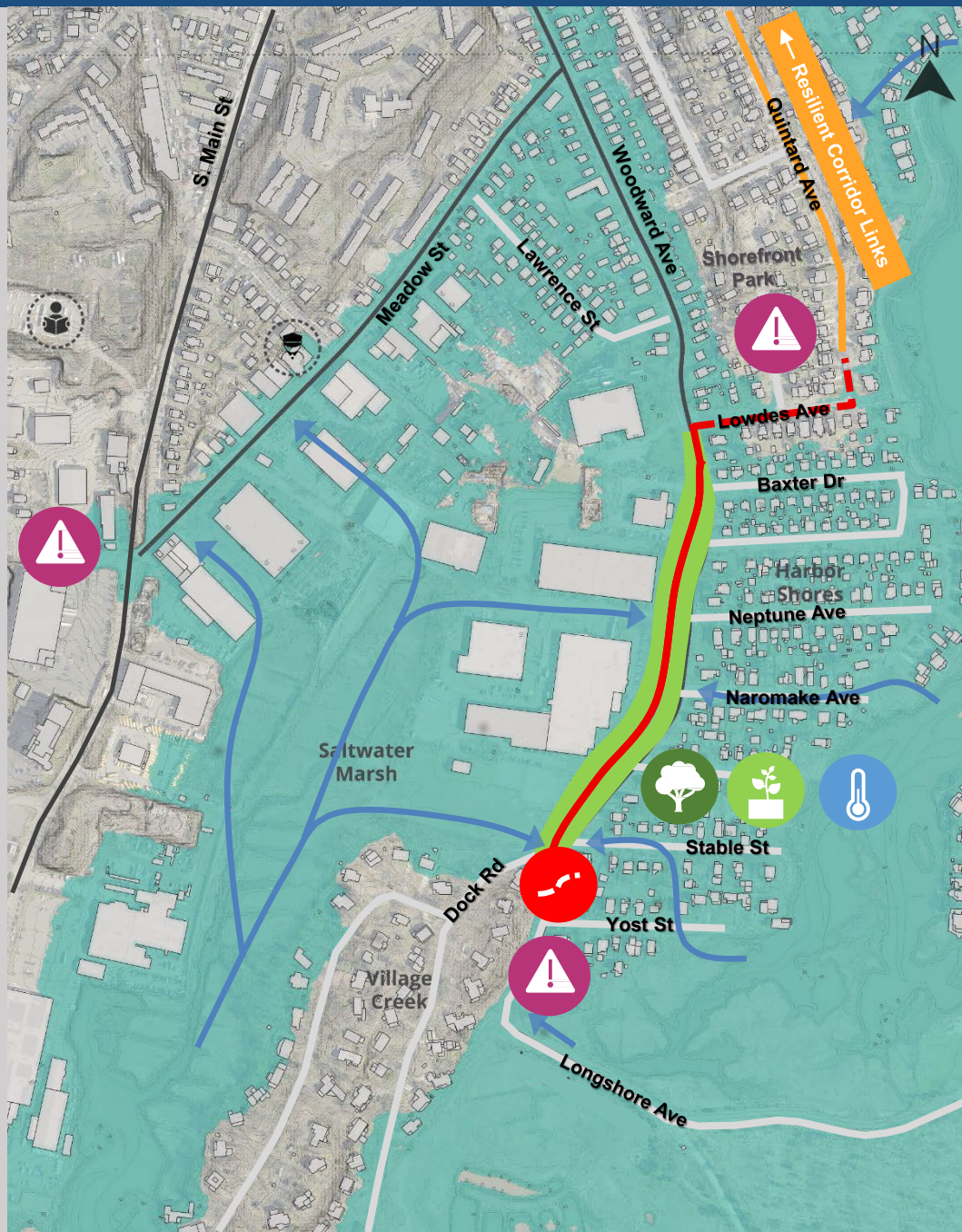
Woodward Avenue Flooded
Courtesy of Norwalk Resident

Focus Area II: Lower Woodward Ave

The elevation of Woodward Ave. creates opportunity for access during flooding. Woodward Ave. also provides an opportunity to incorporate both planted buffers along the sidewalk and bike path as well as a planted median wide enough to accommodate tree plantings.

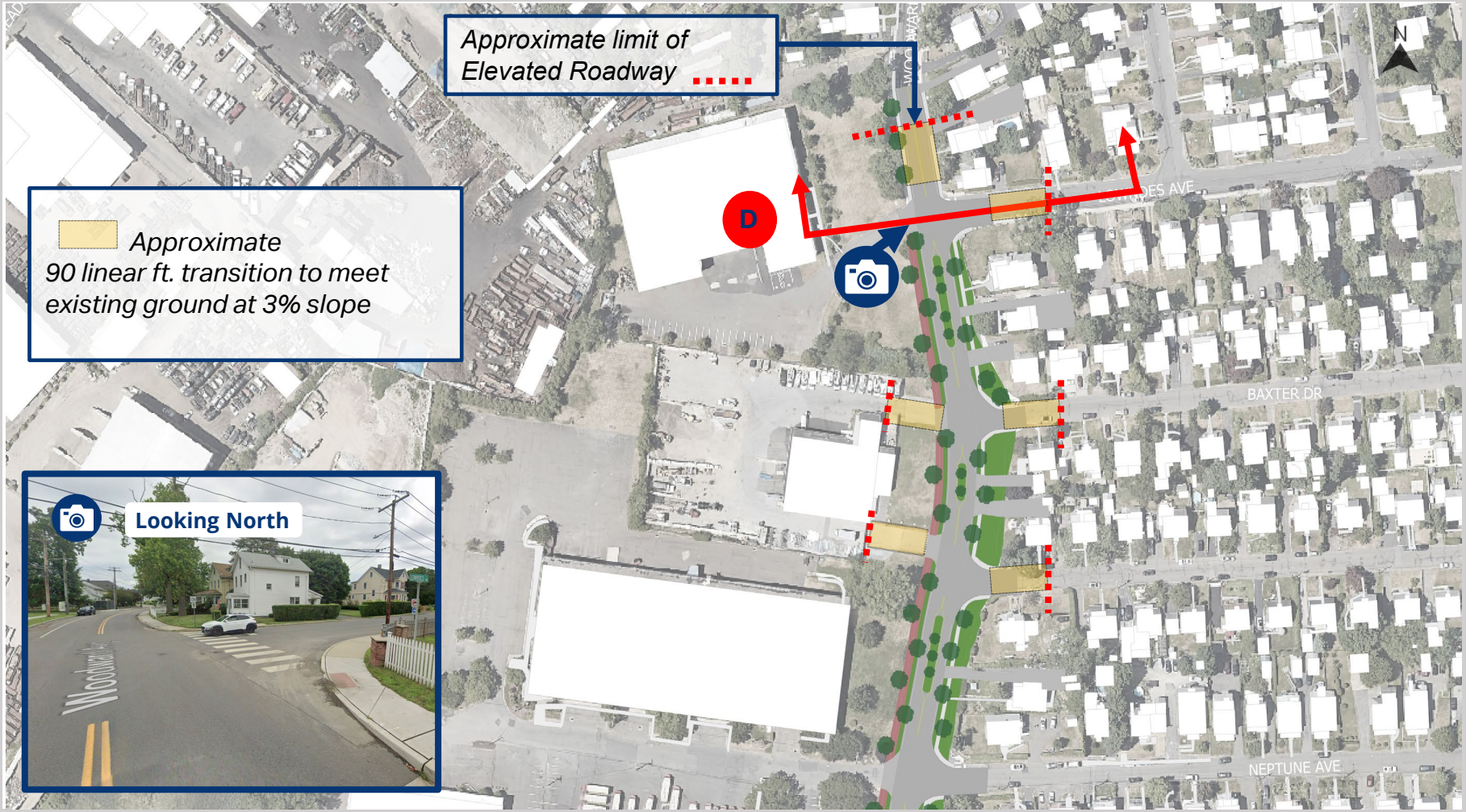
The planted buffers provide additional tree cover adjacent to the sidewalk, shading pedestrians, bicyclists, and the pavement below. The median provides additional area to add tree canopy to the street and the neighborhood, increasing shade across the roadway and decreasing paved surfaces. The planted areas can be utilized for stormwater management, provide a visually interesting environment, and create a more pedestrian friendly streetscape, in addition to their contributions to reducing heat along with right-of-way.

- Elevate Roadway
- Cool Roof & Pavement Colors
- Green Infrastructure
- Expand Tree Canopy & Parks
- Signage for Awareness

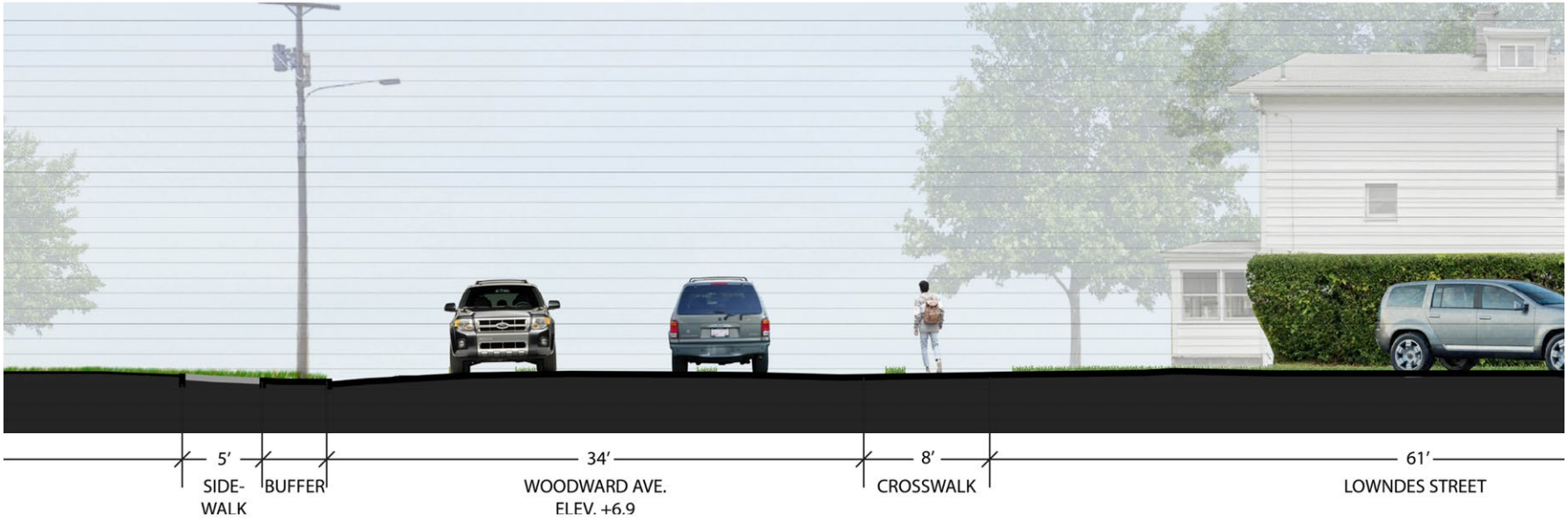



D
Lowndes Avenue
Baxter Drive
BAXTER DR
Baxter Drive
E
Neptune Avenue
NEPTUNE AVE
Naromake Avenue
Woodward Avenue
Burwell Street
Sable Street

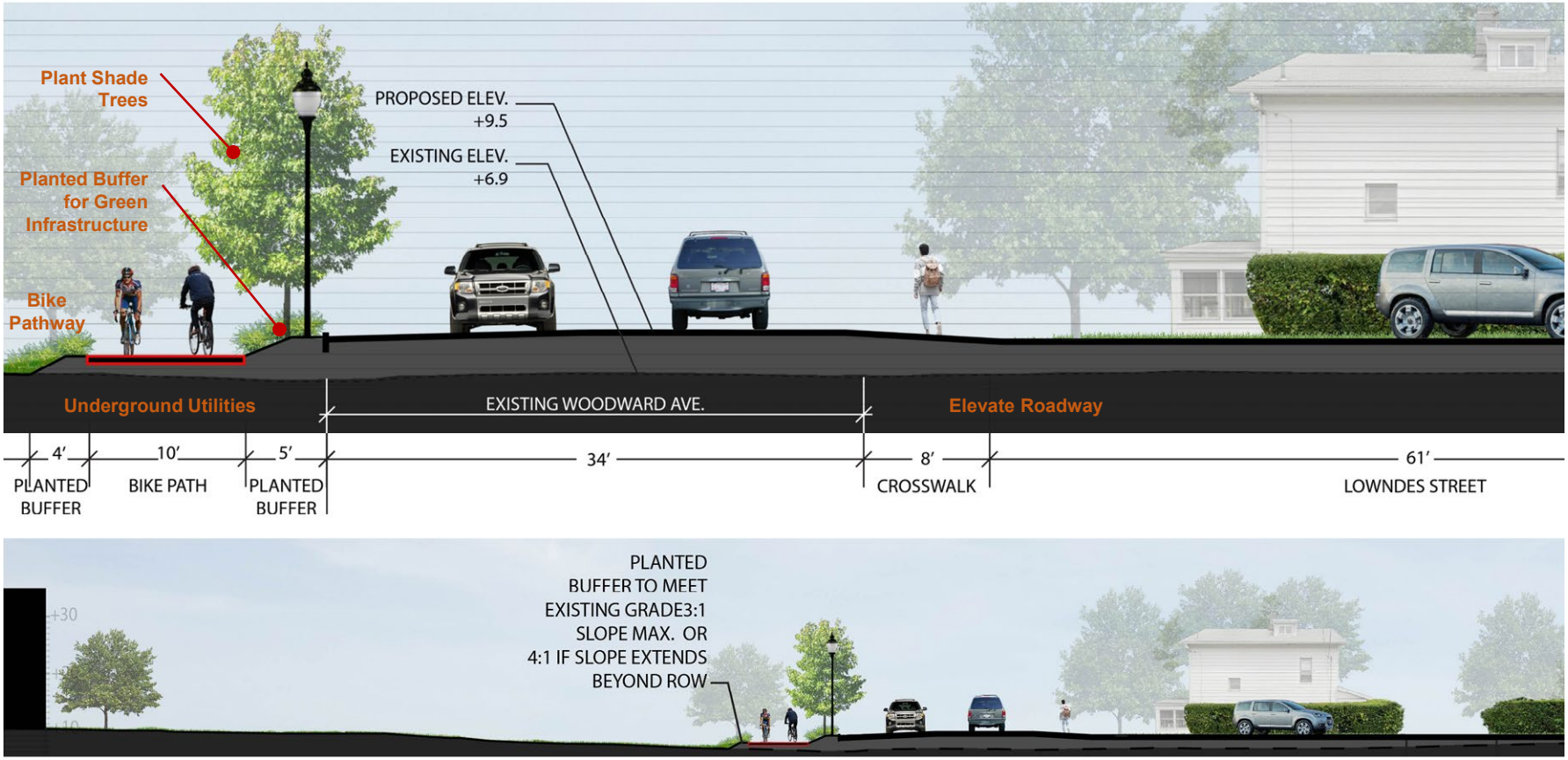
Section D: Woodward Ave And Lowndes Ave | Proposed Conceptual Design



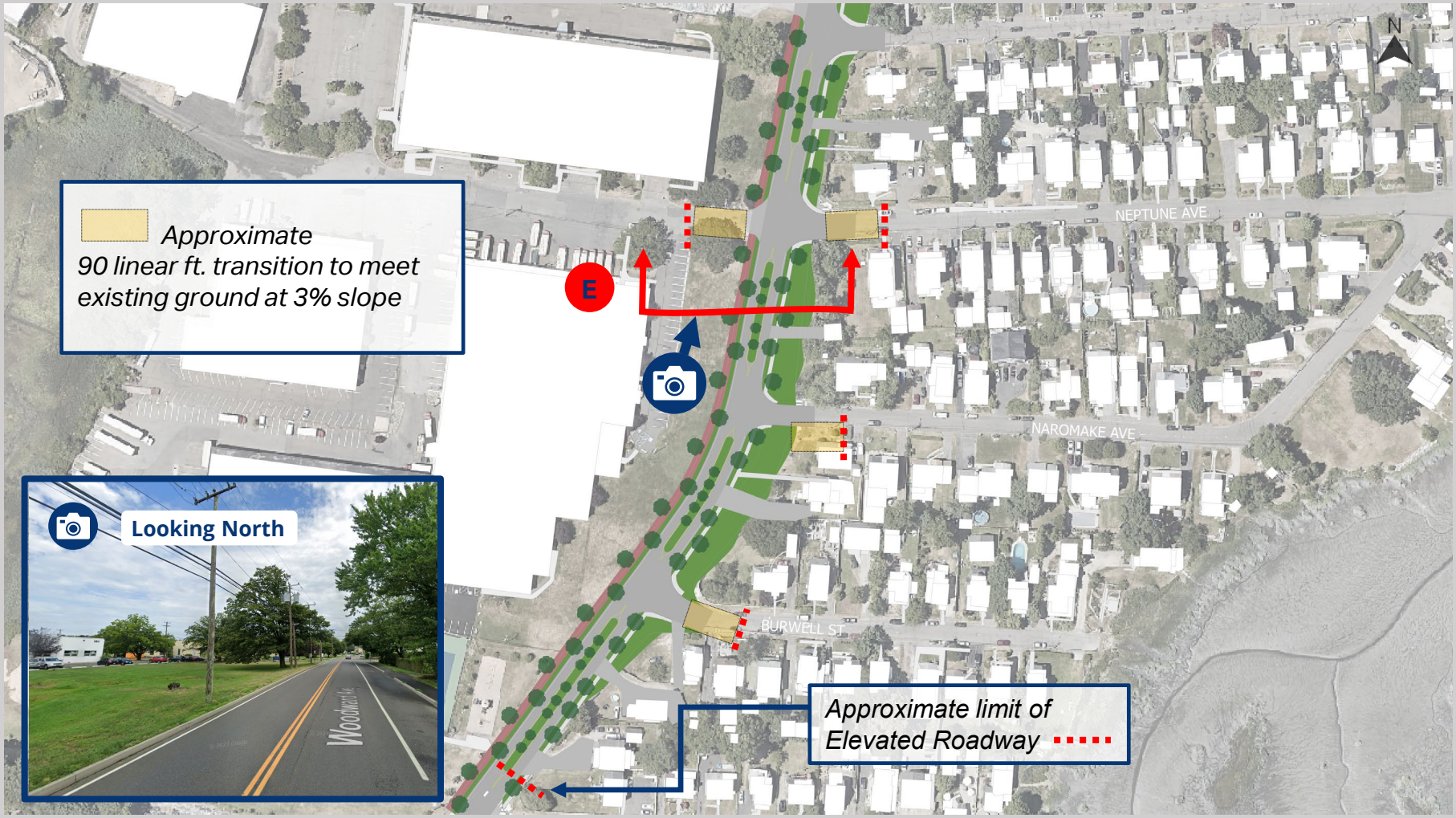
Section D: Woodward Ave And Lowndes Ave| Current Condition



Section D: Woodward Ave And Lowndes Ave | Proposed Conceptual Design

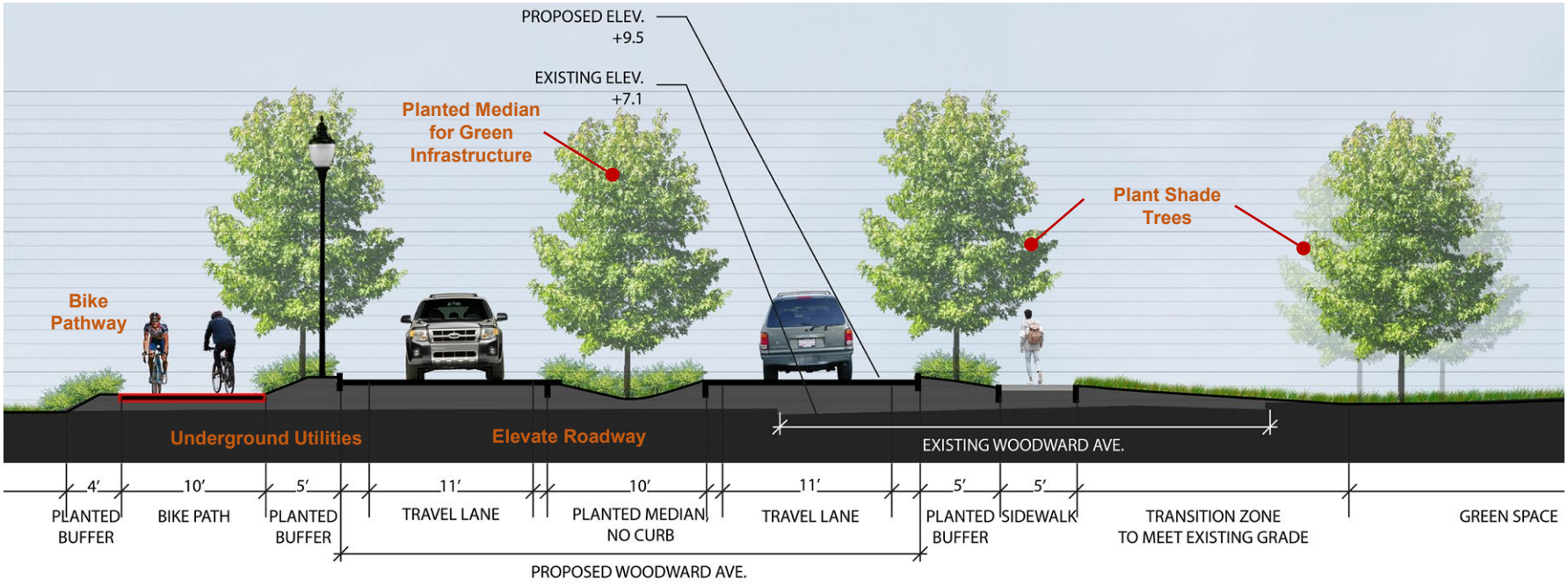


Section E: Lower Woodward Ave | Proposed Conceptual Design



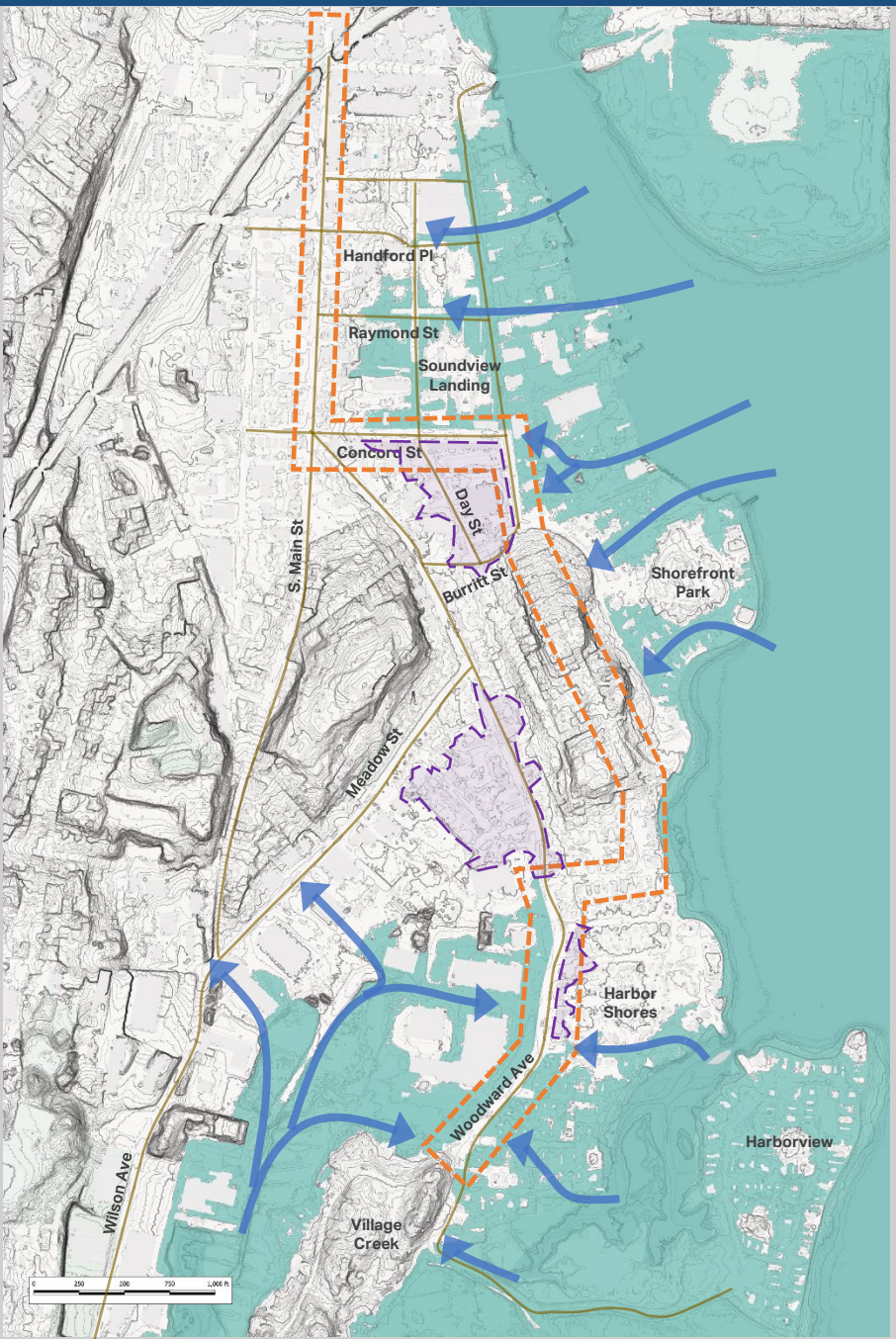
Section E: Lower Woodward Ave| Current Condition

Section E: Lower Woodward Ave| Proposed Conceptual Design



Conceptual Design on Woodward Ave | Existing

Conceptual Design on Woodward Ave | Proposed



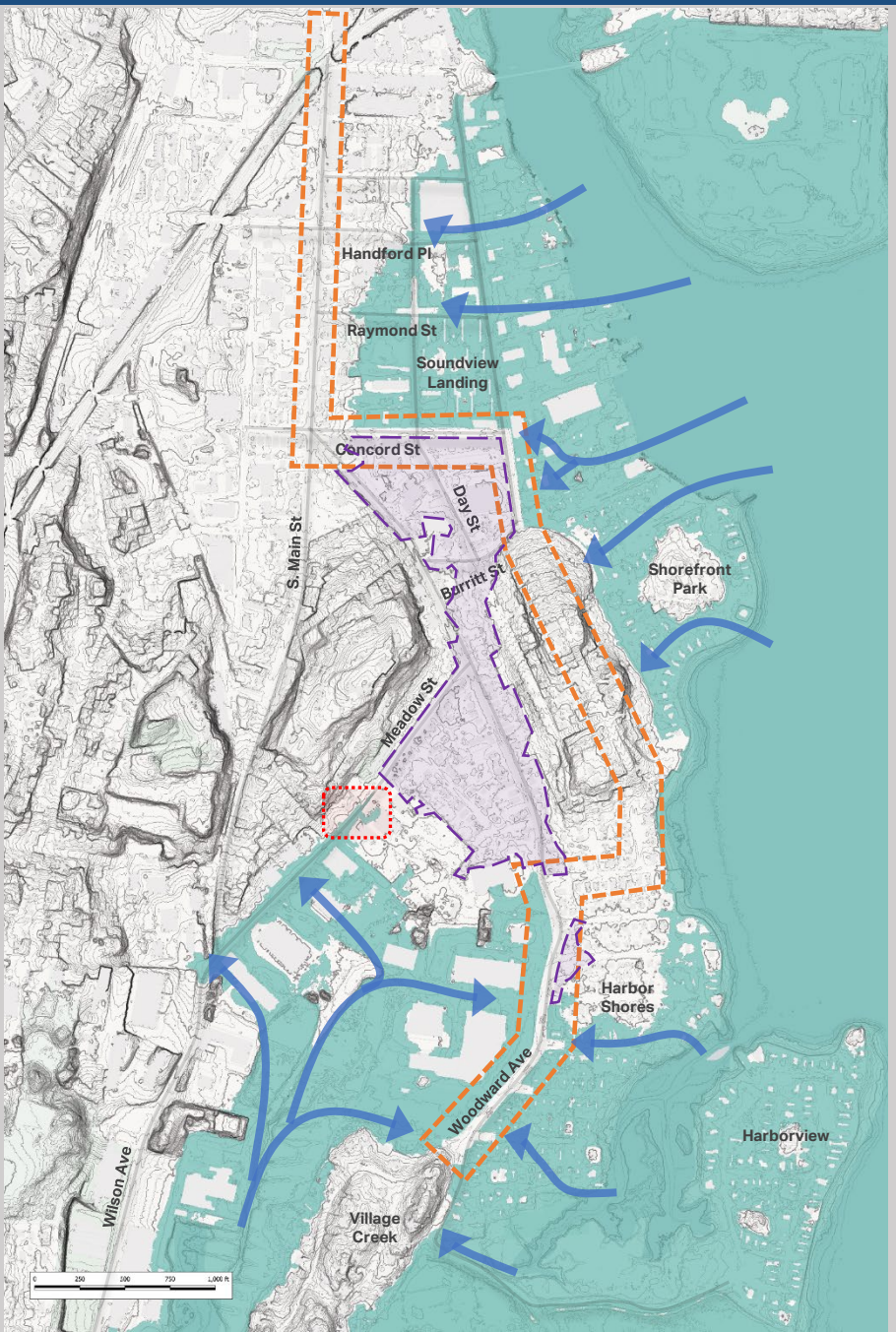
Resilient Corridor Flood Impacts:
10-Year Flood (Present Day)

This figure shows the potential *CURRENT* reduction in flooded areas due to the raising of the resilient corridor roadways to elevation 9.5.

Further study is recommended to determine the detailed design and costs for the elevated roadway option.

Flood limits shown at 7.59 ft. flood level

- Project Area
- Study Corridors
- Resilient Corridor Above Floodplain
- Properties Protected by Intervention
- 10% Annual Storm in Present Day Elevation 7.59 NAVD88
- Flood Pathways



Resilient Corridor Flood Impacts:
10-Year Flood (Projected 2050)

This figure shows the potential *FUTURE* reduction in flooded areas if flooding reaches elevation 9.0, due to the raising of the resilient corridor roadways to elevation 9.5. Note the area of interest for further study at Meadow Street.

Further study is recommended to determine the detailed design and costs for the elevated roadway option.

Flood limits shown at 9.00 ft. flood level

- Project Area
- Study Corridors
- Resilient Corridor Above Floodplain
- Properties Protected by Intervention
- Elevation 9.00 NAVD88
- Flood Pathways
- Areas of Interest for Future Mitigation

Resilient Corridor Flood Impacts:
10-Year Flood (Projected 2050)

This figure shows the potential *FUTURE* reduction in flooded areas if flooding reaches elevation 9.59, due to the raising of the resilient corridor roadways elevation 9.5. Note the area of interest continues to show potential for protection of flood pathways, if further study at Meadow Street is conducted.

Further study is recommended to determine the detailed design and costs for the elevated roadway option.

Flood limits shown at 9.59 ft. flood level

- Project Area
- Study Corridors
- Resilient Corridor Above Floodplain
- Properties Protected by Intervention
- 10% Annual Storm Projected for 2050 with 20" Sea Level Rise Elevation 9.59 NAVD88
- Flood Pathways
- Areas of Interest for Future Mitigation

REFERENCES

Concord St. Looking East
Photo Credit, AECOM

Hurricane Diane, 1955, Historical Photos:
Photo Credit: Connecticut Post

References:

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"Public Spaces, Impervious Surfaces, Town Utilities, & Town Zoning." 1 Jan. 2023, gis-norwalk.opendata.arcgis.com/. | *Complied from 2016 Ortho-imagery from City of Norwalk GIS Data. Data used to create Impervious surface, utility maps, and town zoning*

"Resilient Connecticut Planning Framework." 2 Dec. 2020, resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2020/04/Resilient-Connecticut-Planning-Framework-Final-1-30-20.pdf.

"The Flood of 1955 in Connecticut." 1 Jan. 2015, www.ctpost.com/. Accessed 1 Jan. 2022.

Norwalk Stormwater and Sanitary Sewer Infrastructure https://norwalk.maps.arcgis.com/

APPENDIX

Water St & Burritt Ave Intersection
Photo Credit, AECOM

A. Community Benefits for Woodward Avenue and Lowndes Avenue Road Elevation

This section presents the potential community benefits associated with elevating a portion of the roadbed of lower Woodward Avenue and Lowndes Avenue (henceforth referred to as the Southern Corridor). The roadways will be elevated to prevent road closures during a 2050 10-year storm with sea-level rise, maintaining accessibility to jobs, residential areas, and community assets. The study area for this benefits summary is shown in Figure 1. Boundaries for the study area were determined based on the criticality of the corridor to the surrounding area. The segment of Woodward Avenue included in the Southern Corridor is an identified emergency response route. For the waterfront residential communities along Woodward Avenue and in Harborview, the road segments included in the proposed elevation project could serve as an access route away from modeled present and projected flood limits (Figure 2).

Figure 1. Southern Corridor Study Area for Community Benefits Summary

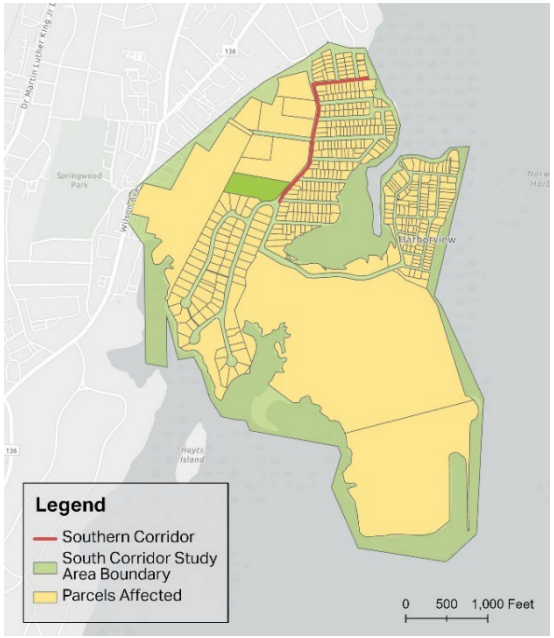
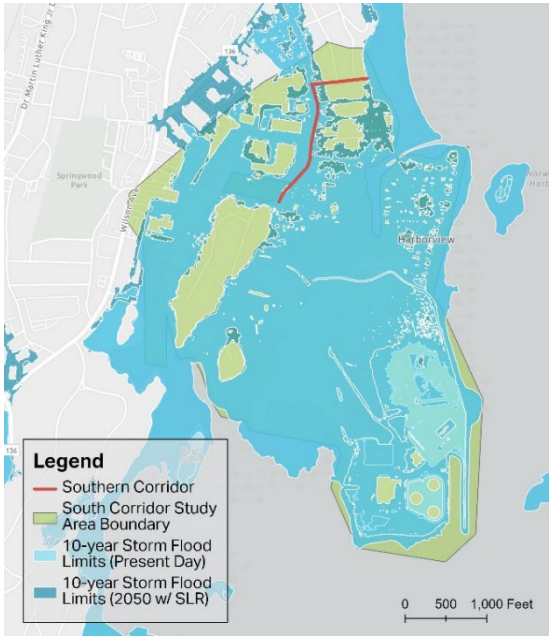


Figure 2. 10-year Storm Flood Limits (present day and 2050 w/ SLR) for Selected Study Area



The study area overlaps with one census tract and two census block groups (see Figure 3). According to 2021 American Community Survey 5-year estimates, the two census block groups have a population of approximately3,600 with the residential communities of Village Creek, Harbor Shores, and Harborview, and extending south to Manresa Island. According to EMSI labor market data, the Census Tract has a workforce of 880 employees as of 2020. The industry that has the highest number of jobs is Wholesale Trade (21%), followed by Public Administrative Services (18%).

Benefits of the road elevation have not been monetized at this stage but have been quantified or qualitatively discussed based on publicly available datasets (e.g., Census) as well as proprietary data (EMSI labor market data). The benefits explored align with those from potential future funding sources, such as FEMA's Building Resilient Infrastructure and Communities (BRIC) grant. The BRIC grant criteria include technical criteria and additional qualitative criteria (applicable when there is a high volume of sub-applications). Some of the relevant criteria to this project include risk reduction, anticipation of climate change and other future conditions, population impacted, and incorporation of nature-based solutions. Overall, key benefits from this project include:

- ❑ Reduce flood risk in a disadvantaged community
- ❑ Maintain accessibility to job, residential areas and community assets
- ❑ Support property values and ongoing fiscal revenues
- ❑ Improve aesthetics with landscaping
- ❑ Reduce runoff with green infrastructure and stormwater improvements
- ❑ Improve bike/pedestrian safety and accessibility
- ❑ Add shade to reduce urban heat island effect

According to the Council on Environmental Quality's Climate and Economic Justice Screening (CEJST) tool, the Census tract that intersects with the study area is identified as a disadvantaged community. Some key drivers include the Census tract having greater than the 90th percentile for the following CEJST indicators: households in linguistic isolation, unemployment, and has low high-school education attainment, share of properties at risk of flood in 30 years and is low income, and share of tract's land area that is covered by impervious surface and is low income. According to the CDC's Socially Vulnerability Index, the Census tract is identified as one with medium to high level of vulnerability with a score of 0.7. The study area is also identified to be highly vulnerable to impacts of extreme heat according to CIRCA's Climate Change Vulnerability (CCVI) Heat Scoring, as it has higher industrial uses and impervious surfaces.

Areas in the Northern Corridor are also a destination for and route to recreation and education services. Within and near the study area there is a community center and a community health center. Furthermore, there are also several beaches and places of worship, Woodward Avenue Park and John Ryan Park, a marina, three bus stops, and 3 schools (one which is currently proposed, and not yet constructed) (Figure 4).

In total, the study area contains 772 parcels with a total assessed value of $570 million according to County assessor data from 2018. Of these, 725 residential parcels with a total residential gross square footage of 2.3 million and a total assessed value of $397 million based on County assessor data. There are 11 industrial parcels totaling almost 700,000 square feet and a total assessed value of $96 million. Maintaining accessibility to these parcels is important not only for residents, employees, and businesses, but also for sustaining their property value and associated fiscal revenues.

Figure 3. Study Area Census Geographies

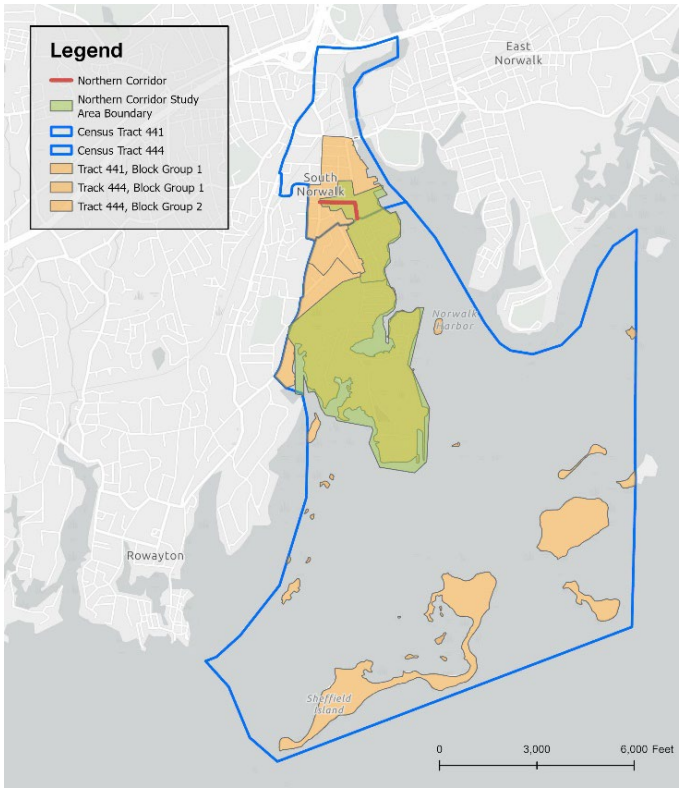


Figure 4. Community Assets in Study Area

B. Community Benefits for Concord and Water Streets Road Elevation

This section presents community benefits of elevating a portion of the roadbed on Concord Street and Water Street (henceforth referred to as the Northern Corridor). The roadways will be elevated to prevent road closures during a 2050 10-year storm with sea-level rise, maintaining accessibility to jobs, residential areas, and community assets. The study area for this analysis is shown in Figure 2. Boundaries for the study area were determined based on the criticality of corridor to the surrounding area. The segment of Water Street included in the Northern Corridor is an identified emergency response route. The road segments included in the proposed elevation project could serve as an access route away from modeled present and projected flood limits not only for the commercial area immediately surrounding the segments but also for the waterfront residential communities along Woodward Avenue and in Harborview (Figure 2).

Figure 2. Northern Corridor Study Area for Community Benefits Summary

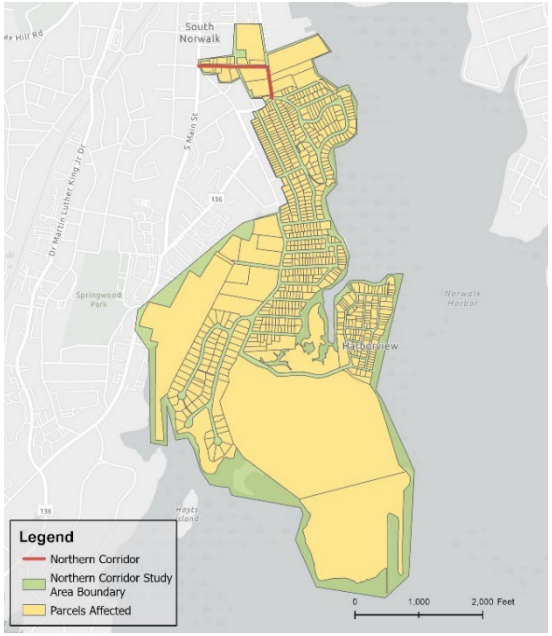
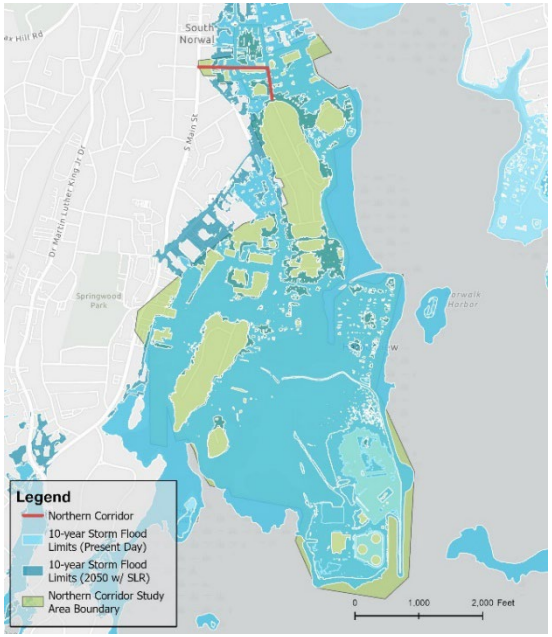


Figure 1. 10-year Storm Flood Limits (present day and 2050 w/ SLR)



The study area overlaps with one census tract and two census block groups (see Figure 3). According to 2021 American Community Survey 5-year estimates, the two census block groups have a population of approximately3,600 with the residential communities of Village Creek, Harbor Shores, and Harborview, and extending south to Manresa Island. According to EMSI labor market data, the Census Tract has a workforce of 880 employees as of 2020. The industry that has the highest number of jobs is Wholesale Trade (21%), followed by Public Administrative Services (18%).

Benefits of the road elevation have not been monetized at this stage but have been quantified or qualitatively discussed based on publicly available datasets (e.g., Census) as well as proprietary data (EMSI labor market data). The benefits explored align with those from potential future funding sources, such as FEMA's Building Resilient Infrastructure and Communities (BRIC) grant. The BRIC grant criteria include technical criteria and additional qualitative criteria (applicable when there is a high volume of sub-applications). Some of the relevant criteria to this project include risk reduction, anticipation of climate change and other future conditions, population impacted, and incorporation of nature-based solutions. Overall, key benefits from this project include:

- ✓ Reduce flood risk in a disadvantaged community
- ✓ Maintain accessibility to job, residential areas and community assets
- ✓ Support property values and ongoing fiscal revenues
- ✓ Improve aesthetics with landscaping
- ✓ Reduce runoff with green infrastructure and stormwater improvements
- ✓ Improve bike/pedestrian safety and accessibility
- ✓ Add shade to reduce urban heat island effect

According to the Council on Environmental Quality's Climate and Economic Justice Screening (CEJST) tool, both the Census tracts that intersect with the study area are identified as a disadvantaged community. Some key drivers include the Census tracts having greater than the 90th percentile for the following CEJST indicators: households in linguistic isolation, unemployment, and has low high-school education attainment, share of properties at risk of flood in 30 years and is low income, and share of tract's land area that is covered by impervious surface and is low income. According to the CDC's Socially Vulnerability Index, Census Tract 444 is identified as the Census tract is identified as one with medium to high level of vulnerability with a score of 0.7 and Census Tract 441 is identified as one with high level of vulnerability with a score of 0.8. The study area is also identified to be highly vulnerable to impacts of extreme heat according to CIRCA's Climate Change Vulnerability (CCVI) Heat Scoring, as it has higher industrial uses and impervious surfaces.

Areas in the Northern Corridor are also a destination for and route to recreation and education services. Within and near the study area there is a community center and a community health center. Furthermore, there are also several beaches and places of worship, Woodward Avenue Park and John Ryan Park, a marina, three bus stops, and 3 schools (one which is currently proposed, and not yet constructed) (Figure 4).

Figure 3. Study Area Census Geographies

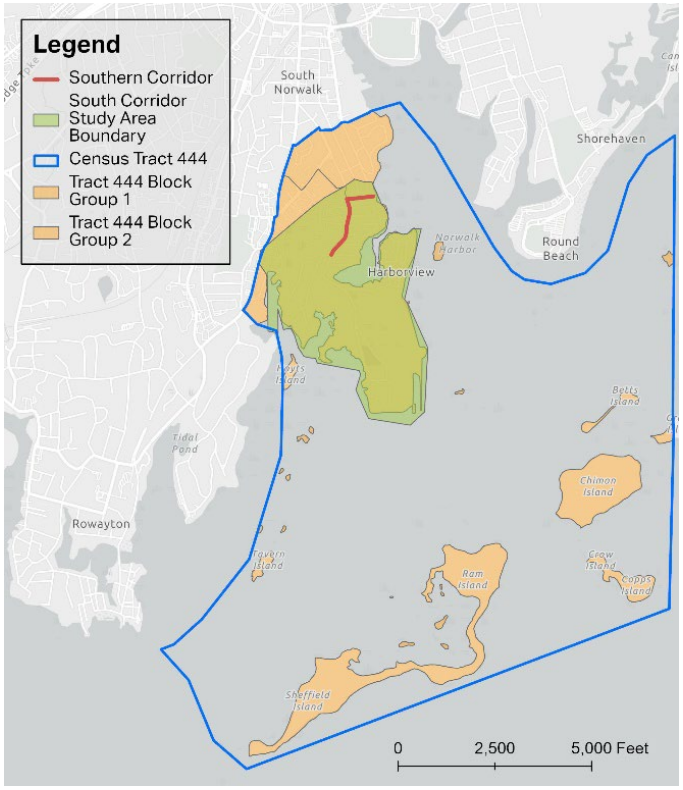


Figure 4. Community Assets in Study Area

Data Sources

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Rough Order of Magnitude Estimate

The figure below outlines estimated costs for Focus Area I and Focus Area II.

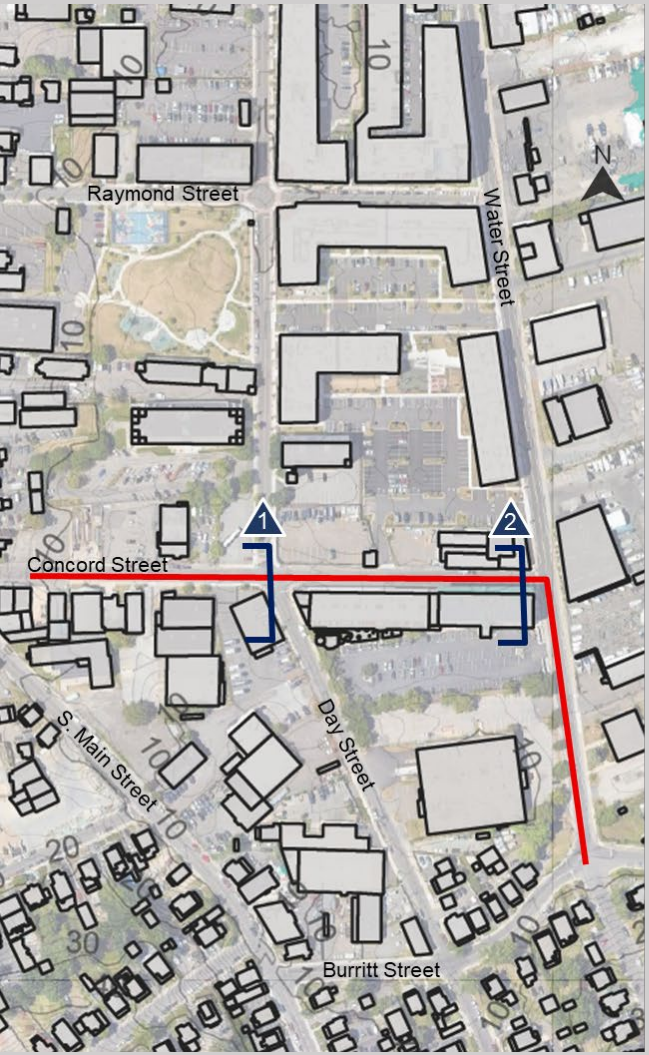
- Focus Area I total cost includes the roadway elevation of Concord Street, Water Street and Burritt Avenue by 1-to-4 feet.
- Focus Area II total cost includes the elevation of Woodward Avenue by 2 feet plus generalized landscaping and a bike path.
- Note: Line Item in orange shows the cost difference with an option of elevating Woodward Avenue 4 ft.

	Portion / Project	Strategy	Project	QTY	Unit	Unit Cost - All in	Total Cost	Comments
Focus Area I	Resilient South Norwalk - Water & Concord Street	Road Elevation	Concord Road - +4FT of Elevation	967.00	LF	$ 2,362	$ 2,283,583	
			Concord Road - +3FT of Elevation	381.00	LF	$ 2,234	$ 851,282	
			Concord Road - +2FT of Elevation	66.00	LF	$ 2,107	$ 139,073	
			Concord Road - +1FT of Elevation	54.00	LF	$ 1,980	$ 106,919	
			Total	1,468.00	LF	$ 2,303	$ 3,380,857	
Focus Area II	Resilient South Norwalk - Woodward Avenue	Road Elevation + Landscaping	Woodward Avenue - +4FT of Elevation + Landscaping	1,380	LF	$ 3,398	$ 4,689,871	
			Woodward Avenue - +2FT of Elevation + Landscaping	1,380	LF	$ 3,026	$ 4,176,425	
			Total	1,380.00	LF	$ 3,026	$ 4,176,425	PLEASE NOTE THIS DOES ISN'T THE SUM OF THE TWO ABOVE. THE 2FT ELEVATION COST IS CARRIED TO THE TOTAL

Rough Order of Magnitude Estimate

The figure below shows the previous table for both Focus Area I and Focus Area II, with an additional detailed breakdown of unit costs outlined in yellow.

	Portion / Project	Strategy	Project	QTY	Unit	Unit Cost - All in	Unit Cost - Excl. Soft Costs	Unit Cost - Excl. GC Mark Ups	Unit Cost - Net Construction Cost - Excl contingency factor for economies of scale	Unit Cost - Net Construction Cost - Excl construction contingencies	Unit Cost - Net ROAD Construction Cost - Excl Landscpaping	Total Cost	Comments
Focus Area I	Resilient South Norwalk - Water & Concord Street	Road Elevation	Concord Road - +4FT of Elevation	967.00	LF	$ 2,362	$ 1,817	$ 1,439	$ 1,370	$ 1,191	$ 1,116	$ 2,283,583	
			Concord Road - +3FT of Elevation	381.00	LF	$ 2,234	$ 1,719	$ 1,361	$ 1,296	$ 1,127	$ 1,052	$ 851,282	
			Concord Road - +2FT of Elevation	66.00	LF	$ 2,107	$ 1,621	$ 1,284	$ 1,223	$ 1,063	$ 988	$ 139,073	
			Concord Road - +1FT of Elevation	54.00	LF	$ 1,980	$ 1,523	$ 1,206	$ 1,149	$ 999	$ 924	$ 106,919	
			Total	1,468.00	LF	$ 2,303						$ 3,380,857	
Focus Area II	Resilient South Norwalk - Woodward Avenue	Road Elevation + Landscaping	Woodward Avenue - +4FT of Elevation + Landscaping	1,380	LF	$ 3,398	$ 2,614	$ 2,070	$ 1,972	$ 1,715	$ 1,297	$ 4,689,871	
			Woodward Avenue - +2FT of Elevation + Landscaping	1,380	LF	$ 3,026	$ 2,328	$ 1,844	$ 1,756	$ 1,527	$ 1,109	$ 4,176,425	
			Total	1,380.00	LF	$ 3,026						$ 4,176,425	PLEASE NOTE THIS DOES ISN'T THE SUM OF THE TWO ABOVE. THE 2FT ELEVATION COST IS CARRIED TO THE TOTAL

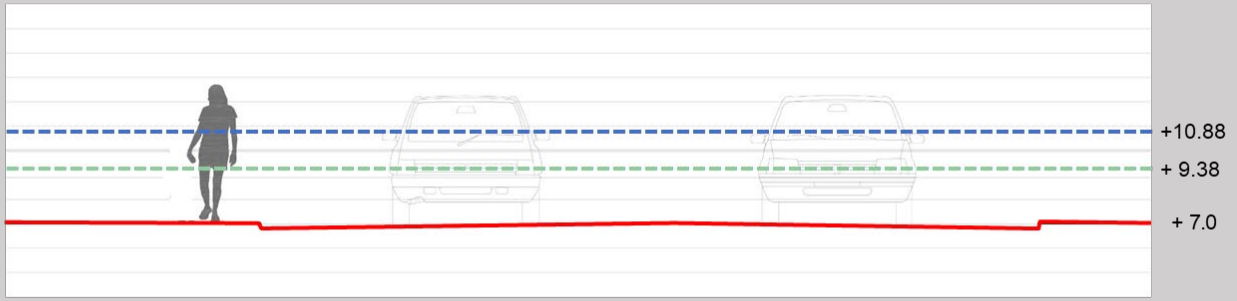


Flood to Elevation 10.88 *ft NAVD88*

1% Annual Storm (2050) – Elev.10.88 NAVD88
1% Annual Storm (Present) – Elev. 9.38 NAVD88

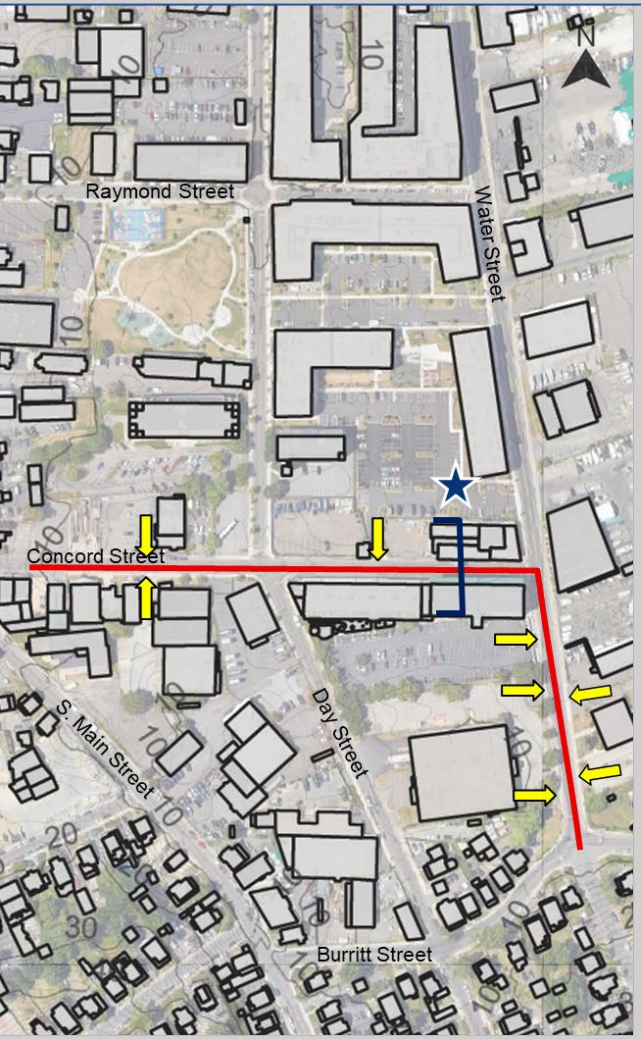
1 Water St & Concord St

Flood mitigation for 1% annual storm requires a minimum of 4' additional elevation



2 Day St & Concord St

Flood mitigation for 1% annual storm requires a minimum of 4' additional elevation



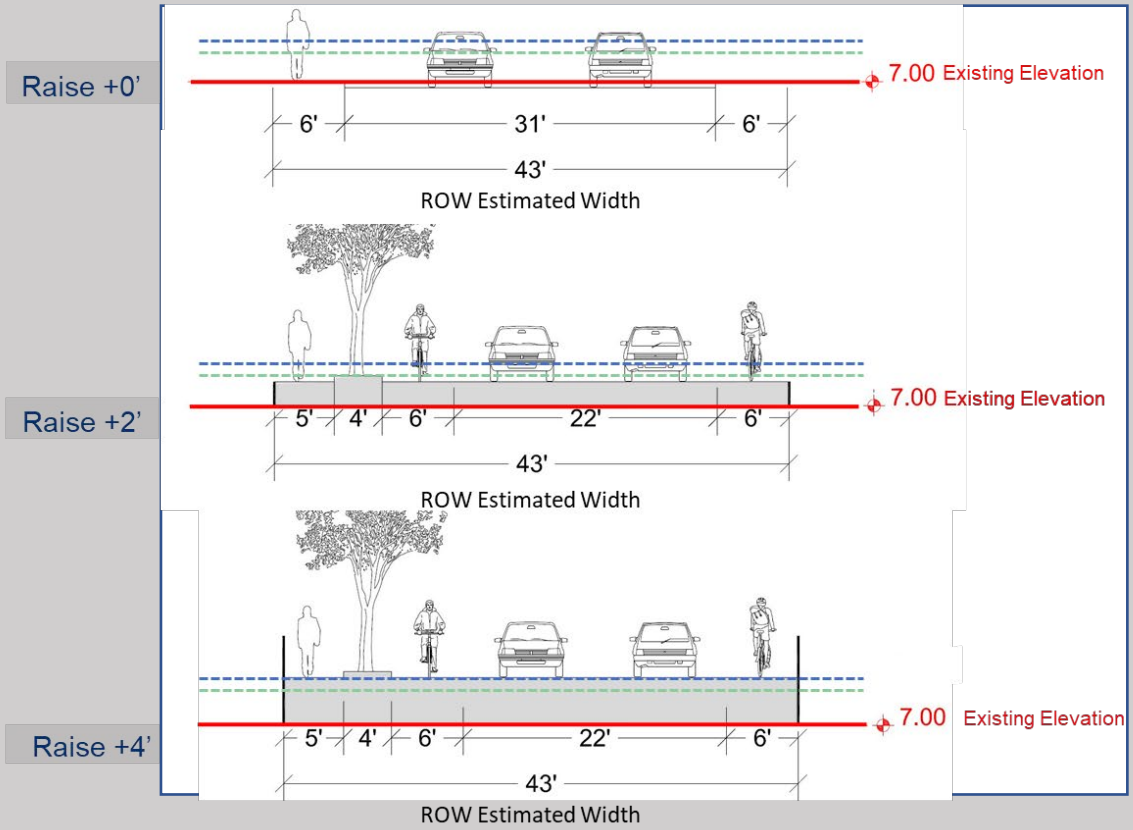
Flood to Elevation 10.88 *ft NAVD88*

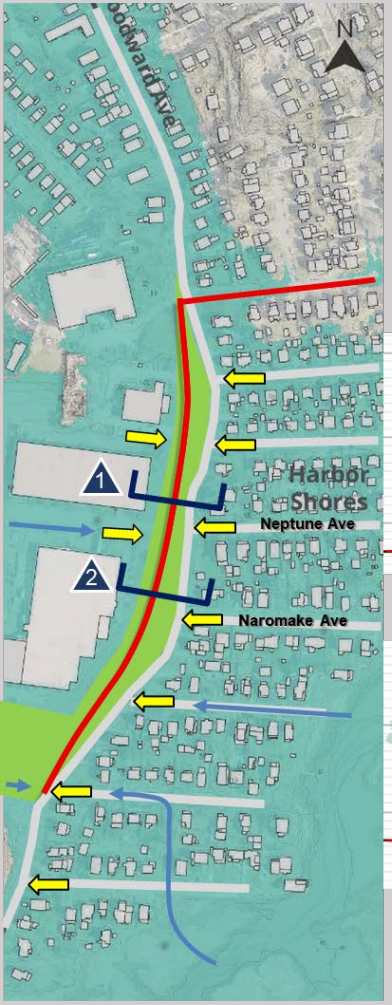
1% Annual Storm (2050) – Elev.10.88 NAVD88

1% Annual Storm (Present) – Elev. 9.38 NAVD88

Concord Street Elevation Studies
Current Elevation at 7.00

Driveway Connections





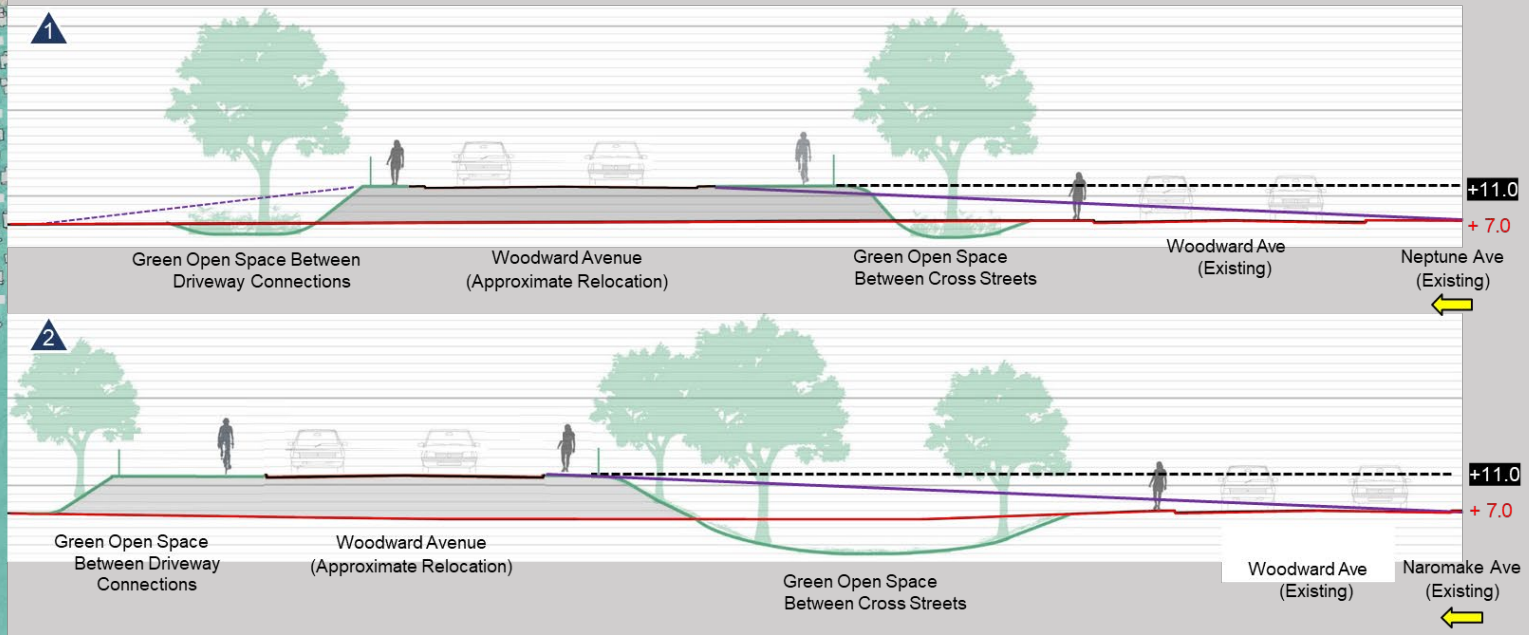
Flood to Elevation 10.88 *ft NAVD88*

1% Annual Storm (2050) – Elev.10.88 NAVD88
1% Annual Storm (Present) – Elev. 9.38 NAVD88

Proposed Road Elevation +11.0
Current Elevation + 7.0
Connecting Road
Neighborhood Road Connections

Woodward Ave & Neptune Ave

Flood mitigation for 1% annual storm requires a minimum of 4' additional elevation



Advisory Committee: Virtual

The Hour, December 6, 2022

Written By Abigail Brone

South Norwalk is among 7 CT neighborhoods picked for climate study. Here's what it means.

NORWALK — The South Norwalk neighborhood is one of seven communities in New Haven and Fairfield counties chosen by the state for climate mitigation planning. In the first meeting of the recently formed Resilient South Norwalk Steering Committee, local leaders and state project managers outlined the city's involvement in the Resilient Connecticut program.

Norwalk's inclusion in the Resilient Connecticut program was announced in August, but the first of four advisory committee meetings took place last week. Resilient Connecticut is a collaboration of the Connecticut Institute for Resilience and Climate Adaptation, which is operated by the University of Connecticut, along with state agencies, regional councils of governments (COGs) and municipalities, according to the program. Resilient Connecticut is part of the HUD National Disaster Resilience Competition and was established in 2018 to help guide the state in planning framework for climate mitigation in the wake of Superstorm Sandy.

The program is focused on projects that lessen the effects of climate change in New Haven and Fairfield counties, CIRCA's Director of Resilience Planning John Truscinski said during the Nov. 30 advisory meeting. "In 2020 to 2021, we did a whole series of workshops with COGs in Fairfield and New Haven counties and several mapping initiatives and vulnerability assessments," Truscinski said. "Overall, the goal was to understand where some of the climate vulnerabilities — particularly for flooding and heat — were located in Fairfield and New Haven counties. We also looked at the idea of social vulnerabilities and vulnerable populations."

South Norwalk was chosen as one of seven vulnerable populations as the area's ZIP code rates high on the Centers for Disease Control and Prevention's Social Vulnerability Index. The 06854 ZIP code was designated by the state Department of Public Health as among the highest in the index, which weighs factors including poverty, employment, housing, access to transportation, education and other variables.

"That effort identified a whole list of resiliency opportunity areas, places we felt there was an unmet need and there was a need for some additional planning work to develop strategies and projects to mitigate climate risks," Truscinski said. "Out of 64 locations identified in two counties, South Norwalk was one of seven we moved into what we called phase 3 and this is the start of the phase 3 process."

As a shoreline community with a high social vulnerability index, SoNo is at risk for serious damage should another superstorm occur. Under state guidelines, shoreline towns are working on infrastructure planning that would account for a sea level rise of 20 inches by 2050, Truscinski said.

"There was a process used to select that number, which included analysis. There's been recent report by NOAA (the National Oceanic and Atmospheric Administration) that just came out this year that basically lowered the range of possibilities to about (the year) 2100," Truscinski said. "The finding of that report is 20 inches. Twenty inches is the upper bound of the likely range at 2050."

The goal of Resilience Connecticut is to provide a roadmap for the selected communities to prepare for the sea level rise, according to Lorayne Black, a project manager and architect at engineering firm AECOM.

The program has four objectives in SoNo: to mitigate climate impacts, determine community member and stakeholder priorities, design scientifically informed adaptations and implement them, Black said.

Specific areas of focus include flood mitigation from the harbor and in the southern bounds of the study area, in Village Creek, establishing evacuation corridors and increase connectivity to other areas of the city and develop adaptation options to reduce the impact of extreme temperatures and alleviate heat islands within South Norwalk, which could include expanding the area's tree canopy, according to the program.

Five tasks are included in the program: engagement, future condition analysis, alternatives and conceptual designs, a benefit/cost analysis and a final report, Black said.

The program directors have been conducting a condition analysis and expect the final report to be ready by the end of May, Black said.

"We're getting ready for public workshops coming up in a few weeks, wrapping up the conditions analysis and at the end of this phase, will prepare memorandum," Black said.

In the new year, a series of three public workshops will be held for community members to voice their flood and climate change concerns in SoNo, Black said.

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Public Workshop #1: Virtual January 12, 2023

The Hour, January 14, 2023 Written By Abigail Brone

Sea levels could rise 20 inches by 2050 due to climate change. Norwalk is developing plans to combat that.

NORWALK — Staring down the possibility of a 20-inch rise in the sea level by 2050, city and state officials are outlining the flooding that Norwalk could experience if nothing is done to mitigate climate change.

The Planning and Zoning Department, in a partnership with the Connecticut Institute for Resilience and Climate Adaptation at the University of Connecticut, held the first of three public meeting outlining flood and heat mitigation plans for Norwalk.

About 100 residents registered for Thursday night's virtual public meeting and about 60 people attended, said Geoffrey Morrison, principal urban planner at AECOM. the engineering firm hired for the study.

"Tonight, is about showing the community the existing solutions and talking about contributing factors," Morrison said. "The next meeting is showing alternative solutions. We wanted to understand what's happening locally, hear from the community first, then hear about interventions."

Through CIRCA, South Norwalk was one of seven communities in the state chosen for the mitigation study. The program, dubbed Resilient Connecticut, is focused on New Haven County and Fairfield County. Resilient Connecticut is a collaboration of CIRCA, along with state agencies, regional councils of governments and municipalities, according to the program. Among Norwalk's advisory committee and involved in discussions, particularly regarding green roofing and tree canopies, is South Norwalk Electric and Water Company, CIRCA Director of Resilience Engineering David Murphy said.

"CIRCA's vulnerability assessment in the two counties resulted in the identification of about 60 areas of flood- and heat-related needs," Murphy said. "Of those 60, we moved ahead with seven for further study, including South Norwalk.

"South Norwalk was selected because of the needs, and the potential for the typologies (the nature of flooding and heat risks) to yield findings that can be used in similar communities," he said.

Under state guidelines, shoreline towns are working on infrastructure plans that would account for a sea level rise of 20 inches by 2050, Morrison said. In mockups presented at Thursday's meeting, the CIRCA team showed what certain areas in South Norwalk would look like with 20 inches of water flooding the roadways.

A main source of flooding in Norwalk is storm surge, which is an abnormal rise in sea level during storms, AECOM civil engineer Megan Gibbons said.

"Air patterns in hurricanes travel counterclockwise and the effect of each storm varies on strength and landfall," Gibbons said. "Water is pushed from the Atlantic into the Long Island Sound, where it's getting trapped and piles up in the Long Island Sound and by SoNo and move to what is normally dry ground. The shape of the coastline greatly effects storm surge flooding."

Three areas of discussion were heat vulnerability, flood risk and existing and future conditions. Changes up for discussion include increasing maintenance of the area's tree canopy, implementing more pervious road and ground materials that prevent pooling of water and preventing an increase in building density. Other alternatives will be explored in the coming months.

Several members of the public weighed in on the study, including several nonoperative pumping stations and the possibility of expanding the borders of the study area.

One resident recommending the installation of an underground flood protection system, such as New London's extensive barrier protecting 173 acres of industrial and commercial areas in the vicinity of Shaw Cove, according to the U.S. Army Corps of Engineers.

"Constructing elaborate and expensive flood protection systems will be rare, so we try to ensure that these types of studies consider things that can be done by the city," CIRCA's David Murphy said.

South Norwalk was split into three regions for the study: the north, central and south study zones, said Lorayne Black, a project manager and architect at engineering firm AECOM.

Public Workshop #1: Virtual cont'd.

The Hour, January 14, 2023 Written By Abigail Brone

The north study zone is made up of waterfront industrial development, Soundview landing, the area surrounding the South Norwalk train station, and Day and Water streets. The central study zone includes Harbor Shores, Shorefront Park and South Main neighborhoods along with Meadow Street and Woodward Avenue.

The south study zone includes Village Creek and Harborview neighborhoods, Longshore Avenue and the Manresa Island powerplant, Black said. The study will examine five key points: creating flood mitigation options, maintaining dry emergency evacuation corridors, establishing "resilient corridors" to maintain access for residents and emergency vehicles during floods, assessing how land is used and density of buildings, and reducing the impact of extreme temperatures and heat pockets, according to the Resilient Connecticut program.

By 2050, the area's average temperature is expected to rise by 5 degrees and the number of days a year over 77 degrees will increase from 81 to 118, Black said.

With the 20-inch rise in sea level expected by 2050, rainfall is also expected to increase of about 8 percent, or 4 inches per year, Black said.

Resilient Connecticut is part of the U.S. Department of Housing and Urban Development's National Disaster Resilience Competition. it was established in 2018 to help guide the state in planning framework for climate mitigation due to the impact of Superstorm Sandy.

South Norwalk was chosen as one of seven vulnerable populations as the area's ZIP code rates high on the Centers for Disease Control and Prevention's Social Vulnerability Index. The 06854 ZIP code was designated by the state Department of Public Health as among the highest in the index, which weighs factors including poverty, employment, housing, access to transportation, education and other variables.

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Public Workshop #2: Virtual June 29, 2023

The Hour, July 3, 2023 Written By Katherine Lutge

In South Norwalk, where residents say it floods every full moon, experts create resiliency plan

NORWALK — As rising sea levels and flooding threaten access to many neighborhoods in South Norwalk, experts suggest ways to mitigate effects from climate change. "The resilient corridors project is a way to invest in South Norwalk, secure the future and maintain and improve the livability of the neighborhoods by rethinking how we can adapt the existing streetscape and roadway infrastructure addressing impacts of climate change." said Lorayne Black, project manager and landscape architect for AECOM, an infrastructure consulting firm. "We can address heat and floods."

Connecticut Institute for Resilience and Climate Adaptation has identified South Norwalk as one of seven flood vulnerable communities in a climate adaptation study to understand and plan for future flooding risks. The study so far has produced suggestions for several tools the city of Norwalk can use to combat flooding. The most significant strategy is to raise Water Street, Concord Street and a southern section of Woodward Avenue's elevation by about three feet to provide an emergency evacuation corridor for residents out of South Norwalk

That is a vital corridor that if we were able to elevate that road to be able to get people connected so there's not only a way to get out from that neighborhood but also to secure some of the resiliency in some of the land uses around that as well," said Geoffrey Morrison-Logan, AECOM's lead urban planner and community outreach. "So, Water Street in our mind became a very critical part of that equation, especially the southern end." These streets are about seven feet above sea level. However, CIRCA projects in major flooding events water could rise to 10 feet by 2050.

The other key strategy the experts suggested is incorporating green infrastructure along these majors corridors to help manage the influx of water. Meadow Street, Woodward Avenue and Concord Street were highlighted as areas to reduce imperious surfaces and incorporate more trees. Green infrastructure is used to mitigate flooding and reduce heat in urban cores.

After CIRCA and AECOM presented their suggestions during a June 29 meeting, they hosted a public discussion where they provided context to the presented plan and residents could voice concerns. One resident questioned about the zoning re-write proposal to zone the upper section of Water Street as an urban waterfront zone, CD-5W, which would allow for mixed-use residential buildings but require public access to the water.

John Truscinski, CIRCA's director of resilience planning, said as consultants they are not focusing on development or land use; however, areas in SoNo are valuable because of their proximity to the train station. "Overall at scale this is a strategy that the state can use to start to lower carbon emissions making development less sprawling and suburban," Truscinski said.

Diana Revolus, a Common Council member representing district B, said she too shares concerns about increase density and development in her district based off concerns she has heard from her constituents for years. I represent B, we have asked for multiple times to just stop: we are overdeveloped here," Revolus said.

Education and awareness about flooding patterns and dangers were another concerned raised by a resident who said she and her neighbors endure flooding every full moon during high tide. While residents in the area are aware of the issue, she said others drive through salt water and are unaware of the consistent flood patterns.

This resident suggested that signs and other educational outreach should be incorporated in this plan.

Toxic waste control during flooding was another concern residents requested be incorporated in the study. One resident asked for the researchers to include these toxic waste sights on future maps with the study.

CIRCA is offering is to help develop a resilience zoning overlay and design guidelines for properties in SoNo impacted by flooding. This overlay could be incorporated within the zoning rewrite.

The study is expected to conclude in October where a final plan will be presented to the city. Another community workshop is planned for September.

Public Workshop #3: October 3, 2023

In Person Meeting at Public Library with Walking Tour

The Hour, October 4, 2023 Written By Katherine Lutge

South Norwalk needs to elevate streets for flood preparedness, experts say

NORWALK — Experts made their case for why three city streets should be raised by 3 feet as they led residents and city officials on a walk of some of the areas in South Norwalk that experience the worst flooding during storms. Over the past year, the Connecticut Institute for Resilience and Climate Adaptation and consultant AECOM have studied South Norwalk's flooding patterns and sea-level rise to determine how to combat future flooding events and create a flood resilient corridor.

Through community workshops, CIRCA and AECOM have developed a toolkit and plan that the city could adopt to make South Norwalk more resilient to flooding and provide a safety corridor for emergency flooding events. CIRCA and AECOM designed the project based on projections that sea levels will rise as high as 20 inches by 2050 — and surge even higher during storms.

On Tuesday afternoon, consultants, residents and city officials gathered to walk some of the streets identified to be raised. Concord Street and a southern portion of Water Street are proposed to be raised roughly 3 feet from an elevation of about 6 ½ feet to 9 ½ feet above sea level. "We are looking at creating a single resilient corridor; one that will allow folks from the southern part of Woodward Avenue to have an elevation along a single route that will come up and meet with South Main Street here," said Lorayne Black, senior manager at AECOM.

The goal is to create an elevated route from Village Creek and Harbor View through South Norwalk, connecting both neighborhoods and the industrial area with an exit route. A majority of the route CIRCA and AECOM have identified is already at or above 10 feet elevation. The streets they are proposing to raise are Woodward Avenue, Concord Street and Water Street. "We really wanted you to be in this space and see what it feels like, what it looks like, what the land use is around, and what the elevation feels like," said Black, standing outside the Calvary Baptist Church on Concord Street.

Black explained that Concord Street was chosen as a good street to elevate because most of the buildings are industrial, and there are few curb cuts that would need to connect to the new elevation. In addition to raising the streets, CIRCA and AECOM have compiled a toolkit of best practices for the city to use when managing stormwater and flooding, such as reducing impervious surfaces and adding more green space.

Some residents critiqued the plan, saying the resilient corridor route's identity is not the natural route for residents coming from SoNo neighborhoods. A 25-year Norwalk resident, Katherine Price Snedaker, said she likes the idea but questions the location because when she evacuates from her Shorefront Park home, she heads inland toward the train station, not toward Water Street and Concord Street.

Price Snedaker questioned why some of the more residential streets like Meadow Street are not being considered for elevation. Houses are the biggest obstacle to elevating streets, explained Geoffrey Morrison-Logan, AECOM's lead urban planner. When streets are raised, the driveways, sidewalks and curb cuts all have to be raised to meet the new elevation. Connecting every driveway on a street would be complicated, explained David Murphy from CIRCA.

CIRCA and AECOM's Resilient South Norwalk plan is still in early stages, Black said. More fine tuning and engineering logistics will need to be worked out if the city decides to move forward with their suggestions.