



# Resilient Ansonia

FUTURE CONDITIONS ANALYSIS & RESILIENT DESIGN STRATEGIES

FINAL REPORT | December 15<sup>th</sup>, 2023



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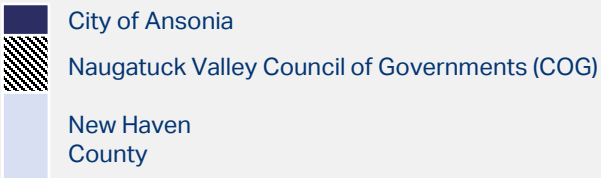
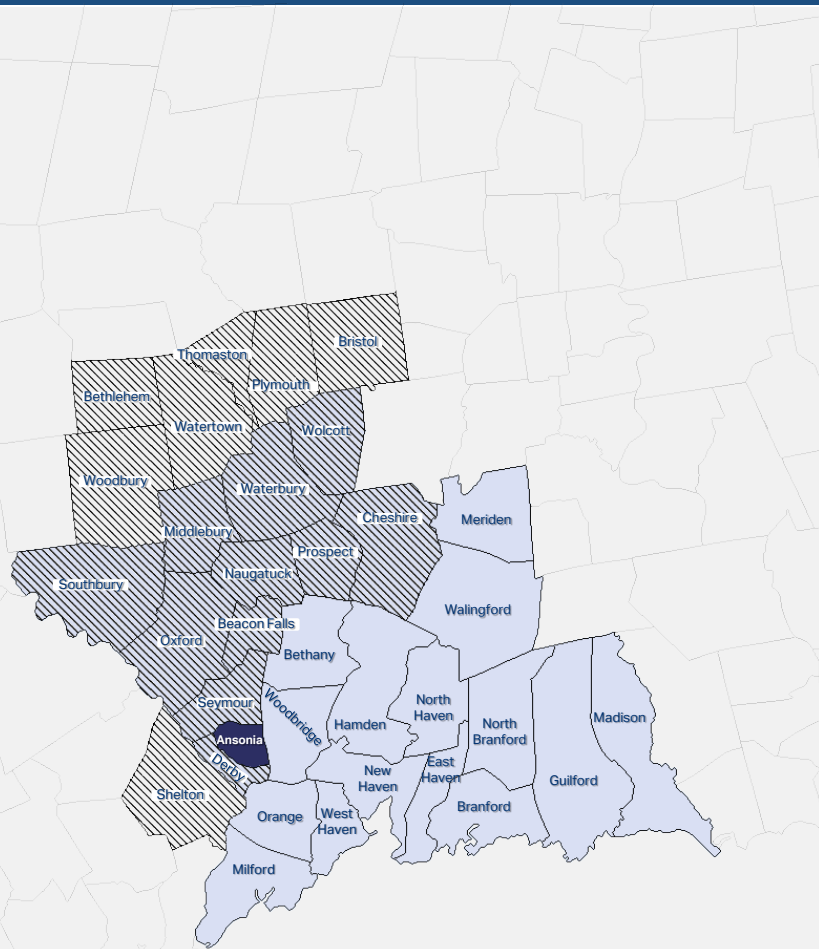
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## CONTEXTUAL OVERVIEW



Historical Images of the Great Flood of 1955  
*Photo Credit, Ansonia Public Library*

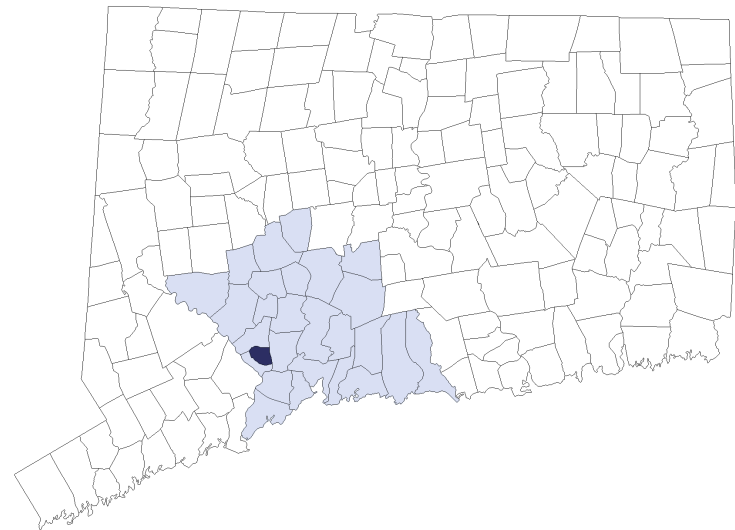




## Introduction

Ansonia, Connecticut is a city in North Haven County located inland along the Naugatuck River just North of Derby. Ansonia is also a member of the Naugatuck Valley Council of Governments (NVCOG), which is a metropolitan planning organization based along the Naugatuck River. The NVCOG provides regional framework within which municipalities can jointly address common interests and coordinate such interests with state and federal plans and programs.

Ansonia has a population of approximately 19,000 ([2020 census](#)). The city is also served by the Connecticut Transit Bus Carrier and the Metro-North Railroad, which is a suburban commuter rail service that connects residents to prominent cities on the coast such as New Haven, Bridgeport and Stamford. Additionally, interstate Connecticut Route 8 serves Ansonia Northbound on exit 19 and southbound on exit 19.



Sourced from Naugatuck Council of Governments and POCD, 2018, p. 5

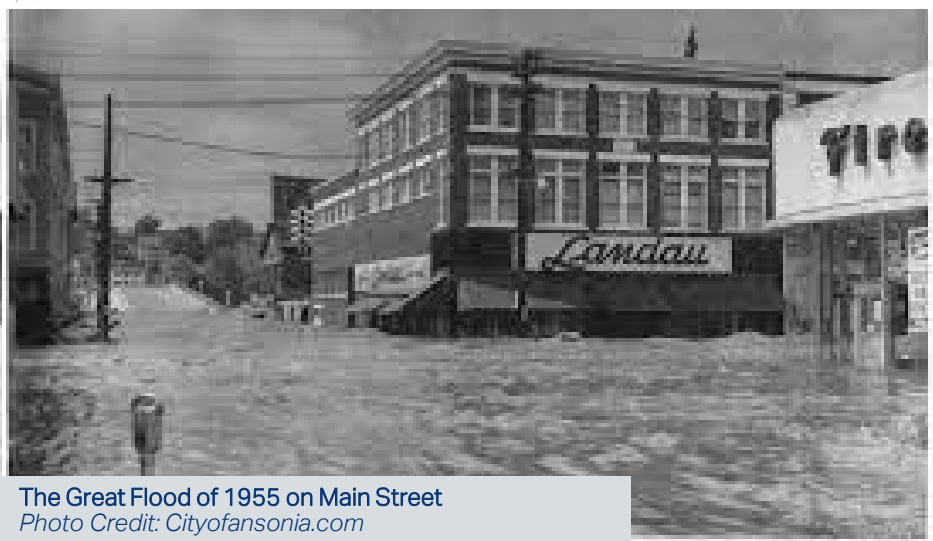
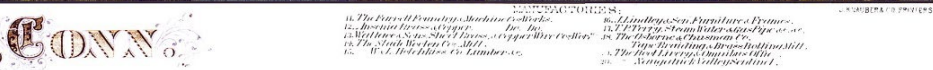


### Historic Context

Ansonia was founded by English colonists in 1652, mainly subsisting off farming and sawmills powered by the strong current of the Naugatuck River.

During the turn of the century Ansonia was one of many New England towns to embrace the age of industrialization. As a response to demand, Ansonia innovated an artificial canal along the river to enhance the productivity of their factories. This new industrial village quickly became one of the most important communities in the state of Connecticut, boasting the production of essential heavy machinery, electric supplies, and brass and copper products.

In 1955 Ansonia suffered grievous damage from a flood as a result of Hurricane Diane, which submerged the land adjoining the river, decimating businesses and homes. In response to this tragedy town officials elected a flood wall along the east and west banks of the river, which still stands prominently in Ansonia today.








The Great Flood of 1955 on Main Street  
Photo Credit: Cityofansoniam.com

Classis Harbor





-  Key Corridors
-  Ansonia Train Station
-  Ansonia City Hall
-  Ansonia Police Station
-  Ansonia Brass & Copper Mill





### Ansonia Today

Once a thriving riverside community, Ansonia is now largely detached from the river's edge with only a small section of the east bank free of the flood barrier protecting the city from future storm surge events. Yet, the impacts of industrialization remain, with dense development and large areas of impervious surfaces still pervasive throughout the town landscape.

With climate change projected to rise temperatures in urban environments, the city is poised to intervene again and make changes that will ensure a more resilient future. This study aims to assess the vulnerability of Ansonia to future heat island effects and target resilient solutions that could promote climate relief in this community and serve as roadmap to other similarly affected communities throughout New England.



Main Street, Ansonia, CT  
Sourced from: CT Post

## 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. CIRCA's 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.

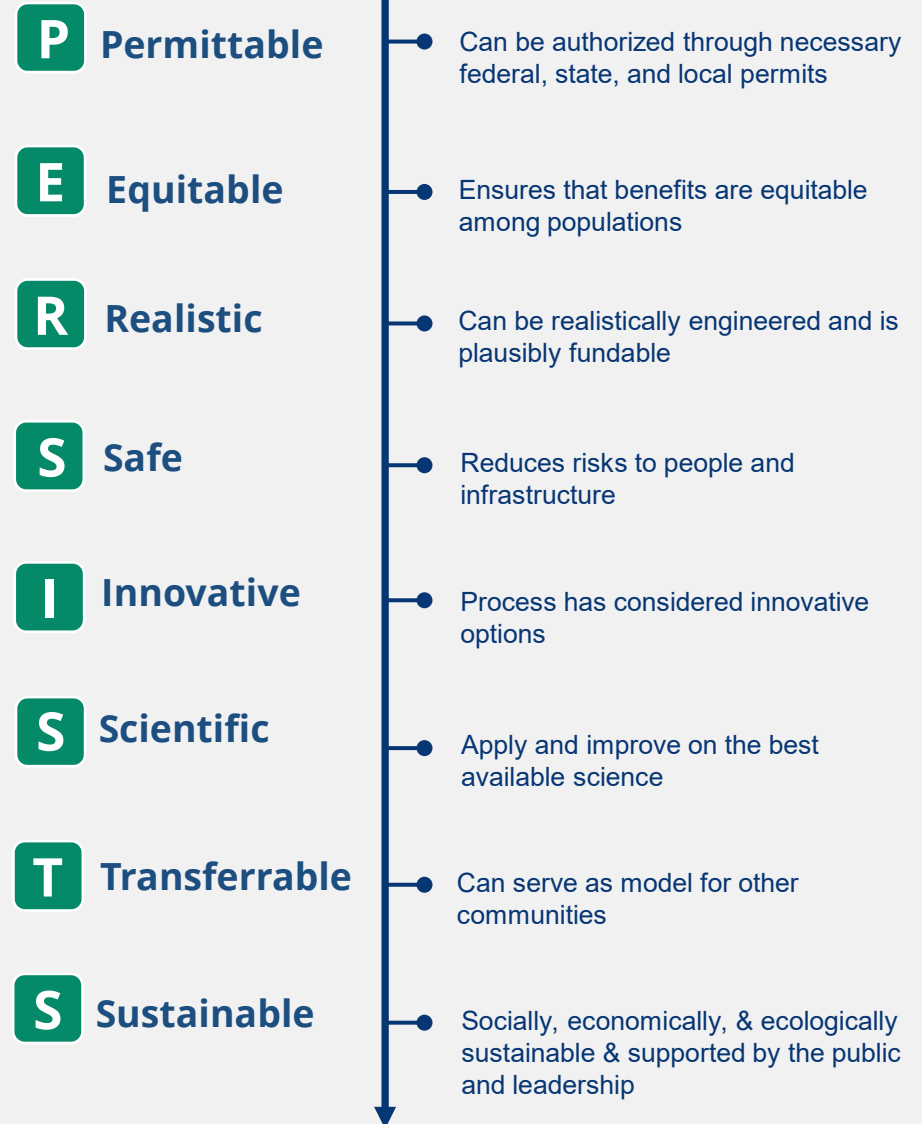
### Phase II

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

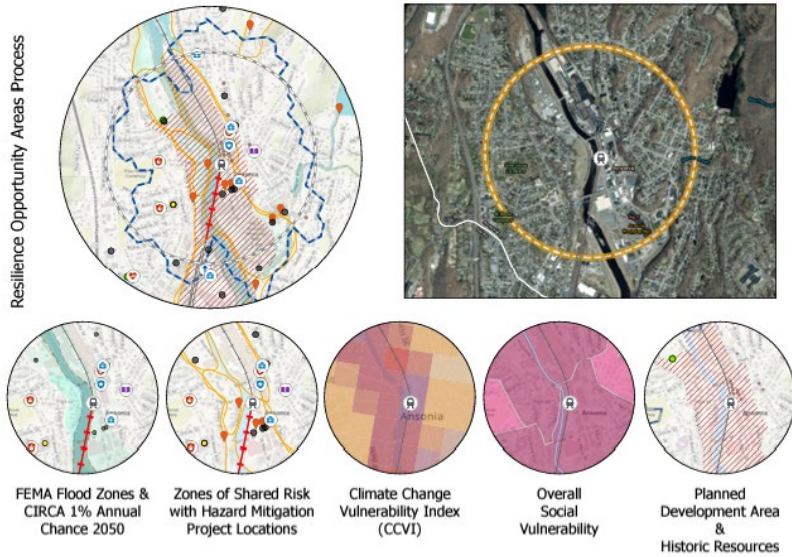
### Phase III (CURRENT PHASE)

- 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







Map: VERR, Gernies, Salsburgh, GeoTechnologies, Inc.; METTRIXA, LOGG, BPA, NPL, US Census Bureau, USDA, Esri, VERR, Gernies, GeoTechnologies, Inc.; MapInfo, LOGG/TERRIS, Esri, VERR, Gernies, GeoTechnologies, Inc.; LOGG, METTRIXA, BPA, LOGG, State of Connecticut, Esri

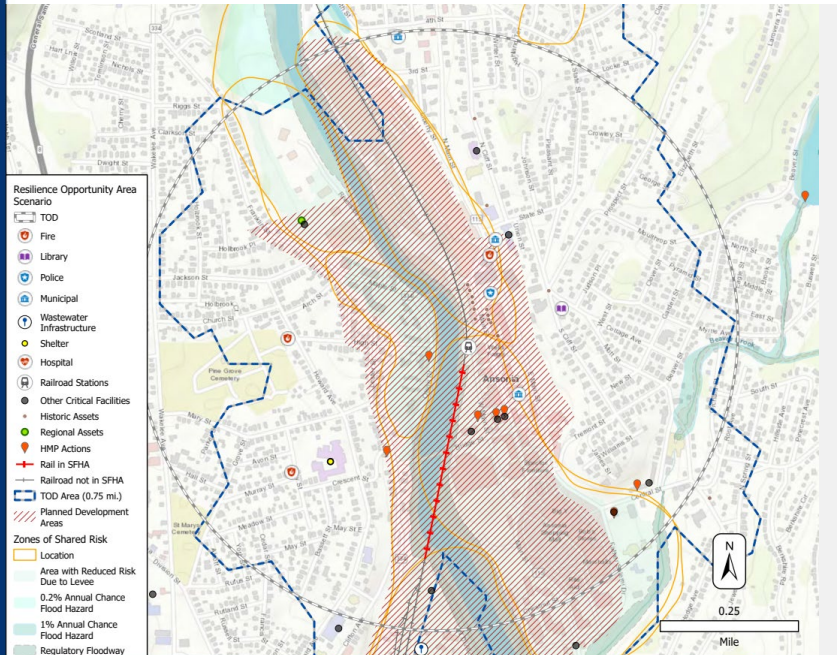
### CIRCA Resilience Opportunity Study

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 Ansonia, Connecticut, located within New Haven County, is one of seven selected Resilience Opportunity Areas (ROARs) prioritized during the Phase II Resilient Connecticut program.

Ansonia has high social, heat, and flood vulnerabilities, has a commitment to transit and supporting passenger rail, already hosts affordable housing, and supports development of new market rate housing. The city currently supports 15% low to moderate income housing which is subsidized. Ansonia is also classified as a distressed municipality. To remain resilient, Ansonia will need to ensure that redevelopment is not at risk of flooding, that people have access to options for mitigating extreme heat, and that transit remains available and viable during extreme events that may be exacerbated by climate change.

The Resilient Ansonia project focuses on adapting to current and future climate induced flooding impacts in the downtown area and mitigating extreme heat impacts for residents. Key questions are whether, and how, future flooding could overtop or otherwise adversely affect the existing flood protection system; whether 0.2% flood zones like the Olson Drive parcels could face increasing flood risks; and whether future redevelopment and a new connector road can foster connectivity in the TOD area while providing opportunities for extreme heat relief and mitigation.



Project description & Resilience Area Opportunity Scenario sourced from : <https://resilientconnecticut.uconn.edu/resilient-ansonial/>






### Outline of Recommendations

The following chapters of this report lay out a series of recommendations guided by preceding work done by CIRCA, recent Ansonia planning studies, and extreme heat data analysis.

- I. Current & Future Conditions
- II. Relief Now: Near-Term Resilience Planning
- I. Thinking Ahead: Resilience Planning Kit of Parts



 Route 8 Rerouting Study

**4** Resilience Planning Framework Example

 Resilience Center Hub

**3** Resilience Planning Framework Example

**1** Resilience Planning Framework Example

 Flood Protection System Efficacy & Maintenance

 Green Infrastructure Design Approach

**2** Resilience Planning Framework Example

-  Key Corridors
-  Ansonia Train Station
-  Ansonia City Hall
-  Ansonia Police Station
-  Ansonia Brass & Copper Mill

## I. Current & Future Conditions

The Current & Future conditions analysis reviews land use and development patterns that impact Ansonia's core historical and industrial neighborhoods, as well as future development centered along the Naugatuck River. This section summarizes the extreme heat risks Ansonia can expect in coming years, using combined data sources.



**Route 8 Rerouting Study:** Route 8 to the Northern border of our study area was reviewed to determine the viability of an alternative route, which could enhance access to the downtown



**Flood Protection System Efficacy & Maintenance:** The final section of this chapter emphasizes the essential role of the existing flood protection system along the banks of the Naugatuck River. Based on flood modeling predictions, we recommend that this system continue to be maintained by city government.

## II. Relief Now: Near-Term Resilience Planning



**Resilience Center Approach Recommendations:** This chapter reviews the near-term benefits of implementing a resilience center hub to support Ansonia's most vulnerable populations during a climate emergency.

## III. Thinking Ahead: Resilience Planning Kit of Parts



**Resilience Planning Framework:** This chapter explores a design framework titled the "Resilience Planning Kit of Parts" which breaks down green Infrastructure recommendations for four key locations across Ansonia downtown. These sample locations demonstrate how the Kit of Parts can be used flexibly to inspire swift problem-solving with long-term resiliency in mind.



**Green Infrastructure Design Approach:** The last section of this chapter uses the example of a planted bump-out to illustrate how green infrastructure can be utilized to serve multiple objectives. Our recommendations break down these objectives and their respective benefits into three categories: *Connectivity & Safety*, *Heat Relief*, and *Stormwater Management*.

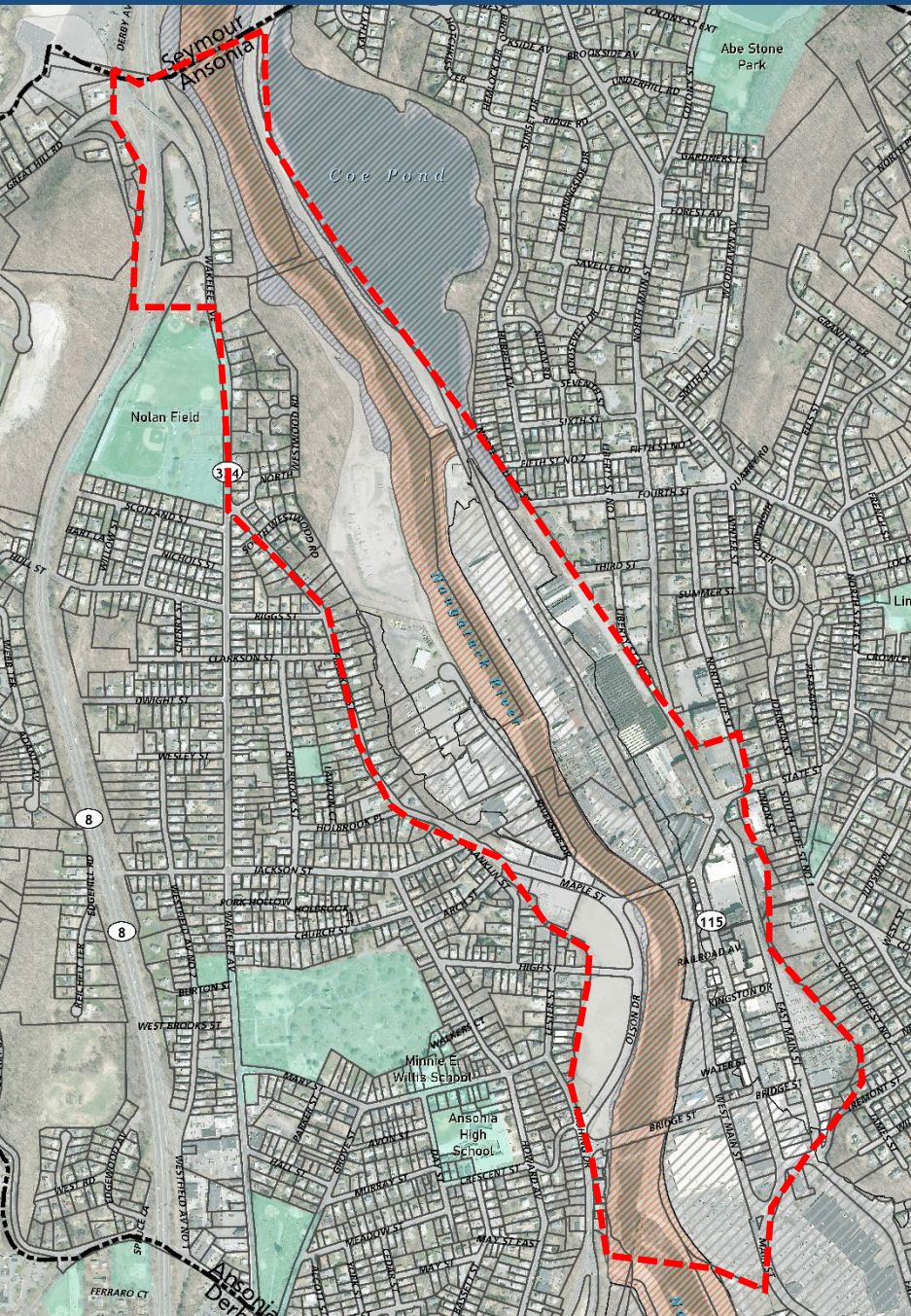


## I. CURRENT & FUTURE CONDITIONS ANALYSIS



Historical Images of the Great Flood of 1955  
Photo Credit, Ansonia Public Library





## Study Area Land Use Introduction

Ansonia's core historical and industrial neighborhoods, as well as future development centered along the Naugatuck River, has determined the study area for this project.

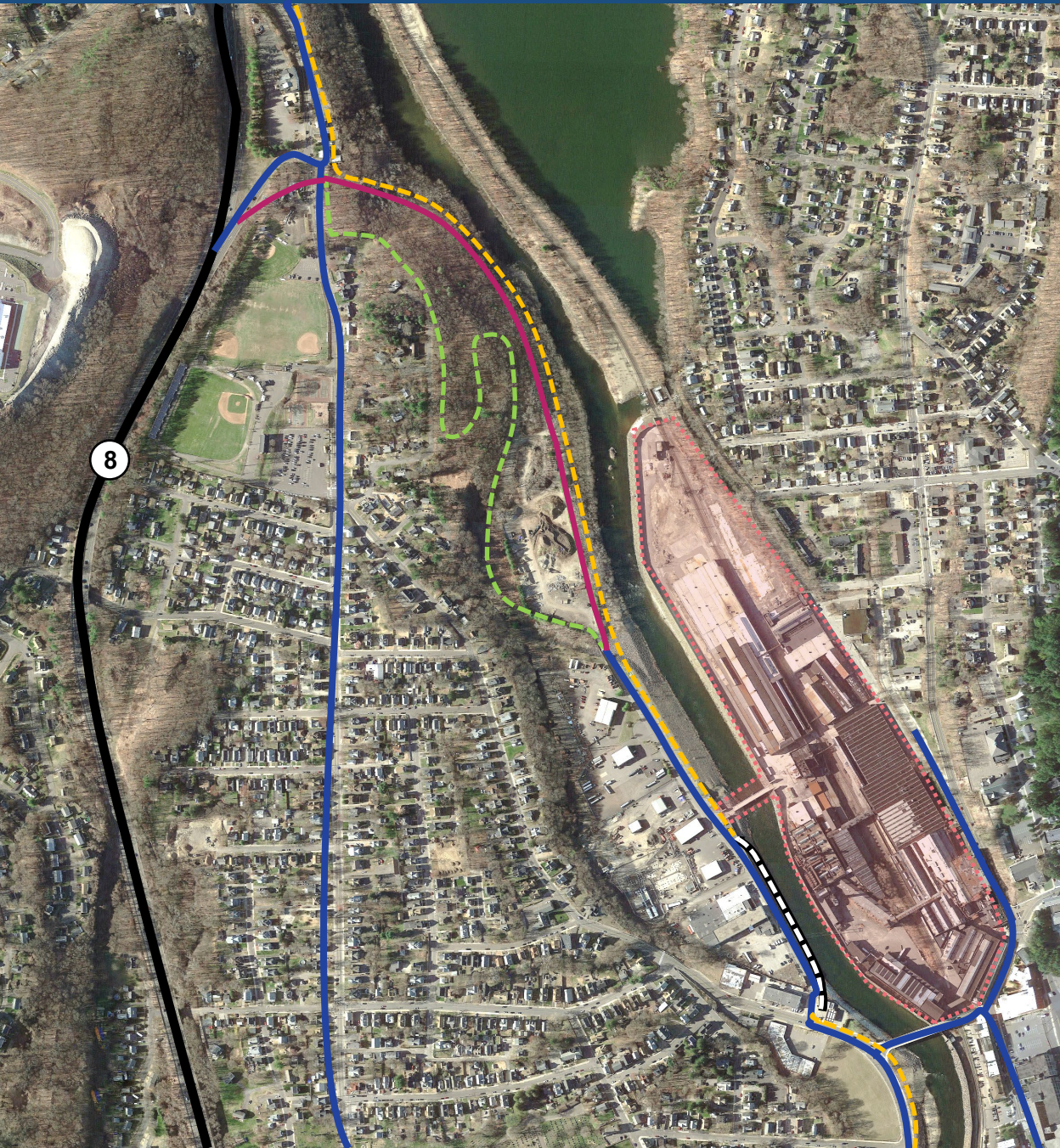
To the southeast lies historic, downtown Ansonia, which is defined by three key north-south corridors running parallel to the river: West Main Street, Main St, and East Main Street. Several key facilities are located on Main Street, such as the train station, Ansonia City Hall, and the Ansonia Police Station. Given the rich history of this area, there are also many historical places of interest in the downtown, such as The Ansonia Opera House (1870) and the Ansonia National Guard Armory (1921). The downtown area currently has one open green space, Veterans' Memorial Park, which is located between Main St and East main St next to the City Hall. Although the downtown is directly at the rivers edge, there is no visibly or access to the water due to the significant flood barrier that fortifies the riverbank.

The southwest portion of the study area contains more residential housing and local businesses. Several significant developments are currently in the planning phases in the open parcels adjacent to Olson Drive, such as a new sports facility and affordable community housing.

There are only two bridge crossings in our study area, which include Bridge Street and Maple Street, which was reconstructed by the townships after the Flood of 1955. The city is currently undergoing plans to revitalize the Copper and Brass Facility located off North Main St, which could create new opportunity for additional economic development and access across the river in the future.

The northern portion of our study area connects the downtown to the key state highway, CT-8. Currently access to this vital corridor is tedious and congested. The city hopes to enhance the connection to this roadway in order to improve long-term transit accessibility.





## Route 8 Rerouting Study

Aside from the train station, route CT-8 is an essential passageway and key evacuation corridor for residents of Ansonia.

In light of future developments, such as the historic Copper and Brass Facility, Ansonia may have the opportunity to strengthen existing road networks. The Naugatuck River Greenway Routing Study (2023) was reviewed to determine the viability of an alternative route, which could enhance access to the downtown.

Route 8



Existing primary roads on route



Proposed Roadway Construction



Option 1:  
Proposed Bike Path/Greenway Link  
*\*Following roadway construction*



Option 2:  
Proposed Bike Path/Greenway Link  
*\*Referenced: Naugatuck River Greenway Routing Study, 2023*



Bike Path unavailable and marked on main road



Ansonia Copper & Brass Mill Site Redevelopment





## Initial Observations

During the initial walkthrough of the study area, the flood wall was a very prominent feature of the landscape. The stretch from Olson Drive to the entrance of Riverside Drive is the only riverside area not protected by the flood wall system, and therefore, the only area that also allows fully exposed views of the Naugatuck River.

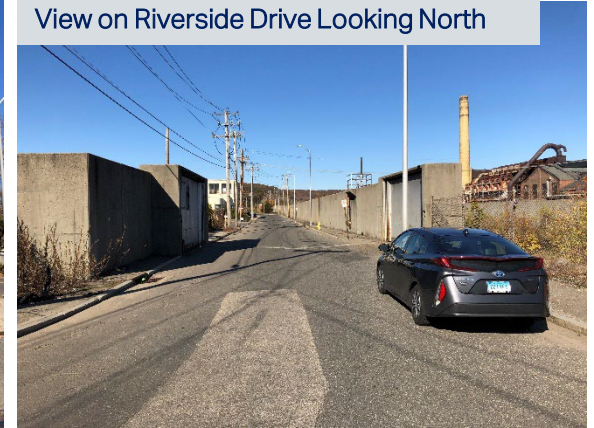
View on Main Street



View on Olson Drive Towards Nolan Field



View on Riverside Drive Looking North

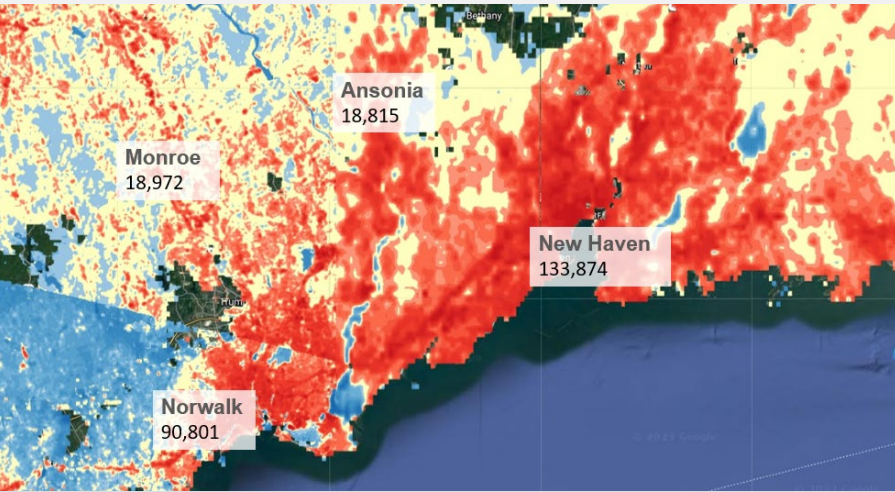


View From Riverside Drive Looking Towards Copper & Brass Facility

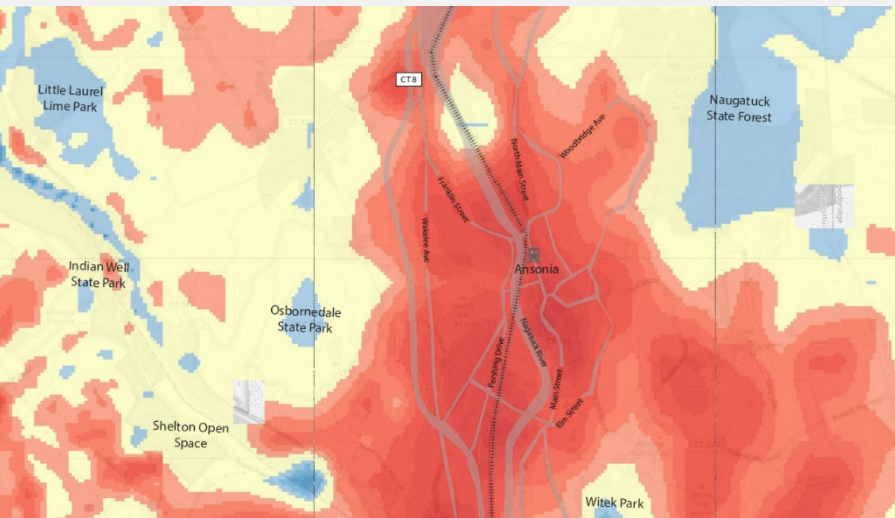


*Photo Credit: CIRCA & AECOM*





Connecticut Coastline Land Surface Temperature



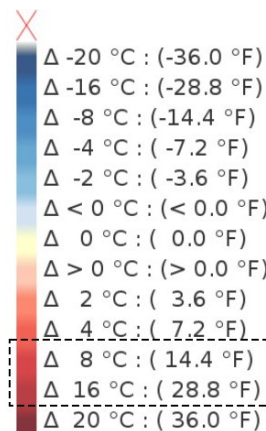
Ansonia, CT Land Surface Temperature

## Regional & Local Heat Increase Trends

Ansonia is part of a large waterfront community that will need to confront heat impacts over time. Existing maps were reviewed showing land surface temperature relative increase within the greater context of Connecticut's coastline, as well as a more detailed view of relative temperature increase of our project area. These maps were generated using data derived from Landsat-8 Thermal Infrared Sensor data and help identify the areas of concern for heat stress in our focus area.

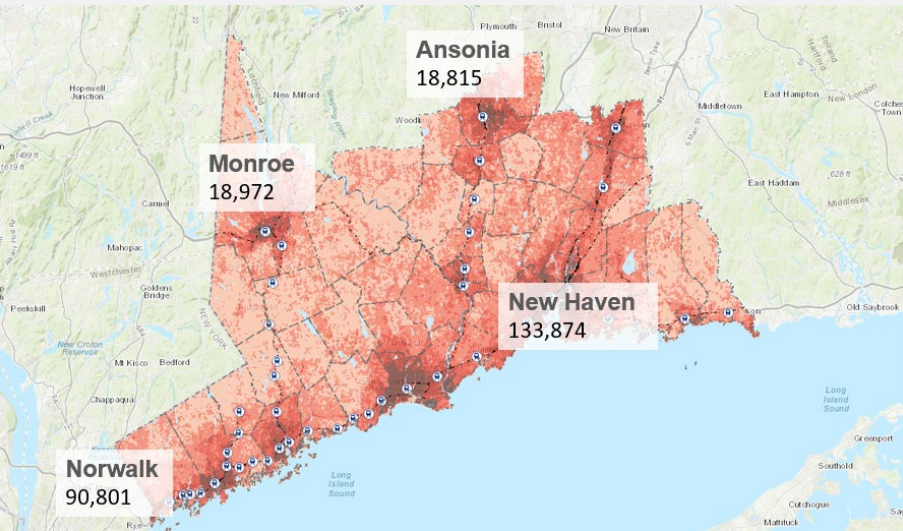
Temperature values shown on the following map demonstrate the differences between the median surface temperature for each Landsat scene. For more detailed information on how these values are calculated please see the [Landsat-8 Handbook](#) (2019).

Our study compared temperature increase with population count to help inform the correlation between urban density and heat island impact. This analysis revealed that Ansonia was heating at twice the rate as Monroe despite having a comparable population size. The data also revealed that Ansonia downtown areas seasonally experience an increased temperature of 8-to-16 degrees Celsius relative to surrounding areas

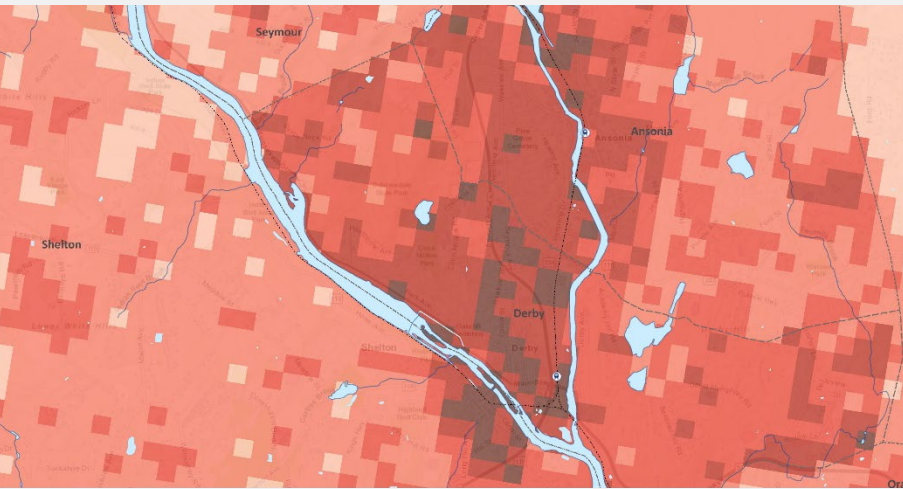


\*Land Surface Temperature Difference data derived from Landsat-8 Thermal Infrared Sensor Data.

Temperature values are the difference from the median surface temperature for each Landsat scene



Connecticut CCCVI Score

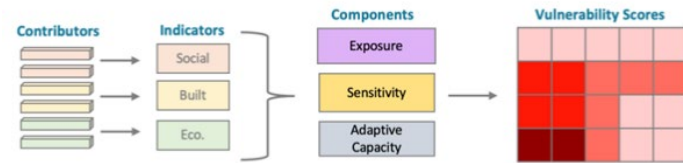


Ansonia, CT CCVI Score

### Climate Change Vulnerability Index (CCVI) Heat Score

We also accessed existing heat vulnerability mapping of the greater context and our study area developed by CIRCA's Climate Change Vulnerability Index (CCVI). The CCVI calculates its vulnerability scores based on the combination of exposure, sensitivity, and adaptive capacity data points. Examples of data that contribute to these categories are air quality and impervious surfaces (exposure), median income and unemployment levels (social sensitivity), and owner-occupied housing and percentage of mixed forest cover (adaptive capacity).

The analysis of this data revealed that Ansonia and Derby are not only physically susceptible to heat increase but are also especially vulnerable to the adverse affects of heat on their communities, due to their lower scoring in social sensitivity and adaptive capacity categories.



Sensitivity			
Social		Built	
Asthma Related Emergency Visits	Lack of Vehicle	Unemployed	Building Density
Median Income	Percent Population over 65	Population Density	Median Structure Age
Older than 5 with a Disability	Percent Population under 5	Race and Ethnicity	Private Wells
Percent below Poverty Level	Speaks English less than well/not at all	Percent Population over 25 without a HS Diploma	
Average no. Per Household	Percent Population		
Exposure		Adaptive Capacity	
Climate	Physical	Social	Built
Air Quality (PM 2.5)	Impervious Surfaces	Percent population with Health Insurance	Distance to Hospitals
Maximum Surface Temperatures	Emissivity	High Owner-Occupied Housing	Distance to Shelters
			Eco.
			Normalized Difference Vegetation Index (NDVI)
			Percent Mixed Forest Cover
			Albedo

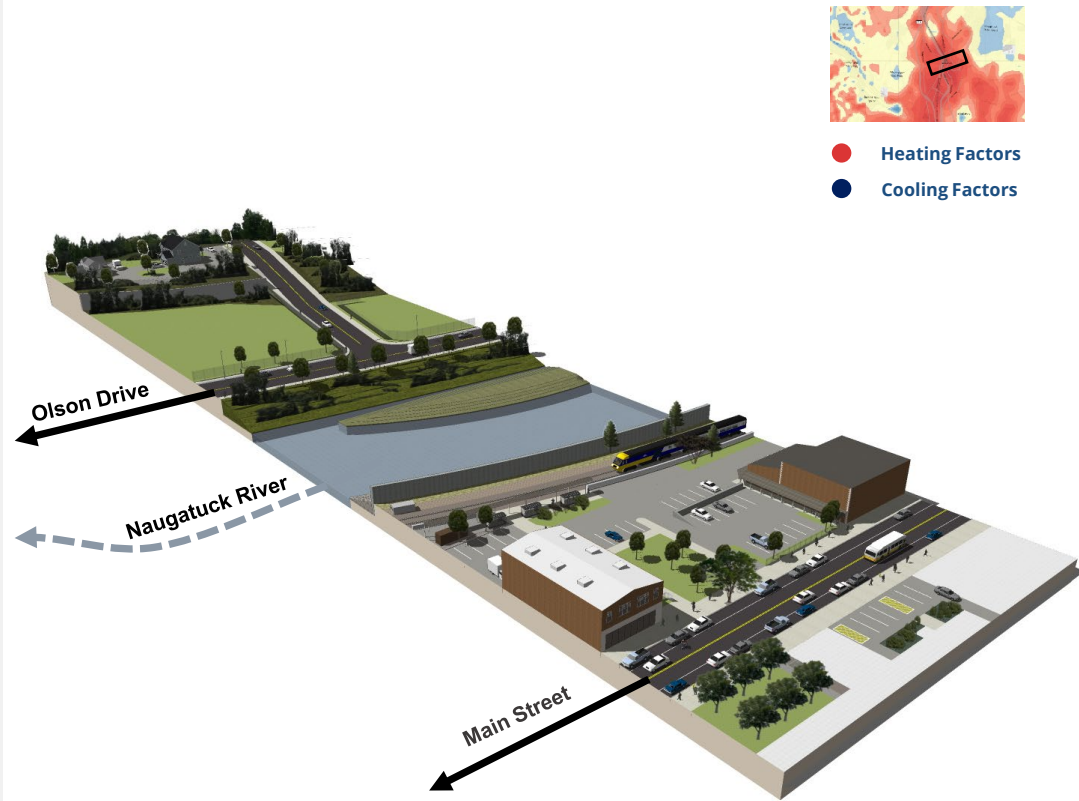
\*Maps provided with CIRCA Climate Change Vulnerability Index (CCVI), <https://resilientconnecticut.uconn.edu/>



### Becoming Familiar with Downtown Ansonia

As demonstrated on the previous graphics, Ansonia has a significant heat challenges. Some environmental factors that contribute to extreme heat conditions are especially evident in the downtown. In order to address these issues, this study looked more closely at some of the contributing factors on a localized scale.

The following graphic shows a transect of downtown Ansonia defined by the Naugatuck River. To the east there is Ansonia train station off Main Street and to the west, across the river, there is Nolan Field off Olson Drive.



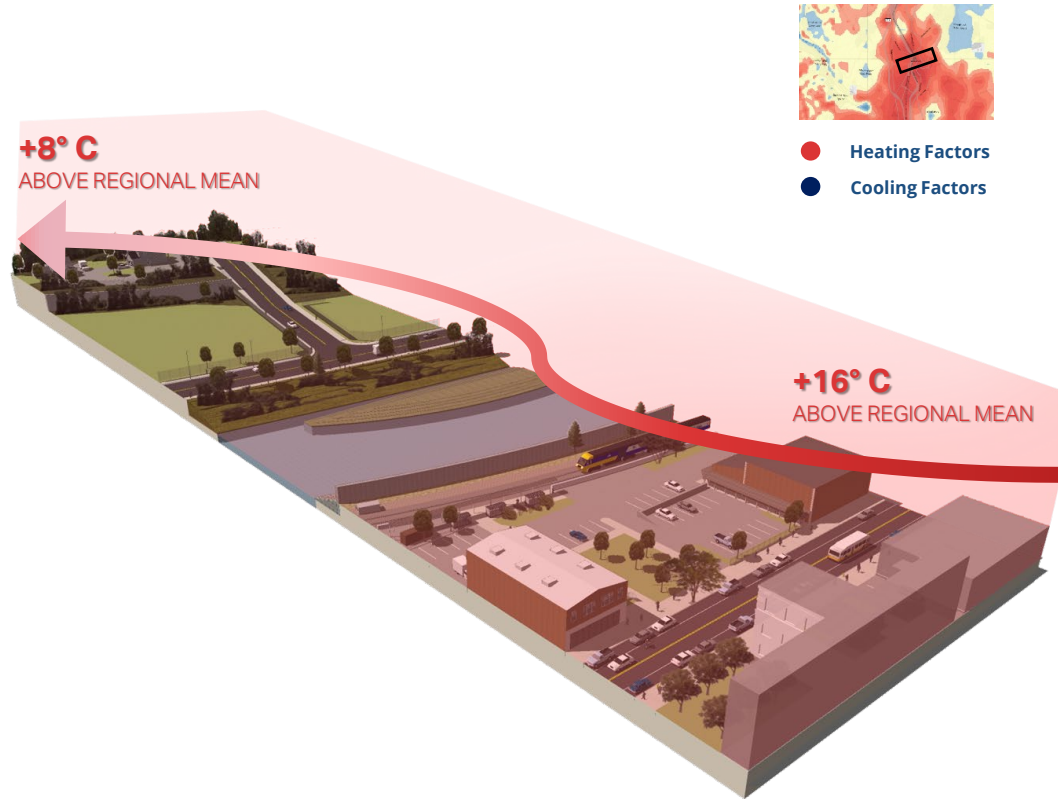
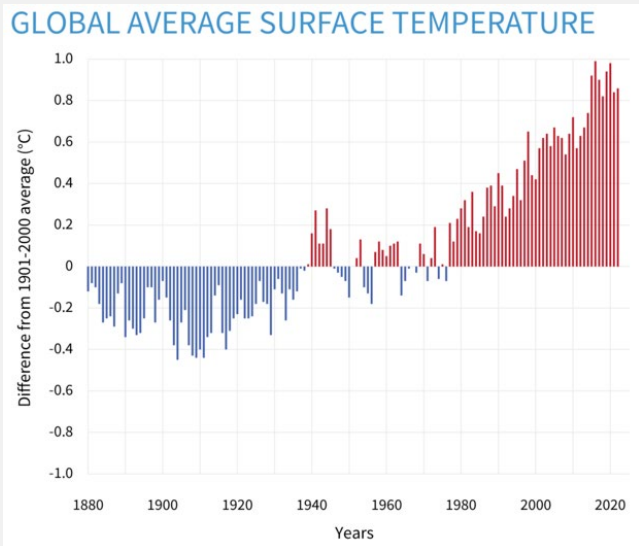
**Heart of Ansonia Downtown**  
*Transect shown at Ansonia Train Station*

### Temperature Increase Trends: Local & Global

Temperature increase throughout Ansonia ranges from +16° C east of the river and +8° C west of the river. Data collected from the Landsat-8 Thermal Infrared Sensor and CCVI sources indicated the downtown region as one of the most vulnerable areas to temperature increase compared to its neighbors.

According to the National Oceanic & Atmospheric Administration (NOAA), 2022 was the sixth-warmest year on record. Since 1981, the global rate of warming has already double the warming rate of the century prior, leveling out at 0.18 ° C per decade. If annual emissions increase more slowly and begin to decline significantly by 2050, models project temperatures would still be at least 2.4 degrees warmer than the first half of the 20th century, and possibly up to 5.9 degrees warmer worldwide. ([NOAA, "Climate Change: Global Temperature"](#))

The graph below shows yearly surface temperature compared to the 20th-century average from 1880–2022. Blue bars indicate cooler-than-average years; red bars show warmer-than-average years.



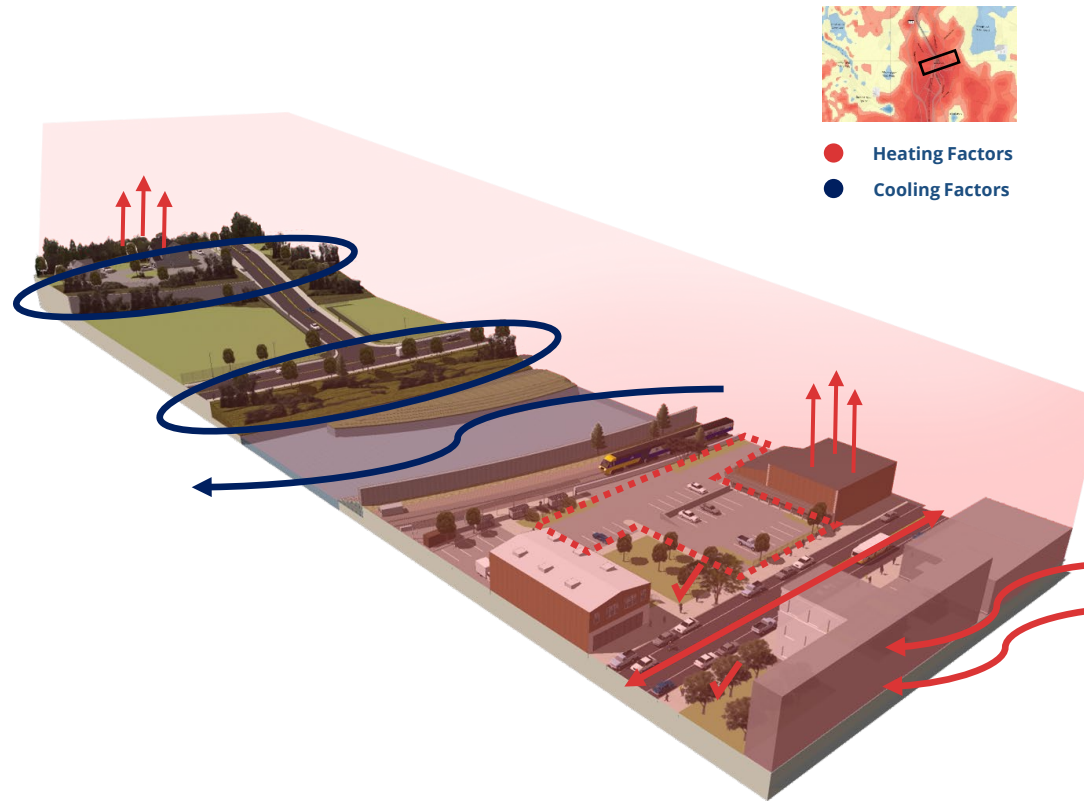
**Temperature Increase Trends**  
*Applied to Ansonia Downtown Setting*

## Urban Conditions Contributing to Rising Temperatures in Ansonia

As demonstrated on the transect diagram, several urban conditions in Ansonia exacerbate high temperatures, while other natural features help to cool the land surface. Factors that help to naturally cool are indicated in blue and include water bodies, which warm at a slower rate than land and continuous blocks of tree canopy.

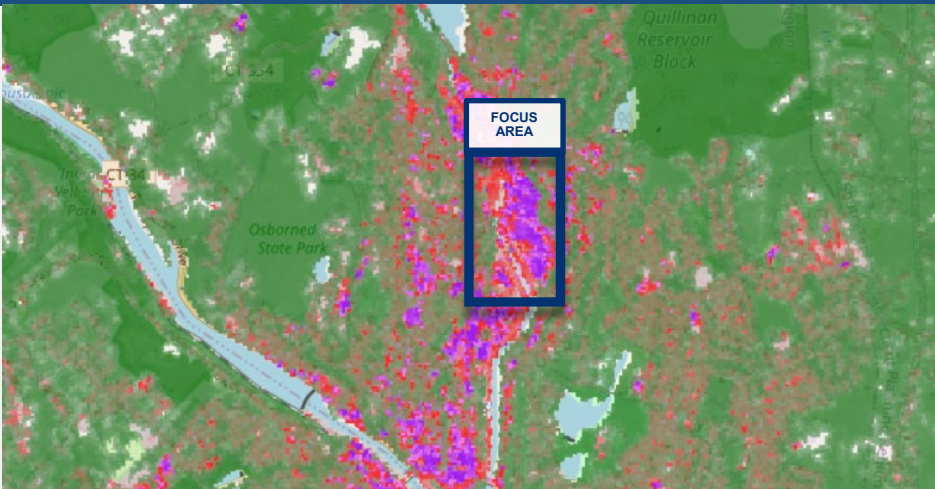
There are many other factors, however, that may contribute heat increase, such as:

- Heavy vehicular traffic traps solar radiation
- Large blocks of impervious pavement & darker surface colors create a heat island effect
- Large buildings absorb heat & block out wind
- Reduced tree canopy along street & lack of shade structures lessens heat relief
- Increased atmospheric pollution VIA HVAC systems in commercial and residential areas

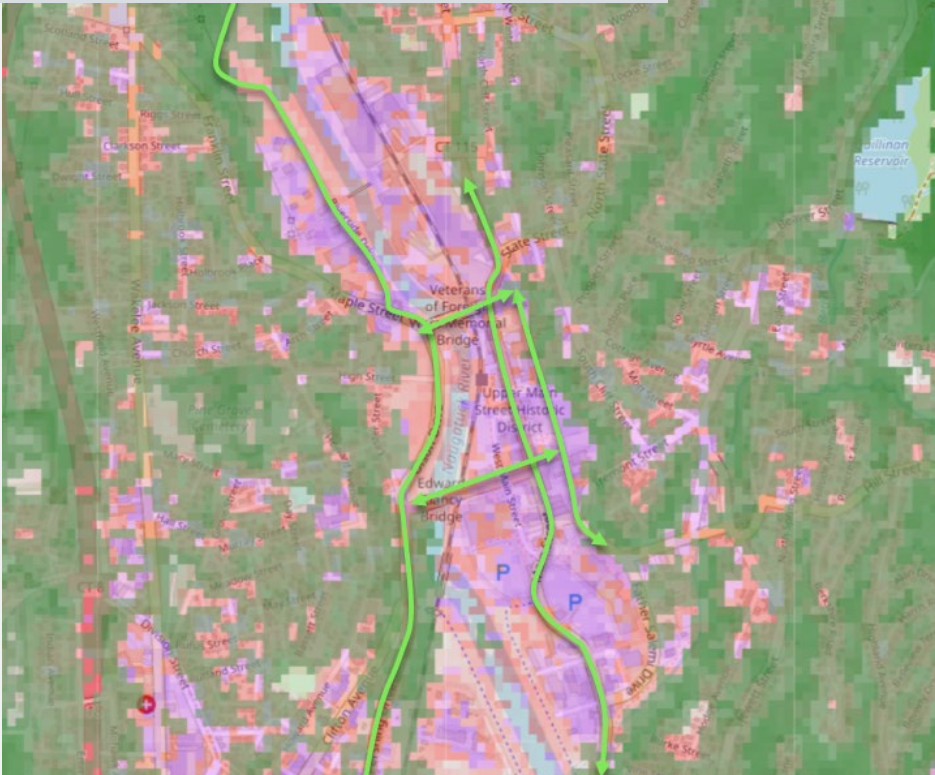


**Heating & Cooling Factors**  
*Applied to Ansonia Downtown Setting*





Ansonia/Derby Context: Tree Canopy/Impervious



Ansonia Center: Tree Canopy/Impervious

### Tree Canopy & Impervious Coverage:

Existing maps were reviewed showing the current urban tree canopy and areas of impervious surfaces within the greater context of the study area. This mapping demonstrates that Ansonia center contains a high density of impervious surface, adversely contributing to its heat island effect.

The key corridors of this study—Main Street, East Main Street, Olson Drive, Riverside Drive, and the connections across Bridge Street and Maple Street—are superimposed on the project focus area to demonstrate the positive impact of promoting green infrastructure in the right-of-way throughout this area.



#### Proposed Green Corridors

- Main Street
- East Main Street
- Pershing Drive/Olson Drive/Riverside Drive – Naugatuck Greenway River Link



#### Shade Canopy Covered

*Density Scale*



#### Impervious Surfaces

*Density Scale*

*\*Land cover classifications are from the MRLC NLCD 2011 (mrlc.gov) and locally collected high resolution maps*

## Role of Existing Flood Protection System

As evidenced by the flood of 1955 that devastated homes and critical infrastructure throughout the city, maintaining flood control of the Naugatuck River is a necessary precautionary measure for Ansonia. Over the past decades since the completion of the structure in 1973, the system has functioned by design and has provided crucial flood protection to the main downtown.

Through this study we have reconfirmed that the top elevation of this flood protection system is adequate for the foreseeable future, and therefore, is a vital piece of infrastructure that must be continually maintained and serviced for the long-term. Investing in the continued success of this structure and embracing the city's long-standing history with the river is important for Ansonia's future as a resilient community.



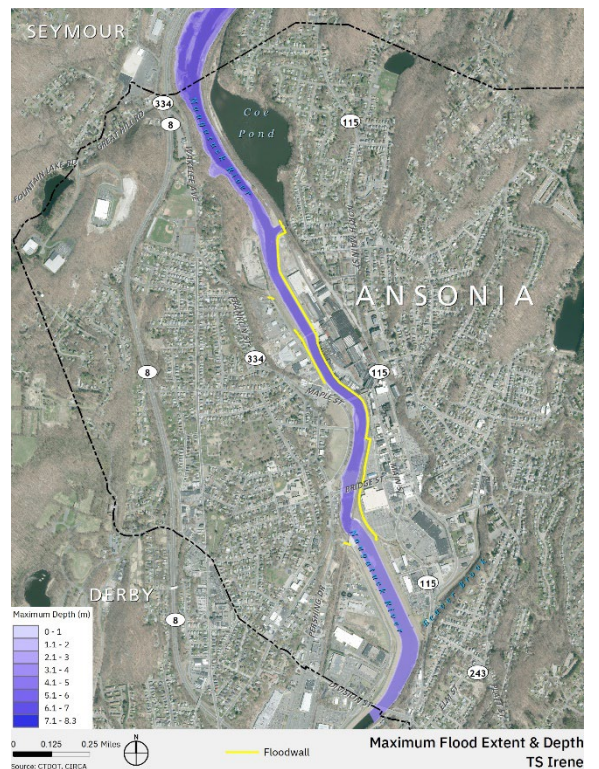
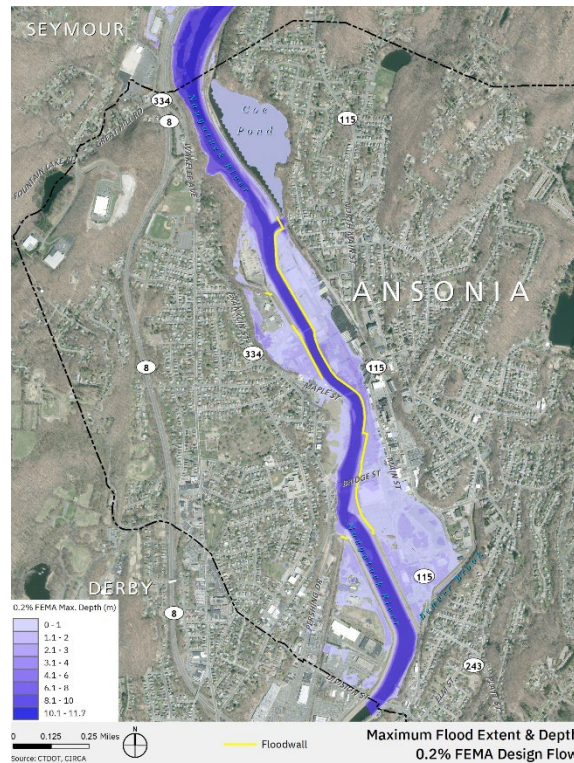
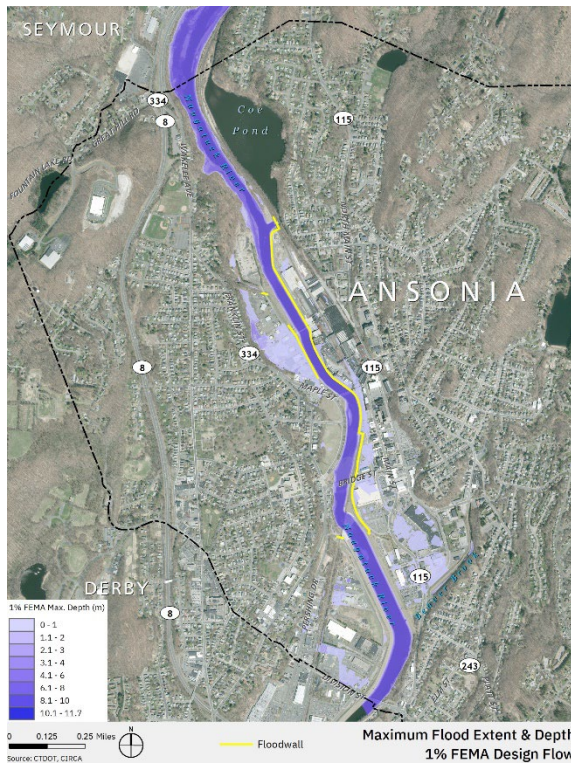
Photo of Flood Wall & Copper and Brass Facility  
Photo Credit: CIRCA



### Flood Modeling with Existing Flood Protection System

The models below compare a 1% Storm event (100-Year Storm) to 0.2% Storm Event (500-Year Storm). These models only measure flooding from the river and severe rainfall, and do not factor in the working pumping stations throughout the city that also significantly lessen the impacts of flood during extreme events. The model confirms that there would be no overtopping of the flood protection system during an extreme storm event, however, it does indicate the potential for additional pluvial flooding on the eastern side of the river, which can be caused by sustained rain or quick, heavy rainfall that cannot be absorbed fast enough by the ground surface. During a rare .02% event, flooding from the river would be evidenced on western side along Olson Drive where no wall is present. Flooding depicted along Riverside Drive in the protected area demonstrates the risk of pluvial flooding in this location as well.

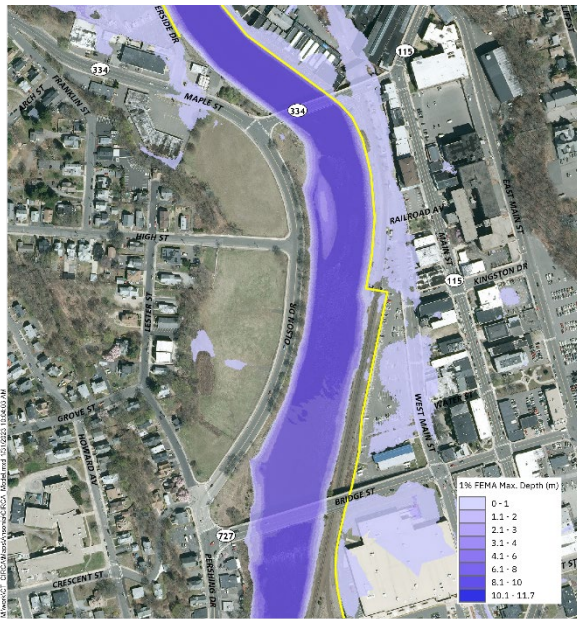
The final figure shows the last major storm to hit Ansonia in recent history, which was Hurricane Irene in 2011. The last scenario demonstrates that the model predicted flooding outcomes accurately, as we know that during this event, there was no flooding beyond the flood wall present.



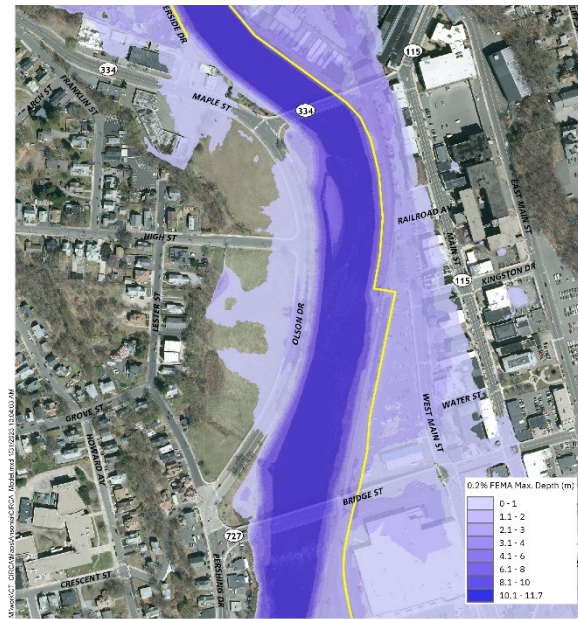
### Flood Modeling with Existing Flood Protection System :

Zooming into Ansonia Center, we see that West Main St is only at risk of flooding 0-to-1' during an extreme 1% storm event and flooding 0-to-2' during an extreme 0.2% storm event. Main St would have risk of flooding during an extreme 0.2% storm event at the intersection of Main Street and Bridge Street. Neither scenario show flooding potential on East Main Street. As previously mentioned, the flooding evidenced in these scenarios would not be from the Naugatuck River, but rather pluvial flooding from excessive rainfall. The second figure shows that Olson Drive would be at risk of minor (0-to-1) flooding from the river during an extreme 0.2% storm event.

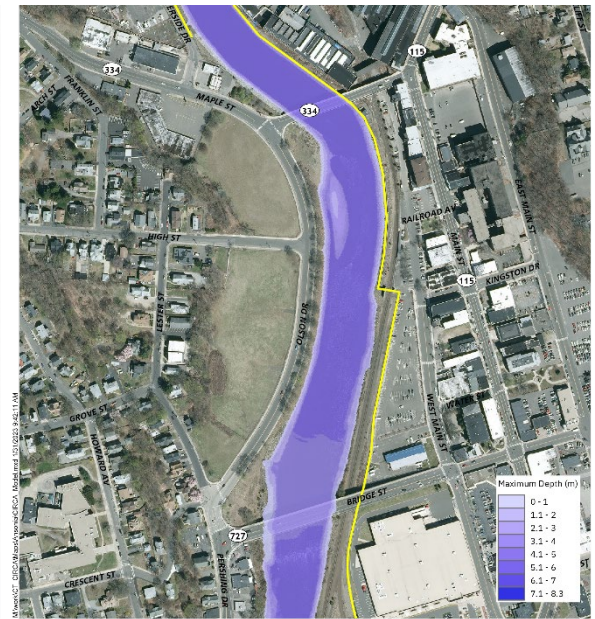
Again, the final figure models data from Hurricane Irene (2011). During this significant storm, the flood barrier successfully protected the downtown and no flooding from extreme rainfall occurred.



Maximum Flood Extent & Depth  
1% FEMA Design Flow



Maximum Flood Extent & Depth  
0.2% FEMA Design Flow



Maximum Flood Extent & Depth  
TS Irene



## II. RELIEF NOW: NEAR-TERM RESILIENCE PLANNING



Historical Images of the Great Flood of 1955  
Photo Credit, Ansonia Public Library

## Resilience Center Approach | Relief Right Now

Green house gas emissions, excessive impervious paving, and lack of urban tree canopy will continue to create extreme heat events in coming years, despite planning efforts in the future.

As defined by the Office of Planning and Research **Resilience** is defined as “the capacity of any entity—an individual, a community, an organization, or a natural system—to *prepare for* disruptions, to *recover from* shocks and stresses, and then to adapt and grow from a disruptive experience.” (ICARP, Office of Planning & Research)

This definition suggests that in order to build toward long-term resilience, each community must also be prepared to lift up their most vulnerable populations and provide short-term relief in the event of a climate emergency.

Officially designated **Resilience Centers** create a safe and cool space for community members to rely upon during an extreme event, such as a severe heat, hazardous flooding, or hurricane.

Furthermore, the statement of the “Resilience Center” creates a powerful, public commitment towards future resilient goals and planning for the community as a whole, which leads the way towards establishing a culture of climate awareness and change.

## Resilience Center Literature Review

Several organizations are embracing the Resilience Center movement and have created resources to lead the way in their own states. For example, The Community Resilience Center (CRC) Program of the California Strategic Growth Council, has already taken steps towards developing design standards for resilience centers in California. The goal of this program is to create a roadmap for municipalities to work within their communities to easily convert public buildings into future Resiliency Centers. Later that year in 2022, Tuolumne County was given funding through the state using CRC guidelines to recover from the Rim Fire and better withstand future catastrophes.

### Community Resilience Centers (CRC) Program

Round 1 DRAFT Program Guidelines  
FY 2022-2023



December 7, 2022



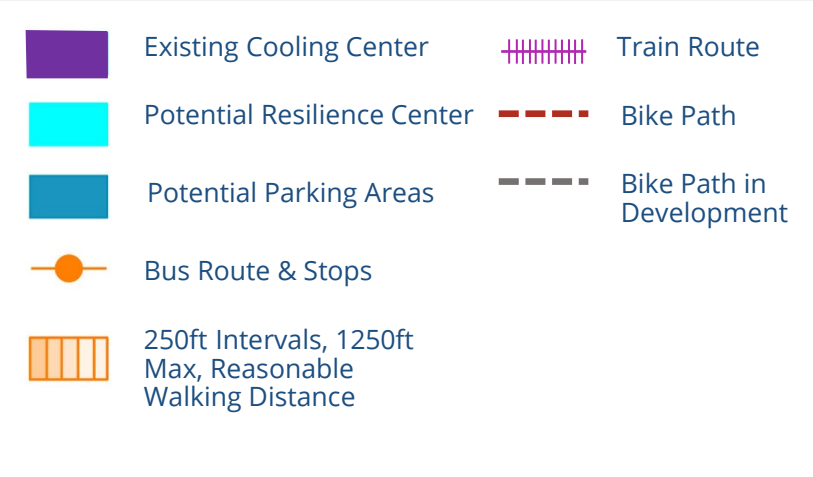
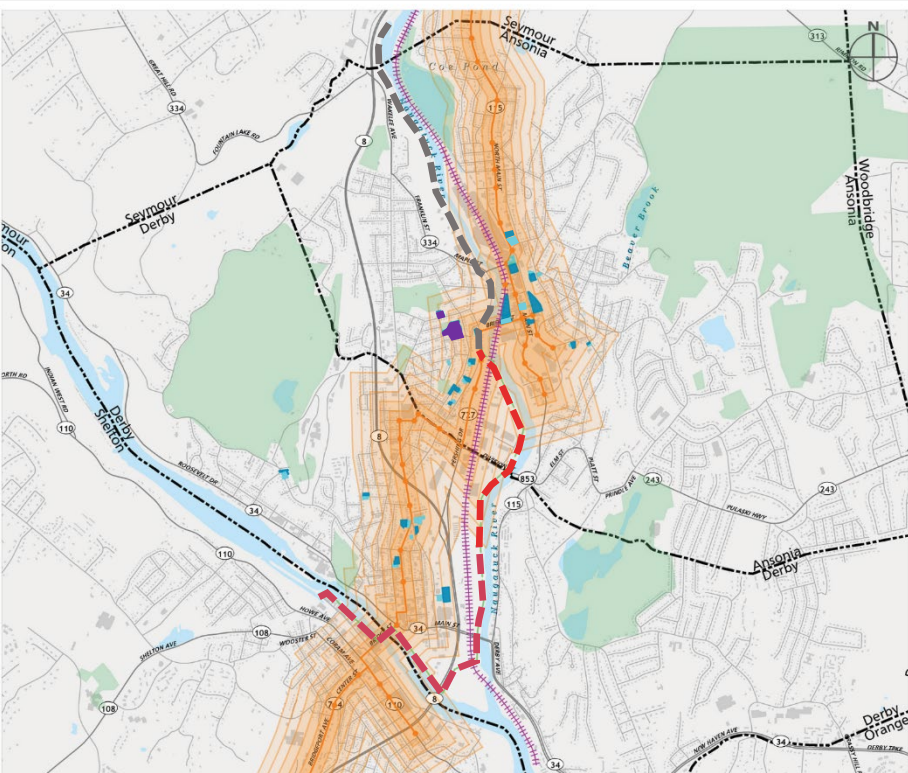
*Additional Resources:*

CRC Program Guidelines | [Full Report](#)

CRC Kick-Off Webinar | [Video](#)

Resilience Center Grand Opening in Tuolumne County | [Video](#)





### Resilience Center Location Analysis:

During our future conditions analysis, we reviewed several locations in Ansonia that could be suitable as future Resilience Centers, given their proximity to critical facilities, available space, and accessibility accommodations. These centers would provide relief during climate emergencies by offering essential services to the community.

The figure to the left shows existing cooling center locations in purple and potential resilience centers and parking areas in shades of blue. Currently there is only one active “cooling center” in Ansonia, which is located at the Ansonia Middle School on Howard Street. Public and private institutions, in a quarter mile walking distance from public transit routes, were selected as potential cooling centers based on their availability of accessible facilities, familiarity to the public, and large available square footage. Other public transit routes such as major bike routes and train stops were also factored into the selection process.

These locations were then ranked on a scale of 1-5 based on several additional criteria:

1. Estimated square footage
2. Estimated parking lot square footage
3. Distance from nearest bus stop
4. Local heat vulnerability ranking from CCVI
5. Cultural Neutrality Ranking, which slightly reduced the score of public spaces that may make some people uncomfortable, such as police stations or places of worship

The scoring matrix was developed to provide a quantifiable framework for the selection of future cooling centers. Given the limited accessibility determined by the geography of the river and local transit routes, the selection of these crisis centers will be important for future resilience in this community. The complete scoring analysis and final recommendations are detailed in Table 1 on the following page.

*\*Transit information sourced from CTtransit. Potential cooling center locations selected and measured on Google Earth*

**Locations Ranking Over 4.5**

- Ansonia Armory
- City Hall
- St. Mary St Michael School
- Irving School

**Locations Ranking Over 4.0**

- Ansonia High School/Middle School (Existing Cooling Center location)
- Ansonia Arms Department
- Ansonia Police Department
- The Boy's & Girls Club
- St. Mary's Church

**Rational For Calculating Score**

*Area:*  
above 10,000sqft (5), 5,000sqft (4), 1,000sqft (3)

*Parking Area:*  
above 20,000sqft (5), 10,000sqft (4), 5,000sqft (3), 2,000sqft (2)

*Public Transit Distance:*  
0-250sqft (5), 500sqft (4), 750sqft (3), 1000sqft (2), 12500+ (1)

*Cultural Neutrality:*  
Place of Worship/Police Station (3), Library/School/Community Center (5)

Table 1:







NAME	AREA (sqft)	AREA RANKING	PARKING LOT AREA (sqft)	PARKING RATING	DISTANCE FROM NEAREST BUS STOP	BUS ROUTE RANKING	HEAT VULNERBILITY RANKING	CULTURAL NEUTRALITY RANKING	FINAL RANKING
Ansonia High School/Middle School	97326	5	46037	5	750	3	3	5	4.2
Ansonia Armory	14250	5	22042	5	0	5	4	5	4.8
Ansonia Arms Department	8981	4	103966	5	0	5	4	4	4.4
Senior Community Center (Ansonia Police Department)	24642	5	41054	5	0	5	4	3	4.4
Clinton AME Zion Church	1750	3	14406	4	250	5	3	3	3.6
St. Joseph's Parish	3944	3	3063	2	750	3	4	3	3
Three Saints Orthodox Church	6064	4	5553	3	250	5	3	3	3.6
The Boy's & Girls Club	4288	3	28497	5	250	5	3	5	4.2
Saint Peter & Saint Paul Ukrainian	8357	4	14549	4	0	5	3	3	3.8
Team, Inc. Early Care & Education Center	7257	4	15923	4	0	5	3	5	4.2
Liberty Hall	5290	4	0	1	1000	2	3	5	3
Macedonia Baptist Church	2313	3	9640	3	0	5	3	3	3.2
Ansonia Public Library	6669	4	0	1	500	4	4	5	3.6
City Hall	11171	5	95231	5	0	5	4	5	4.8
Derby Police Department	15138	5	68918	5	1250	1	5	3	3.8
Walnut Hill Community Church Valley	12125	5	9651	3	0	5	4	3	4
St. Mary St Michael School	15027	5	26348	5	0	5	4	5	4.8
Derby Public Library	4294	3	0	1	0	5	4	5	3.6
St. Mary's Church	9018	4	21827	5	0	5	5	3	4.4
Irving School	30781	5	11485	4	0	5	4	5	4.6





**Ansonia Armory**

Map Key

-  Key Corridors
-  Bus Stops
-  Ansonia Train Station
-  Ansonia City Hall
-  Ansonia Police Station
-  Ansonia Brass & Copper Mill



# COMMUNITY HEALTH IMPROVEMENT PLAN WORKSHOP

Thursday, December 15, 2022  
Ansonia Armory  
5-7pm

Light refreshments will be provided at 5pm  
The workshop will begin promptly at 5:30pm

**Registration Required**  
<https://www.surveymonkey.com/r/CHIP22>

Join Valley residents and professional stakeholders as we work together to fill health improvement priority areas and working groups for the next 3 years

Scan me to register:

© Mayo Foundation for Medical Education and Research. All rights reserved.

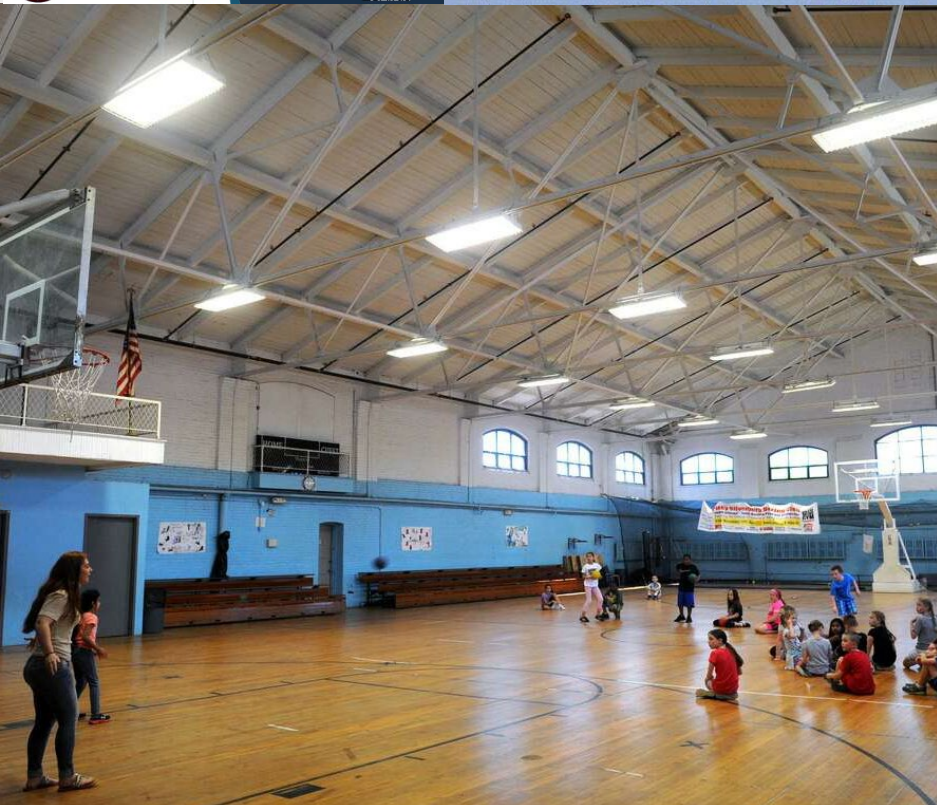
## Resilience Center Example | Ansonia Armory

Next we selected one of the top ranking resilience center locations, The Ansonia Armory and conducted an experiment of how well the Armory would be able to accommodate the needs of the public during an emergency.

The Armory was originally built in the early 1920s as headquarters for area Civil Defense and National Guard through the early 1980s. Its gymnasium was commonly used from the 1930s through 1960s for police and fireman balls, dance fundraisers, automobile and electronics shows. Sold to the city by the state in the early 2000s for \$1, it continues as use for youth basketball and cheerleading programs, political gatherings and voting destination.

In 2020 during the COVID public crisis, the Armory was used as a vaccination and corona virus testing location. In recent years the Armory Gymnasium has been open for free public exercise, affording people a safe and warm place indoors to maintain, or begin, an exercise regiment during the winter months, when outdoor walking is not an option.

The Armory is an excellent resilience center location, due to its central location, accessible parking and regularly utilized public facilities, and familiarity amongst the community.



Ansonia Armory Gymnasium: Public Exercise during winter months





Ansonia Armory Gymnasium: Public Rear Entrance



Associated Commercial Kitchen &amp; Restroom Facilities

### Resilience Center Considerations:

The following list suggests several essential services that a resilience center would need to provide during a climate emergency.

Before being put to the test, any qualified center would need to work with local departments to assess other additional needs that would make center even more robust.

- ❑ **Flexible Seating:** Provides space for seating, which can be adjusted to best meet the needs of the public
- ❑ **Air-Conditioning:** Provides a cool, comfortable place to gather
- ❑ **Clean Drinking Water:** Provides freely accessible drinking water
- ❑ **Back-Up Generator Capacity:** Provides a reliable hub for electricity suitable for supporting the public needs
- ❑ **Internet Services:** Provides reliable internet connectivity
- ❑ **On-Call Medical Assistance:** Can accommodate a medical table and on-call medical staff
- ❑ **Accessible Entrances & Restrooms:** Provides wheel-chair accessible accommodations and adequate restrooms
- ❑ **Privacy Stalls:** Private areas reserved for nursing mothers
- ❑ **Waste Management:** Location has existing waste management system which can accommodate the public

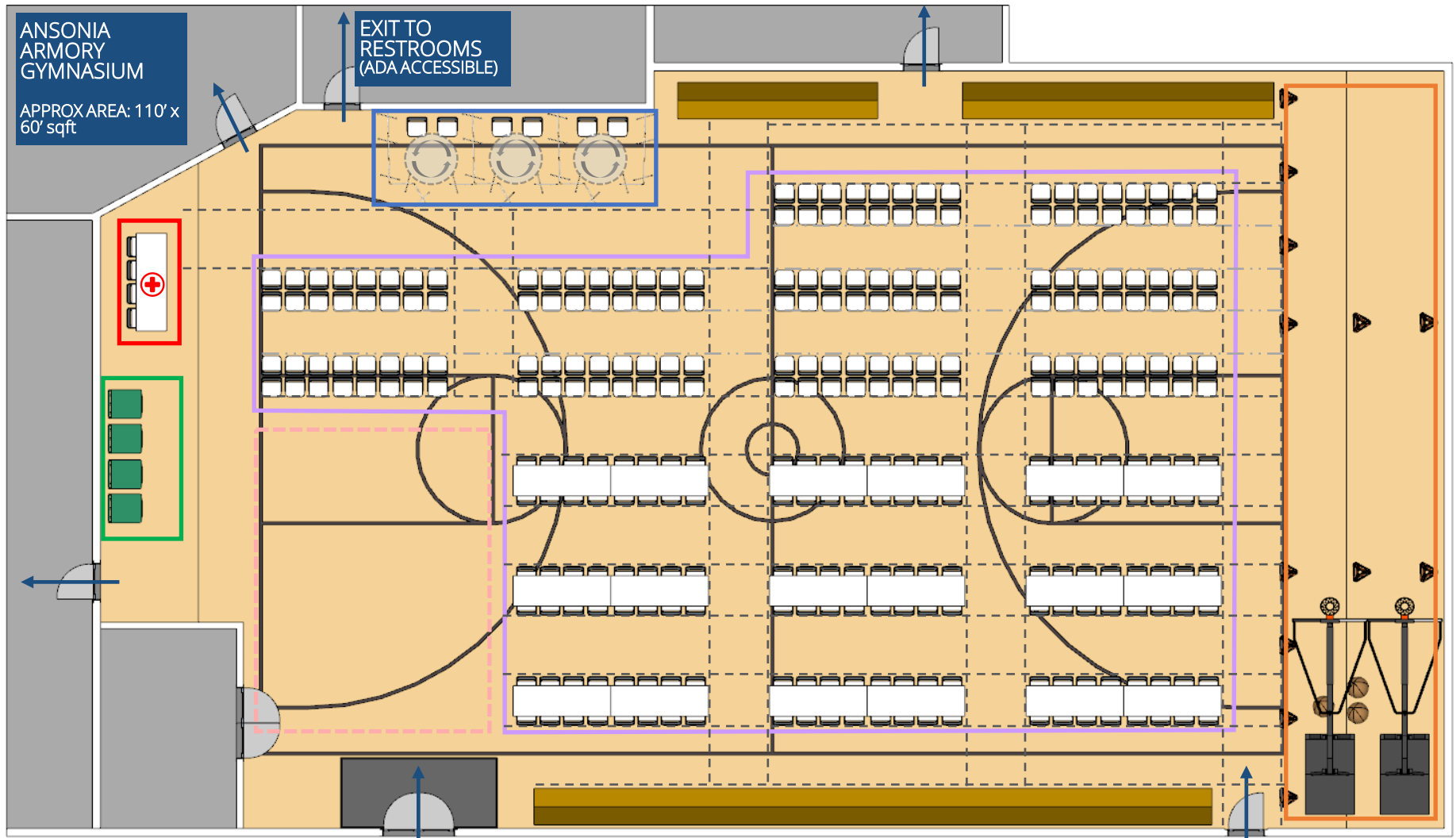


### Test-Fitting Ansonia Armory

The essential services listed above, were test fitted into the Ansonia Armory Gymnasium, in order to identify if the building would have sufficient capacity for the public needs. The gymnasium is the primary space that currently hosts events and seasonal services.

The approximate usable square footage of the gymnasium is 60' x 110. This flexible open space provides an advantage as a pop-up location, as it could be utilized differently depending on the need during a crisis event. In the scenario presented, we demonstrate how the space can accommodate flexible seating and active space, privacy stalls, and designated medical, waste and storage areas. In addition to the services identified this checklist, the building would be required to be in full ADA compliance, including accessible restroom facilities and exits.





<p>↑ ENTRANCES &amp; INTERIOR DOORWAYS</p> <p>60° CIRCLE WHEEL CHAIR TURNING RADIUS</p>	<p>..... ASSUMED 36" SINGLE WHEEL CHAIR ACCESSIBLE ROW</p> <p>----- ASSUMED 60" DUAL WHEEL CHAIR ACCESSIBLE ROWS</p>	<p><span style="border: 1px solid blue; padding: 2px;"> </span> PRIVACY STALLS</p> <p><span style="border: 1px solid red; padding: 2px;">+</span> CHECK-IN/MEDICAL TABLE</p>	<p><span style="border: 1px solid green; padding: 2px;"> </span> WASTE MANAGEMENT</p> <p><span style="border: 1px solid orange; padding: 2px;"> </span> STORAGE AREA</p> <p><span style="border: 1px dashed pink; padding: 2px;"> </span> FLEXIBLE ACTIVE SPACE</p>	<p><span style="border: 1px solid purple; padding: 2px;"> </span> FLEXIBLE SEATING</p>
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### III. THINKING AHEAD: RESILIENCE PLANNING KIT OF PARTS



Historical Images of the Great Flood of 1955  
Photo Credit, Ansonia Public Library





## Introduction to Resilience Planning “Kit of Parts”

The Resilience Planning “Kit of Parts” was created to organize and group green design strategies into overarching themes, which all contribute to the area’s ability to adapt to changing climate demands.

These parts are designed to inspire swift problem-solving with long-term resiliency in mind.

### LINK



Link and enhance existing public parks through green infrastructure improvements and integration into green corridors

### INFRASTRUCTURE



Maintain existing flood protection system



Solar infrastructure and EV charging stations promotes green Ansonia

### ACCESSIBILITY



Bike path enhances accessibility and creates missing link in Naugatuck River Greenway path network



Planted bump-out and crossings for improved visibility and accessibility

### ENGAGE



Engaging with river’s edge creates opportunity for new amenities, educational programming, and events



Outlooks embrace Ansonia’s relationship to the Naugatuck River

### MULTI-USE



Multi-use spaces in ROW & flexible public parks encourage vibrant and resilient downtown



Signage for public amenities & education





**Riverside Dr Connection to Copper & Brass Facility**

**Olson Dr**





**Main St**

**East Main St**

Applied “Kit of Parts” Throughout Downtown

The following locations in Ansonia were chosen to demonstrate how resilient design strategies could be applied throughout the downtown.

Each of the case studies selected have their own opportunities and challenges. The first location on Main Street by the train station is in the heart of historic downtown. Main Street is subject to pluvial flooding risk, which is worsened by abundant impervious surfaces throughout the industrial landscape. East Main Street is also significantly paved, however the existing wide roadway and the large parking lot across from the Veterans’ Memorial Park, offers the opportunity for additional green infrastructure and energy innovation. On the other side of the river, Olson Drive and Riverside Drive are associated with plots that are marked for future development, such as Nolan Field to the south and The Copper and Brass Facility to the North. These are also opportune locations to continue the Naugatuck River Greenway biking network that connects the region.

- 
**1 | Resilient Corridor Placed within the Cultural Hub**  
 Main St @ Ansonia Train Station
- 
**2 | Celebrating Green: Energy & Infrastructure**  
 East Main St @ Ansonia City Hall & Veterans’ Memorial Park
- 
**3 | Creating An Accessible Waterfront Experience**  
 Olson Drive @ Nolan Field Sports Center
- 
**4 | Strengthening a Resilient Corridor**  
 Riverside Drive @ Connection to Ansonia Copper & Brass Facility



1 | Resilient Corridor Placed Within the Cultural Hub



**Green Buffer** 

visually connects existing green spaces and allows for additional street trees

**Planted Bump-Out** 

And crossing for Improved visibility and accessibility

**Permeable Paving** 

To help absorb stormwater run-off during flooding events

**Signage** 

Emphasizing resiliency awareness and public amenities

**Solar Infrastructure** 

EV charging stations make electric vehicles more accessible to public

## 2 | Celebrating Green: Energy & Infrastructure



**Green Buffer** 

visually connects existing green spaces and allows for additional street trees

**Planted Bump-Out** 

And crossing for improved visibility and accessibility

**Rain Gardens** 

Or "bioretention beds" help absorb stormwater run-off

**Shade Structures** 

Provide additional cooling and create more public use

**Solar Infrastructure** 

EV charging stations make electric vehicles more accessible to public



### 3 | Creating An Accessible Waterfront Experience



\*All design recommendations are optional and consistent with the Naugatuck River Greenway

**Green Buffer**

Preserve existing mature trees and create planted buffer

**Bike Path**

Path creates missing link in Naugatuck River Greenway path network

**Permeable Pavement**

Applied to new parking areas for stormwater run-off permeability

**Engagement & Outlooks**

Ramp to lower ground creates opportunity for educational programming, water sports, & events. Outlook embraces Ansonia's relationship to the Naugatuck River

**Flood Barrier Awareness**

Educate public on history of the flood barrier

### 4 | Strengthening a Resilient Corridor



**Green Buffer** 

Visually connects existing green spaces and allows for additional street trees

**Bike Path** 

Path creates missing link in Naugatuck River Greenway path network

**Rain Gardens** 

Or "bioretention beds" help absorb stormwater run-off

**Signage** 


Emphasizing resiliency awareness and public amenities

**Flood Barrier Awareness** 

Educate public on history of the flood barrier



## Versatile Green Infrastructure: bump-out applications and improvements on Main Street

**Planted bump-outs** (  ) provide a safety benefit by reducing pedestrian crossing distance. They also provide an opportunity for additional green space in the right-of-way or public amenities.

In the follow exercise we demonstrate how something as simple as a planted bump-out could benefit Ansonia downtown by three different approaches to resilient design: Connectivity & Safety, Heat Relief & Resilience, and Stormwater Management. Lastly, we reveal a hybrid example, which shows how several of these benefits can work together to enhance the overall design strategy.

### CONNECTIVITY & SAFETY



- ✓ Provides public safety benefit by reducing pedestrian crossing distance
- ✓ Integrate bus stop locations into traffic-slowing bump-outs
- ✓ Provide bike parking stations
- ✓ Provide signage for climate awareness and public programing
- ✓ Integrate electric vehicle changing stations

### HEAT RELIEF & RESILIENCE



- ✓ Integrate light-colored pavement to lessen heat impacts
- ✓ Integrate public seating and shade structures
- ✓ Provide shade trees for natural cooling and ecological benefits

### STORMWATER MANAGEMENT



- ✓ Integrate raingarden or "bioretention beds" into planted buffer to increase stormwater management capability
- ✓ Redirect rooftop water run off from public buildings into planted buffers
- ✓ Integrate porous pavement into crossing areas to reduce runoff volume

**Sample View of Main Street, Ansonia**





**Resilient Connectivity:** Public Transit & Community Engagement

Integrate bus stop locations into traffic-slowing bump-outs



Integrate bike parking into bump-outs



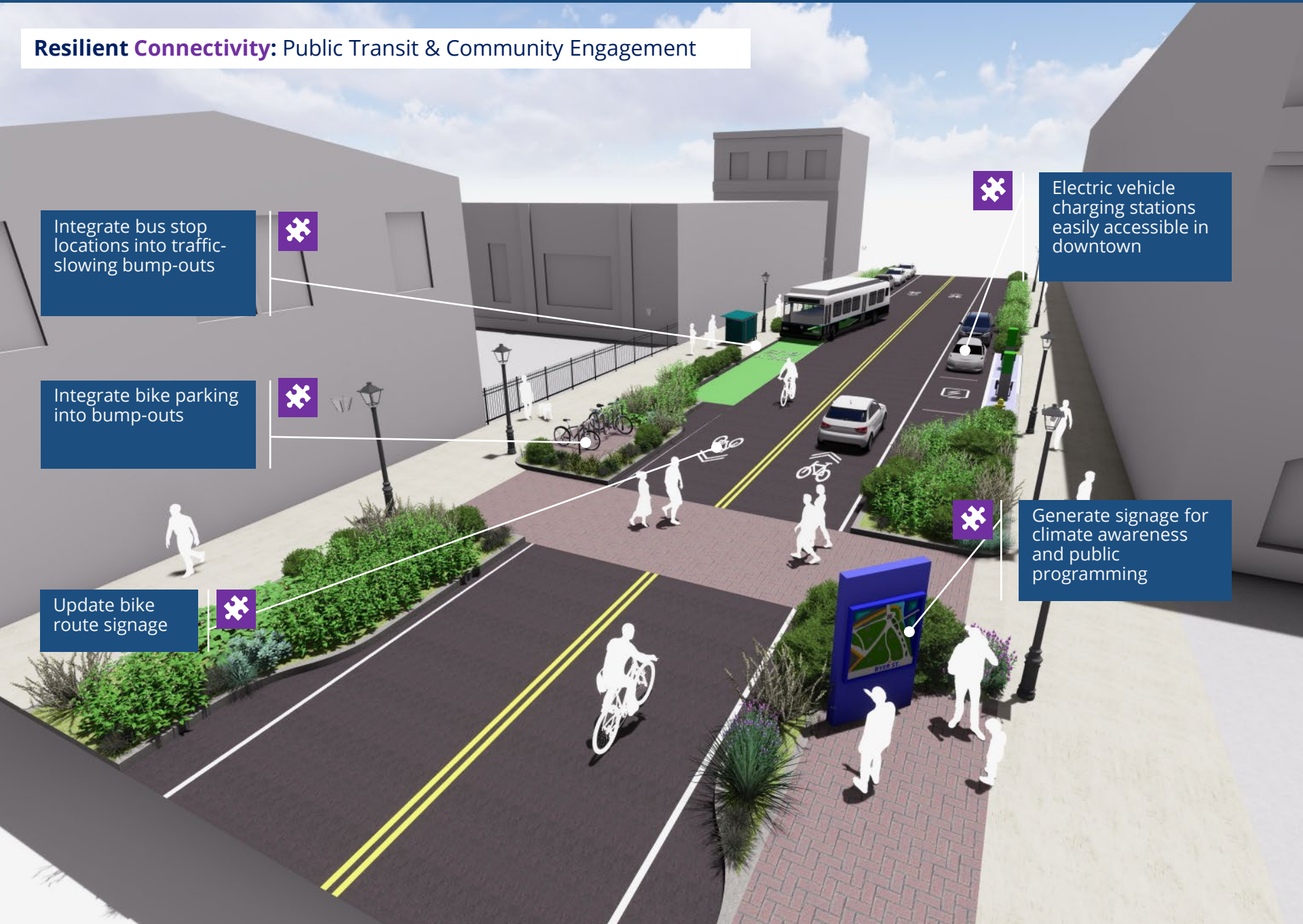
Update bike route signage



Electric vehicle charging stations easily accessible in downtown



Generate signage for climate awareness and public programming





**Resilient Heat Relief:** Creating a Cool Public Corridor

Promote shade canopy trees along walkways to create cool corridor



Integrate light colored pavement to reflect light and keep the ground surface cooler



Integrate public seating and shade structures into bump out





**Resilient Stormwater Management:** Water Security & Recycling

Porous Pavement supports stormwater management



Rooftop water catchment systems lessen stormwater runoff and can be recycled



Rainwater gardens integrated into bump-outs and street buffer areas





**Hybrid Example:** Connectivity, Heat Relief, and Stormwater Management Combined





## PLANNING ACTIONS SUMMARY



Historical Images of the Great Flood of 1955  
Photo Credit, Ansonia Public Library



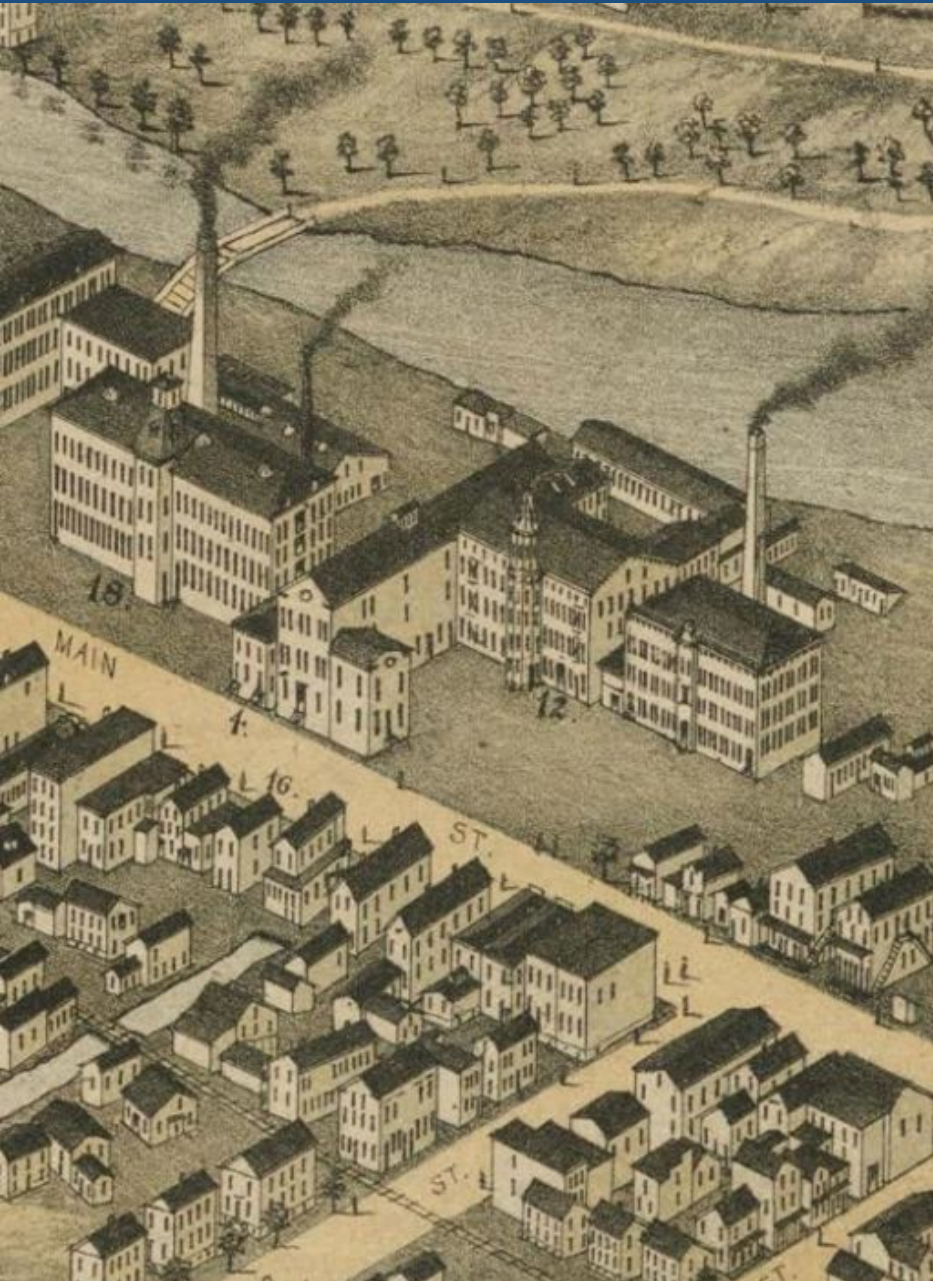
## Resilient Planning Recommendations

In response to the unique challenges of extreme heat, the adaptation options for Ansonia were designed under a Resilience “Kit of Parts” Framework. This approach of projects of varied scales and levels of complexity, provides flexibility for prioritization and implementation for the Ansonia study area. It also provides guidance for replication throughout other areas of the city.

Based upon input from the city, stakeholders, and public, several strategies within the Kit of Parts were set as priorities for Ansonia. 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
<b>Develop clean and accessible energy sources</b>	Support development of solar energy and electric vehicle charging facilities throughout project area	1-2yrs
<b>Resilience Center Development</b>	Update public building to accommodate vulnerable members of the community during a climate emergency	1-2yrs
<b>Incorporate Green Infrastructure</b>	Provide additional strategies to manage stormwater through permeable paving, stormwater planters, and curb extensions.	1-2yrs
<b>Expand the Urban Tree Canopy</b>	Provide comfortable corridors for pedestrians and bicyclists, providing a healthy and safe environment for the community.	Ongoing
<b>Add Signage</b>	Establish and mark limits of climate impact zones and increase the opportunities to educate the public about heat and flood.	1-2yrs
<b>Expand the Resiliency Hub</b>	Promote development of core roadways to support key evacuation routes and future resilient design planning	Ongoing
<b>Develop a Resilience Overlay District</b>	Define the areas that are most impacted by flooding and provide a roadmap for future developers to consider	3-5yrs





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

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## APPENDIX: ROM COST ESTIMATE MEMO



Historical Images of the Great Flood of 1955  
Photo Credit, Ansonia Public Library



# Resilient Ansonia

## Resilient Strategies

## ROM Cost Estimate

November 28, 2023

**Document Issue Sheet**

Issue Nr.	Document	Issue Date	Parties Sent To	Prepared By	Reviewed By
1.0	Ansonia Resilient Strategies- Conceptual Cost Estimate - Internal Draft	10/3/2023	AECOM NE Urban Planning	Michael Botha	PCC
2.0	Ansonia Resilient Strategies- Conceptual Cost Estimate - Final	11/28/2023	AECOM NE Urban Planning	Michael Botha	PCC



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4.0   East Main Street - Energy & Infrastructure upgrades	5
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5.0   Main Street - Hybrid Option	6
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**1.0 | Executive Summary**

11/28/2023

- 1.1 This cost summary represents the resiliency strategies options cost for the Resilient Design Strategies Project in Ansonia, Connecticut. The Conceptual design estimate has been based upon the information listed in Section 2.0. The estimate is a current day fixed price at 4th Quarter 2023 price levels and excludes other items listed in section 2.0.
- 1.2 The high level breakdown of the estimated construction costs are summarized below:

Item	Ansonia Armory / Gymnasium Upgrades	East Main Street - Energy & Infrastructure upgrades	Main Street - Hybrid Option
<b>Ansonia Armory / Gymnasium Upgrades</b>	<b>\$ 1,178,000</b>		
<b>East Main Street - Energy &amp; Infrastructure upgrades</b>		<b>\$ 795,000</b>	
<b>Main Street - Hybrid Option</b>			<b>\$ 424,000</b>
<b>SUB-TOTAL   Excluding Soft Costs</b>	<b>\$ 1,178,000</b>	<b>\$ 795,000</b>	<b>\$ 424,000</b>
<b>Soft Costs</b>			
Env. Permits, Owners cost	Excluded	Excluded	Excluded
<b>TOTAL   Including Soft Costs</b>	<b>\$ 1,178,000</b>	<b>\$ 795,000</b>	<b>\$ 424,000</b>

- 1.3 This estimate is based on the General Contract being competitively bid with a minimum of Three (3 EA) qualified general and main subcontractors.
- 1.4 A number of assumptions have had to be made in compiling this estimate with regards to specification / quality and scope. We would strongly recommend that all assumptions and exclusions made are thoroughly reviewed to re-confirm our base assumptions. These are outlined in section 2.0.
- 1.5 This estimate has been prepared solely for the use of Connecticut Institute for Resilience and Climate Adaption and should not be relied upon by any third party.



## 2.0 | Basis, Assumptions and Exclusions

### Basis and Assumptions

- 2.1 This cost summary represents a Rough Order of Magnitude (ROM) Cost Study to provide the indicative cost ranges for general guidance purposes. The cost model was constructed based on an assumed scope. This model should not be used for setting budgets or for commitment of funds without additional evaluation of the site in contention and the related design.
- 2.2 The general contract will be administered as a competitively bid / negotiated GMP with a selected Construction Manager / General Contractor & pre-qualified sub-contractors.
- 2.3 In compiling this estimate, we have assumed that the design will be developed within a controlled sequence to facilitate a competitive bid on the basis of completed design information within normal and stable market conditions.
- 2.4 The allowances for the General Contractor's Indirect Markups are summarized below:
  - General Conditions @ 8.5%
  - Mobilization and Demobilization @ 4%
  - Insurance and Bonds @ 1.75%
  - General Contractor Overhead and Profit @ 5%
- 2.5 A Design Reserve and Contingency has been included @ 30%
- 2.6 The contractor will be required to pay prevailing wages.
- 2.7 This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work. Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors. Since AECOM has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents AECOM's best judgment as professional construction consultant familiar with the construction industry. However, AECOM cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.
- 2.8 Sales Tax included
- 2.9 This ROM Estimate is based on current day pricing and does not include any escalation allowances.
- 2.10 Document used for this Conceptual Estimate is the "Ansonia Community Workshop\_2" dated October 19,2023

## 2.0 | Basis, Assumptions and Exclusions

### Exclusions

- 2.11 Off site work and utility upgrades unless otherwise noted
- 2.12 Out of hours working except as assumed/allocated
- 2.13 Non-standard material sizes
- 2.14 Assessments, taxes, finance, legal charges
- 2.15 Environmental impact mitigation
- 2.16 Land and easement acquisition
- 2.17 Off Site Utility Upgrades and / or Off Site Infrastructure improvements
- 2.18 Mock-ups
- 2.19 Builder's risk, project wrap-up and other owner provided insurance program
- 2.20 Disconnections and diversions of existing services
- 2.21 Developers risk allowance / overall project contingency
- 2.22 Finance charges, developers costs and profit
- 2.23 Phasing requirements
- 2.24 Hazardous abatement and disposal other than specifically noted
- 2.25 No improvement or work to existing infrastructure and services except as specified
- 2.26 No requirement for a pause on construction activities
- 2.27 Soft costs
- 2.28 No stockpiling required
- 2.29 Purchased/processed earth filling – provision for using local material only
- 2.30 Dump charges, assume material can be dumped locally
- 2.31 Stormwater mitigation work, assume no stormwater pumps, pipes or channels are required
- 2.32 Rock excavations
- 2.33 No crushing or screening is required



	<b>Qty</b>	<b>Units</b>	<b>Rate</b>	<b>Amount</b>
--	------------	--------------	-------------	---------------

**Assumptions & Clarifications (in addition to section 2)**

\*HVAC: We're assuming that a ducted system plus a roof top unit would suffice. This would only supply heating and cooling to the gymnasium area. Smaller split or fancoil units might be more appropriate to heat smaller, isolated areas.

\*Drinking water: We're assuming the building has clean, drinking water. Would portable water stations be part of a future strategy?

\*Generator: We've allowed for a 31KVA generator, including a belly tank ; housekeeping pad ;excavation and installation of underground feeders back to the building ; a new panel and associated work.  
area.

\*Accessible Restrooms: Our allowance is based on converting 4 x existing stalls to ADA stalls.

\*Privacy Stalls: We've allowed for freestanding, office divider walls to be configured in a suitable layout.

**Costs**

Flexible seating - loose FF&E excluded	1	LS	\$	-	Excluded
Air-Conditioning - HVAC.	6,600	SF	\$	60.00	\$ 396,000
Clean Drinking Water	1	LS	\$	-	Existing
Back Up Generator - Assume 31 KVA Generator, including associated work	1	EA	\$	255,514.00	\$ 255,514
Internet Services	6,600	SF	\$	9.00	\$ 59,400
On-Call Medical Assistance - loose FF&E excluded.	1	LS	\$	-	Excluded
Accessible Entrances / Ramps	2	EA	\$	13,937.00	\$ 27,874
Accessible Restrooms - alterations to convert 4 x existing stalls to ADA stalls.	4	EA	\$	1,858.00	\$ 7,432
Privacy Stalls - say 8 x stalls	8	EA	\$	697.00	\$ 5,576
Waste Management	1	EA	\$	-	Existing

**Estimated Direct Construction Cost Before Indirect Markups \$ 751,796**

Mobilization & Demobilization	4.00%	\$	30,072
General Conditions	8.50%	\$	66,459
Bonds & Insurance	1.75%	\$	14,846
Contractor's OH&P	5.00%	\$	43,159
Escalation to Start Date (April 2022)	0.00%		<i>Excl</i>
Contingency	30.00%	\$	271,899

**Estimated Total Construction Cost \$ 1,178,230**

	Qty	Units	Rate	Amount
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**Assumptions & Clarifications (in addition to section 2)**

\*Assume this solution is purely off grid, ie no infrastructure upgrades would be required.

\*Please note that the neither the conceptual design nor the costs below, guarantee that the surface area of panels drawn and priced, would generate sufficient electricity to power all EV stations. A dedicated study would be required.

\*The size of a bay of PV panels have been assumed to be 300SF. We're also assuming suitable battery storage would be required and as a result, also secure housing structures.

\*We assume that a new canopy structure would be required. No allowance for fire sprinklers are included.

**Costs**

Green Buffer Lanscaping	3,750	SF	\$	14.00	\$	52,500
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PV Panels + EV Charging

PV Panels - assumed 300SF per arrangement	1,200	SF	\$	33.00	\$	39,600
Canopy Structure	4	EA	\$	13,937.00	\$	55,748
Battery Storage - assuming a storage capacity of 50KWH per PV bay	4	EA	\$	15,000.00	\$	60,000
Allowance for battery housing structure	4	EA	\$	9,291.00	\$	37,164
Invertor/s	4	SF	\$	5,000.00	\$	20,000
EV Charger, assumed L02 , AC	14	EA	\$	7,898.00	\$	110,572
Bollards - assumed 5 x per two chargers	70	EA	\$	1,394.00	\$	97,580
Underground Conduit & Feeder, including excavation, compacting and backfill	180	LF	\$	93.00	\$	16,740
Allowance for surface repairs	900	SF	\$	19.00	\$	17,100

<b>Estimated Direct Construction Cost Before Indirect Markups</b>					<b>\$</b>	<b>507,004</b>
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Mobilization & Demobilization	4.00%				\$	20,280
General Conditions	8.50%				\$	44,819
Bonds & Insurance	1.75%				\$	10,012
Contractor's OH&P	5.00%				\$	29,106

Escalation to Start Date (April 2022)	0.00%					<i>Excl</i>
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Contingency	30.00%				\$	183,366
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<b>Estimated Total Construction Cost</b>					<b>\$</b>	<b>794,587</b>
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	<b>Qty</b>	<b>Units</b>	<b>Rate</b>	<b>Amount</b>
<b>Assumptions &amp; Clarifications (in addition to section 2)</b>				
*A general assumption has been made w.r.t. the indicative quantity / areas, as indicated below.				
*Assume that electrical infrastructure upgrades would be required. A nominal allowance has been included for primary equipment like a transformer, panelboard etc				
*Porous pavement: we've included 18" of layerworks which should allow natural drainage of water, at a reduced rate. Any subteranean drainage or connections to the existing stormwater system has not been included.				
<b>Cost</b>				
Clear asphalt - allowance	500	SF	\$ 7.00	\$ 3,500
<u>Connectivity</u>				
Landscaping allowance	1,000	SF	\$ 19.00	\$ 19,000
Bus Stop + Traffic-Road painting - Allowance	1	EA	\$ 2,787.00	\$ 2,787
Bike Rack - assumed 1 x rack with 5 x bicycle spaces (paving elsewhere)	1	EA	\$ 1,710.00	\$ 1,710
Road Signage - general allowance	10	EA	\$ 139.00	\$ 1,390
EV Charger, assumed L02 , AC	1	EA	\$ 7,898.00	\$ 7,898
Bollards	2	EA	\$ 1,394.00	\$ 2,788
Underground Conduit & Feeder, including excavation, compacting and backfill - allowance, assumed quantity	100	LF	\$ 93.00	\$ 9,300
Allowance for surface repairs - allowance, assumed quantity	500	SF	\$ 19.00	\$ 9,500
Allowance for electrical infrastrucure upgrades	1	EA	\$ 46,457.00	\$ 46,457
Allowance for climate awareness & public programming signage - asusmed to be a non-digital board.	1	EA	\$ 4,646.00	\$ 4,646
Allowance for general pedestrian paving and bump-outs - allowance, area assumed.	2,000	SF	\$ 46.00	\$ 92,000
Curbs	400	LF	\$ 42.00	\$ 16,800
<u>Heat Relief</u>				
Extra over allowance for trees - allowance	7	EA	\$ 1,394.00	\$ 9,758
Public seating & shade structure	1	EA	\$ 13,937.00	\$ 13,937
<u>Stormwater Management</u>				
Porous Pavement, including 18" layerworks	240	SF	\$ 65.00	\$ 15,600
Roof top water catchment - allowance for gutters & down pipes + 2 x 500 GAL PVC tanks	1		\$ 13,366.00	\$ 13,366
<b>Estimated Direct Construction Cost Before Indirect Markups</b>				<b>\$ 270,437</b>



## 5.0 | Main Street - Hybrid Option

11/28/2023

Mobilization & Demobilization	4.00%	\$	10,817
General Conditions	8.50%	\$	23,907
Bonds & Insurance	1.75%	\$	5,340
Contractor's OH&P	5.00%	\$	15,525
Escalation to Start Date (April 2022)	0.00%		<i>Excl</i>
Contingency	30.00%	\$	97,808
<b>Estimated Total Construction Cost</b>		<b>\$</b>	<b>423,834</b>



Submitted by:

**Program Cost Consultancy | PMCM  
AECOM**