DRAFT

Albany County

Broadway Multimodal Resiliency Study

June 2025

Acknowledgments

This Study was funded through the Capital Region Transportation Council's 2023-2024 Linkage Program with support from Albany County. It is intended provide a framework for advancing design concepts intended to make Broadway more resilient to flooding and other weather related impacts by enhancing and improving the connectivity of transit, bicycle, and pedestrian infrastructure, increasing the urban forest and tree cover to cool the corridor, and integrating green infrastructure to better manage stormwater runoff. Recommendations are conceptual in nature, and do not commit the Transportation Council, affected communities, Albany County, or NYSDOT to funding any improvements. Undertaking additional engineering or other follow-up work will be based upon funding availability.

Broadway Multimodal Resiliency Study Advisory Committee

Audrey Burneson, NYS Department of Transportation

Melissa Cherubino, City of Watervliet

Patrick Curran, Albany County County Executive's Office

Scott Duncan, Albany County Department of Public Works

Donald Handerhan, Village of Menands

Joe LaCivita, City of Watervliet

Teresa LaSalle, Capital Region Transportation Council

Emily Loughlin, Capital District Transportation Authority

Brian Marsh, Village of Menands

Lauren Oertel, Capital District Regional Planning Commission

Poulomi Sen, City of Albany

Ethan Ward, Capital Region Transportation Council

Ethan Warren, Capital District Transportation Authority

Charles Weldge, Albany County Department of Health

This Study was prepared by Highland Planning with support from Byer Planning, Creighton Manning, LandArt Studio, and Stantec. It was prepared in cooperation with Albany County, the Village of Menands, the City of Albany, the City of Watervliet, and the Capital Region Transportation Council. This report was funded in part through grants from the Federal Highway Administration and the U.S. Department of Transportation. The views and opinions of the authors expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

Table of Contents


CAR CRASH?
HARDING & MAZZOTTI
12 - 3

01
Introduction

This chapter describes the Broadway Multimodal Resiliency Study's purpose, goals, and the Study area. It also provides a brief history of the Study corridor.

Study Purpose and Goals

The Study corridor is an important intermunicipal connector carrying multiple modes of transportation and linking several destinations. The purpose of the Broadway Multimodal Resiliency Study is to increase the resilience of the Broadway study corridor to future disturbances.

Purpose

Broadway / Route 32 is an important north-south corridor linking communities along the Hudson River in Albany, Menands, Colonie and Watervliet. **In many ways, Broadway / Route 32 is the main street for these communities,** providing access to a diversity of local destinations such as schools, libraries, employment, shopping, parks, trails, and housing. This corridor also supports several different modes of transportation including motor vehicles, pedestrians, cyclists, and the Capital District Transportation Authority's (CDTA) Blue Line, which is a bus rapid transit (BRT) route connecting Albany, Watervliet, and Troy. With its position along the Hudson River and at the outlet of several urbanized watersheds, this important local corridor is flood prone and susceptible to extreme heat due to its lack of tree canopy cover and expansive areas of pavement.

To ensure this important local corridor is prepared for and resilient to future extreme storm and heat events, the Albany County Broadway Multimodal Resiliency Study (Study) was proposed by the Albany County Executive's Office and is being funded by Albany County, CDTA, and the Capital Region Transportation Council through its 2023-2024 Unified Planning Work Program. It is part of an effort to implement the Capital Region Transportation Council's Metropolitan Transportation Plan, New Visions 2050, and to assess the impacts of climate change and identify concepts that support resiliency in accordance with New York State's Climate Leadership and Community Protection Act (Climate Act).

The purpose of the Resilient Broadway project is to identify and evaluate design concepts that ensure Broadway is resilient to climate change by enhancing and improving the connectivity of transit, bicycle, and pedestrian infrastructure, increasing the urban forest and tree cover to cool the corridor, and integrating green infrastructure to better manage stormwater runoff.

This Study explores and recommends several conceptual changes to the Broadway / Route 32 corridor focused on integrating natural systems with transportation systems to better manage stormwater, improve air quality, reduce heat stress, and expand the interconnectivity of active transportation and transit to promote viable low-carbon transportation choices. Proposed design concepts have been vetted through a robust public engagement process that involves municipal officials, agencies, residents, and the general public. Special consideration was given to groups more vulnerable to the health, social, and economic impacts of hazards caused by climate change.

Resilience is...
The capacity of a social-ecological system to absorb or withstand disturbances and other stressors and still maintain its basic structure and function.

(Holling 1973; Gunderson & Holling 2002; Walker et al. 2004)

Study Corridor

The Study corridor is approximately 6.5 miles long and follows the Broadway / Route 32 corridor. In Albany, the Study corridor begins at the intersection of Broadway and Clinton Avenue and then continues north along Broadway through Menands and into Watervliet. In Watervliet, the Study corridor follows 3rd Avenue northeast to Broadway, jogs west on 13th Street, and then continues northeast along 2nd Avenue to 25th Street. The Study corridor is wholly contained in Albany County and traverses four local municipalities including the City of Albany, Village of Menands, Town of Colonie, and City of Watervliet. The recently completed Bus Plus Blue Line transit service uses Broadway for much of its route between Albany and Waterford, and the Study corridor runs parallel to I-787 and a portion of the Empire State Trail, which connects Albany south to New York City through the Hudson River Valley, west to Buffalo along the Erie Canal, and north to the Champlain Valley and Adirondacks.

Within the Cities of Albany and Watervliet, each city owns and maintains its respective section of the Study corridor. In the Village of Menands and the Town of Colonie, New York State Department of Transportation (NYSDOT) owns and maintains the Study corridor.

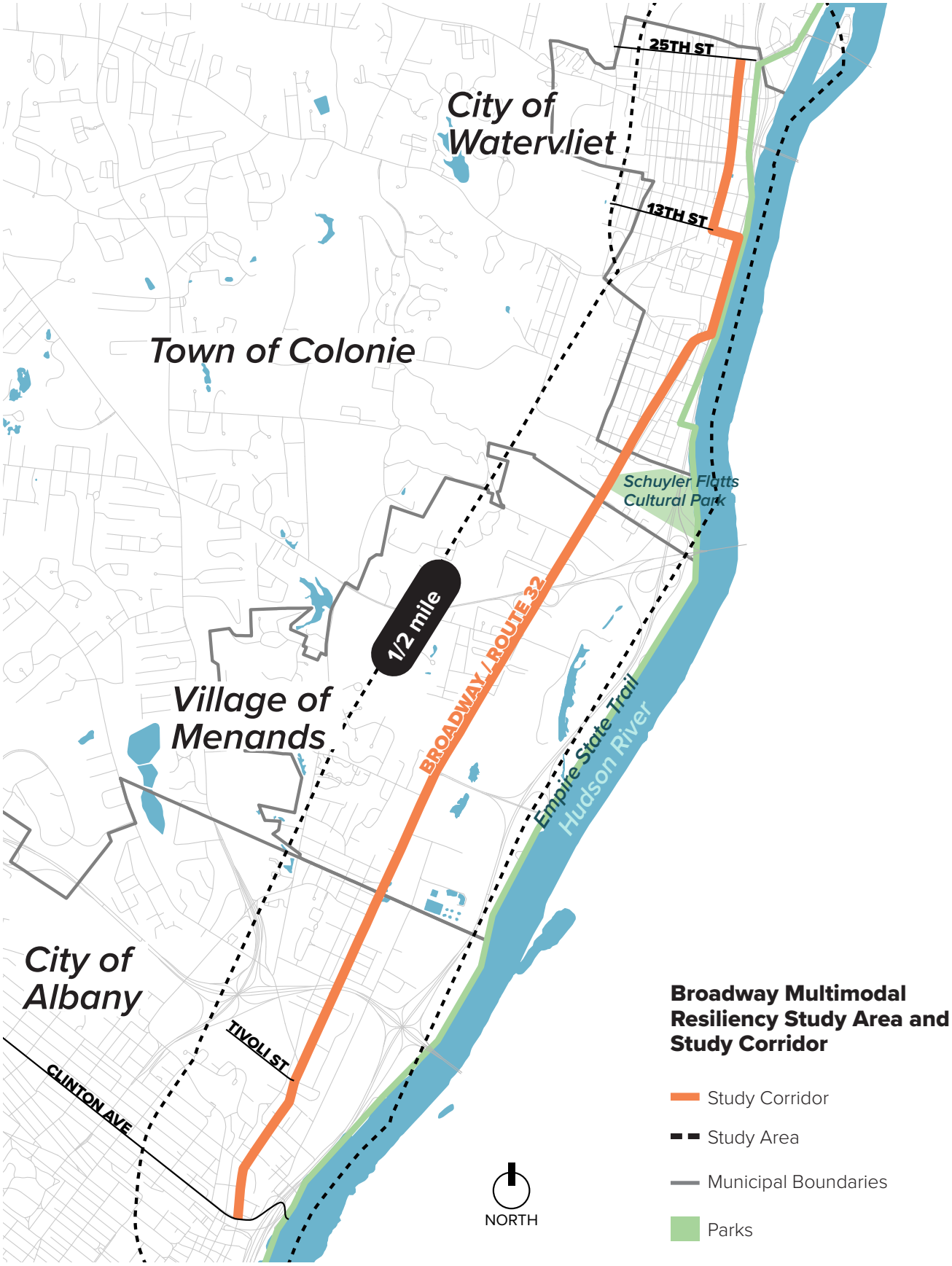
Study Area

A half-mile buffer around the Study corridor was established to document and understand the surrounding communities, land uses, and environment that are connected to and affect the conditions along the Study corridor. This half-mile buffer was primarily used to document existing land use, transportation, and demographic conditions in Chapter 2: Baseline Corridor Assessment.

Project Goals

When considered together, the following goals will increase the resiliency of Broadway / Route 32 to climate change:

1. **Increase the safety, availability, and connectivity of public transit, bicycle, and pedestrian infrastructure** to promote viable, healthy, and low-carbon transportation choices
2. **Interconnect public transit, bicycle, and pedestrian systems** to enhance functionality, efficiency, and user experience
3. **Integrate natural systems with transportation systems** to mitigate flooding, improve air quality, reduce heat stress, and provide a beautiful green public space for all
4. **Create redundancy** by providing viable alternative options that preserve local mobility during a disturbance
5. **Test innovative solutions** to serve as a regional urban model for transportation and ecological resiliency


City of Watervliet
25TH ST
13TH ST
Town of Colonie
Schuyler Flatts Cultural Park
1/2 mile
BROADWAY / ROUTE 32
Empire State Trail
Hudson River
Village of Menands
City of Albany
TIVOLI ST
CLINTON AVE
NORTH
Broadway Multimodal Resiliency Study Area and Study Corridor
Study Corridor
Study Area
Municipal Boundaries
Parks

Development Over Time

Spanning from Albany to Watervliet, the Study corridor has long served as a vital link for transportation, commerce, and culture, reflecting the corridor's growth, change, and continued importance over time.

It is with gratitude and humility that we acknowledge that we are learning, speaking and gathering on the ancestral homelands of the Mohican people, who are the indigenous peoples of this land. Despite tremendous hardship in being forced from here, today their community resides in Wisconsin and is known as the Stockbridge-Munsee Community. We pay honor and respect to their ancestors past and present as we commit to building a more inclusive and equitable space for all.

Environmental and Historical Context

Today, the Study corridor is vital to the region as it connects several destinations, downtowns, and neighborhoods between Albany and Watervliet and carries the Capital District Transportation Authority's (CDTA) Bus Rapid Transit (BRT) Blue Line. The corridor weaves in and out of the Hudson River floodplain, and prior to development and urbanization, the Study area was primarily comprised of riparian forest and wetlands.

The Study area's location in the Hudson River Valley also makes it environmentally sensitive and historically and culturally significant to the Native Nations who lived in the area long before the cities of Albany and Watervliet and the Village of Menands were established. The Study area is part of the traditional lands of the Mohican and Mohawk peoples, who were part of the larger Iroquois Confederacy (Haudenosaunee), and the Study area is now home to descendants of these nations, including the Stockbridge-Munsee Community.

1600s

Broadway was one of the first post-roads and functioned as a waterfront thoroughfare. First called the Whitehall Turnpike, or Northern Turnpike, it was the primary north-south transportation route for the region and likely originated as a Indigenous footpath. Passing through Watervliet, it ran along the shoreline of the Hudson and Stone Hook. Stone Hook was an easily recognized reference point for navigators and land surveyors alike as it was an elevated topographic portion of natural blackish rock jutting out from the western banks of the Hudson River and was a common mooring place for ships as early as 1675.

1800s - 1900s

The Albany Broadway–Livingston Avenue Historic District, located in the Study area, is the only intact concentration of 19th-century commercial and residential architecture on Broadway north of downtown Albany. Most of its buildings are two- and three-story rowhouses interspersed with brick commercial buildings of comparable scale and built between 1829 and 1876, a time period when the neighborhood enjoyed great prosperity as the eastern terminus of the Erie Canal. A bridge was built in 1900 to carry the New York Central Railroad tracks across Broadway at Colonie Street.

2000s

This former bustling industrial corridor is now more defined as an older highway commercial corridor with a mix of varying land uses and large expanses that are underutilized (e.g., large surface parking lots, vacant buildings).

The Village of Menands (Village) recently updated their land use regulations and zoning code. Recognizing Broadway as the Village's main street, the updated zoning code includes a Broadway Corridor Form-Based District (Broadway Business District) that promotes walkability and complete streets. This District allows mixed-use residential, commercial, and industrial development and recommends building placement that will provide a sense of enclosure, framing public space and helping to offset the physical and visual dominance of the roadway.

Historic Floodplain

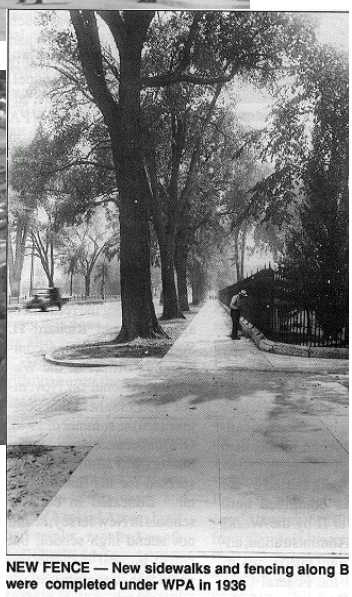
Prior to European settlement

Whitehall Turnpike

1600s - 1700s

Industrial Center

1800's



NEW FENCE — New sidewalks and fencing along B were completed under WPA in 1936

Walkable, Mixed-Used Corridor

2025+


ALBANY
TRUCK SALES
OLYMPIC
LANES
12 Elmwood Rd

02
Baseline Corridor Assessment

This chapter provides an overview of the existing conditions along the Study corridor and within one-half mile of the Study corridor (hereafter referred to as the Study area). Key findings related to issues, constraints, and opportunities for improvement are highlighted throughout this Chapter and provide the basis for the development of conceptual alternatives to improve the Study corridor and achieve the goals of the Broadway Multimodal Resiliency Study defined in Chapter 1.

The following topics are documented and assessed in this Chapter:

- Existing related plans and projects
- Demographic profile
- Development patterns
- Destinations
- Natural hazards and climate resilience
- Urban tree canopy
- Transportation systems
- Utility infrastructure

Existing Related Plans & Projects

There are several recently completed and ongoing studies, plans, and projects that directly impact the Study corridor. This section provides a brief overview of those related initiatives and clearly defines how they overlap with and affect the Study corridor.

01 The Empire State Trail Plan

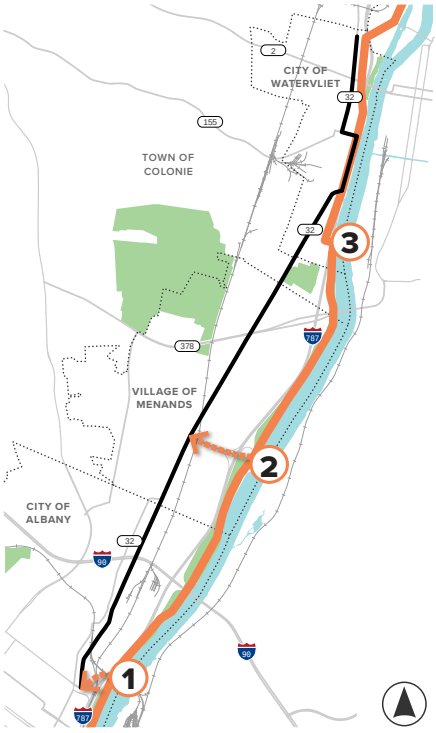
Year Completed:

2018 (plan completed)

2020 (trail implemented)

Link to Project Website:

https://empiretrail.ny.gov/



Project Description:

The Empire State Trail Plan and New York State Department of Transportation (NYSDOT) On-Road Routes Plan identified recommendations for a connected multi-use trail spanning 750 miles across New York State, linking York City through the Hudson River Valley, west to Buffalo along the Erie Canal, and north to the Champlain Valley and Adirondack Mountains. The plans were developed to promote outdoor recreation, encourage healthy lifestyles, support community vitality, and bolster tourism-related economic development. The Empire State Trail Plan provides an overview of the Empire State Trail, including maps identifying the entire 750-mile route, while the NYSDOT On-Road Routes Plan further details recommendations for on-road sections of the Empire State trail, often involving coordination with NYSDOT.

Relationship to the Broadway Study Corridor:

The Empire State Trail parallels the entire length of the Study corridor, and currently three connections exist between the Study corridor and the Empire State Trail, including:

1. At the south end of the corridor in the City of Albany at Clinton Avenue via the Albany Skyway;
2. In the Village of Menands at I-787 Exit 6, adjacent to the Capital District Transportation Authority (CDTA) Riverview Center transit stop, via a new bicycle and pedestrian path constructed in 2021; and,
3. In the City of Watervliet at the Empire State Trail trailhead located at the intersection of Broadway and 4th Street.

The Empire State Trail Plan recommends a two-way separated bikeway on Broadway in Watervliet from the intersection with 3rd Avenue (located at the southern end of Watervliet) to the intersection with 16th Street. This recommendation has been implemented and incorporated into the Empire State Trail.

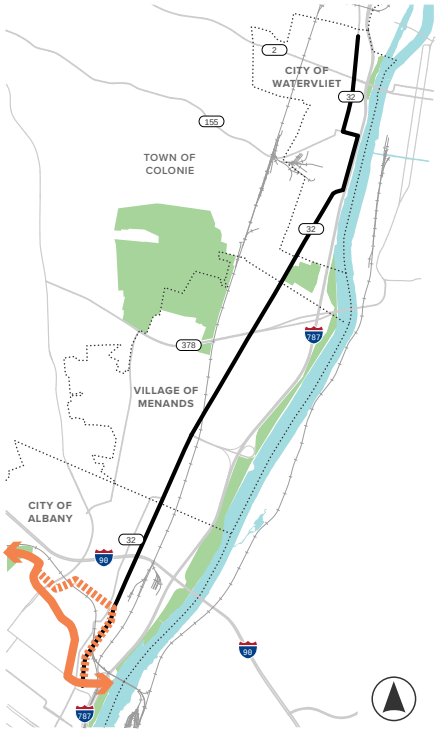
02 Patroon Creek Greenway Feasibility Study

Year Completed:

2021

Link to Project Documents:

https://tinyurl.com/FinalPatroonGrnwy



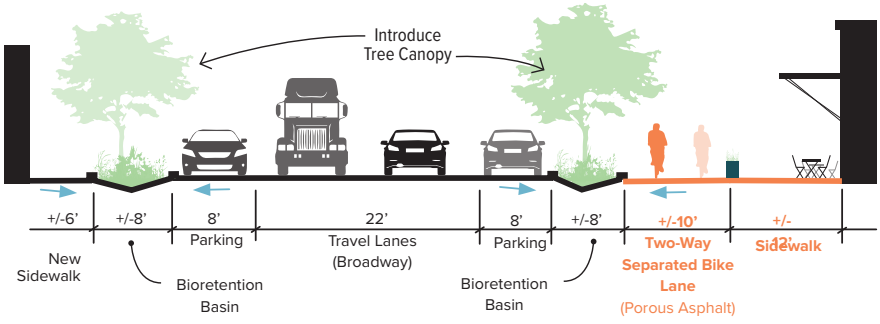
Project Description:

The Capital Region Transportation Council's Patroon Creek Greenway Feasibility Study proposes an approximately nine mile long multi-use trail corridor paralleling Patroon Creek and connecting Albany Pine Bush Preserve, Tivoli Preserve, the Hudson River waterfront, and the many neighborhoods in between. The proposed Greenway would provide a much needed east-west connection for cyclists, pedestrians, and other forms of active transportation in the City of Albany and the Capital District Region. The Patroon Creek Greenway Feasibility Study explores several alternative trail alignments and facility types and proposes a short-term and long-term vision for the Patroon Creek Greenway based on extensive analysis and public feedback.

Relationship to the Broadway Study Corridor:

The recommended long-term vision for the Patroon Creek Greenway connects Tivoli Preserve to Broadway via steep, forested property owned by the City of Albany along I-90 and Tivoli Street. At Tivoli Street, the trail proceeds east along a shared road with a new sidewalk proposed along the northern side to Broadway. At Broadway, the trail continues south to the Albany Skyway.

Due to the wide right-of-way along Broadway (varying from 65-feet to 130-feet wide), the ongoing redevelopment of the corridor, and its location in the 100-year floodplain, the vision for the Patroon Creek Greenway includes transformative improvements across the entire width of Broadway. These improvements include narrowing the street, bioretention basins on either side of Broadway, expanding the tree canopy, new sidewalks, and a two-way separated bike lane at sidewalk level (see graphic on below). The Greenway is proposed on the east side of Broadway to maximize connectivity to the waterfront.



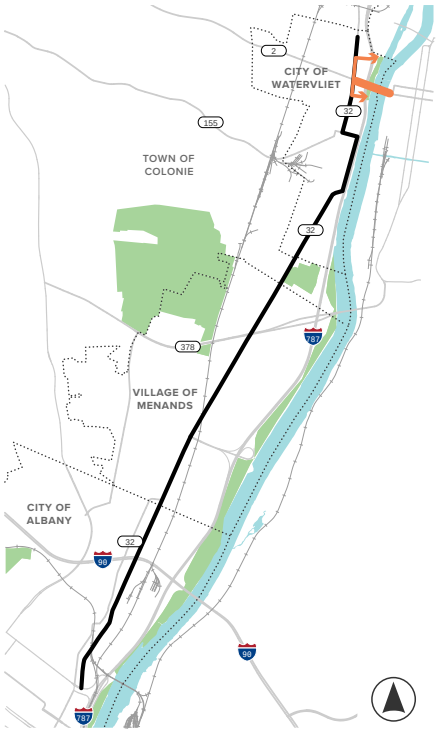
03 Congress Street Bridge Study

Year Completed:

2021

Link to Project Documents:

https://www.troyny.gov/216/Congress-Street-Bridge-Study



Project Description:

The Congress Street Bridge Study covers a broad range of recommendations for increased mobility and the creation of a sense of place within the Study areas for the cities of Watervliet and Troy. Priority projects were identified and described in detail which serve as a catalyst for future projects and redevelopment within both communities, create beneficial economic impacts for the cities, and increase the quality of life for residents.

Relationship to the Broadway Study Corridor:

Several priority projects recommended in the Congress Street Bridge Study impact the Broadway Study corridor, including:

- Creation of a 14-foot wide shared use path on the south side of Congress Street Bridge separated by motor vehicle traffic by an existing concrete barrier and a proposed landscape buffer with trees. **In March 2024, $2.16 million in federal funding was announced to advance this recommendation**;
- Intersection reconfiguration and improvements at 19th Street and 2nd Avenue in Watervliet to provide safer pedestrian accommodations and create a stronger gateway to Watervliet. Proposed improvements include reducing an eastbound through lane, incorporating a shared use path on the southside of the bridge, installing mountable truck aprons at all four corners of the intersection, and incorporating a pedestrian refuge island on the westbound approach;
- Creation of a southern connection to Hudson Shores Park through the construction of a bicycle and pedestrian underpass connecting 16th Street to Hudson Shores Park under I-787. From the intersection of the proposed tunnel with Broadway, protected bike lanes are recommended to connect west along 16th Street to 2nd Avenue;
- Traffic calming improvements along 23rd Street to connect 2nd Avenue and Hudson Shores Park; and,
- Installation of a protected two-way cycle track and raised center median along 2nd Avenue from 16th Street to 23rd Street. This proposed project also includes bookending the corridor with roundabouts to reduce vehicular speeds along 2nd Avenue, and mitigate left turn conflicts at driveways.

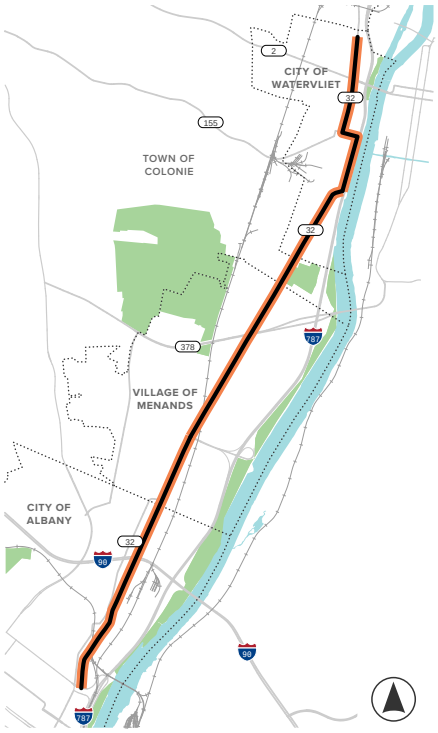
04 Albany County Climate Resiliency Plan

Year Completed:

2023

Link to Project Documents:

https://www.albanycounty.com/government/county-executive/albany-county-climate-resiliency-plan



Study corridor

Albany County Climate Resiliency Plan: Broadway Focus

Project Description:

The Albany County Climate Resiliency Plan provides a roadmap for Albany County (County), local municipalities, and other public and private entities to prepare for, adapt to, and minimize the impacts of flooding, sea level rise, extreme heat, and other severe weather events — all of which will be exacerbated by climate change. The County's Climate Resiliency Plan includes a comprehensive assessment of the impacts of climate change on the County's systems including the economy, infrastructure, health and social services, natural and cultural resources, housing, and vulnerable populations. Based on this assessment and feedback from interested and impacted parties and the public, the Climate Resiliency Plan identifies and describes a suite of inter-related capital projects, programs, and policies to build capacity and community resilience to the impacts of climate change.

Relationship to the Broadway Study Corridor:

One of the 20 recommended projects in the County's Climate Resiliency Plan proposes a county-wide analysis of the vulnerability of roadways and transportation systems to the impacts of climate change. As part of this project description, the Broadway / Route 32 corridor, from Clinton Avenue in Albany to 25th Street in Watervliet, is specifically identified as a regionally important, yet flood-prone corridor. The Climate Resiliency Plan makes the following recommendations along Broadway / Route 32:

- Incorporate green infrastructure along Broadway as well as on roads upstream of the corridor and along the Hudson River.
- Evaluate the feasibility of adding protected bike infrastructure and dedicated bus rapid transit (BRT) lanes along Broadway to promote multi-modal travel.
- Tie improvements on Broadway into ongoing projects (e.g., Reimagine I-787 and the Route 378 Bridge Study) to expand opportunities for flood mitigation / resiliency.
- Mitigate flooding along Patroon Creek (Creek) by taking measures upstream to impound or divert flow and/or by enlarging the Creek's current cross section, as well as increasing the permeable area of the Creek's watershed so that less runoff enters the Creek during rain events.

These recommendations are the reason that Albany County sought funding from the Capital Region Transportation Council to fund the Broadway Multimodal Resiliency Study.

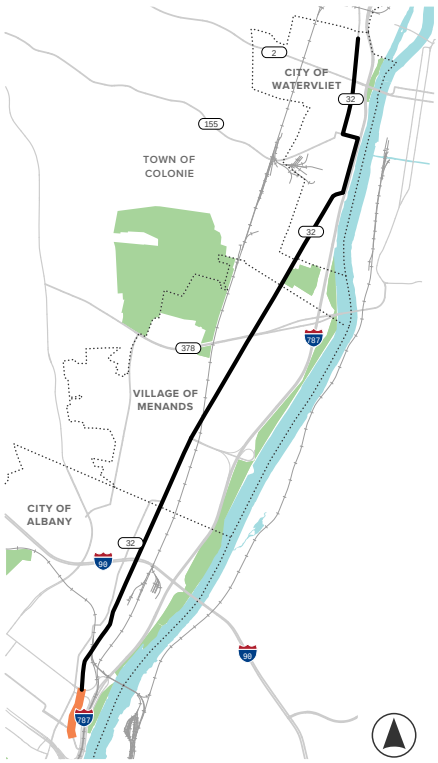
05 CDTA Bus Lane Feasibility Study

Year Completed:

2023

Link to Project Documents:

https://www.capitalmpo.org/wp-content/uploads/2023/11/BLFS-Final-Report-with-Appendices-sm.pdf



Project Description:

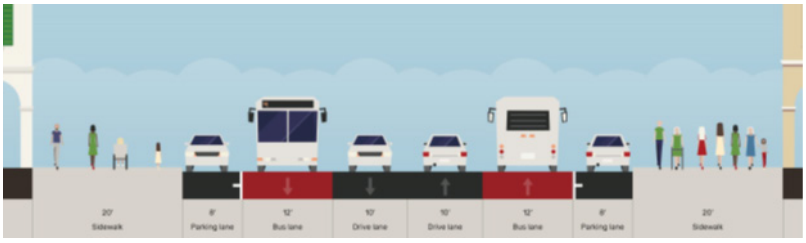
As part of the Capital Region's long range metropolitan transportation plan, the Capital Region Transportation Council and the Capital District Transportation Authority (CDTA) identified the use of bus only lanes and infrastructure improvements as potential tools to support the development of a high-performance regional transit system. As a result of the extensive community and public input, feedback, and comments, the final recommendation for each corridor includes a combination of bus, bike, and pedestrian improvements to improve safety for all users while increasing bus service performance. In each corridor this means that rather than having a single bus priority in a given segment, multimodal improvements should be pursued that prioritize pedestrian safety and comfort, bicyclist safety and comfort, and improve bus operations through targeted and tactical strategies.

Relationship to the Broadway Study Corridor:

Along Broadway, the following recommendations were made in the Bus Lane Feasibility Study (Study):

- Pedestrian improvements;
- Queue jump lanes;
- Bicycle infrastructure improvements; and
- Short tactical bus lanes on Broadway between State Street and Hudson Avenue

The Study's initial screening identified twelve priority corridors, three of which are located within the Resilient Broadway Study area (Albany Downtown Broadway, Albany Broadway, and Watervliet Broadway). Only the top five corridors were moved forward for preliminary concept design, including the Albany Downtown Broadway segment which extends from Hudson Avenue north to Clinton Avenue.



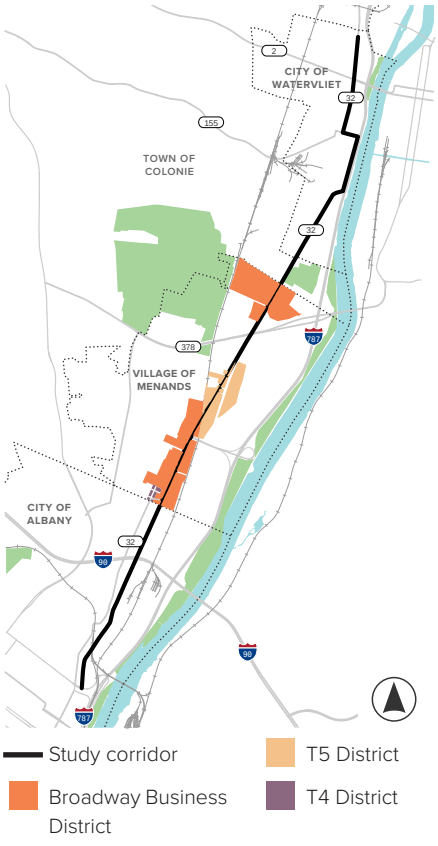
Conceptual design option for mid-block conditions on Washington/State/Broadway

06 Village of Menands Land Use Regulations

Year Completed:
2023

Link to Project Documents:

https://tinyurl.com/MenandsLURegs



Project Description:

The purpose of the Village of Menands (Village), New York Land Use Regulations Update was to develop zoning regulations consistent with the future land use vision presented in the Village's 2020 Comprehensive Plan and aligned with the needs of Menands' diverse community. With support from the Capital Region Transportation Council, the updated zoning regulations will guide future development in the Village of Menands and advance several goals relevant to the Broadway Multimodal Resiliency Study:

- Facilitate revitalization of vacant/underutilized parcels;
- Promote and improve walkability and transit use;
- Encourage mixed-use development;
- Foster compact design and development; and,
- Integrate complete streets standards and design guidelines.

Relationship to the Broadway Study Corridor:

Recognizing Broadway as the Village's main street, the Menand's updated zoning code includes several Broadway Corridor Form-Based Districts, which are described below.

- The **Broadway Business District (BBD)** allows mixed-use residential, commercial, and industrial development up to a height of four stories. Building placement in the BBD must create a consistent street wall that will provide a sense of enclosure, frame public space, and offset the physical and visual dominance of the roadway. Design principles include: focus on the buildings, design with the pedestrian in mind, keep things green, and create a local identity.
- The **Village Center District (T5)** is intended to create a recognizable Village Center with a strong mix of commercial and residential uses, with lower levels of buildings providing retail sales, restaurants, local services, and offices. Design principles are the same as the Broadway Business District.
- The **Neighborhood District (T4)** encourages new small-scale infill development incorporating a mix of unit types within a block grid typical of existing residential areas in Menands. Design principles include: maintain neighborhood scale, design with the pedestrian in mind, keep things green, and create a local identity.

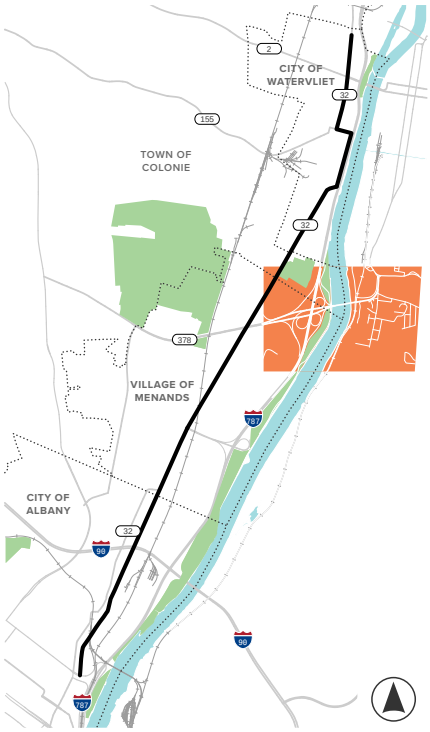
07 Route 378 Troy-Menands Bridge Study

Year Completed:

2024

Link to Project Documents:

https://www.dot.ny.gov/troymenandsbridge/reports



Study corridor

Route 378 Troy-Menands Bridge PEL Study Area

Project Description:

The New York State Department of Transportation (NYSDOT) Region 1 recently completed a Bridge Scoping/Planning and Environmental Linkages (PEL) Study, in conjunction with the Capital Region Transportation Council and the Federal Highway Administration (FHWA), for New York State (NYS) Route 378 (Troy-Menands Bridge) as approved in the 2019-2024 Capital Region Transportation Council Improvement Program (TIP). This year-long study assessed the engineering feasibility and environmental impacts associated with reconstructing the bridge at both its current location as well as alternative alignments. Ongoing growth along the nearby commercial U.S. Route 4 corridor, recurring traffic issues at multiple intersections, and steep elevation changes along this area have prompted NYSDOT to consider alternate locations for the new crossing. The findings from this PEL Study will ultimately feed into NYSDOT's Preliminary Engineering/National Environmental Policy Act (NEPA) phase once funding has been identified.

Relationship to the Broadway Study Corridor:

The Route 378 Troy-Menands Bridge PEL Study resulted in the generation of several conceptual alternatives, three of which will be evaluated as alternatives through the National Environmental Policy Act process (concepts 1, 3, and 4B). While none of the concept alternatives studied how Route 378 intersects with Broadway, there are several ways in which the concept alternatives impact the Broadway Study corridor:

- All concepts show a gain in open space west of the Hudson River with the reduction of the NYS Route 378/I-787 Interchange;
- All concepts show a reduction of impervious surface;
- Concepts 3 and 4B show an improved shared use path across the Hudson River;
- Concepts 3 and 4B show new accessible sidewalks and crossings
- All concepts would create temporary road closures during construction and potential impacts to traffic operations.

As the design of the Route 378 concept alternatives is advanced in a later phase, it should be noted that a future at-grade intersection of Route 378 and Broadway would create a direct connection between Menands and Troy for cyclists and pedestrians.

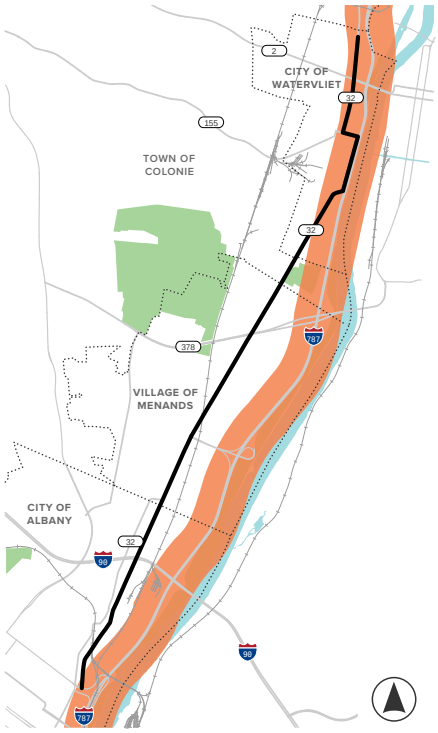
08 Reimagine I-787

Year Completed:

Ongoing

Link to Project Documents:

https://webapps.dot.ny.gov/reimagining-i-787



Study corridor

Reimagine I-787 Study Area *(approximate)*

Project Description:

The NYSDOT is undertaking a PEL Study to reimagine the Interstate 787 (I-787) Corridor and its relationship to the Hudson River. The Study expands on the previously completed I-787 Hudson Waterfront Study completed in 2018 by the Capital Region Transportation Council (Transportation Council). The PEL Study will build on the prior recommendations to identify potential future transportation strategies that support and balance economic development and revitalization efforts, including enhanced waterfront access, improved access between neighborhoods and to and from destinations, and increased connectivity for pedestrians and bicyclists.

The Reimagine I-787 Study area follows I-787 from its beginning U.S. Route 9W in south Albany north to the interchange with State Route 7 in the Town of Colonie.

Relationship to the Broadway Study Corridor:

Several conceptual alternatives are currently being evaluated in the southern portion of the Reimagine I-787 Study area, with a focus on improving access and connectivity to the Hudson River. The conceptual alternative with the most significant impact to the Broadway Study corridor includes the re-watering of the Erie Canal along Broadway and Water Street and the re-establishment of the lock system. The re-watering would transform Broadway into a waterway from Clinton Avenue south through Downtown Albany.

A concept to enhance public access to the Little River in the Village of Menands is also being explored through Reimagine I-787. The concept includes creating a publicly accessible recreation area along the Little River and the Hudson River. The concept also proposes new bicycle facilities along the village-owned historic Erie Canal alignment, which could provide an active transportation connection between Erie Boulevard in the City of Albany to East Elmwood Road and Broadway in Menands.

As Reimagine I-787 advances, the impacts of proposed conceptual alternatives on the Broadway Study corridor will be assessed.

Demographic Profile

This section provides a snapshot of the socio-demographic characteristics of the residents living along or near the Broadway Study corridor. Data presented in this section are aggregated to the U.S. Census Tract level and include population density, income, language, race, age, housing tenure, and commute information.

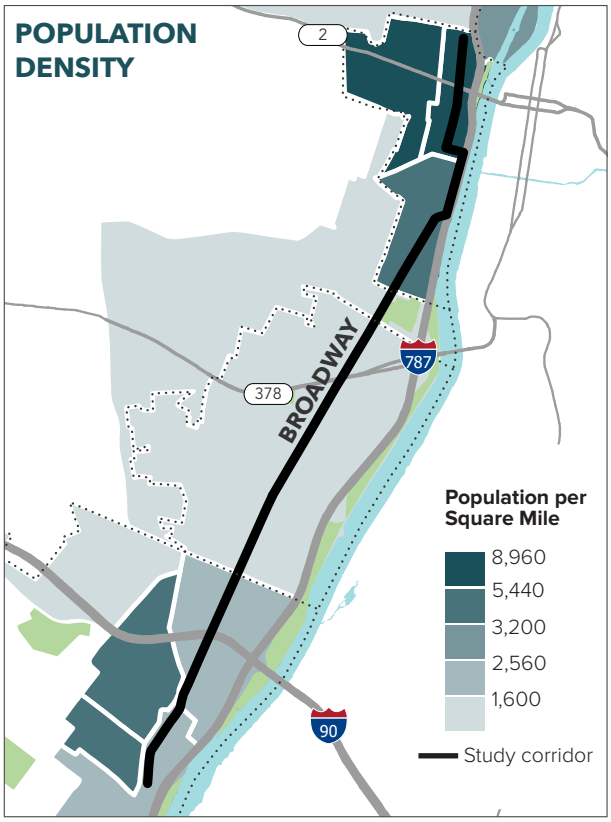
Analyzing demographic characteristics is an important consideration in planning for climate resiliency, active transportation, and transit needs. Understanding demographic trends within a community helps identify vulnerable populations who may be disproportionately affected by climate change impacts and transportation disparities. By understanding demographics such as age, race, income levels, and commute statistics, planners can ensure that resilience strategies and transportation options are accessible to all residents, mitigating the risk of exacerbating existing inequalities.

Understanding a community's demographic characteristics is also an important part of designing effective participatory decision-making processes. By involving residents from various demographic backgrounds in the planning process, the Broadway Multimodal Resiliency Study will gain valuable insights into the unique challenges and priorities of different communities, leading to more effective and culturally sensitive solutions.

This section breaks down various demographic indicators of the Broadway Study Corridor including age, race, income, limited English proficiency, housing, and commute trends. Many of the statistics included in this section were generated using ESRI Business Analyst, a demographic mapping software utilizing data from the American Community Survey (ACS) (2017-2021) as well as the 2020 Decennial Census. Using this tool, various demographic profiles were generated based on United States Census data collected for the Census Tracts overlapping with the half-mile buffer around the Broadway Study corridor.

Population Density

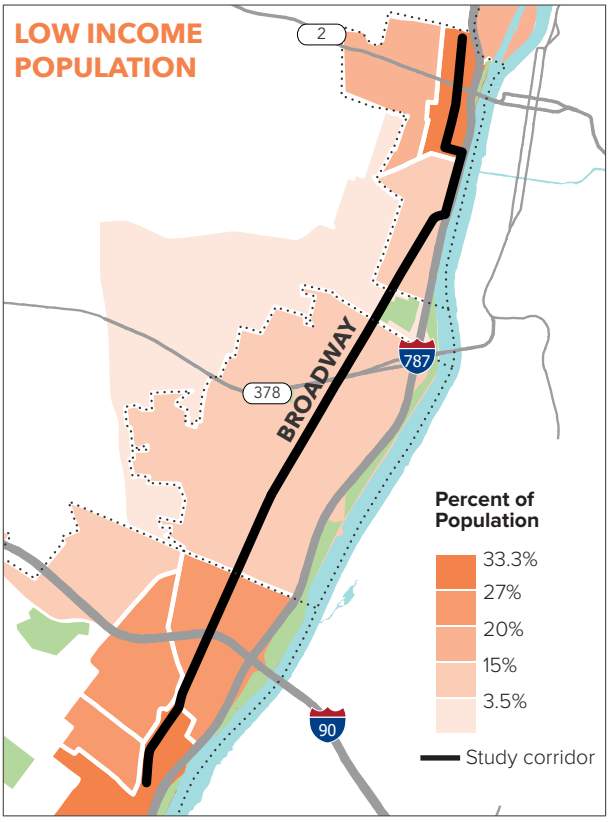
Population density varies along the length of the Study corridor. The most densely populated Census Tracts are in the City of Watervliet, where population density ranges from 5,440 to 8,960 people per square mile. Population densities are also relatively high in the City of Albany in the Ten Broeck, Arbor Hill and Clinton Avenue neighborhoods. Population density is relatively low in the Village of Menands and the Town of Colonie.



Income

Analyzing income trends of residents is a critical component of the planning process to identify and address socioeconomic disparities and ensure equitable access to opportunities, resources, and support. Low-income communities often lack the financial means to implement adaptive measures or recover from climate-related disasters, exacerbating existing vulnerabilities. By prioritizing the needs of economically disadvantaged residents in resilience strategies, communities can promote fairness, reduce inequality, and build stronger, more resilient societies for all members.

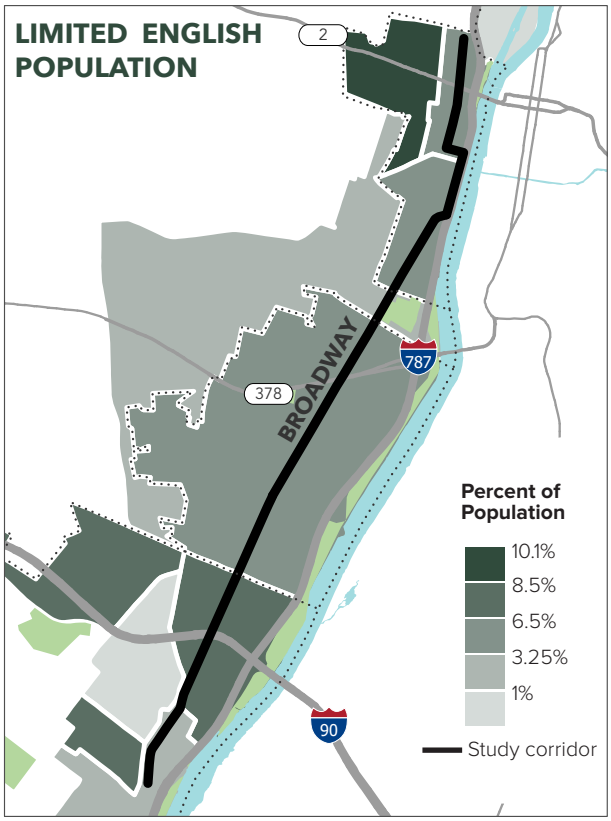
The northern and southern termini of the Broadway Study Corridor have the highest percent of low-income populations. One-third of those residing within Census Tract 11 in Downtown Albany are categorized as low-income households, while just over 30% of Watervliet residents within Census Tract 132 are part of low-income households.



Limited English

Considering the languages spoken by residents is an important factor to consider when planning for the climate resiliency of a community to ensure effective communication and access to vital information. Language barriers can hinder residents' understanding of climate risks, evacuation procedures, and available support services during climate-related emergencies. By providing multilingual resources, translation services, and culturally competent outreach, communities can empower linguistically diverse populations to actively engage in resilience efforts, fostering inclusivity and enhancing overall preparedness and response capabilities.

Census Tract 133 in Watervliet, just west of the Broadway Study Corridor, has the highest percentage of limited English-speaking residents at 10.1%. The City of Albany has the next highest percentage of limited English-speaking residents — Census Tract 2.01 at 8.5%, Census Tract 3.02 at 8.2%, and Census Tract 1 at 7.9%.



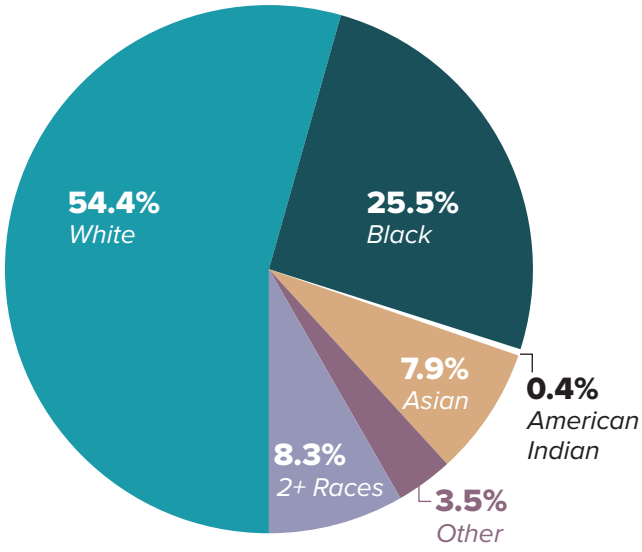
Race

It's essential to consider race statistics within a community to address systemic inequalities and ensure equitable outcomes. Marginalized racial and ethnic groups often bear the brunt of environmental hazards due to factors like historical segregation, economic disparities, and limited access to resources. By incorporating race-conscious approaches into resilience planning, communities can identify and rectify these disparities to build more resilient and inclusive societies.

Of the total population of the Census Tracts intersecting the Study area, 54.4% of respondents indicated their race as white, 25.5% reported their race as Black, 7.9% are Asian, and 8.3% reported two or more races. A full breakdown of information reported related to Population by Race can be seen in the accompanying graphic (Figure 2.1).

The highest concentrations of minority populations within the Broadway Study area are located within Downtown Albany — Census Tracts 2.02 and 2.01 report 81.1% minority populations while Census Tract 1 has 79.1% minority population.

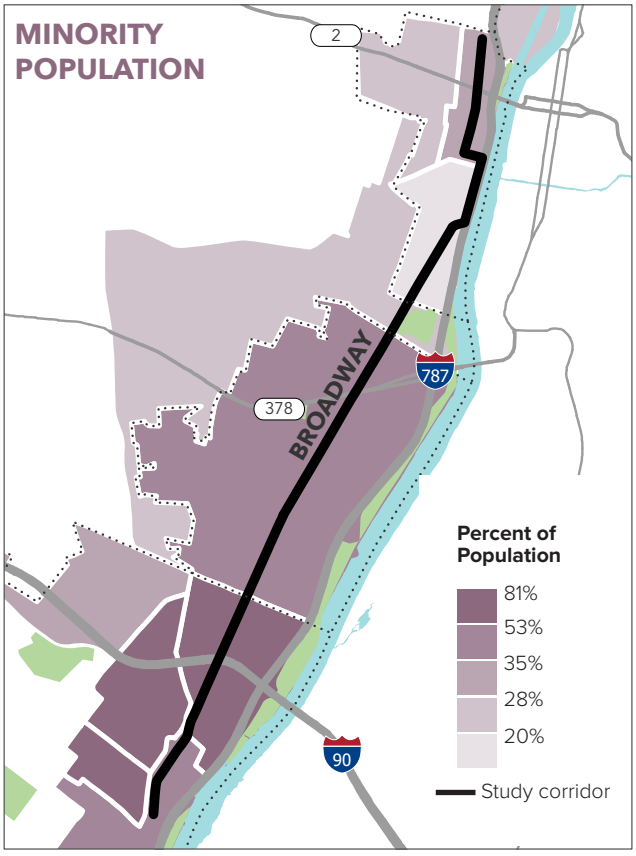
Figure 2.1 - Population by Race



Age

Different age groups have varying vulnerabilities and capacities to cope with climate-related hazards or events. For instance, an aging population may face challenges related to mobility, health, and access to resources during extreme weather events, while children may require special attention and protection. Tailoring resilience strategies to accommodate the needs of diverse age groups can enhance community preparedness and mitigate the disproportionate impact of climate change on vulnerable populations.

A majority of the population residing within the Study area Census Tracts are 20-29 years old (16.7%), followed by those 30-39 years of age (15.4%), then ages 50-59 (12.4%). 7,911 residents within this area are under the age of 18, making up 20.9% of the total population. Those 65 years and older make up 14.6% of the population. Special attention should be paid to the needs of these two age groups as they tend to be vulnerable to climate risks and accessible transportation opportunities.



Housing

The quality, design, and location of housing greatly influence residents' ability to withstand and recover from extreme weather events such as floods, storms, and heatwaves. By implementing measures such as retrofitting, zoning regulations, and affordable housing initiatives, communities can enhance the resilience of their housing stock, safeguarding residents' safety, well-being, and economic stability in the face of climate change.

There were a total of 19,862 housing units reported for the 2020 Census. Of these, 88% (17,485) are occupied while 12% (2,377) were reported as vacant. Out of the 17,485 households reported, single-person households are most common (41.4%). 11,297 households (65%) are renter-occupied while the remaining 6,188 households (35%) are owner-occupied. The most common household type within the Study area Census Tracts is a female householder reporting to have no spouse or partner present in the household, which accounts for 6,530 (37.3%) of all households.

Commute

Understanding how people travel to work, school, and other essential destinations informs the development of sustainable transportation infrastructure, such as bike lanes, public transit systems, and pedestrian-friendly pathways. By promoting alternative modes of transportation and reducing dependency on fossil fuel-powered vehicles, communities can mitigate the impacts of climate change, improve air quality, and increase overall resilience to transportation disruptions caused by extreme weather events.

The ESRI Community Analyst commute profile provides information about how the population in a given area travels to work and includes residents aged 16 years and above. Using ESRI Business Analyst a commute profile was generated for the Study area and included commute information from 18,709 working residents (see Table 2.1). A majority of this population drives alone to commute to work (68.9%), followed by carpooling (10.8%), then public transportation (8.1%). 5.4% of this population indicated they walk to work, while 0.2% bike to work. Just over 23% of the working population in the Study area spends 15-19 minutes commuting, followed by 10-14 minutes (just over 19%), with the third most common commute time being 20-24 minutes (17%).

Table 2.1 - Commute Profile

Commute to Work	Study Area	Albany	Menands	Watervliet
Drive Alone	**68.9%**	56.6%	80.8%	73.4%
Carpool	**10.8%**	10.2%	4.8%	9.4%
Public Transit	**8.1%**	12.3%	3.1%	8.0%
Walk	**5.4%**	9.8%	3.6%	5.9%
Bike	**0.2%**	0.6%	0%	0%
Other*	**6.6%**	10.5%	7.7%	3.3%

**not included in ESRI Community Analyst Commute Profile*

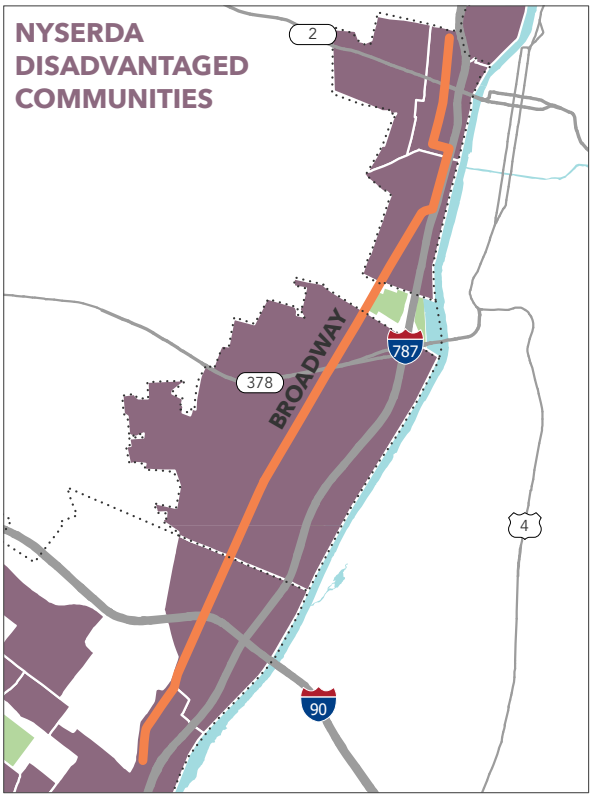
Vulnerable Populations

Identification of potentially vulnerable populations in the Study Area will help allocate resources and prioritize investments in areas that have been historically underserved and impacted by disinvestment. By identifying areas with high concentrations of vulnerable populations or inadequate transportation infrastructure, community leaders can target interventions to enhance climate resilience and improve transportation options where they are most needed.

New York State Disadvantaged Communities

New York's Climate Act recognizes that climate change doesn't affect all communities equally. The Climate Act charged the Climate Justice Working Group (CJWG) with the development of criteria to identify disadvantaged communities to ensure that frontline and otherwise underserved communities benefit from the state's historic transition to cleaner, greener sources of energy, reduced pollution and cleaner air, and economic opportunities.

Census tracts overlapping the Broadway Study area within Albany, Menands, and Watervliet are identified as disadvantaged communities by New York State.



Development Patterns

Land development patterns provide a high level snapshot of how the Study area is used, including where people live, work, and access public spaces. The way in which land is developed also plays a major role in how people travel — large, expansive lots with single uses encourage personal vehicular use whereas a diverse mix of small-scale uses that engage the street encourages walking, biking, and transit use.

Land Use

There are a wide variety of land uses present within the Broadway Study area (Figure 2.2). Commercial properties are the most common land uses (35.8% of all land uses), followed by residential properties (20.2% of all land uses), and vacant land (14.4% of all land uses). Community services (13%), public services (8.2%), and industrial uses (4.4%) comprise a relatively small proportion of land uses in the Study area. Public parks, conservation areas, and recreational uses comprise the smallest proportion of land uses in the Study area (4%) and include: Schuyler Flatts Cultural Park, Reds Field, Mayor Hugh F. Donnelly Erie Canal Side-Cut Park, 15th Street Park, the Watervliet Pool, and Watervliet Veterans Memorial Park.

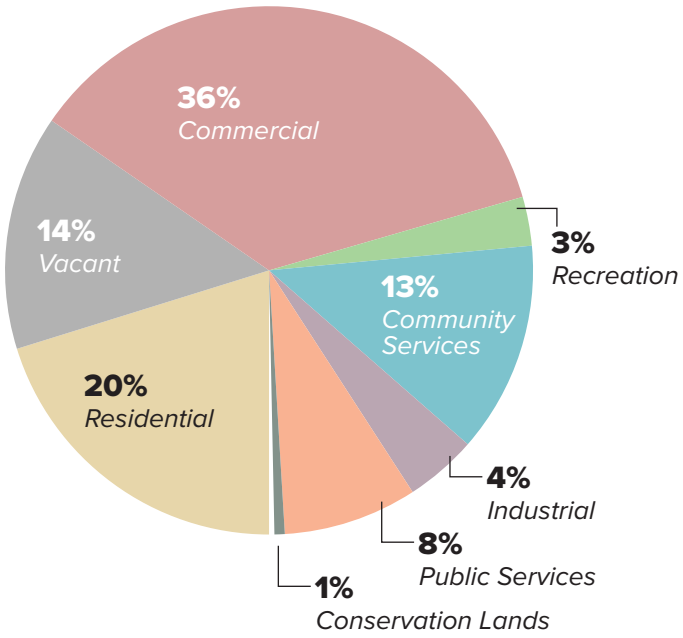
City of Albany

In Albany, the land uses fronting Broadway are predominantly commercial, with industrial and residential uses intermixed. Notably, many of the former vacant industrial uses between North Ferry Street and Bridge Street have been converted to food and beverage uses over the past decade, with a focus on the craft beverage industry. At the southern end of the Study corridor, new apartment units have recently been constructed or are currently under construction on the edge of downtown Albany between Clinton Avenue and Livingston Avenue. In North Albany, immediately south and north of the I-90 overpass, the scale of residential development along Broadway is more fine grained, with detached single and multi-family homes fronting the Study corridor.

Village of Menands

Similar to Albany, the majority of land uses with frontage along Broadway are commercial and residential, many of which include large surface parking lots. Within the Study area, most residential uses are located west of Broadway, and the areas between Broadway and the Hudson River include large-scale commercial, community and public services, and vacant land.

Figure 2.2 - Distribution of Land Use in the Study Area

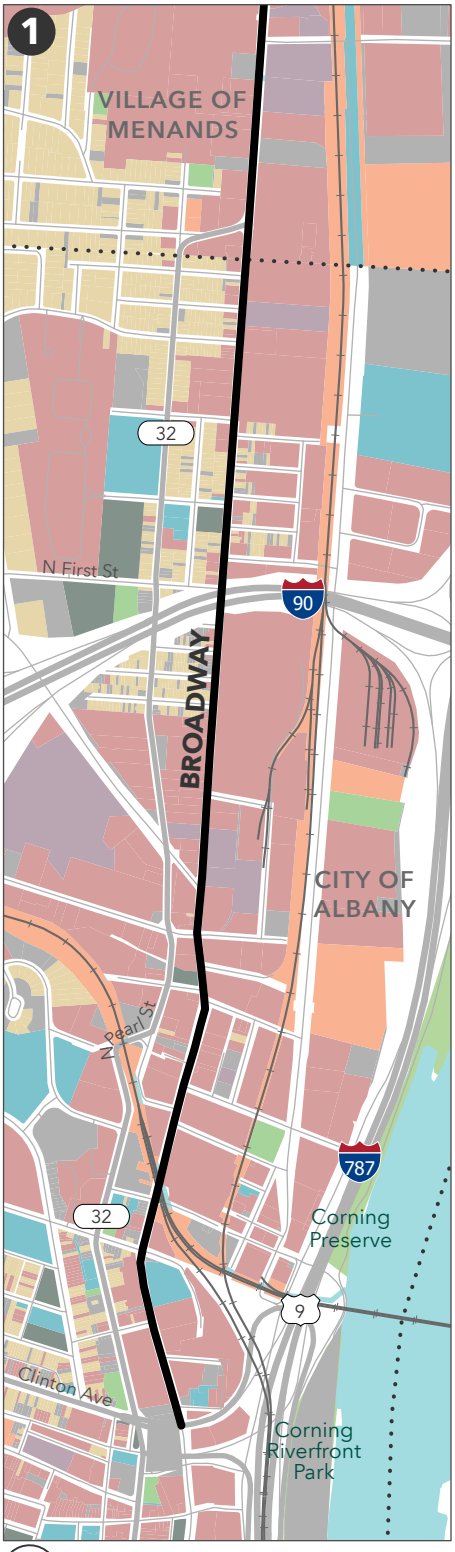


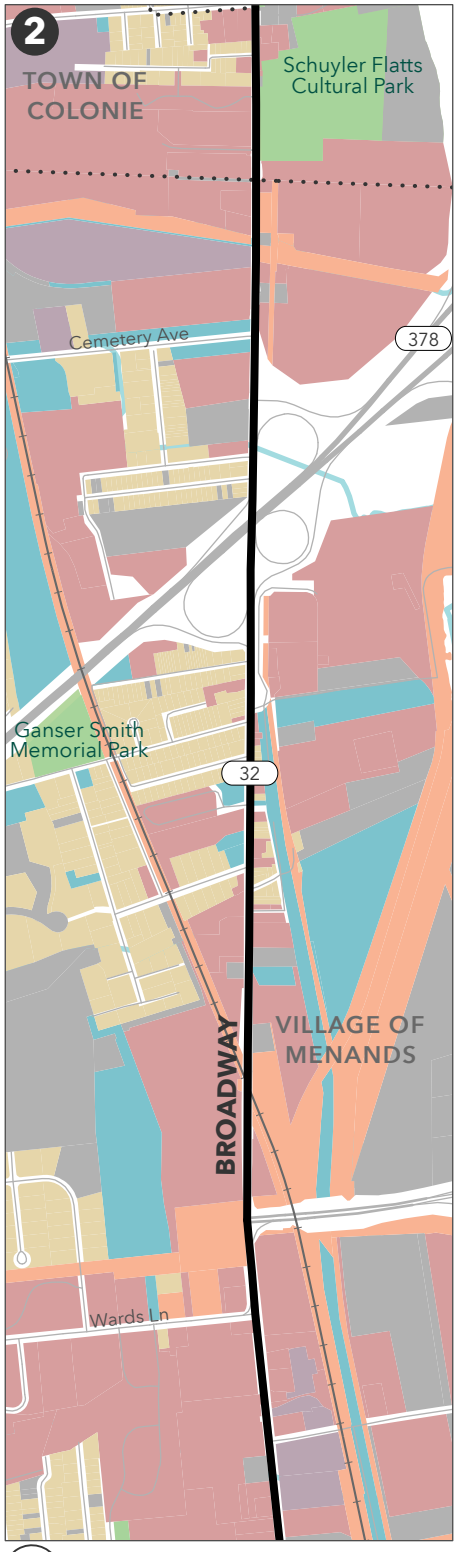
Town of Colonie

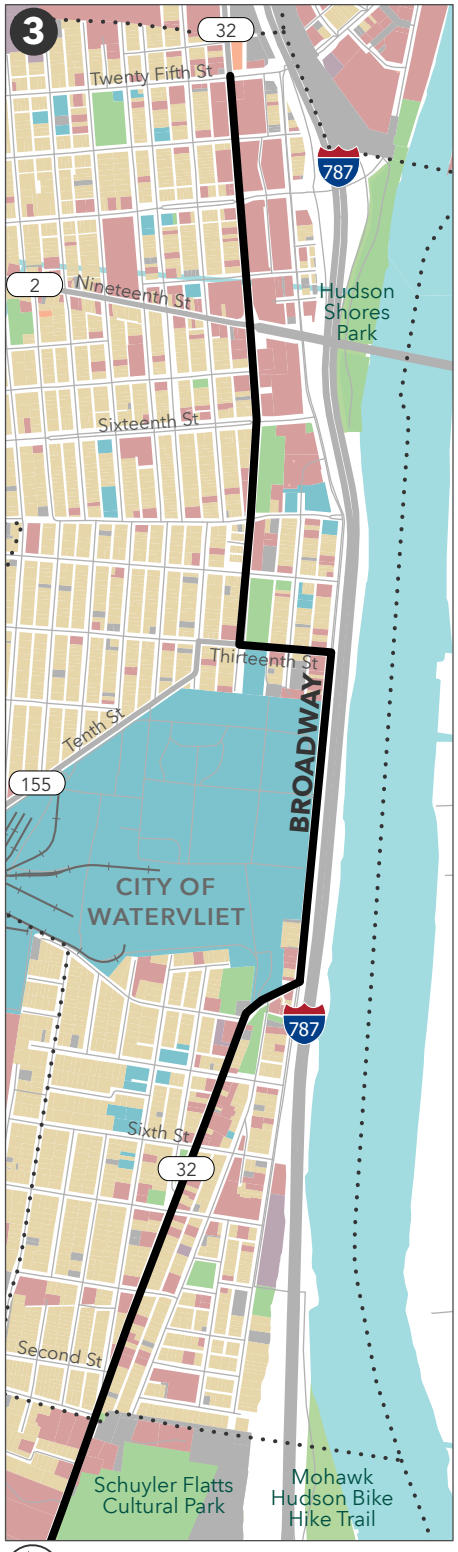
Land uses in the Town of Colonie along Broadway include the Schuyler Flatts Cultural Park, commercial uses on either side of Broadway, and vacant property between Schuyler Flatts Cultural Park and the Hudson River. Residential uses are concentrated west of Broadway.

City of Watervliet

In Watervliet, the scale of development is much more dense than Menands or north Albany. Smaller scale commercial uses are concentrated along and around the Study corridor. A mix of residential and recreational uses also occur along the Study corridor, including the Veterans Memorial Swimming Pool and several Watervliet Housing Authority properties. The Watervliet Arsenal introduces a large continuous tract of community service uses along the Study corridor.





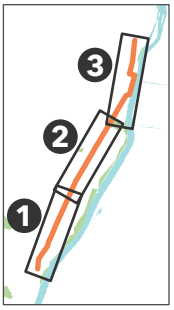


Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:17 PM

Albany County Broadway Multimodal Resiliency Plan

Land Use

- Residential
- Vacant Land
- Commercial
- Recreation and Entertainment
- Community Services
- Industrial
- Public Services
- Wild, Forested, Conservation Lands, and Public Parks



Zoning

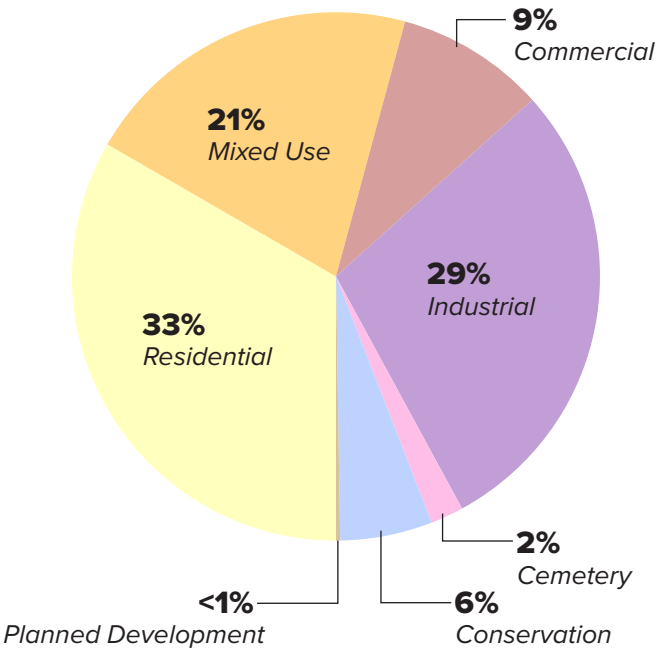
Zoning is a land use regulation tool that municipalities use to define where particular uses are allowed or prohibited. Zoning can also be used to regulate the form of the built environment as well as the relationship between the built environment and the streetscape.

All of the municipalities in the Study area have zoning ordinances. The zoning codes in the Village of Menands and the City of Albany have recently been updated and include a combination of form-based requirements and land use regulations that encourage more mixing of uses, development and building forms that engage the streetscape.

In order to compare zoning districts across multiple municipalities, this section utilizes a zoning classification developed by Albany County, which broadly defines the uses allowed in each district. When discussing the Albany County zoning classification, the local municipality's zoning district is always notated in parentheses.

The most common zoning districts within the Broadway Study area (Figure 2.3) are residential (33.3% of all zoning districts), industrial (28.7% of all zoning districts), and mixed use (20.9% of all zoning districts).

Figure 2.3 - Distribution of Zoning Districts in the Study Area



City of Albany

In the City of Albany, nearly all parcels along the Study corridor are zoned Mixed Use (MU-CH, MU-CI, MU-CU, MU-DT, MU-FW, MU-FW, MU-NC, and MU-NE). To the west of the Study corridor and north of I-90, Residential zoning districts predominate. Industrial zoning districts are confined to the rail corridors and waterfront areas north of I-90 and east of the Study corridor.

Village of Menands

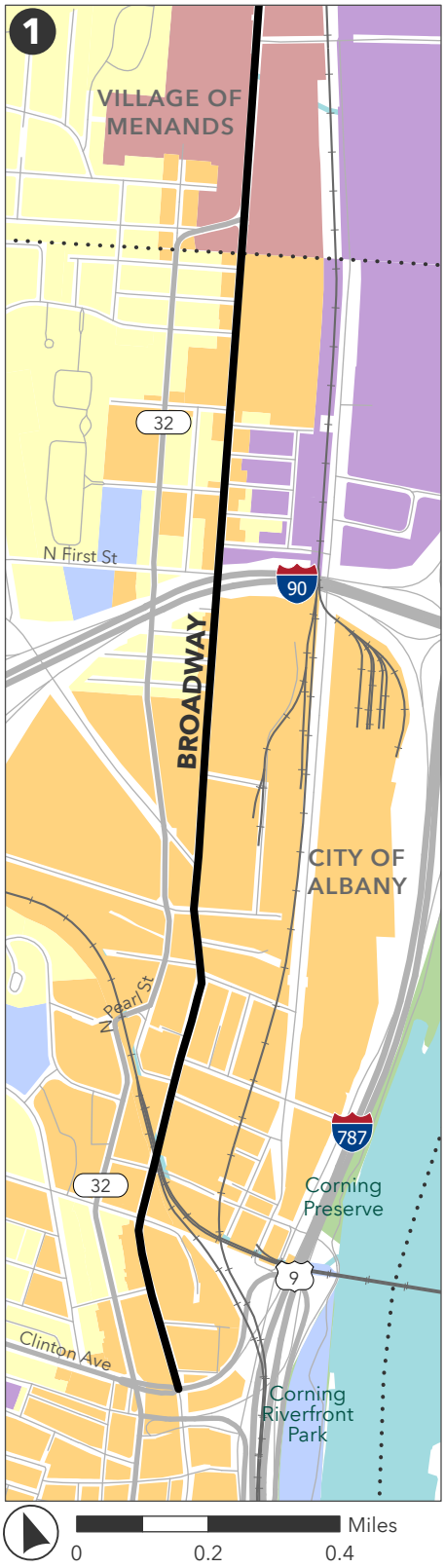
Within the Village of Menands, parcels are primarily zoned Commercial (BBD) and Mixed Use (T5), with smaller areas of Residential (R1-M, R4, R2A, R3) and Industrial (LI-M) zones along Broadway. As noted in the Existing Related Plans and Projects section, Menands recently updated its zoning code and the Broadway Business District (BBD) focuses on creating a more walking, pedestrian-friendly streetscape along the Broadway corridor.

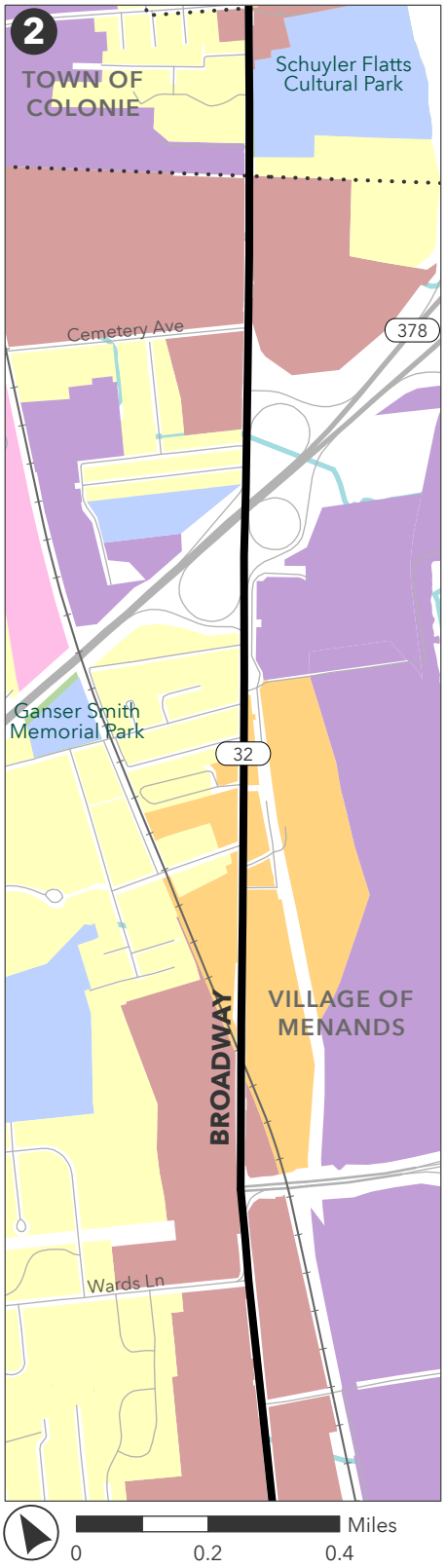
Town of Colonie

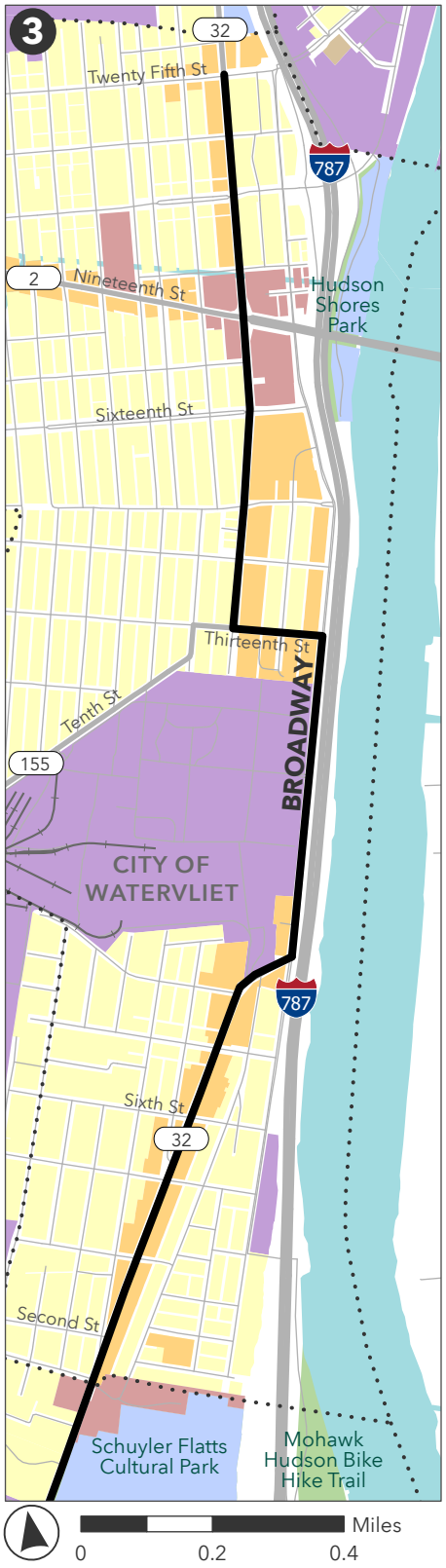
Schuyler Flatts Cultural Park is the largest parcel in a Conservation zoning district along the Study corridor. On the west side of the Study corridor, parcels are zoned Residential (MFR, SFR) or Industrial.

City of Watervliet

In Watervliet, the southern end of the Study corridor is primarily Mixed Use (MU1) zoning and transitions to Industrial (L-I) zoning at the Watervliet Arsenal. North of the Watervliet Arsenal, there is a mix of Mixed Use (MU1) and Residential (R-2) zoning. As the Study corridor approaches 19th Street in Watervliet, there are more Commercially-zoned (B) properties. North of 19th Street, the Study Corridor is split between Mixed Use (MU2) zoning on the west side of the roadway and Residential (R-3) zoning on the east side of the roadway.





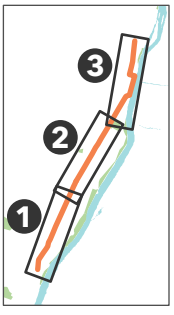


Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:04 PM

Albany County Broadway Multimodal Resiliency Plan

Zoning

- Residential
- Mixed Use
- Commercial
- Industrial
- Recreation
- Cemetery
- Conservation
- Planned Development



Zoning Code Overlays

There are three zoning overlays present within the Broadway corridor Study area. The floodplain overlay, historic resources overlay, and combined sewer overlay all impact the southern end of the Study corridor in the City of Albany.

Floodplain Overlay

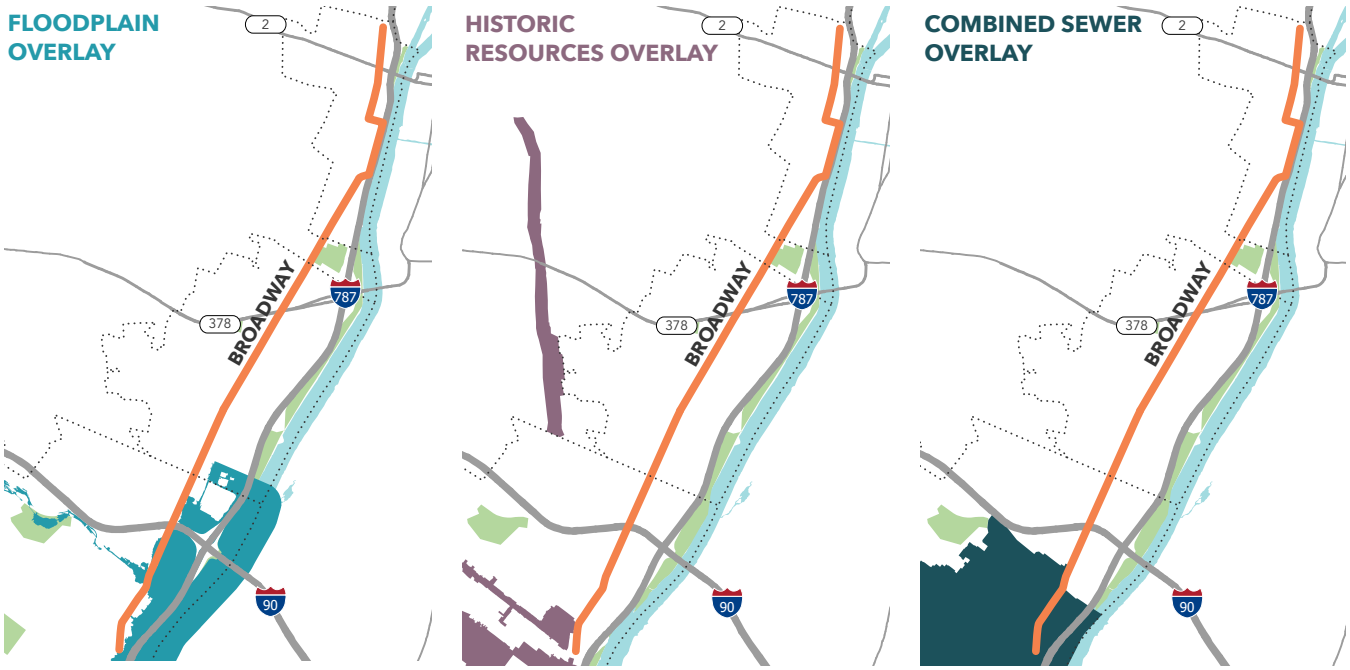
The purpose of the Flood Plain Overlay District is to ensure that development in floodplains defined by Federal Emergency Management Agency (FEMA) complies with all applicable FEMA regulations to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas. This overlay includes a majority of the area to the east of the Study corridor in Albany.

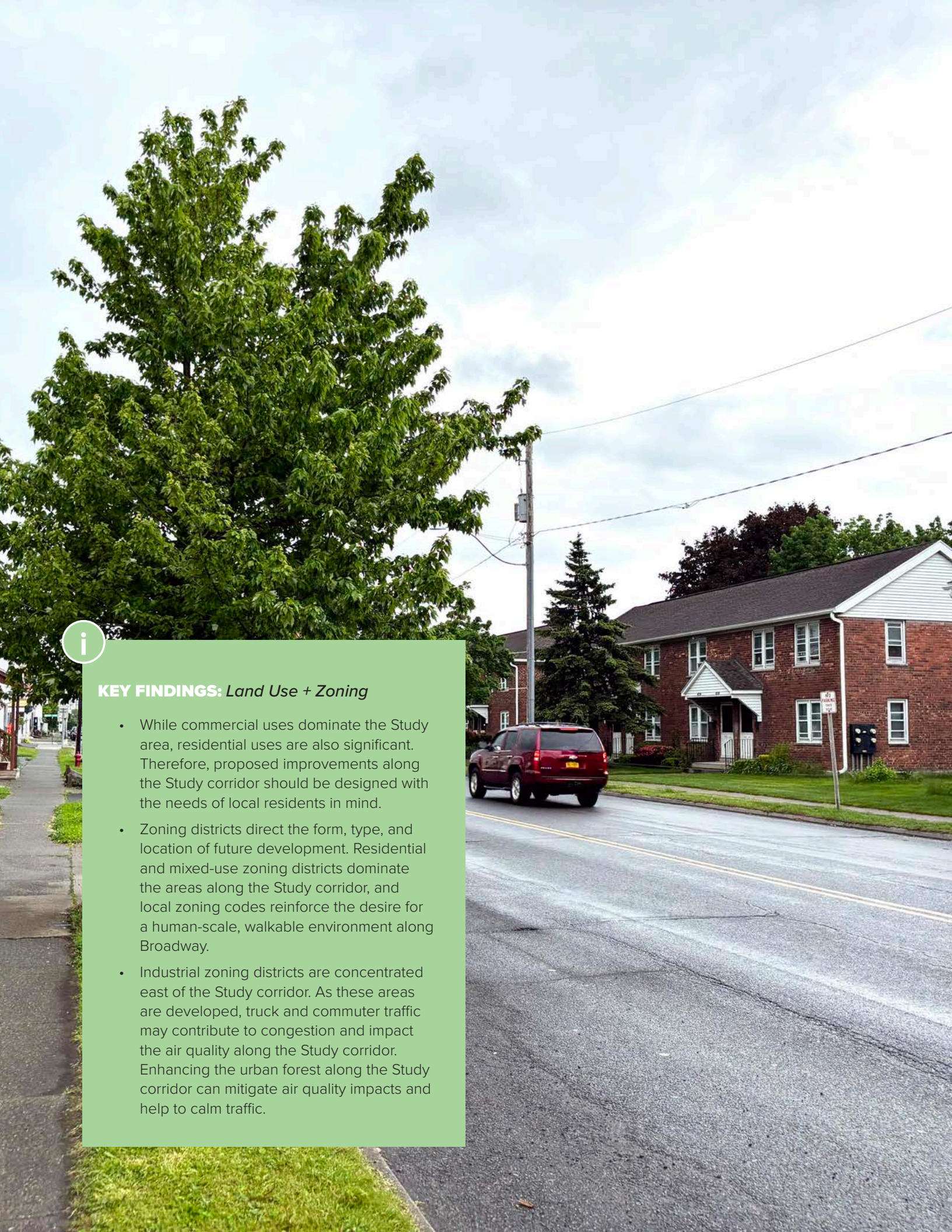
Historic Resources Overlay

The purpose of the Historic Resources Overlay is to promote the general welfare by providing for the identification and protection of buildings and sites that reflect special elements of historical, architectural, cultural, economic or aesthetic heritage. This overlay includes areas along Clinton Avenue to the west of the Study corridor.

Combined Sewer Overlay

The purpose of the Combined Sewer Overlay District is to mitigate impacts of new development and redevelopment on combined sanitary/storm sewer system and to ensure compliance with applicable consent orders regarding management of stormwater flows. This overlay applies to a majority of the parcels in the Study area south of I-90 in Albany.





KEY FINDINGS: *Land Use + Zoning*

- While commercial uses dominate the Study area, residential uses are also significant. Therefore, proposed improvements along the Study corridor should be designed with the needs of local residents in mind.
- Zoning districts direct the form, type, and location of future development. Residential and mixed-use zoning districts dominate the areas along the Study corridor, and local zoning codes reinforce the desire for a human-scale, walkable environment along Broadway.
- Industrial zoning districts are concentrated east of the Study corridor. As these areas are developed, truck and commuter traffic may contribute to congestion and impact the air quality along the Study corridor. Enhancing the urban forest along the Study corridor can mitigate air quality impacts and help to calm traffic.

Public Land Ownership

While a majority of properties along the Broadway Study corridor and within the half-mile buffer are privately-owned, there is approximately 630 acres of publicly-owned land (Figure 2.4):

- Combined, Albany, Watervliet, Menands, Colonie, and Green Island own approximately 385 acres within a half-mile of the Broadway Study corridor;
- Albany County owns approximately 92 acres within a half-mile of the Broadway Study corridor;
- New York State owns approximately 15 acres within a half-mile of the Broadway Study corridor; and,
- The Federal Government owns approximately 138 acres within a half-mile of the Broadway Study corridor.

City of Albany

At the intersection of Broadway and Clinton Avenue, there are several properties owned by the City of Albany, including the building housing the Irish American Heritage Museum and Discover Albany Visitors Center, a parking garage, and the new Clinton Square Park. At the northwest corner of the intersection of Broadway and Pleasant Street, there is a small open space property owned by the City of Albany, which includes a BusPlus stop. A similar city-owned property is located on the southwest corner of the intersection of Broadway and North 2nd Street.

Village of Menands

The Village of Menands owns several properties along the Study corridor, including the Menands Fire Department, the Village Clerk's Office, Polk Switzer Park, and the Menands Water Pumping Department. The Village also owns a long, linear parcel that extends north from I-787 Exit 6 to the intersection of Canal Road and Broadway.

Town of Colonie

The Town of Colonie owns the Schuyler Flatts Cultural Park property as well as vacant land in the vicinity of Schuyler Lane, just south of the border with Watervliet and immediately adjacent to the east side of Broadway.

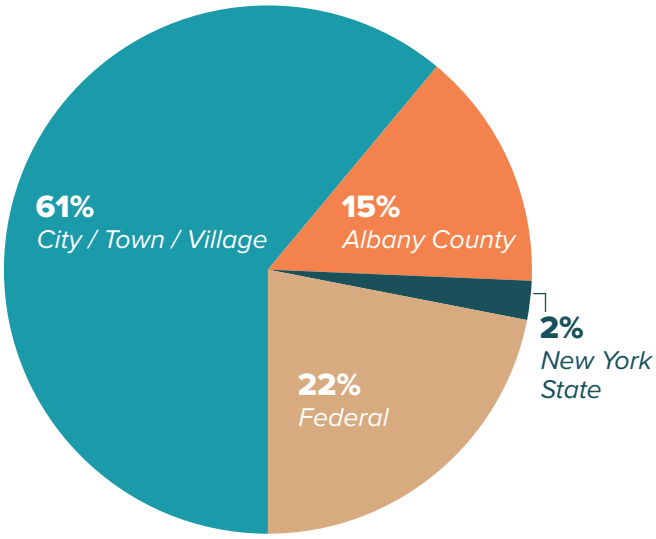
City of Watervliet

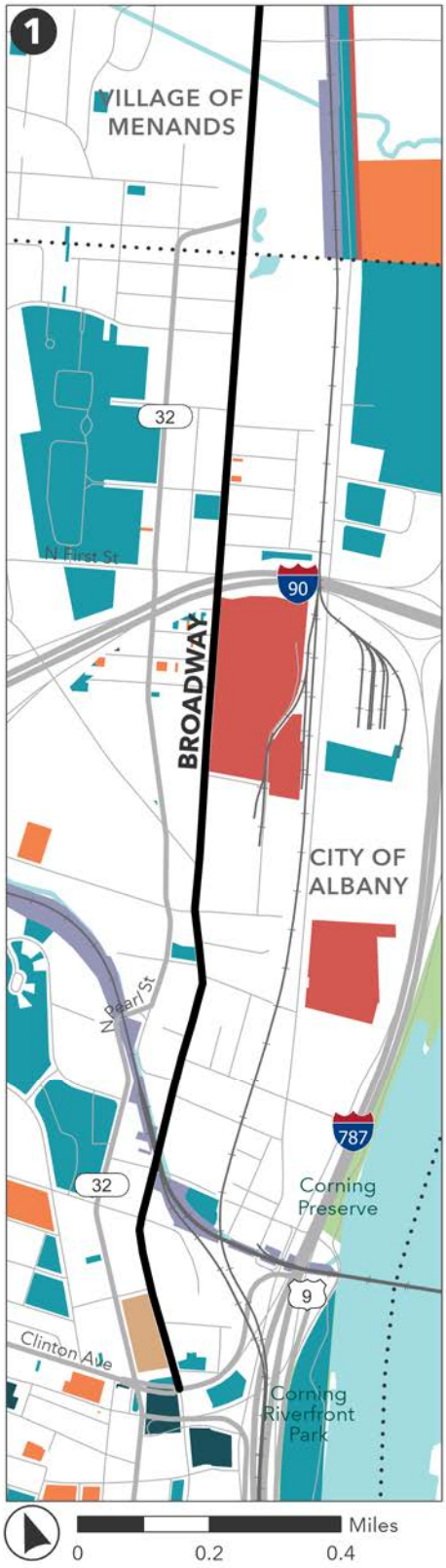
The City of Watervliet owns a small parcel of land just north of the intersection with Schuyler Lane which is largely vacant with grass, trees, and a gateway sign announcing to roadway users they are entering the City of Watervliet. The City owns several parks and open space properties along the corridor, including: one located at the southwest corner of the intersection with 6th Street, Reds Field, Mayor Hugh F. Donnelly Erie Canal Side-Cut Park, the Watervliet Dome, 15th Street Park, and the Watervliet Veterans Memorial Park and Pool. The City of Watervliet also owns the Watervliet Fire Department property located on the south side of 13th Street. At the north end of the Study corridor, the Watervliet Housing Authority owns several apartment buildings between 21st and 25th Streets.

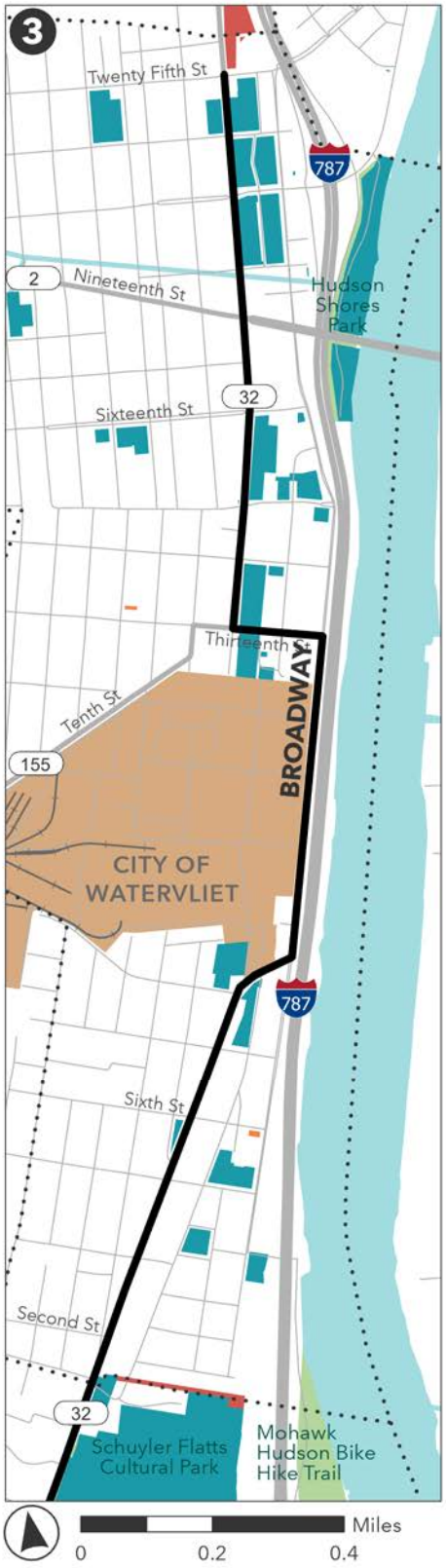
Albany County-Owned Properties

While there are no county-owned properties located directly along the Study corridor, there are several parcels owned by Albany County within the one-half mile buffer around the Study corridor. Primary landowners of these properties include: Albany County, Albany County Land Bank Corporation, Albany County Historical Association, and Albany County Water Purification District. Most county-owned property is located in the southern portion of the Study area in the City of Albany and Village of Menands.

Figure 2.4 - Distribution of Publicly-Owned Land in the Study Area







Map developed by Byer Planning, LLC. Date Exported: 6/10/2024 4:47 PM

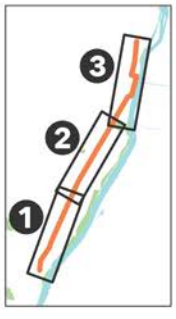
Albany County Broadway Multimodal Resiliency Plan

Public Land Ownership

- Albany County
- City / Town / Village
- New York State
- Federal Government

Private Land Ownership

- Electric Utility
- Railroad
- Other



Public Land Ownership (cont.)

Federally-Owned Properties

The federal government owns two large properties along the Study corridor. Just north of the intersection of Broadway and Clinton Avenue, there is a federally-owned property which houses a number of offices, including the United States (U.S.) Social Security Administration and the U.S. Department of Labor. At the northern end of the Study corridor, the U.S. Army owns and operates the Watervliet Arsenal. The arsenal is the oldest, continuously active arsenal in the United States. The Watervliet Arsenal also includes the U.S. Army's Combat Capabilities and Development Command Benet Laboratories — a research and design facility for large caliber weapons.

Private Land Ownership

A majority of the land (approximately 84%) along and within one-half mile of the Broadway Study corridor is privately-owned by different entities and individuals.

Railroads and utilities own several large parcels along the Study corridor as well as long linear parcels that intersect with or run roughly parallel to the Study corridor. These large privately-owned parcels house and carry critical infrastructure, and pose both constraints and opportunities for the Broadway Multimodal Resiliency Study.

Railroad Properties

CSX Transportation Inc. owns the railroad corridor located in the southern end of the Study area in the City of Albany. The CSX railroad carries high-speed Amtrak trains and crosses the Broadway Study corridor above-grade just north of Colonie Street.

The Delaware and Hudson Railway Company owns the railroad corridors in the Village of Menands. In addition to an active rail line that crosses below Broadway near the Riverview Center (150 Broadway), the Delaware and Hudson Railway owns a long linear parcel east of Broadway and parallel to the Hudson River comprised of private roads and forested, vacant property.

Utility Properties

National Grid owns two large parcels in the City of Albany: a large substation east of Broadway along Erie Boulevard near the intersection of Thatcher Street and the property at 1125 Broadway, which includes office buildings, warehouses and garages, and a substation. At the north end of the Study corridor, National Grid also owns a smaller parcel in the City of Watervliet at the northeast corner of the intersection of 2nd Avenue and 25th Street.

Niagara Mohawk Power Corporation owns several long, linear electrical transmission corridors that parallel and intersect the Study corridor, primarily in the Village of Menands. One of these transmission corridors is immediately adjacent to the vacant Delaware and Hudson Railway corridor that runs roughly from I-787 Exit 6 northeast towards the Hudson River.

KEY FINDINGS: *Land Ownership*

- A majority of the land along the Study corridor is privately-owned. If improvements are proposed as part of this Study that go beyond the Study corridor public right-of-way, land acquisition or an easement will likely be required.
- The long, linear north-south corridors in the Village of Menands located between the Study corridor and the Hudson River owned by the Village, Delaware and Hudson Railway Company, and Niagara Mohawk Power Corporation could be opportunities to connect the Study corridor to the Hudson River.
- Publicly-owned park and open space along the Study corridor provides opportunities to expand active transportation infrastructure, green infrastructure, and the urban forest into these areas to mitigate flooding and extreme heat and expand recreational resources.
- As a major employer and with multiple frontages along the Study corridor, the Watervliet Arsenal will be an important stakeholder in this Study.


CENTER
LANE
ONLY

Impervious Surface

Impervious surfaces are a dominant feature within one-half mile of the Study corridor. Impervious surfaces are comprised of buildings, pavement, and other materials that prevent water from reaching the soil and being absorbed into the ground. Instead, when it rains or during a flood, water flows over impervious surfaces until it reaches a catch basin or permeable surface where it can be absorbed into the ground.

Approximately 41% of the Study area is covered by impervious surfaces. Of these impervious surfaces, buildings and surface parking lots are the most abundant (see Table 2.2 below). Smaller buildings are concentrated in the densely developed City of Watervliet, while large buildings and surface parking lots dominate much of the landscape in North Albany and the Village of Menands.

Roadways and sidewalks comprise approximately 28% of all impervious surfaces in the Study area. These roadways include both local streets and larger regional corridors, such as I-90, I-787, State Highway 378, and the Study corridor itself.

Conversely, most permeable land cover (e.g., open space, parks) is concentrated to the east of the Study corridor in the Village of Menands along the Hudson River. To the west of the Study corridor, permeable surfaces are concentrated in the forested, vacant lot owned by the Village of Menands immediately west of the Menands Elementary School, in the Saint Agnes Cemetery, and in the Albany Rural Cemetery.

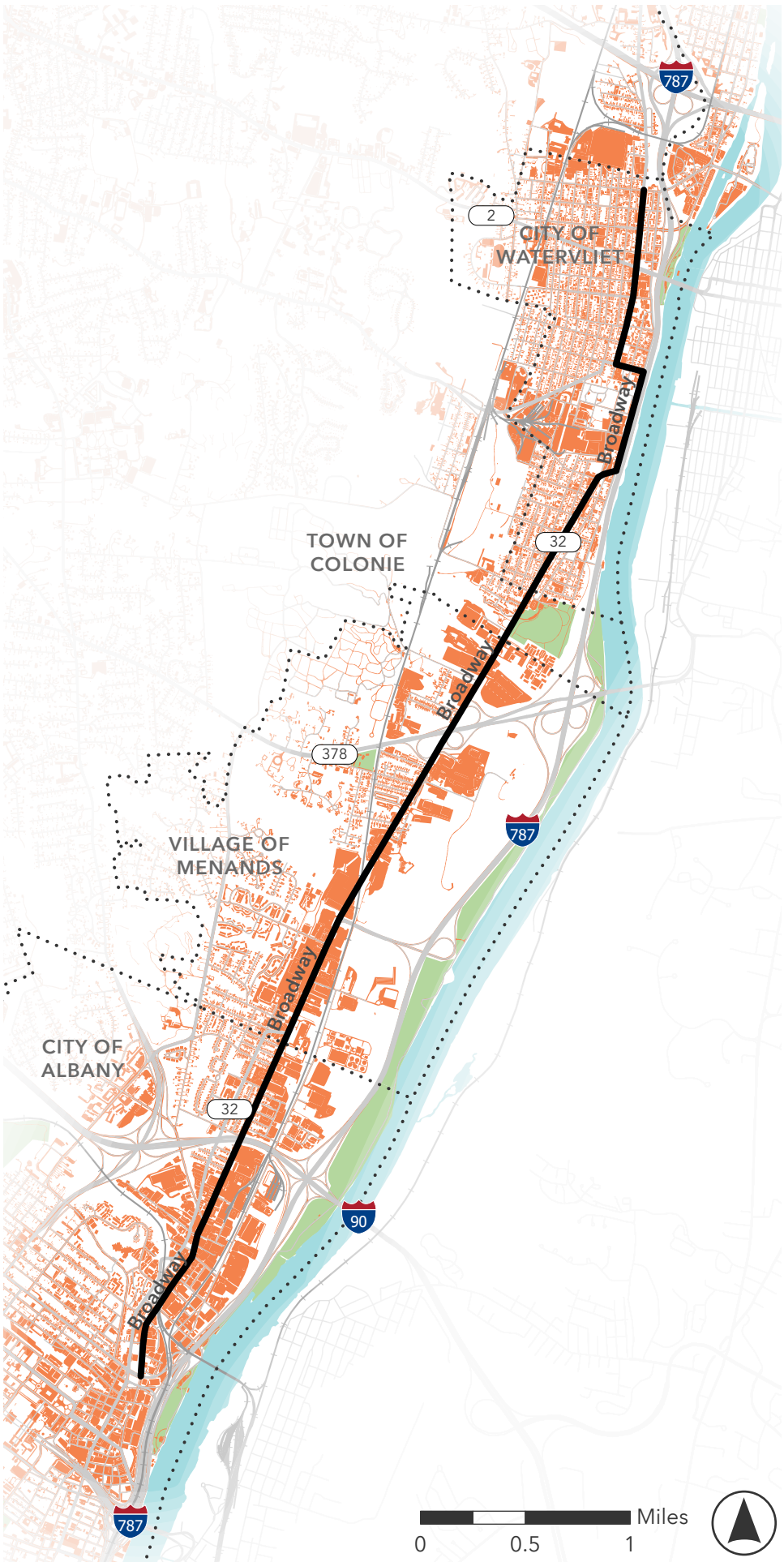
Table 2.2 - Impervious Land Cover in the Study Area

Impervious Land Cover Type	Acres within Study Area	% of Study Area	% of impervious cover
Buildings	508.8	12.5%	30%
Parking	495.4	12.2%	29%
Roadway/Travel ways	482.5	11.8%	28%
Driveways	75.6	1.9%	5%
Sidewalks	60.0	1.5%	4%
Asphalt/Concrete Slabs/Patios	24.9	0.6%	2%
Travel way Overpass	21.5	0.5%	1%
In Ground/Above Ground Pools	7.6	0.2%	0.5%
Water Treatment Plant	5.5	0.1%	0.3%
Courts	3.5	0.1%	0.2%
Golf Trails	0.2	0.01%	0.01%
TOTAL	**1,685.5 acres**	**41.41%**	**100%**

Albany County Broadway Multimodal Resiliency Plan

Impervious Surfaces

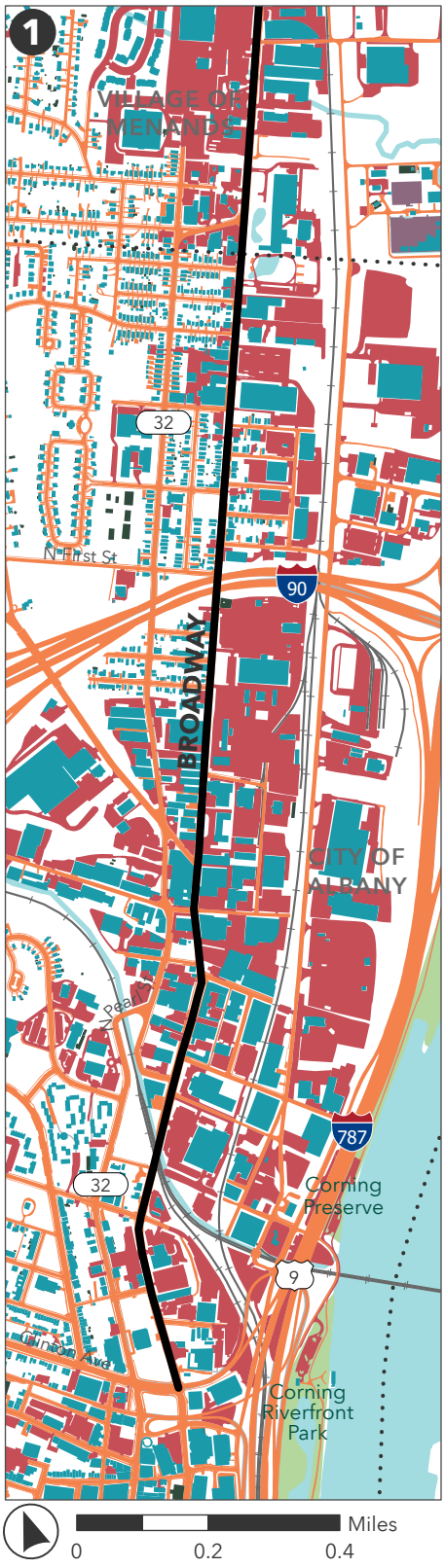
Impervious Surfaces



KEY FINDINGS: *Impervious Surfaces*

- Impervious surfaces are abundant along and within one-half mile of the Study corridor. Because these surfaces prevent water from absorbing into the ground, they exacerbate flooding during intense rain and storm events.
- While the Study corridor represents a relatively small proportion of the impervious cover within the entire Study area, increasing permeable surfaces and creating opportunities for stormwater to infiltrate on-site will help mitigate localized flooding along the Study corridor.
- Other strategies should also be considered to increase permeable cover in the Study area, including updated zoning regulations to require increased coverage of permeable surfaces, preservation of existing open space, and re-forestation of open spaces to increase the uptake of stormwater by trees and plants.

Water pooling along the Study corridor on 2nd Avenue at the intersection of 14th Street in the City of Watervliet

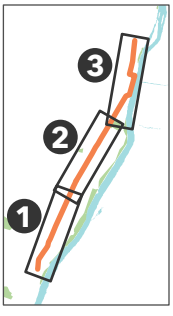


Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:05 PM

Albany County Broadway Multimodal Resiliency Plan

Impervious Surfaces

- Parking
- Transportation Corridors
- Patios, Courts, and Pools
- Water Treatment Plant
- Buildings



Destinations

Broadway is an important local and regional corridor with several destinations along the Study corridor. This section provides an overview of the local and regional destinations that generate trips, serve the local community, and attract visitors from across the region and state.

This section describes the many different destinations along the Study corridor. While the lists below are not all-inclusive, they aim to capture important community resources, employment destinations, housing developments, and recreation and entertainment districts that draw people to the Study area.

Educational Resources

Three schools are located in the Study area including: Arbor Hill Elementary School (Albany City School District) North Albany Middle School (Albany City School District), and Menands School. In the Albany City School District, school buses are provided for elementary students, while bus service for middle and high school students is provided by CDTA.

Three libraries are also located in the Study area: North Albany Branch Library, Menands Library, and Watervliet Library.

Employment Centers

With the Study area's dense mix of commercial, industrial, and public and community service uses, there are several employment centers along the Study corridor that attract commuters on a daily basis, including:

- State and federal offices near the intersection of Clinton Avenue and Broadway;
- National Grid;
- The Riverview Center in Menands, which houses several large employers including New York State; and,
- The Watervliet Arsenal

Regeneron, a large biotech company, recently acquired a former shopping plaza along the Study corridor in Menands and is expected to develop a new facility on the 18-acre site, creating approximately 80 new jobs.

Entertainment

Several entertainment destinations and districts are located in the Study area:

- The Palace Theater, Empire Live, and Capital Repertory Theatre anchor the southern end of the Study corridor and attract people from across the region for performances;
- In North Albany, the Warehouse District is a hub for food and craft beverage concentrated between North Ferry Street and Bridge Street along Broadway; and,
- Huck Finn's Playland located on Erie Boulevard in Albany.

Community Services / Resources

Community services are distributed throughout the Study area and serve both local and regional populations, including:

- Endure Skatepark in North Albany;
- The Mohawk-Hudson Humane Society in Menands;
- Several facilities in Albany and Menands serving vulnerable populations, including St. Joseph's, Fusion Recovery, and the Schuyler Inn;
- The Watervliet Fire Department located along the Study corridor; and,
- Price Chopper, a large grocery store, located just west of the Study corridor along 23rd Street in Watervliet.

Trails

Existing Trails

Existing trail systems in the Study area include the Empire State Trail (also referred to as the Mohawk-Hudson Bike-Hike Trail) and Albany Rural Cemetery trails.

The Study corridor parallels the Empire State Trail, which generally follows the Hudson River for the length of the Study area. There are three primary access points to the Empire State Trail from the Study corridor:

- The Albany Skyway;
- The pedestrian and bicycle tunnel under I-787 Exit 6; and,
- The Mohawk-Hudson Bike-Hike Trailhead at Broadway and 4th Street

The Mohawk-Hudson Trailhead is connected to Broadway via a tunnel under I-787. Due to its proximity to the Hudson River and low elevation, this access point is particularly prone to flooding, and during flood events, it can be completely blocked.

The Albany Rural Cemetery also features an extensive system of walking trails. The main entrance to the cemetery is located on Broadway at Cemetery Avenue in Menands.

Proposed Trails

The Capital District Trails Plan presents a comprehensive vision for a seamless regional trail network connecting cities, towns, and villages throughout the Capital Region. The Capital District Trails Plan identifies Core Trails and Supporting Trail Networks. Core Trails are those which have been identified and proposed as the primary transportation corridors for non-vehicular travel in the Capital Region. Supporting Trail Networks intersect with Core Trails and serve less dense areas in the region. Several Core Trails and Supporting Trail Networks converge along and around the Study corridor.

Of the six Core Trails identified in Albany County, three intersect with the Study area and include:

1. **Albany Loop (15.2 miles):** This trail is a proposed on-road bicycle corridor connecting to the Albany County Helderberg-Hudson Rail Trail in the southwest and generally following Route 155 to loop around Albany and connect to the Albany Rural Cemetery. The Albany Loop travels through Watervliet along a rail corridor and heads east, just north of 25th Street, using railroad bridges to cross Route 32 and I-787 and connect to Green Island and Troy.
2. **Patroon Creek Greenway (9 miles):** This trail is a proposed shared-use path providing separated facilities for pedestrians and cyclists. In addition to connecting several neighborhoods, including Ten Broeck, Arbor Hill, and West Hill, this proposed trail links the Albany Skyway and Hudson River waterfront west through Tivoli Preserve to Six Mile Waterworks Park and the Albany Pine Bush Preserve. The short-term vision for the Patroon Creek Greenway intersects with the Study corridor at Broadway and Clinton Avenue in Albany, New York. The long-term vision for the Patroon Creek Greenway follows Tivoli Street to Broadway, and then continues south along Broadway to connect with the Albany Skyway.
3. **Empire State Trail / Mohawk-Hudson Bike-Hike Trail (existing):** This existing Core Trail parallels the Study corridor and is described in the preceding section.

Of the 14 Supporting Trail Networks identified in Albany County, four intersect with the Study area and include:

1. **The Crossings Connection (3.6 miles):** This proposed trail starts at the intersection of Wards Lane and Broadway in Menands and proceeds west adjacent to Menands School and follows an existing electric utility right-of-way, across Van Rensselaer Boulevard and through residential neighborhoods to link into the existing trail system in The Crossings.
2. **Route 9 Connection (11.5 miles):** This proposed route follows Loudonville Road and Route 9 north from Broadway in Albany and includes upgrading the existing on-road bike route to a dedicated off-road shared use path wherever feasible. This proposed route would ultimately connect Broadway north to the Mohawk River at Vischer Ferry Round where it would connect with the Champlain Canal to Rexford Aqueduct Trail.
3. **Route 32 Cycle Track (3.2 miles):** This proposed corridor is a planned on-road protected bicycle facility connecting the Empire State Trail in Menands at Exit 6 to the Watervliet Arsenal and the Empire State Trail along Broadway in Watervliet.
4. **Van Rensselaer Bike Path (2.6 miles):** This trail corridor provides a north-south connection linking the proposed Route 9 Connection, the Crossings Connection, and the Albany Loop. This proposed bike path utilizes the existing bike lanes on Van Rensselaer Boulevard. At the Albany Rural Cemetery, the proposed path extends north through the Cemetery as an off-road trail.

While not directly called out in the Capital District Trails Plan, the proposed Schuyler Flatts Connector and the Livingston Avenue Bridge are important components of the regional trail network and intersect with the Study corridor.

The proposed Schuyler Flatts Connector would provide an off-road trail for pedestrians and cyclists, linking Broadway, near the Route 378 interchange in Menands, to Schuyler Flatts Cultural Park and the Empire State Trail in Watervliet.

The proposed redesign and replacement of the Livingston Avenue Bridge would provide an important protected bicycle and pedestrian connection from the Albany Skyway, across the Hudson River, to Troy. In particular, this connection would link several Core Trails, including the Patroon Creek Greenway, the Empire State Trail, and the Rensselaer Riverwalk.

Albany County Broadway Multimodal Resiliency Plan

Capital District Trails Plan

Core Trails

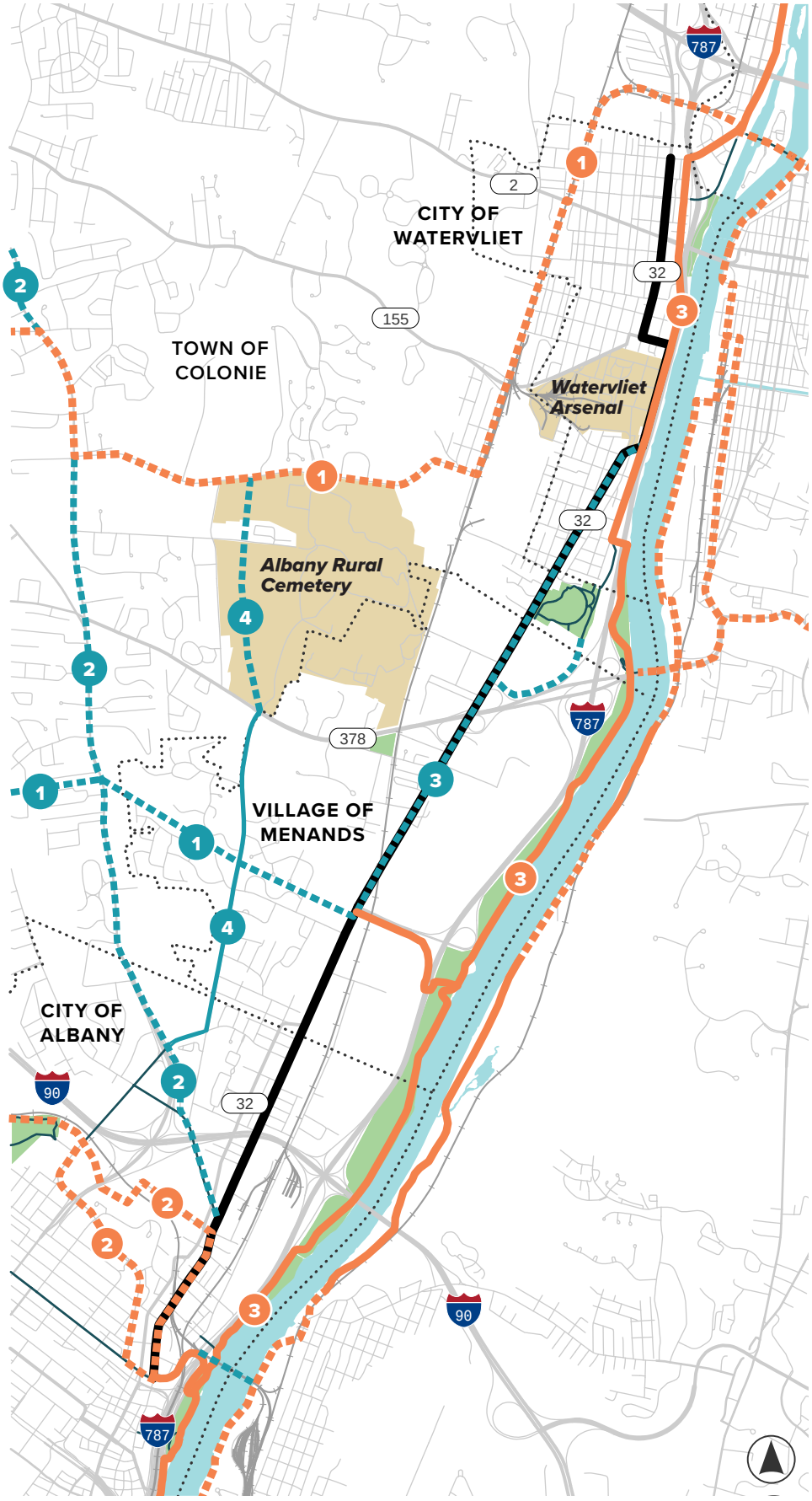
- Existing
- Proposed
- 1 Albany Loop
- 2 Patroon Creek Greenway
- 3 Empire State Trail

Supporting Network Trails

- Existing
- Proposed
- 1 Crossings Connection
- 2 Route 9 Connection
- 3 Route 32 Cycle Track
- 4 Van Rensselaer Bike Path

Other

- Existing Bicycle or Trail Infrastructure
- Parks
- Study Corridor



Historic and Cultural Resources

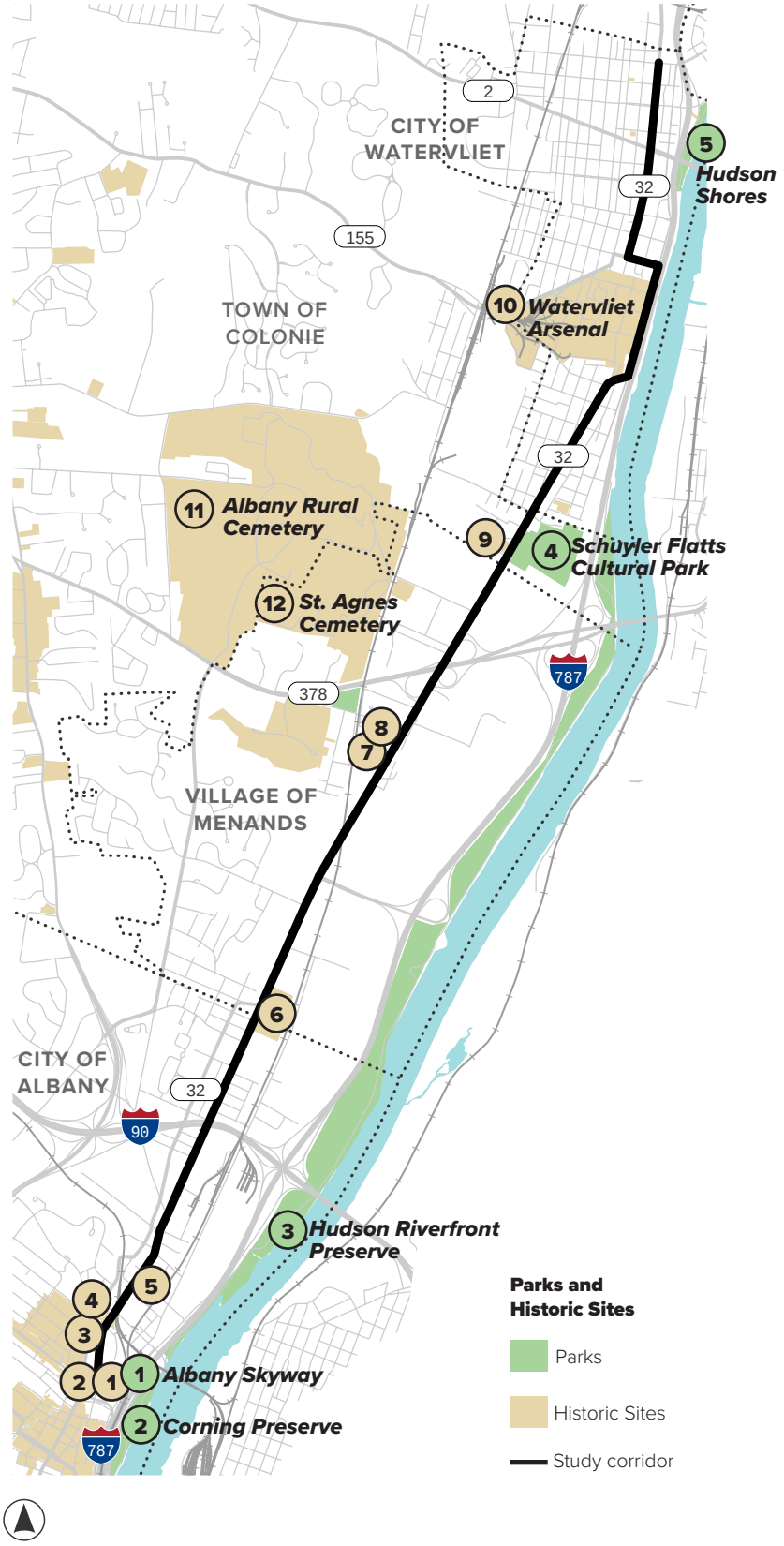
Several historic sites are located in the Study area, ten of which are located immediately adjacent to the Study corridor. These sites are important cultural resources and contribute to the character and identity of the Study area. They include:

1. Quackenbush House and Pumping Station
2. Clinton Avenue Historic District
3. 744-750 Broadway
4. Broadway-Livingston Historic District
5. Lil's Diner
6. Albany Felt Company Complex
7. Menands Manor
8. Menands Park Historic District
9. Hedge Lawn
10. Watervliet Arsenal
11. Albany Rural Cemetery (direct access from the Study corridor at Cemetery Avenue)
12. St. Agnes Cemetery (direct access from the Study corridor at Cemetery Avenue)

Parks

The Study area includes several large parks and open spaces concentrated along the Hudson River, including:

1. Albany Skyway
2. Corning Preserve
3. Hudson Riverfront Preserve
4. Schuyler Flatts Cultural Park
5. Hudson Shores Park



Several smaller parks are also distributed throughout the Study area, providing important recreational amenities to the local community. From south to north, these parks include:

- Wallenburg Park, which includes a dog park
- Clinton Square
- Mullens Park and Hackett Park, adjacent to North Albany Middle School
- Ganser-Smith Memorial Park
- Polk Switzer Park
- Pershing Green Memorial Park
- Seventh Street Park
- Reds Field
- Veterans Memorial Swimming Pool
- 5th Street Park
- Watervliet Veterans Memorial Park

KEY FINDINGS: ***Destinations***

- The Study corridor provides direct access to a diversity of regionally and locally important destinations in Albany, Menands, Colonie, and Watervliet. These destinations attract residents, commuters, and tourists on a daily basis.
- The concentration of local destinations and close proximity of residential areas presents an opportunity to enhance the walkability and bikability of the Study corridor.
- Several trails exist or are planned in the Study area (e.g., the Empire State Trail, Crossings Connector, Route 32 Cycle Track, and Patroon Creek Greenway). Active transportation improvements along the Study corridor could significantly advance the Capital District Trails Plan. Furthermore, improving connectivity between the Study corridor and these existing and planned trail systems will increase mobility options, create redundancy in the transportation system (e.g., providing multiple ways to get to a destination), and increase resilience.
- The Study corridor is the only north-south corridor providing local, direct access to many local destinations. While several transportation corridors parallel Broadway, they either do not offer intermunicipal connectivity (e.g., North Pearl Street) or they only provide limited access (e.g., I-787, Empire State Trail).
- In the event of a flood or roadway closure in the Study corridor, access to destinations may be disrupted. Strengthening connections between the Study corridor and the broader transportation network for all modes of transportation is a critical component of increasing resilience to climate change and other natural disturbances.

Natural Hazards and Climate Resilience

This section provides an overview of the natural hazards impacting the Study area and corridor, including flooding, sea level rise, and extreme heat. These hazards will be exacerbated by climate change and future improvements along the Study corridor should be designed to mitigate these hazards and build resilience to climate change.

Watershed Context

Understanding how natural hazards impact the Study area, particularly flood hazards, requires a watershed-based approach. The Study area is located at the base of five local watersheds draining to the Hudson River. These watersheds extend west beyond the Study area, gathering water from urbanized areas in the City of Albany and the Town of Colonie and funneling this water across the Study corridor to the Hudson River. These watersheds[1] include:

- The Patroon Creek Watershed
- The Macaffer Watershed
- The Kromma Kill Watershed
- The Dry River Watershed
- The Salt Kill Watershed

The Albany County Climate Resiliency Plan calculated the percentage of land area covered by impervious surfaces in each watershed. Both the Patroon Creek and Macaffer watersheds are characterized by high impervious surface cover — more than 75% of the land area in these watersheds is covered by impervious surfaces. In the Kromma Kill, Dry River, and Salt Kill watersheds, impervious surfaces cover between 51 and 75% of the land area, which is also quite high.

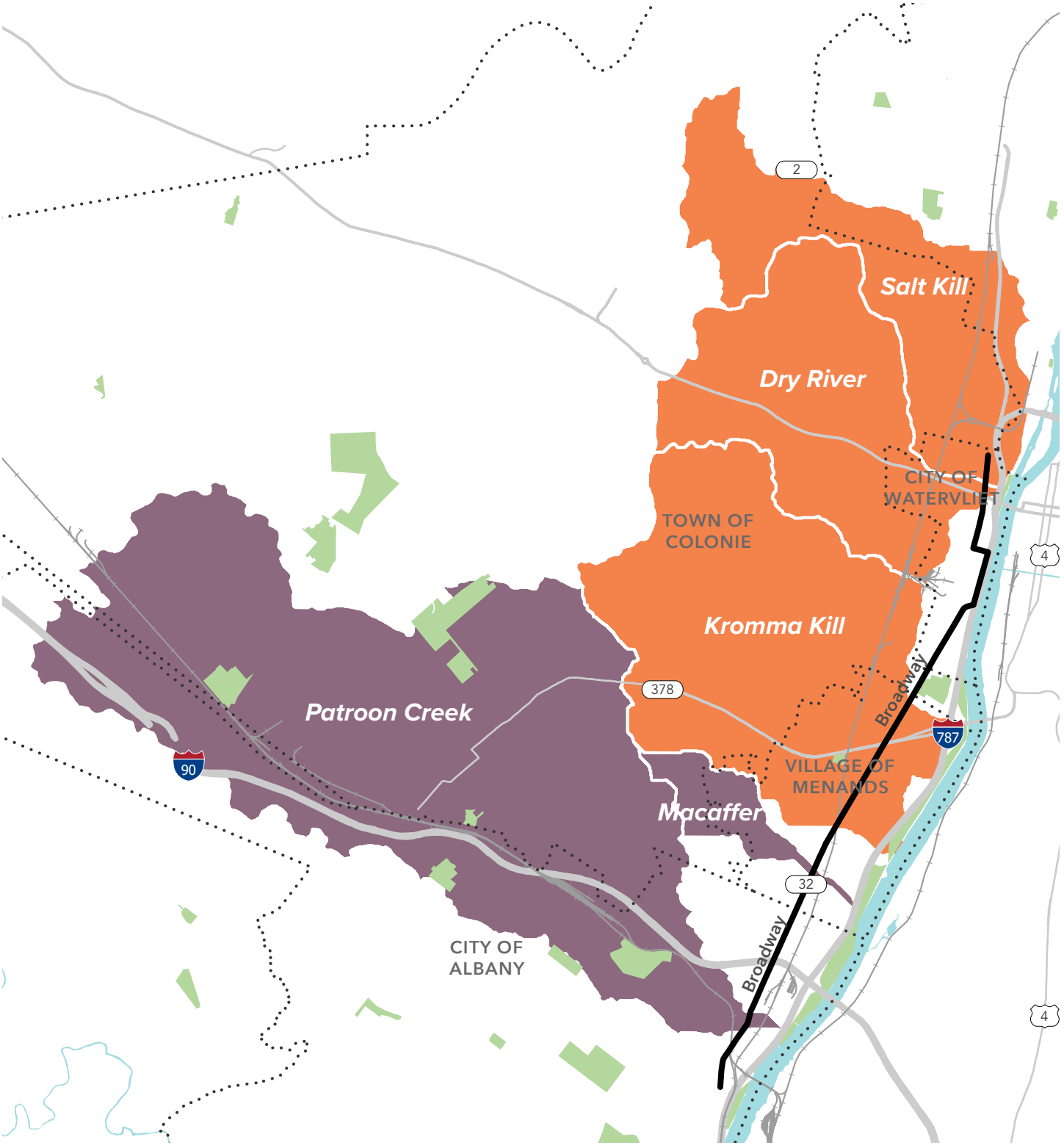
As noted in the Development Patterns section of this chapter, impervious surfaces prevent stormwater from infiltrating into the ground, creating stormwater runoff that travels downhill until it can be absorbed by soil, plants, other waterbodies, or the storm sewer system.

Impervious surfaces increase the amount and rate at which stormwater is delivered to receiving waterbodies or infrastructure systems, which can result in flooding and erosion. As stormwater travels across impervious surfaces, it also gathers pollutants and sediments that degrade water quality in receiving waterbodies.

According to the Center for Watershed Protection, when watershed imperviousness exceeds 25%, stream ecosystems will become negatively impacted. Watershed imperviousness of 25% or higher can be non-supporting of aquatic life.

Increasing resilience to the impacts of climate change and flooding along the Study corridor will require an intermunicipal, multi-pronged approach including land use regulations, integration of green infrastructure to reduce impervious surface cover, upstream flood storage, and continued upgrades to water infrastructure. While this Study and future improvements may not completely solve flooding issues along the Study corridor, they are an important starting point.

1 *Watershed drainage areas were delineated by Stormwater Coalition Staff using USGS StreamStats between 2010 and 2015.*



Albany County Broadway Multimodal Resiliency Plan

Watersheds

- 51 to 75% Impervious
- 75%+ Impervious

Miles
0 1 2

Wetlands

Approximately 10% of the Study area is comprised of wetlands, as defined by the U.S. Fish and Wildlife Service's National Wetlands Inventory. Riverine wetlands are the most abundant type of wetland in the Study area (48% of all wetlands). Riverine wetlands include several streams that flow through developed areas in the Cities of Albany and Watervliet and the Town of Colonie, cross under the Study corridor and discharge into the Hudson River. The Hudson River, which is tidal within the Study area, is also classified as a riverine wetland.

Emergent and forested wetlands are concentrated in North Albany and the Village of Menands and are predominantly located between the Study corridor and the Hudson River. In Albany, emergent and forested wetlands are limited to the areas between I-787 and the Hudson River, along the Empire State Trail. The Village of Menands contains larger wetland complexes, most of which are concentrated between the Study corridor and I-787 to the north and south of Exit 6.

Wetlands are important transitional areas between aquatic and terrestrial habitats. They provide wildlife habitat, support biodiversity, filter stormwater runoff and improve water quality, recharge ground water, and importantly, they increase flood storage capacity.

KEY FINDINGS: *Wetlands*

- As a tidal waterbody, the Hudson River will be impacted by sea level rise. Relative to the 2000-2004 baseline, the New York State Department of Environmental Conservation (NYSDEC) projects that sea level rise along the Hudson River could be 27 inches above the baseline by the 2050s and 54 inches above the baseline by the 2080s if a high emissions scenario is realized. This amount of sea level rise will increase flooding and likely expand the Hudson River's floodplain towards the Study corridor.
- Preservation and expansion of existing wetlands, particularly within the floodplain of the Hudson River and the streams that traverse the Study corridor, will increase flood storage capacity and help mitigate the risks of flooding along the Study corridor.

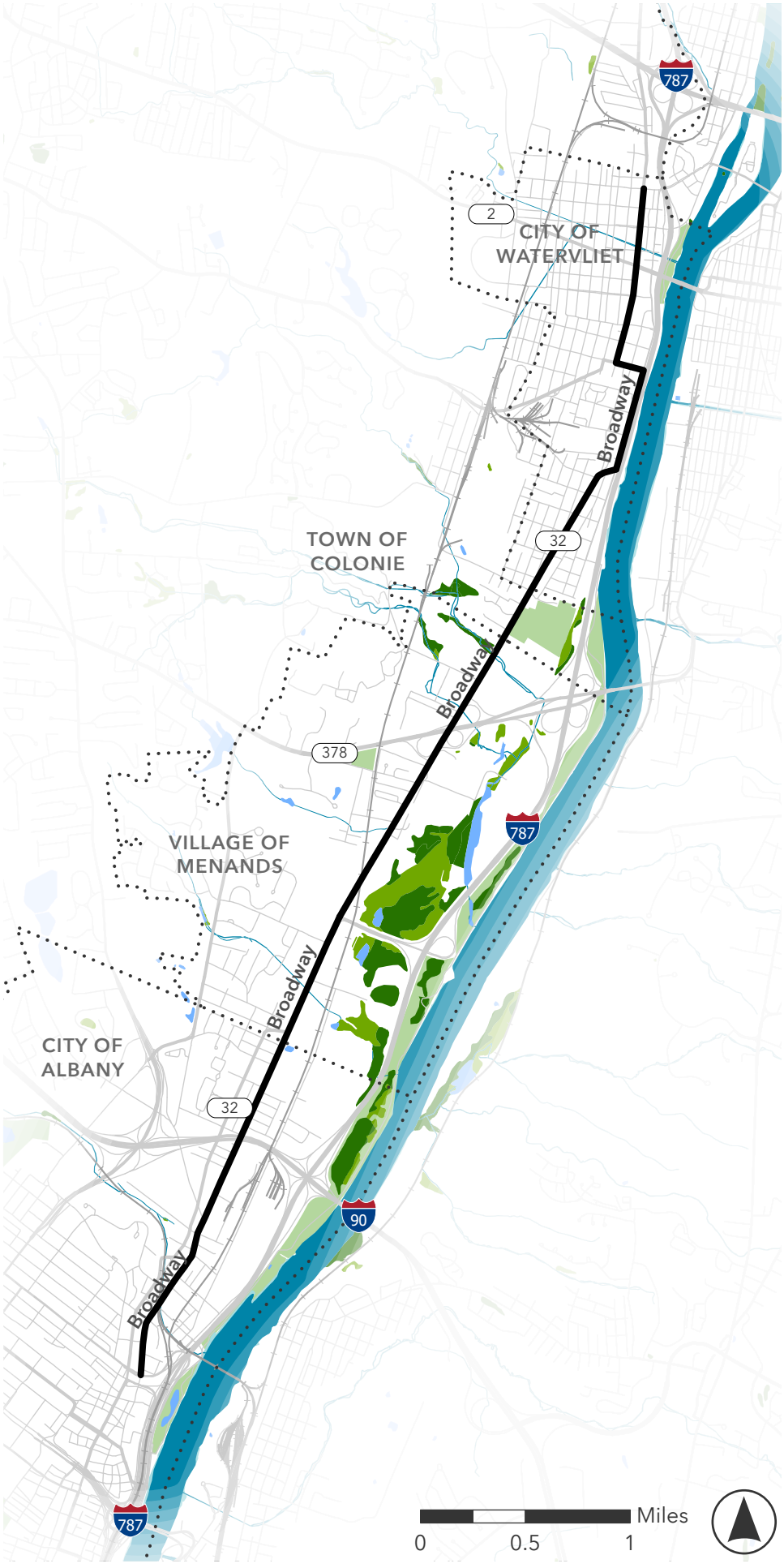
Table 2.3 - Wetlands in the Study Area *(source: National Wetland Inventory)*

Wetland Type	Acres within Study Area	% of Study Area	% of wetland acres
Freshwater Emergent	78.9	12.5%	19%
Freshwater Forested/Shrub	112	12.2%	27%
Freshwater Pond	24.3	11.8%	6%
Riverine	200.8	1.9%	48%

Albany County Broadway Multimodal Resiliency Plan

Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Pond
- Riverine



Flood Hazards

Due to the proximity of the Hudson River and the Study area's location at the base of several urbanized watersheds, the Study corridor is exposed to significant flood hazards. Approximately 30% of the Study area is located within the Federal Emergency Management Agency's (FEMA) 100-year floodplain, and an additional 10% of the Study area is located within the FEMA 500-year floodplain. Approximately 1% of the Study area is in the FEMA regulatory floodway.

Areas within the FEMA regulatory floodway have the greatest risk of flooding. At the southern end of the Study corridor, near the intersection of Broadway and Tivoli Street, the regulatory floodway associated with Patroon Creek intersects Broadway and continues east to the Hudson River. There is also a small portion of regulatory floodway in the Town of Colonie and the eastern border of Schuyler Flatts Cultural Park.

The FEMA 100-year floodplain, which represents areas with a 1% chance of flooding each year, is concentrated between the Study corridor and the Hudson River. In several locations, the Study corridor is contained within the 100-year floodplain:

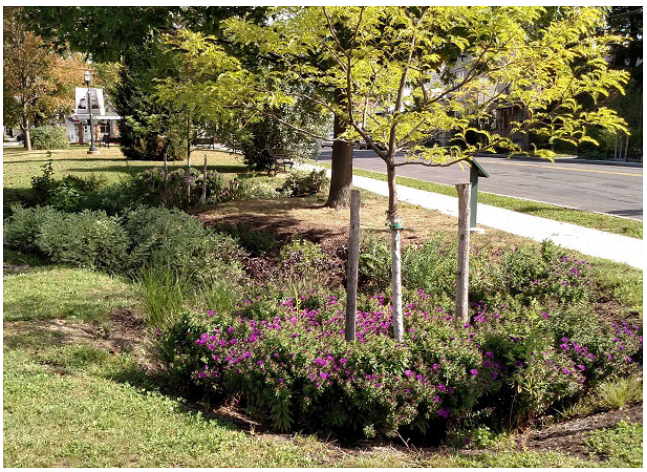
- At the intersection of Broadway and the CSX railroad corridor in the City of Albany;
- Along Patroon Creek, near the intersection of Tivoli Street and Broadway, in the City of Albany; and,
- Along Broadway, between 3rd Avenue and 13th Street, in the City of Watervliet.

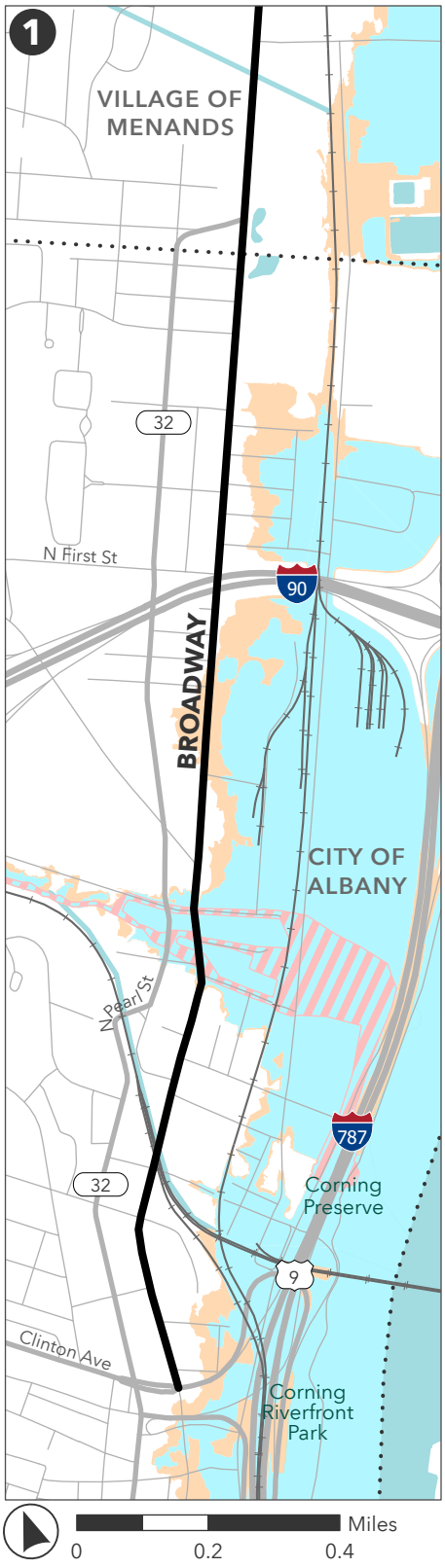
The FEMA 500-year floodplain, which represents areas with a 0.2% chance of flooding each year, overlaps with the Study corridor in several locations:

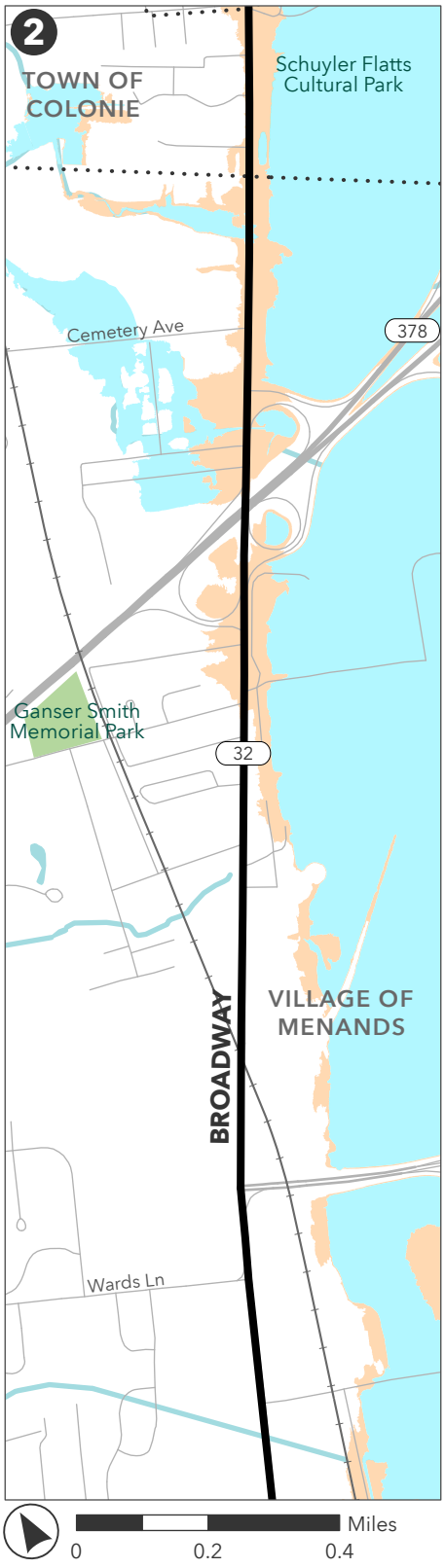
- In Albany, between Bridge Street and the I-90 overpass;
- In Menands, to the north and south of the State Highway 378 overpass; and,
- Along a majority of the Study corridor's length in the City of Watervliet.

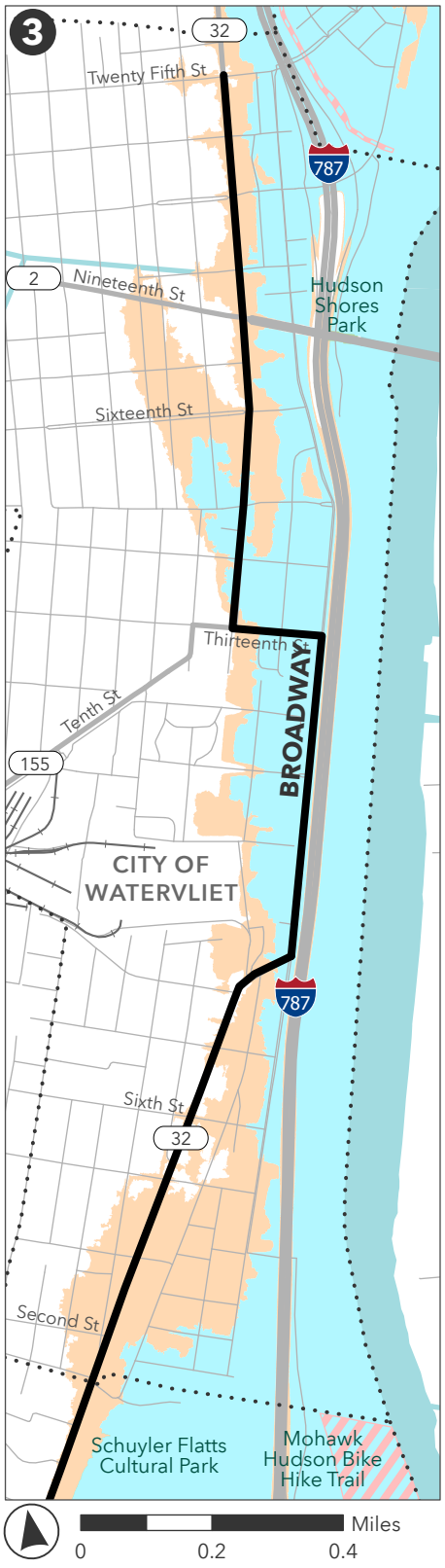
GREENING THE STREETS OF WATERVLIET

In 2017, the City of Watervliet completed the Route 32 Green Infrastructure Project, which was designed to improve water quality and reduce stormwater runoff that contributes to Combined Sewer Overflows (CSOs) into the Hudson River. The project integrated green infrastructure practices along approximately 0.75 miles of the Study corridor (3rd Avenue) including rain gardens, permeable pavement in parking lanes, new trees, and roadside bioretention basins (see images below).









Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:11 PM

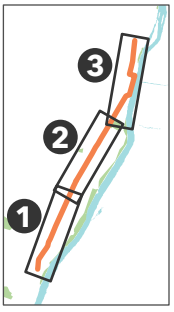
Albany County Broadway Multimodal Resiliency Plan

FEMA Flood Zones

- 1% annual chance flood (100-year flood)
- 0.2% annual chance flood (500-year flood)
- Regulatory Floodway

Basemap

- Railroad
- Water
- Parks and Open Space



Impervious Cover and Flood Hazards

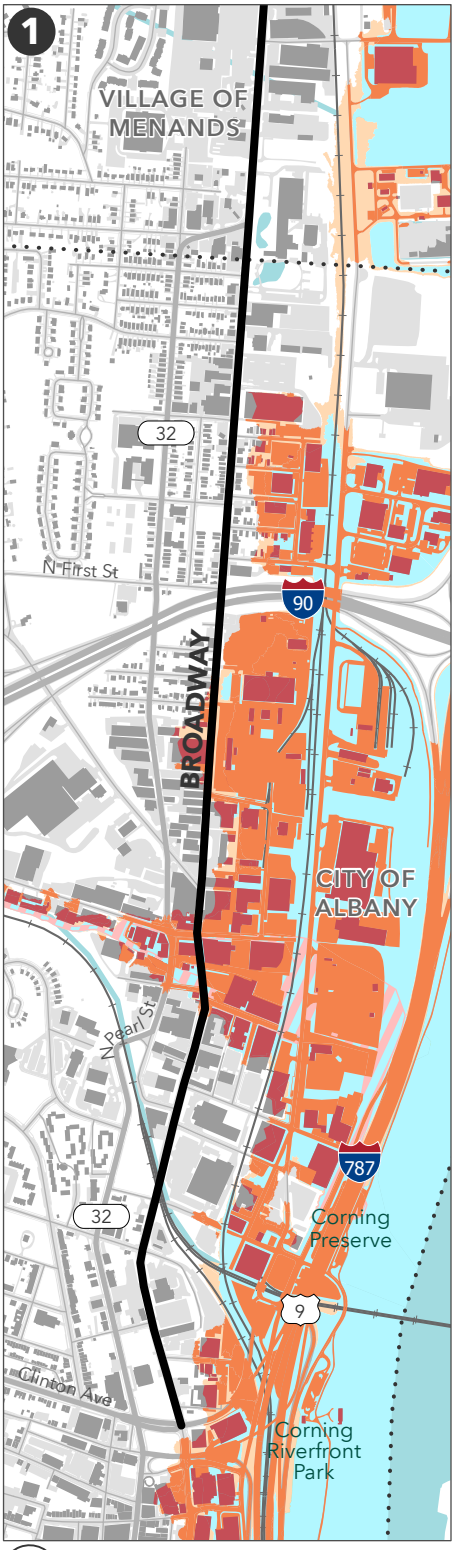
Of the approximately 1,686 acres of impervious surfaces in the Study area, 586 acres (35% of the total impervious cover) are located in either the FEMA 100-year floodplain, 500-year floodplain, or regulatory floodway.

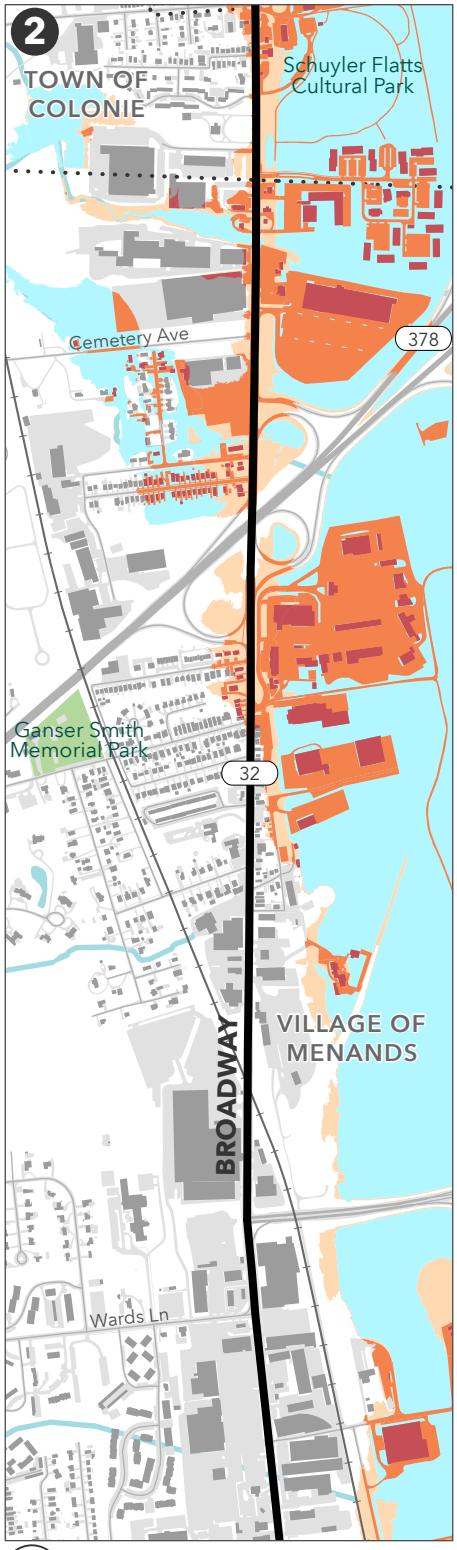
This abundance of impervious cover in the floodplains along the Hudson River and Patroon Creek (along Tivoli Street) prevents water from infiltrating into the ground and exacerbates flooding during storm events. Further, as sea levels rise along the tidal Hudson River rises, flooding hazards will be intensified.

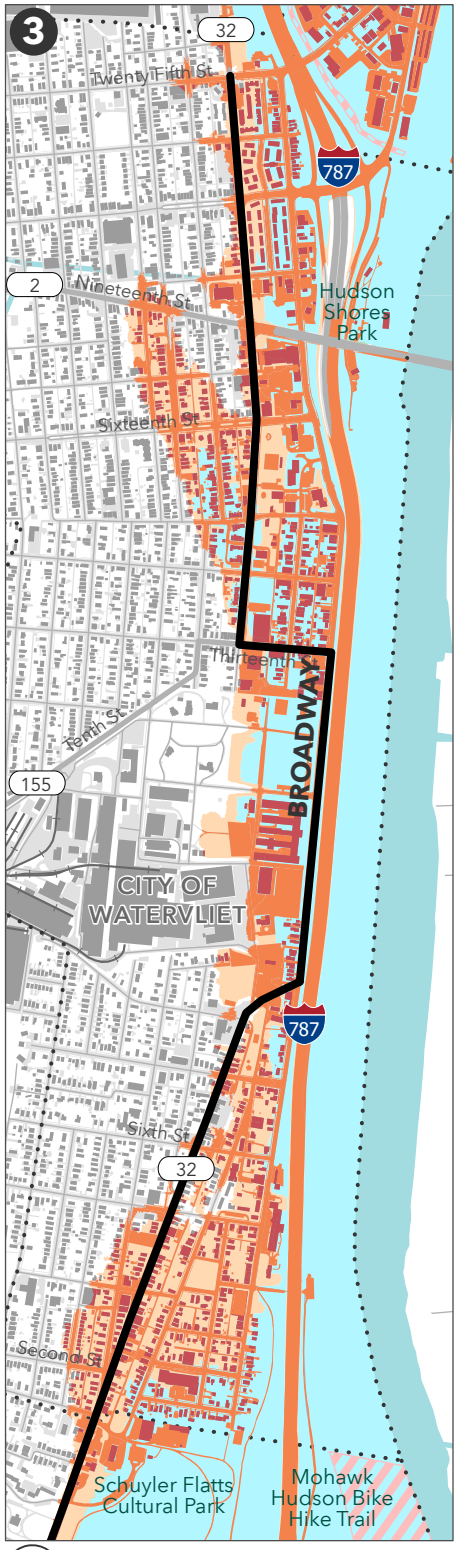
Opportunities to replace pavement with permeable green infrastructure will be explored in this Study along the length of the Study corridor.

Table 2.4 - Impervious Cover in FEMA Flood Zones in the Study Area

Impervious Surfaces	Acres within Study Area	% of Study Area
In the FEMA 100-year floodplain	333	8%
In the FEMA 500-year floodplain	236	6%
In the FEMA regulatory floodway	17	0.5%
TOTAL	**586**	**14.5%**







Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:39 PM

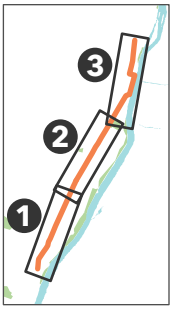
Albany County Broadway Multimodal Resiliency Plan

Impervious Surfaces and Buildings

- Buildings within FEMA Flood Zone
- Impervious Surfaces within FEMA Flood Zone
- Buildings Not within FEMA Flood Zone
- Impervious Surfaces Not within FEMA Flood Zone

FEMA Flood Zones

- 1% annual chance flood (100-year flood)
- 0.2% annual chance flood (500-year flood)
- Regulatory Floodway



Albany County Climate Risk Assessment

As part of the Albany County Climate Resiliency Plan, a risk assessment was performed to identify areas and assets in the county at high risk to the impacts of climate change. The risk assessment used flood risk, heat vulnerability, and social vulnerability data from multiple state and federal sources to create a composite "climate risk score" for each parcel in the county. The level of climate risk can range from minimal (0), which suggests little to no impacts, to extreme (5), which implies critical impacts that can greatly disrupt systems and potentially put life and property at risk.

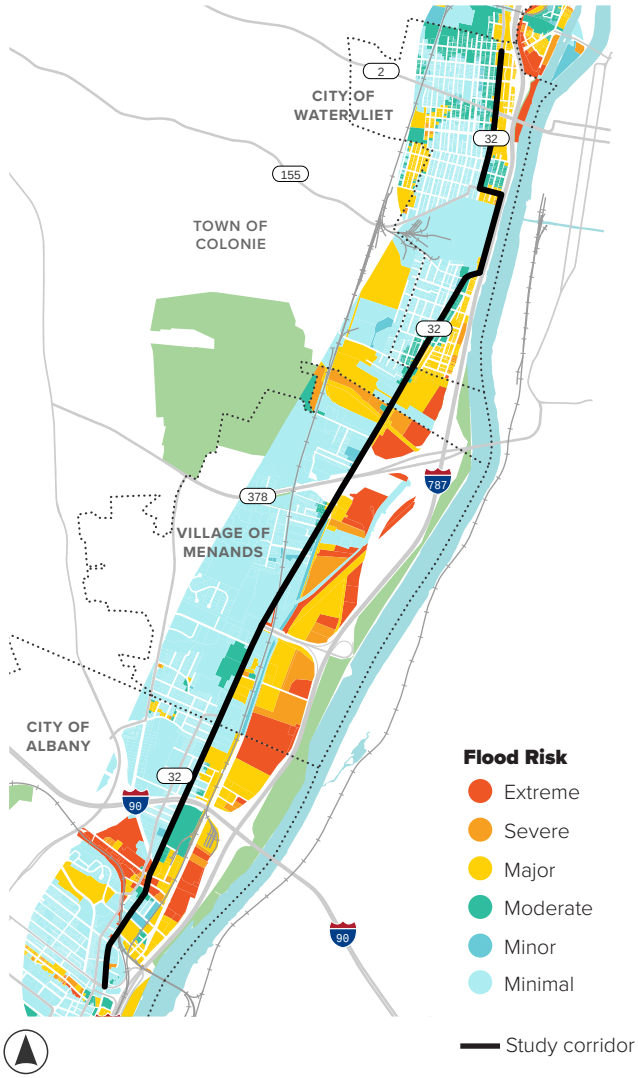
Albany County's climate risk assessment data is presented on this page and the following page for all parcels within the Study area. A brief overview of the data sources used in the County's climate risk assessment is provided below:

- **Flood risk** was identified for each parcel using First Street Foundation's "Flood Factor" score, which identifies flood risk based on the likelihood of flooding at different depth intervals over a 30-year time period. The Flood Factor scores incorporate climate change models.
- **Heat vulnerability** was approximated at the U.S. Census tract scale using the New York State Department of Health's (NYSDOH) Heat Vulnerability Index (HVI). The HVI uses a composite of several factors, including language spoken, age, environmental conditions, and socioeconomic characteristics to approximate overall heat vulnerability. In instances where a parcel spanned multiple census tract boundaries, the highest HVI measure was used.
- **Social vulnerability** was approximated for each parcel based on its overlap with three datasets: the NYSDEC Potential Environmental Justice Areas, the Center for Disease Control and Prevention's Social Vulnerability Index, and the New York State Energy Research and Development Authority's Draft Disadvantaged Communities.
- **Overall climate risk** was approximated for each parcel by summing its flood risk, heat vulnerability, and social vulnerability scores.

Flood Risk

The parcels most at risk to flooding are located to the east of the Study corridor, along the Hudson River There are also discrete areas at higher flood risk to the west of the Study corridor along Tivoli Street in Albany and along unnamed streams flowing through the Albany Rural Cemetery, across the Study corridor, and to the Hudson River.

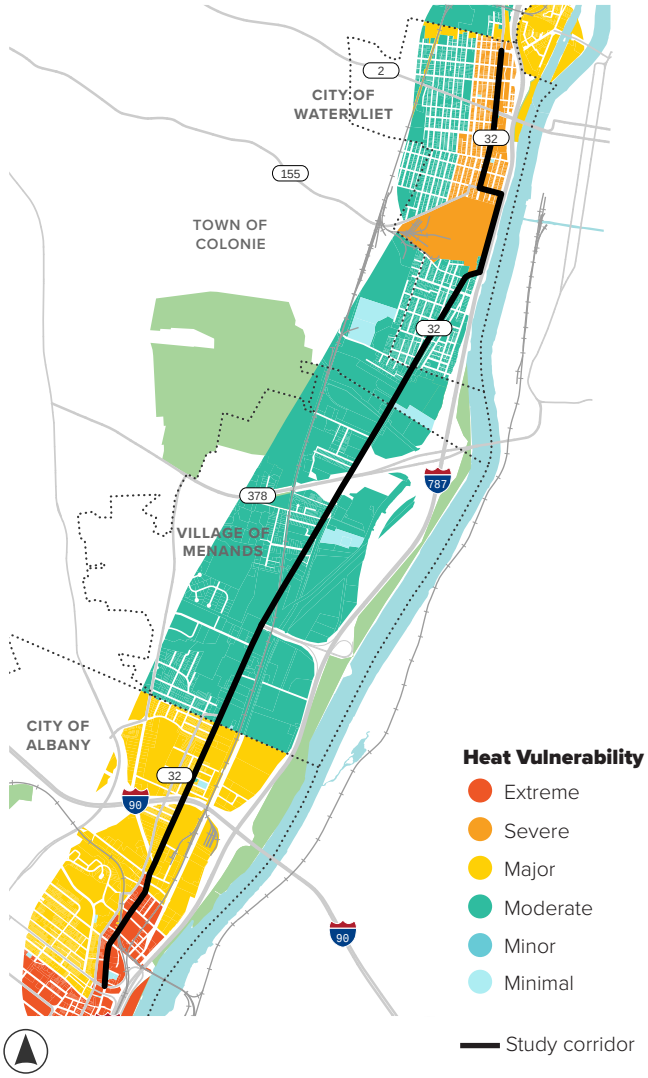
In the Study area, 181 parcels (~3%), 12 of which are owned by a public entity, are identified as at extreme or severe risk to flooding. These include the Schuyler Flatts Cultural Park owned by the Town of Colonie, several City of Albany properties along Erie Boulevard, and a small parcel owned by the Village of Menands, just east of the Mohawk-Hudson Humane Society.



Heat Vulnerability

A majority of the Study area is classified as being at moderate, major, severe, or extreme vulnerability to heat. Very few parcels are identified as being minor or minimally vulnerable to heat.

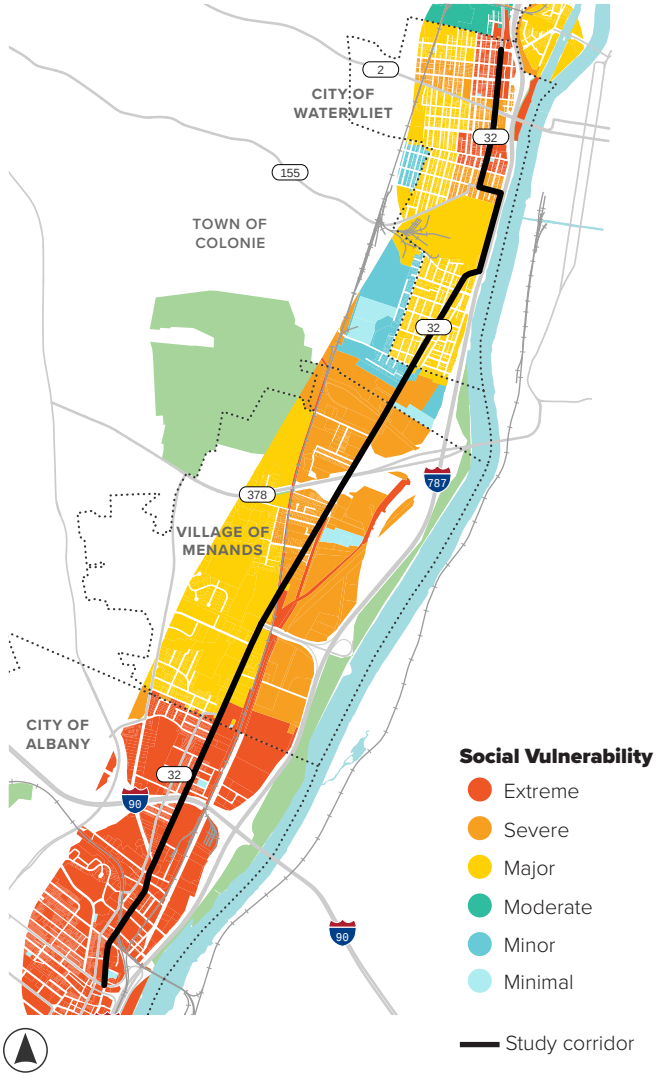
In the Study area, 1,308 parcels (~20%), 88 of which are owned by a public entity, are identified as extremely or severely heat vulnerable. These heat vulnerable parcels are concentrated in the Cities of Albany and Watervliet. The overall heat vulnerability in Menands is relatively lower than the rest of the Study area due to lower socio-economic vulnerability. However, the environmental conditions in Menands, such as lack of tree canopy cover, are a major contributor to the heat vulnerabilities in the central portion of the Study area.



Social Vulnerability

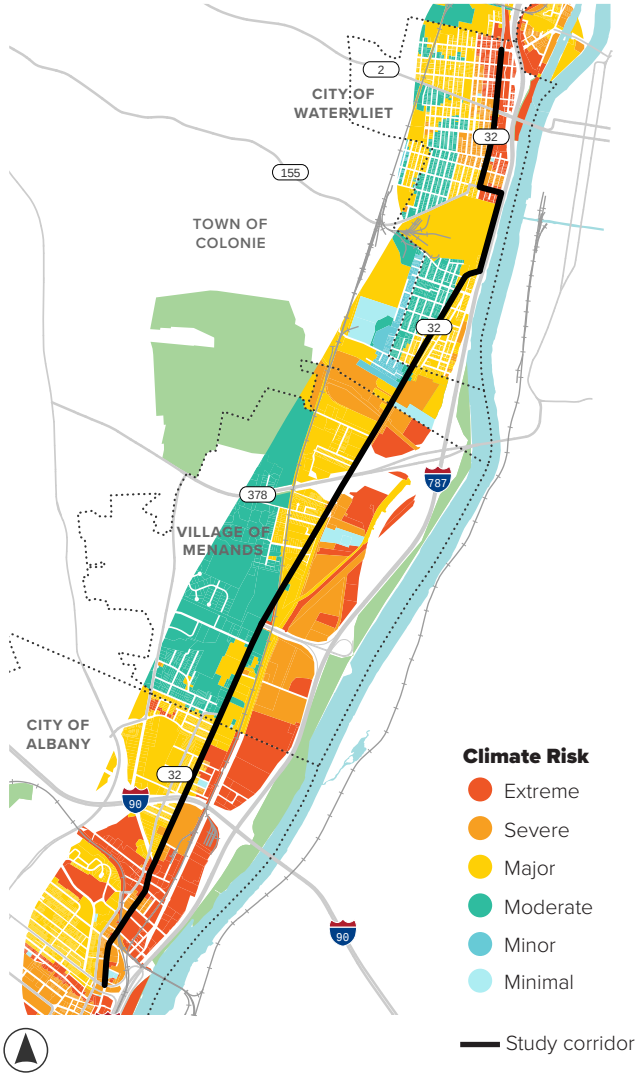
A majority of the Study area is classified as being majorly, severely, or extremely socially vulnerable. This concentration of high social vulnerability is driven by a high concentration of low-income households and minority populations, many of whom rely on public transit and alternative modes of transportation. The few parcels identified at minor or minimal social vulnerability are located in the Town of Colonie.

In the Study area, 3,882 parcels (~60%) are identified at extreme or severe social vulnerability.



Climate Risk

Overall, climate risk in the Study area is relatively high. This is driven largely by flood risks and exacerbated by high social and heat vulnerabilities in the cities of Watervliet and Albany. In the Study area, nearly a quarter of the parcels (1,516) are identified at extreme or severe climate risk. While a majority of these parcels are privately-owned, improvements to public space that reduce flood and heat risks and support vulnerable populations will be a critical component of building climate resiliency in the Study area and beyond.



KEY FINDINGS: ***Climate-Related Risks***

- The entire Study area is impacted by climate-related risks. Flooding risks are pronounced between the Study corridor and the Hudson River. Socially vulnerable populations are concentrated in the cities of Albany and Watervliet, but occur throughout the Study area. Similarly, heat vulnerable areas are concentrated in the cities of Albany and Watervliet.
- Environmental conditions, such as the prevalence of impervious surfaces, contribute to flood risk and heat vulnerabilities through the Study area. Strategies that remove impervious surfaces and increase tree canopy cover will tackle multiple climate-related impacts.
- Wetland complexes are concentrated in the Village of Menands, between the Study corridor and Hudson River. Preserving and enhancing these ecosystems will improve water quality, increase flood storage, provide riparian habitat, and could create new recreational amenities that increase the public's access to nature.

Urban Tree Canopy

The urban forest is a powerful tool in fighting climate change. Trees cool the urban environment and mitigate the impacts of extreme heat. They intercept and absorb stormwater and mitigate flooding. They sequester carbon and filter the air. And, they create inviting outdoor public spaces where people want to spend time walking, biking, relaxing, and/or socializing.

Tree Canopy Cover Assessment

Trees provide a multitude of benefits in urban areas. Their canopies provide shade, which significantly lowers pavement surface temperatures, cools the urban environment, and creates a comfortable space to walk, bike, and spend time. Trees intercept and infiltrate stormwater, and in turn mitigate flood hazards. And, they enhance the aesthetics of transportation corridors and can create a sense of enclosure that helps to slow traffic.

To assess tree canopy cover along the Study corridor, canopy cover was digitized based on aerial imagery from ESRI's ArcGIS Online World Imagery Mapping Services (Albany County Orthos, 3/20/2021). A polygon was drawn around the estimated extent of each tree's canopy within the Study corridor's public right-of-way. Google Earth "street view" (5/2023) was used to confirm whether the subject was a tree and that it was located in the public right-of-way rather than on private property.

Tree canopies cover approximately 13 acres (13%) of the public right-of-way along the Study corridor. A majority of the tree canopy cover is concentrated in the Village of Menands around the State Route 378 interchange and just north of I-787 Exit 6. In Watervliet, there is fairly continuous tree canopy cover along the east side of Broadway, adjacent to the Empire State Trail and I-787. Tree canopy cover is fairly sparse along the remainder of the Study corridor.

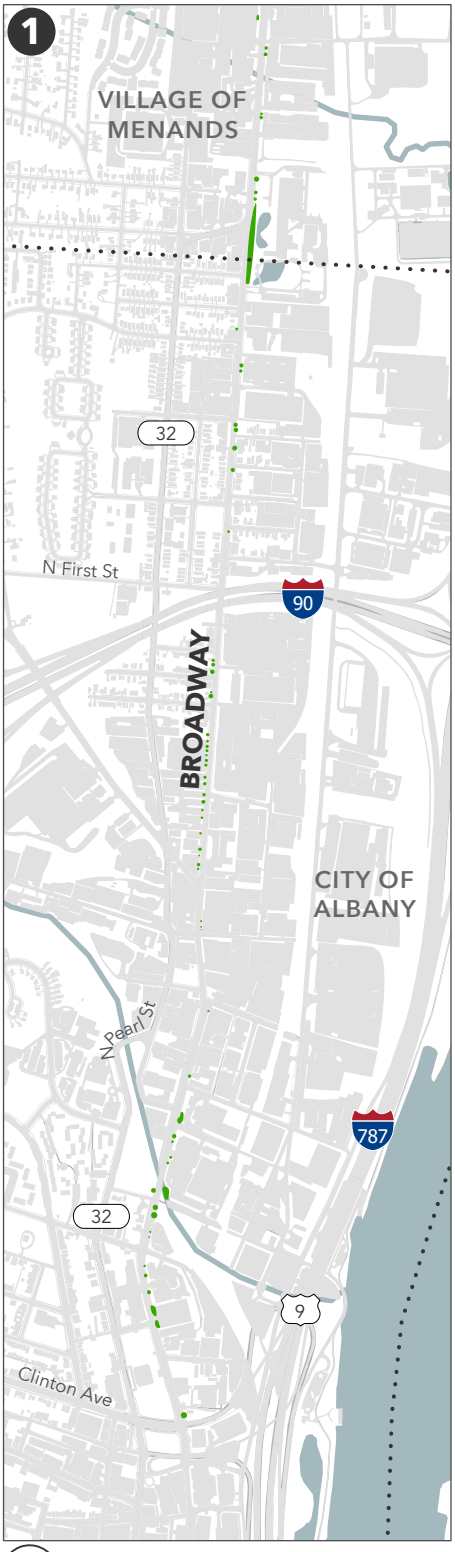
iTree Canopy Assessment

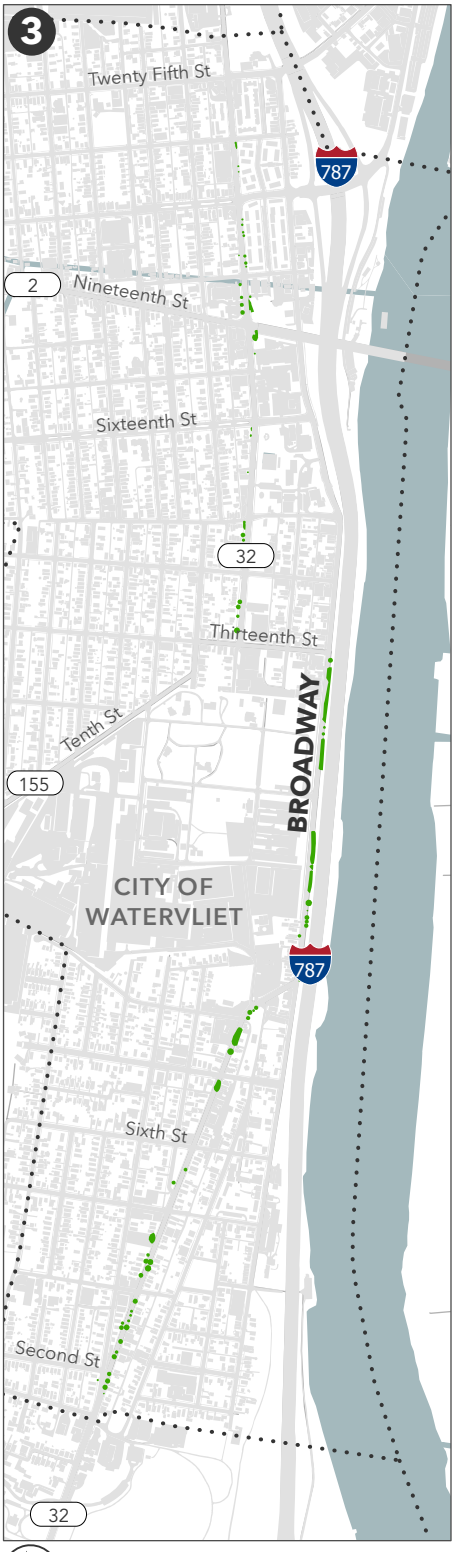
The U.S. Forest Service's iTree Canopy tool (https://canopy.itreetools.org) was also used to generate a baseline desktop assessment of the urban tree canopy in the Study corridor's public right-of-way and in the entire Study area. This tool was used to gain a preliminary understanding of the ecosystem benefits provided by the existing canopy of trees, including carbon sequestration, hydrological benefits, and air pollution removals.

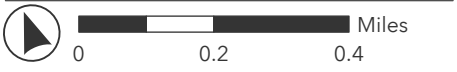
Shapefiles of the Study corridor public right-of-way and the Study area (one-half mile buffer around the Study corridor) were uploaded to the publicly available iTree Canopy tool for two assessments:

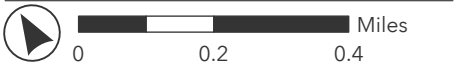
- For the Study corridor right-of-way, 100 points were randomly selected for the assessment.
- For the Study area, 500 points were randomly selected for the assessment.

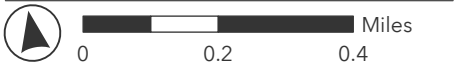
For each assessment, the randomly selected points were classified into the following landcover categories based on Google Earth imagery: grass/herbaceous, impervious surfaces (buildings, parking lots, roads, other), soil/bare ground, tree/shrub, vehicles, and water. After the points were classified, the iTree Canopy tool was run and reports were generated quantifying land cover, carbon sequestration benefits, air pollution removal benefits, and hydrologic benefits. The results from both assessments are summarized in the tables on the next page.











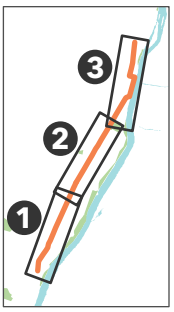
Map developed by Byer Planning, LLC. Date Exported: 4/16/2024 3:30 PM

Albany County Broadway Multimodal Resiliency Plan

Tree Canopy Cover

Tree Canopy Cover in the Study Corridor Right-of-Way

Impervious Surfaces



KEY FINDINGS: *Canopy Cover*

- The prevalence of impervious surfaces, especially roads and parking lots, is a key takeaway from this baseline assessment. As discussed in the previous section, impervious surfaces inhibit stormwater absorption and increase the likelihood of flooding. Impervious land cover also dramatically increases the risk of urban heat island effect and associated negative public health consequences.
- Low tree canopy cover, as observed along the Study corridor, decreases the environment's ability to absorb air pollution from industry and automobiles, which are prevalent uses in the Study area.
- Compared to the Study corridor, the Study area has substantially more tree, shrub, and herbaceous cover due to the presence of parks, cemeteries, and forested open spaces along the Hudson River's shoreline. The Study area also encompasses more residential development, where yards, street trees, and backyard trees are more common.

Table 2.5 – Land Cover (% of total area)

Site	Grass/Herb	Impervious Surface	Soil/Bare Ground	Tree	Water
Study Corridor	25.74	63.37	0	11	0
Study Area	25.45	44.45	1.41	24.04	4.65

Table 2.6 – Carbon Benefits

Site	Annual Sequestration	Storage in Trees	Value (Combined)
Study Corridor	14.39 T	361.27 T	$64,068.00
Study Area	1.34 kT	33.58	$5,995,605.00

Table 2.7 – Air Pollution Benefits

Site	CO	NO2	O3	SO2	PM 2.5	PM 10
Study Corridor	11.91 lb	65.77 lb	508.08 lb	32.33 lb	25.96 lb	144.20
Study Area	1,106.74 lbs	6,114.05 lbs	47,229.14 lbs	3,005.57 lbs	2,412.76 lbs	13,404.61

Table 2.8 – Hydrological Benefits

Site	Avoided Runoff	Evaporation	Interception	Transpiration	Potential Evaporation	Potential Evapo-transpiration
Study Corridor	87.29 gal	1,960.31 gal	1,973.06 gal	1,856.25 gal	12,607.10 gal	10,397.59
Study Area	8.11 Kgal	182.22 Kgal	183.41 Kgal	172.55 Kgal	1,171.91 Kgal	966.52 Kgal

Existing Tree Inventory

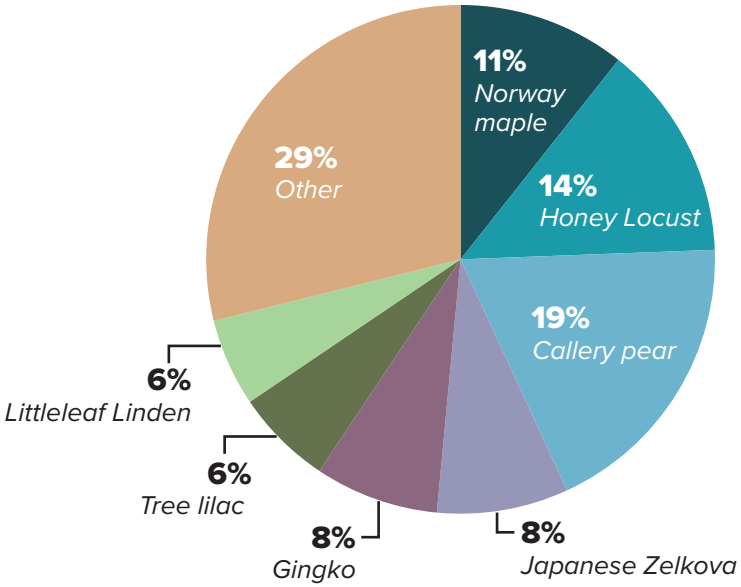
A field-based inventory assessment of existing trees along the Study corridor was conducted over the span of five days in late May and early June, 2024. All trees in the Right Of Way (ROW) were assessed, with the exception of trees at the I-378 interchange, which appear to be planted and maintained by the NYS DOT.

A total of 356 trees were counted and included identification of genus and species, location of the tree, diameter at breast height (DBH), and percent die back of the canopy of the tree. Additional notes were taken when utility conflicts were observed, maintenance practices had damaged the tree, pests contributed to the decline of the tree, and other conditions relevant to the long term survival of the tree. Photos of selected individual trees and streetscape tree layouts were taken to increase the understanding of field conditions.

Inventory information was recorded digitally with ArcGIS Field Maps. Data was downloaded and converted to excel files, and then processed for upload to iTree Eco, a modeling application developed and maintained by the U.S. Forest Service to calculate the ecosystem benefits of urban forest communities.

Trees occupy a total of 2.64 acres of the Study corridor, and the leaf area of those trees provide shade over 13.8 acres. Species composition across the Study corridor was fairly homogeneous with seven species represented at numbers greater than 5% of the overall urban forest (Figure 2.5). Most of the older species seem to have been selected for ornamental, shape and size characteristics. The other twenty species are distributed nominally, and many of these are relatively new plantings, which is a good sign that more attention is being paid to the diversity of urban forest. The most dominant species in the corridor are Callery pear (18.8%), Honey Locust (13.8%) and Norway maple (10.7%); these are all commonly found street trees that withstand difficult environmental conditions. Unfortunately, Callery pear and Norway maples are susceptible to limb breakage and are highly invasive in New York State. Invasive species are a leading contributor to wildlife and ecosystem declines globally. Because these species originate in countries other than our own, controls to their populations have not evolved; therefore, when introduced to new ecosystems, they rapidly colonize and out compete native species. Because wildlife and insects have not adapted to these plant intruders, their presence results in a substantial loss of forage and habitat, which results in declining populations of a range of species. The chart below shows the distribution of native vs. non-native trees in the Study corridor. Of note, 67% percent of the trees are not native to North America.

Figure 2.5 - Urban Forest Composition by Species



Nearly one-third (30%) of the urban forest within the Study corridor's right-of-way is comprised Callery pears and Norway maples, which are highly invasive species in the State of New York and susceptible to limb breakage.

Lack of species diversity in the urban forest can be problematic when pests and diseases emerge that attack individual species. This was evidenced most recently with the severe destruction caused by emerald ash borer (EAB): millions of ash trees across New York State perished as this pest spread across the landscape. A pesticide is on the market that effectively controls EAB but municipalities are often not prepared to utilize it and costs can be prohibitive. Urban forests with high diversity are more resilient to pest outbreaks and when mortality does occur, replacement costs and related impacts (loss of shade/character of the neighborhood) are less severe because fewer trees are affected. It does appear that recently planted trees are more diverse and tend to have a higher composition of species. Serviceberries, red oaks, honey locusts, and ginkgos are found in the Study corridor and are all native to the United States. Recommended future planting strategies and species lists are discussed in Chapter 4.

The condition of the trees along the ROW varies widely, and the trees are subject to common challenges and constraints found in urban settings. Trees with ample space for root growth, such as those found in parks and open spaces, fared much better than those planted in small cut outs in the sidewalk. Some trees are suffering from root damage resulting from construction activities. A notable example includes the mature trees between the bike path and I-787 in Watervliet, many of which lost more than 50% of their root mass during the construction of the bike path.

Maintenance activities, such as over mowing with riding mowers and weed whacking have resulted in severe damage to the base of the trunk of many newly planted trees and dessication/compaction of the ground surface. Salt spray and herbicide use also appear to have taken a toll on some specimens. Unfortunately, emerald ash borer (EAB) has claimed the lives of many ash trees in the project area. Other potentially damaging pests include the pine shoot beetle, the spruce beetle, spruce budworm, and heterobaidion root disease. Finally, climate change is producing more erratic swings in temperatures, extreme heat, flash droughts, warmer temperatures in winter with corresponding increases in pests and diseases. Trees are struggling to adapt, and often succumb to stressors more easily than when the climate was more stable and low winter temperatures kept pest populations in check.

Stress from climate change, pollution, urban infrastructure, poor maintenance, and other environmental conditions shows up in the crown (leafy canopy) of trees. Assessing the percentage of crown die back provides a report of the tree's condition, and in some cases, when an irreversible trajectory of decline is occurring. The table below shows a ranking of crown health throughout the project corridor. Trees with less than 25% crown dieback are typically in stable condition, while those with more than a third of the canopy in decline are more likely to perish without intervention.

Table 2.9 – Crown Health of the Study Corridor's Urban Forest

Excellent (% crown dieback = 0)	**Good** (% crown dieback ≤ 10)	**Fair** (% crown dieback ≤ 25)	**Poor** (% crown dieback ≤ 50)	**Critical** (% crown dieback ≤ 75)	**Dying** (% crown dieback ≤ 99)	**Dead** (% crown dieback = 100)
13% of all trees	**26%** of all trees	**31%** of all trees	**15%** of all trees	**6%** of all trees	**9%** of all trees	**1%** of all trees

Fortunately, opportunities exist throughout the corridor to replace invasive and declining species with resilient, native trees. More than 40% of existing trees in the Study area have diameters less than 6". This indicates that many young trees have been planted in recent years, and those species tend to be more diverse and native to the northeast. Older, smaller diameter trees were also very common. While smaller trees are excellent for constrained settings, it is possible to create larger spaces for bigger trees by increasing plantings in open spaces, in large rights-of-ways, and through deliberate infrastructure strategies such as conversion of selected parking places to tree islands. Larger trees with vigorous canopies provide more shade and reduce heat island, and offer better habitat for birds and pollinators. A phased approach can be created to prioritize removal and replacement of declining trees, those with utility conflicts, and trees with inadequate space to thrive to ensure a resilient canopy in the coming decades.

The iTree Eco model performed post-field assessment quantified not only the physical distribution characteristics of the urban forest in the Study area, but also the air pollution removal, carbon storage and sequestration, oxygen production, and stormwater runoff avoidance, and replacement values of the trees.

Air pollution removal is of particular importance in the urban environment, since poor air quality has such negative impacts on public health. Pollutants evaluated in the iTree Eco model include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter less than 2.5 microns (PM 2.5), particulate matter greater than 10 microns (PM 10), and sulfur dioxide (SO_2). These pollutants damage respiratory airways, increase the risk of asthma and heart disease, and can even cause low birth weights. Trees provide incredible pollution removal ecosystem services. Approximately 147.7 pounds of air pollution are removed annually by the urban forest in the project corridor, at a correlated cost of 1.18 thousand dollars. Individual pollutants removed by the urban forest are listed below.

Table 2.10 – Pollutant Removal by the Study Corridor's Urban Forest

Pollutant	Annual Average Removal (pounds)	Annual Average Value* ($)
Carbon Monoxide (CO)	**2.3**	**$1.72**
Nitrogen Dioxide (NO_2)	**15.1**	**$5.54**
Ozone (O_3)	**94.7**	**$327**
Particulate Matter >10 microns	**28.2**	**$99**
Particulate Matter >2.5 microns	**5.8**	**$749**
Sulfur Dioxide (SO_2)	**1.6**	**$0.18**

**Pollution removal value is calculated based on the prices of $0.74 per pound (CO), $3.46 per pound (O3), $0.37 per pound (NO2), $0.11 per pound (SO2), $129.19 per pound (PM2.5), and $3.50 per pound (PM10).*

Trees do emit volatile organic compounds (VOCs), and in certain situations, this can be aggravating to certain respiratory conditions. Trees in the project area emit at total of 45.06 pounds of VOCs annually. VOCs can react with sunlight and vehicle emissions to form O3, found in smog. However, the shade benefits and pollution absorbing power of trees provide a wide range of health benefits; therefore, it is important to contemplate the larger picture when managing the urban forest. Instead of removing trees, reducing reliance on vehicles will decrease nitrogen dioxide emissions and a suite of other toxic air pollutants and substantially lower the risk of the development of smog in the summer months. Certain tree species, such as catalpa, elm, horse chestnuts are low VOC emitters, and can be used to increase the diversity of the forest canopy along the project corridor.

Urban forests are fundamentally important mechanisms to mitigate climate change. Trees not only sequester carbon in their growth of biomass, they also reduce the need for fossil-fuel based energy to heat and cool buildings by providing shade and protection from the wind. The trees in the Study corridor currently sequester 2.03 tons of carbon annually, at a value of 393 dollars. Interestingly, oxygen production (O2) in trees is directly correlated to the volume of carbon sequestered by the trees. The trees in the Study corridor currently produce an estimated 6.14 tons of O2 per year. Trees also store carbon in their tissues as they mature. The Study corridor trees are estimated to store 113 tons of carbon at a value of 19.2 thousand dollars. Maintenance, replanting, and expansion of the urban forest will increase these values if done proactively.

Stormwater runoff avoidance and flood protection is of particular importance for this Study corridor since so much of it is located within the floodplain. Climate change is producing increasingly severe storms, with higher volumes of rainfall in shorter periods of time. Flooding is a serious hazard to property and life, the risk of which is expected to become far worse in the coming decades. Surface runoff becomes problematic when the landscape is converted for anthropogenic use, and unfortunately, in the U.S. much of our urban infrastructure is designed for vehicles. Massive parking lots, oversize roads, and sprawling buildings inhibit the ability of water to be absorbed through the landscape and into the water table. Fortunately, green infrastructure, urban forestry improvements, and smarter building codes can reverse outdated development practices. Trees not only intercept rain as it falls from the sky, but their large root systems absorb a great deal of stormwater and promote infiltration into the soil. The trees currently planted in the Study corridor reduce an estimated 42.9 thousand gallons of runoff a year, at a value of 380 dollars. Most of these trees lack adequate area for their roots zones and aside from the green infrastructure project in Watervliet, trees are not planted with other green infrastructure measures such as bioswales, rain gardens, or below grade tree planters. Stormwater runoff avoidance could be greatly improved by the inclusion of green infrastructure and larger tree planting spaces. The expansion and diversification of a healthy, thoughtful urban forest will have an immense impact on the quality of life of people who live in and travel the Study corridor, and will undoubtedly increase the beauty and resilience of the area for generations to come.

Transportation Systems

This section provides an overview of the diverse transportation systems and infrastructure in the Study area, including transit, bicycle, pedestrian, and roadway infrastructure. This section also addresses the quality of and gaps in the transportation infrastructure network.

Transit Routes and Infrastructure

The transit infrastructure within the Broadway Study area is robust and diverse, encompassing Bus Rapid Transit (BRT) and local bus services, as well as convenient Park and Ride facilities. CDTA's BRT service is branded as BusPlus. The Study corridor is traversed by the CDTA Blue Line, a BRT route (#922/923) completed and launched in November 2022. Operating along a 15-mile corridor adjacent to the Hudson River, the Blue Line connects Albany, Cohoes, Menands, Troy, Waterford, and Watervliet. Boasting more than 2 million annual boardings, it stands as the third busiest transit corridor in the Capital Region. The 32 station pairs along the BusPlus Blue Line include 7 pairs along the Broadway Study corridor. BRT stations feature modern amenities such as larger bus shelters, benches, lean bars, LED lights, USB charging ports, trash receptacles, heated sidewalks, and solar panels.

Bus Routes and Stops

Local transit options are provided by various bus routes, including the 22, 182, 524, 801, 805, 806, and the 815, with 56 local stops along the Study corridor (Routes 12 and 870 do not run along the Broadway Study corridor, but do connect transit users to the intersection of Broadway and Clinton Avenue). These stops offer varying amenities, ranging from simple signs to less modern and smaller green shelters, benches, trash receptacles, and bike racks. Some stops only feature a sign. The level of Bus Stop amenities at each stop are guided by CDTA's infrastructure standards, with more amenities placed at stops with higher ridership.

Northbound BRT station at on 2nd Avenue at 19th Street

Transit Stops and Amenities along Corridor	#
Stop Only (no added amenities)	88
Stop with Bench Only	1
Stop with Shelter Only	17
Stop with Bench and Shelter	60
TOTAL	**166**

Map developed by Byer Planning, LLC. Date Exported: 6/11/2024 4:35 PM

Albany County Broadway Multimodal Resiliency Plan

CDTA Transit Stops and Routes

- Transit Stop
- Transit Stop with Bench
- Transit Stop with Shelter
- Transit Stop with Bench and Shelter
- CDTA Routes
- Broadway Corridor without Transit Routes

Basemap

- Railroad
- Parks and Open Space
- Water

Below is description of the bus routes along the Study corridor and the destinations they connect:

- **Route 22: Albany - Troy via Watervliet:** Runs along the Broadway corridor from Clinton Street in Albany to 13th Street in Watervliet
- **Route 182: Troy - Albany via Cohoes and Latham:** Runs along the Broadway corridor (2nd Avenue) from 19th Street to 25th Street in Watervliet
- **Route 524: Broadway Menands Express:** Runs along the Broadway corridor from the Crowns Castle driveway entrance to the on/off ramp for I-787 in Menands
- **Route 801: Albany Shuttle:** Runs along the Broadway corridor from Center Street to Lawn Avenue in Albany
- **Route 805: Mid Town Shuttle:** Runs along the Broadway corridor from Clinton Street in Albany to N Pearl Street in Menands
- **Route 806: Delaware Shuttle:** Runs along the Broadway corridor from Clinton Street to Loudonville Road in Albany
- **Route 815: Troy Shopping Bus:** Runs along the Broadway corridor (13th Street) from 2nd Avenue to Broadway in Watervliet; this route also crosses the Broadway corridor (2nd Avenue) at the intersection with 16th Street in Watervliet
- **Route 922: BusPlus Blue Line Cohoes to Delaware Station:** Runs along the Broadway corridor from Clinton Street in Albany to 13th Street in Watervliet; Runs along the Broadway corridor (2nd Avenue) from 16th Street to 19th Street in Watervliet
- **Route 923: BusPlus Blue Line Waterford to Rail Trail Station:** Runs along the Broadway corridor from Clinton Street in Albany to 13th Street in Watervliet; Runs along the Broadway corridor (2nd Avenue) from 16th Street to 19th Street in Watervliet

Canopy Cover and Transit Stops

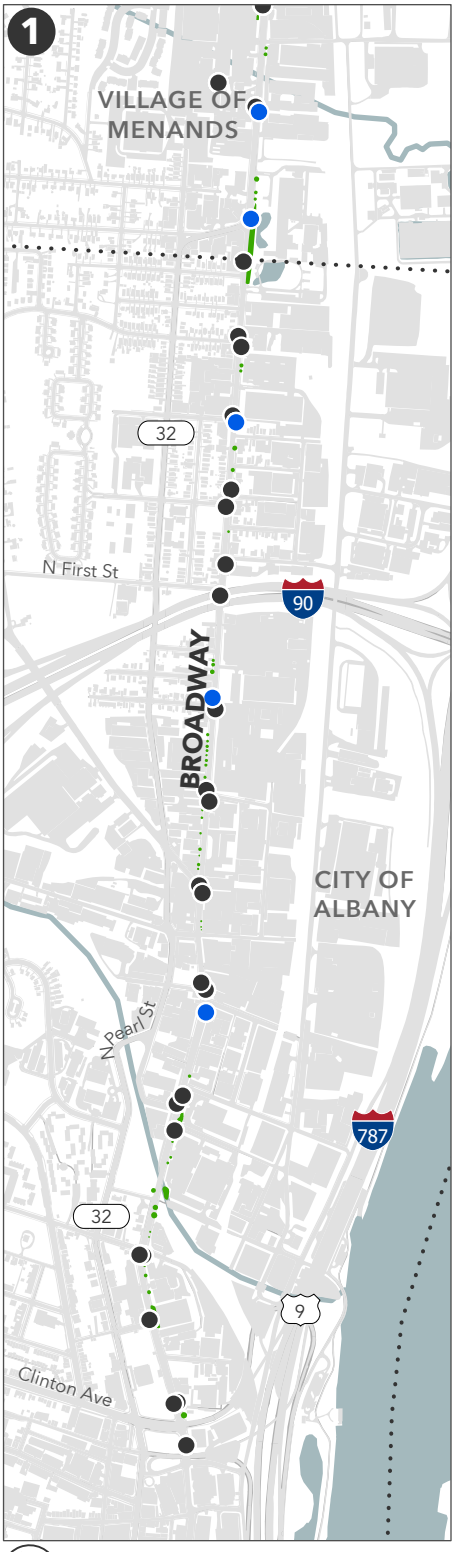
A majority of transit stops along the Study corridor are not shaded by tree canopy cover. Only three transit stops, all located in Watervliet, overlap with tree canopy cover along the Study corridor. Nine additional transit stops are within 20-feet of tree canopy cover and likely benefit from some shade.

Increasing tree canopy cover adjacent to transit stops, especially the 89 stops with no shelters to provide shade, can help cool the surrounding environment and make it more comfortable to wait for the bus.

Transit Improvements at Intersections

Along the BusPlus and Study corridor, CDTA utilizes intersection improvements such as transit signal priority (TSP) and queue jump lanes. TSP technology allows buses to make traffic signals stay green longer or turn from red to green quicker, reducing the amount of time buses are stopped at traffic lights.

There is also a queue jump lane located near the Route 378 Park and Ride. A queue jump lane is a transit treatment that is either a short segment of dedicated bus only lane or shared with right turns. The lane works in conjunction with a special signal, so the bus can pull alongside a queue, then jump the queue as it heads downstream of the signal. The queue jump gives priority to buses at intersections and is restricted to transit vehicles only.



Miles
0 0.2 0.4

Miles
0 0.2 0.4

Miles
0 0.2 0.4

Map developed by Byer Planning, LLC. Date Exported: 4/16/2024 3:29 PM

Albany County Broadway Multimodal Resiliency Plan

CDTA Transit Stops

- Bus Stops Intersecting with Tree Canopy
- Bus Stops within 20 Feet of Tree Canopy
- Other Bus Stops not within 20 Feet of Tree Canopy

Existing Tree Canopy

Existing Tree Canopy

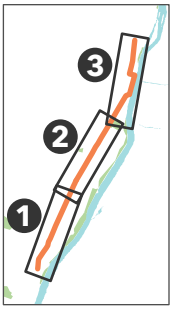


Table 2.11 – Notable Ridership at Stops in the Study Corridor

Stop Name	Type	Total Ons	Total Offs	Total Ridership
Watervliet 19th St Station - 2nd Ave & 19th St	BRT	127.00	264.29	391.29
Watervliet 19th St Station - 2nd Ave & 19th St	BRT	260.43	116.57	377.00
80 Broadway Lot	P&R	228.19	148.19	376.38
North Albany Station - Broadway & N. 2nd St	BRT	191.62	48.90	240.52
North Albany Station - Broadway & Center St	BRT	53.24	183.67	236.90
Livingston Station - Broadway & Livingston Ave	BRT	134.33	51.19	185.52
Broadway & Orange St	Local	110.48	39.43	149.90
Livingston Station - N. Pearl St & Livingston Ave	BRT	42.19	96.10	138.29
Riverview Center Station - Broadway & I-787 Exit 6	BRT	69.48	40.57	110.05
Route 378 Station - 563 Broadway	BRT/P&R	31.48	74.14	105.62
Riverview Center Station - Broadway & I-787 Exit 6	BRT	38.76	65.43	104.19
Route 378 Station - 550 Broadway	BRT/P&R	68.95	31.95	100.90
Port Schuyler Station - 3rd Ave & 5th St	BRT	51.00	39.90	90.90
590 Broadway (FedEx)	Local	61.38	17.14	78.52
Port Schuyler Station - 3rd Ave & 6th	BRT	40.00	36.33	76.33
587 Broadway (The Village One Apts)	Local	18.24	50.43	68.67

Intermodal Connectivity

Intermodal connectivity refers to direct linkages between different modes of transportation. When intermodal connectivity is increased, transportation options are expanded and travelers' ability to use their preferred mode of transportation is enhanced.

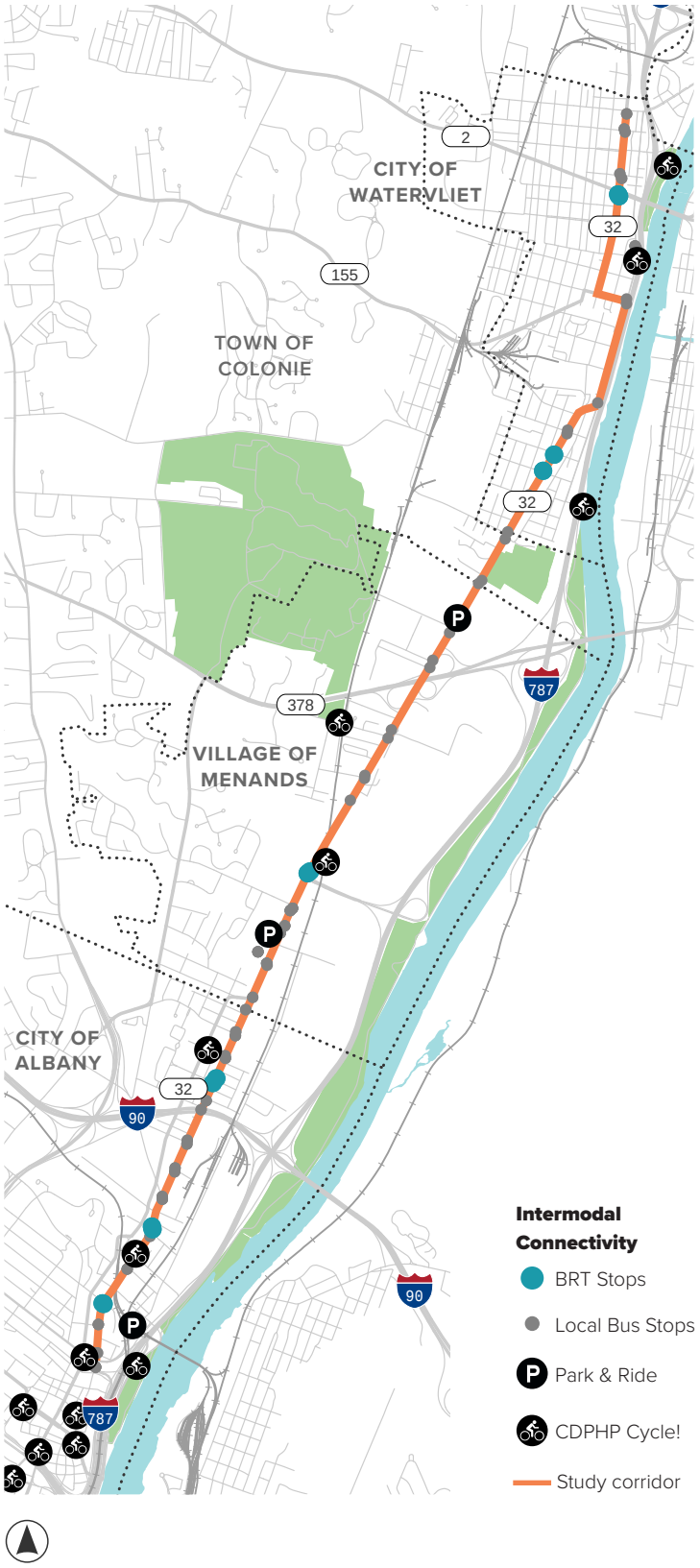
Park & Ride Facilities

Park & Ride facilities play a crucial role in the transit network, expanding access to transit for those who want to take the bus but are unable to walk/bike to a transit stop. There are three Park & Ride locations within the Study Area:

- The Menands Route 378 Park and Ride provides 83 spaces, including four with electric vehicle charging stations, and easy access to the Blue Line BusPlus 922 and 923 via the Route 378 Station.
- The Water Street lot, historically divided, now combines lot A and B for a total of 580 spaces. The Water Street C lot is now known as the Water Street Annex and has 137 spaces.
- The 80 Broadway lot, adjacent to I-787 Exit 6, offers 550 spaces and two bus stops. CDTA plans to consolidate nearby service to the 80 Broadway site and construct a BRT station. This would relocate parking demand from the existing parking lots at McCarty Avenue, Water Street, and the Water Street Annex which will be closed. This station would serve several purposes including State employee permit parking customers, the New York State Office of General Services (OGS) shuttle to the Empire State Plaza, and the existing CDTA Route #22 and River Corridor BRT service. These Park & Ride facilities contribute to the overall accessibility and connectivity of the transit system within the Study area.

CDPHP Cycle Share

CDPHP Cycle! is a bikeshare network for the Capital Region. There are two bikeshare stations located directly along the Broadway corridor: one near the intersection of Broadway and North Ferry Street in Albany adjacent to a local bus stop and one on Broadway just north of I-787 Exit 6 and adjacent to a BRT stop in Menands. There are additional bikeshare stations in the Study area. Enhancing pedestrian infrastructure between the Study corridor and these bikeshare stations would expand access to destinations for cyclists and transit users.



Pedestrian and Bicycle Infrastructure

Sidewalks

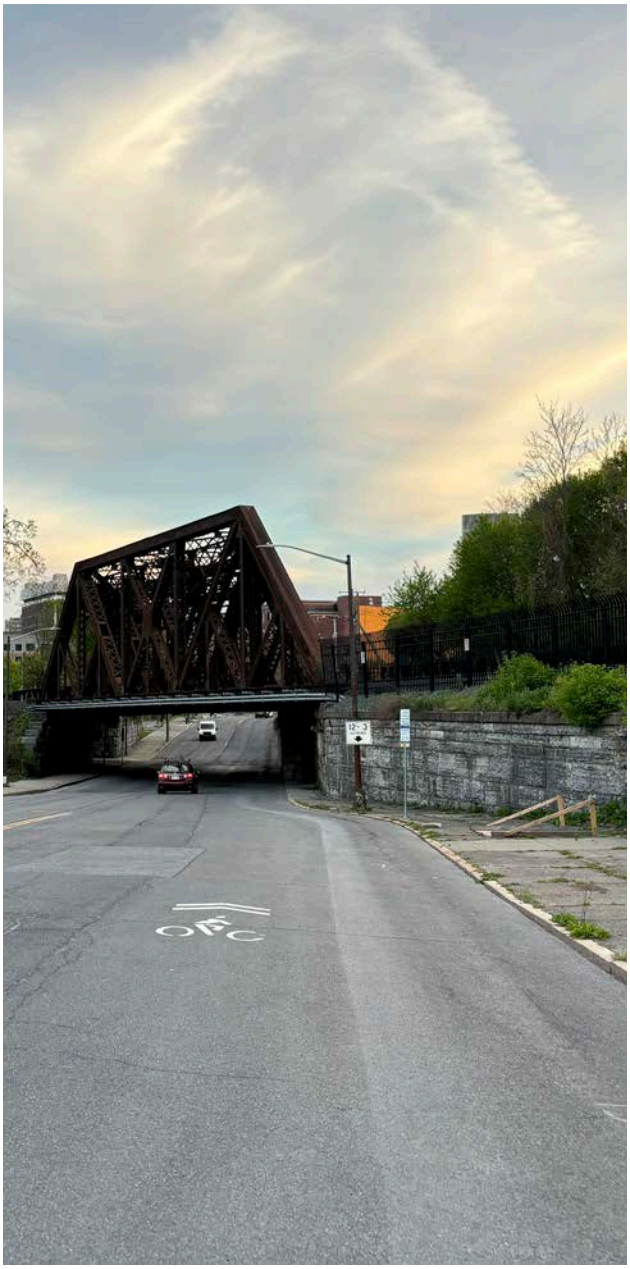
Along the southbound side of the Study corridor, sidewalks are consistently present, with the exception of the area under the CSX/Amtrak railroad bridge in the City of Albany.

On the northbound side, two distinct segments lack sidewalks. The first is approximately 3,100 feet along Broadway from East Elmwood Road through the NYS Route 378 interchange to CDTA's Park and Ride in Menands. The second is approximately 2,575 feet along Broadway from 2nd Avenue to 13th Street in Watervliet. It is noteworthy that this sidewalk gap in Watervliet overlaps with the Empire State Trail cycle track.

Along the length of the Study corridor there are several sidewalk connections on intersecting roads to facilitate pedestrian movement. North Pearl Street, which runs parallel to Broadway in the City of Albany, also features several sidewalk connections to the Study corridor. However, sidewalk connectivity is limited in Albany on the east side of the Study corridor through the warehouse district and in Menands, where the number of streets intersecting the Study corridor is much lower than in the cities of Albany and Watervliet.

The City of Albany developed an Americans with Disabilities Act (ADA) Transition Plan in 2022 to ensure that their pedestrian infrastructure in the public right-of-way is accessible for everyone, including those with disabilities. As a part of the Study, the City of Albany identified locations that are either not accessible or partially accessible. These locations include sidewalks and trails, intersections, crossings, and transit stops. The Village of Menands Draft ADA Public Streets and Sidewalks Plan also identifies and evaluates all pedestrian infrastructure in the public right-of-way to ensure that the Village's pedestrian infrastructure is accessible for everyone. The Broadway corridor is identified as a priority location in the Plan. An ADA Transition Plan is currently under development for the City of Watervliet.

While ADA accessibility is not a primary focus of this Study, it is recommended that the inaccessible or partially accessible locations are reviewed and enhanced to be ADA compliant, and it is assumed that any ongoing ADA transition planning in the corridor will address in detail the ADA needs.



Looking south along a segment of Broadway, just north of the CSX railroad bridge in Albany. At this location, the sidewalk on the southbound side of the Study corridor ends at the railroad bridge.

Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:16 PM

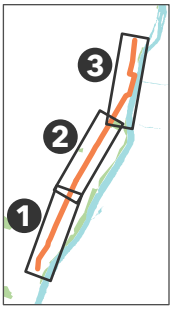
Albany County Broadway Multimodal Resiliency Plan

Existing Pedestrian Facilities

- Sidewalks
- Shared Use Path

Basemap

- Railroad
- Water
- Parks and Open Space



Bicycle Facilities

In general, bicycle infrastructure is disconnected and varies greatly in quality, type, and level of protection along the Study corridor. Bicycle facility types vary along the length of the Study corridor, and include:

- **1.2 miles of sharrows/shared roadway** along Broadway from Clinton Avenue to Genesee Street in Albany;
- **2.4 miles of bike lanes** from Wolfert Avenue to Schuyler Lane in Menands. Along this segment bike lanes sometimes include a striped buffer;
- **0.5 miles of two-way cycle track** along the east side of Broadway from 8th Street to 13th Street in Watervliet. There is a grass buffer with curb between the cycle track and the roadway for 500 feet on the southern end of this segment as well as 400 feet on the northern end of this segment;
- **530 feet of sharrows/shared roadway** along 2nd Avenue from 13th Street to 14th Street in Watervliet. The sharrows/shared roadway merges into a bike lane on the east side of the roadway as it approaches 14th Street; and,
- **0.4 miles of bike lanes** from 14th Street to 21st Street in Watervliet.

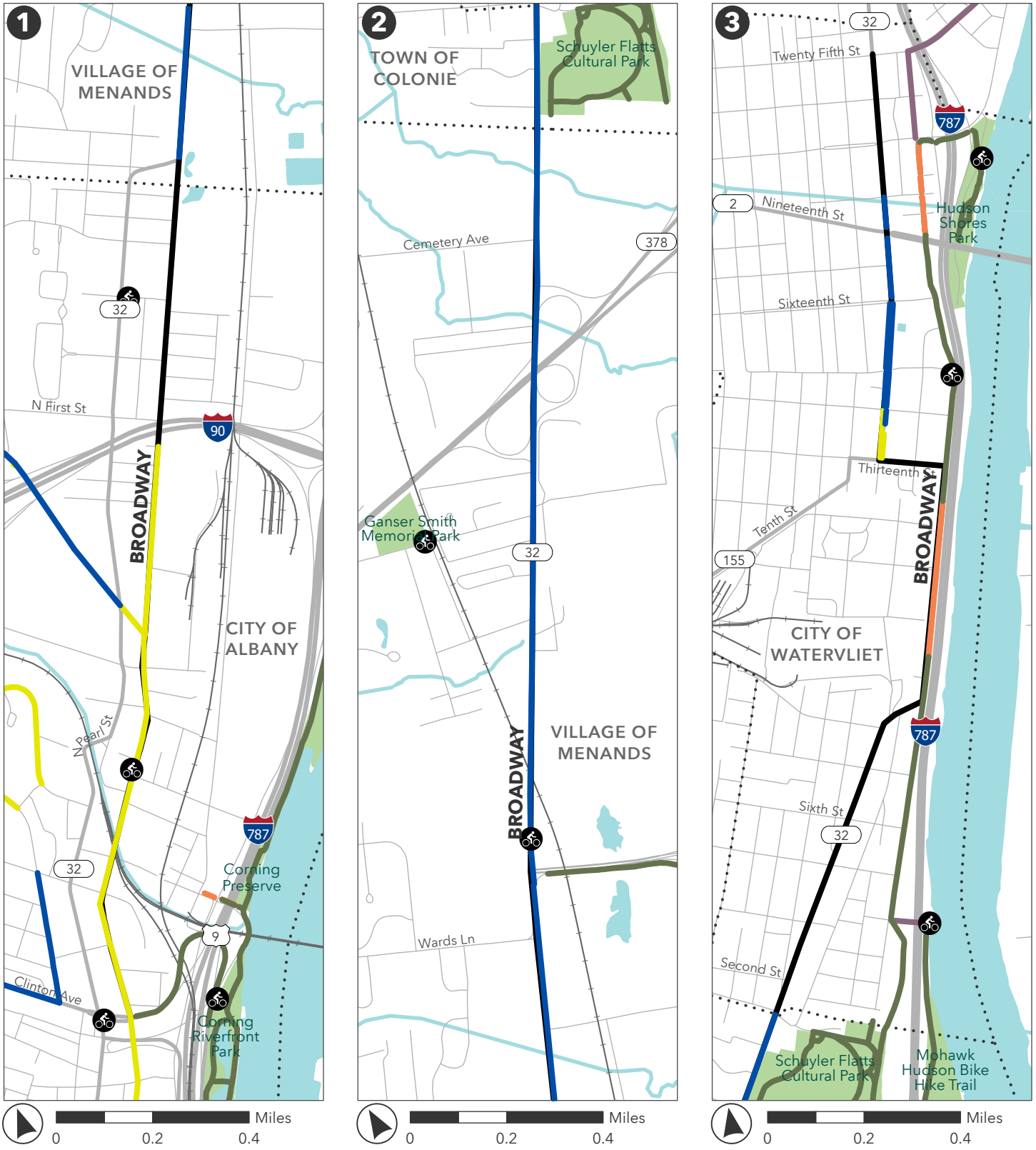
There are several areas in the Study corridor where bicycle facilities are completely absent. The table on the next page provides a detailed overview of the type and location of bicycle facilities along the Study corridor.

Empire State Trail

The Empire State Trail runs adjacent to the Study corridor (~1000 feet east) between Broadway and the Hudson River. It is an off-road facility from Albany to Watervliet running between I-787 and the Hudson River. At 4th Street the trail crosses under I-787 and transitions to an on-road facility until 23rd Street. The Hudson River Way, Albany Skyway, Menands Mohawk Hudson Connector Trail, and Schuyler Flatts Trail all connect Broadway in an east-west manner to the Empire State Trail. There are several parking areas allowing access to the Empire State Trail within the Study area. There are two areas in downtown Albany: Corning Preserve on Quay Street and Corning Preserve Boat Launch Parking on Water Street. In Watervliet there are two parking areas: one at the Mohawk Hudson Bike Hike Trail at 330 Broadway and the other at Hudson Shores Park at 23rd Street.

Capital District Trails Plan

The Capital District Trails Plan, completed in 2019, identifies recommendations for multi-use trails within the Capital District. This Plan recommends a Route 32 Cycle Track along the Study corridor from I-787 Exit 6 in Menands to the intersection of 8th Street and Broadway in Watervliet.



Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:06 PM

Albany County Broadway Multimodal Resiliency Plan

Existing Bicycle Facilities

- Shared Use Path
- Cycle Track
- Bike Lane
- Sharrows / Shared Roadway
- CDPHP Cycle Stations

Basemap

- Railroad
- Water
- Parks and Open Space
- Broadway Corridor without Bicycle Facilities

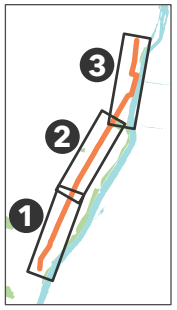


Table 2.12 – Existing Bicycle Infrastructure

Study Corridor	Municipality	Segment	Southbound Bike Facility	Northbound Bike Facility
Broadway	City of Albany	Clinton Ave to N. 1st St	Sharrow	Sharrow
		N. 1st St to Wolfert Ave	None	None
	Village of Menands	Lindenberg Ave to Wolfert Ave	Sharrow	Conventional bike lane
		Wolfert Ave to I-787 Exit 6 on/ off ramp	Buffered	Buffered
		I-787 Exit 6 on/off ramp to NYSDOH Building	Buffered	Conventional bike lane
		NYSDOH Building to E Elmwood Rd	Signed shoulder	Signed shoulder
		E Elmwood Rd to Clifford Rd	None	None
		Clifford Rd to Glenwood Rd	Conventional bike lane	Conventional bike lane
		Glenwood Rd to 378 Park and Ride	None	Conventional bike lane
		378 Park and Ride to 1st Street	None	None
3rd Ave	City of Watervliet	1st Street to NY 32	None	None
NY 32		3rd Ave to 9th St	NB cycle track	Cycle track (EST)
		9th St to 350 ft south of 13th St	NB cycle track	Cycle track (EST)
		350 ft south of 13th St to 13th St	NB cycle track	Cycle track (EST)
13th St		NY 32 to 2nd Ave	None	None
2nd Ave		13th St to 14th St	Sharrow	Sharrow
		14th St to 16th St	Buffered	Buffered
		16th St to 21st St	Conventional bike lane	Conventional bike lane
		21st St to 25th St	None	None

Crashes

Crash data from NYSDOT's Crash Location and Engineering Analysis Repository (CLEAR) was obtained and analyzed for a 5-year period, from April 1, 2018 through March 31, 2023, for the Study corridor. This dataset includes crashes reported to the police. Due to underreporting, it may underestimate the number of crashes between vulnerable users and motor vehicles.

There were a total of 689 crashes reported along the Study corridor between April 1, 2018 and March 31, 2023. Of those, eight were bicyclist-involved crashes and twenty were pedestrian-involved crashes. Five of the bicyclist-involved crashes and seven of the pedestrian-involved crashes resulted in injury or serious injury.

Bicyclist-involved crashes occurred primarily in the Cities of Albany and Watervliet, whereas pedestrian-involved crashes occurred along the entire length of the Study corridor. Pedestrian- and bicyclist-involved crashes were concentrated at the intersection of 2nd Avenue and 19th Street and the entrance to the Congress Street Bridge. Another hotspot of pedestrian- and bicyclist-involved crashes occurred in North Albany, to the north and south of the I-90 overpass.

Four fatal crashes were reported during the 5-year time period studies. These fatal crashes did not involve pedestrians or cyclists.

Motor vehicle crashes were concentrated at the following intersections:

- Broadway and Colonie Street;
- At all intersections in Albany's warehouse district, between North Ferry Street and Bridge Street;
- Broadway and Wards Lane;
- At all intersections along 3rd Avenue in Watervliet, between 1st Street and 7th Street; and,
- At several intersections along 2nd Avenue in Watervliet, including 19th Street, 21st Street, 23rd Street, and 25th Street.

Table 2.13 – Summary of Crashes in the Study Area

Injury Severity	# Pedestrian-Involved Crashes	# Bicyclist-Involved Crashes	# Other Crashes	TOTAL
Serious Injury (A)	4	3	18	**25**
Injury (B)	3	2	16	**21**
Possible Injury (C)	8	0	59	**67**
Unknown Severity (U)	5	3	564	**572**
Fatal (K)	0	0	4	**4**
TOTAL	**20**	**8**	**661**	**689**

Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:31 PM

Albany County Broadway Multimodal Resiliency Plan

Pedestrian-Involved Crashes

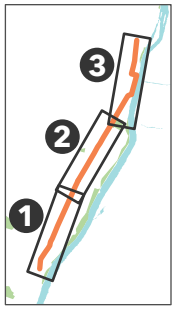
- Serious Injury (A)
- Injury (B)
- Possible Injury (C)
- Unknown Severity (U)

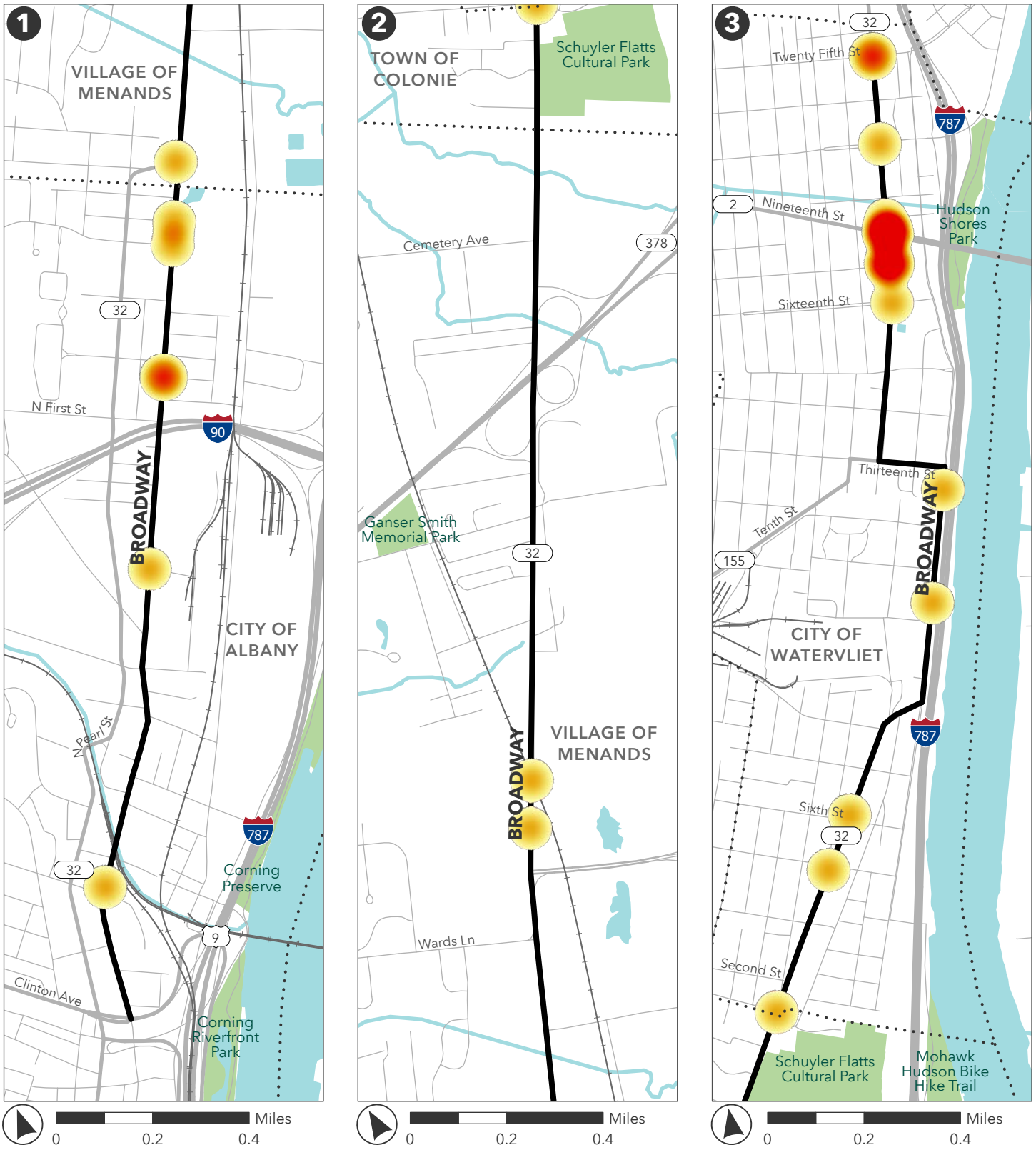
Bicyclist-Involved Crashes

- Serious Injury (A)
- Injury (B)
- Possible Injury (C)
- Unknown Severity (U)

Other Crashes

- Serious Injury (A)
- Injury (B)
- Possible Injury (C)
- Fatal (K)
- Unknown Severity (U)





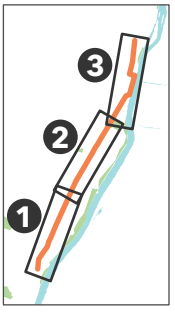
Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:27 PM

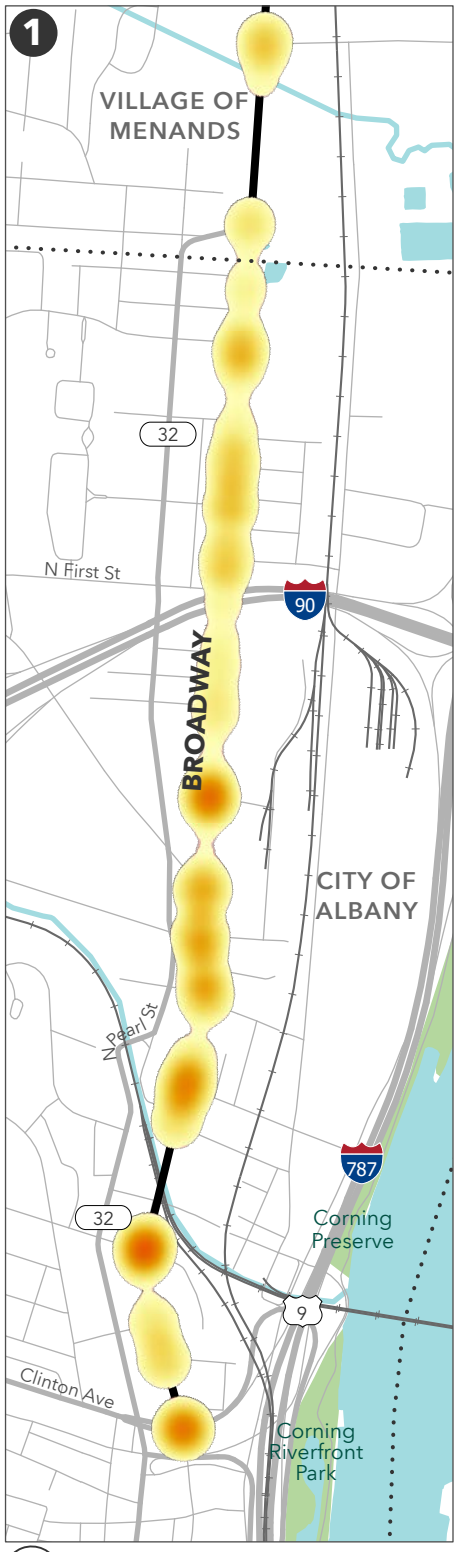
Albany County Broadway Multimodal Resiliency Plan

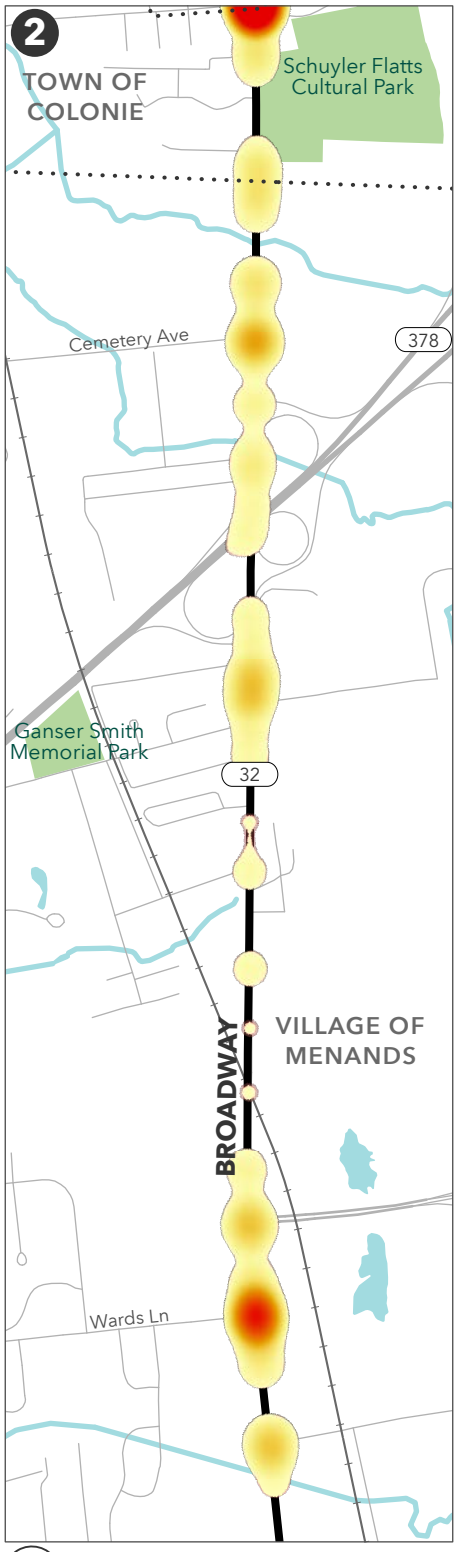
Pedestrian- and Bicyclist-Involved Crashes

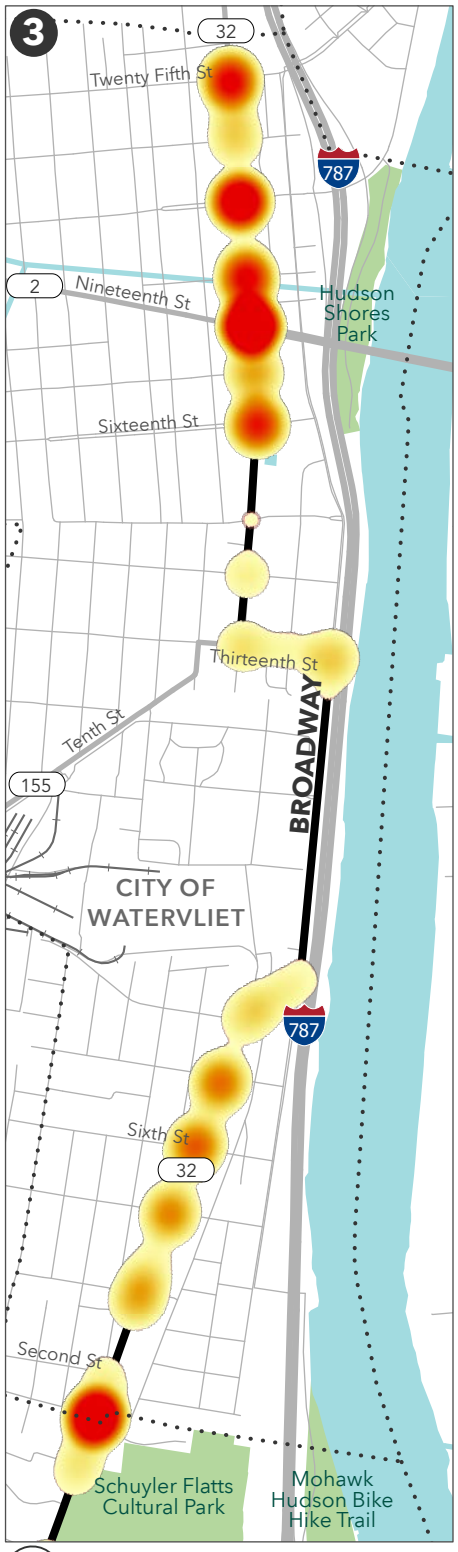
Lower Crash Density

Higher Crash Density









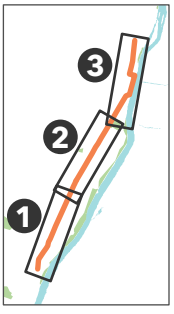
Map developed by Byer Planning, LLC. Date Exported: 3/25/2024 12:23 PM

Albany County Broadway Multimodal Resiliency Plan

Other Crashes (No Bicyclist or Pedestrian Crashes Included)

Lower Crash Density

Higher Crash Density



Traffic Volumes

Annual Average Daily Traffic (AADT) values provide an approximate measure of motor vehicle traffic volumes along different segments of roadway. The data presented in this section and on the maps on the next page were accessed from the NYSDOT Traffic Data Viewer (https://www.dot.ny.gov/tdv) and represent volume estimates for 2021.

AADT volumes along the Study corridor range from 2,686 to 12,226 vehicles per day. The highest traffic volumes along the Study corridor are found on:

- 2nd Avenue (Route 32) in Watervliet from 19th Street (Route 2) to 23rd Street (AADT 12,226)
- Broadway (Route 32) in Menands from Wolfert Avenue to the on/off ramp for I-787 (AADT 10,824)
- Broadway (Route 32) in Menands from the Route 378 interchange to 1st Street in Watervliet (AADT 10,510)
- 3rd Avenue / Broadway (Route 32) in Watervliet from 1st Street to 13th Street (AADT 8,408)

Existing traffic volumes will be an important factor as changes that reconfigure the Study corridor are considered. According to the Federal Highway Administration's Road Diet Informational Guide (2022), roadways with an AADT volumes of 20,000 or less may be good candidates for a road diet (i.e., travel lane reduction) and should be evaluated for feasibility. The observed and estimated AADT volumes along the Study corridor are well below this threshold, and road diets may be feasible at multiple locations. Notably, NYSDOT implemented a road diet along a half-mile stretch of Broadway in Menands, reducing the roadway from four travel lanes to two travel lanes with a center turning lane in 2016.

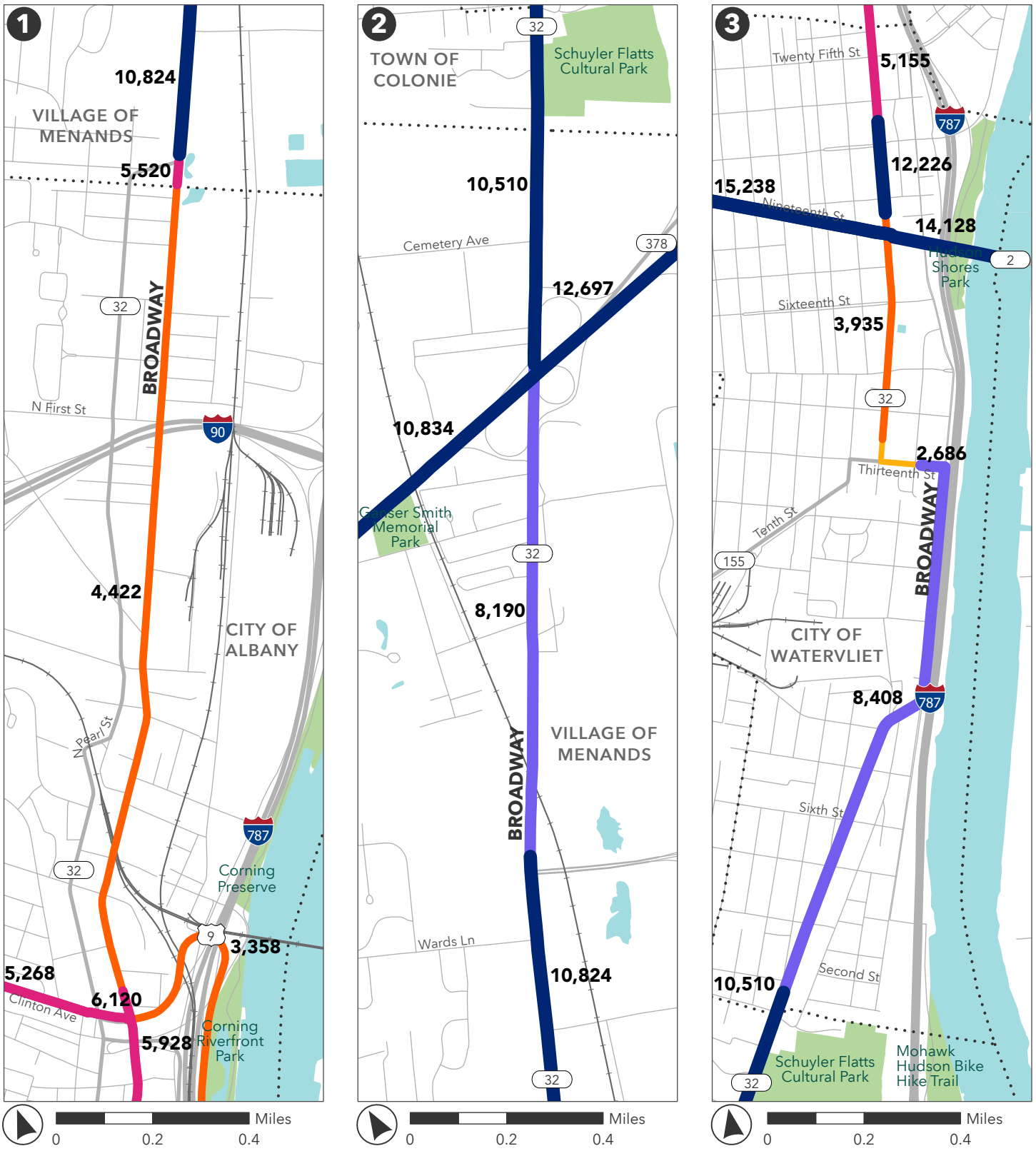
Speed

Posted speed limits for several of the roadways in the Study area are recorded and displayed in the NYSDOT Traffic Data Viewer (https://www.dot.ny.gov/tdv). The entirety of the Broadway corridor has a posted speed limit of 30 miles per hour (MPH) within all municipalities (see map on the next page). Several high-speed roadways connect with the Study corridor at several locations, including I-787 via Exits 4B and 6 and State Route 378.

The 85th percentile speed along a roadway provides a sense of the actual speeds at which motor vehicles are traveling. Specifically, the 85th percentile speed is the speed at or below which 85 percent of the drivers travel on a road segment. The 85th percentile speeds realized along the Study corridor range from 31 MPH to 40 MPH, according to the NYSDOT Traffic Data Viewer (https://www.dot.ny.gov/tdv). The highest 85th percentile speed (40 MPH) is located along Broadway within Menands between I-787 Exit 6 and the State Route 378 interchange.

SPEED LIMIT REDUCTION IN ALBANY

On January 1, 2025, the City of Albany reduced its municipal speed limit by 5 mph, from 30 mph to 25 mph. When cars travel at lower speeds, the likelihood a crash will result in a serious injury or death is greatly reduced. For example, the likelihood of a pedestrian dying if hit at 40 mph is 46%, at 30 mph the likelihood of death is 20%, and at 20 mph the likelihood a pedestrian will die if hit is 8% (AAA Foundation, Tefft, B.C., 2011).



Map developed by Byer Planning, LLC. Date Exported: 12/3/2024 11:36 AM

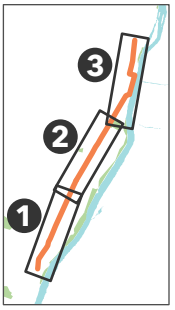
Albany County Broadway Multimodal Resiliency Plan

Annual Average Daily Traffic (AADT 2021)

- <3,001
- 3,001 - 5,000
- 5,001 - 8,000
- 8,001 - 10,000
- 10,001+

Basemap

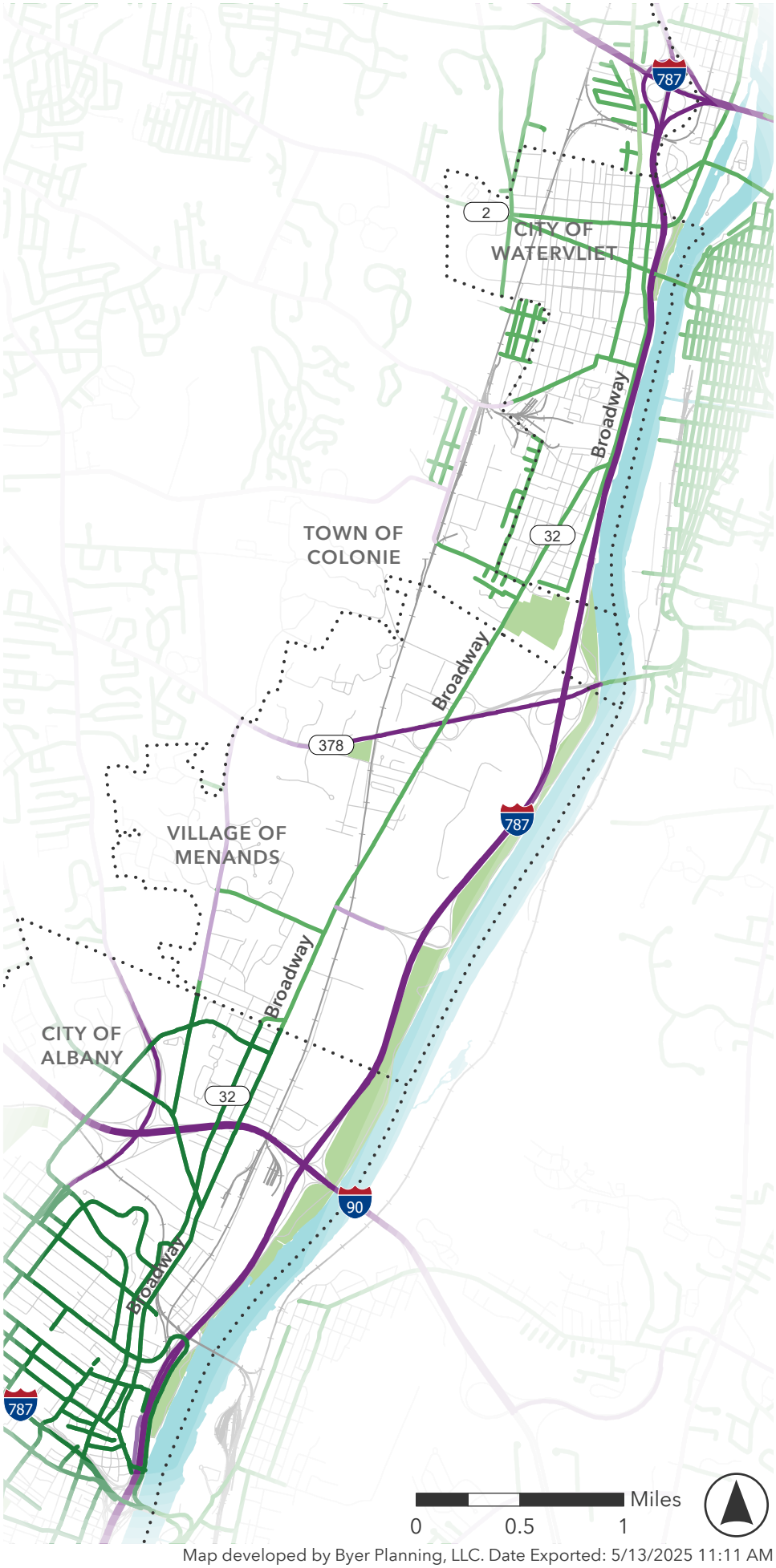
- Railroad
- Water
- Parks and Open Space



Albany County Broadway Multimodal Resiliency Plan

Posted Speed Limit

- 25 MPH
- 30 MPH
- 35 MPH
- 40 MPH
- 45 MPH
- 50 MPH
- 55 MPH

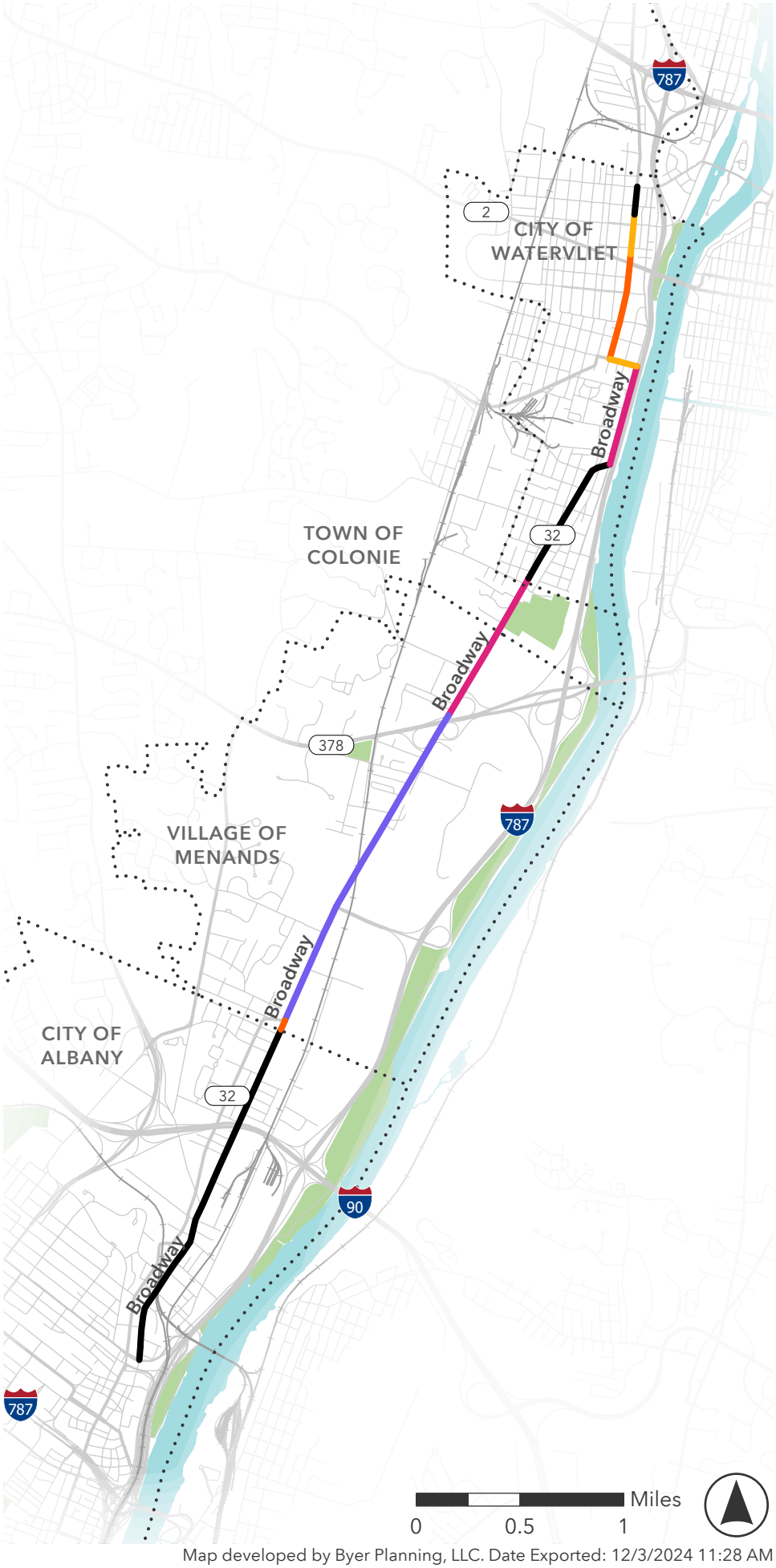


Map developed by Byer Planning, LLC. Date Exported: 5/13/2025 11:11 AM

Albany County Broadway Multimodal Resiliency Plan

85th Percentile Speeds

- 31 MPH - 33 MPH
- 34 MPH - 35 MPH
- 37 MPH - 38 MPH
- 39 MPH - 40 MPH
- Unknown 85th Percentile Speed along Broadway Corridor



Map developed by Byer Planning, LLC. Date Exported: 12/3/2024 11:28 AM

Pavement Condition

Pavement condition impacts the ability of different modes of transportation to safely and comfortably use the roadway. Pavement condition varies along the length of the Study corridor (see Table 2.X below). Along 35% of the 6.5 mile long Study corridor, the pavement features clearly visible surface distress and is rated as fair condition. Along approximately 28% of the Study corridor, the pavement is beginning to show surface distress and is rated as good condition. Approximately 1.2 miles of the Study corridor (18%) shows no surface distress and is rated as excellent condition. Segments of the Study corridor in excellent condition occur in north Albany, the Village of Menands near I-787 Exit 6, and along Broadway in Watervliet.

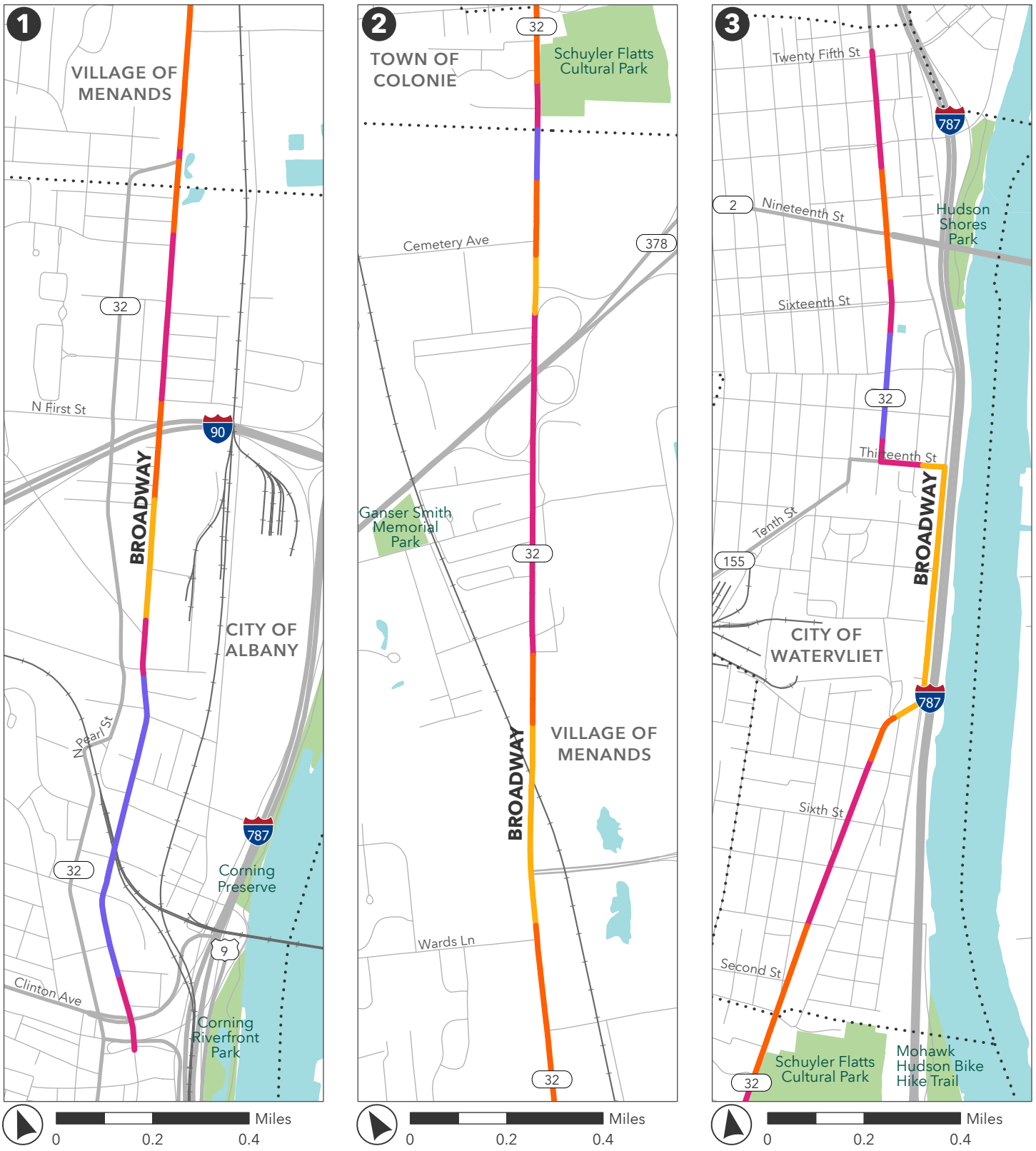
Just under one mile of the Study corridor features frequent and severe distress and is rated as poor condition. A majority of the poor pavement condition is located in Albany, between Spencer Street and Loudonville Road. This stretch of poor pavement condition connects downtown Albany to the popular warehouse district, which contains several food and craft beverage establishments.

Pavement condition along 3rd Avenue in the City of Watervliet.

Table 2.14 – Pavement Rating Descriptions

Rating	Condition/Description	Miles of Pavement Condition along the Study Corridor
9-10	**Excellent** - No surface distress	1.2 miles
7-8	**Good** – Surface distress beginning to show	1.8 miles
6	**Fair** – Surface distress is clearly visible	2.3 miles
1-5	**Poor** – Distress is frequent and severe	0.95 miles

Pavement condition ratings were obtained from the NYSDOT Network Level Pavement Condition Assessment. The network level Pavement Surface Rating Survey is conducted by region-based crews consisting of a driver and a rater. While traveling at the posted speed limit, the rater will make two assessments of each pavement segment: (1) assign a condition rating from "1" (impassable) to "10" (new) based on the distresses appearing on the pavement surface, and (2) identify the presence of specific types of distresses called Dominant Distresses.



Map developed by Byer Planning, LLC. Date Exported: 12/3/2024 11:26 AM

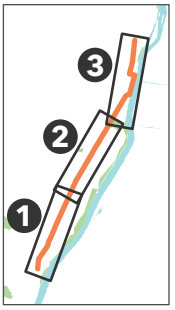
Albany County Broadway Multimodal Resiliency Plan

NYSDOT 2022 Pavement Ratings

- Poor - Distress is frequent and severe (Score 1-5)
- Fair - Surface distress is clearly visible (Score 6)
- Good - Surface distress beginning to show (Score 7-8)
- Excellent - No surface distress (Score 9-10)

Basemap

- Railroad
- Water
- Parks and Open Space



On-Street Parking

Throughout the Study corridor, the availability of on-street parking varies. Where on-street parking is present, it typically serves a mix of multi-family residences and smaller businesses.

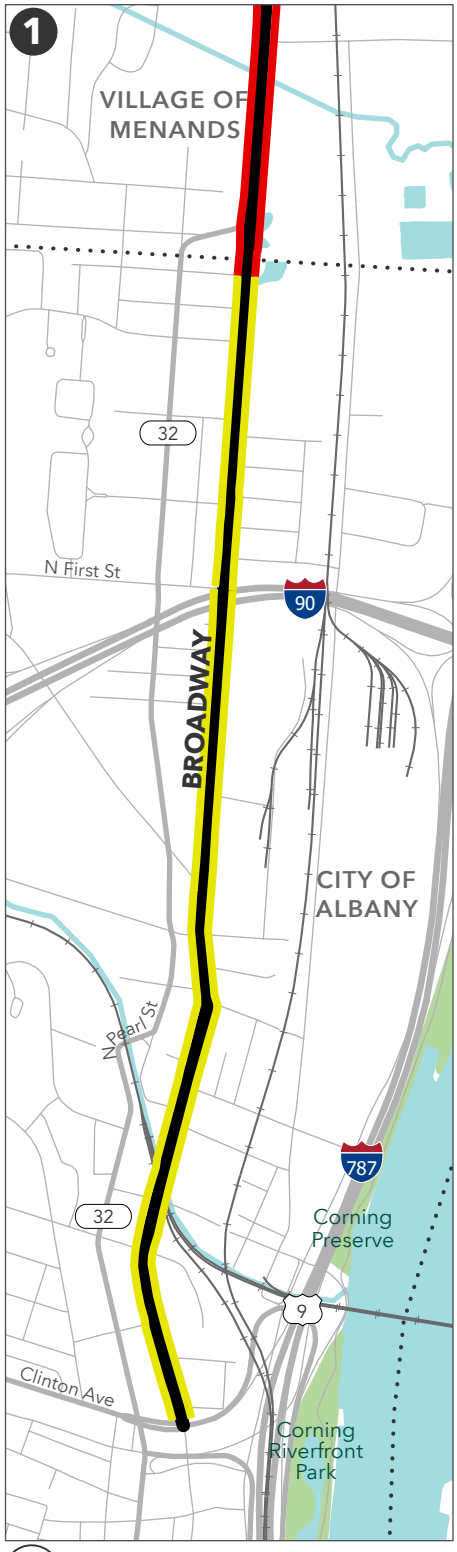
In the City of Albany, on-street parking is generally available on both sides of the Study corridor. There are a few isolated exceptions where on-street parking is prohibited, including at transit stops and under the CSX railroad bridge. In the Warehouse District, from approximately North Ferry Street to Bridge Street, on-street parking is well utilized, especially in the evenings when this District is busiest. North of the I-90 overpass, on-street parking serves several small businesses and residences.

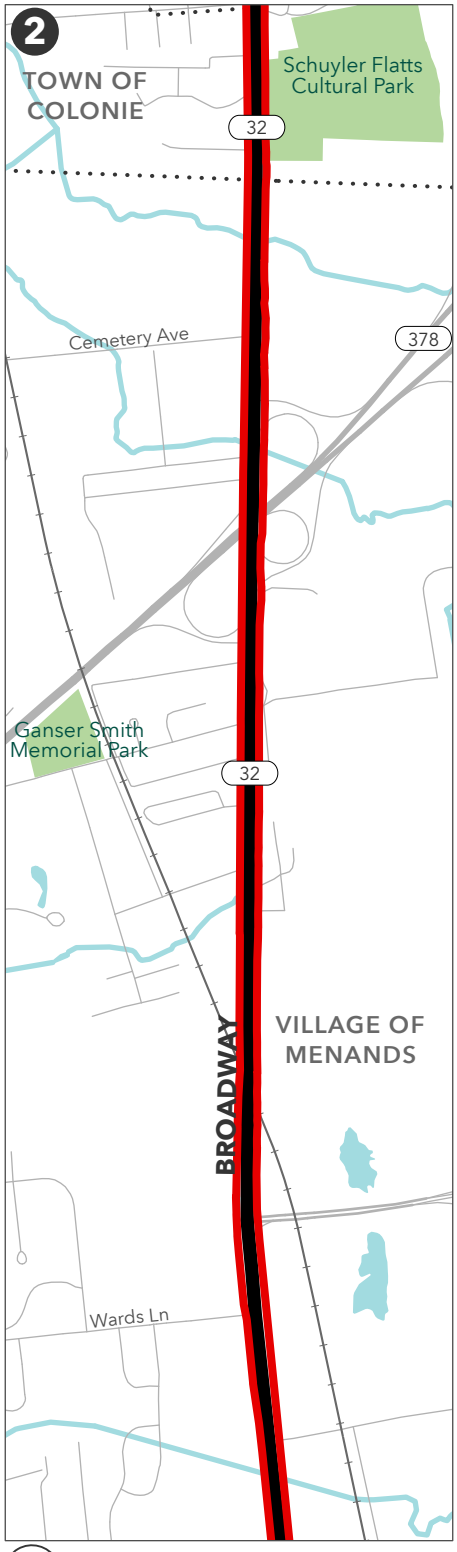
In the Village of Menands, on-street parking is prohibited along the length of the Study corridor. In general, the outer travel lanes are dedicated to bicycle infrastructure rather than on-street parking.

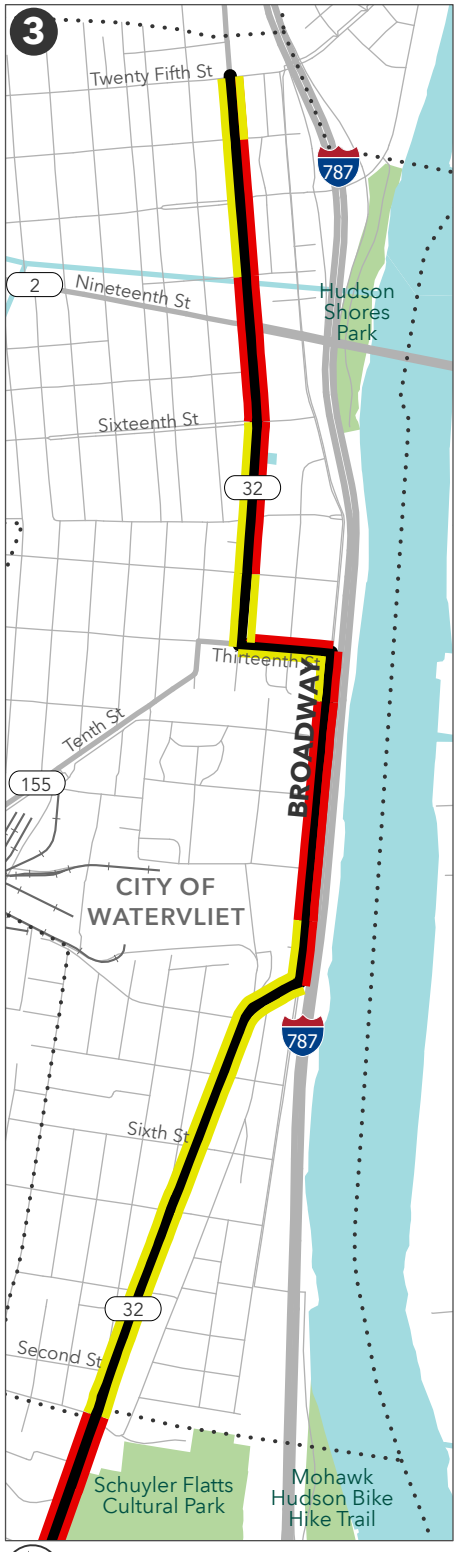
In the City of Watervliet, the availability of on-street parking varies. Along 3rd Avenue / Route 32, on-street parking is available on both sides of the road until the intersection with 8th Street, adjacent to the Watervliet Arsenal. This stretch of on-street parking serves small businesses and dense residential areas. Along Broadway in Watervliet, on-street parking is generally prohibited. Along 2nd Avenue, on-street parking is typically available along at least one side of the Study corridor.

Table 2.15 – Existing On-Street Parking

Study Corridor	Municipality	Segment	Southbound On-Street Parking	Northbound On-Street Parking
Broadway	City of Albany	Clinton Ave to Pleasant St	Yes	Yes
		Pleasant St to Loudonville Rd	No	No
		Loudonville Rd to Lindenberg Ave	Yes	Yes
	Village of Menands	Lindenberg Ave to 1st Street	No	No
3rd Ave	City of Watervliet	1st Street to NY 32	Yes	Yes
NY 32		3rd Ave to 9th St	Yes	No
		9th St to 350 ft south of 13th St	No	No
		350 ft south of 13th St to 13th St	Yes	No
13th St		NY 32 to 2nd Ave	Yes	No
2nd Ave		13th St to 14th St	Yes	Yes
		14th St to 16th St	Yes	No
		16th St to 21st St	No	No
		21st St to 23rd St	Yes	No
		23rd St to 25th St	Yes	Yes







Map developed by Byer Planning, LLC. Date Exported: 4/16/2024 3:21 PM

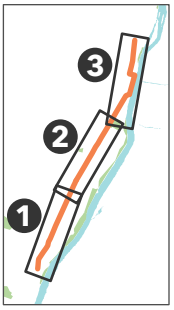
Albany County Broadway Multimodal Resiliency Plan

Presence of On-Street Parking

- On-Street Parking Present
- No On-Street Parking Present

Basemap

- Railroad
- Water
- Parks and Open Space



Right-Of-Way Characteristics

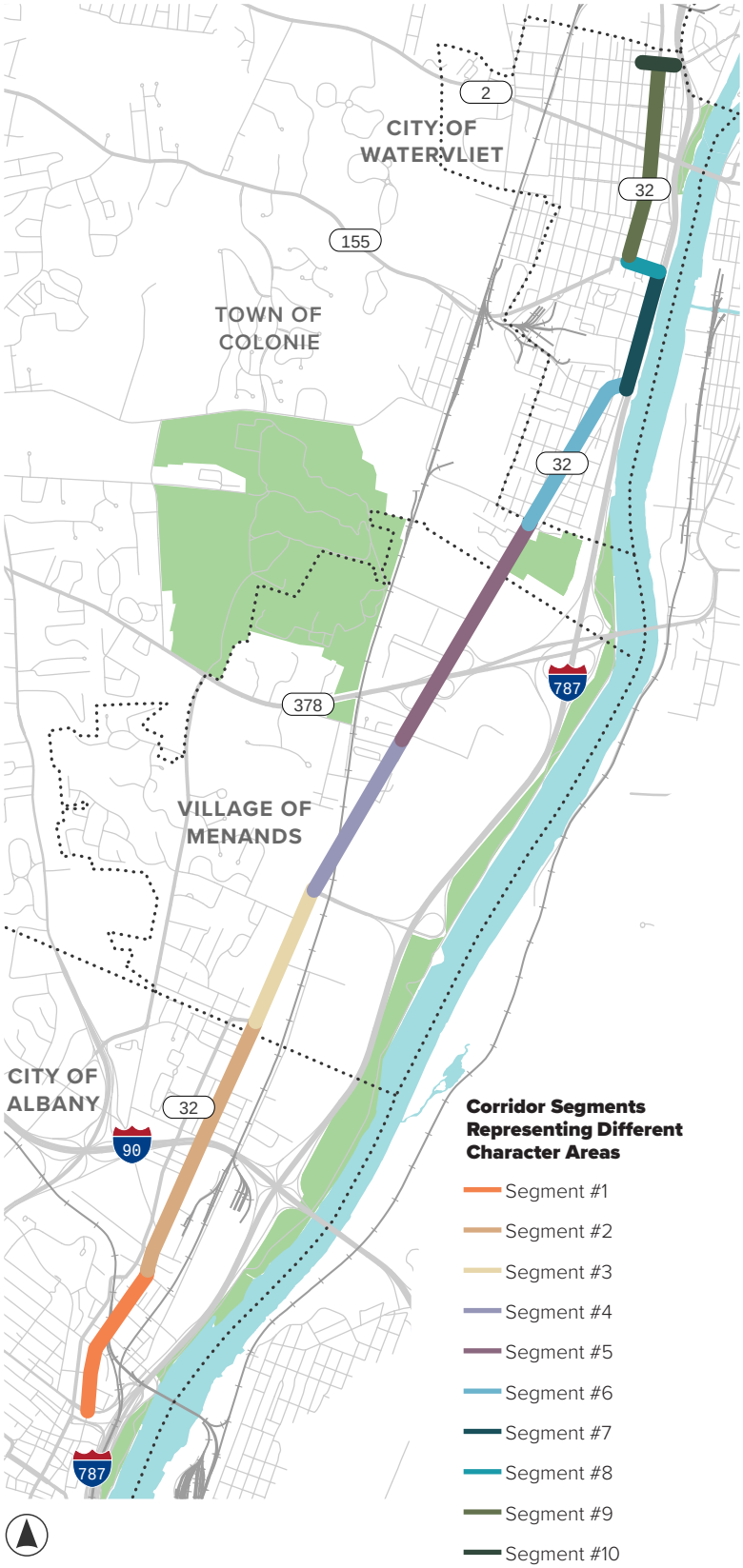
The characteristics of the right-of-way varies significantly along the length of the Study corridor. To develop a comprehensive and representative understanding of the different right-of-way conditions and lay the foundation for conceptual alternative development, the Study corridor was divided into ten segments. The segments were selected based on population density, municipal boundaries, roadway characteristics (e.g., width, number of lanes), and adjacent land uses.

The ten roadway segments representing different character areas along the Study corridor include:

1. Clinton Avenue to Pleasant Street;
2. Pleasant Street to Wolfert Avenue;
3. Wolfert Avenue to I-787 Exit 6;
4. I-787 Exit 6 to Menand Road;
5. Menand Road to the Watervliet City Line;
6. The Watervliet City Line to Broadway;
7. Broadway to 13th Street;
8. 13th Street;
9. 13th Street to 25th Street
10. 25th Street

Along each of the ten segments, at least one transect was collected at the narrowest roadway location. The following information was collected for each transect:

- Photographs;
- Curb to curb widths;
- Lane measurements;
- Distance between the curb face and building face (if applicable); and,
- General observations.



By collecting each transect at the narrowest roadway location, the most constrained areas are clearly documented. In the next chapter, several conceptual alternatives will be assessed along each roadway segment to identify feasible strategies for calming traffic, expanding the urban forest, integrating green infrastructure, and enhancing transit, bicycle, and pedestrian infrastructure.

The following graphics represent the general conditions along each segment. Key features of each segment, such as jurisdiction, annual average daily traffic (AADT), 85th percentile speed, and travel lanes widths, are also presented.

BICYCLE INFRASTRUCTURE FOR ALL AGES AND ABILITIES

Protected bicycle lanes provide physical separation between cyclists and motor vehicle traffic and create a condition where people of all ages and abilities feel comfortable biking. According to the National Association of Transportation Officials (NACTO) Urban Bikeway Design Guide, protected bicycle infrastructure increases safety for all modes of transportation and improves the overall organization of the street. To design for all ages and abilities, the Urban Bikeway Design Guide recommends the following:

"Build protected bike lanes where motor vehicle speed consistently exceeds 25 mph, where daily motor vehicle volume is higher than approximately 6,000 vehicles per day, where curbside conflicts are expected, or wherever there is more than one motor vehicle lane per direction."

As illustrated in this section, traffic volumes along the Study corridor frequently exceed 6,000 AADT and posted and 85th percentile speeds are consistently over 25MPH.

Northbound

Segment #1 Characteristics: Clinton Avenue to Pleasant Street

Study Corridor: Broadway

Jurisdiction: City of Albany

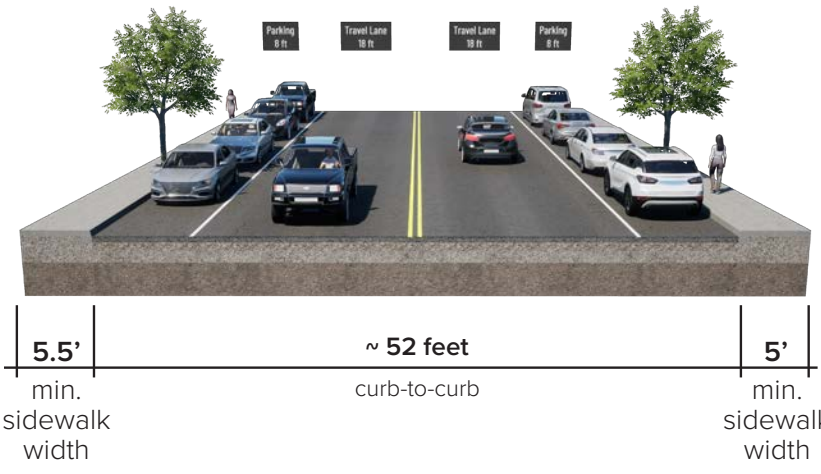
AADT: 4,422

Functional Class: Urban Minor Arterial

85 Percentile Speed: 35 MPH

Travel Lane Width: ~ 18 feet

Right-of-Way Width: 80 to 102 feet



Northbound

Segment #2 Characteristics: Pleasant Street to Wolfert Avenue

Study Corridor: Broadway

Jurisdiction: City of Albany

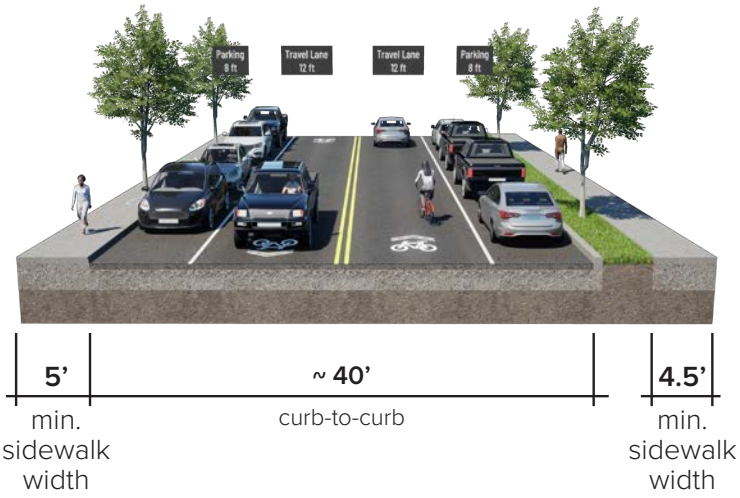
AADT: 4,422 - 5,520

Functional Class: Urban Minor Arterial

85 Percentile Speed: 34 MPH

Travel Lane Width: ~ 12 feet

Right-of-Way Width: 65 to 75 feet



Segment #3 Characteristics: Wolfert Avenue to I-787 Exit 6

Study Corridor: Broadway

Jurisdiction: NYSDOT

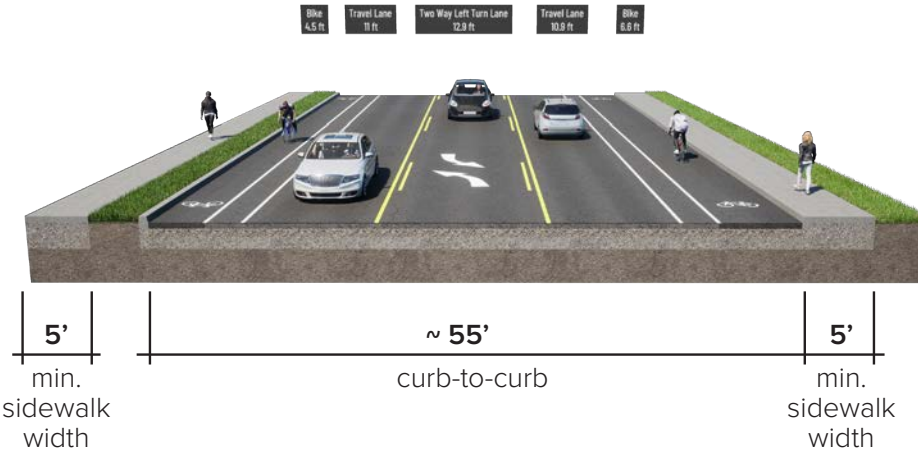
AADT: 10,824

Functional Class: Urban Minor Arterial

85 Percentile Speed: 39 MPH

Travel Lane Width: ~ 11 feet

Right-of-Way Width: 70 to 105 feet



Segment #4 Characteristics: I-787 Exit 6 to Menands Road

Study Corridor: Broadway

Jurisdiction: NYSDOT

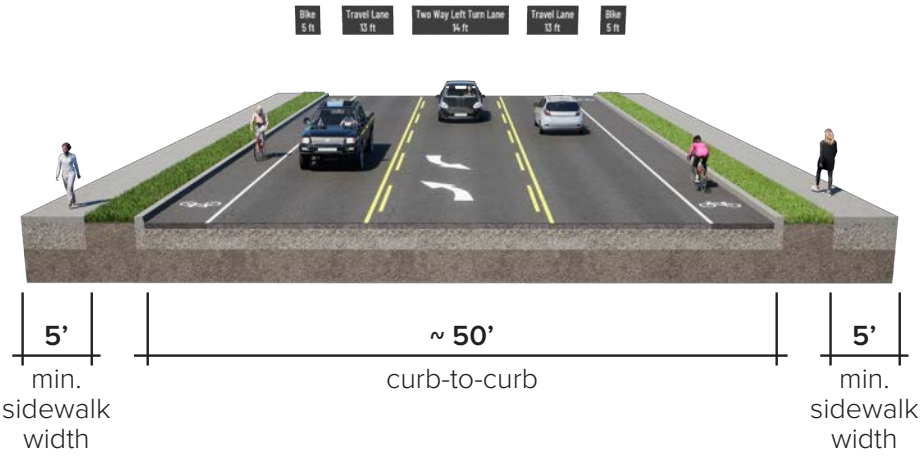
AADT: 8,190

Functional Class: Urban Minor Arterial

85 Percentile Speed: 40 MPH

Travel Lane Width: ~ 13 feet

Right-of-Way Width: 65 to 100 feet



Northbound

Segment #5 Characteristics: Menands Road to Watervliet City Line

Study Corridor: Broadway

Jurisdiction: NYSDOT

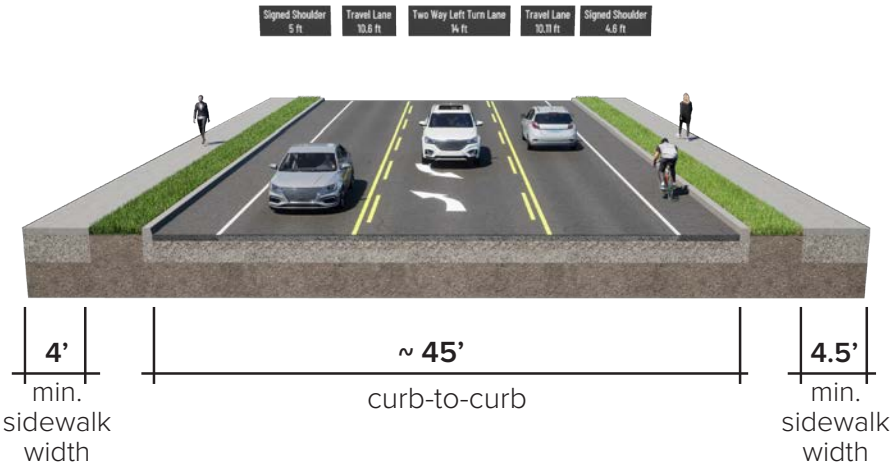
AADT: 8,190 - 10,510

Functional Class: Urban Minor Arterial

85 Percentile Speed: 38 MPH

Travel Lane Width: ~ 10.5 feet

Right-of-Way Width: 60 to 140+ feet



Segment #6 Characteristics: Watervliet City Line to Broadway

Study Corridor: 3rd Avenue

Jurisdiction: City of Watervliet

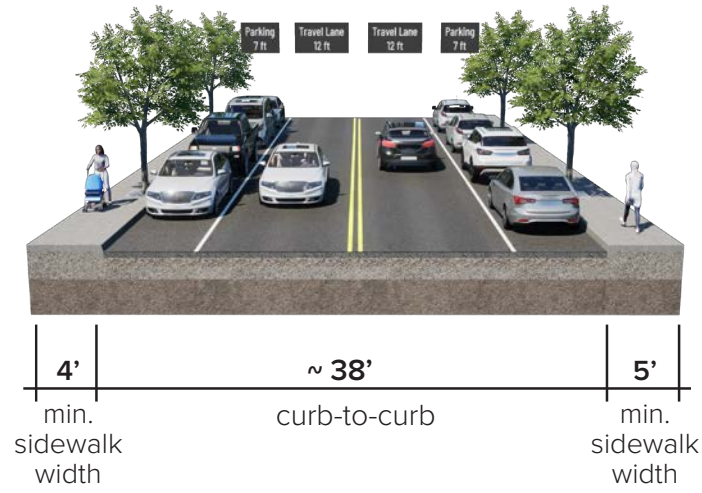
AADT: 8,408

Functional Class: Urban Minor Arterial

85 Percentile Speed: No data

Travel Lane Width: ~ 12 feet

Right-of-Way Width: ~ 65 feet



Segment #7 Characteristics: Broadway to 13th Street

Study Corridor: Broadway

Jurisdiction: City of Watervliet

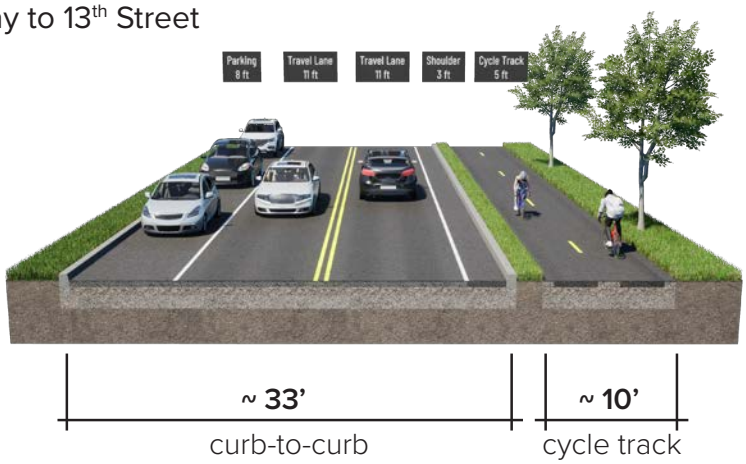
AADT: 8,408

Functional Class: Urban Minor Arterial

85 Percentile Speed: 37 MPH

Travel Lane Width: ~ 11 feet

Right-of-Way Width: ~ 110 feet



Westbound

Segment #8 Characteristics: 13th Street

Study Corridor: 13th Street

Jurisdiction: City of Watervliet

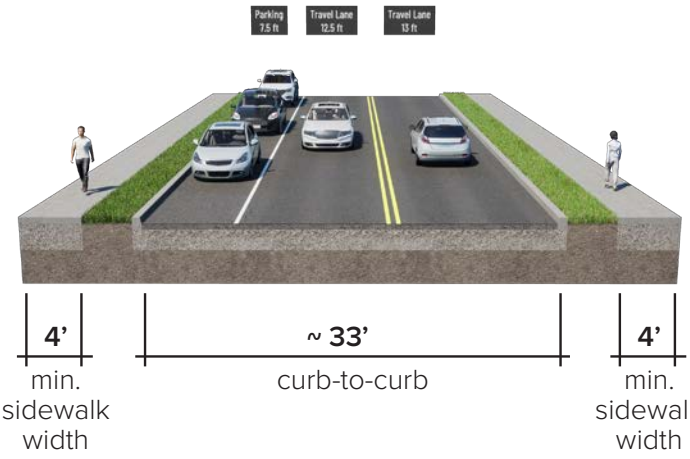
AADT: 2,686

Functional Class: Urban Minor Arterial

85 Percentile Speed: 31 MPH

Travel Lane Width: ~ 13 feet

Right-of-Way Width: ~ 60 feet



Northbound

Segment #9 Characteristics: 13th Street to 25th Street

Study Corridor: 2nd Avenue

Jurisdiction: City of Watervliet

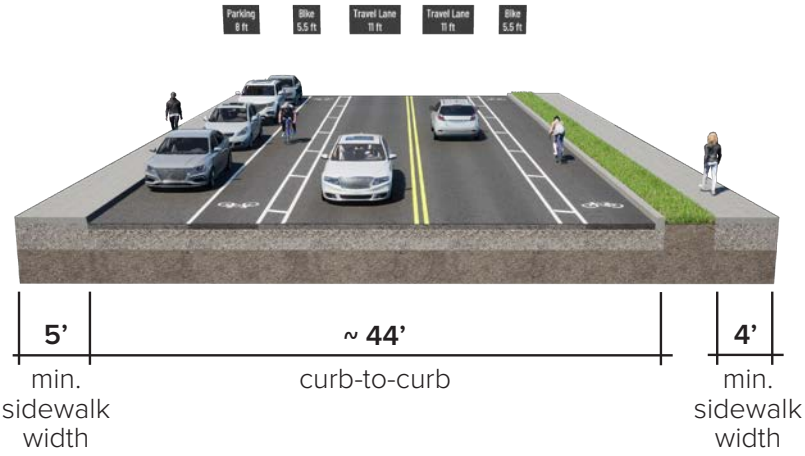
AADT: 3,935 - 12,226

Functional Class: Urban Minor Arterial

85 Percentile Speed: 33-34 MPH

Travel Lane Width: ~ 11 feet

Right-of-Way Width: 68 to 78 feet



Segment #10 Characteristics: 25th Street

Study Corridor: 25th Street

Jurisdiction: City of Watervliet

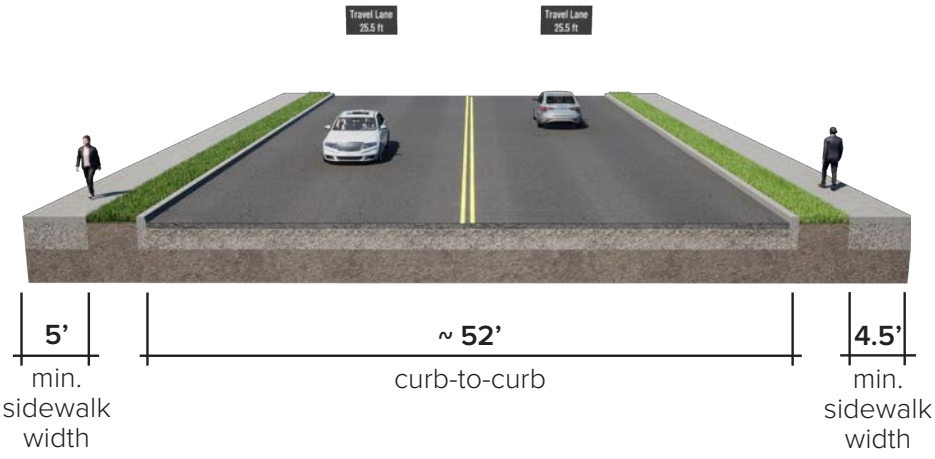
AADT: 4,760

Functional Class: Urban Major Collector

85 Percentile Speed: 27 MPH

Travel Lane Width: ~25.5-feet

Right-of-Way Width: 60 to 85 feet



Utility Infrastructure

This section provides a brief overview of utility infrastructure in the Study area, with a focus on stormwater and sewer infrastructure and overhead utilities. Any proposed changes to the Study corridor will need to consider impacts to this critical utility infrastructure.

Water Utility Infrastructure

A dense network of stormwater and wastewater infrastructure is present in the Study area. This infrastructure is critical to quickly removing stormwater from impervious surfaces to mitigate flooding, separating stormwater and wastewater flows, and cleaning wastewater prior to discharge in the Hudson River.

Albany County's Water Purification District owns and operates two wastewater treatment plants. The North Plant is located in the Study area between Erie Boulevard and the Hudson River in the Village of Menands. The North Plant treats an average daily flow of 22 million gallons per day (MGD), with wastewater originating from portions of the cities of Albany, Cohoes, and Watervliet, parts of the towns of Colonie and Guilderland, and the villages of Colonie, Menands, and Green Island. Wastewater is transported to the North Plant via gravity-fed collection systems, including two County-owned interceptor sewers — a 72-inch Hudson River Interceptor and a 60-inch Patroon Creek Interceptor.

The xities of Watervliet and Albany, the Village of Menands, and the Town of Colonie are all members of the Albany County Stormwater Coalition. The Stormwater Coalition supports these municipalities in complying with the requirements of the Municipal Separate Storm Sewer Systems (MS4) program, which aims to address stormwater pollution and protect water quality in receiving waterbodies.

As conceptual alternatives are evaluated for the Study corridor, it will be important to assess their impacts on existing stormwater infrastructure and their ability to improve water quality prior to discharge into the storm sewer system.

Electrical Utility Infrastructure

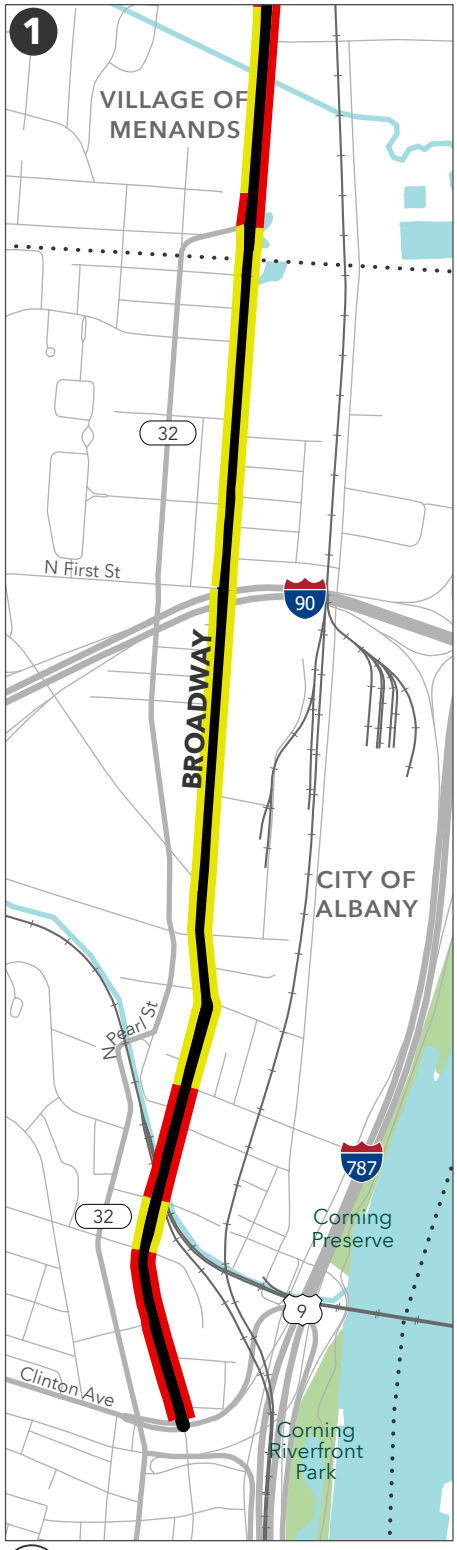
Along the Study corridor, there are two substations owned by National Grid. The Genesee Street station is located at 1125 Broadway, immediately south of the I-90 overpass. The Menands station is located at 128 Broadway, across from I-787 Exit 6 and immediately south of the Riverview Center.

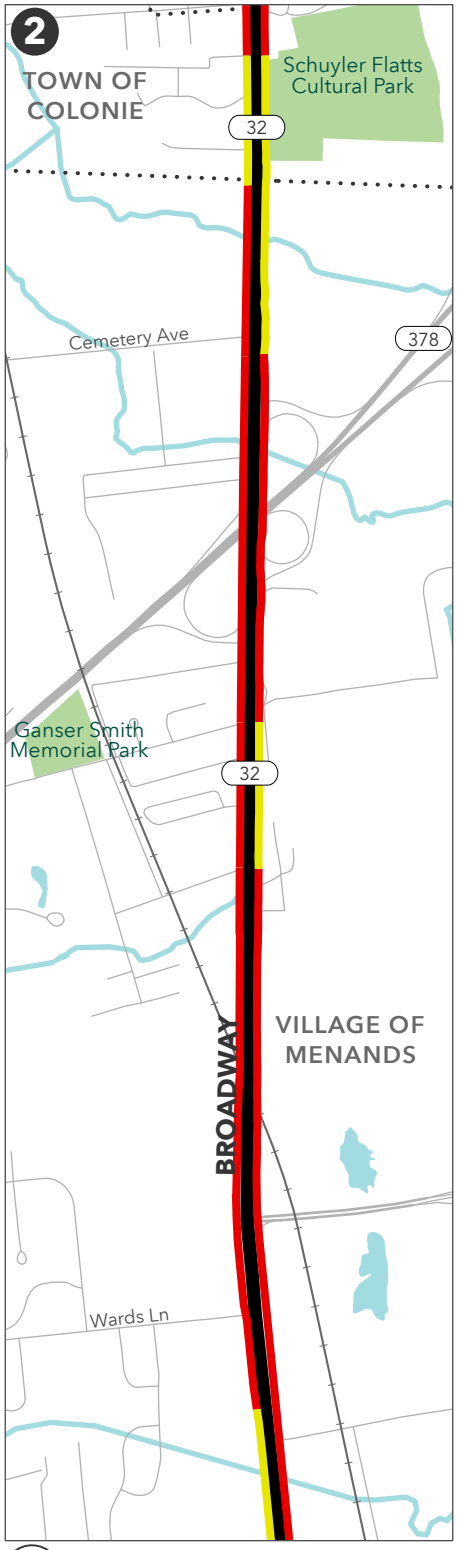
Three phase overhead power distribution infrastructure is located along a majority of the Study corridor and is often located within the Study corridor right-of-way.

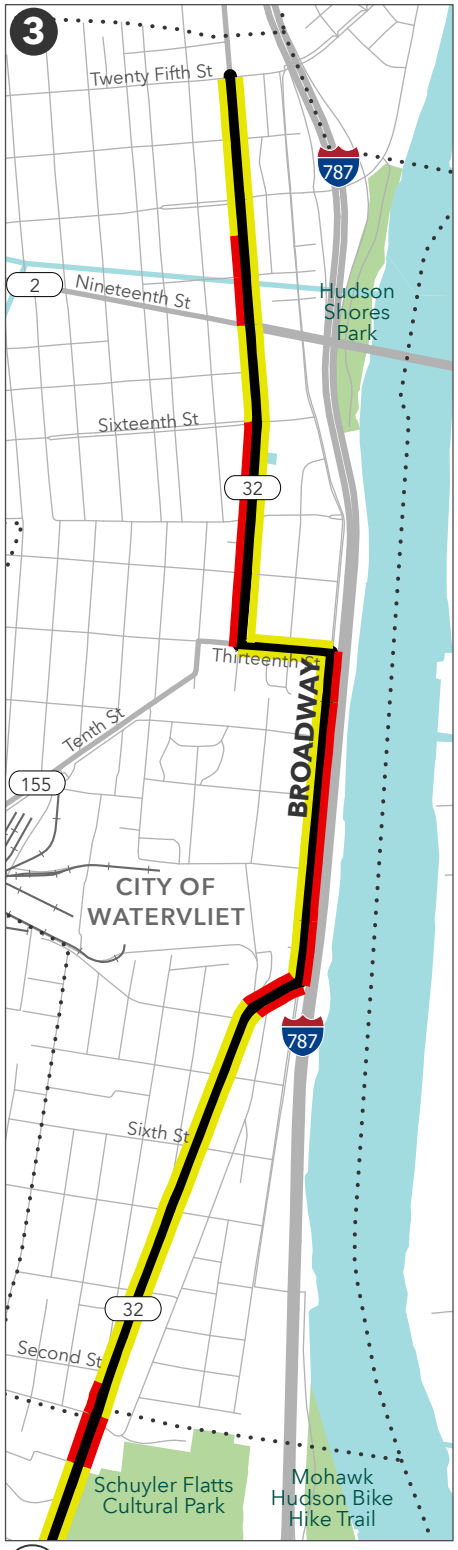
Similar to water infrastructure, as conceptual alternatives are developed and evaluated for the Study corridor, it will be important to consider the impacts to electrical utility infrastructure and other overhead utilities in the Study corridor.

ALBANY CSO POOL COMMUNITIES

The mission of the Albany Pool Communities is to improve the water quality of the Hudson River and meet water quality standards for this important natural resource. The activities of the Pool Communities are guided by a Long-Term Control Plan (LRTP), which includes more than 65 projects and programs aimed at abating untreated Combined Sewer Overflows (CSOs) and removing a high percentage of debris from CSO discharges. Several of the projects implemented to date include green infrastructure to address CSOs and improve water quality, including the Watervliet Route 32 Green Street Project and the installation of floatables removal facilities at outfalls along the Hudson River in Albany.







Map developed by Byer Planning, LLC. Date Exported: 4/23/2024 5:04 PM

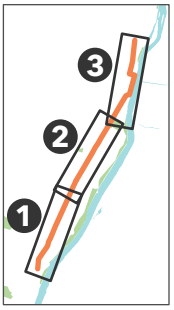
Albany County Broadway Multimodal Resiliency Plan

Presence of Overhead Utilities

- Overhead Utilities Present
- No Overhead Utilities Present

Basemap

- Railroad
- Water
- Parks and Open Space




U-HAUL

03
Public Engagement

This chapter summarizes the public feedback gathered over the course of the Broadway Multimodal Resiliency Study and describes the engagement strategies used to gather input from the public and interested and impacted parties. Public input played a major role in shaping the design concepts and recommendations presented in Chapter 4.

Engagement strategies described in this chapter include:

- A Study Advisory Committee;
- An online survey;
- Focus groups with interested and impacted parties;
- Pop-up events in high-traffic areas along the corridor; and
- Public meetings.

Public Input

Community input is crucial for understanding local needs and concerns, and for guiding the development of appropriate design concepts. This section provides an overview of the public engagement conducted for the Broadway Multimodal Resiliency Study.

Purpose of Public Engagement

The purpose of public engagement in the Broadway Multimodal Resiliency Study is to actively involve the community in identifying and addressing key issues related to transportation safety, connectivity, and climate resilience along the Study corridor. By engaging with residents, business owners, and other interested and impacted parties, the goal is to gain a deeper understanding of the challenges they face and their priorities for the area. This engagement helps ensure that the recommendations developed through the Study are not only feasible and implementable but also reflect the concerns, needs, and desires of the community. Ultimately, the aim is to create solutions that are both practical and responsive to the unique needs of the local population, leading to a more resilient and connected corridor.

Types of Engagement

Study Advisory Committee

A Study Advisory Committee (SAC) comprised of representatives from Albany County, regional entities, State agencies, and municipal staff oversaw the project and provided guidance to the project team. The SAC met at key project milestones to review draft deliverables and design concepts.

Organizations represented on the SAC include:

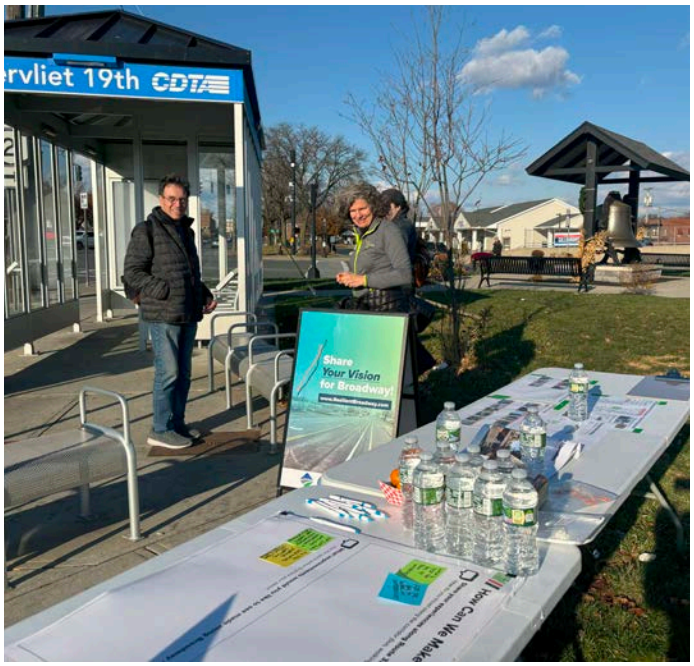
- Albany County
- Capital Region Transportation Council
- Capital District Transportation Authority (CDTA)
- Capital District Regional Planning Commission (CDRPC)
- New York State Department of Transportation (NYSDOT), Region 1
- City of Albany
- City of Watervliet
- Village of Menands
- Town of Colonie

Focus Groups

As part of the Study, focus groups and project team attendance at neighborhood meetings gathered valuable input on transportation, economic development, and housing issues along the corridor. Participants in the focus groups expressed concerns that Broadway currently feels unwelcoming to visitors, citing issues like uneven sidewalks, excessive concrete, and a lack of green spaces. They emphasized the need for better walkability, more green space, and improved wayfinding to make the area more appealing to tourists and residents alike. There was a strong desire to enhance the vibrancy of the area, with suggestions like promoting connections between local businesses and cultural venues like the Palace Theatre and Capital Repertory Theatre. Additionally, participants from the focus groups stressed the importance of improving pedestrian safety, particularly with better lighting, crosswalks, and transit amenities, while also addressing parking issues and potholes.

At neighborhood meetings, attendees voiced similar concerns about the corridor's pedestrian safety and overall welcoming atmosphere. Many noted discomfort walking along Broadway, especially with young children, and expressed a preference for driving rather than walking to nearby destinations due to perceived safety risks. Residents also called for more green space, tree plantings, and improvements to the pedestrian experience, including buffered bike lanes and dedicated bus lanes to support existing transit services.

Participants from Menands emphasized the importance of upgrading transit stops, enhancing lighting, and improving pedestrian crossings, particularly near key bus stops. All groups supported further investment in green infrastructure and better access to recreational areas like the Empire State Trail. As the Study progressed, these concerns helped inform design concepts aimed at making the Broadway/Route 32 corridor safer, more accessible, and more attractive for both residents and visitors.



WHO WE ENGAGED

- Albany Bicycle Coalition
- Albany County
- Albany Running Exchange
- Capital District Transportation Authority (CDTA)
- Capital Region Chamber of Commerce City of Watervliet
- Capital Region Transportation Council
- Capital Streets
- Capitalize Albany Corporation
- City of Albany
- City of Watervliet
- Discover Albany
- Downtown Albany BID
- Lionheart on the Green
- New York State Department of Transportation
- North Albany Neighborhood Association
- Ten Broeck Neighborhood Association
- Village of Menands
- Walkable Albany
- Watervliet Housing Authority

WHAT WE HEARD FROM MUNICIPALITIES AND AGENCIES

- Upgraded transit stops wherever possible throughout Menands
- Desire for uniform light fixtures along the corridor
- Opportunity for connection to Empire State Trail from Broadway via National Grid power easement
- Need for improved crossing infrastructure at Linbergh/Broadway and an upgraded transit stop at this location
- Albany repaving just over one-mile from Genesee Street to Village of Menands line in 2025
- DOT noted trials with permeable asphalt did not do well with road salt
- Qualifying access highway portion of Broadway (north of 378) may limit ability to reduce lane widths
- Curbed/raised bike lanes are safer for the bicyclist
- Need for agreement between the State and the municipalities for maintenance of the bike lanes and pedestrian zones
- Further study of parking, pedestrian crossings, crash data, and lighting is needed

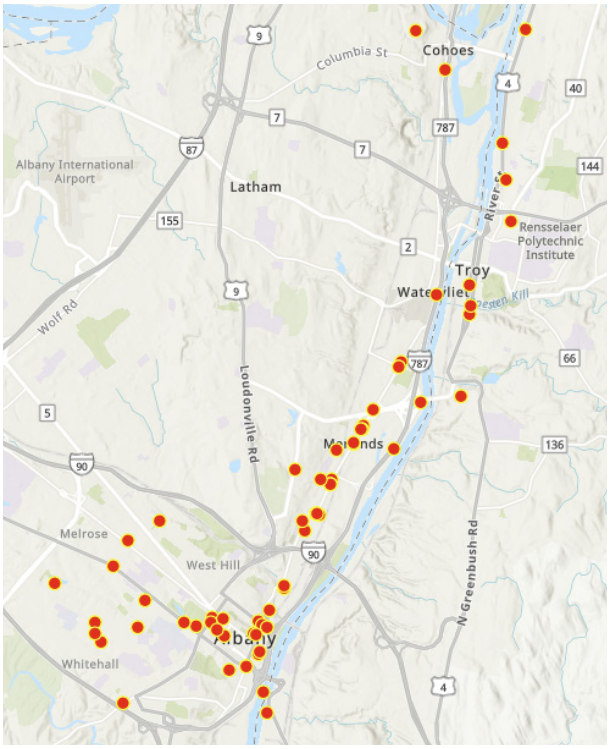
Online Survey

An online survey was launched in April 2024 and remained open through the end of December 2024. The survey was promoted by signs mounted in the schedule display case of every bus shelter along the Study corridor, at pop-up events, during focus group discussions, on the Study website, and through email blasts. A total of 126 unique survey responses were received, and most respondents know the Study corridor well. Approximately 75% of respondents travel along the Study corridor at least once a week, and 78% of respondents use the Study corridor to access a local destinations. Many respondents noted they use the Study corridor to access several different destinations, and the most frequently cited destinations cited include: the Warehouse District, downtown Albany, Menands, Watervliet, Stewarts, Schuyler Flatts Cultural Park, the Riverview Center, Albany Rural Cemetery, and local restaurants and shops.

Respondents identified several key issues when traveling along Broadway/Route 32. The most common concern, reported by 70% of respondents, is the lack of protection for pedestrians and/or cyclists.

"Having the whole length of Broadway be the same layout with two driving lanes, **on street parking, protected bike lanes, and sidewalks would greatly increase the confidence of all** traversing the corridor for all modes of travel. You would know what the street will look like and how it will function for your whole path."
- online survey respondent

"Make it more **multi-modal.** There is so much space dedicated to cars and no one else."
- online survey respondent



Distribution of where survey respondents reside.

"Make it delightful. Trees are good, but **the combination of amenities, greenery, and public art would make it an extremely desirable destination.** Relaxing lighting, impressive urban ecosystems (flora AND fauna), art that is thought-provoking, amenities to make great places to loiter and socialize - these are things that make urban living wonderful."
- online survey respondent

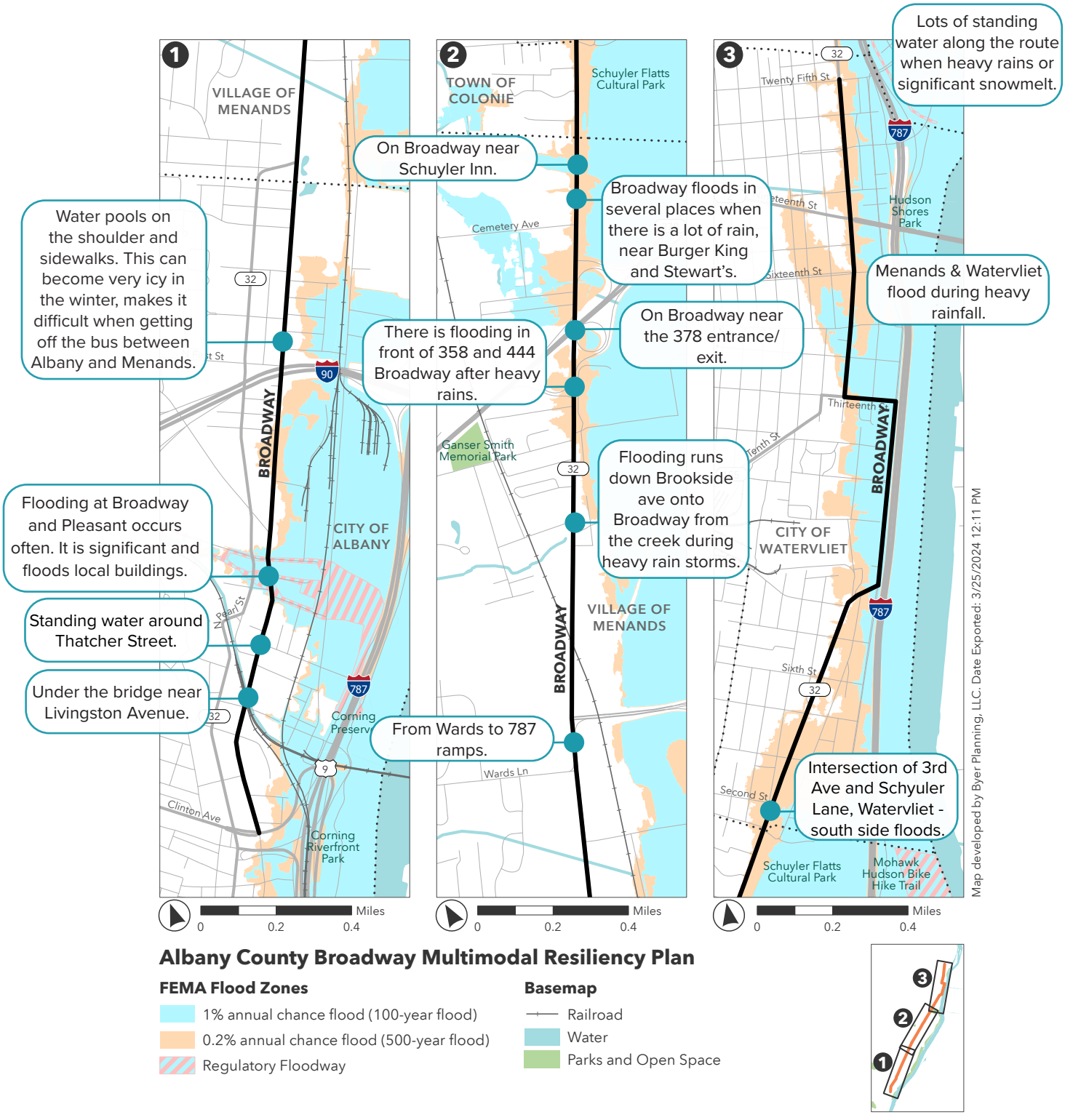
"I live on 3rd Avenue in Watervliet, part of the [Study] corridor. **Everything I do is on the corridor.** I take it to work, the parks, to get gas and small amounts of groceries, and to the farmers market."
- online survey respondent

Difficulty crossing intersections on foot, by bike, or with an assistive mobility device is a concern for 58% of respondents. Maintenance issues, such as potholes and uneven sidewalks, are a concern for 51% of respondents, and the lack of amenities (e.g., benches, transit shelters) and high traffic speeds were both cited as issues by 40% of respondents. Air and noise pollution is a concern for 32% of respondents, while 30% struggle with extreme heat in the summer. Additionally, 13% experience difficulty finding on-street parking, and 11% report issues with flooding or standing water.

When asked to describe their ideal vision for Broadway/Route 32 in 10 years, respondents used words such as **safe, beautiful, bike-friendly, walkable, friendly, and pedestrian-focused.**

When asked which improvements would have the most impact on increasing users' comfort while traveling along the Study corridor, survey respondents shared the following:

- The top ranked improvements to enhance respondents' walking experience include adding more trees for shade, providing more separation between the sidewalk and roadway, and providing better connections to parks, trails, and other destinations.
- The top ranked improvements to enhance respondents' biking experience include providing bike lanes separated from cars by a landscaped or curbed median and increasing connections to other bike infrastructure and trails.
- The top ranked improvements to enhance respondents' transit experience include more frequent service, faster service, and more amenities at bus stops (e.g., trees, lighting, shelters, benches).
- The top ranked improvements to address flooding include more trees to absorb water and the integration of bioretention areas to manage stormwater.



Albany County Broadway Multimodal Resiliency Plan

FEMA Flood Zones

- 1% annual chance flood (100-year flood)
- 0.2% annual chance flood (500-year flood)
- Regulatory Floodway

Basemap

- Railroad
- Water
- Parks and Open Space

Online survey respondents were asked, "Where have you experienced flooding or standing water along the Study corridor?" Their responses are overlaid on FEMA flood maps in the image above.

Public Events

In the fall and winter of 2024, the project team organized a series of public engagement events as part of the Study. These events, which included a combination of pop-ups and a public workshop, were designed to gather broad community feedback on key issues such as transportation safety, multimodal connectivity, public amenities, and green infrastructure opportunities along the Broadway/Route 32 corridor. The pop-up events took place in Menands, Watervliet, and Albany, providing a platform for residents and stakeholders to learn about the Study, review draft roadway concepts, and offer input on proposed improvements. These interactive sessions were an important opportunity for the public to influence the Study by sharing their insights and ideas for how the corridor could be better designed to serve the community's needs.

Additionally, a public meeting was held in December 2024, at the Menands Fire House, where attendees were presented with key findings from the Baseline Corridor Assessment, which analyzed current conditions along the Broadway/Route 32 corridor. The meeting also highlighted public feedback received to date and gave participants the chance to provide further input on the draft roadway concepts. The overall goal of these events was to refine design concepts that not only improve transportation facilities and connectivity but also promote sustainability by increasing urban tree cover and integrating green infrastructure. These efforts are crucial for creating a more resilient, accessible, and environmentally-friendly corridor that reflects the needs and desires of the community while addressing long-term challenges related to climate and transportation.

WHAT WE HEARD FROM THE PUBLIC

- More cohesion along the length of the corridor to make destinations feel connected
- Lots of people walk and ride the bus along the study corridor on a regular basis
- Pedestrian safety needs to be prioritized, especially at intersections
- Upgrade quality of sidewalks and bike infrastructure throughout the study corridor
- Protected bike infrastructure will encourage more people and families to bike
- Strong support for more trees, green spaces, pavement reduction, and green infrastructure
- Desire for lighting, wayfinding, and public art
- Accessible for all ages and abilities
- Parking is important; desire for public access to surface lots in Warehouse District
- Transit along the corridor is great; continue expansion of amenities (e.g., shelters, heated shelters, seating)
- Speeding is an issue

Final public meeting placeholder

What We Learned

Public engagement efforts highlighted the need for greater cohesion along the Broadway/Route 32 corridor, with a strong interest in prioritizing pedestrian safety through sidewalk updates, curb extensions, and improved intersection crossings. Expanded bike infrastructure was identified as a key priority to enhance cyclist safety and encourage ridership. Those engaged with also expressed a desire for more trees to mitigate heat and increase shade, wayfinding improvements, and additional public parking, particularly in the warehouse district. While transit service along the corridor is generally well-regarded, there is interest in upgrading transit stops and amenities. Speeding was noted as a concern, and recommendations were made to install pedestrian-scale lighting and improve connectivity to the Empire State Trail.

Survey results from 126 respondents reinforced these themes, with the majority of feedback coming from frequent corridor users. The most common concerns included the lack of protected pedestrian and cycling facilities, difficult crossings at intersections, and maintenance issues. Flooding was also identified as a significant issue, with respondents pointing to specific problem areas. When asked about potential improvements, the most popular choices were adding trees for shade and installing bike facilities separated by a landscaped buffer to enhance pedestrian and cyclist comfort.

Study Advisory Committee discussions on concept alternatives included calls for increasing connections to the Empire State Trail, developing a maintenance plan for urban forestry, and addressing issues related to tree placement, stormwater runoff, and flood mitigation. Interest in traffic-calming measures such as curb extensions at intersections and landscaped medians was balanced with concerns about emergency vehicle access and traffic flow. The committee also explored opportunities to enhance transit infrastructure, improve bike and pedestrian connectivity, and incorporate urban forest elements into transportation planning. Suggestions ranged from adding wayfinding signage and last-mile transit connections to expanding tree canopy coverage for shade and visual continuity along the corridor.

04
Recommendations

This chapter describes the recommendations for the Broadway Multimodal Resiliency Study. The recommendations are based on public and community advisory committee feedback, the baseline corridor assessment, and the Study goals.

The topics described in this chapter include:

- Corridor-Wide Recommendations
- Transit Stops
- Intersections
- Public Parking
- Streetscape Amenities
- Connections to Adjacent Trails
- Tree Canopy Expansion
- Green Infrastructure

Corridor-Wide Recommendations

This section describes the recommended approaches for Corridor-wide improvements to the roadway, transit stops, intersections, public parking, streetscape amenities, tree canopy, green infrastructure and adjacent trails connections.

This section provides a detailed overview of the proposed multimodal facilities and resiliency features recommended along the length of the Study corridor. These recommendations were developed in alignment with the Study's goals, in response to public feedback gathered over the course of this Study (see Chapter 3), and to address key findings from the Baseline Corridor Assessment (see Chapter 2).

The subsequent sections in this chapter provide more detailed recommendations related to transit facilities, intersection improvements, public parking, streetscape amenities, connections to adjacent trails, and expansion of the urban forest and green infrastructure.

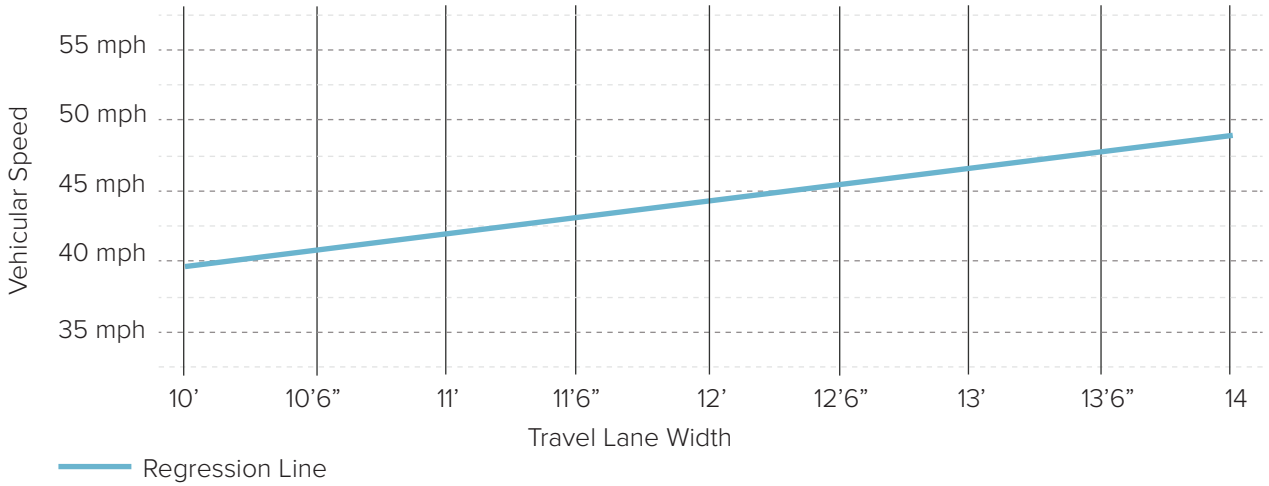
Recommended Multimodal Facilities

To address gaps in the multimodal transportation system, enhance safety for all, and improve connectivity to local destinations and adjacent bicycle, pedestrian, and transit infrastructure (e.g., the Empire State Trail), the following facilities are proposed along the Study corridor:

- **One-way separated bike lanes** are proposed on each side of Broadway / Route 32 from Clinton Avenue north to Schuyler Flatts Cultural Park and along 2nd Avenue in Watervliet from 13th Street to 25th Street.
- **Enhancements to the Schuyler Flatts shared-use path** are proposed to connect Broadway through Schuyler Flatts Cultural Park north to the Empire State Trail and the intersection of Broadway and 4th Street in Watervliet.

Wider Travel Lanes are Correlated with Faster Vehicle Speeds

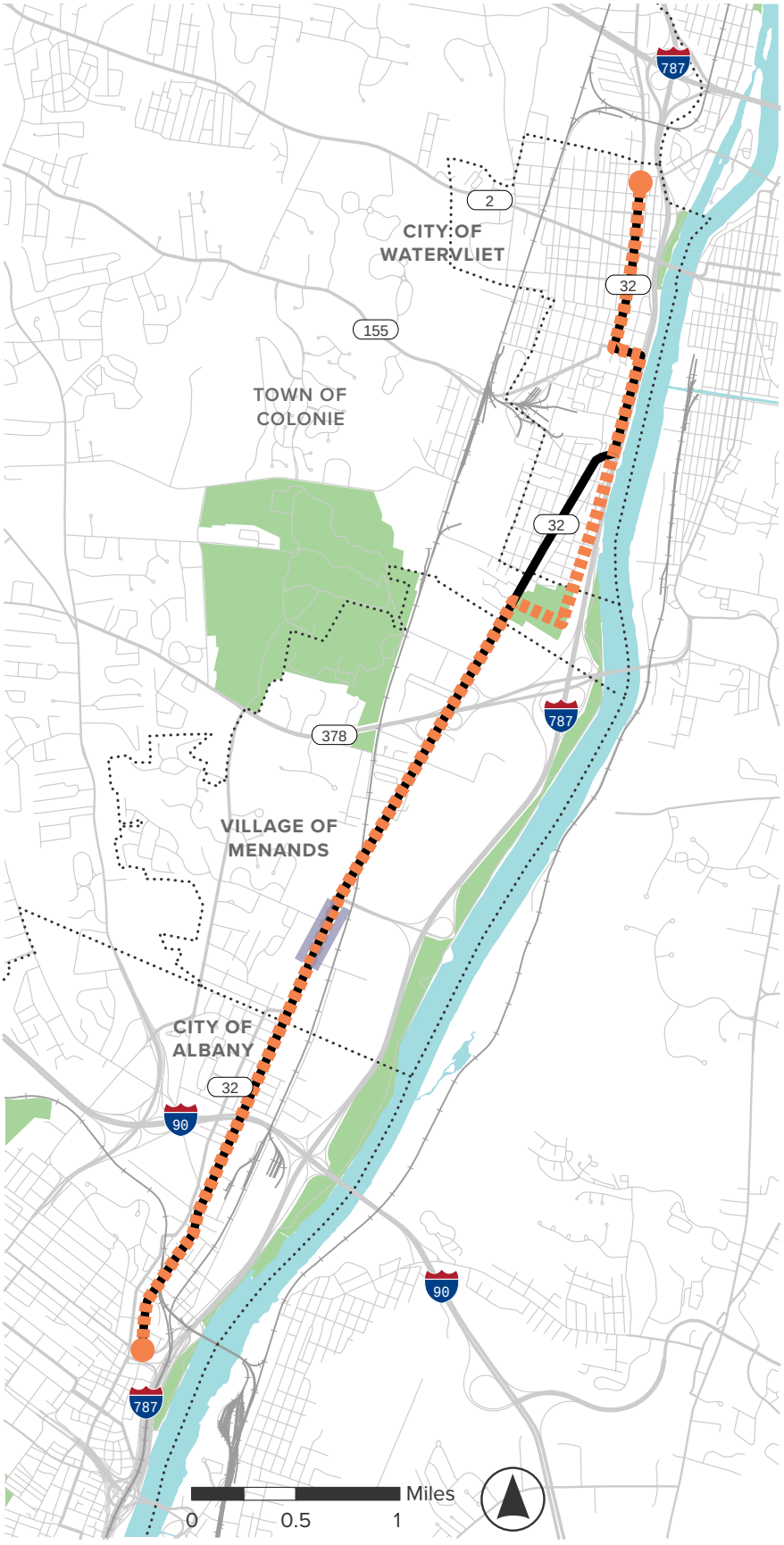
Source: Fitzpatrick, Carlson, Brewer, and Wooldridge. 2000. "Design Factors That Affect Driver Speed on Suburban Streets." Transportation Research Record 1751: 18-25.



Albany County Broadway Multimodal Resiliency Plan

Proposed Improvements

- Dedicated Bus Lanes
- Protected Bike Lanes
- Study Corridor



- **Enhancements to the existing two-way separated bike lane**, which carries the Empire State Trail, are proposed along Broadway in Watervliet from 4th Street to 13th Street.
- **Dedicated northbound and southbound bus lanes** are proposed in Menands along the Study corridor from Wards Lane north to the Riverview Center.
- **New sidewalks** are proposed on the west side of Broadway under the Livingston Avenue Bridge and on the east side of Broadway / Route 32 in Menands from E. Elmwood Road to the CDTA Park and Ride lot. These new proposed sidewalks address gaps in the existing sidewalk system along the Study corridor.
- **Upgrades to sidewalks and transit stops** are proposed along the length of the Study corridor to improve accessibility, safety, and multimodal connectivity. Detailed recommendations regarding transit and intersection improvements are provided in the subsequent sections.
- **Addition of tactile warning and guidance surfaces** to improve accessibility and safety for all users and separate different modes of transportation. For example, where separated bike lanes are proposed adjacent to and at the same level of sidewalks, a tactile warning strip or textured permeable pavers are recommended.

"Road improvements are desperately needed along Broadway. From improved pedestrian and cyclist infrastructure, to simply painting the lines...**making a variety of mobility options not only possible, but safe and pleasant would go a long way** to enhancing Broadway's appeal.."
- online survey respondent

RECOMMENDED MATERIALS

Concrete: Light colored concrete, which is durable and absorbs less heat, is recommended for sidewalks.

Unit Cost: *$135 per square yard*

Permeable Pavers: Light-colored permeable pavers can be used in secondary sidewalk areas outside the main path of travel and/or as buffers between the bike lane and curb.

Unit Cost: *$270 per square yard*

Textured Permeable Pavers: Heavily textured porous pavers can be used to separate sidewalks and bike lanes where a landscape buffer does not fit, making the paths more discernible for the visually impaired.

Unit Cost: *$270 per square yard*

Porous Asphalt: Porous asphalt is recommended for bike lanes and parking lots. It is cost effective and can be made lighter by adding colored aggregate, recycled rubber, or using a compatible light-colored surface paint. It also increases infiltration and can reduce flooding.

Unit Cost: *$170 per square yard for basic (no color or rubber)*

Metal Trench Drain: Decorative metal trench drain covers with vertical relief could be used in tight areas where flooding is more problematic or where connections are made between the roadway and bioswales.

Unit Cost: *$550 per linear foot*

Recommended Resiliency Features

To mitigate flooding, improve air quality, provide shade, reduce heat stress, and provide a beautiful, enjoyable public space for all, the following resiliency features are recommended along the length of the Study corridor:

- **Removal of excess pavement to expand tree canopy and green infrastructure** along the entire Study corridor. As noted in Chapter 2, approximately 30% of the Study area is located in the 100-year floodplain and 41% of the Study area is covered by impervious surfaces (e.g., roadways, parking lots, buildings). The abundance of impervious surfaces combined with extensive flood hazards underscores the need to increase permeable land cover in the Study area. Detailed recommendations regarding urban forest and green infrastructure improvements are provided in the subsequent sections, starting on page 162.
- **Use of structural soils and soil cells in constrained areas** to improve trees' survival rate, increase soil volume, reduce soil compaction, and increase water storage.
- **Creation of bioretention islands** in on-street parking lanes to provide access to nature and stormwater management in areas where space is limited.
- **Incorporation of permeable materials to increase on-site infiltration and light colored materials to reduce the urban heat island effect** throughout the Study corridor. Using permeable pavement options for bike lanes, utility strips, and parking areas can help reduce stormwater concentrations by increasing infiltration. Use of lighter materials reduces the urban heat island effect by reducing surface heat absorption.

GREEN INFRASTRUCTURE TYPOLOGIES

Green Infrastructure Example Condition #1: For areas where green infrastructure is incorporated between the sidewalk and bike lanes.

Green Infrastructure Example Condition #2: For areas where green infrastructure is incorporated between the sidewalk and bike lanes and patio sidewalk space may benefit local businesses.

Green Infrastructure Example Condition #3: For constrained areas where green infrastructure is incorporated in curb extensions.

Please also refer to the green infrastructure section beginning on page 174.

Design Standards for Proposed Facilities

This section and the graphic on the following page define the design standards for the proposed multimodal and resiliency improvements along the Study corridor. These standards were informed by public feedback, the Capital Region Transportation Council's Capital District Complete Streets Design Guide, and municipal planning documents including the City of Albany Bicycle and Pedestrian Master Plan, the City of Albany Complete Streets Policy and Design Manual and the Village of Menands ADA Public Streets and Sidewalks Plan. These standards were used to develop the proposed roadway design typologies presented on the subsequent pages.

Travel and Parking Lanes

The recommended maximum width for travel and turning lanes is 11-feet and the recommended maximum width for on-street parking lanes is 8-feet. In constrained areas, on-street parking widths of 7-feet may be considered. The recommended width for dedicated bus lanes is 11-feet. Due to the urban nature of the Study corridor, shoulders are only proposed in constrained areas under bridges to ensure emergency vehicles can pass motor vehicles, if needed.

Bike Lanes and Sidewalks

The recommended minimum width of bike lanes and sidewalks is 5-feet. Where possible, 6-feet wide bike lanes are recommended, and in areas of high pedestrian activity, sidewalk should be increased to a minimum width of 8-feet. For separated bike lanes at sidewalk level, a minimum 2.5-foot wide buffer should be provided between the curb and the bike lane, and at least 3-foot wide buffer should be provided at driveways. Where bike lanes and sidewalks are at the same level and adjacent, a tactile warning surface must be used to clearly indicate the two different travel lanes to visually impaired individuals.

Green Infrastructure

The recommended minimum width for tree plantings is 4-feet. The recommended minimum width of areas planted with grasses and perennials is 3-feet. Wherever a width of 6-feet cannot be achieved for tree plantings, structural soils or soil cells should be considered to expand soil volume and rooting space.

Transit

The recommended clear space in front of bus stop is 5-feet. The minimum width for bus shelters is 6-feet. Curb extensions of 6-feet are recommended at all transit stops to allow buses to stop in lane.

One-way separated bike lane adjcacent to sidewalk in Utica, NY.

Two-way separated bike lane in Rochester, NY.

Design Standards

Bicycle Lanes

- **5’ minimum width** all bike lanes
- **2’6” minimum buffer** between bike lane and edge of roadway
- **3’ minimum buffer** at driveways

Green Infrastructure

- **4’ minimum width** for all tree plantings
- **3’ minimum width** for grasses and perennials

Travel Lanes & Parking

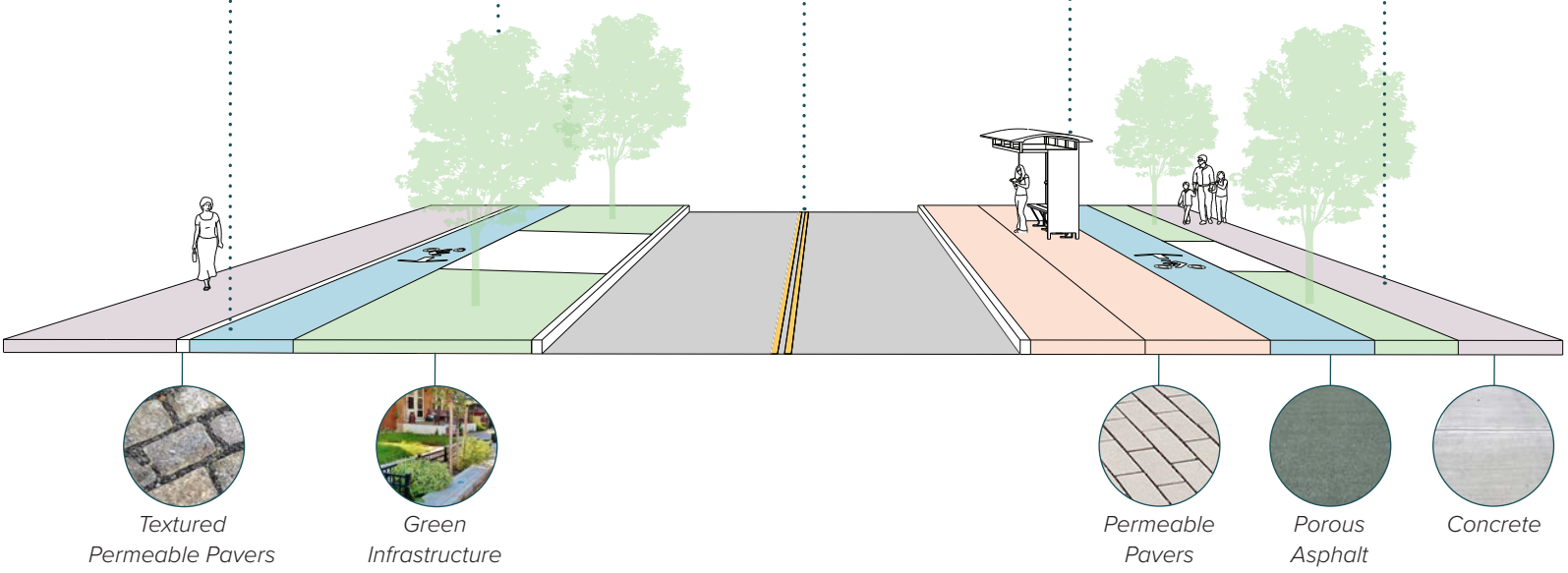
- **11’ maximum width** all travel lanes
- **8’ maximum width** all parking lanes
- **11’ maximum width** all turning lanes

Transit

- **5’ minimum width** all clear spaces in front of stations
- **6’ minimum width** shelter width

Sidewalks

- **5’ minimum width** all sidewalks



Textured Permeable Pavers

Green Infrastructure

Permeable Pavers

Porous Asphalt

Concrete

▲ *The diagram above shows a conceptual example of how the design standards can be applied across different elements found along the corridor.* ***Note that the costs per linear foot presented in the subsequent section are based on these design standards and material recommendations.***

BIORETENTION LOCATIONS

The recommended placement of green infrastructure bioretention areas is between the bike lane and sidewalk. This location provides better separation between cyclists and pedestrians and protects the urban forest from damage caused by commercial vehicles or winter road salt, as shown on the right-hand side of the diagram above and in Green Infrastructure Example Condition #1.

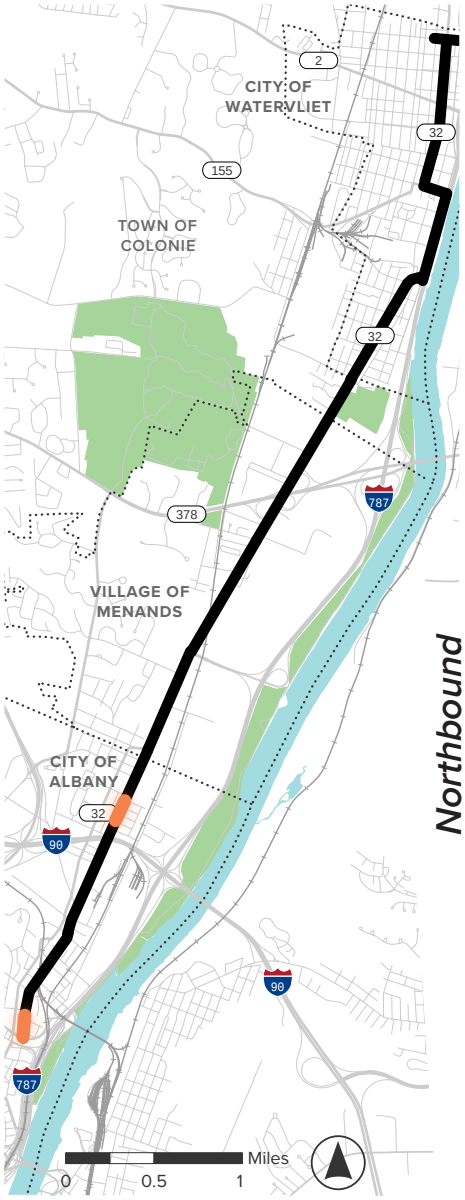
In space constrained areas, the bike buffer and green infrastructure bioretention area can be combined, as shown on the left-hand side of the diagram.

Rendering of the design standards applied to a section of the Study corridor in the Village of Menands.

Proposed Roadway Design Typologies

Ten proposed roadway typologies were developed for the length of the Study corridor based on the available right-of-way width, presence of on-street parking, and adjacent land uses. Each typology aims to increase the safety and accessibility of pedestrian, transit, and bike infrastructure, minimize impacts to traffic flow, maximize space for the urban forest and green infrastructure, and minimize the relocation of above-ground utilities to the extent possible. For each proposed typology, this section describes where the typology applies, the key features of the typology, and potential alternative configurations that may be considered to expand space for pedestrian, parking, and/or green infrastructure uses.

The typologies are presented from south to north. For a detailed set of cross-sections that present existing and proposed conditions for the length of the Study corridor, please see Appendix A.



This Study recommends applying typology A in the highlighted section(s) above.

Typology A

High Pedestrian Areas

Where It Applies

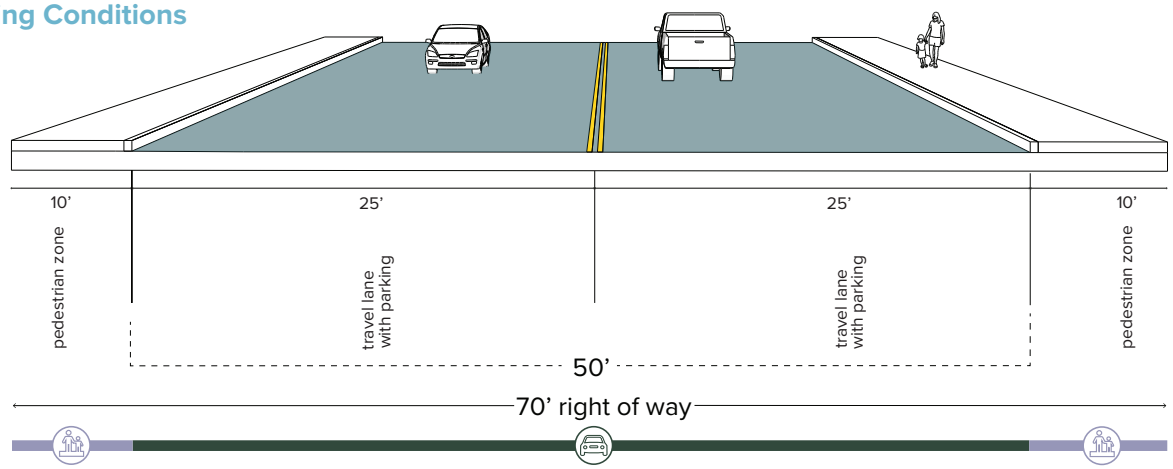
- Right-of-way (ROW) widths ranging from 65-feet to 80-feet with one lane of travel in each direction and on-street parking.
- In downtown Albany, between Clinton Avenue and Livingston Avenue, and in North Albany between N. 3rd Street and Lawn Avenue.

Proposed Features

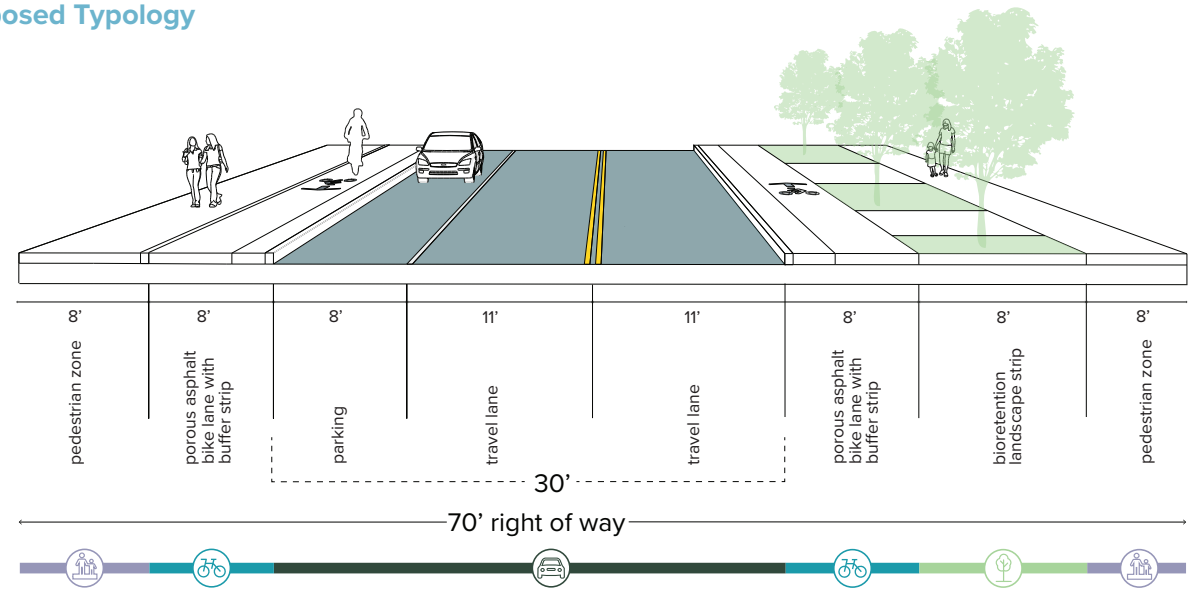
- **Remove One Lane of On-Street Parking:** More roadway space could be reallocated to the sidewalk for larger bioretention areas and/or wider sidewalks by removing one lane of on-street parking. Wherever parking is removed, it will be important to identify alternative parking locations for residents and visitors to minimize negative impacts.
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- Sidewalks at least 8-feet wide in areas of high pedestrian activity, such as downtown Albany. Sidewalks should be separated from the bike lane by permeable pavers that provide a tactile warning surface or bioretention strip.
- Where space allows, a bioretention strip should be used to separate bicycle and pedestrian traffic. This vegetated buffer provides vertical separation between cyclists and pedestrians while also moving trees away from the curbline to reduce conflicts between canopies and commercial vehicles.

Example: Typology A

Existing Conditions



Proposed Typology



Typology A: Implementation Considerations

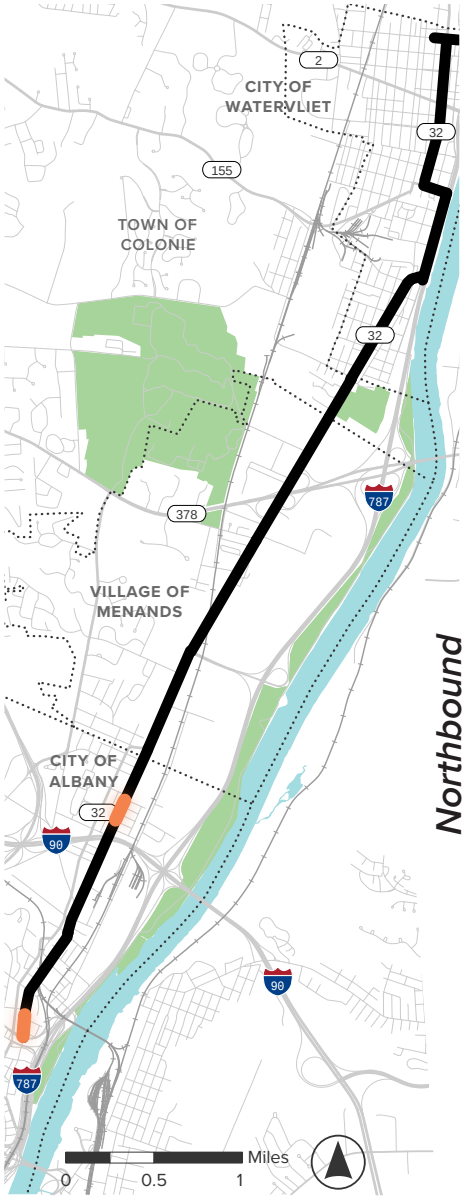
Impervious Surface Reduction	33%
Cost per linear foot	$3,000

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology A Alternative Configurations

Alternative Configurations

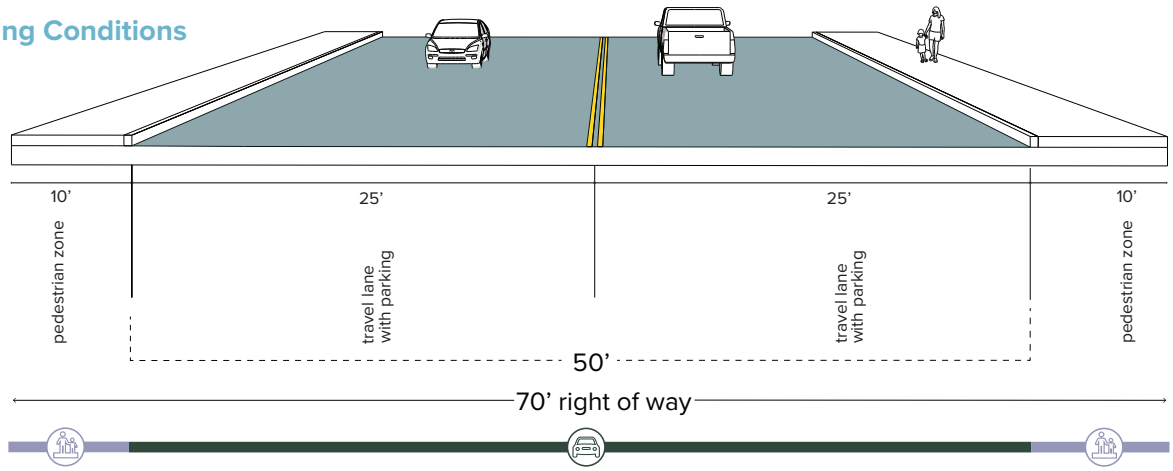
- Two travel lanes (11-feet wide each) and two lanes of on-street parking (8-feet wide each).
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- Sidewalks at least 8-feet wide in areas of high pedestrian activity, such as downtown Albany. Sidewalks should be separated from the bike lane by permeable pavers or bioretention strip.
- In constrained areas, the bioretention strip can be merged with the buffer between the curbline and bike lane to save space.
- **Bioretention Islands:** If wider sidewalks are preferred over bioretention strips, single on-street parking spaces can be intermittently replaced with a bioretention island to ensure trees and green infrastructure can still be integrated into the corridor. Please see page 174 for precedent imagery of bioretention islands.



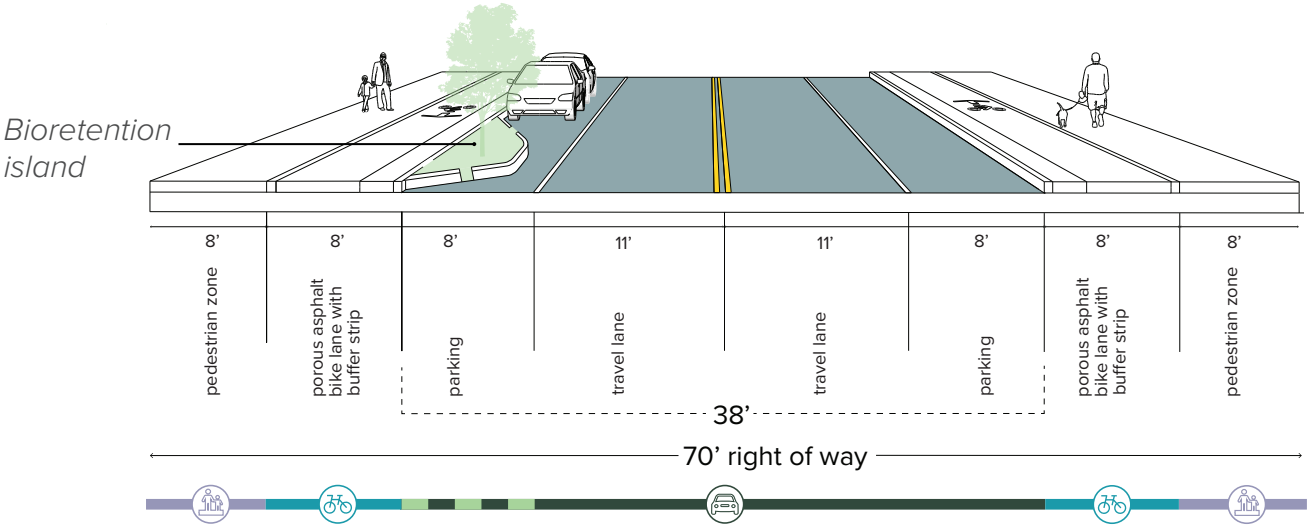
This Study recommends applying typology A in the highlighted section(s) above.

Example: Typology A Alternative Configurations

Existing Conditions



Proposed Typology



Typology A Alternative: Implementation Considerations

Impervious Surface Reduction	22%
Cost per linear foot	$2,600

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology B

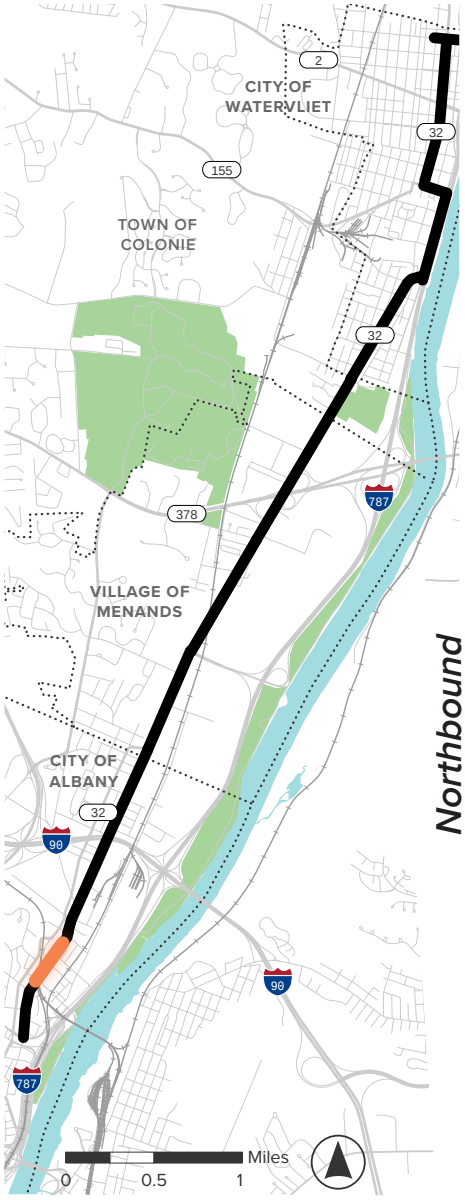
Wide ROW with a Diversity of Uses

Where it Applies

- ROW ranging from 80-feet to 100-feet with one lane of travel in each direction and on-street parking.
- This typology is common in the Warehouse District where multiple land uses and modes of transportation converge.

Proposed Features

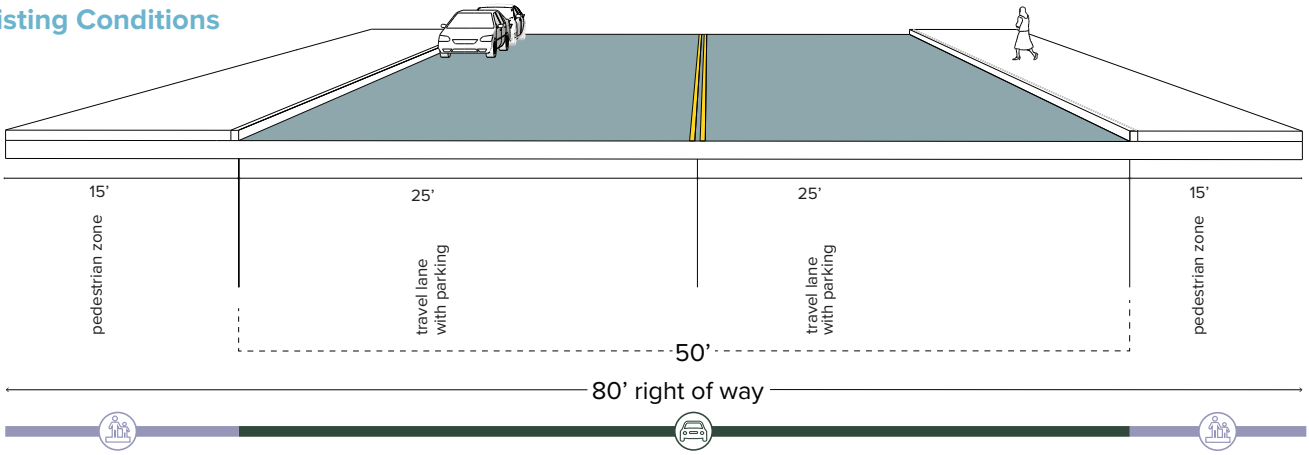
- Two travel lanes (11-feet wide each) and two lanes of on-street parking (8-feet wide each).
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- A 7-foot wide bioretention strip separates bicycle and pedestrian traffic. This vegetated buffer provides vertical separation between cyclists and pedestrians while also moving trees away from the curbline to reduce conflicts between canopies and commercial vehicles.
- **This typology can also accommodate more streetscape amenities**, like benches and outdoor dining, by integrating sections of permeable pavers within the bioretention strip.
- As the ROW extends from 80-feet to 100-feet, landscape buffers and amenities can be expanded to capture additional stormwater, create space for public art, and further enhance a sense of place.



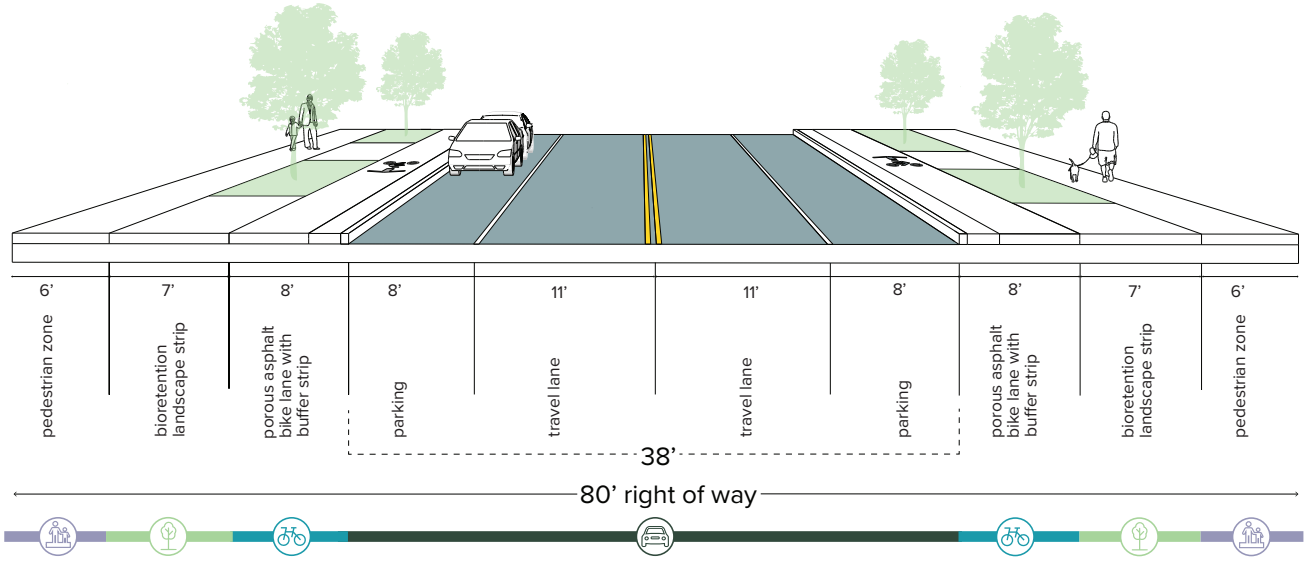
This Study recommends applying typology B in the highlighted section(s) above.

Example: Typology B

Existing Conditions



Proposed Typology



Typology B: Implementation Considerations

Impervious Surface Reduction	38%
Cost per linear foot	$3,375

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology C

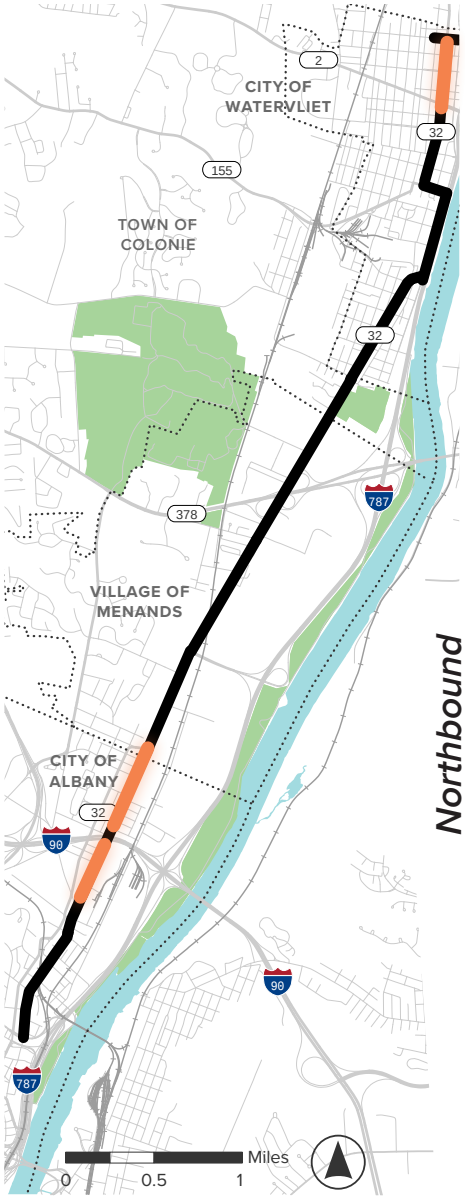
Constrained ROW

Where it Applies

- ROW ranging from 60-feet to 65-feet with one lane of traffic in each direction and on-street parking on both sides of the street.
- This typology occurs in North Albany from north of the warehouse district to the Menands line. It is also found in Watervliet along 2nd Ave from 19th Street to 25th Street.

Proposed Features

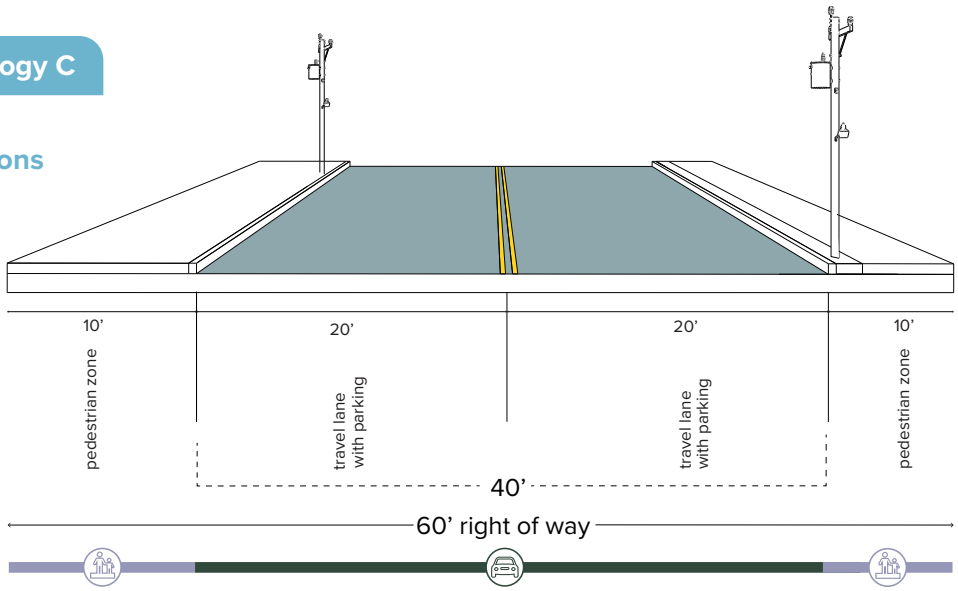
- Two travel lanes (11-feet wide each) and one lane of on-street parking (8-feet wide each).
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- To save space, the bioretention strip serves as the buffer between the curb and bike lane, while the bike lane and sidewalk are separated by permeable pavers.
- This option removes one lane of on-street parking to provide safer, continuous bike and pedestrian facilities and expand the urban forest. **A parking study is recommended to further evaluate impacts and continue discussions with local residents and businesses.**



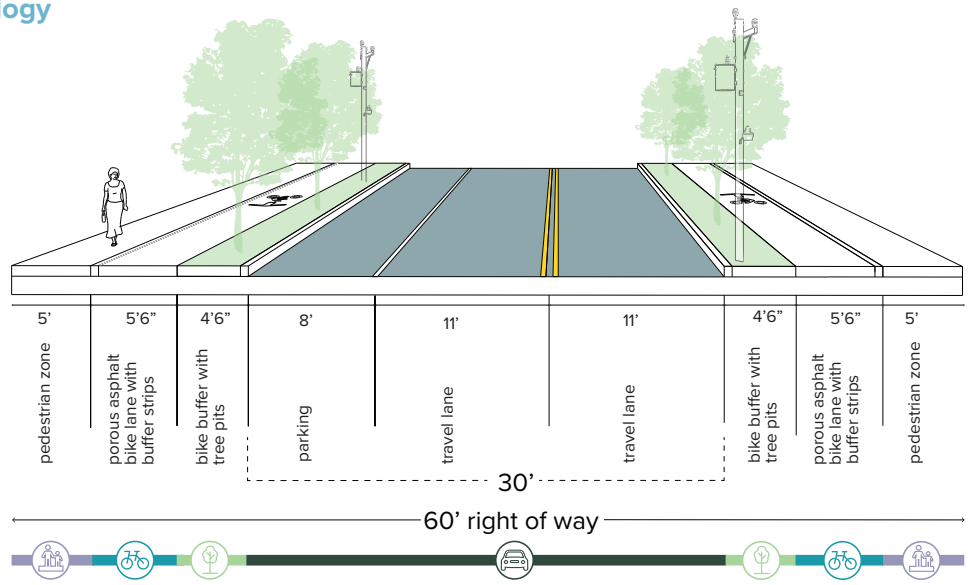
This Study recommends applying typology C in the highlighted section(s) above.

Example: Typology C

Existing Conditions



Proposed Typology



Typology C: Implementation Considerations

Impervious Surface Reduction	33%
Cost per linear foot - Albany	$2,650
Cost per linear foot - Watervliet	$2,450

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Note: Utility pole relocations are reflected in estimated costs, and can be attributed to the higher cost per linear foot shown for Albany.

Typology D

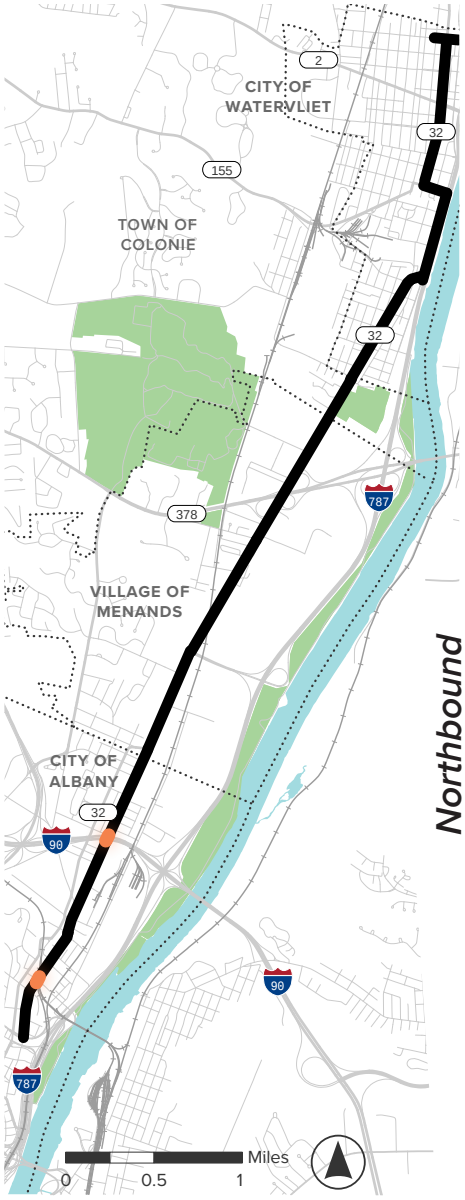
Under Bridges

Where it Applies

- This typology occurs under the I-90 bridge and under the Livingston Avenue Bridge where sidewalk, lighting, and roadway conditions deviate from the adjacent sections of the corridor.

Proposed Features

- Two travel lanes (11-feet wide each) with one to two foot wide shoulders to provide additional space for emergency vehicles to pass as needed.
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- **The bike buffer includes bollard path lighting to enhance safety by providing additional vertical separation and increase ground-level lighting**.



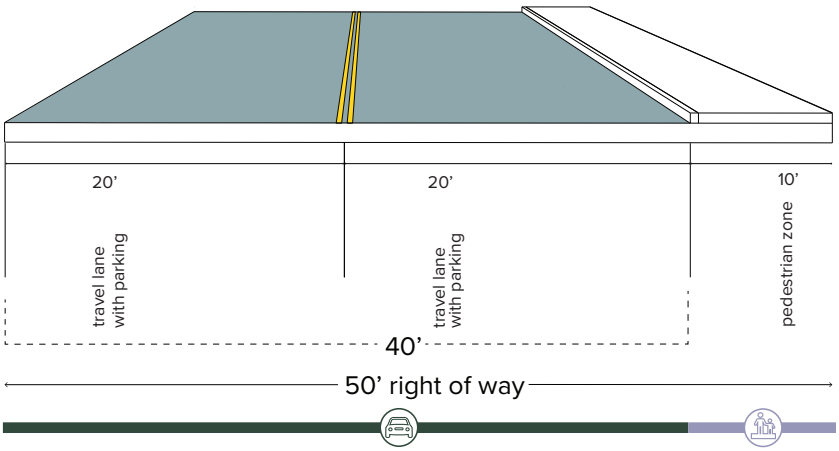
This Study recommends applying typology D in the highlighted section(s) above.

SUBSURFACE WATER STORAGE

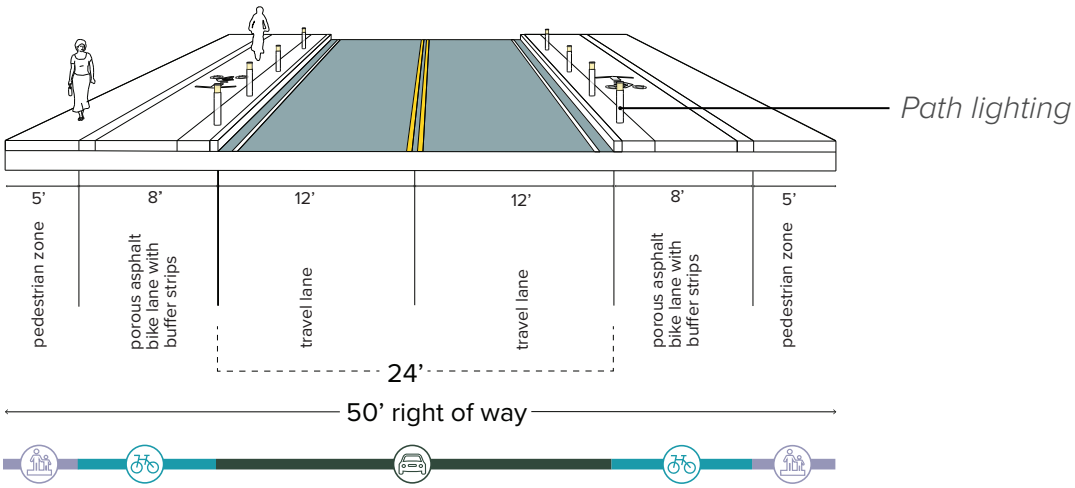
Subsurface water storage systems, such as the StormTech chambers shown below, allow for underground detention and infiltration of water during storm events. These systems can be utilized to divert water from overburdened storm sewers, and improve damp conditions under bridges along the corridor. This system could be a solution for the drainage issues under the Livingston Ave Bridge where space for green ifrastructure is limited.

Example: Typology D

Existing Conditions



Proposed Typology



Typology D: Implementation Considerations

Impervious Surface Reduction	32%
Cost per linear foot	$3,900

Transit
Sidewalks
Bicycle Lanes
Travel Lanes & Parking
Green Infrastructure

Typology E

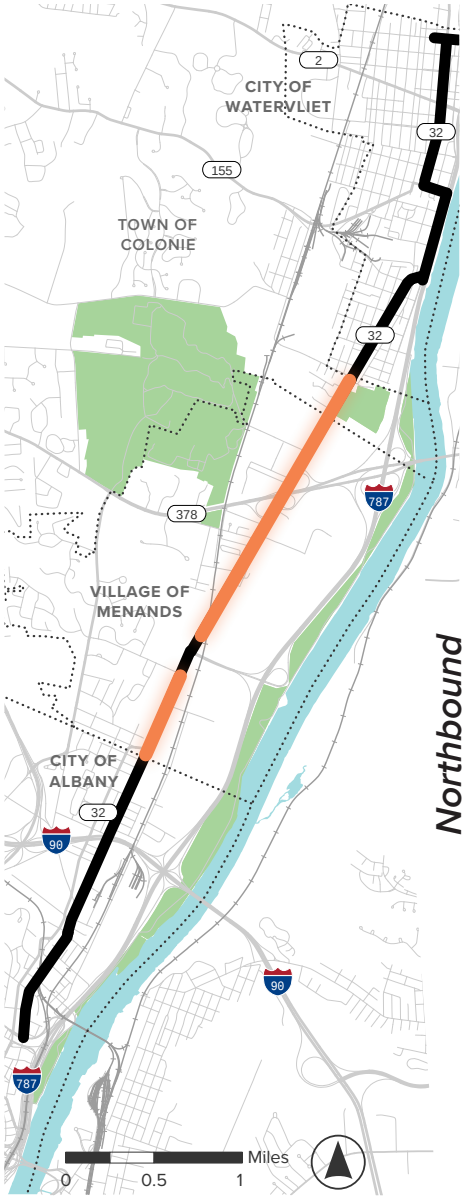
Center Turn Lane

Where it Applies

- This typology occurs in the Village of Menands from the Albany City line to Wards Lane, and from the Riverview Center to the Watervliet City line.
- ROW ranging from 65-feet to 70-feet, with one lane of traffic in each direction and a center turn lane.

Proposed Features

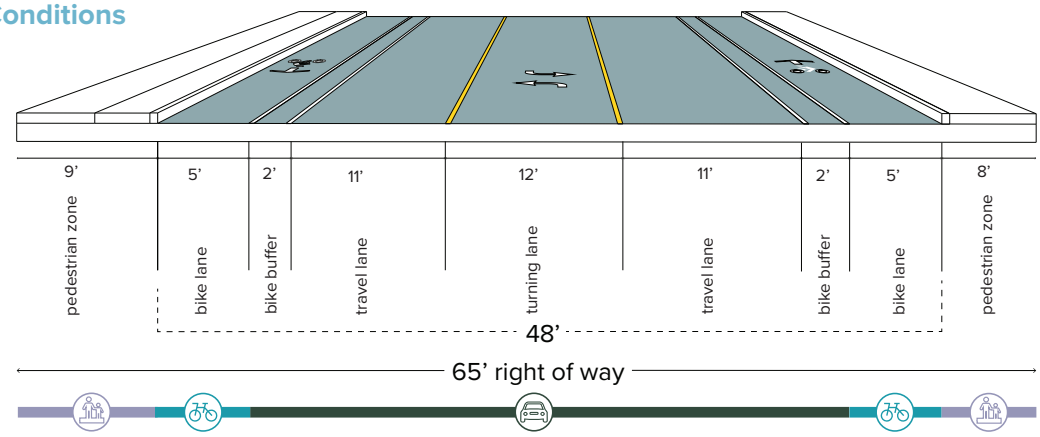
- Two travel lanes (11-feet wide each) without shoulders and one two-way center turn lane (11-feet wide).
- One-way separated bike lanes on either side of the road at sidewalk level.
- To save space, the bioretention strip serves as the buffer between the curb and bike lane, while the bike lane and sidewalk are separated by permeable pavers.
- **In areas where ROW is 67-feet wide or greater, the bioretention strip should be moved to separate bike and pedestrian traffic. This provides vertical separation between cyclists and pedestrians and moves trees off of the curbline, reducing conflicts with tree canopy and larger trucks.**



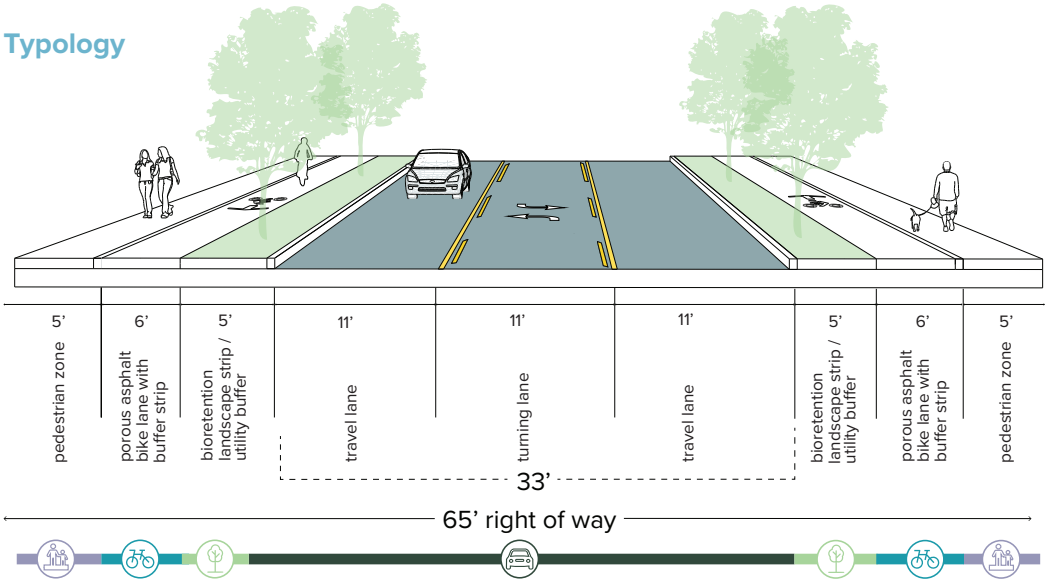
This Study recommends applying typology E in the highlighted section(s) above.

Example: Typology E

Existing Conditions



Proposed Typology



Typology E: Implementation Considerations

Impervious Surface Reduction	34%
Cost per linear foot	$2,550

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology F

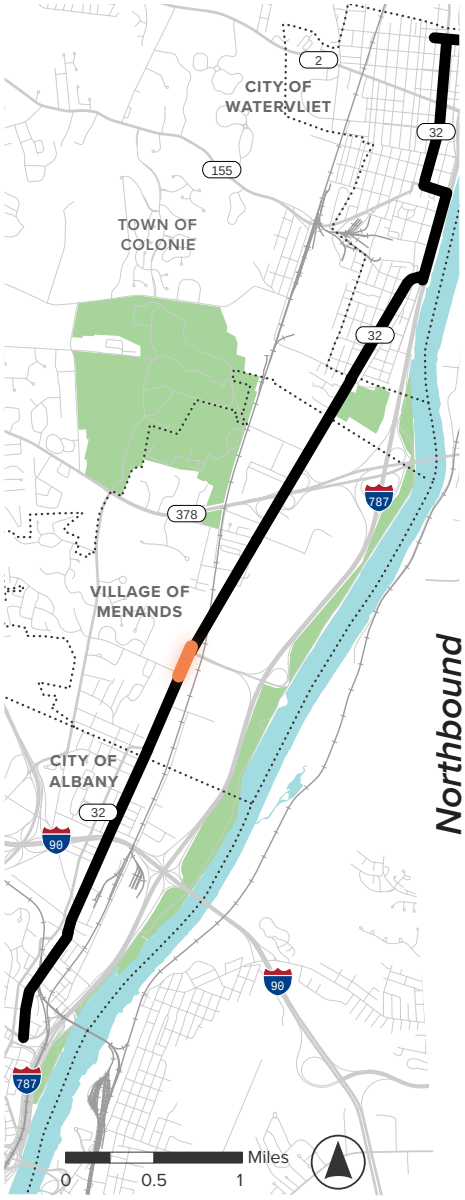
Dedicated Bus Lanes

Where it Applies

- This typology occurs in the Village of Menands from Wards Lane to the Riverview Center.
- In this area, the ROW is approximately 95-feet with one lane of traffic in each direction, two turning lanes, partial bus lanes, and on-street bike lanes.

Proposed Features

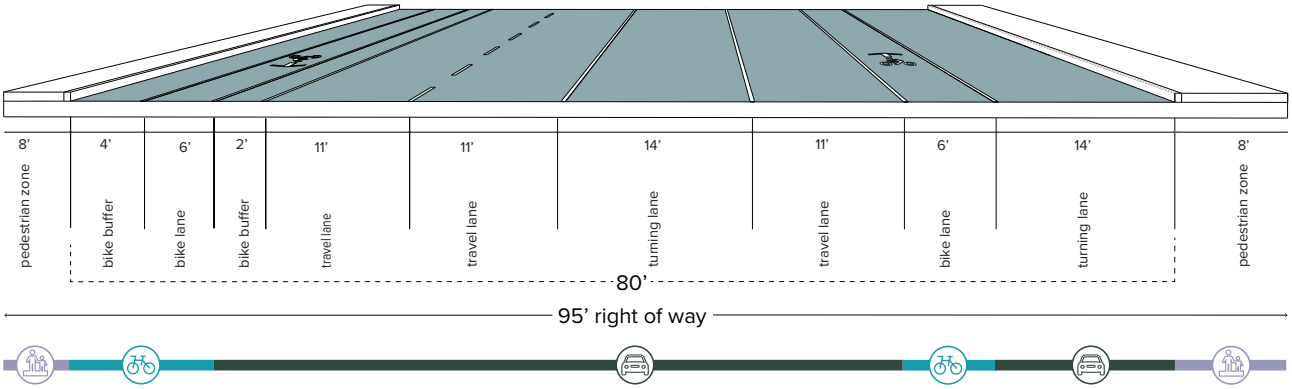
- Two travel lanes (11-feet wide each) without shoulders, one turning lane (11-feet wide), and two bus lanes (11-feet wide each).
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- The bike lane and sidewalk are separated by an approximately seven foot wide buffer.
- **At Riverview Station, the bike lane should be routed behind the bus shelter to reduce conflicts with cyclists and riders that are boarding and alighting the bus.**



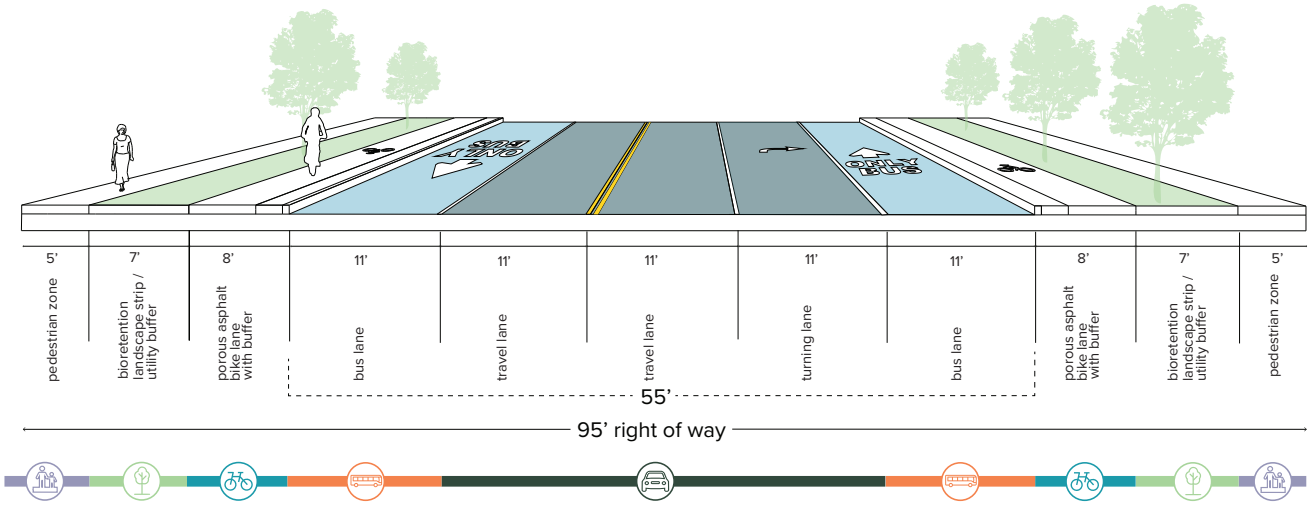
This Study recommends applying typology F in the highlighted section(s) above.

Example: Typology F

Existing Conditions



Proposed Typology



Typology F: Implementation Considerations

Impervious Surface Reduction	32%
Cost per linear foot	$2,825

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology G

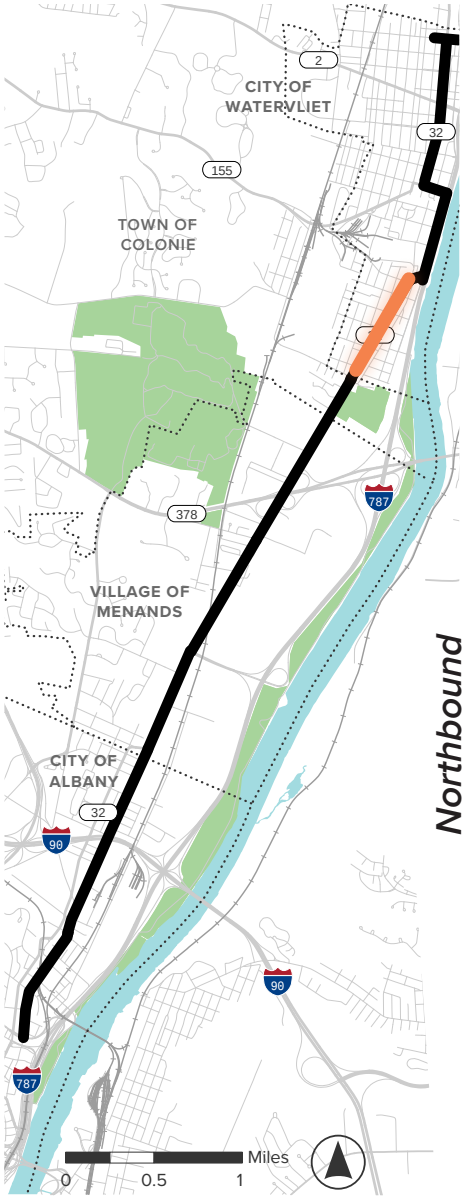
Constrained ROW on 3rd Ave

Where it Applies

- This typology occurs in the City of Watervliet, from the north end of Schuyler Flatts Cultural Park to Broadway.
- The ROW range is approximately 55-feet wide with one lane of traffic in each direction and parking lanes on both sides.

Proposed Features

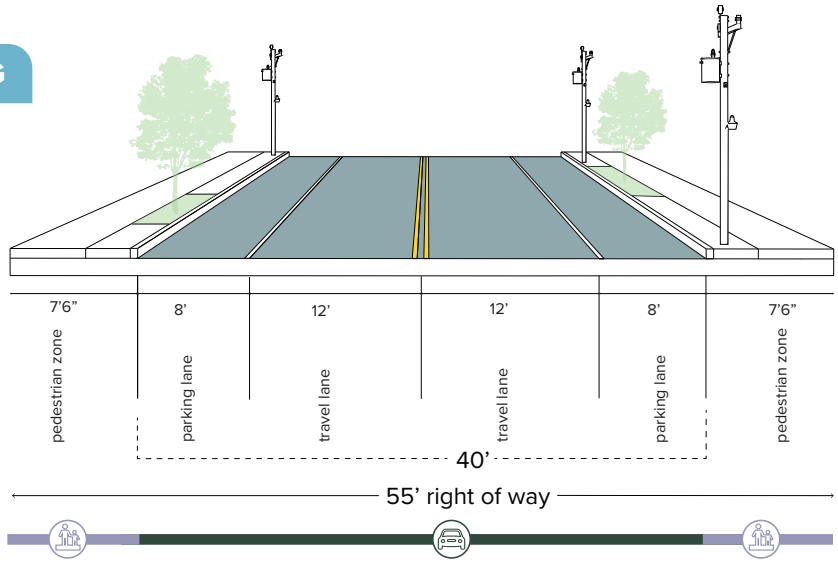
- Bioretention islands intermittently replace single on-street parking spaces to ensure trees and green infrastructure are integrated into the corridor and have sufficient space to thrive. Please see page 174 for precedent imagery of bioretention islands.
- **While this option does not change the existing roadway configuration, it would include accessibility updates at intersections, additional vegetation, and improved east-west bicycle and pedestrian trail connections to Broadway and the Empire State Trail.**



This Study recommends applying typology G in the highlighted section(s) above.

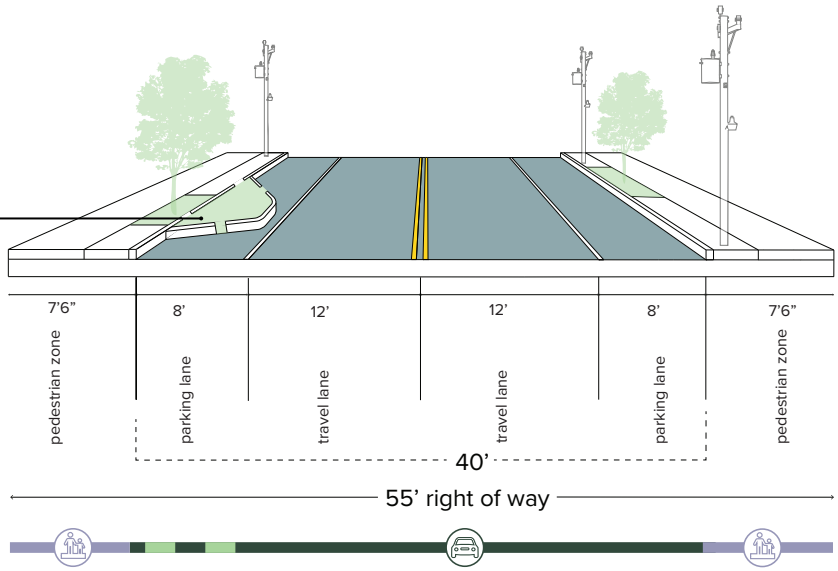
Example: Typology G

Existing Conditions



Proposed Typology

Remove one parking space on each side of the street on each block to create space for trees and green infrastructure



Typology G: Implementation Considerations

Impervious Surface Reduction	2%
Cost per linear foot	$330

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology H

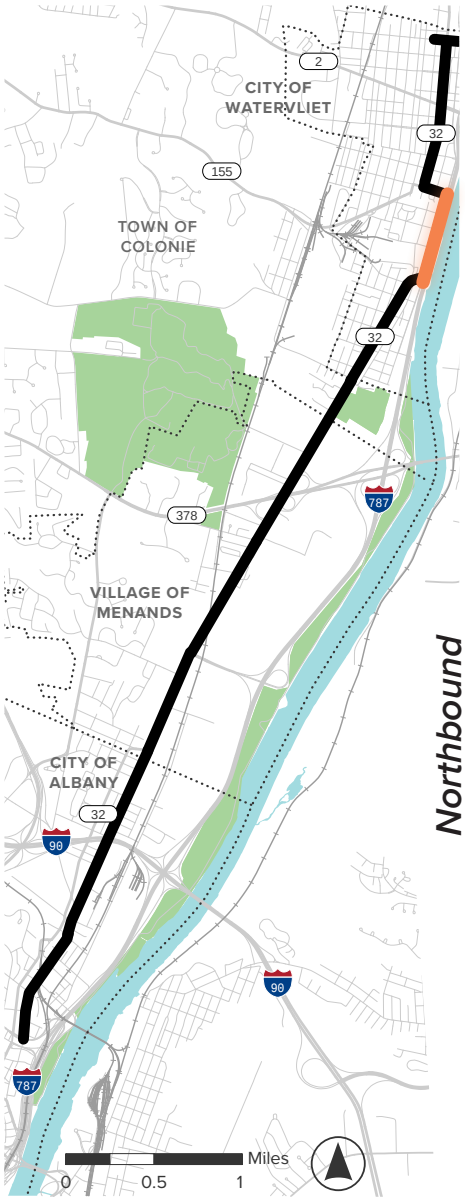
Broadway Along the Empire State Trail

Where it Applies

- This typology occurs in the City of Watervliet where Broadway runs parallel to the Empire State Trail, adjacent to I-787.
- The ROW is approximately 55-feet wide with one lane of traffic in each direction and a two-way separated bike lane. On-street parking is intermittently allowed and the bike lane buffer is either paint or a curb.

Proposed Features

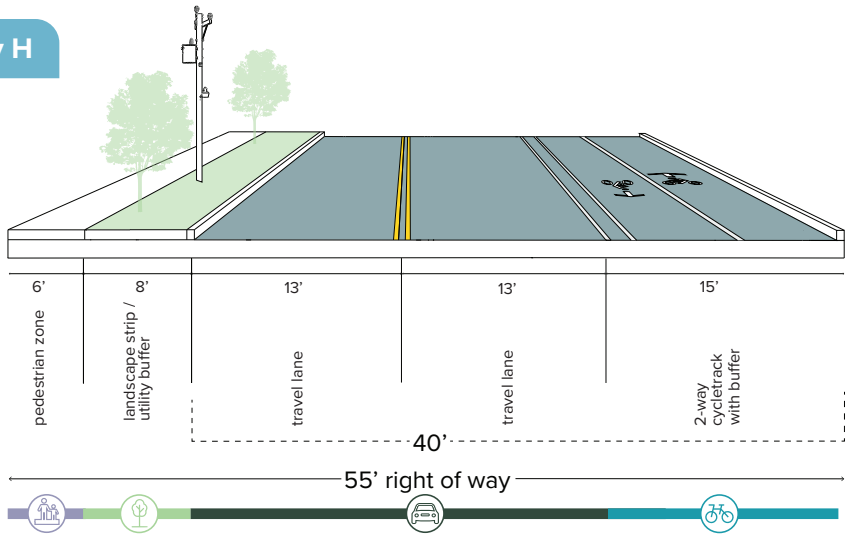
- This Study recommends converting the existing asphalt two-way separated bike lane to porous asphalt.
- Travel lanes should be narrowed to 11-feet wide, and existing on-street parking should be retained.
- Curbing should be installed to provide more protection for cyclists.
- Where space allows, a bioretention strip should be integrated into the buffer area separating motor vehicle traffic from cyclists.
- Additional trees should be planted along this section of roadway to infill gaps.



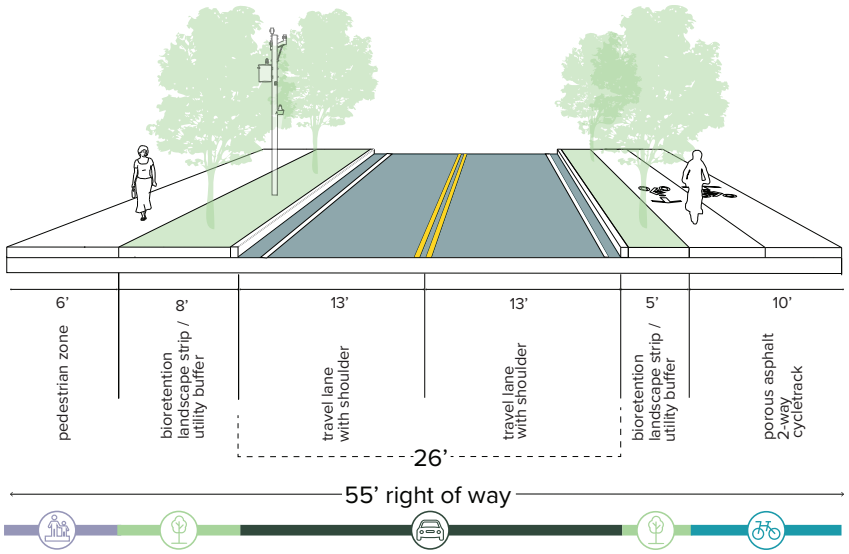
This Study recommends applying typology H in the highlighted section(s) above.

Example: Typology H

Existing Conditions



Proposed Typology



Typology H: Implementation Considerations

Impervious Surface Reduction	24%
Cost per linear foot	$1,400

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology I

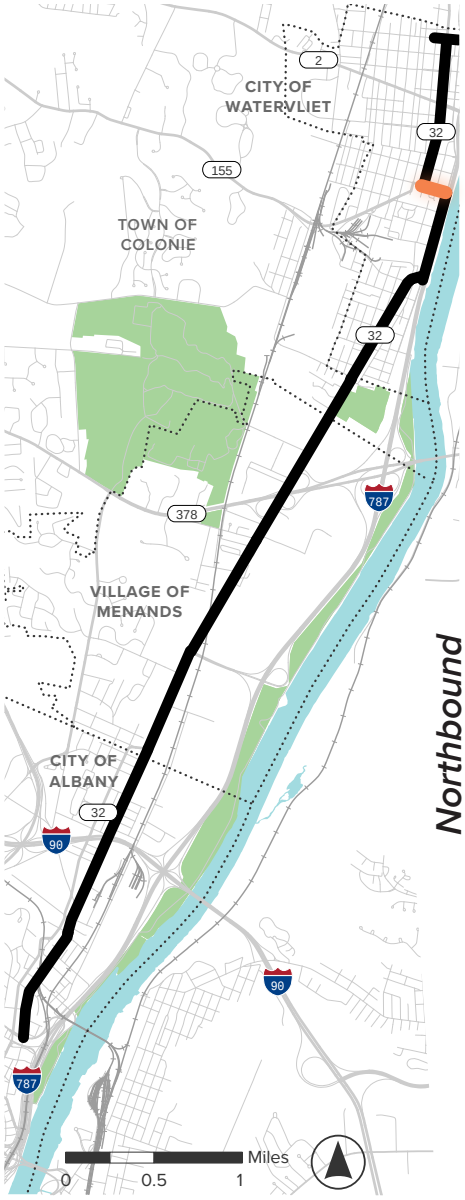
13th Street Sidepath

Where it Applies

- This typology occurs in the City of Watervliet on 13th Street from Broadway to 2nd Avenue.
- The ROW is approximately 48-feet wide, with one lane of traffic in each direction and parking on one side.

Proposed Features

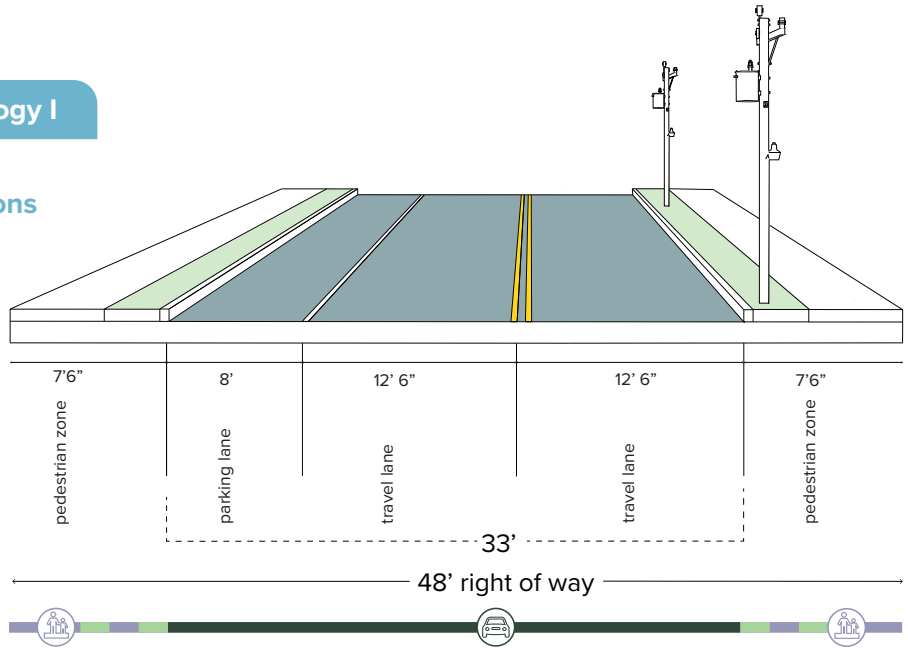
- Two travel lanes (10-feet wide each) and one lane of on-street parking (8-feet wide).
- **Two-way shared use path at sidewalk level, separated from the curb by a 2-foot to 3-foot wide bioretention strip or permeable pavers.**
- Bioretention islands can be used to intermittently replace single on-street parking spaces to ensure trees and green infrastructure can still be integrated into the corridor.



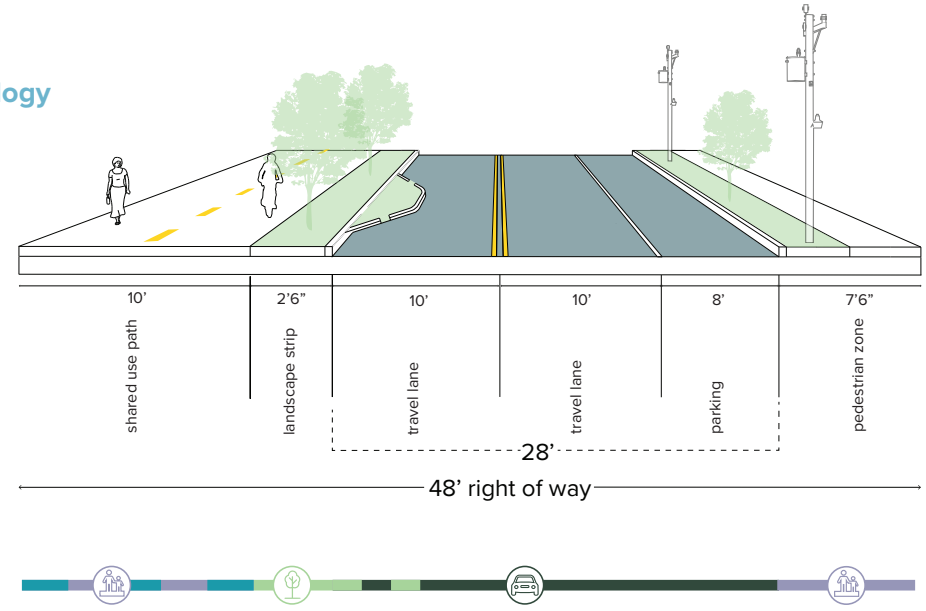
This Study recommends applying typology I in the highlighted section(s) above.

Example: Typology I

Existing Conditions



Proposed Typology



Typology I: Implementation Considerations

Impervious Surface Reduction	16%
Cost per linear foot	$1,800

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Typology J

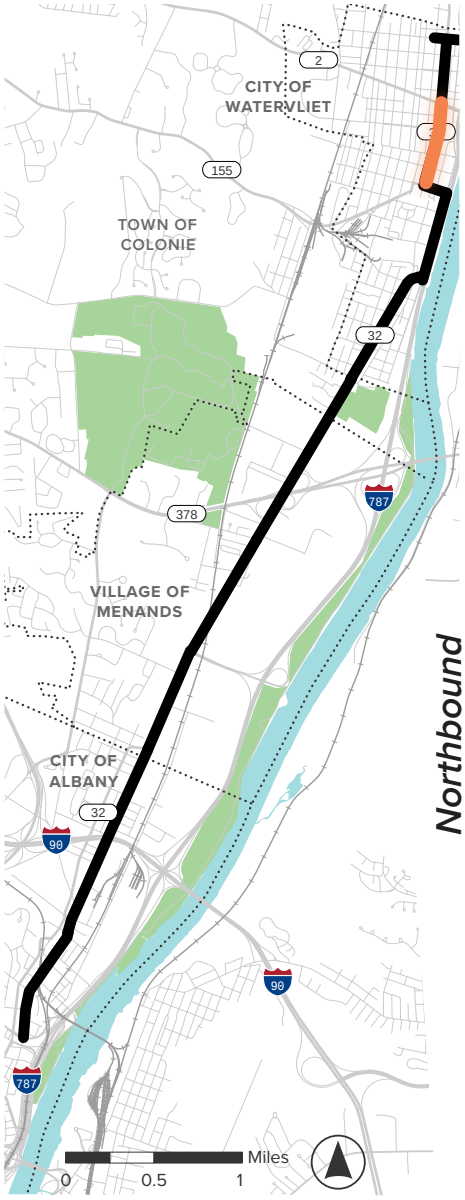
Typology J - 2nd Ave

Where it Applies

- This typology occurs in the City of Watervliet on 2nd Avenue from 13th Street to 19th Street.
- The ROW is approximately 70-feet wide with one lane of traffic in each direction, parking on one side, and on-street bike lanes with two-foot buffers.

Proposed Features

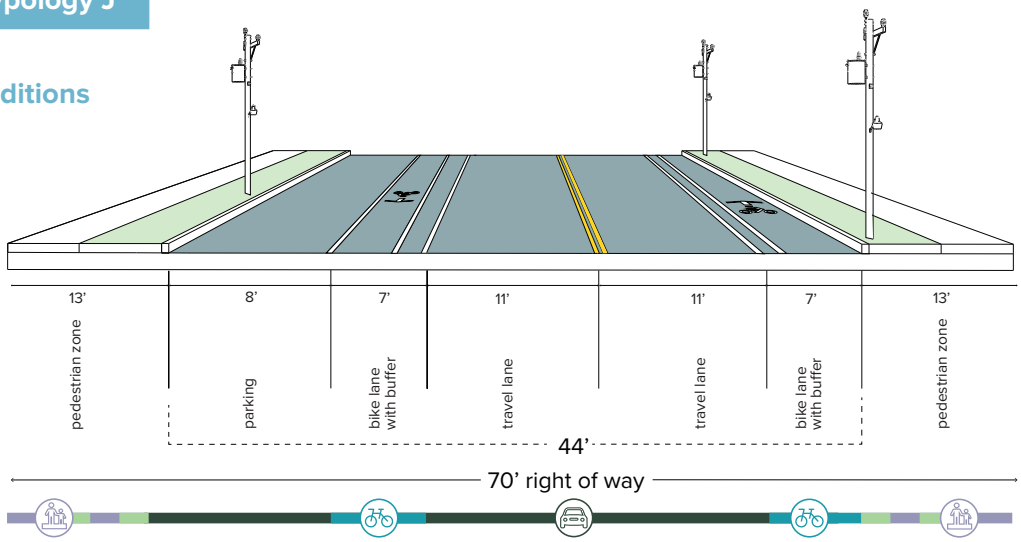
- Two travel lanes (11-feet wide each) and one lane of on-street parking (8-feet wide).
- One-way separated bike lanes on either side of the road at sidewalk level, separated from the curb by a 3-foot wide buffer.
- A 6-foot wide bioretention strip separates bicycle and pedestrian traffic. This vegetated buffer provides vertical separation between cyclists and pedestrians while also moving trees away from the curbline to reduce conflicts between canopies and commercial vehicles.



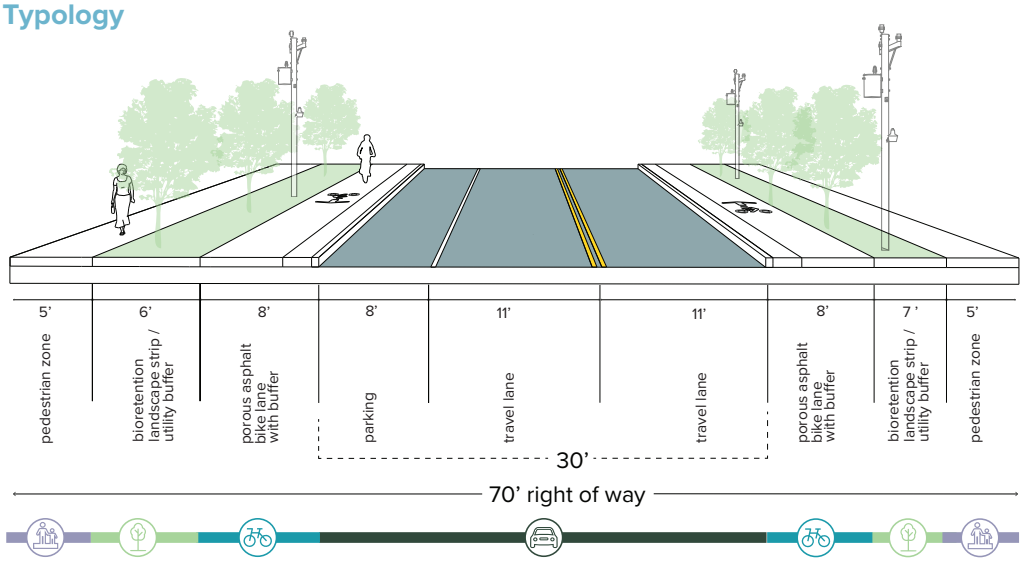
This Study recommends applying typology J in the highlighted section(s) above.

Example: Typology J

Existing Conditions



Proposed Typology



Typology J: Implementation Considerations

Impervious Surface Reduction	33%
Cost per linear foot	$2,900

- Transit
- Sidewalks
- Bicycle Lanes
- Travel Lanes & Parking
- Green Infrastructure

Transit Infrastructure

Transit users start and end every trip as a pedestrian or cyclist, so it is essential that corridor improvements ensure the safety of all transportation modalities. This section provides an overview of transit recommendations.

Bus Stop Recommendations

Current parking regulations prohibit on-street parking in front of bus stops. To increase compliance, this Study recommends constructing curb extensions at all bus stops where an on-street parking lane exists to ensure parked cars do not obstruct stops. These proposed curb extensions also allow the bus to stop in lane. While this may delay traffic slightly, it prioritizes bus service by allowing buses to quickly re-enter the travel lane as no merging is required. A minimum of 5-feet of clearance is also recommended in front of all bus stops for accessibility.

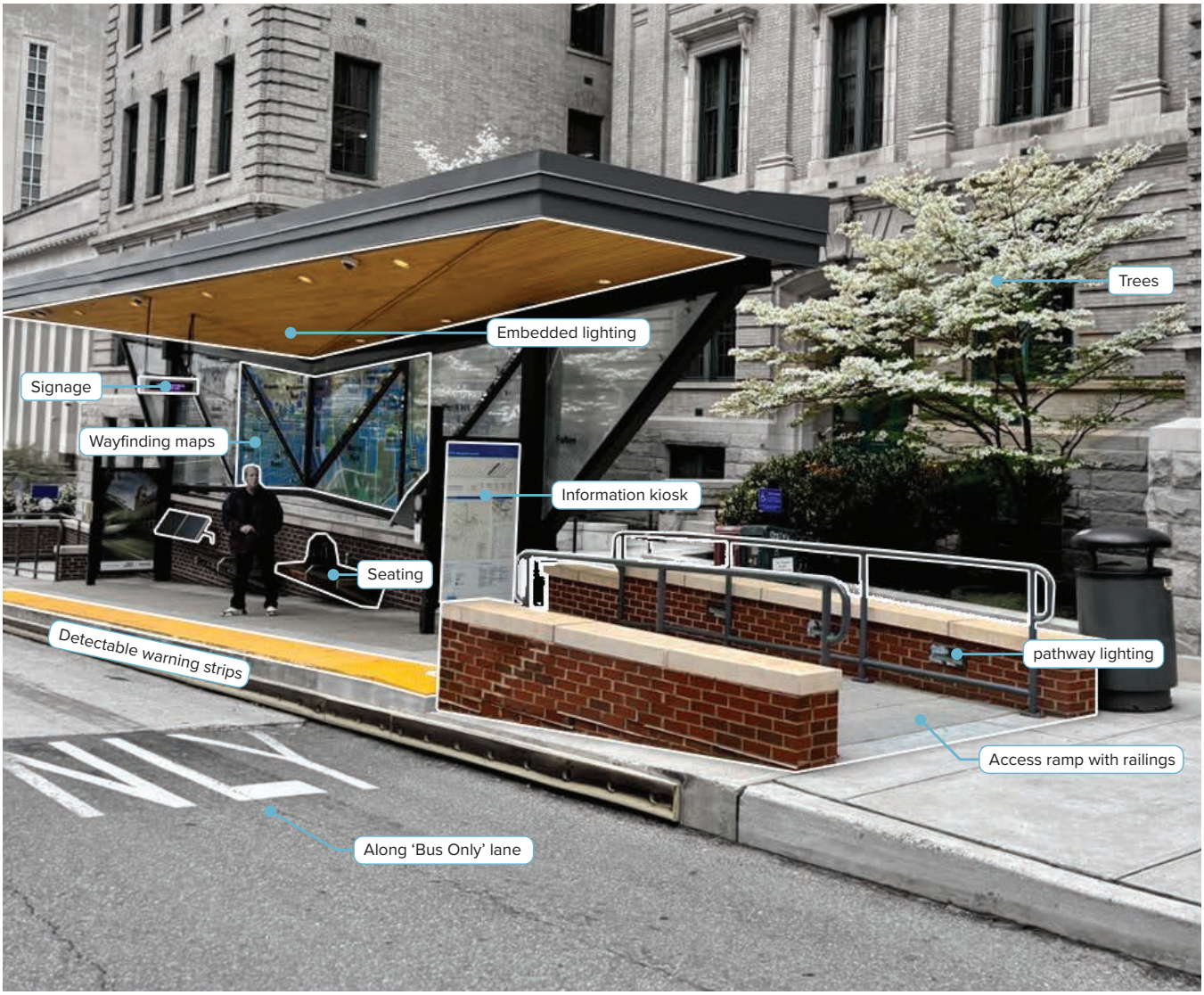
The following bus stop improvements are recommended along the Study corridor:

- **Port Schuyler Bus Rapid Transit (BRT) station:** The northbound Port Schuyler BRT station would benefit from a curb extension, which would allow room for a bus shelter and seating, in addition to a shorter crossing across 3rd Avenue.
- **80 Broadway:** CDTA's proposed improvements to the stops at 80 Broadway in Menands at the Simmons Lane intersection are currently under review. The proposed design would have southbound buses stopping where they currently do, in-lane on Broadway. Northbound buses would turn left at the Simmons Lane signal into new bus only lanes in the 80 Broadway parking lot, dropping off at a new shelter, and then turning left back onto Broadway at a new bus only traffic signal. The new traffic signal will be tied to the Simmons Lane cycle. The stop is primarily used by New York State workers who park in the 80 Broadway lot and ride the bus downtown. This new design would eliminate the need for riders to cross Broadway to get back to the parking lot when riding northbound.
- **Existing Stop Upgrades:** Where space allows and in accordance with CDTA's stop amenity guidelines, existing bus stops marked only by a sign should be upgraded to include seating, trees, lighting, and shelters. For example, the bus stops at Broadway/Lindbergh and Broadway/Brookside are well-used and would benefit from shelters.

TRANSIT AND DESIGN PROCESSES

Early coordination with CDTA throughout the design process is essential to minimize service interruptions.

Approximately 12 transit shelters are located along the Study corridor. It is important that the municipalities in the Study corridor engage with CDTA early in the design process to anticipate and plan for potential shelter or infrastructure removal or relocation during or after construction.



Design elements such as lighting, signage, trees, and ramps, as shown in the image above from Richmond, Virginia, ensure that transit stops are accessible and comfortable for all user types.

- **In-Lane Bus Stops:** In-lane bus transit stops with boarding islands are recommended to prevent transit riders from stepping into the bike lane when boarding or exiting a bus. These stops also offer protection for cyclists and improve visibility for bus operators. In-lane bus stops are particularly important for BRT stations, as pull-off stops slow down service when the buses re-enter traffic. Bus boarding islands should have a width of 8.5-feet to 12-feet depending on the type of bus and necessary space for accessibility elements. The length varies based on bus types, potential for two buses arriving simultaneously, and required cut-throughs and access ramps. For shorter blocks, the island should extend the full length of the block to offer pedestrian access on both sides and act as a refuge at two crosswalks; if not feasible, a secondary signalized or enhanced crossing should be considered. To achieve near-level boarding, the curb-reveal should be up to 10.5 inches. A shelter on the island serves as an amenity for bus riders and a visual signal for drivers.

Bus Lane Recommendations

Northbound and southbound bus lanes are recommended near I-787 Exit 6, from Wards Lane to the Riverview Center. Currently, there is a short bus lane in each direction north of the Exit 6 intersection, with a queue jumper in the southbound lane. Continuing the bus lane all the way through the Wards Lane intersection is recommended, given the width of the road and lightly used center turning lane on that stretch. This would create a cohesive bus priority corridor from the entrance of the Riverview Center, through the Wards Lane intersection.

Routing bicycle lanes behind bus shelters reduces conflicts between cyclists, transit users, and vehicles, as shown in this example from Mount Hope Station on South Pearl Street, in Albany

Mobility Hubs

A mobility hub provides access to multiple forms of transportation in one convenient location, such as bus stops, bikeshare, and/or carshare. Successful mobility hubs prioritize improvements that not only provide transit user diverse mobility options, but also combine multi-modal and streetscape amenities to create a sense of place.

CDTA currently has three mobility hubs: Gateway Plaza in Schenectady, Liberty Square in Troy, and Manning Boulevard in Albany. There are also two mini-hubs; one on Remsen Street in Downtown Cohoes and the other on Western Avenue at the Downtown University at Albany Campus.

Potential locations in the Study area for future mobility hubs include:

- **Warehouse District Station at Pleasant Street:** A future mobility hub would support connections to new area developments, the City of Albany's Downtown Revitalization Initiative (DRI) projects, and future connections to the Patroon Creek Greenway and other Reimagine I-787 changes.
- **Riverview Station:**This BRT station is adjacent to the Riverview Center and I-787 Exit 6. With the proposed changes recommended along the length of the Study corridor, there is space to combine this station with a larger bikeshare station and to improve connectivity to the Empire State Trail through enhanced crossing improvements at Exit 6.
- **Route 378 Stations:** This is a BRT station that coincides with an existing park and ride. It is near Schuyler Flatts Cultural Park and the Mohawk-Hudson Bike Trail access point, and could potentially be integrated into future changes to Route 378.
- **Watervliet 19th Street Stations**: This busy transit stop is at the confluence of multiple current and future projects (Reimagine I-787, New York Route 2 Improvements, Congress Street Bridge). There is also high potential for a future transit-oriented development project at this location.

TRANSIT STOP AND URBAN FOREST RECOMMENDATIONS

Tree plantings are recommended at all bus stops, especially those that do not have shelters to provide shade.

Though twelve stops along the Study corridor are within 20-feet of tree canopy, there are 89 stops with no shelter to provide shade. Prioritizing urban forest upgrades adjacent to transit stops can provide shade, help cool the surrounding environment and make it more comfortable to wait for the bus.

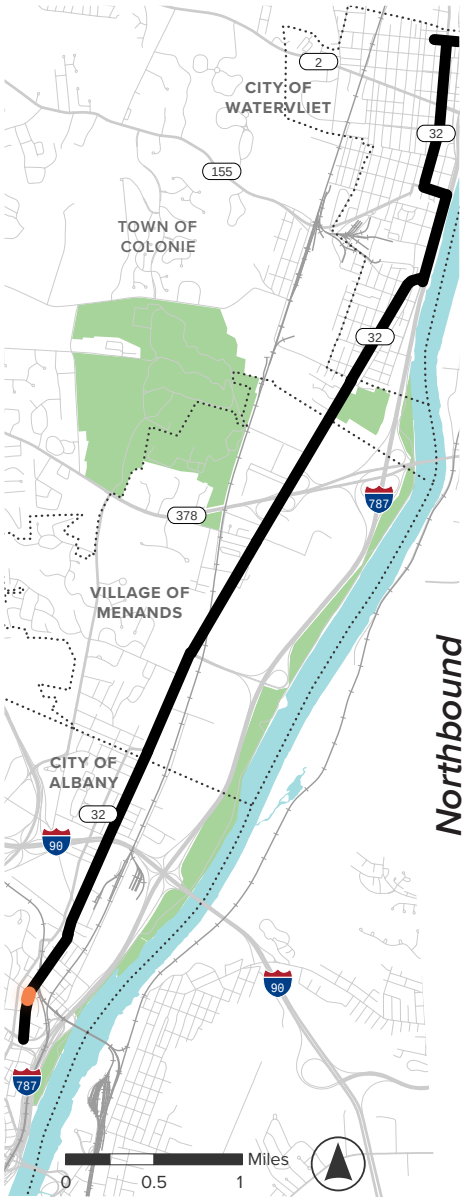
Example: Bus Stop Typology A

Where it Applies

- This typology occurs where bus stops are located across from one another, such as in Albany at Broadway and Livingston Ave.

Proposed Features

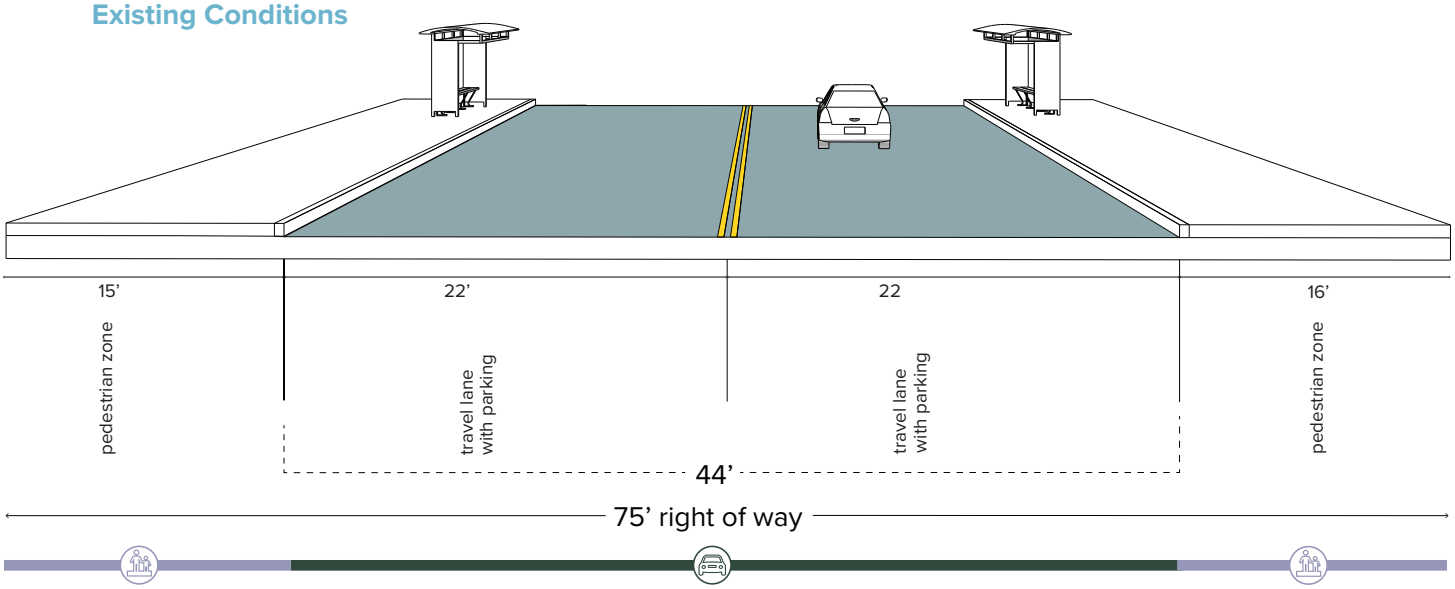
- **On-street parking is prohibited in front of bus stops.** The proposed curb extensions ensure that vehicles cannot park in front of bus stops.
- **Curb extensions allow for buses to stop in-lane.** While this recommendation may slightly delay traffic, it prioritizes transit service by allowing buses to quickly re-enter the travel lane as no merging is required.
- A 5-foot wide minimum clear space in front of all bus stops is recommended to ensure that stops are accessible to all transit users. This clearance creates opportunities to increase amenities at bus stops, including bicycle parking and tree plantings for shade.
- Bicycle lanes run behind bus shelters. This configuration reduces conflicts between cyclists, transit users, and vehicles.



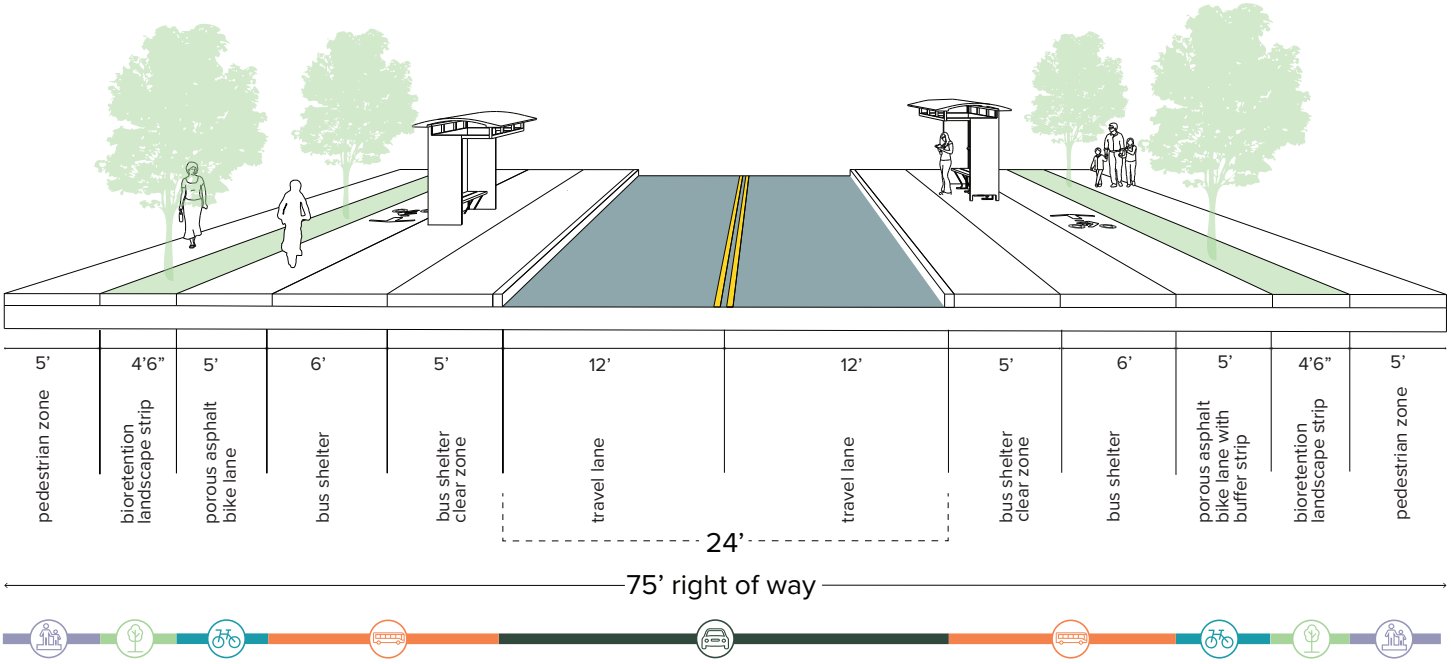
This Study recommends applying Bus Stop Typology A in the highlighted section(s) above.

Example: Bus Stop Typology A

Existing Conditions



Proposed Typology



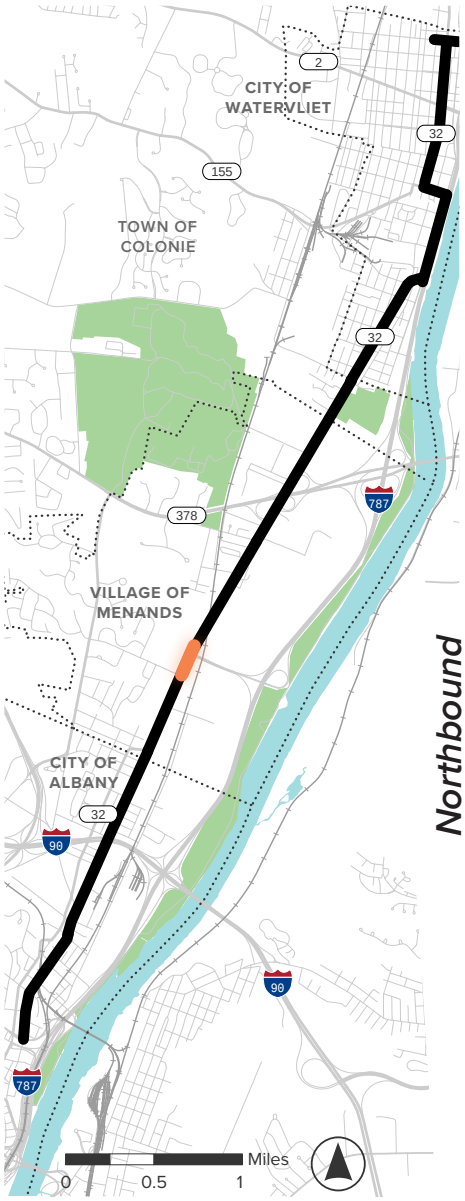
Example: Bus Stop Typology B

Where it Applies

- This typology occurs in locations where bus stops are serviced by dedicated bus lanes, such as in the Village of Menands from Wards Lane to the Riverview Center.

Proposed Features

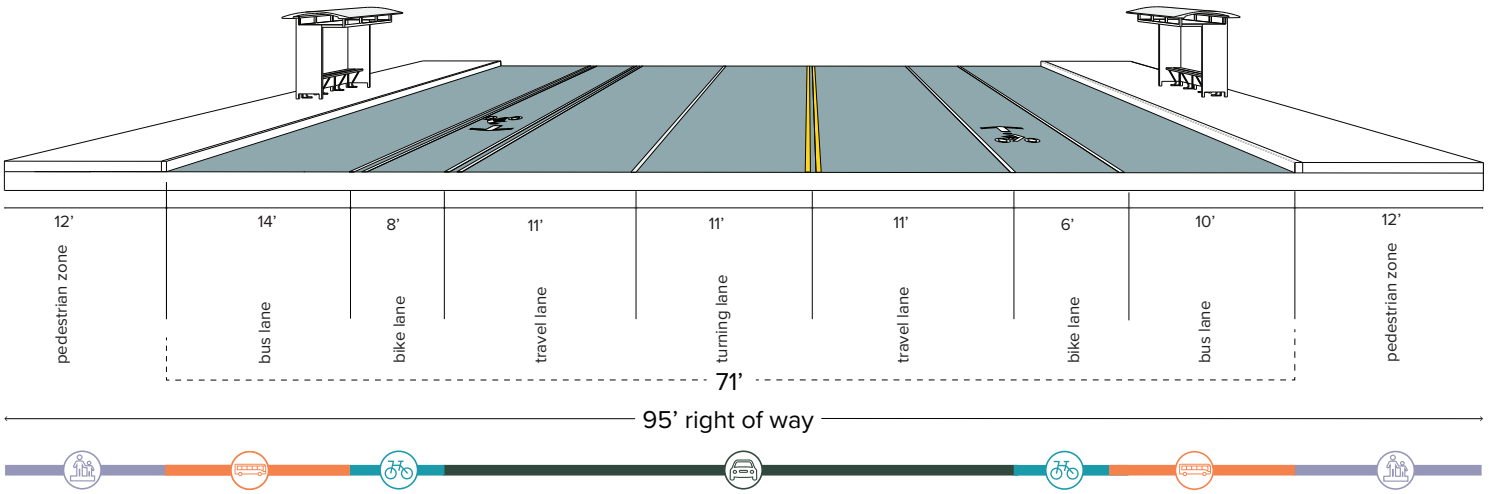
- Two bus lanes (11-feet wide each) abut the bus shelter clear zone.
- A 5-foot wide minimum clear space in front of all bus stops is recommended to ensure that stops are accessible to all transit users. This clearance creates opportunities to increase amenities at bus stops, including bicycle parking and tree plantings for shade.
- Bicycle lanes run behind bus shelters. This configuration reduces conflicts between cyclists, transit users, and vehicles.



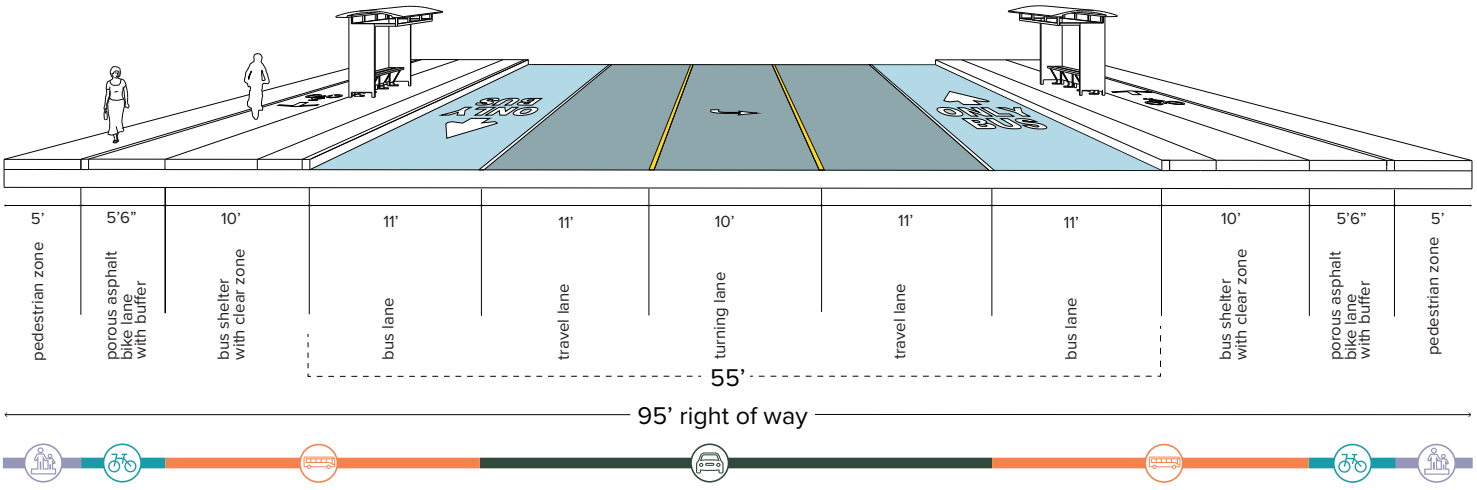
This Study recommends applying Bus Stop Typology B in the highlighted section(s) above.

Example: Bus Stop Typology B

Existing Conditions



Proposed Typology



Intersections

This section provides an overview of recommendations to improve the safety and visibility of all modes of transportation as they navigate intersections.

Pedestrian Accessibility

Along the corridor and at intersections, pedestrian accommodations compliant with the Americans with Disabilities Act (ADA) are critical to the success of the roadway redesign. This Study recommends prioritizing pedestrian safety through separated, dedicated facilities that meet ADA and Public Right-of-Way Accessibility Guidelines (PROWAG) standards. This includes marked crosswalks, ADA curb ramps with detectable warnings, pedestrian signals, mid-block crossings, raised medians with refuge islands, new or reconstructed segments of sidewalk, and traffic calming to slow vehicles and to reduce conflict points. Sidewalks throughout the corridor are concrete and a minimum of five-feet wide, with buffers adjacent to vehicular and bicycle infrastructure.

The City of Albany completed an ADA Transition Plan to ensure that pedestrian accommodations in the city right of way are accessible for everyone. The ADA Transition Plan contains a summary of existing facilities including curb ramps, sidewalks, crosswalks, pedestrian signals, transit stops and multi-use paths as well as long-term commitments to improve accessibility of pedestrian facilities. The plan also summarized responsible agencies for maintenance of the facilities, which includes the following entities: City of Albany, Albany County, and New York State Department of Transportation. Corridor and intersection improvements shall include recommendations out of this plan.

The Village of Menands Draft ADA Public Streets and Sidewalks Plan also identifies and evaluates all pedestrian infrastructure in the public right-of-way including curb ramps, sidewalks, crosswalks, pedestrian signals, and pedestrian accessible transit stops to ensure that the Village's pedestrian infrastructure is accessible for everyone. The Broadway corridor is identified as a priority location and intersection improvements should include recommendations from this plan.

The City of Watervliet is currently developing their own ADA Transition Plan and similar standards should be met for linear segments and intersection crossings.

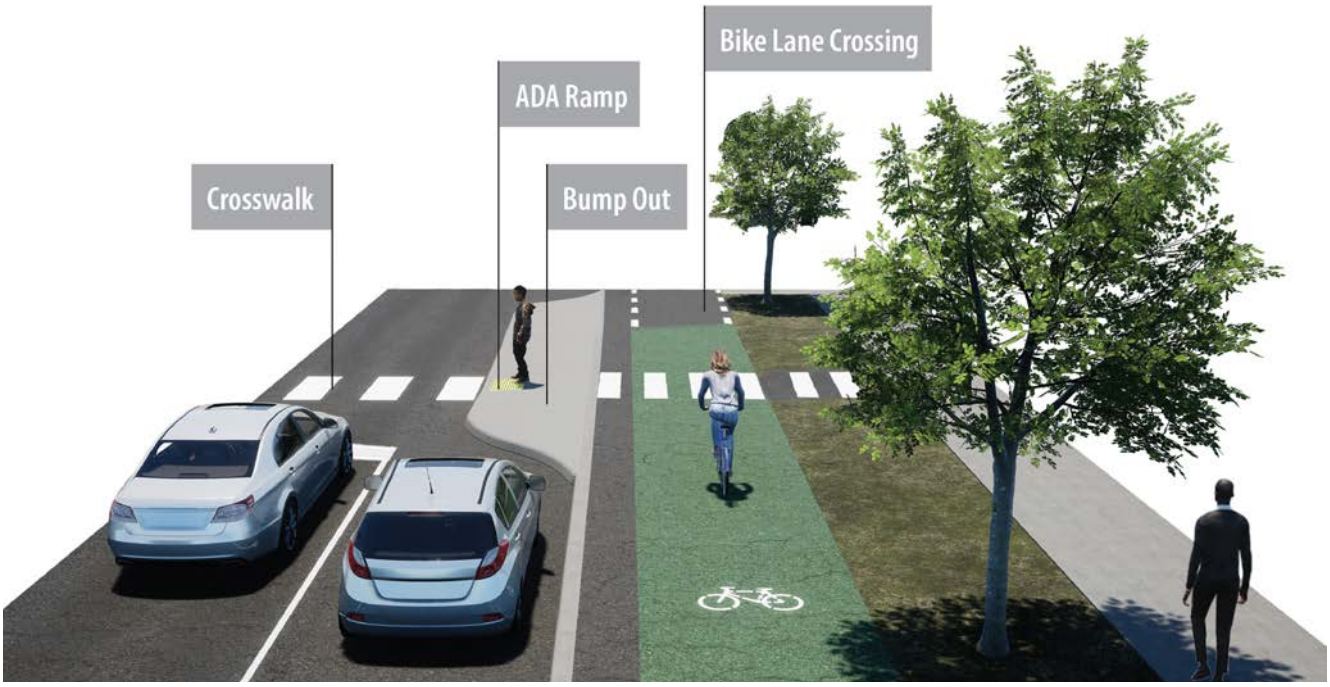
Recommendations from each municipality's ADA Transition Plan should be implemented along with the recommendations in this Study.

PROBLEMATIC INTERSECTIONS

The following list defines challenging intersections that require upgrades to enhance pedestrian safety based on public feedback and crash data:

- I-787 Exit 6 On/Off Ramp (Menands)*
- Wolfert Avenue at Broadway (Albany / Menands)*
- Livingston Avenue at Broadway (Albany)*
- Loundonville Road at Broadway (Albany)
- Route 378 Interchange at Broadway (Menands)
- Wards Lane at Broadway (Menands)
- 3rd Avenue & 6th Street (Watervliet)
- 2nd Avenue & 16th Street (Watervliet)
- 2nd Avenue & 19th Street (Watervliet)
- 2nd Avenue & 25th Street (Watervliet)

*Conceptual improvements for this intersection are proposed in this Study.



Bike Accessibility

To enhance bike accessibility at intersections, it is essential to implement design treatments that prioritize the safety, visibility, and convenience of cyclists. The following recommendations should be considered as the design for Broadway / Route 32 advances:

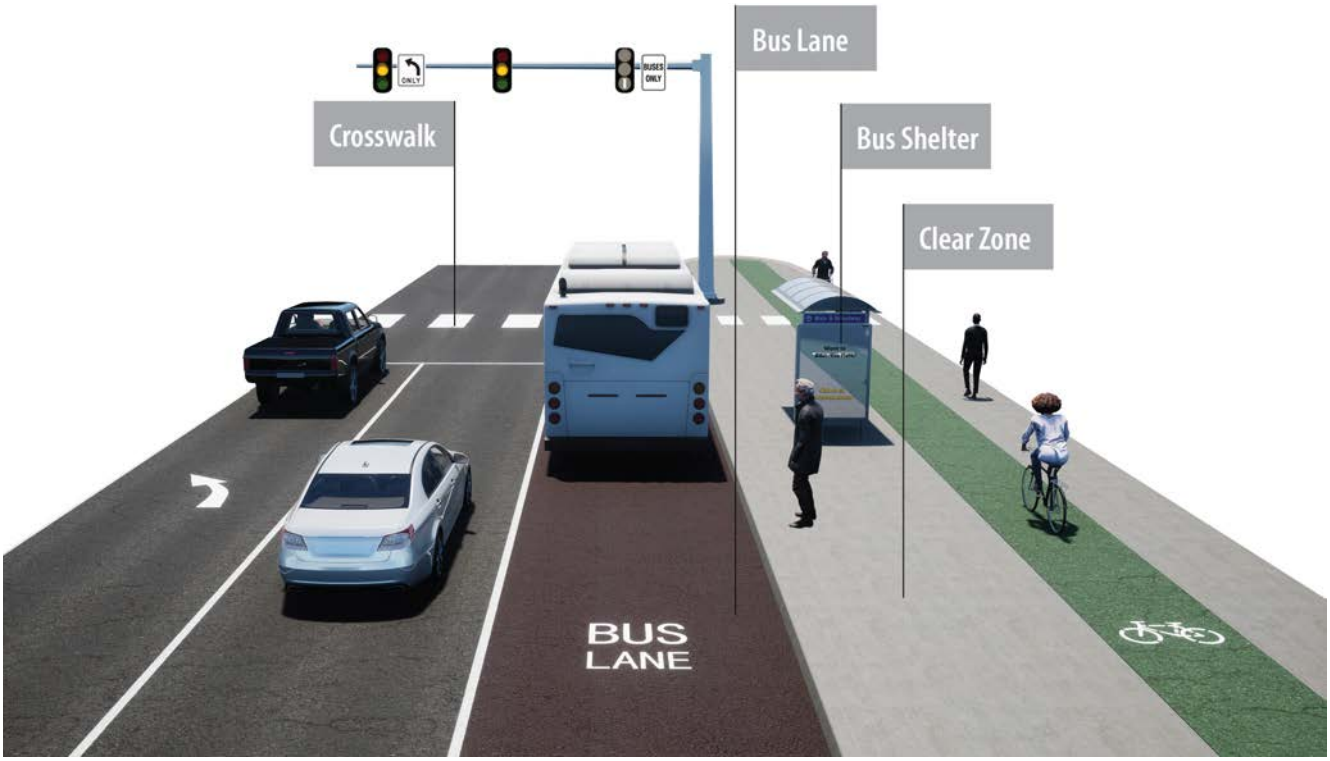
- Provide separate crossing markings for pedestrians (crosswalks) and bicyclists (cross bikes) at every intersection and driveway crossing;
- Reduce curb radii at intersections to slow motor vehicle turns;
- Restrict right turns on red at busy signalized intersections where conflicts between cyclists and motorists are more likely to occur; and,
- Provide a visibility zone of 40-50 feet along the Study corridor as the bike lane approaches an intersection. Large obstructions, such as parked cars, should be prohibited in this zone to ensure mutual visibility for cyclists and motorists.

Curb Extensions

A curb extension, also known as a “bulbout” or “bump-out,” is a traffic calming measure used to improve pedestrian safety and manage vehicle speeds at intersections and mid-block crossings. A curb extension involves extending the sidewalk or curb line into the parking lane, effectively narrowing the roadway at that point. This creates a shorter crossing distance for pedestrians and visually signals drivers to slow down.

By narrowing the overall width of the roadway, curb extensions provide a visual cue to drivers that they are entering a reduced speed area. They enhance pedestrian visibility by aligning them with the parking lane and shortening the crossing distance, allowing more time for preferential treatments like leading pedestrian intervals and transit signal priority. Additionally, curb extensions tighten intersection curb radii, encouraging slower turning speeds.

Curb extensions can be implemented by extending curblines or they can be demarcated using lower-cost materials such as flexible delineators, planters, or striping. **Along the length of the Study corridor, 6-foot wide curb extensions are recommended at transit stops and at all intersections where on-street parking is permitted.**



Transit Priority at Intersections

Transit priority features are designed to improve the efficiency and reliability of public transportation by giving buses and other transit vehicles preferential treatment at intersections and along routes.
The following transit priority improvements are recommended at signals along the Study corridor:

- **Transit Signal Priority (TSP)** involves modifying traffic signals to give priority to transit vehicles. This can be done by extending the green light or shortening the red light when a bus approaches an intersection.
- **Queue jumpers** are short stretches of bus-only lanes that allow buses to bypass queues of traffic at intersections. These lanes are often combined with TSP to give buses an early green signal, enabling them to move ahead of other vehicles. Queue jumpers should be considered as part of the 2nd Avenue and 19th Street improvements.

Curb Radii

A curb radius is the curvature or the rounded edge of a curb at intersections. It is a road design element that impacts vehicle movement, pedestrian safety, and traffic flow. Corner radii significantly influence vehicle turning speeds and pedestrian crossing distances.

Reducing the corner radius is essential for designing compact intersections with safe turning speeds. Although standard curb radii range from 10-feet to 15-feet, some cities opt for corner radii as small as 2 feet. In urban environments, smaller corner radii are favored, and corner radii exceeding 15-feet should be rare exceptions.

Priority Intersections for Safety Improvements

This section identifies intersections that are priorities for improvement and proposes several conceptual changes to enhance safety, multimodal accessibility and connectivity, and expand the urban forest. The conceptual improvements proposed in this section are broadly applicable to other intersections along the Study corridor.

Livingston Avenue at Broadway

Livingston Avenue at Broadway is a four-way signalized intersection. The proposed improvements at this intersection combine two of the proposed typologies (Typology A and D) due to the differing right-of-way widths and transit access north and south of Livingston Avenue. The northbound approach will maintain the existing two travel lanes, adjacent parking, and transit stops. The typical section includes a sidewalk buffered by a landscape strip and a protected bike lane on both sides of the road. The bike lane will follow the back side of the transit stop as to allow boarding and alighting from the bus. Crosswalks should be provided from the transit stop through the bike lane to the sidewalk.

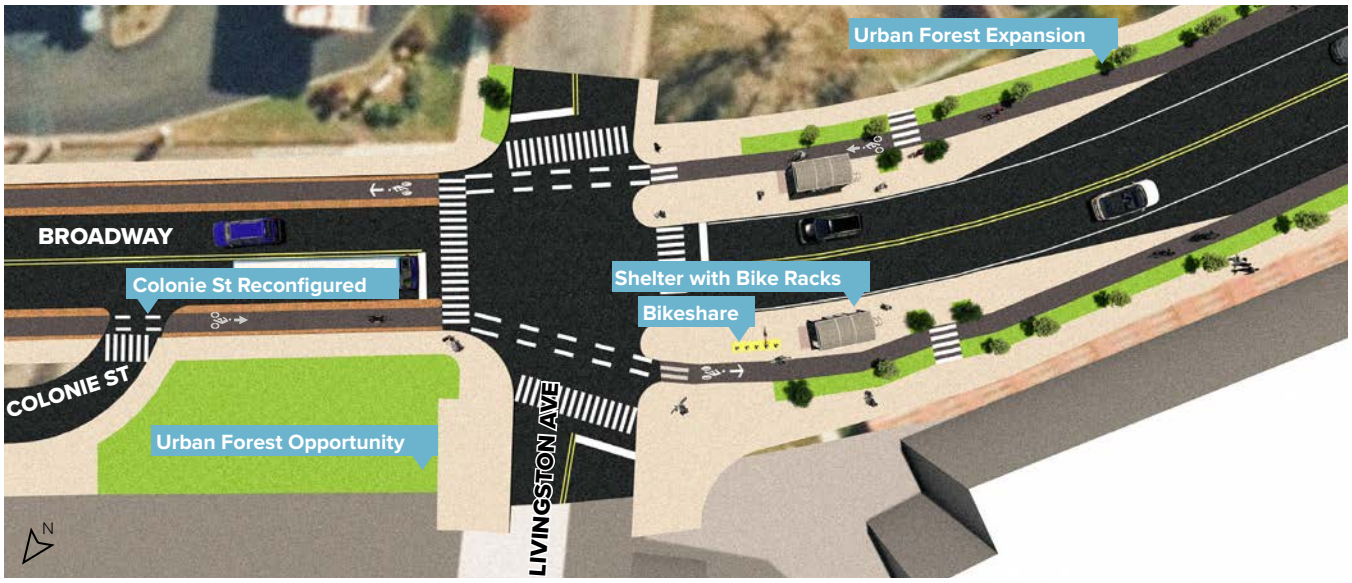
The southbound approach has a narrow right-of-way due to the Livingston Avenue Bridge located 400 feet north of the intersection. This section of road will consist of two travel lanes, a protected bicycle facility buffered by a vertical median, and a sidewalk on both sides of the road. Bike lane crossings and crosswalks are proposed through the intersection.

Colonie Street is one-way southbound and currently intersects Broadway at an angle that allows for a 50-foot-wide roadway opening. To provide safer pedestrian and bicycle accommodations at this location, it is recommended that Colonie Street turn to intersect Broadway at closer to a 90-degree angle with a narrowed roadway width.

Livingston Avenue at Broadway

Existing

Proposed



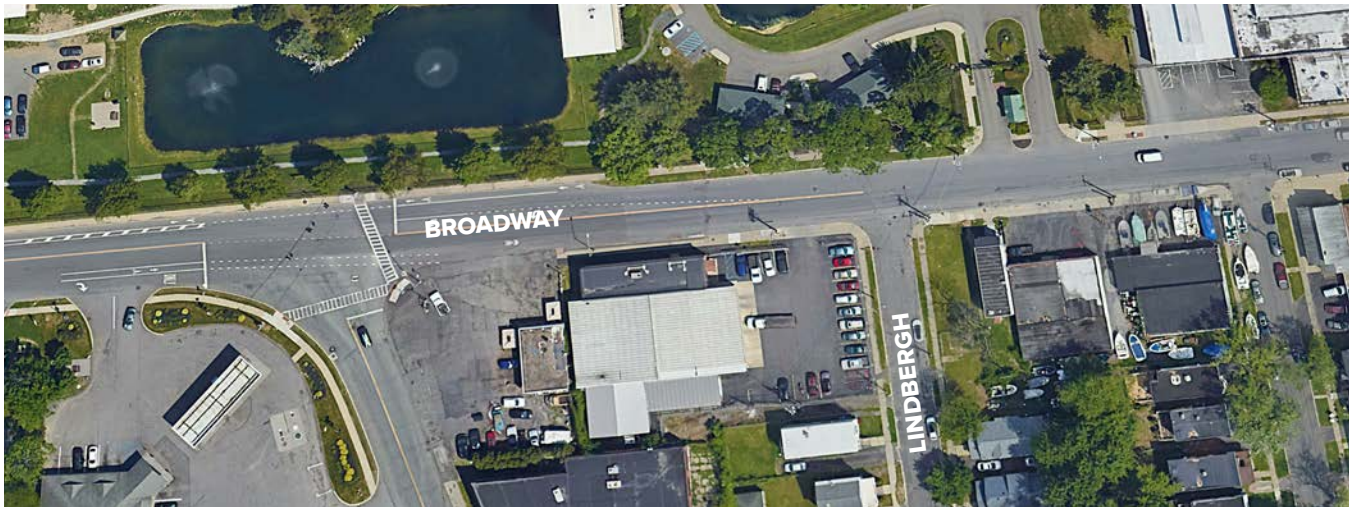
Wolfert Avenue at Broadway

Wolfert Avenue at Broadway is a three-leg signalized intersection. There is currently excessive pavement, long pedestrian crossings and wide turning radii. The proposed typical section through this intersection includes a sidewalk buffered by a landscape strip and a protected bike lane on both sides of the road. The northwest and southeast corner radii were reduced to promote shorter pedestrian crossings and slower vehicle turning movements. Bike lane crossings and crosswalks are proposed.

As a result of public feedback, a mid-block crossing is proposed south of this intersection between Lindbergh Avenue and the driveway to the One Broadway Apartments to improve connectivity to the bus stop on the west side of the street. This intersection is also a priority area identified in the Village of Menands ADA Public Streets and Sidewalks Plan.

Lindbergh Avenue at Broadway

Existing



Proposed

I-787 Exit 6

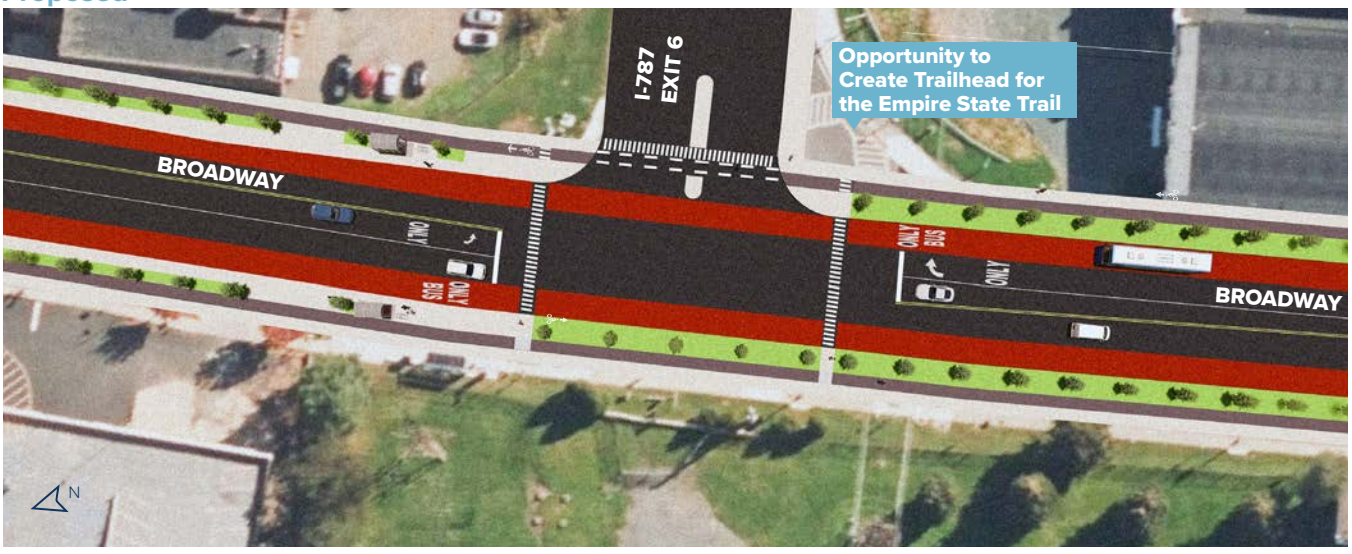
The I-787 Exit 6 on/off-ramp at Broadway in the Village of Menands is a three-leg signalized intersection that demonstrates a convergence of multi-modal facilities and the widest of the typical sections. A reduction of turn lanes and narrowing of travel lanes is recommended in this section of Broadway to provide space for multimodal infrastructure, including protected pedestrian and bicycle facilities, transit stops, a mobility hub, and dedicated bus lanes.

The roadway width and curb radii should be narrowed to provide shorter pedestrian crossings, slower vehicle turning movements, and an expanded refuge island. **By reducing curb radii, a significant amount of space is created at the southeastern corner of the intersection, at the entrance to the Empire State Trail. This new space provides a perfect opportunity to create an enhanced gateway, expanded trailhead, and highly visible connection between Broadway and the Empire State Trail.**

I-787 Exit 6 On/Off Ramp

Existing

Proposed



Parking

This section provides an overview of public parking impacts and recommendations for future study.

Impacts To Existing Parking

On-street parking is allowed along the Study corridor in Albany and Watervliet, but is not allowed in Menands and the Town of Colonie. Based on public feedback and field observations, on-street parking is highly utilized in Albany's Warehouse District (District), where many people from surrounding areas drive to the District's restaurants and bars, and in Watervliet along 3rd Avenue, where dense residential and commercial uses line the Study corridor. In the City of Albany, the Albany Parking Authority generates revenue from on-street parking from Clinton Avenue to North Ferry Street.

On-street parking is impacted by the recommendations outlined in this chapter in the following ways:

- At the north end of Albany's Warehouse District, the right-of-way narrows from approximately 70-feet to 60-feet near Tivoli Street, reducing the available space for multimodal and resiliency improvements. Therefore, this Study recommends reducing on-street parking from two lanes to one lane from Tivoli Street north to the Village of Menands boundary. This recommendation will create adequate space for one-way separated bike lanes on both sides of the street, bioretention areas with trees on each side of the street, and upgraded sidewalks. Furthermore, this recommendation significantly reduces the amount of impervious cover and expands the urban forest in North Albany where flooding is an issue and tree canopy cover is limited.
- This Study's recommendations do not impact existing parking in Menands, as on-street parking is currently prohibited in the Village.
- In Watervliet, this Study recommends reducing on-street parking from two lanes to one lane along 2nd Avenue / Route 32 from 23rd Street to 25th Street. Based on field observations, on-street parking in this area is not highly utilized.

WHAT WE HEARD

Reducing on-street parking in Albany's Warehouse District would be acceptable if paired with the creation of public parking lots to offset on-street parking losses and increase the overall supply of parking.

This sentiment was shared by both business owners in the Albany Warehouse District and North Albany residents, noting there is an excessive amount of nearby private parking lots that are underutilized. Individuals engaged during this Study indicated many people visit the Albany Warehouse District and mistakenly park in private lots due to a lack of clear signage and public parking areas, resulting in towing or parking tickets.

To remedy this issue, some suggested the Albany Parking Authority should acquire, operate, and maintain parking lots in the Albany Warehouse District to expand the public parking supply and better support the Warehouse District as an entertainment destination.

Parking Recommendations

On-Street Parking

The following recommendations should be considered as this Study advances from the planning phase to implementation:

- All proposals to reduce on-street parking in this Study should be further evaluated through a parking study and additional discussions with local residents and businesses.
- In areas where on-street parking is available, but tree canopy cover is limited, the intermittent replacement of one on-street parking spot with a landscape island is recommended. The removal of one on-street parking spot creates approximately 100 square feet of area (about 16.5-feet long and 6-feet wide) that can be planted with trees and vegetation to provide shade, absorb stormwater, and improve the aesthetics of the corridor.

Individual on-street parking spaces can be intermittently replaced with a bioretention island to ensure trees and green infrastructure can still be integrated into the corridor.

Parking Lots

Parking lots are one of the most abundant forms of impervious cover in the Study area. There are nearly 500 acres of parking lots, covering 12.5% of the total land area and accounting for 30% of all impervious cover in the Study area. This abundant land use increases flood hazards by preventing water from infiltrating into the ground, and in turn, generating large amounts of stormwater runoff during storms. Most parking lots along the Study corridor are large expanses of asphalt with little to no shade, which absorb heat during the day and slowly release heat back into the environment throughout the night. This effect increases the exposure of residents, pedestrians, cyclists, and transit users to extreme heat conditions along the Study corridor. **Parking lots provide an immediate opportunity to expand the urban forest and green infrastructure practices in order to mitigate flooding and extreme heat along the Study corridor.**

The following recommendations should be considered as this Study advances from the planning phase to implementation:

- In partnership with the Albany Parking Authority, identify opportunities to create new public parking lots in the Albany Warehouse District and North Albany to offset on-street parking losses and also make it easier for visitors to park and then walk throughout the District.
- Many parking lots in the Study area are located in flood prone areas and provide an opportunity to increase on-site infiltration and mitigate flood hazards in neighboring areas. Municipalities, with Albany County's support as needed, should review and update local zoning code regulations to require on-site stormwater infiltration through the use of green infrastructure practices in parking lots within the Study area. Municipalities should also consider establishing and/or increasing the required percent cover of permeable surfaces on parcels in the Study area.
- When reconstruction of parking lots is required, prioritize the use of porous asphalt.

Streetscape Amenities

Streetscape amenities contribute to both the function and aesthetics of the corridor, and help to establish a sense of place. This section provides an overview of amenity recommendations.

Streetscape amenities include benches, wayfinding signage, lighting, and other elements that make the streetscape more welcoming, inviting, and vibrant. Incorporating amenities along the length of Broadway / Route 32 will make the corridor feel like a pleasant and delightful place to spend time, not just a conduit to get from one destination to the next.

This Study's recommendations create significantly more space at the sidewalk level for new amenities to be incorporated into the streetscape. **An immediate next step is to develop a detailed amenity palette and plan for the Study corridor.** To create a sense of cohesion and connectivity, it is recommended that at least one element of the amenities, such as materiality or color, be held constant along the length of the Study corridor. Streetscape amenities should also be strategically customized for particular areas to indicate the entrance to a district or neighborhood, enhance placemaking, and reveal the history, culture, and/or ecology of a place.

Benches and Seating

Benches and public seating make an area more welcoming to all user groups, create the perception of streets as public space, and help support local businesses. Benches and seating should include accessibility considerations (e.g., adjacent clear space for wheelchairs, backrests, and armrests) and be sited in areas of concentrated activity (e.g., Albany Warehouse District), regularly along the corridor to provide opportunities for rest, and at transit stops.

Wayfinding

Wayfinding signage provides information and directional cues to street users, helping visitors comfortably and easily navigate an area. Along the Study corridor, wayfinding signage should be used to establish a neighborhood or district's identity by marking gateways, defining boundaries, and guiding people to nearby attractions. It should also be used to direct visitors to key points of interest, such as trail connections, adjacent municipalities, special districts, and public parking areas.

Lighting

Lighting enhances accessibility by illuminating signs, street furniture, and potential obstacles, and fosters a more inviting pedestrian environment by strengthening the streetscape's identity and serving as a cohesive design element. Along the Study corridor, pedestrian-scale lighting should be prioritized at intersections and in areas with high pedestrian activity to enhance public safety and increase visibility of all roadway users. **To increase energy resilience, solar-powered lighting should be prioritized along the Study corridor.**

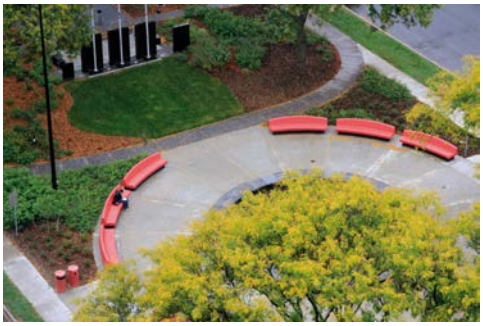
Public Art

When thoughtfully designed, public art strengthens a community's identity and enhances its sense of place. For example, public art, such as murals and sculptures, can be used to celebrate local artists, tell stories important to the community, and activate underutilized spaces along the Study corridor. Public art can also be utilized to establish gateways, seating areas, and provide a thematic connection across different stretches of the corridor.

CREATIVE STREETSCAPE AMENTIES CASE STUDY: SYRACUSE CONNECTIVE CORRIDOR

Syracuse's Connective Corridor was initiated to connect and enliven a central thoroughfare of the city in need of revitalization. A key goal of the project was to transform the corridor into a promenade where businesses and institutions can engage pedestrians with a diverse, inspiring, and enriching experience. To highlight Syracuse's unique identity and support local industry, the design incorporates materials and manufacturers from the city and surrounding region.

This approach also significantly reduces costs by using simple, everyday materials in creative and thought-provoking ways. Native plantings and porous recycled materials are used both as stormwater filtration systems and as educational elements along the route. Through its innovative use of locally sourced, familiar materials, the Syracuse Connective Corridor shows that high-quality, low-cost design is achievable, and that simple strategies can enhance a community's civic identity.



More art, more walkers, bikers, more greenery. More things that are good for people. [Be] creative, and shoot for the stars!

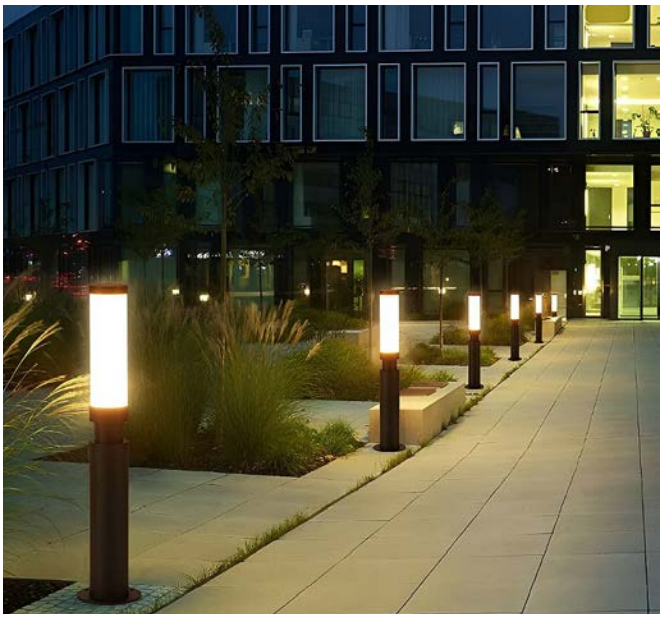
- online survey respondent

▲ *Streetscape amenities such as solar lighting, benches, and asphalt art complement the urban forest and pedestrian and cycling facilities throughout the corridor to establish a cohesive sense of place.*

This corridor has so much opportunity! Please make this a vital, vibrant connection between communities that we can be proud of.

- online survey respondent

Combined streetscape elements, such as seating with lighting or artful wayfinding, helps to creates a sense of arrival and can encourage the public to spend more time along the corridor.



Connections to Adjacent Trails

This section identifies key opportunities to strengthen connections to proposed or existing trails along the Study corridor.

Increasing connectivity to existing trail systems is an essential element of improving transportation resiliency. In the event that flooding, extreme storm events, or a disaster impacts a section of Broadway or the Empire State Trail, users need to be able to safely and easily move between these two parallel transportation corridors. Adding redundancy through trail connections and access points will minimize mobility impacts during a disaster.

Empire State Trail

The recommended intersection improvements at I-787 Exit 6 discussed on page 153 will enhance existing connections to the Empire State Trail by increasing the visibility of trail linkages through signage and additional amenities (e.g., bike repair stations, benches, lighting, etc.).

There is also potential to create additional connections to the Empire State Trail in the Village of Menands north of Route 378 through a National Grid easement that could connect behind Village One Apartments to Schuyler Flatts Cultural Park and the Empire State Trail.

Little River

There is an existing concept to reopen the section of the Little River which was once a part of New York State's waterway system prior to the development of I-787. The Reimagine I-787 concept renderings show boat launch and trail access points that would reopen the former Little River access to the Hudson waterway and also provide access to the Empire State Trail. A reopened waterway would also help restore some of the ecological and stormwater management capabilities of the Little River.

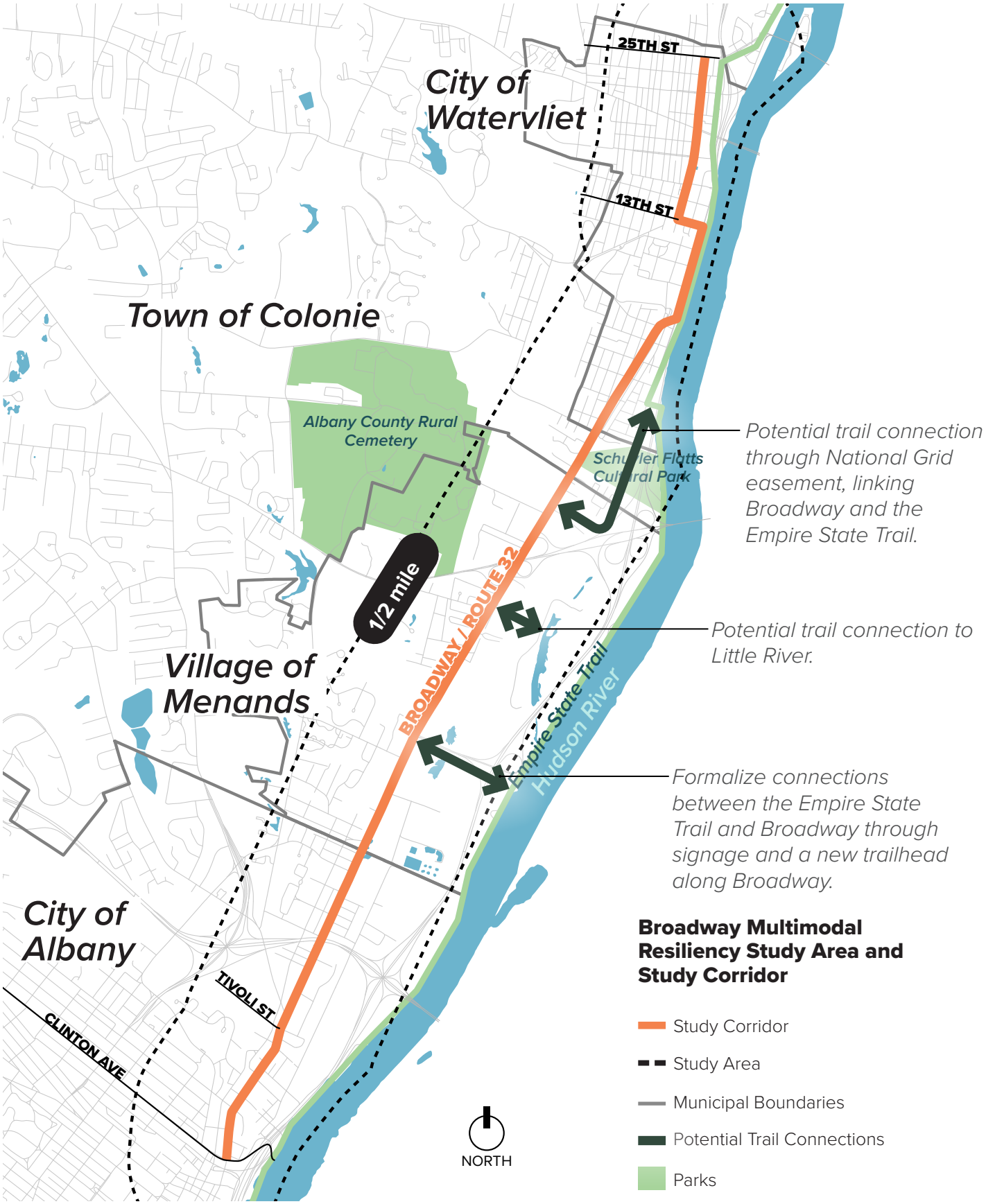
Albany Rural Cemetery

The main entrance to the Albany Rural Cemetery is on Broadway, and many people from Watervliet and Menands walk along Broadway to access the trails in the Albany Rural Cemetery. Enhancing wayfinding and connections to the Albany Rural Cemetery entrance from Broadway should be prioritized.

Reimagine I-787

The I-787 Planning and Environment Linkage Study recommends the construction of a new trail facility in Menands parallel to Broadway, starting at Simmons Lane and continuing north along the historic canal alignment on land owned by the Village of Menands to East Elmwood Road. This parallel trail facility would provide important redundancy in the transportation system for active transportation users (e.g., cyclists and pedestrians).

> [I] would love if the plan prioritized the section of Broadway between Clinton Road and Loudonville Road and **connect the Skyway bike lanes to Loudonville bike lanes**. Please pay special attention to the "gateway" from the Skyway/Clinton Avenue under the rail bridge and into the warehouse area...if it was better connected I would travel there more as a destination and be more inclined to use it as a travel corridor.
>
> *- online survey respondent*


City of Watervliet
25TH ST
13TH ST
Town of Colonie
Albany County Rural Cemetery
Schuyler Flatts Cultural Park
1/2 mile
BROADWAY / ROUTE 32
Empire State Trail
Hudson River
Village of Menands
City of Albany
TIVOLI ST
CLINTON AVE
NORTH
Potential trail connection through National Grid easement, linking Broadway and the Empire State Trail.
Potential trail connection to Little River.
Formalize connections between the Empire State Trail and Broadway through signage and a new trailhead along Broadway.
Broadway Multimodal Resiliency Study Area and Study Corridor
Study Corridor
Study Area
Municipal Boundaries
Potential Trail Connections
Parks

Tree Canopy Expansion

This section provides an overview of tree canopy and urban forest expansion opportunities designed to provide shade, lower temperatures, improve biodiversity, and uptake stormwater along the Study corridor.

Sustainability and Resiliency Benefits of the Urban Forest

Urban forests are critical to mitigating climate change. Trees not only sequester carbon, they also reduce energy costs to heat and cool buildings by providing shade and protection from the wind. Studies show a reduction of almost 10% of energy loads on buildings situated near forested open spaces and robust street tree corridors. The cooling effect of trees in urban environments is profound. Studies have shown that mature tree canopies can provide up to 10 degrees of cooling compared to sites without established canopies. Trees cool the landscape through evapotranspiration and by directly blocking the sun with their leaves (or needles) and branches. Trees also positively affect air movement and absorb less solar energy than impervious surfaces.

Stormwater Management

Stormwater mitigation and flood protection are especially important along the Study corridor, as so much of it lies within the floodplain. Climate change is causing more intense storms, resulting in higher volumes of rainfall over shorter periods of time. This increase in severe weather heightens the risk of flooding and threats to property and human safety, and is projected to intensify in the coming years.

Flooding caused by surface runoff is worsened when the landscape is replaced with urban infrastructure, particularly where development prioritizes vehicles. Oversized parking lots, wide roads, and sprawling buildings reduce the land's ability to absorb water, preventing it from replenishing the water table. Fortunately, implementing green infrastructure, urban forestry improvements, and smarter building codes can reverse outdated development practices. Trees, for example, play a vital role by intercepting rainfall and using their large root systems to absorb a great deal of stormwater and promote infiltration into the soil. A single, healthy tree can capture almost 4,000 gallons of water each year – an incredible feat. The more space provided for tree roots, the better the potential for stormwater capture will be.

Ecosystem Services

As the climate changes and temperatures rise, it will be tremendously important to expand our urban forests so they can provide essential ecosystem services to sustain and improve lives across the urban landscape. It is not only human lives that benefit from healthy urban forests. Wildlife, birds, and pollinators all depend on these systems for food, habitat, reproductive cycles, and rest during migration. Urban forests play an important role in the fight to reverse the biodiversity crisis. Opportunities abound to plant a wide range of native and naturalized species, and to look more broadly at development patterns in the region that result to the loss of habitat and existing intact forests. Planting urban forests systematically to create and preserve connectivity can provide protected landscape buffers for species to traverse the urban environment.

Ecosystem Services Provided by the Urban Forest Over Time

iTree Eco was used to calculate the ecosystem benefits under future planting scenarios for the corridor's urban forest communities. The iTree Eco forecast model was run with a series of applicable reports with values estimated for the following scenarios: no plantings, 10 trees planted per year, 25 trees planted per year, and 50 trees planted per year across the Study area.

The model assumes the planted trees will be 2" diameter breast height. The forecast was run with default values, with a duration of 30 years for each planting scenarios. The number of days without frost was set to 150, which is the current average. Base annual mortality rates for the model were also set to the default, which estimates average healthy urban forest trees to have a 3% mortality rate, sick trees to have a 13.1% mortality rate, and dying trees to have a 50% mortality rate. The iTree Eco forecast model quantified the cover area future urban forest scenarios in the study area with the total number of trees expected to survive for each year. Carbon sequestration and stormwater runoff avoidance were also modeled.

Pollutant removal values evaluated in the iTree Eco forecast model include ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter less than 2.5 microns (PM 2.5), particulate matter greater than 10 microns (PM 10), and sulfur dioxide (SO2). The table below reveals the combined value for all of these pollutants. Several additional options for ecosystem service modeling are available through the iTree forecast model if a more detailed assessment is required at a later stage.

Annual Tree Planting Recommendation

The results of the forecast model make plain the importance of a consistent, thoughtful tree planting regimen. Extreme weather, pest outbreaks, and some urban stressors are unavoidable. Not all trees will be able to survive, and inevitably, certain species may not be able to withstand climate change. There is much that is out of the control of municipal staff and leadership; however, it is possible to plan, adapt, and use best management practices to sustain the urban forest.

To ensure the urban forest in the project corridor can provide the highest value of ecosystem services and public benefits in the years to come, this Study recommends planting and maintaining at minimum 50 trees per year. The sections that follow proposes an adaptive approach to select the right species, create planting sites to give trees enough space to thrive, and maintenance strategies designed to help trees get established and keep them healthy through the course of their lives.

Table 4.1 – Scenarios of Future Tree Plantings: Number of Trees

Plantings Per Year	**2025** (# of trees)	**2040** (# of trees)	**2055** (# of trees)
No Plantings	353	210	130
10 Trees	353	299	286
25 Trees	353	484	569
50 Trees	353	373	1,049

Table 4.2 – Scenarios of Future Tree Plantings: Carbon Sequestration

Plantings Per Year	Carbon Sequestration (tons) (2025)	Carbon Sequestration (tons) (2040)	Carbon Sequestration (tons) (2055)
No Plantings	2.24	1.92	1.54
10 Trees	2.24	2.07	1.86
25 Trees	2.24	2.22	2.36
50 Trees	2.24	2.63	3.62

Table 4.3 – Scenarios of Future Tree Plantings: Avoided Runoff

Plantings Per Year	Avoided Runoff (gallons) (2024)	Avoided Runoff (gallons) (2040)	Avoided Runoff (gallons) (2055)
No Plantings	5,774	4,946	3,926
10 Trees	5,774	5,121	4,353
25 Trees	5,774	5,197	5,274
50 Trees	5,774	5,929	7,934

Table 4.4 – Scenarios of Future Tree Plantings: Pollutant Removal Values

Plantings Per Year	USD (2024)	USD (2040)	USD (2055)
No Plantings	$1,181	$1,109	$809
10 Trees	$1,181	$1,055	$897
25 Trees	$1,181	$ 1,069	$1,087
50 Trees	$1,181	$1,222	$1,365

Diversity in the Urban Forest

A diverse urban forest benefits not only wildlife and pollinators, but reduces the risk of dire economic consequences associated with pest invasions such as Emerald Ash Borer (EAB). Diverse assemblages of tree species support natural pest predators, and pests will multiply less rapidly if there are not large stands of suitable host trees.

Diverse forests are also more resilient to climate fluctuations – species have different levels of tolerance to extremes in weather, such as floods, excessive heat and drought. And the climate is changing, and quite rapidly. In fact, the USDA revised the plant hardiness zone in Albany and surrounding municipalities from a 5b (-15 to 10° F) to a 6a (-10 to -5° F) in 2023. This revision reflects a + 3° F change in average temperatures since 2012. The shift in hardiness zones occurred across half of the United States.

Because severe fluctuations in temperature are hard to predict, it is important to be cautious about species selection based on the prediction of warmer winters as a consistent result of global climate change. Extremely low winter temperatures may still occur in the years to come; therefore, focusing on diversity and species that tolerate a range of climates is advised and evidenced in the recommended planting palette below.

The 10-20-30 Rule

A good rule-of-thumb to follow is the "10-20-30" rule, which has been referenced as a planting guidance method since the early 1990's. This method limits urban forest species to 10% of any single species, 20% of any single genus, or 30% of a single family. This rule is not always easy to perfectly achieve, given constraints of available tree stock, the difficulties of tree survival in urban settings, and issues with declines associated with pests and disease. It is, however, a good guide to consider when municipalities plan for tree plantings as part of larger infrastructure projects. Understanding what exists in the urban forests at a wider, community level will help to determine which species should be selected for individual projects to move the needle closer to the 10-20-30 composition goal.

Urban Forest Aesthetics

Planting with diversity in mind can present aesthetic challenges. People are used to seeing uniform rows of the same type of tree, and our current culture tends to favor a traditional, orderly landscape (mowed lawns, round or boxed hedges, and round or conical trees) over what is perceived as "messy." However, attitudes are changing, and many cities around the world are revising their landscapes to include habitat for pollinators, birds, and green infrastructure elements to capture stormwater and provide spaces for native plantings. Public education through signage, information sessions, and other forms of communication will assist with the adoption of new approaches and visual changes.

Although mowed lawns are a common feature in the streetscape right-of-way (top), attitudes are changing around what is perceived as "messy" to encourage goals related to both biodiversity and aesthetics (bottom).

Table 4.5 – Hardy Species Selection Recommendations

Binomial	Common	Height	Native to US (Y/N)
Crataegus crus-galli	Cockspur hawthorne	< 30’	Y
Crataegus phaenopyrum	Washington hawthorne	< 30’	Y
Cratagus viridis ‘Winter King’	Winter king hawthorne	< 30’	Y
Koelreuteria paniculata	Golden-rain tree	< 30’	N
Macckia amurensis	Amur maackii	< 30’	N
Celtis occidentalis	Hackberry	> 30’	Y
Eucommia ulmoides	Hardy rubber tree	> 30’	N
Gymnocladus dioicus	Kentucky Coffee Tree	> 30’	Y
Maclura pomifera	Osage orange	> 30’	Y
Quercus bicolor	Swamp white oak	> 30’	Y
Quercus macrocarpa	Bur oak	> 30’	Y
Quercus muehlenbergii	Chinkapin oak	> 30’	Y
Quercus robur	English oak	> 30’	N
Ulmus ‘Accolade’	‘Accolade’ elm	> 30’	N/A
Ulmus ‘Frontier’	‘Frontier’ elm	> 30’	N/A

Table 4.6 – Resilient Upland and Floodplain Species

Binomial	Common	Height	Native to US (Y/N)
Acer rubrum	Red maple	> 30’	Y
Acer saccharum	Sugar maple	> 30’	Y
Carpinus caroliniana	American hornbeam	< 30’	Y
Carya tomentosa	Mockernut hickory	> 30’	Y
Liquidambar styraciflua	Sweetgum	> 30’	Y
Nyssa sylvatica	Blackgum tupelo	> 30’	Y
Ostrya virginiana	Hophornbeam	<30’	Y
Populus tremuloides	Quaking aspen	> 30’	Y
Quercus alba	White oak	> 30’	Y
Quercus velutina	Black oak	> 30’	Y
Quercus rubra	Red oak	> 30’	Y
Sassafras albidum	Sassafrass	> 30’	Y
Quercus montana	Chestnut oak	> 30’	Y

Selecting Species

Species selection recommendations have been developed in table 4.5 maximize biodiversity and habitat values, reduce the number of non-native/ invasive species, maximize resilience in our rapidly changing climate, and to consider adjacent site conditions to maximize long-term survivability.

Because the corridor is highly trafficked and subject to salting during icy and snowing conditions, species that are tolerant of salt were prioritized. Often, salt is spread injudiciously or deposited in haphazard piles when equipment malfunctions. Oversalting can stress the roots of trees and landscape plants. Wherever trees and green infrastructure plantings are sited, education of maintenance staff is recommended to reduce salt volumes where feasible.

Where trees can be planted in larger, open space areas, the range of appropriate species increases dramatically. Table 4.6 shows a selection of upland and floodplain species that are predicted to be resilient to climate-based disturbances.

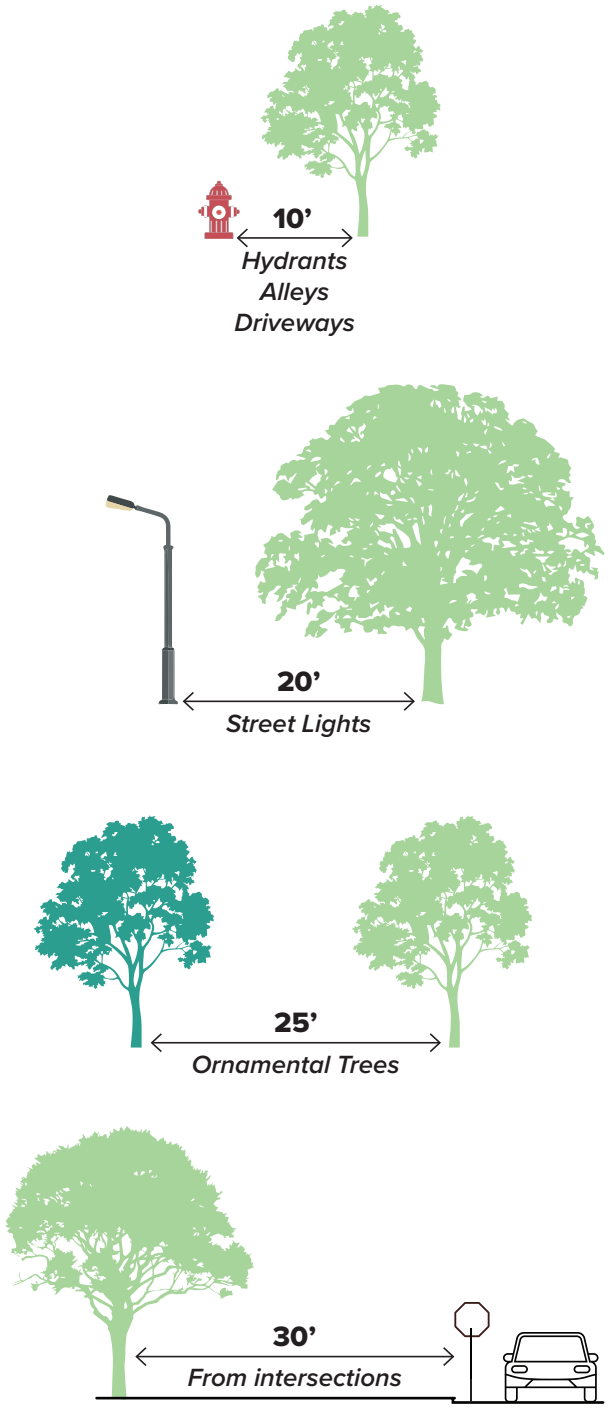
Planting

While smaller trees are excellent for constrained settings, it is possible to create larger spaces for bigger trees by increasing plantings in open spaces, in large rights-of-ways, and through deliberate infrastructure strategies such as conversion of selected parking places to tree islands. Larger trees with vigorous canopies provide more shade and reduce heat island, and offer better habitat for birds and pollinators. A phased approach can be created to prioritize removal and replacement of declining trees, those with utility conflicts, and trees with inadequate space to thrive to ensure a resilient canopy in the coming decades.

Soil Volume

Trees are remarkably adaptable to life in the urban environment, but there is a limit to longevity and vigor where impervious surfaces are highly constrictive and omnipresent. Tree lifespans decrease dramatically where roots are confined to shallow and narrow planting pits. Roots with little space to grow tend to remain just below the surface, where exposure to salt, compaction, drought, and pollution is persistent. The compaction required for the construction of sidewalks, roads, and other paved areas crushes the macro-pores of the soils below, which deprive tree roots of oxygen, water, and essential nutrients.

Minimum Spacing Requirements



The diagrams above show minimum spacing requirements, which help to save time, money, and potential problems over time as trees mature in urban settings.

Wherever possible, removal of pavement and concrete adjacent to tree planting areas is highly recommended to give trees the best chance at a long life. In the best case scenario, urban street trees would be provided approximately two cubic feet of soil for every square foot of crown area. A simple formula to use to calculate the amount of soil required follows:

Soil Volume =

(Crown Projection Area) x (Desired Soil Depth)

To achieve higher soil volumes, creativity in the design process is required. Options include (but are not limited to) converting parking spaces to tree islands, multi-purpose green infrastructure elements, removal of linear sections of sidewalk between street trees, establishing partnerships with property owners adjacent to travel ways who have open space for trees, and where required, the utilization of structural soils.

Structural Soils

Structural soils are used to mitigate the effects of compaction, so often seen in planting areas in the urban environment. These soils improve aeration and the capacity of water to drain around the root zone through the use of aggregates. They are typically used in locations with low vehicular traffic volumes (such as parking lots and access roads), under sidewalks, and in city squares or shopping districts.

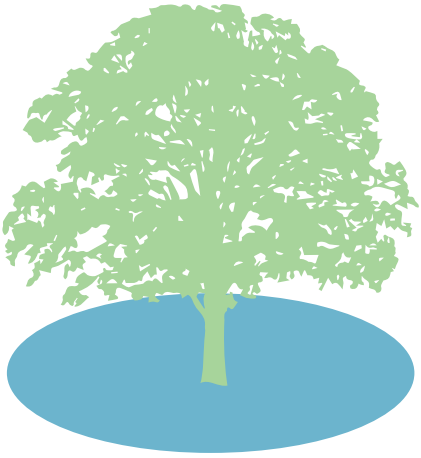
STRATEGIES FOR INCREASING SOIL VOLUME

- Converting parking spaces to tree islands
- Connecting tree pits by removing linear sections of sidewalks between trees
- Partner with adjacent property owners adjacent to travelways with space for trees
- Use structural soils and/or soil cells: plan for two cubic feet of structural soils for square foot of tree crown projection area

Structural soils are engineered mediums typically comprised of limestone or granite crushed stone (80% by volume), screened clay loam soil (20% by volume), and with a small amount of hydrogel. To avoid putting more polymers into the environment, plant-based hydrogels are recommended for structural soil mediums. Species-appropriate topsoils are placed in the opening where the tree is planted and around the rootball. Trees that are tolerant of drought and alkaline soils typically do well with structural soils: the type of crushed stone aggregate can have an affect on pH.

When pondering soil volume requirements, a system-thinking approach should be used to consider what additional site and cultural factors may contribute to the success or failure of the tree. Examples include whether the tree will be irrigated, potential underground utility conflicts, what types of maintenance is expected, the suitability of the existing or amended soils, and anticipated climatic conditions.

While the upfront costs may be higher, it is important to consider how much it costs to replace a tree. These costs may not just be monetary – when mature trees decline and have to be removed, the shade, aesthetic value and habitat those trees provided also disappears.



Soil Volume =

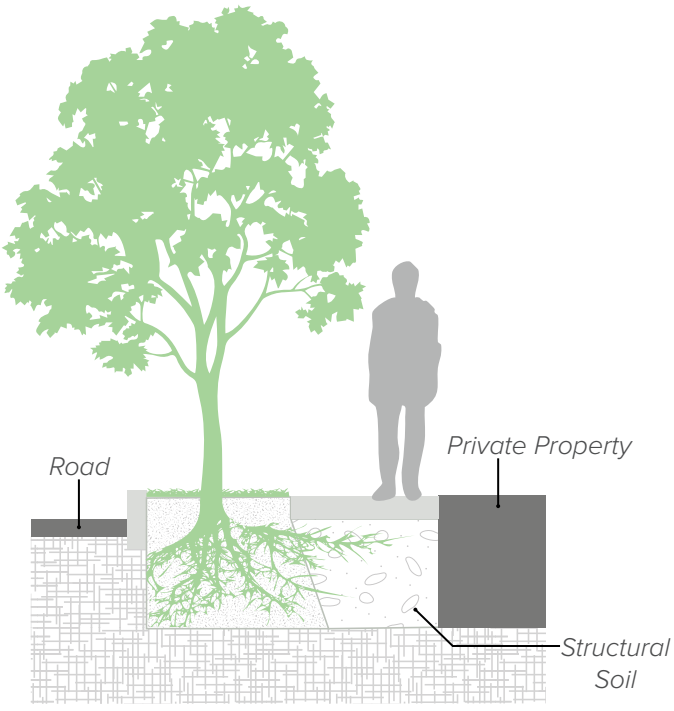
(Crown Projection Area) **x (Desired Soil Depth)**

Maintenance

Stress from climate change, pollution, urban infrastructure, poor maintenance, and other environmental conditions shows up in the crown (leafy canopy) of trees. Trees subject to chronic stress will enter a mortality spiral, which can be difficult, if not impossible, to reverse. Extreme weather, climate change, and certain urban stressors are inevitable, but the maintenance of trees is a factor within the control of municipal leaders and staff.

Watering Requirements

Newly planted trees will need to be watered during the first year to help roots recover from the shock of transplanting and to provide moisture during dry periods. Home and business owners may be willing to "adopt" a new tree and assist with watering. Between May and October, trees should be given 15 – 20 gallons of fresh water each week. This can be done twice during the week, or in one setting if the water can be applied slowly.



In constrained areas, sidewalk slabs adjacent to tree lawns can be removed and reconstructed with a base of structural soils to allow tree roots to safely grow without heaving the sidewalk.

A popular approach is the use of a Treegator, which is a plastic bag with small holes in the bottom, that can be zipped loosely around the trunk and filled with the recommended volume of water once a week. The Treegator releases water in a concentric area around the tree, slowly enough for the water to infiltrate into subsoils. If enough funding and staff capacity is available, trees can be watered the following year on a less frequent basis. As the tree matures, watering is recommended during periods of extreme heat or prolonged drought. While this may come at a cost, the cost to replace trees (along with the loss of shade and ecosystem services) will be substantially more.

Mulch

Mulch can be applied in the planting area of the trees to reduce water evaporation and provide nutrient cycling to the root zone. Mulch must be kept away from the base of the trunk (known as the root flare) where the tree exchanges water and carbon dioxide. A thin layer of compost can be applied before the mulch is laid. Three inches of layered mulch are recommended.

Mulching trees has the corollary benefit of keeping weeds down, and establishing a visual delineation of the trunk. Prior maintenance activities, such as over mowing and weed wacking, have severely damaged the trunks of many newly planted trees in the Study corridor. When weed wackers scar the bark of trees, girdling (the loss of a continuous layer of bark around the trunk of a tree) will certainly kill the tree. Weed wacking should be avoided where trees are planted unless staff are carefully trained and trusted to be vigilant. If this is not possible, wire mesh tree trunk protectors can be installed. These must eventually be removed, as the trunk will grow and expand beyond the diameter of the guard. The same is true for at-grade tree grates. Grates should be upsized periodically as the tree grows to ensure the trunk does not get girdled.

Construction Coordination

To avoid damage to the root zone of planted trees, timing and coordination of construction activities across municipal agencies is essential. Some trees are more susceptible to root damage than others, but as a general rule, trees that lose more than 30% of the their critical root zone have a difficult time surviving. Therefore, when a construction project is anticipated, it is recommended to contact the municipal urban forester (or local certified arborist) to determine whether the tree can be preserved, how to best protect the tree during construction, and what type of maintenance should be performed post construction to help the tree bounce back from stress. Construction activities, when coordinated efficiently and collaboratively, can provide cost effective opportunities for tree plantings.

Often, roads and sidewalks are opened for utility upgrades, repaving, or other maintenance activities. Tree planting, if planned and sited ahead of time, can be done concurrently to avoid needing to remove pavement and sidewalks to accommodate the plantings at a later date.

"Landscaping! **Adding trees, open green spaces, benches, and other similar improvements makes the space more enjoyable to be in.** I would like Broadway to be a destination, where people stroll down the street because it's a nice day and it's a pleasant place to spend time. Making the street feel like a park improves the area a hundred fold."

- online survey respondent

URBAN FOREST RECOMMENDATIONS

Annual Tree Plantings

- This Study recommends planting and maintaining at minimum 50 trees per year.

Tree Selection and Diversity

- Follow the "10-20-30" rule: this method limits urban forest species to 10% of any single species, 20% of any single genus, or 30% of a single family.

Maintenance

- In their first year, trees should be given 15 – 20 gallons of fresh water each week from May - October.
- Apply mulch to reduce water evaporation, provide nutrients, and lessen competition from weeds.
- Tree grates should be upsized periodically to ensure the trunk does not get girdled.
- Tree training is recommended to establish healthy branching and structure.

Interdepartmental Coordination

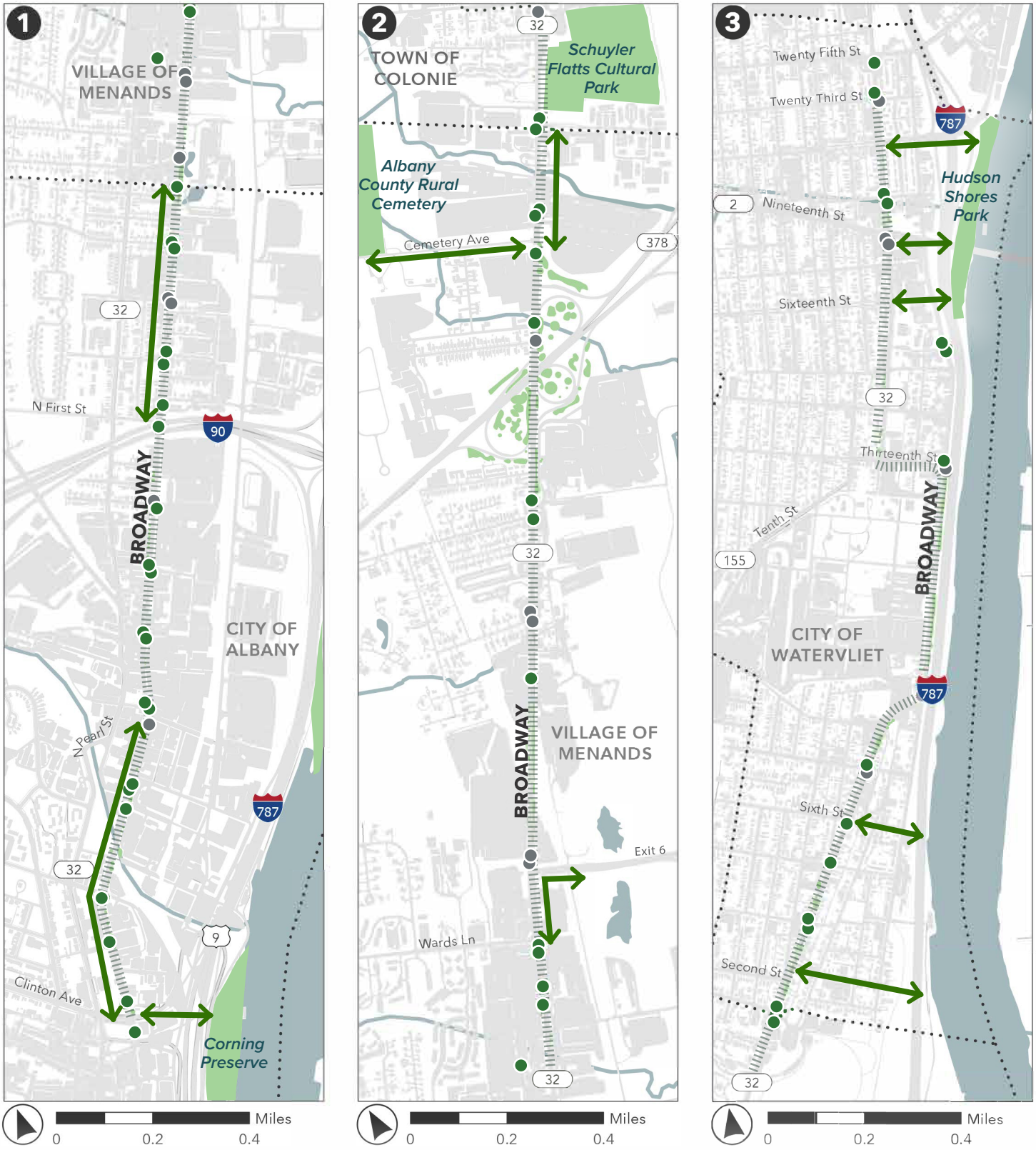
- Ensure timing and coordination of construction activities across municipal agencies.

Priority Areas for Urban Forest Expansion

Tree canopy expansion should be prioritized in the following locations:

- Where a diversity of public services and land uses are concentrated (e.g., Warehouse District, Watervliet Pool area);
- Where connections to parks and trails occur;
- At bus stops without shade; and,
- At highly trafficked pedestrian areas.

Urban forest priority areas are shown in the map on the following page.



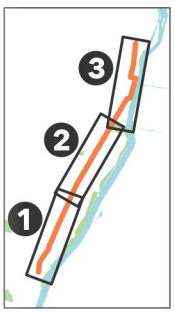
Broadway Multimodal Resiliency Study Area and Study Corridor

Existing Urban Forest

- Bus Stops within 20 Feet of Tree Canopy
- Existing Urban Forest
- Study Corridor

Priority Areas for Urban Forest Expansion

- Bus Stops not within 20 Feet of Tree Canopy
- Priority Areas for Urban Forest Expansion



Finally, the use of plastic erosion control mesh should be avoided entirely. This mesh entraps small mammals, snakes, and amphibians and does not biodegrade. The mesh eventually works its way out of the ground layer and becomes another piece of unsightly, polluting garbage in the community. Biodegradable materials such as jute, hemp, or coconut fiber can be used in place of plastic erosion control fabric and logs.

Tree pruning will need to be factored in to ensure the tree will remain vigorous, to minimize risk, and to remove diseased or broken limbs throughout the life of the tree. Tree training (careful pruning in the first five years) is recommended to establish healthy branching and structure that will reduce the need for interventions as the tree matures.

Municipalities across the country are developing inventories across a range of software platforms to track the maintenance of trees in the urban forest. Regularly updated inventories and maintenance tracking reduces costs over time, by providing real-time records of planting, removal, and pruning of each tree. These inventories can also be used to plan for future planting, obtain funding for urban forest initiatives, and to measure a wide range of ecosystem services.

Example of connecting tree pits

Green Infrastructure

Green Infrastructure will play a critical role in minimizing the risks to the Broadway corridor of flooding, sea level rise, and extreme heat. This section provides an overview of green infrastructure opportunities designed to mitigate these hazards and build resilience to climate change.

This section outlines a variety of green infrastructure options for reducing the threats and impacts of flooding, sea level rise, and extreme heat along the Broadway corridor. The list of opportunities below focuses on a range of green infrastructure models that have been used successfully along streetscapes to reduce climate-related hazards while also improving the environmental conditions to better benefit users and local businesses alike.

Green Infrastructure Solutions

Green infrastructure uses natural systems and relationships to help manage water and improve environmental conditions such as air quality and ambient temperatures.

There are many different types of green infrastructure and which models can and should be incorporated in a design or project depends upon available space, physical conditions such as soil type and drainage, and funds available during implementation.

Green Infrastructure Typologies

Street Trees and Bioretention

As discussed in the previous section, street trees can play a tremendous role in alleviating stormwater issues, reducing the urban heat island effect, reducing thermal pollution, and improving air quality. They also help surrounding vegetation by providing shade, reducing soil evaporation, increasing soil nutrients, and deep-rooted trees can even make water more readily available during times of drought through hydraulic lift whereby tree roots can transport deeper groundwater to their shallower roots and release any excess water not needed by the tree.

Bioswales and rain gardens are examples of stormwater retention and infiltration systems. Through their design and plant make-up, they capture and filter stormwater and increase on-site infiltration and retention, which reduces surface pooling and flooding. There are many benefits to integrating bioswales and rain gardens in street designs:

- Reduces stormwater runoff which contributes to flooding and overloading sewer systems;
- Improves water quality through pollutant filtering and reducing temperature loads;
- Reduces the urban heat island effect by shading and cooling the surrounding environment;
- Supports biodiverity by providing important wildlife habitat;
- Increases attractiveness of corridor, aids in traffic calming, and increases curb appeal for local businesses and residents.

A series of bioswales connected via trench drains in Queens, NY, capture and filter stormwater from sidewalks and the adjacent on-street parking.
Image Credit: Chris Hamby / flickr

Surface water can be diverted to bioswales and rain gardens by way of surface runoff and/or connected inlets and culverts that can convey water to them. The amount of water a bioswale or rain garden can handle will depend upon the size and capacity of the system, which is determined by available space, depth to groundwater, and subsurface materials. Systems which have to contend with a lot of road salt function best with more complex designs that allow for multiple chambers whereby the heavy salt loads are filtered out in the chambers that have the most salt tolerant species of plants.

Permeable Pavements

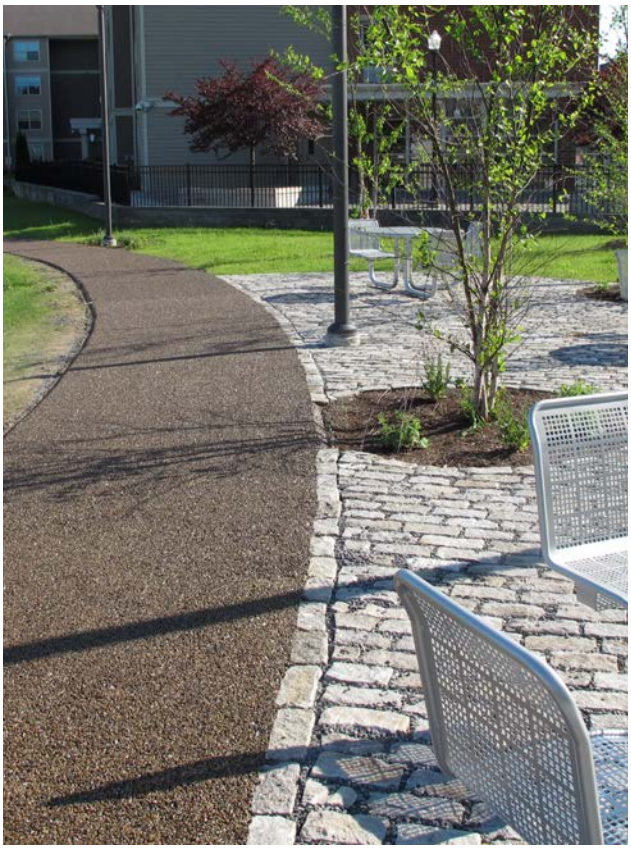
Permeable pavements are surfaces that allow stormwater to infiltrate through the surface into the ground, as opposed to impervious surfaces which concentrate stormwater and require other means of managing it.

Permeable pavements offer several advantages including

- Reduces stormwater concentrations which can impede pedestrian and vehicular movement;
- Reduces stormwater concentrations in flood-prone areas and discharges that may exacerbate flooding in other areas;
- Reduces thermal pollution to waterways by infiltrating on site and minimizing the time that rainwater is exposed to hot surface temperatures; and
- Increases water made available to surrounding vegetation by infiltrating it into the immediate ground.

There are several types of permeable paving and each have different advantages:

- Permeable pavement (traditional asphalt or asphalt / recycled rubber combination paving with reduced sands and fines to allow for porosity and infiltration) can be a less expensive option and works particularly well for bike paths and parking spaces where traffic loads are less and vehicular turning movements are lower);



Two types of permeable paving can be seen in this image. The path on the left is pour-in-place flexible pavement that uses a mix of aggregate and recycled tires. The permeable pavement system on the right uses reclaimed granite street cobbles with a small drainage aggregate between pavers and as the subbase.

- Pervious concrete (traditional concrete with reduced sand and fines to increase porosity and infiltration) can provide increased traction and a lighter surface which can help reduce the urban heat island effect in most conditions ; and
- Permeable interlocking concrete pavement and permeable pavement systems (concrete, stone, or masonry units with small openings between units that typically contain small, rounded aggregate that makes the overall surface highly permeable) can serve as an important design element through its unique texture and appearance, can provide lighter surface options which can help reduce the urban heat island effect in most conditions, and can aid in slowing traffic and reducing ponding and splashing.

The area and capacity of a permeable pavement system depends upon its depth and storage capacity which is effected by material types and groundwater conditions. Understanding the soil types, infiltration rates, and groundwater levels in the desired location will be critical to a successful design and implementation.

Structural Soil and Modular Suspended Pavement Systems

Access to useable soil is the most limiting factor for urban tree growth. Structural soils and suspended pavement systems increase access to usable soil and can better support urban vegetation and extend the life of surrounding pavement systems.

Structural soil is a compacted mixture of gap-graded aggregate and growing medium that promotes urban tree health by allowing for sustainable root growth while also supporting roads, sidewalks, and other paving systems. In urban areas, it can provide additional storage space for nutrients and stormwater reserves while still supporting the surrounding pavement. It is especially beneficial when connecting isolated tree plantings to larger permeable areas such as bioswales, landscape buffers, and open lawn areas.

Modular suspended pavement systems utilize a grid of structural components that support the weight of paving systems while creating a subsurface void that is filled with soil for root growth. The advantage of this system is that is allows for lightly compacted, high quality soils that support larger and healthier plants and provide increased stormwater management by increasing the volume of water-holding materials and nutrients made available to plants while also greatly reducing the amount of area displaced by impervious materials such as aggregate. While suspended pavement requires more upfront costs, it is a superior long-term solution for healthy street systems that can minimize the urban heat island effect, which creates a better environment for pedestrians and can significantly extend the life of the pavement by reducing exposure to extreme temperature changes over the life of the pavement.

Deeproot Silva Cells are one example of a modular suspended pavement systems that has been used successfully in cities around the world. Image credit: Deeproot

Recommended Plants

Vegetation in urban areas needs to be versatile and resilient. Species considerations include:

- Hardiness (how well the plant can survive winter in a given area);
- Wet tolerance (some may need to be able to be submerged for periods of time while others may only need to be able to handle wet soils);
- Drought tolerance;
- Heat tolerance;
- Sun or shade tolerance;
- Root types and sizes and how much space a plant requires;
- Compatibility with surrounding utilities;
- Plant origins and local compatibility (native plants should be prioritized and invasive species should be avoided);
- Snow storage versatility (trees and perennials that are dormant and have minimal surface volumes in winter are best suited to areas where snow is stored);
- Maintenance needs;
- Diversity; and
- Resistance to pests and disease.

Due to the complex requirements for versatile plants, it is critical that the selection take into account their setting and what maintenance can be expected. It is therefore recommended that landscape and bioretention areas be designed by a professional with in-depth plant knowledge. Appendix H (Landscaping Guidance) of the 2015 Stormwater Design Manual is an excellent resource and includes lists of plants that will tolerate different levels of inundation. The Cornell Botanic Gardens website plant database also provides a useful list of bioswale garden plants.

If properly maintained until they grow together, a mix of resilient grasses and perennials can successfully manage stormwater and provide important pollinator and bird habitat.

Maintenance

For green infrastructure components to be most effective, it is critical to establish and follow clear protocols for the inspection and care of these systems. Performing regular maintenance on systems can greatly reduce the overall demand and will help ensure optimal system performance.

Maintenance varies depending on the type of green infrastructure:

Street Trees and Bioretention

The most effective way to ensure proper maintenance for successful bioretention is for the municipality to work closely with the project designer and to build the maintenance into the installation and long-term plan for the success of the project. Chapter 12 (Maintenance Guidance) of the New York State Department of Environmental Conservation (DEC) 2024 Stormwater Design Manual is an excellent resource for planning for stormwater and green infrastructure maintenance and also contains information on budgeting for maintenance.

The first one to three years when plants adapt to their new surroundings and establish themselves is the most critical maintenance window and if properly undertaken can result in a lower long-term maintenance. Maintenance generally includes:

- Watering: Plants require the most regular watering during the first year when new roots are establishing and have not yet extended into the soil. Any watering should take into account natural rainfaill and should be done in a way that promotes deeper root growth (for example, watering the soil using drip hoses is more effective and easier on the plants than overhead watering). Plants should require only occasional watering during the second year, particularly during periods of heat and/or drought. By the third year, most of the plants should be well established and may only require watering during periods of extended drought. Care should be taken not to over-water.

- Mulching: Mulch is useful in providing a surface layer that can minimize competition from weeds, moderate soil temperatures, capture sediment, slow water flow, and contribute to the overall aesthetics. Shredded hardwood typically works best and it is critical that mulch layers not be too thick or they can harm the desired plantings. Mulch should never be piled against tree trunks. Over time, the need for mulch should be reduced as the plant systems grow together and cover areas.
- Amending: Soil may occasionally need more organic or microbial matter. Test and amend soil as needed.
- Periodic weeding: Weeding will be most important during the first years of establishment. As plants grow larger and fill in, landscape areas should require less weeding. Having or hiring staff who can identify weeds and remove them properly (ideally, they should be pulled when young and the roots should be removed so they do not grow back, go to seed, or expose much soil when removed) is critical to reducing overall maintenance demands.
- General cleanup: Landscape areas will require annual cleanup from the fall/winter season which may require leaf and dead foliage removal. Any accumulated trash will also need to be removed regularly. Coordinating street sweeping with trash removal schedules can minimize the amounts of trash that reach landscape areas. Including trash bins along the corridor will also encourage users to dispose of trash appropriately.
- Invasive species monitoring and prevention: Invasive species can take over and compromise stormwater management quickly and it is critical that systems be monitored as early as possible and regularly throughout their existence. Bioretention areas will be most vulnerable during the period of establishment and monitoring needs should be less as plant communities stabilize and grow together. Coordination with the New York State Invasive Species staff in the Bureau of Invasive Species and Ecosystem Health throughout the project is recommended.
- Replacements: Plants will need to be replaced upon occasion, particularly when exposed to lots of salt or unusual periods of drought.

Permeable Pavements

The greatest maintenance concern for permeable pavement systems is clogging which can limit infiltration rates and effectiveness. Some key considerations for installation and maintenance include:

- Avoid installing permeable pavement systems in high sediment load areas unless areas designed to reduce sediment loads before stormwater reaches the permeable paving can be included;
- Divert stormwater from disturbed areas until they have become established and stabilized;
- Do not use sand for treating snow or ice;
- Periodically remove fine sediments from the paver surface. This can be done by regular sweeping or blowing the surface and/or using a vacuum sweeper or low-pressure power washer. Always be careful not to disrupt the joint material and replenish with appropriately sized drainage stone as necessary.
- Some systems, such as the aggregate and recycled rubber systems have fairly large pores that require less frequent vacuuming but do recommend spraying a fresh layer of epoxy over the surface every few years to maintain adhesion as part of the surface upkeep.

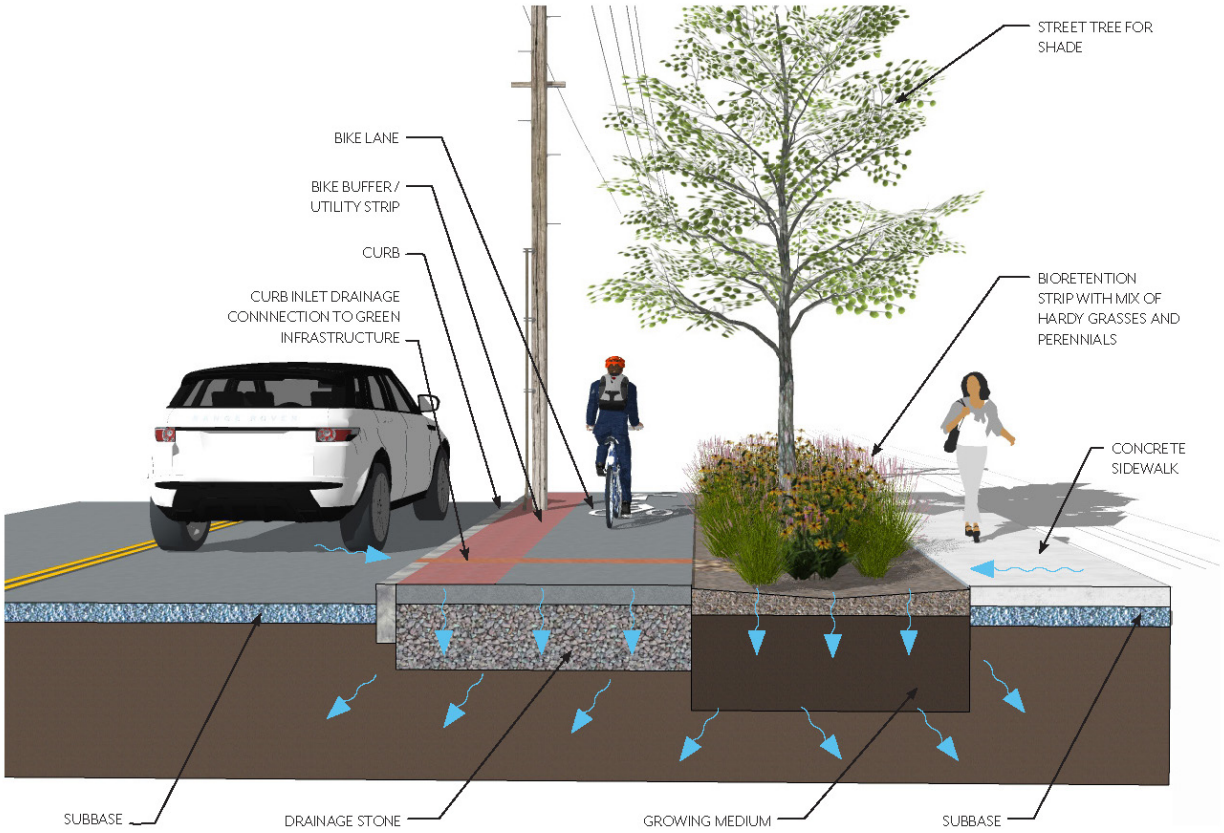
Structural Soil and Modular Suspended Pavement Systems

A properly designed landscape should be able to support trees and vegetation with minimal maintenance requirements, but installing the design correctly and tending to vegetation during its establishment is critical. Starting with healthy, uncompacted soil and amending it as needed with the right balance of nutrients and microbes will increase the success of the project and its chances to become a lower-maintenance landscape. Soil testing and monitoring of soil biology should be a regular part of maintenance as it can have the greatest impacts on vegetation health and effectiveness. Too much water or nutrients can be just as problematic as not enough.

Policy Recommendations

The increasing demands of climate resilience require the development of green infrastructure, which requires policy support to be implemented at the needed scale and to succeed. The Broadway Study area is nearly six miles in length and passes through three different municipalities and successful implementation will require careful planning and coordination. Incorporating green infrastructure requirements and design standards into planning documents and street design guidelines will facilitate the process and can aid municipalities in accomplishing the goals of this Study.

Green Infrastructure Example Condition #1: ***For areas where green infrastructure is incorporated between the sidewalk and bike lanes.***



▲ *This cross-section is conceptual in nature and any final designs should be based on site-specific conditions and stormwater calculations.*

Due to the Study area's location at the base of several urbanized watersheds, it is recommended that policies be updated to incorporate green infrastructure not just along the corridor, but throughout the contributing watersheds.

Stormwater management has become increasingly expensive and problematic for municipalities, particularly in regards to addressing persistent flooding and system overflows. Green infrastructure is a cost-effective means of managing stormwater. Establishing partnerships with private property owners and offering financial incentives for them to make green infrastructure upgrades to their properties could help address stormwater issues on a larger scale.

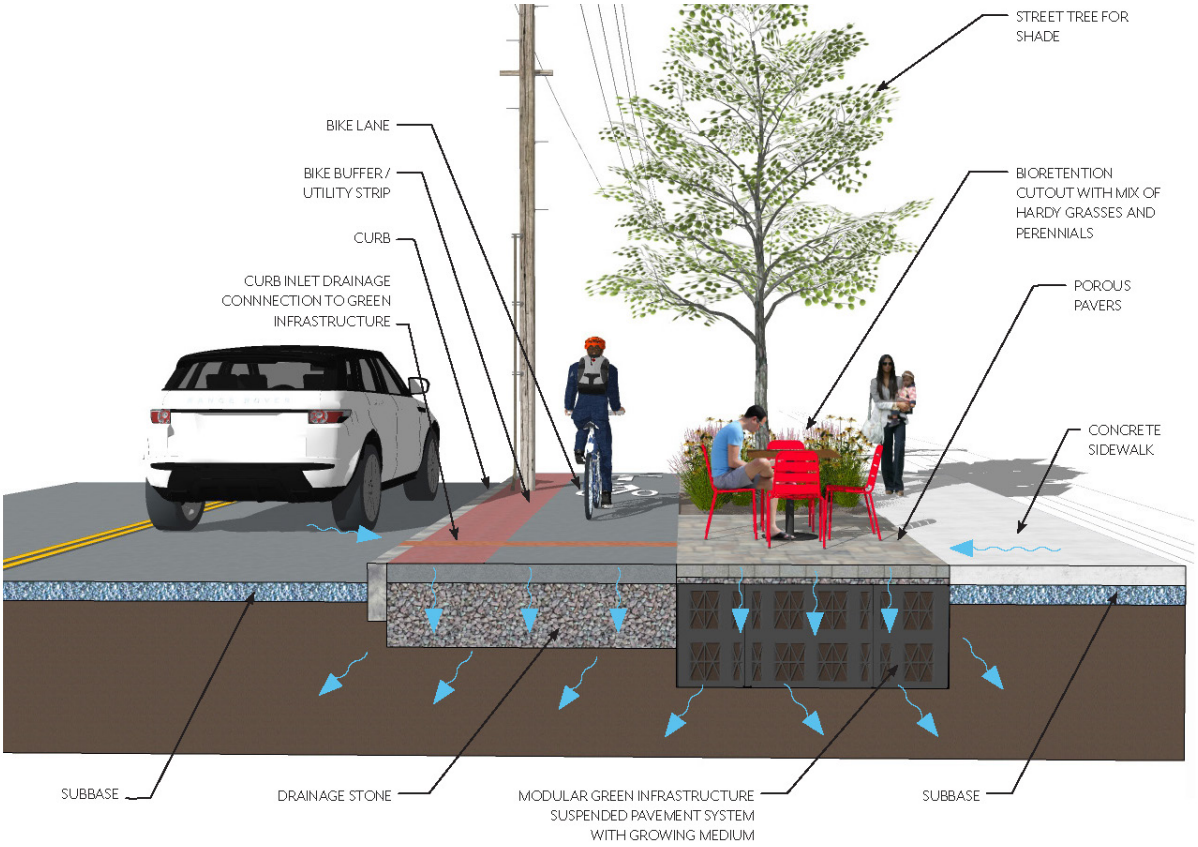
Design Standards

Design standards can play a strong role in the implementation of green infrastructure by providing clear guidelines for designers and installers and ensuring that the standards are consistently employed as intended. Examples of standards for green infrastructure include:

- Permeability minimums - area requirements and standards can be used to require a minimum percentage of surfaces be permeable, which can be addressed through landscaping and/or permeable paving systems.

Green Infrastructure Example Condition #2:

For areas where green infrastructure is incorporated between the sidewalk and bike lanes and patio sidewalk space may benefit local businesses.

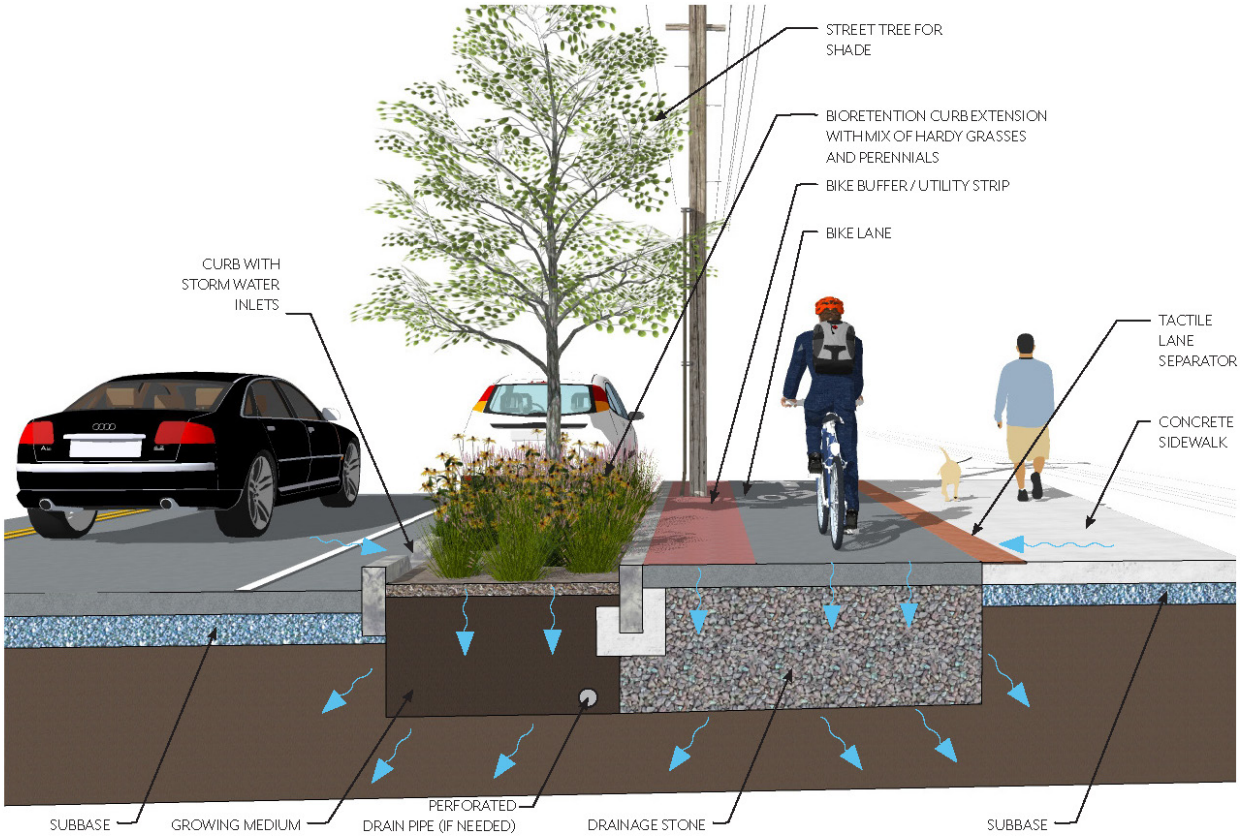


▲ *This cross-section is conceptual in nature and any final designs should be based on site-specific conditions and stormwater calculations.*

- Stormwater management - standards can require that green infrastructure systems be included in projects to better manage stormwater and maximize on-site infiltration; formulas can be included to help determine the size and capacity of systems based on local conditions.
- Minimum landscape requirements - standards can mandate that trees and vegetation be incorporated in designs, as well as what size and type of vegetation should be used.
- Minimum soil volumes - many municipalities now mandate access to minimum soil volumes which can be accomplished using structural soils and/or suspended pavement systems to provide and connect areas of uncompacted soil.
- Engineering details and specifications - municipalities can provide standard details showing how and where green infrastructure should be included in different conditions.
- Vegetation selection guidelines - lists of native and appropriate plant species for different site conditions can be included.
- Maintenance and inspection protocols - recommendations for the short- and long-term care of green infrastructure can be included.

Green Infrastructure Example Condition #3:

For tight areas where green infrastructure is incorporated in curb extensions.



This cross-section is conceptual in nature and any final designs should be based on site-specific conditions and stormwater calculations.


ALBANY
TRUCK SALES
OLYMPIC
LANES
12 Elmwood Rd
1958-1960

05
Implementation Plan

This chapter serves as a guide to implementing the multimodal and resiliency recommendations described in Chapter 4. Specifically, this chapter:

- Identifies near-term opportunities to advance this Study's recommendations through other related projects along the Study corridor;
- Defines additional pre-development work needed to refine and further develop this Study's recommendations;
- Provides planning-level cost estimates for the corridor-wide recommendations contained in Chapter 4 and identifies potential funding sources; and
- Describes a phased approach to achieving the long-term vision for Broadway / Route 32, ensuring immediate, incremental progress.

Preparing for Action

This section provides an overview of recommended coordination and immediate next steps for project partners to advance the recommendations in this Study.

Coordination with Ongoing and Upcoming Projects

Several planning and capital projects are underway along the Study corridor. These projects represent opportunities to incrementally advance this Study's recommendations and leverage other funding sources and include:

- **New York State's $400M Investment in Downtown Albany:** In January 2025, New York Governor Kathy Hochul announced the State's plans to invest $400 million in downtown Albany. These plans include approximately $35 million for the next phase of planning for I-787 and $200 million for yet to be defined projects in downtown Albany. As one of Albany's primary downtown corridors and I-787's local access road, this historic State investment creates a significant opportunity to implement many of the recommendations contained in this Study.
- **Livingston Avenue Bridge Replacement:** New York State Department of Transportation (NYSDOT) is replacing the Livingston Avenue Railroad Bridge, which spans the Hudson River and connects the cities of Albany and Rensselaer. Protected bicycle and pedestrian facilities will be included in the new Livingston Avenue Bridge, creating a safe and direct connection between Broadway and the City of Rensselaer for cyclists and pedestrians. Bicycle and pedestrian access to the Livingston Avenue Bridge will be provided via the Albany Skyway, which can be accessed at the intersection of Broadway and Clinton Avenue in downtown Albany.
- **New York State Route 378:** NYSDOT recently completed a Planning and Environmental Linkages (PEL) Study for New York State Route 378 (Troy-Menands Bridge), recognizing the bridge will need to be replaced within the foreseeable future. While the Study area for the Troy-Menands Bridge PEL Study did not include the Route 378 interchange at Broadway / Route 32, the Village of Menands has been working closely with NYSDOT to develop an alternative concept for this interchange, which would create an at-grade connection between Troy and Menands. Once this Study is completed, the recommendations should be integrated into the design. Specifically, the proposed at grade intersection should include pedestrian facilities on the east and west side of Broadway, one-way separated bike lanes on each side of Broadway, and upgraded pedestrian and bicycle crossings. The proposed at-grade reconfiguration has the opportunity to fill a gap in the existing sidewalk network along Broadway (currently there is no sidewalk on the east side of Broadway through the Route 378 interchange at Broadway / Route 32), improve bicycle connectivity, and significantly expand the urban forest to increase infiltration, mitigate stormwater runoff, and address know flooding issues in this area. Further coordination between the Village of Menands, Albany County and NYSDOT will be needed as this project moves from planning into design.

- **Reimagine I-787:** The I-787 Planning and Environment Linkage Study recommends the construction of a new trail facility in Menands parallel to Broadway, starting at Simmons Lane and continuing north along the historic canal alignment on land owned by the Village of Menands to East Elmwood Road. This parallel trail facility would provide important redundancy in the transportation system for active transportation users (e.g., cyclists and pedestrians).
- **80 Broadway in Menands:** CDTA's proposed improvements to the stops at 80 Broadway in Menands at the Simmons Lane intersection are currently under review. The proposed design would have southbound buses stopping where they currently do, in-lane on Broadway. Northbound buses would turn left at the Simmons Lane signal into new bus only lanes in the 80 Broadway parking lot, dropping off at a new shelter, and then turning left back onto Broadway at a new bus only traffic signal. The new traffic signal will be tied to the Simmons Lane cycle. The stop is primarily used by New York State workers who park in the 80 Broadway lot and ride the bus downtown. This new design would eliminate the need for riders to cross Broadway to get back to the parking lot when riding northbound.
- **2nd Avenue / 25th Street Intersection:** The City of Watervliet is undertaking a project to reconstruct the 2nd Avenue (Route 32) / 25th Street intersection with pedestrian improvements. Recommendations from this Study should be incorporated into the design to the greatest extent practicable.
- **Congress Street Bridge / Route 2 Improvements:** As part of the Congress Street Bridge improvement project, Watervliet will be implementing several intersection improvements at 2nd Avenue/Route 32 and 19th Street. This intersection was frequently cited by the public as a challenging and unsafe intersection to cross on foot, by bike, or while using an assistive mobility device (e.g., scooter, wheelchair, or walker). The redesign for the 2nd Avenue / 19th Street intersection should integrate the one-way separated bike lanes on each side of 2nd Avenue that are proposed in this Study. The combination of the Broadway Multimodal Resiliency Study, the intersection upgrades at 2nd Avenue and 19th Street, and the redesign of the Congress Street Bridge creates a pedestrian and bicycle friendly connection between Watervliet and Troy.
- **Capital Region Vision Zero Safety Action Plan:** The Capital Region Transportation Council is leading the development of the Vision Zero Safety Action Plan for the Capital Region. The plan will include recommended actions, programs, and projects to improve safety and work towards eliminating fatalities and serious injury crashes throughout the region. Priority projects listed in the plan will be eligible to apply for Safe Streets and Roads for All implementation funding once the plan is approved. Of note, the Capital Region's Vision Zero Safety Action Plan includes the development of conceptual safety countermeasures for the city block in Watervliet bound by 15th Street, 16th Street, Broadway, and 2nd Avenue, and the recommendations for 2nd Avenue between 15th Street and 16th Street from this Study have been integrated into the Vision Zero concept plan. This overlap creates an opportunity to leverage additional federal funding sources for the implementation of this Study's recommendations in Watervliet.

Pre-Development Actions

There are several next steps Albany County, the cities of Albany and Watervliet, and the Village of Menands can take to continue to advance the recommendations contained in this Study. These next steps include:

- **Grant Writing:** Grant writing is a necessary next step in securing additional funding for permitting, design, and construction of the design concepts presented in this Study. There are several funding sources that focus on improving transportation safety, expanding transportation options, sustainably managing stormwater, and reducing greenhouse gas emissions to address climate change. The Broadway Multimodal Resiliency Study is well-aligned with these priorities as its recommendations increase access to active transportation infrastructure, enhance safety for all, and integrate green infrastructure and expand the urban tree canopy to address flood hazards along the Study corridor. The following section provides an overview of potential, relevant funding sources.
- **Continued Engagement:** Continued outreach and communication with affected residents and businesses along the Study corridor is critical as the design concepts presented in this Study are further refined and advanced into design development.
- **Streetscape Amenities and Wayfinding Plan:** The recommendations in this Study reduce roadway widths and in turn expand the sidewalk zone. This expansion at the sidewalk level creates many opportunities to integrate wayfinding signage, benches, bus shelters, public art, and trees into the Study corridor's right-of-way. The development of detailed streetscape amenities and wayfinding recommendations is an important next step in refining cost estimates, improving cohesion across the corridor, and making Broadway / Route 32 a welcoming and comfortable place to spend time.
- **Parking Study:** A parking study is necessary to determine the impacts of selective removal of on-street parking and to identify opportunities to create new public parking lots in the Warehouse District to offset on-street parking losses. The Study area includes both residential and commercial properties, each with distinct parking needs. A thorough evaluation of how proposed changes may impact current parking availability, to ensure residents and businesses are not adversely affected, is needed. Parking utilization within approximately one-quarter mile of the Study corridor, particularly in the Warehouse District and North Albany, should be quantified for representative time periods throughout the day on weekends and weekdays to determine peak hours, duration of parking, and turnover rates. The results from this study will inform the design and implementation of this Study's recommendations, with a goal of having no net less in parking.
- **Design and Permitting:** Agency coordination should occur early and often in the design process to ensure permit requirements are fully integrated into final designs. This Study only presents very high-level conceptual recommendations that will need to be further developed. Next steps in the design process will require survey, concept design and schematic design, and ultimately the development of contract documents. Given the length and complexity of the Study corridor, design development and construction of the proposed improvements will need to be phased. Phasing will likely be determined by municipality, priority, public support, and available funding.

- **Maintenance Agreements:** The long-term maintenance of green infrastructure, the urban forest, porous asphalt, and other streetscape features is critical to maximizing the environmental, social, and flood mitigation benefits proposed in this Study. Intermunicipal partnerships as well as maintenance agreements with CDTA, municipal departments, a Business Improvement District (BID), local community groups, local businesses, and/or private property owners will be essential to maintaining the full length of the Study corridor. Responsibility for snow removal, bike lanes, and right-of-way elements should be defined to cultivate a sense of place and ownership. Maintenance considerations should also plan for the long-term rehabilitation and replacement of specialty features, including decorative pavement, custom lighting, street furniture, porous pavement, stormwater planters, or other non-standard infrastructure. Clearly defining who is accountable for ongoing maintenance and eventual replacement of these items will be essential to preserving the project's functionality and appearance over time.

- **Cross-Jurisdictional, Interdepartmental, and Utility Coordination:** As the Study corridor extends through multiple municipalities, coordinated planning will be important to maintain consistency in design, construction, and communication. Challenges such as narrow roadways and existing utilities, including utility poles, should be addressed early as these constraints will significantly influence project feasibility and should be incorporated into both design and permitting strategies. Coordination with utility providers including National Grid is especially important if relocating or burying utilities is under consideration. Coordination with municipal water departments should also occur early in the design process. Given their role in managing critical infrastructure within the project area, water department input is essential to avoid potential conflicts and to ensure alignment with other systems. Early coordination with the Capital District Transportation Authority should also occur. Identifying impacts to riders, infrastructure upgrades or relocation, and the installation of bus lanes should be done in collaboration with CDTA to ensure transit services are prioritized throughout the design process.

Action Plan

This section provides an action plan for project partners by providing planning-level cost estimates for the proposed improvements, phasing recommendations, and a list of potential funding sources.

Planning-Level Cost Estimates by Municipality

Planning level cost estimates were developed to approximate the cost of constructing the recommended typologies proposed on pages 118 - 139. These planning level cost estimates are presented on the next page and are broken down by municipality and proposed typology.

These planning level cost estimates include the following assumptions:

- All bike lanes are implemented as porous asphalt;
- All sidewalks are replaced;
- Upgrades at every intersection along the corridor include new curb ramps, crosswalks, and detectable warnings;
- Utility poles will have to be relocated in some instances;
- Bioretention islands are co-located with catch basins to minimize impacts to stormwater infrastructure; and
- Streetscape amenities, such as benches, new bus shelters, pedestrian scale lighting, and wayfinding signage are **not** included in the cost estimates. The quantity and location of streetscape amenities will require further study and will add additional cost.

As this Study represents a very preliminary stage of conceptual design, several contingencies were applied to the total estimated cost of materials and labor, including work zone traffic control (7%), mobilization (4%), survey operations (2%), erosion and sediment control (1%), design and permitting (12%), construction (25%), and construction inspection / field change orders (10%).

The total estimated cost of implementing the recommended typologies in the City of Albany is $26,750,000 over 9,210 linear feet (1.75 miles). The total estimated cost of implementing the recommended typologies in the Village of Menands is $32,500,000 over 12,550 linear feet (2.4 miles). The total estimated cost of implementing the recommended typologies in the City of Watervliet is $22,250,000 over 10,250 linear feet (1.9 miles).

The recommended typologies proposed on pages 118 - 139 represent the long-term vision for the Study corridor, with the goal of providing continuous and cohesive multimodal infrastructure and extensive bioretention areas and street trees to increase the corridor's resilience to climate change. These recommendations represent significant infrastructural changes along the Study corridor, and therefore, the estimated costs to implement the full long-term vision are high. However, by phasing the improvements, layering funding sources, and leveraging all of the upcoming work that is already occurring along the Study corridor, the cost burden to each municipality can be reduced.

Table 5.1 – City of Albany

Typology Applied	Total Estimated Cost	Length (linear feet)	Cost per linear foot
A - Clinton Avenue to Livingston Avenue, N 3rd Street to Lawn Avenue	$3,750,000	1,250	$3,000
B - Warehouse District	$4,250,000	1,260	$3,375
C - North Albany	$15,250,000	5,800	$2,650
D - I90 and Livingston Avenue Bridge	$3,500,000	900	$3,900
TOTAL	**$26,750,000**	**9,210 linear feet**	

Table 5.2 – Village of Menands

Typology Applied	Total Estimated Cost	Length (linear feet)	Cost per linear foot
E - Wolfert to Wards	$6,500,000	2,500	$2,600
E - Riverview to Schuyler Flatts	$21,500,000	8,450	$2,550
F - Dedicated Bus Lanes	$4,500,000	1,600	$2,825
TOTAL	**$32,500,000**	**12,550 linear feet**	

Table 5.3 – City of Watervliet

Typology Applied	Total Estimated Cost	Length (linear feet)	Cost per linear foot
G - 3rd Ave	$1,250,000	3,800	$300
H - Broadway / EST	$2,500,000	2,600	$1,400
I - 13th Street	$1,250,000	700	$1,800
J - 13th St to 19th St	$7,250,000	2,500	$2,900
C - 19th St to 25th St	$4,750,000	1,950	$2,450
TOTAL	**$22,250,000**	**10,250 linear feet**	

A Phased Approach

A phased approach allows for incremental change to have a growing impact over time. The long-term vision for the Broadway / Route 32 corridor involves narrowing travel lanes by moving curb lines toward the center of the roadway to calm traffic, enhance safety, and create more space for trees, protected bicycle and pedestrian infrastructure, and pedestrian amenities.

Moving curbs lines is costly, as demonstrated in Tables 5.1 - 5.3, and requires changes to other existing infrastructure systems (e.g., drainage, above- and below-ground utilities). To continue the momentum of this Study, it is recommended that project partners pursue lower-cost changes in the near-term to test, build support for, and incrementally progress towards the long-term vision for the full length of the Study corridor.

The Power of Paint

Restriping the Study corridor to narrow travel lanes to 11-feet wide and define curb extensions is a simple way to quickly implement and test the recommendations in this Study. For example, on 2nd Avenue / Route 32 in Watervliet between 13th and 19th Streets, the corridor could be re-striped to simply rearrange the travel lanes, buffered bike lanes, and parking lane to create a parking protected bike lane on the west side of the street.

Asphalt art is another way to visually narrow travel lanes while also creating a more welcoming, vibrant corridor for all users. The images to the right demonstrate how lanes can be quickly narrowed and pedestrian spaces can be defined in an artful, attractive way. While temporary, asphalt art also provides an opportunity for community collaboration during the design and installation.

Low-Cost Vertical Elements

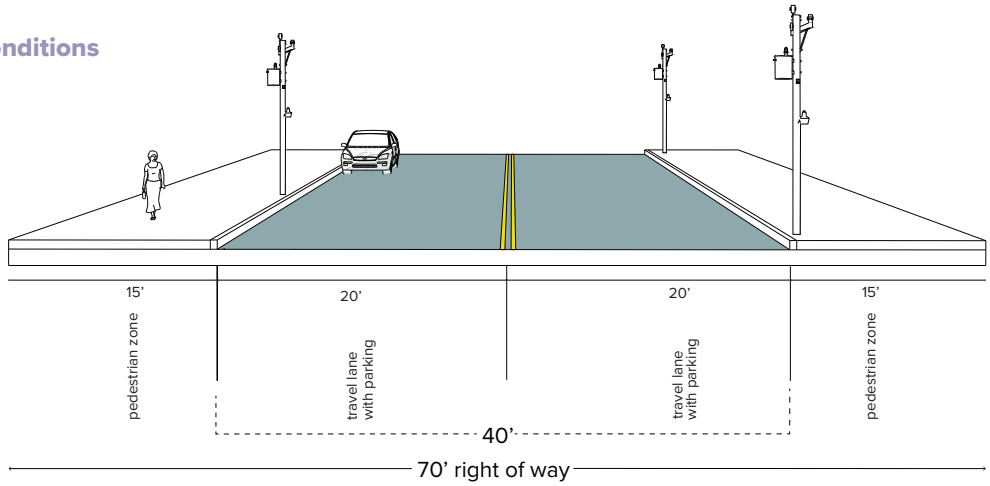
An additional level of definition and protection for pedestrians, cyclists, and other vulnerable roadway users can be provided by flexible delineator posts and/or planters. These elements can also be seasonally applied to the corridor, as they can be easily removed in the winter to enable snow plowing.

APPLYING A PHASED APPROACH ALONG THE STUDY CORRIDOR IN NORTH ALBANY

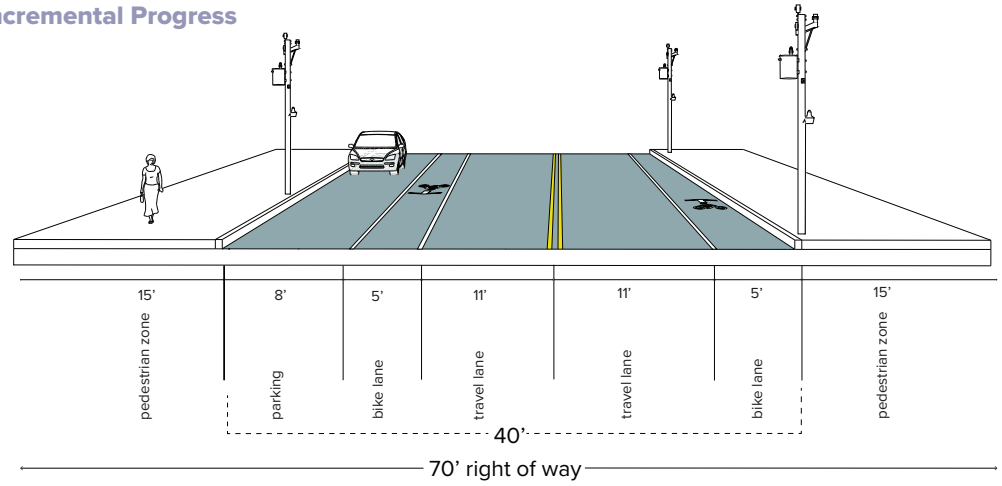
The City of Albany's Department of Engineering has funding to repave the section of Broadway from Genesee Street north to the Village of Menands line in 2025. While the City's funding is not sufficient to implement all of the recommendations in this Study, the following should be considered:

- Restripe the corridor to narrow travel lanes to 11-feet in width and parking lanes to 8-feet in width;
- Remove one lane of on-street parking to create space for striped bike lanes;
- Partner with Albany Parking Authority to acquire one of the many existing surface parking lots to establish public parking lots in the Warehouse District and North Albany and create a net increase in public parking;
- Implement curb extensions at mid-block crossings and intersections; and,
- Install structural soils under travelways areas adjacent to tree pits that are less than 6-feet in width.

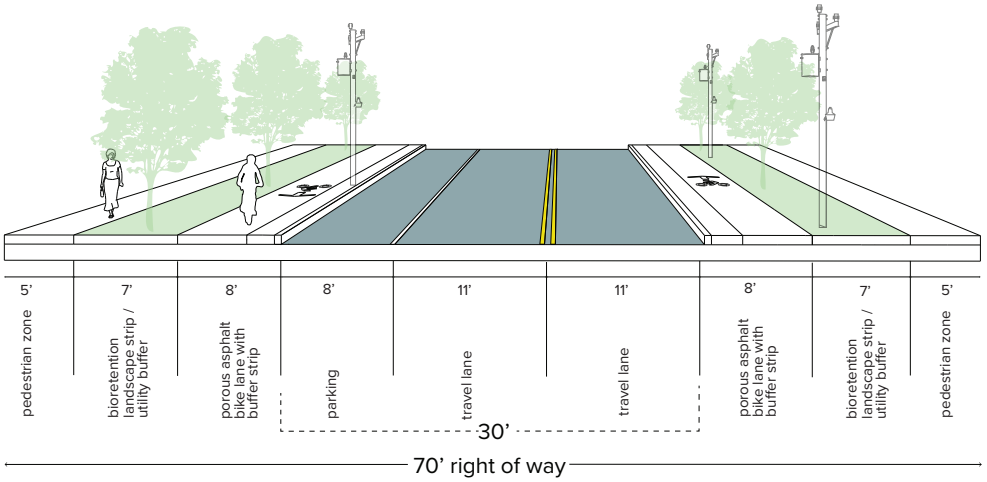
Existing Conditions



Phase 1: Incremental Progress



Phase 2: Long-Term Vision



▲ *The phasing series shown above shows cross-section concepts for the North Albany segments of the Study corridor.*

Table 5.4 – Phasing Cost Estimates

Item Description	Unit	Quantity	Price
Striping	Linear Foot	1	$5
Striping Removal	Linear Foot	1	$3
Flexible Delineator Posts	Each	1	$100
Planters	Each	1	$2,000

Asphalt art can visually narrow travel lanes while also creating a more welcoming corridor for all users. Flexible delineator posts and planters can be used to provide separation between motorists and cyclists, pedestrians, and other vulnerable roadway users.

Potential Funding Sources

Table 5.4 summarizes several state and federal funding sources that could be used to finance the improvements recommended in this Study. Because this Study focuses on integrating natural systems into a transportation corridor, it opens up the opportunity to leverage several non-transportation funding sources as well. Importantly, New York State recently approved the $4.2 billion Environmental Bond Act, creating a significant new funding source for projects that protect water quality, help communities adapt to climate change, improve resiliency, and create green jobs.

Table 5.5 – Summary of Potential Funding Sources

Program	Description	Eligibility & Applicability
Transportation Alternatives Program / Air Quality Improvement Program (TAP/ CMAQ) This is a federally funded program, administered by the NYSDOT.	Supports bicycle, pedestrian, multi-use path, and non-motorized transportation- related projects. Projects must be related to surface transportation.	Roadway improvements, bike lanes, pedestrian improvements
Transportation Improvement Program (TIP) This is a federally funded program, administered by the Capital Region Transportation Council	Supports capital and non-capital surface transportation projects, bicycle and pedestrian facilities and other transportation enhancements.	Roadway improvements, bike lanes, pedestrian improvements
Green Resiliency Grant (GRG) Funded and overseen by the New York State Environmental Facilities Corporation (EFC).	A competitive grant program designed to support flood-prone communities in implementing transformative green infrastructure projects that combat the effects of climate change. This funding is available as part of the Environmental Bond Act.	Green infrastructure, urban forest expansion
Environmental Bond Act Funded through the New York State Clean Water, Clean Air and Green Jobs Environmental Bond Act of 2022.	State agencies, local governments, and partners can access funding to protect water quality, help communities adapt to climate change, improve resiliency and create green jobs.	Green infrastructure, urban forest expansion
NYS Council for the Arts Funded through the New York State annual budget.	Local governments and partners can access multi-year funding to facilitate large-scale capital projects that prioritize community development and placemaking.	Public art installation, asphalt art, streetscape amenities

Table 5.6 – Summary of Potential Funding Sources Continued

Program	Description	Eligibility & Applicability
Green Innovation Grant Program (GIGP) Funded and overseen by the New York State Environmental Facilities Corporation (EFC).	Provides grants on a competitive basis to projects that improve water quality and implement green infrastructure in New York State	Green infrastructure, urban forest expansion
Consolidated Local Street and Highway Improvement Program (CHIPS) This is a federally funded program, administered by the NYSDOT.	Funds support the construction and repair of highways, bridges, highway railroad crossings, and other facilities not in the State highway system.	Roadway improvements, bike lanes, pedestrian improvements
Water Infrastructure Improvement (WIIA) program This is a federally funded program, administered by the NYS EFC.	Provides competitive grants to help municipalities affordably undertake critical wastewater and drinking water infrastructure projects.	Green infrastructure, urban forest expansion
Water Infrastructure Improvement Program (WQIP) Funded and overseen by the NYSDEC.	Provides competitive grants to directly improve water quality or habitat, promote flood risk reduction, restoration, and enhanced flood and climate resiliency, or protect a drinking water source.	Green infrastructure, urban forest expansion
Clean Water State Revolving Fund (CWSRF) This is a federally funded program, administered by the NYS EFC.	Provides interest free or low-interest rate financing for wastewater and sewer infrastructure projects to municipalities throughout New York State.	Green infrastructure, urban forest expansion

Continued, Long-Term Coordination

Given the intermunicipal nature of this Study, it is recommended that Albany County continue to convene the Study Advisory Committee biannually. These annual meetings could be used to discuss phased implementation of this Study's recommendations, review progress, discuss upcoming grant opportunities and planned projects along the Study corridor, establish maintenance agreements, share lessons learned, and generally enhance intermunicipal, interdepartmental, and state agency cooperation. **This Study's recommendations aim to create a cohesive, connected corridor, which will only be possible if all project partners are committed to regular communication and long-term collaboration.**


LOUDONVILLE
32
378


COUNTY LEGISLATURE
COUNTY OF ALBANY

CAPITAL REGION
Transportation
Council

CDTA