Streetscape Study and Design Concepts
Riverside Avenue and Divinity Street/Park Street
City of Bristol

April 2021

Prepared for: City of Bristol

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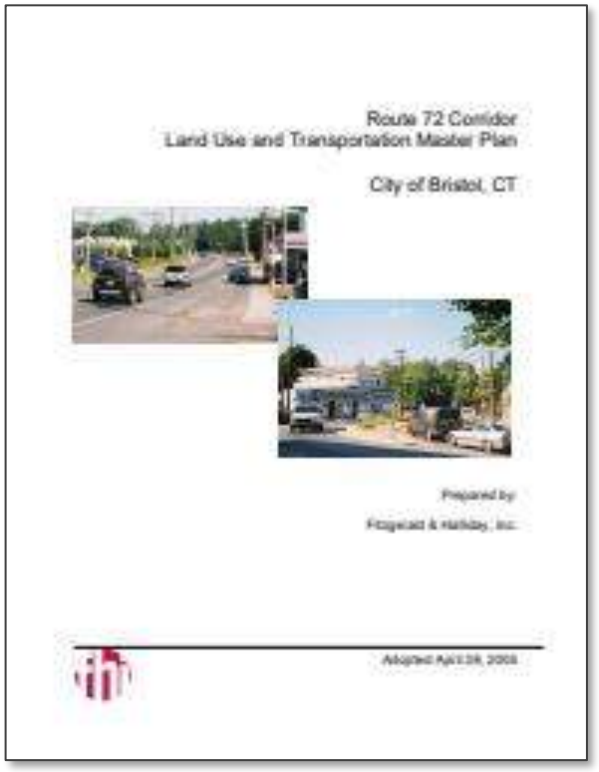
Introduction

Background

Riverside Avenue and Park Street carry portions of State Route 72 in the City of Bristol. Route 72 is an important east-west arterial between New Britain and Harwinton, serving Bristol and surrounding communities. But for Bristol, Riverside Avenue and Park Street are also primary corridors serving the Downtown area. The City has initiated the *Streetscape Study and Design Concepts, Riverside Avenue and Divinity Street/Park Street* ("Improvement Study") to explore potential design strategies that would achieve safety and aesthetic improvements of these important Downtown gateways.



The Improvement Study is undertaken as an implementation step following the vision and goals outlined in the *Route 72 Corridor Land Use and Transportation Master Plan.* A large part of the Master Plan's "Corridor Vision" is specific to Riverside Avenue and has the following objectives:

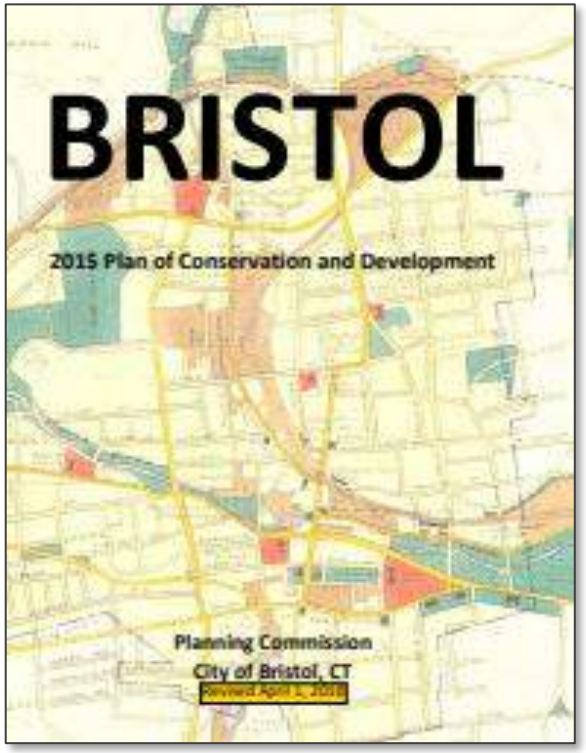
- Improve the aesthetics of Riverside Avenue as a gateway to Downtown Bristol.
- Provide a connected, cohesive system of sidewalks.
- Strengthen the linkage between Riverside Avenue and Memorial Boulevard Park.
- Improve traffic flow along Riverside Avenue and into Downtown Bristol.
- Improve public access to the Pequabuck River.
- Utilize access management along Riverside Avenue to limit the number, design, and locations of driveways.
- Install directional and signature/logo signage.

Additional supporting guidance is provided in the City's *2015 Plan of Conservation and Development (POCD - Revised April 1, 2018)*. Transportation goals in the POCD include:

- Provide for a comprehensive and integrated transportation system to best meet the needs of Bristol residents, businesses, and visitors.
- Establish and maintain a roadway network which provides for the safe, efficient and orderly movement of people and goods and provides for adequate access to places of employment, residential, educational, recreational and commercial activity.
- Promote pedestrian circulation.
- Seek to enhance the opportunities for bicycle circulation and mobility.
- Improve public transit options available in Bristol.

Other pertinent facts noted in the POCD include:

- Riverside Avenue and Park Street are within the higher priority pedestrian zone.
- Riverside Avenue is within a higher transit level of service area.
- Riverside Avenue and Park Street are part of "Enterprise Zone"
- Riverside Avenue is part of "Bioscience Zone"



Purpose

The purpose of this study is to provide concepts for improving the safety, comfort, and visual experience of pedestrians and motorists using Riverside Avenue and Divinity Street/Park Street. The study offers optional streetscaping treatments and visually appealing connectivity; gateway treatments; place making; improved pedestrian facilities and safety; traffic calming; and roadway-safety improvements on Riverside Avenue. Specifically, the concepts:

- recommend improvements that will support safe, comfortable pedestrian activity and beautify the street environments
- recognize the importance of Riverside Avenue and Park Street as entryways to the Downtown area, reinforcing that through unifying streetscape and gateway treatments
- improve roadway safety through roadway geometry improvements and better roadway-edge delineation
- support improved roadway safety and visual quality of the corridors through implementation of access management strategies
- support quality of life, property values, business activity, and development and redevelopment opportunities
- highlight the fact that achieving both pedestrian and motorist safety can be accomplished through a unified improvement plan
- offer realistic improvements that are implementable, fundable, and will meet the design parameters for State approval

Study Area

The Study area consists of two sections of State Route 72: The east section includes Riverside Avenue between the intersection with Blakeslee Street and the intersection with Main Street (0.9 miles); the west section includes a small section of Divinity Street at West Street, and Park Street between Divinity Street and the vicinity of Rockwell Park (0.6 miles).

Study area.

City Precedents

The City has implemented streetscape improvements on Main Street, North Main Street and the western end of Riverside Avenue.

Streetscape on Main Street.

Streetscape on North Main Street near the Riverside Avenue intersection.

Streetscape on North Main Street.

Existing Conditions – Riverside Avenue

This eastern portion of the study area includes Riverside Avenue between Blakeslee Street and Main Street, a distance of approximately 0.9 miles. It runs between the intersection of Riverside Avenue at Blakeslee Street and Downs Street, with Memorial Boulevard and Memorial Boulevard Park immediately adjacent. Memorial Boulevard runs parallel to Riverside Avenue toward Downtown Bristol. Riverside Avenue, also known as State Route 72, is classified as a Principal Urban Arterial. It runs east-west with an average daily traffic (ADT) of between 10,500 and 11,100 vehicles per day (2017). CTDOT projects a 20% growth in traffic volumes by the year 2040.

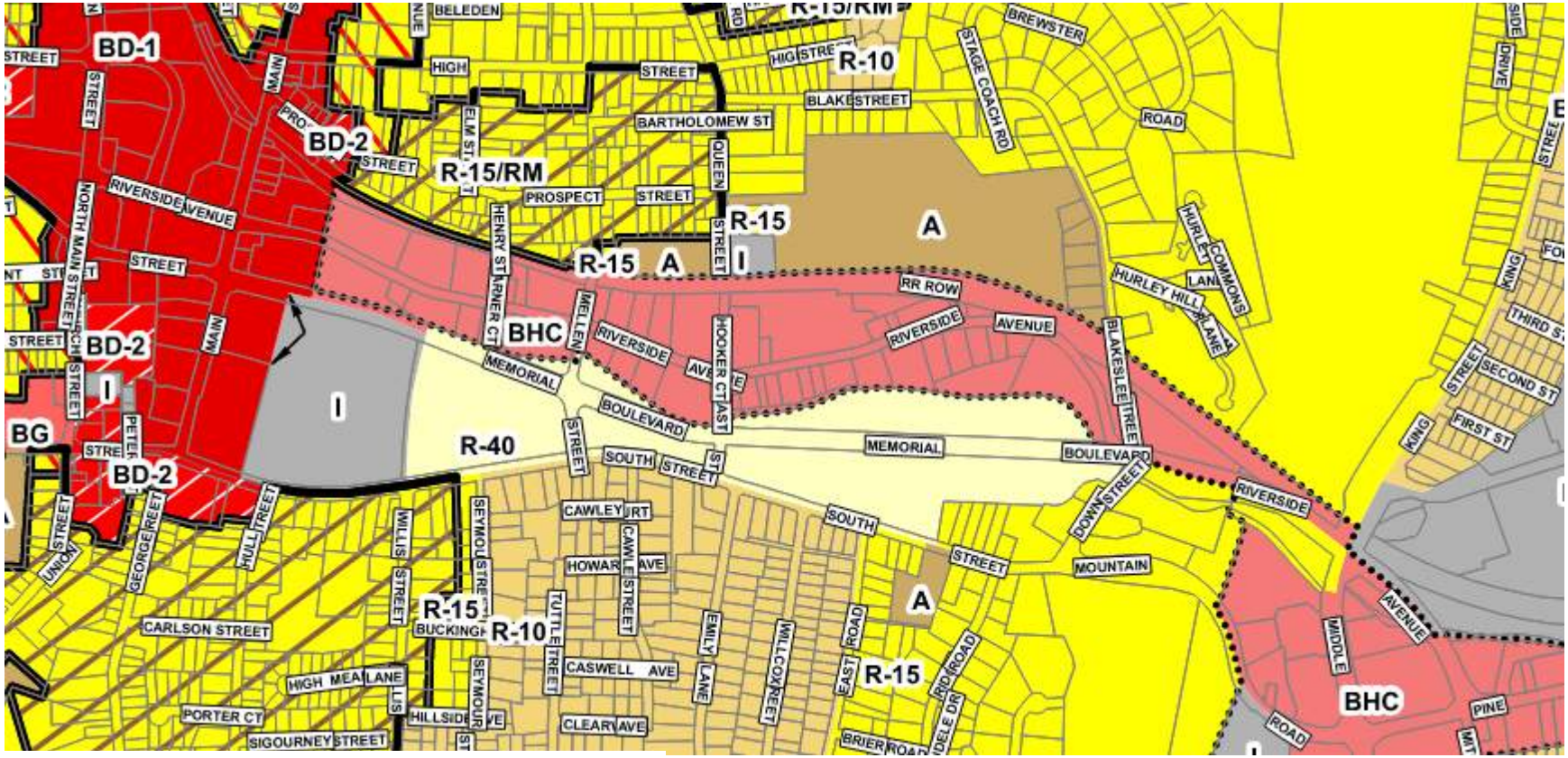
Riverside Avenue has a posted speed limit of 30mph; however, speed data collected in 2008 showed the 85th percentile speeds were in the 34.9 to 36.5 mph range, several miles-per-hour above the posted speed limit. The 85th percentile speed is the speed at or below which 85 percent of the vehicles travel on a road under free-flow traffic conditions, unaffected by slower traffic or poor weather. Fifteen percent of drivers are traveling faster than the 85th percentile speed.

With the exception of the westbound approach at Main Street where there is additional pavement width for turn lanes, Riverside Avenue has 24-foot travelway width, consisting of one lane in each direction, and painted shoulders that are 4 to 6 feet wide, for a total roadway pavement width of approximately 32 - 36 feet.

Typical roadway cross section dimensions of existing Riverside Avenue.

Land Use & Zoning. Riverside Avenue lies within the Route 72 Corridor Business Zone. The land use along Riverside Avenue consists of business, industrial, institutional, residential and infrastructure. There are numerous driveway curb cuts, some of which are very wide, and a large amount of off-street parking and other paved and unpaved areas.

To the north of Riverside Avenue are the railroad line and Federal Hill Historic District residential area. To the south are Memorial Boulevard, Veterans' Memorial Park and residential areas. Nearby, at the Memorial Boulevard/Willis Street intersection, is the under-construction Memorial Boulevard Intradistrict Arts Magnet School.



Zoning map surrounding the project area.

Expansive curb cuts, missing curbs and sidewalks, and no visually-appealing street elements all contribute to a poor-quality streetscape on Riverside Avenue.

Aesthetics and Streetscaping

Nearly all sections of Riverside Avenue have a low-level aesthetic quality and streetscape environment, a stark contrast to nearby Memorial Boulevard and Downtown areas, the only exception being the very western limits at Main Street where streetscape improvements have occurred. There are numerous large curb cuts for driveways and paved areas, with little actual or implied separation between the roadway and adjacent parking areas, giving the appearance of a wide sea of pavement. In fact, in many areas the paved area adjacent to the roadway is so wide, one cannot discern a driveway at all, so ingress and egress is haphazard. In the areas of the roadway that have sidewalks, most have no buffer of any kind between the sidewalk and the roadway. Where there is room for a snow shelf, either pavement or gravel is present, rather than a more aesthetic grass strip or other visually appealing treatment. There are numerous utility poles on both sides of the street, no formal street landscaping, and little greenery adjacent to the right-of-way. The lack of sidewalks in many areas and non-existent pedestrian lighting further contribute to an uninviting, unaccommodating and unattractive street environment.

Pedestrian Accommodation and Safety

The existing sidewalk system on Riverside Avenue is disconnected and poorly developed; there are missing sidewalks along significant portions of the corridor. And of the existing sidewalks, most sections are in disrepair. Utility poles are frequently located in the sidewalk, and most sections lack ADA-compliant curb ramps and other ADA-conforming features.

Pedestrian Safety Trends. Nationally, pedestrian fatalities are increasing more than any other type of traffic fatality. Since 2009 the number of pedestrian deaths has increased by 53%, while all other traffic fatalities have increased by only 2%. In Connecticut over the past five years, the state has averaged about 58 pedestrian fatalities annually. Preliminary crash data indicates there were 65 pedestrian fatalities on Connecticut's roadways in 2020. National trends and state data point to the need to improve pedestrian safety.

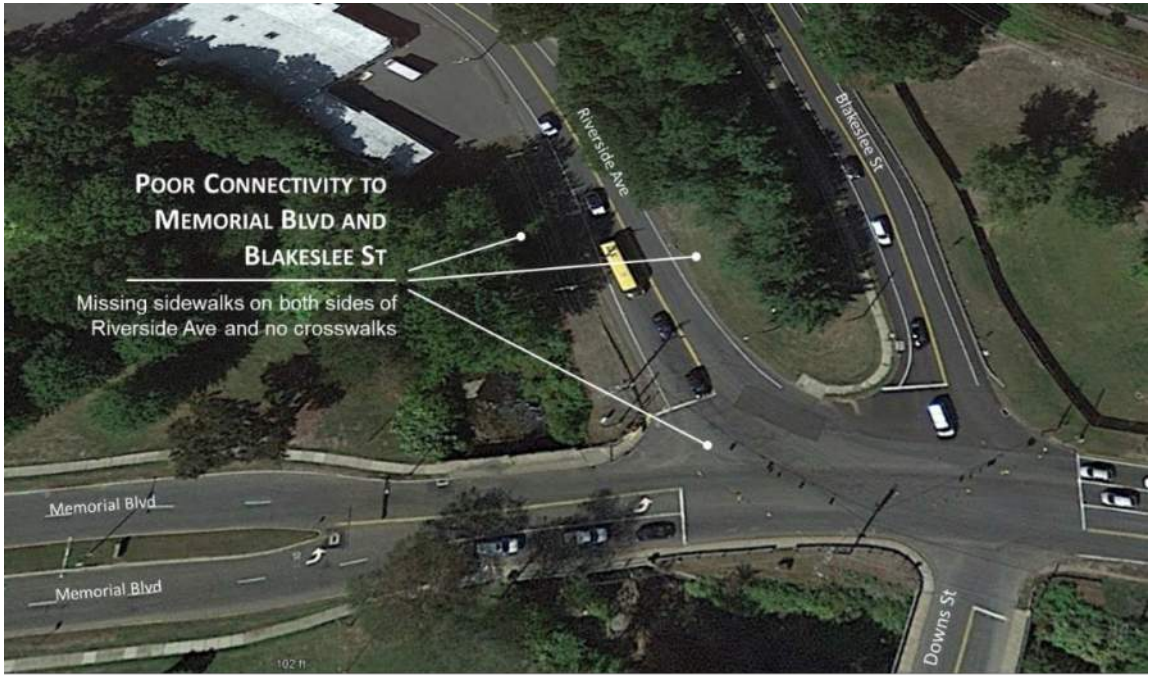
Worn path in area of missing sidewalk.

Where there are sidewalks, most are in fair to poor condition.

There are 4 points of connection between Riverside Avenue and Memorial Boulevard (and destinations further to the south)

1. Eastern connection point: Memorial Boulevard/Blakeslee Street
2. Mid-section connection point: East Street
3. Mid-section connection point: Mellen Street
4. Western connection point: Main Street

Of these 4 connection points, only at the Mellen Street intersection does Riverside Avenue have sidewalks on both sides and crosswalks across Riverside Avenue.



Roadway Safety

Crash History. Crash analysis previously performed by the CT Department of Transportation (CTDOT) indicates that 70 crashes occurred on this section of Riverside Avenue during the three-year period 2016 – 2018. Of particular note, there has been a concentration of crashes in the area of the signalized intersection of Riverside Avenue and Mellen Street. The crash data indicates a total of 23 accidents can be associated with operations at the intersection. Further study of the crashes, traffic signal operation and traffic volumes would provide a more in-depth understanding of what is contributing to the crashes at this location.

Of the 70 total crashes, 15 were "Fixed Object" type crashes, meaning the vehicle left the roadway and hit a fixed object, such as a utility pole, tree, wall, etc. Nationally, collisions between a motor vehicle and a fixed object are the second most common type of crash involving fatalities, and utility poles are the highest-percentage objects struck.

In the subsequent three-year period, 2018 - 2020, there were 59 total crashes. Below is a graphic indicating all of the crashes and their approximate location in that time period. As in the previous three-year period, there was a concentration of crashes at and in the vicinity of the Riverside Avenue/Mellen Street intersection. Again, there was a high number of crashes (17) involving fixed-object impacts; 14 of those crashes involved a single vehicle.

Number of crashes and approximate location on Riverside Avenue (2018 – 2020).

Utility Poles. On Riverside Avenue, there are utility poles on both sides of the roadway for about 80% of the length of the study area, and many are close to the roadway. An engineer from Eversource reported that one pole in particular was hit 6-7 times in less than a 24-month period. As stated above, utility poles pose a roadside risk for fixed-object crashes, especially in areas where the pole is close to the edge of roadway. Eversource has placed yellow reflectors on most of the utility poles; their policy is as follows:

- All utility poles located within three feet of the edge of the traveled way (edge of pavement), (except for decorative lighting poles, fiberglass, or metal poles)
- Any pole that has been previously hit by a motor vehicle, or any replacement pole at a pole-accident site
- Poles where it would be an aid to motorists by improving the visibility of the pole at night
- Poles located on curved sections of roadway and poles located at intersections and forks in the road

Yellow reflectors on utility poles on Riverside Avenue.

Costs associated with utility poles that would have to be relocated to avoid conflict with roadway or sidewalk improvements could be significant, and funding participation in those costs vary, depending on the project particulars. For projects on State roads (as with Riverside Avenue and Park Street), it is common for private utility companies to bear 50% of the relocation costs and the other 50% covered by the project funding source. Relocating the utility poles solely for safer roadside conditions would not only be an expensive proposition, but property rights might be needed given the limited right-of-way. However, there are design strategies that can be implemented to reduce fixed-object type crashes and achieve other safety improvements without having to move the utility poles.

Poor Roadway Edge Delineation. The poor delineation of the roadway edge due to the lack of curbing and presence of extremely wide driveways is likely a contributing factor in the run-off-the-road crashes. Curbing in urban environments functions to help delineate the edge of the roadway, giving drivers positive guidance along the roadway's right edge, especially important at night time or during inclement weather. On many sections of Riverside Avenue, it is especially difficult to distinguish the travelway from adjacent parking areas.

Another example of missing sidewalks, wide driveways, and poor roadway edge delineation.

While the history of fixed-object crashes is indicative of concerning roadside safety, there have also been a variety of other types of crashes on Riverside Avenue, including angle, front-to-rear, and front-to-front, most notably in the vicinity of the Mellen Street intersection and the stretch between Mellen Street and East Street. It's common to have crashes, such as front-to-rear type, at signalized intersections, but the number of crashes near Mellen Street are relatively high. Again, contributing roadway conditions for many of the crashes is likely the poor delineation of the edge-of-travelway and the number and excessively wide curb cuts. Because of the poorly defined access and egress points, there may be circumstances in which drivers are either confused where to turn into a driveway or don't expect to encounter a turning vehicle. Driver confusion is often the cause of crashes.

Addressing roadway safety will likely be an important consideration from the perspective of CTDOT, as the agency has noted the troubling pattern of crashes on Riverside. A City-supported CTDOT project to reconfigure the Riverside Avenue/Memorial Blvd/Blakeslee Street/Downs Street intersection, which will encourage more traffic to use Riverside Avenue instead of Memorial Boulevard, may hinge on first addressing the safety concerns on Riverside Avenue.

Design Concepts - Riverside Avenue

The concepts presented for Riverside Avenue reflect the study's Purpose and translate the project goals into design strategies and specific recommendations.

Design Goals

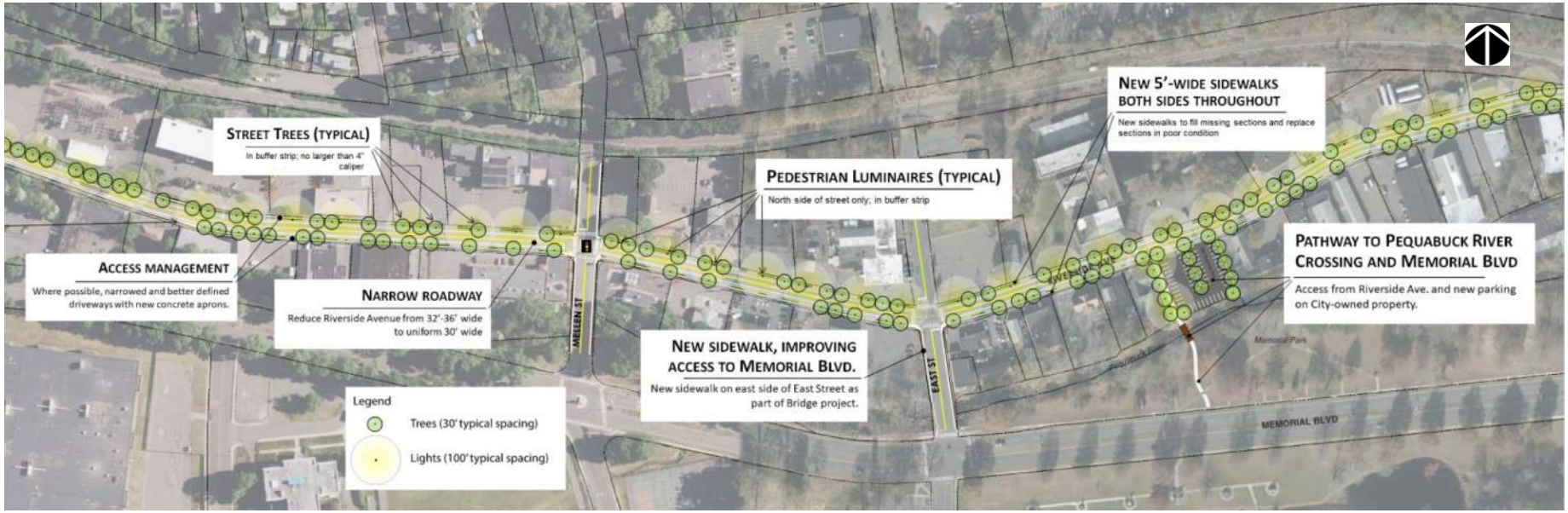
- Develop design concepts that are consistent with the *Route 72 Corridor Land Use and Transportation Master Plan* and the *Plan of Conservation and Development*
- Promote safe, pedestrian-friendly corridor environment
- Beautify the street environment
- Improve roadway safety
- Implement traffic calming strategies
- Create a gateway to Downtown
- Support development and redevelopment

The proposed design concepts for Riverside Avenue have multiple aspects. They address all of the project goals through design elements that have overlapping purposes.

- Filling in the missing gaps with new sidewalks and curbing will not only improve the pedestrian environment (comfort, safety, convenience and accessibility), combined with reduced driveway widths, they will contribute to a safer roadway by creating a much more visible delineation of the roadway's edge.
- Grass or brick-paved strips between the roadway and sidewalks will not only provide a more attractive street, it will create a safer environment for pedestrians by making a stronger separation between the pedestrian area and the motor vehicle area.
- A traffic-calming effect will be achieved by narrowing the roadway's width from 32-36 ft. to a uniform 30 ft. and by adding vertical elements such as the pedestrian luminaires and street trees.

The streetscape elements in the concepts include the following:

- New curbing, concrete sidewalks, and grass or brick-paved buffer strips
- Concrete driveway aprons
- Street trees
- Ornamental pedestrian lighting on north side of Riverside Avenue
- Signage and signature features to enhance Riverside Avenue's identity and create a gateway to Downtown



Riverside Avenue improvements.

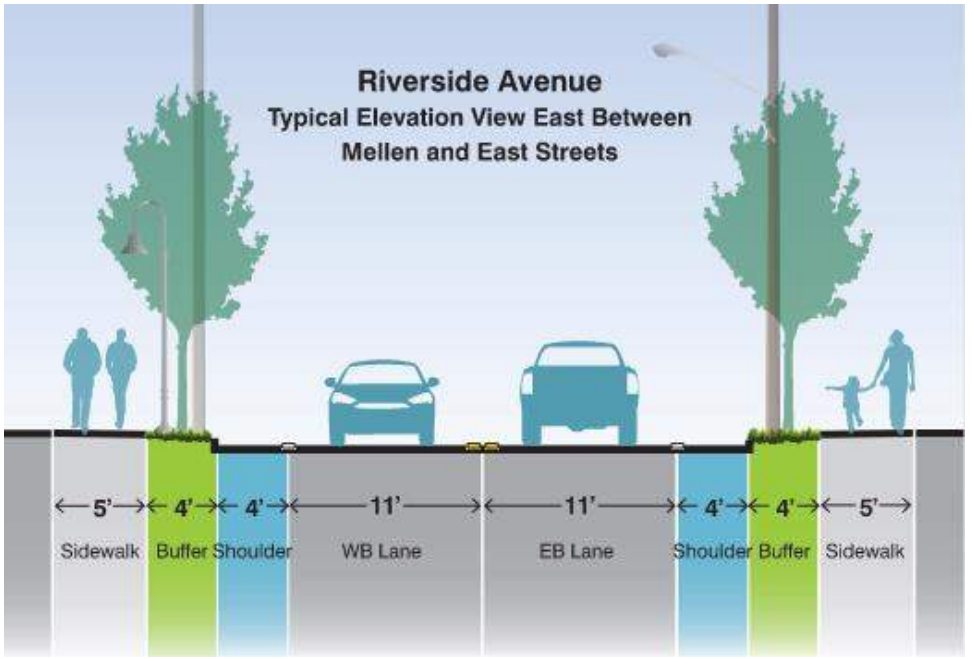
The concept includes new sidewalks throughout the corridor will fill missing sections and replace existing sections that are in poor condition. Concrete sidewalks would typically be 5 ft. wide, though they would be narrower where constraints limit available width, such as near the western end, where 4-ft. wide sidewalks may be all that might fit. A retaining wall would likely be required to fit in 5-ft.-wide sidewalks above the steep slop along the river.

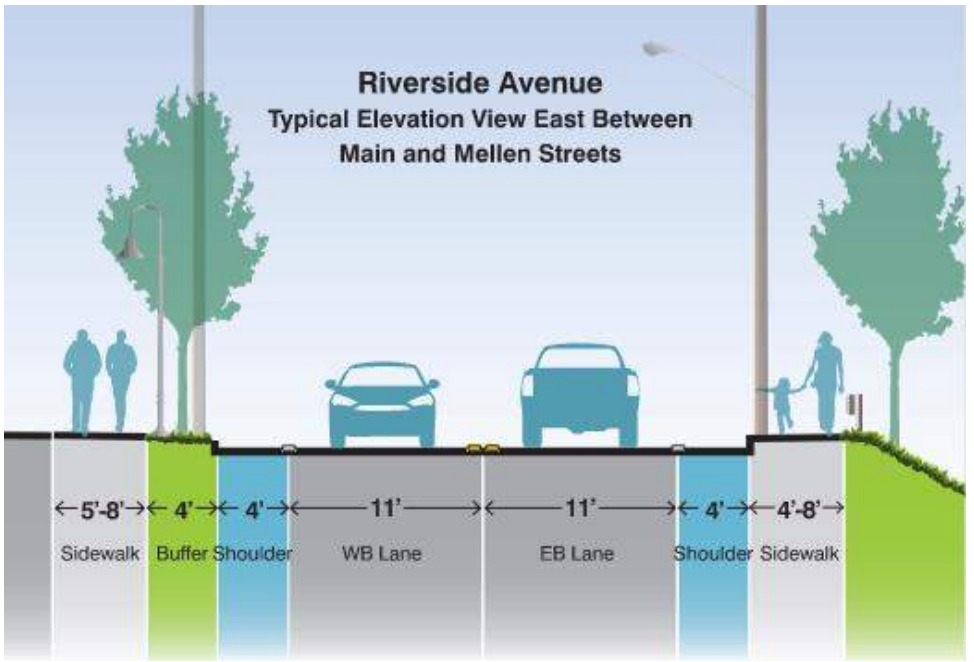
New curbing, along with narrower driveways, would improve safety by better defining the roadway's edge. In some areas, because of the proximity of buildings to the roadway, new sidewalks may have to be constructed flush with existing terrain to avoid sloping problems on private property.

The paved width of Riverside Avenue would be reduced from 32' – 36' in width to a uniform 30'. Travel lanes would be reduced from 12' to 11', and the shoulders would be a uniform 4' in width. These dimensions conform to CTDOT minimum design standards for principal urban arterials. The narrower roadway and the curbing lining the edges will have a traffic calming effect, as drivers will be in a tighter, better defined travelway.

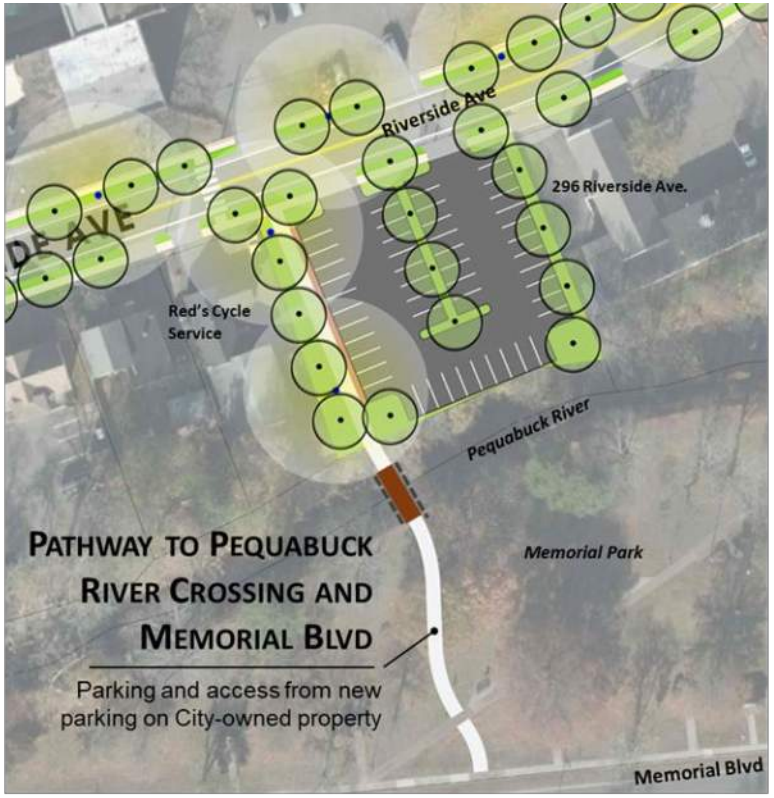
A grass or brick-paver buffer strip would provide separation between the travelway and the pedestrian space, increasing comfort for pedestrians. Opportunities may exist to have grass-, landscaped-, or paver-strips on backside of sidewalks to separate the pedestrian space from parking areas.

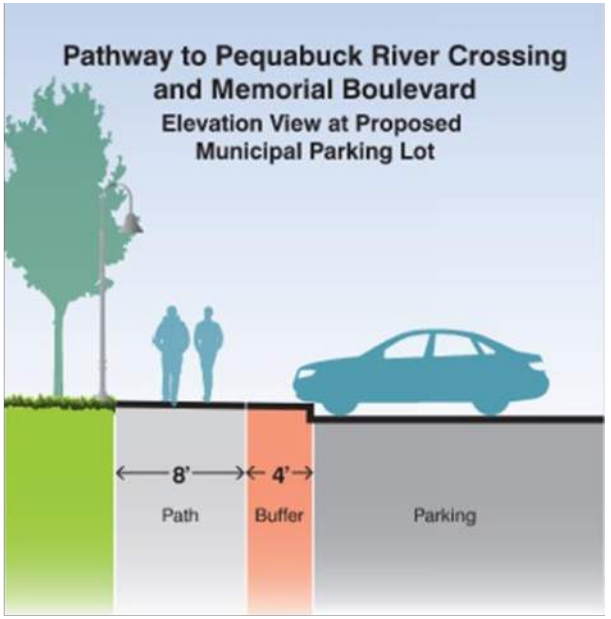
Decorative luminaires would line the roadway on the north side; the amount and location of utility poles on the south side interfere with proper location and spacing of luminaires on that side of Riverside Avenue.





A new pedestrian access to the Pequabuck River could be constructed through the City-owned lot at 296 Riverside Avenue. This lot's use may be converted to parking and possibly public recreation. A pedestrian bridge could be constructed over the Pequabuck River to connect to Memorial Park and Memorial Boulevard.





Rights-of-Way

At the conceptual level, it appears the only potential right-of-way impacts would be minor regrading of slopes and driveways to blend the work onto private properties. Rights-to-slope and right-to-regrade driveways are non-compensable under Federal and State processes. If during design any potential slope easement or sliver acquisition of land along the frontages is discovered, efforts can be made to adjust the design to avoid or minimize the impact, either through realigning or narrowing the sidewalk if feasible and prudent. One area that may be subject to sloping is near the west end near Main Street where the new proposed sidewalk on the south side of the street is very constrained by the steep slope down to the river.

Street Trees

Street trees would be selected in accordance with their proposed location. Tree caliper should not exceed 4" when mature to avoid roadside fixed-object concerns. Street trees planted should be a species identified as suitable for under-wire planting by Eversource, as all recommended tree locations on Riverside Avenue would be below utility lines. Trees recommended for Riverside Avenue include:

- Syringa reticulata (Japanese tree lilac)
- Chionanthus virginicus (Fringe tree)
- Prunus Sargentii (Sargent's cherry).

At least two different tree species should be used to avoid a monoculture that would be susceptible to total loss should infestation or disease become a threat.

All trees to be planted at 2" to 2.5" caliper.

Typical installed cost: $600 per tree

Tree Characteristics:

Syringa reticulata (Japanese tree lilac)

- Mature height: 20-30 ft
- Mature width: 15-25 ft
- Light exposure: full sun
- Identified by Eversource as a suitable under-wire tree

Chionanthus virginicus (White Fringetree)

- Mature height: 12-20 ft
- Mature width: 12-20 ft
- Light exposure: full sun or partial sun
- Identified by Eversource as a suitable under-wire tree

Syringa reticulata

Chionanthus virginicus

Prunus sargenttii (Sargent's cherry)

- Mature height: 25-40 ft
- Mature width: 25-40 ft
- Light exposure: full sun or partial sun
- Identified by Eversource as a suitable under-wire tree

Prunus sargenttii

Street Lighting

New light poles and fixtures would be ornamental and intended to provide additional lighting in the pedestrian realm and to link Riverside Avenue aesthetically with other areas with similar amenities such as Hope Street and Main Street. Poles and fixtures would match existing poles and fixtures in those areas. Poles to be 12', 14', or 16' high. Lights to be illuminated by LED fixtures. Poles and fixtures to be black in color.

Banner arms on the poles will not be used in areas where the arms would be vulnerable to being hit by trucks, such as near loading docks.

Approximate installed cost: $3,000 per unit

Recommended luminaire for Riverside Avenue. Matches luminaires on Hope Street and other Downtown streets.

Pavement Materials

This discussion applies to both Riverside Avenue and Divinity Street/Park Street.

The following pavement materials may be considered for use between sidewalk and curb or as a crosswalk treatment in select areas:

- clay brick pavers
- concrete unit pavers
- stamped asphalt with thermoplastic overlay
- stamped concrete

On State roads, CTDOT will not approve unit pavers within the roadway. CTDOT will allow:

- stamped/colored asphalt (within roadways)
- stamped/colored concrete off the roadway or in raised or flush medians protected with curbing
- pavers in sidewalks.

Granite curbing is recommended to protect against chipping decorative pavements. State treatment examples include Route 4 in Farmington and the recently-completed streetscape project on Route 44 in Hartford.

Clay brick pavers are highly resistant to freeze/thaw damage and salt damage. They present excellent color and surface quality retention. Multiple color options, brick sizes, and brick edge details are available. Manufacturers include Belden Brick Company, Pine Hall Brick, and others.

Clay Brick Pavers: Typical installed cost: $20 per sf.

Example clay brick paver: Belden Admiral Full Range Paver.

Concrete unit pavers are lower in material cost than clay brick pavers. They are available in multiple shapes, sizes, surface textures, and colors. Concrete unit pavers are more susceptible to free/thaw damage than clay pavers and are highly susceptible to salt damage. Manufactures include Unilock, Nicolock, Techo-Blo and others.

Typical installed cost $15 per sf.

Example concrete unit paver: Holland paver, rustic red color.

Stamped asphalt is a technique that can be applied to fresh asphalt or existing asphalt provided surface condition is good. The product is installed by applying a colored thermoplastic overlay to the asphalt and heating the asphalt to a plastic state and pressing a mold into the surface to establish a textured pattern. The material is highly resistant to freeze/thaw damage and salt damage. This treatment is most commonly used for crosswalks but may also be used in areas such as between curb and sidewalk. The most common supplier is Ennis Flint.

Typical installed cost: $5 per sf on existing asphalt, $10 per sf including new asphalt.

Example stamped asphalt with thermoplastic overlay.

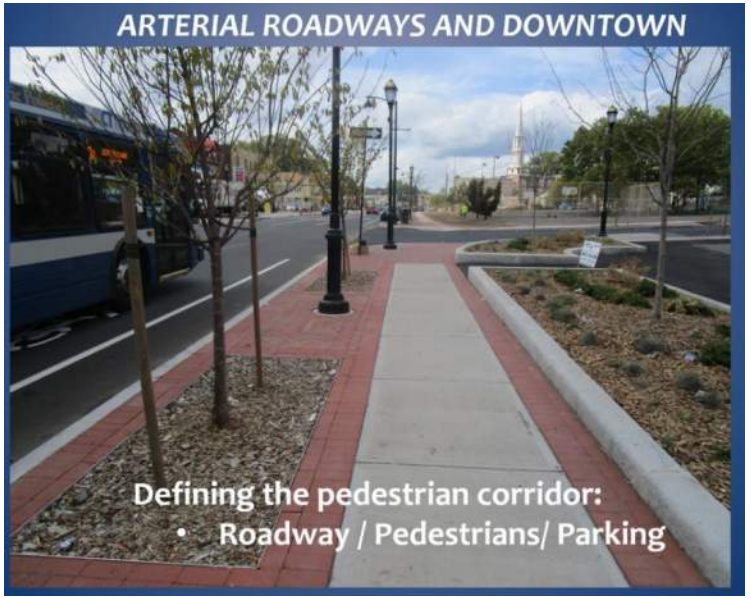
Stamped concrete uses pigment added to the concrete or applied on the surface in addition to a surface mold and surface hardeners and sealers. Concrete is otherwise prepared and specified in accordance with typical concrete sidewalks and surfaces. Stamped concrete is more susceptible to free/thaw damage than stamped asphalt and is highly susceptible to salt damage once surface sealers wear away. A common supplier of required materials is Euclid Chemical via the Increte product line.

Typical installed cost $15 per sf.

Example: stamped concrete.

Example Projects on State Routes

Example: Stamped and colored asphalt on Route 4, Farmington.



Excerpt from CTDOT presentation on Complete Streets.

Example: Brick pavers in sidewalks as part of Route 44 pedestrian safety/streetscape project in Hartford.

Example: Roadway, access management, and streetscape improvements Route 31, Coventry.

Example: Streetscape improvements Route 44, Winsted.

Gateway Treatments

This discussion pertains to both Riverside Avenue and Park Street:

The streetscape concepts presented in this study provide the visual elements that would be cues to drivers and pedestrians that the length of the roadways are gateways to Downtown. The pattern of street trees and luminaires would provide a visual rhythm and define the space of the streets as portals leading to Downtown.

Example gateway columns: Hyde Park in London and Trumbull Street in Hartford.

Monuments at entry points could draw even greater attention to the importance of the streets and create unique identities for each of the corridors. Multiple gateway treatments could be considered for use at key locations. Brick or stone columns are commonly used as landmarks at the entrance of a walkway or roadway as a means to emphasize the arrival at the opening or beginning of a new location. Street signage may also be presented on columns in the form of a plaque for pedestrian viewing. Additionally, the columns present sufficient space for plaques with relevant historical information.

Where sufficient space allows, monumental columns should be accompanied by landscaping such as annual and perennial flowers and small flowering bushes that would not obscure the columns.

Typical installed cost: $5,000-$10,000 per column

Potential locations within the project area include Park Street at Divinity Street and Riverside Avenue at Memorial Drive.

Potential site for gateway treatment: Riverside Avenue at Memorial Blvd.

Potential view on Riverside Avenue.

Existing view on Riverside Avenue.

The buffer strip between roadway and sidewalks could be grass or brick-paver, or a combination, though grass would be the far less expensive alternative.

Potential view on Riverside Avenue.

Existing view on Riverside Avenue.

Existing Conditions – Divinity Street/Park Street

This portion of Route 72 is approximately 0.6 miles long and is the western portion of the project study area. It begins at the West Street (Route 69)/School Street (Route 72) intersection and ends at the area of Rockwell Park. Route 72 here is also known as Divinity Street from West Street until it turns into Park Street to the west. It is classified as a Principal Urban Arterial, running in an east-west direction. Traffic volumes are high: From 2018 data, it has an ADT of 15,800 vpd between West Street and Park Street; on Park Street, it has an ADT of 9,400 vpd. The posted speed limit in the eastern portion of this stretch is 25 mph and 30 mph in the western portion. No travel-speed data were available for review, though it would not be surprising if actual travel speeds routinely exceed the posted speed limits, given it's an important east-west arterial and the high volume of vehicles.

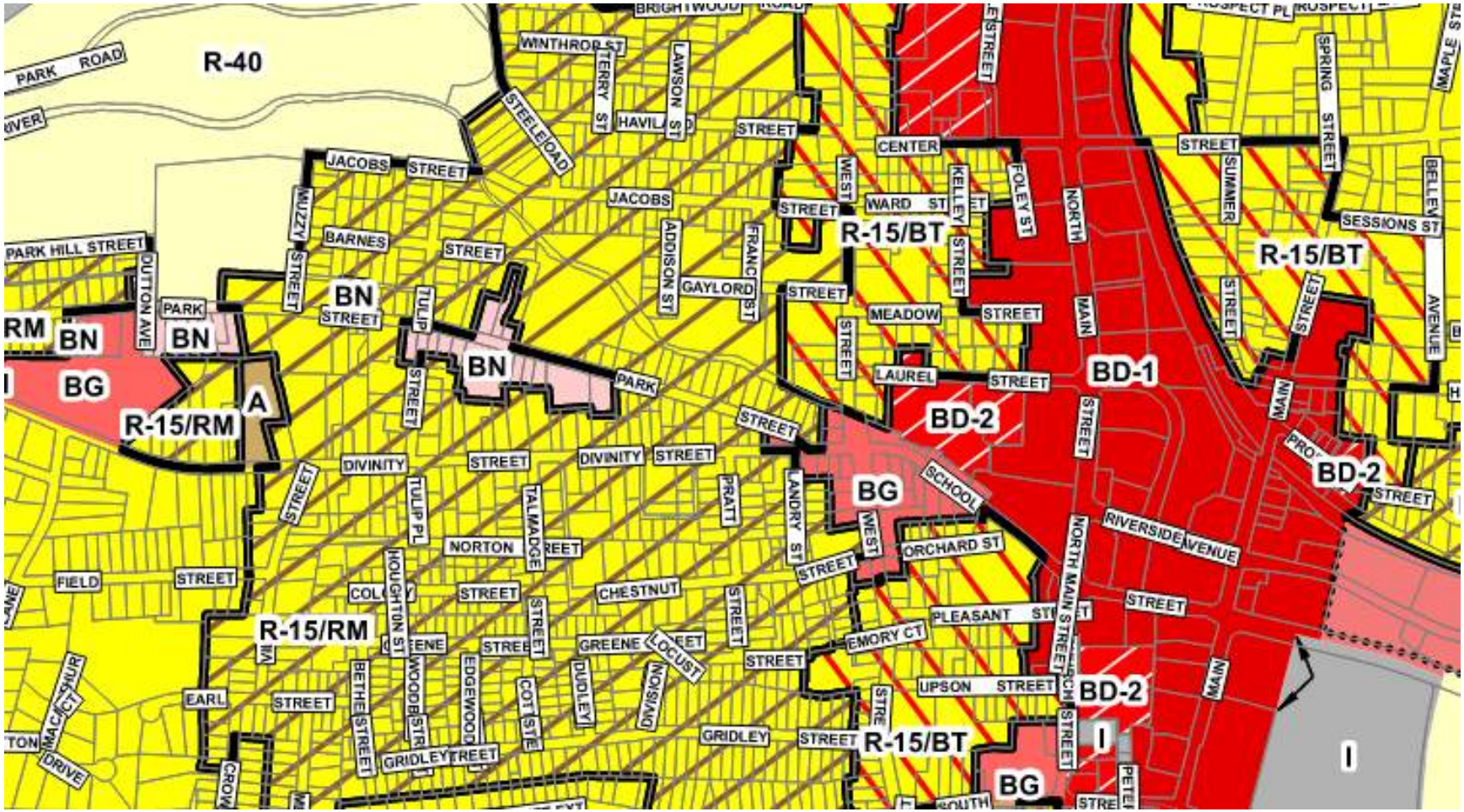
It's often a strain on local communities when State arterials run through downtowns or neighborhood areas, as the high through-put traffic volumes and speeds are not conducive to a comfortable and inviting street environment. Still, there are opportunities along Park street to improve its aesthetics and calm traffic.

Typical roadway width on Park Street is about 26 feet, consisting of two 11-foot travel lanes and 2-foot painted shoulders. There are 4 – 5 ft.-wide concrete sidewalks present along both sides of the street the entire length between West Street and Rockwell Park.

Characteristics of Urban Arterials

- Serve major activity centers, highest traffic volume corridors and longest trip demands
- Carry high proportion of total urban travel on minimum of mileage
- Interconnect and provide continuity for major rural corridors to accommodate trips entering and leaving urban area and movements through the urban area
- Serve demand for intra-area travel between the central business district and outlying residential areas

Land Use & Zoning. The majority of Park Street through the study area is within the R-15 Single-Family Residential Zone. However, a portion of the study area is also within the BN Neighborhood Business Zone, highlighting the critical importance of pedestrian accessibility and connection between the residential properties and local businesses. The area is part of a Mixed Residential Overlay Zone. At the western limits of the study area is historic Rockwell Park and Muzzy field.



Zoning map surrounding the project area.

Aesthetics and Streetscaping

Though not as severe as on Riverside Avenue, Park Street has a relatively low-quality streetscape, some areas more so than others. Today, there is some aesthetic treatment to the sidewalks on Divinity Street and a short stretch of Park Street at its approach, which includes a strip of brick pavers along the sidewalk edge. This is a streetscaping treatment used on other Downtown streetscaping efforts; however, there are no pedestrian luminaires, street trees, etc. Beyond this eastern section, there are no other specific streetscaping elements along Park Street, though grass buffers strips fronting the residential properties do improve the aesthetics in those areas.

Residential and commercial properties along Park Street

An area of low-quality streetscape on Park Street.

Park Street has 4 – 5-foot-wide concrete sidewalks and grass buffer strips, but typically no other streetscaping elements.

A nice-quality residential streetscape example (High Street).

Perhaps an ideal residential streetscape.

Near Muzzy Street, replacement sidewalks have been constructed, grass has replaced pavement on either side of the sidewalk, and the parking lot has been reconstructed. This work improves both the functionality and aesthetics at that location.

There are utility poles primarily on the south side of Park Street within the buffer strip. As on Divinity Street, there are no pedestrian luminaires; street lighting is via utility pole-mounted luminaires.

At the eastbound approach to Divinity Street, brick-paver edge on Park Street, but no other aesthetic streetscaping features.

Pedestrian Accommodation and Safety

The existing sidewalk system is well developed on Divinity and Park Streets and in the surrounding residential areas. There is one mid-block crosswalk at the historic Clara T. O'Connell School apartment building. No specific accommodations for bicyclists are present. While an in-depth ADA review has not been performed, it is noted that some sidewalk ramps lack tactile warning surfaces.

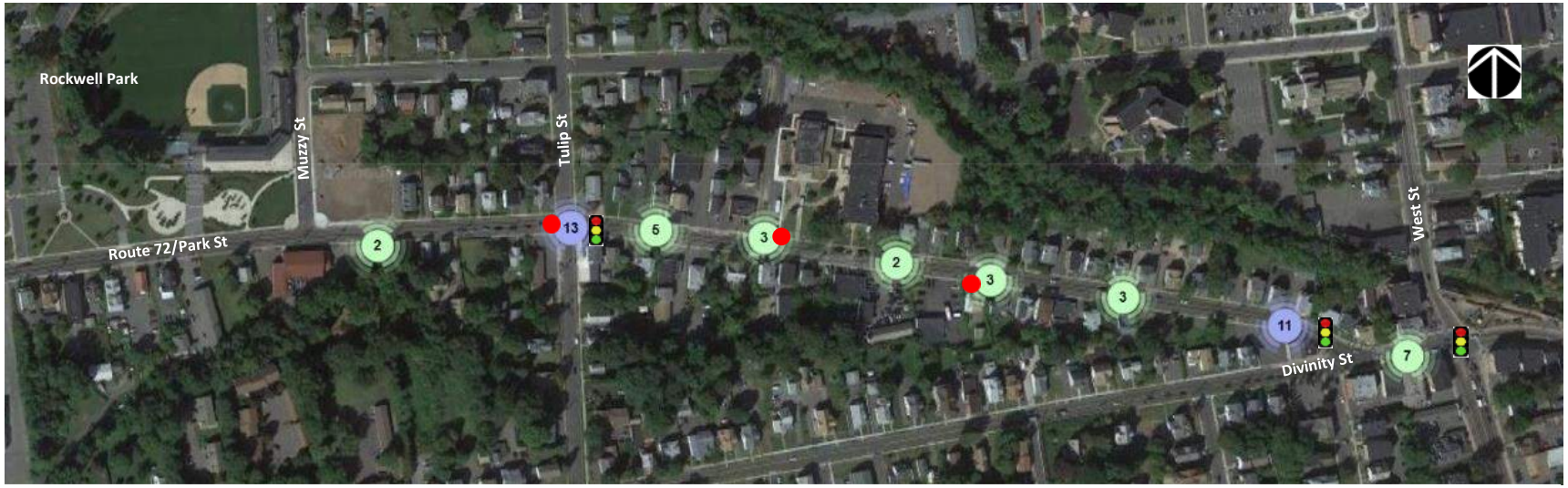
A review of the crash data for the three-year period 2018-2020 indicates that there were three crashes involving struck pedestrians: One was in the crosswalk crossing Park Street at the Tulip Street intersection; the second was struck on the edge of the roadway near Skytop Collision Center; and the third occurred in the sidewalk across a driveway near Sam's Food Stores.

New sidewalks at the Park Street/Muzzy Street intersection

Park Street is primarily a residential street that also carries heavily-travelled State Route 72. The existing sidewalk system provides access to Downtown businesses, employment centers, and important services. Rockwell Park and Muzzy Field are destinations within the Study area that are well served by the sidewalk system. It's important to maintain and enhance pedestrian accommodation, comfort, and safety along Divinity and Park Streets.

Roadway Safety

Crash History. Review of crash data indicates that 49 crashes occurred on the Divinity/Park Streets section during the three-year period 2018–2020. More than half the crashes occurred at or near the three signalized intersections at Tulip, Divinity, and West Streets. The most numerous crash type (18) was front-to-rear crashes, a common type of crash at signalized intersections. There were 6 angle-type crashes, 4 sideswipe crashes, and 3 fixed-object crashes. As noted above, three crashes in the corridor involved pedestrians.



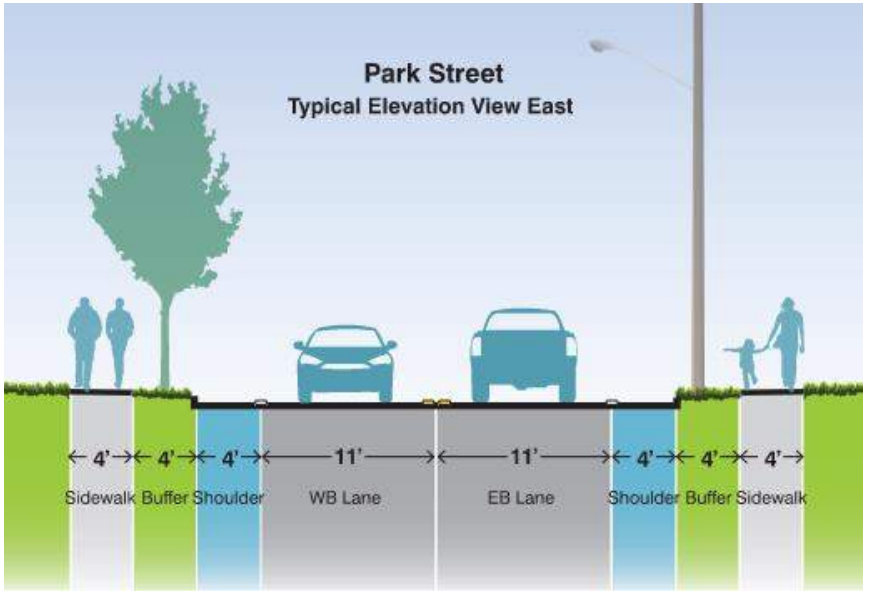
Number of crashes and approximate locations on Divinity/Park Streets (2018-2020). Red dots indicate locations of struck pedestrians.

Design Concepts – Divinity Street/Park Street

The concepts presented for Park Street reflect the study's Purpose and translate the project goals into design strategies and specific recommendations.

Design Goals

- Develop design concepts that are consistent with the *Plan of Conservation and Development* and the needs of the specific needs of the corridor
- Promote safe, pedestrian-friendly corridor environment
- Beautify the street environment
- Improve roadway safety through traffic calming
- Create a gateway to Downtown
- Support neighborhood quality-of-life and local businesses



The proposed design concepts for Divinity/Park Streets have multiple aspects. They address all of the project goals through design elements that have overlapping purposes.

- Brick-paved areas at targeted areas, such as at the signalized intersections, would provide an attractive streetscape element and reinforce that through unifying streetscape and gateway treatments into Downtown.
- Street trees planted typically at minimum 30-ft. spacing to soften and beautify the street corridor in a manner consistent with a primarily residential neighborhood. The street trees will also serve as a gateway treatment into Downtown.
- Attractive pedestrian lighting in key locations to further cue drivers that the corridor is an active pedestrian environment.
- Reduction in size of some driveway openings will further define the roadway's edge; increasing length of buffer strips will make for a more attractive street.

- Installation of radar speed-awareness signs for traffic calming purposes. They are used to reduce traffic speeds by making drivers aware of how fast they are moving relative to the speed limit and inducing them to adjust their speed accordingly. Speed awareness signs have been installed on Route 4 in Burlington and Route 7 in Kent.

Radar speed awareness sign.

Streetscape Elements

The streetscape elements in the concepts include the following:

- Ornamental pedestrian lighting and special paving/hardscape areas at intersections
- Concrete driveway aprons
- Street trees
- Signature features to enhance Riverside Avenue's identity and create a gateway to Downtown

Park Street/Divinity Street improvements.

RRFBs at mid-block cross walks for improved pedestrian safety. They can be activated by pedestrians manually by push button or passively by a pedestrian detection system (e.g. video or infrared).

Rights-of-Way

At the conceptual level, it appears the only potential right-of-way impacts would be minor regrading of slopes and driveways to blend the work onto private properties. Rights-to-slope and right-to-regrade driveways are non-compensable under Federal and State processes. If during design any potential slope easement or sliver acquisition of land along the frontages is discovered, efforts can be made to adjust the design to avoid or minimize the impact, either through realigning or narrowing the sidewalk if feasible and prudent.

Street Trees

Recommended locations for tree planting on Park Street are all on the north side to avoid conflict with utility lines on south side. On the north side, street trees would not be below or in conflict with utility lines, therefore, in addition to the trees recommended on Riverside Avenue, somewhat taller tree species may be considered for Park Street. Tree caliper should not exceed 4" when mature to avoid roadside fixed-object concerns.

Acer freemanii (Freeman maple)

- Mature height: 40-60 ft
- Mature width: 20-40 ft
- Light exposure: full sun

Acer freemanii

Recommended luminaire for Park Street/Divinity Street: Match luminaires at Rockwell Park.

Street Lighting

New light poles and fixtures would be ornamental and intended to provide additional lighting in the pedestrian realm and to link Park Street/Divinity Street aesthetically with other areas with similar amenities such as on Rockwell Park. Poles and fixtures would match existing poles and fixtures in those areas. Poles to be 12', 14', or 16' high. Lights to be illuminated by LED fixtures. Poles and fixtures to be black in color.

Alternatively, light poles and fixtures could be similar to those in Downtown areas and as proposed on Riverside Avenue.

Approximate installed cost: $3,000 per unit

Potential view on Park Street at the Tulip Street intersection: Street trees, use of brick pavers, stamped/colored asphalt, and Rockwell Park-style luminaires.

Existing view.

Potential view showing Downtown-style luminaires.

Potential view on Park Street: Street trees (Freeman maple street trees on north side).

Existing view.

Potential view in autumn.

Estimated Costs and Potential Funding

Riverside Avenue

Base Estimate: $2.4 to $2.7 Million (Contract Items, Contingencies, and Incidentals)

The Base Concept for Riverside Avenue includes new concrete curbing, grass/landscaped buffer and new concrete sidewalks and driveway aprons. Also included are approximately 150 street trees and lighting along the north side of the street (44 lights). The costs are based on CTDOT estimating guidelines and include a 10% - 25% contingency factor and incidentals (construction engineering and inspection costs) at 25% of the contract items cost. Inflation and ROW costs have not been estimated.

The density of some construction items, such as lighting and trees, can be reduced to provide moderate cost savings. Other items, such as brick paver crosswalks at the Mellen Street and East Street intersections or stamped concrete finishes on the buffer areas, can be added at additional cost (see table below).

Additional Streetscape Features as Add-Alternates	
Brick Paver Crosswalks	$40,000 per intersection
Stamped Concrete Buffer	$100 per linear foot
Additional Light Fixtures	$3,500 per fixture
Additional Street Trees	$350 per tree

Divinity Street/Park Street

Base Estimate: $650,000 to $700,000 (Contract Items, Contingencies, and Incidentals)

The Base Concept for the Park Street improvements includes concrete driveway aprons and the construction of concrete paver crosswalks at the Tulip Street intersection and at three mid-block crossings along the study corridor. This base estimate also includes 75 street trees and 12 decorative light fixtures. Milling and overlaying the roadway's pavement is not included. The costs are based on CTDOT estimating guidelines and include a 10% - 25% contingency factor and incidentals (construction engineering and inspection costs) at 25% of the contract items cost. Inflation and ROW costs have not been estimated.

Alternative improvements that may be considered at additional cost are: new concrete curbing along Park Street to replace the existing bituminous curbing, and stamped concrete or brick pavers within the existing buffer areas near Divinity Street at the east end and Muzzy Street at the west end of the project limits (see table above). Similarly, some streetscape elements, such as street trees and light fixtures, can be reduced from the base estimate for cost savings.

Utility Relocations (Park Street and Riverside Avenue)

Along Park Street, overhead utilities are mostly located along the south side of the street with poles approximately every 150 feet within the buffer strip between the curb and sidewalk. The sidewalk and buffer strip will not be affected by the proposed work (street trees are only proposed in the north side of the road), and therefore, no utility impacts are anticipated. No underground utility impacts would be anticipated.

Within the Riverside Avenue portion of the study, there are significant overhead utilities on both the north and south side of the street and underground utilities within the roadway that may be affected. Based on available information and site visits, it appears many existing poles are between one to three feet from the existing edge of pavement. This would put them near the back of the proposed landscaped buffer strip. Every effort should be made to avoid relocation of these poles, where feasible. In some cases, the proposed sidewalk may be able to bend around the poles, or where that is not possible, at least 3 feet of sidewalk should be clear on either side of the pole for ADA-compliance. There is the potential for impacts to underground gas and water facilities within Riverside Avenue, where new curb is to be installed. Additional utility coordination will be necessary during the design phase.

Per State of Connecticut statute, for projects on State roads (as with Riverside Avenue and Park Street), private utility companies bear 50% of the relocation costs, excluding betterments, and the other 50% covered by the project funding source.

Funding

There are several potential funding sources the City might pursue to fund design engineering and construction. Since the project has multiple goals (i.e. streetscape improvements, pedestrian accommodation and safety, and roadway safety), various funding sources may be able to be used. Most funding sources are administered through CTDOT.

- **TA Funding.** The is a set-aside of the Federal Surface Transportation Block Grant (STBG) program funding for transportation alternatives (TA). These Federal funds include all projects and activities that were previously eligible under the Transportation Alternatives Program (TAP), encompassing a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, safe routes to school projects, and others.

  TA funding is administered by CTDOT. Eligible project expenses are reimbursable 80% by the FHWA, with the City's share at 20%. All project phases are eligible for Federal participation: Preliminary Engineering, (i.e., design), Rights-of-way, and Construction. Cost increases are reviewed by CTDOT. Right-of-way acquisitions are typically performed by the State, while construction contracts are administered by the municipality.

  CTDOT solicits for new project applications about every 4 years, and did so most recently in 2019. The program has in the past typically provided $8-9 million per year for projects throughout the state. TA projects that did not receive funding from the 2019 solicitation due to limited funding would likely be first in line for new funding before a new solicitation would occur. Future project solicitations will be subject to available TA funding in the next Federal transportation bill. Preliminary indications are that funding levels for TA/Complete Streets projects may be equal to or higher than past levels.

- **LOTCIP.** The Local Transportation Capital Improvement Program is a State-funded program administered by CTDOT. The State Bond Commission allocates State funding to regional planning agencies. LOTCIP was established with substantially few requirements that required under Federally-funded transportation programs. To be eligible for LOTCIP funding, projects must meet the eligibility requirement of the Federal STBG-Urban Program. Here are some of the parameters:
  - In general, LOTCIP projects must be located on a roadway classified as an urban collector or higher on CTDOT's Functional Classification database. (Both Riverside Avenue and Divinity/Park Streets are of higher classification.)
  - Exclusive (stand-alone) sidewalk projects may be considered eligible along other roadway classifications.
  - Bridge improvements may be eligible on other roadway classifications as long as the Federal definition (20 feet or greater span length as defined in 23 CFR 650.305) of a bridge is met.
  - Pavement preservation, pavement rehabilitation, and exclusive (stand-alone) sidewalk projects should be limited to approximately 15% of the COG's annual LOTCIP funds, or $500,000 total project cost, whichever is greater. That is, a COG may pursue a combination of new sidewalk and pavement rehabilitation projects for up to 15% of its annual funding, but not 15% for each type of project. Note that full-depth reconstruction, where warranted, is exempt from this cap.

- Projects must have a minimum construction cost of $300,000 to qualify for LOTCIP funding.
- Although transportation enhancement/alternative projects will be eligible for LOTCIP funding without an explicit cap initially, it is expected that the COGs will limit funding allocation for such projects to a reasonable level.
- A project's cost must be endorsed by the COG board before the application phase and anytime project costs increase by 20% or more.
- Projects on a State road will require coordination with CTDOT and an Encroachment Permit.

The program requires that the municipality fund the design phase, and the State will fund the construction phase. On projects with substantial work on State roads (such as Route 72), privately-owned utilities are reimbursed 50% of their eligible relocation costs; municipally-owned utilities are reimbursed 100%.

- **Community Connectivity Grant Program (CCGP).** This is a State-funded program for pedestrian and bicycle safety and improved access projects in urban, suburban and rural community centers to encourage more people to use these health and environmentally sustainable modes of travel. https://ctconnectivity.com/ The State typically awards - $125,000 – 600,000 per project through a solicitation by CTDOT. The program provides construction funding directly to municipalities; design and rights-of-way costs are not eligible costs. Construction phase costs above the grant payment amount are the sole responsibility of the Municipality. Projects on a State road will require coordination with CTDOT and an Encroachment Permit.

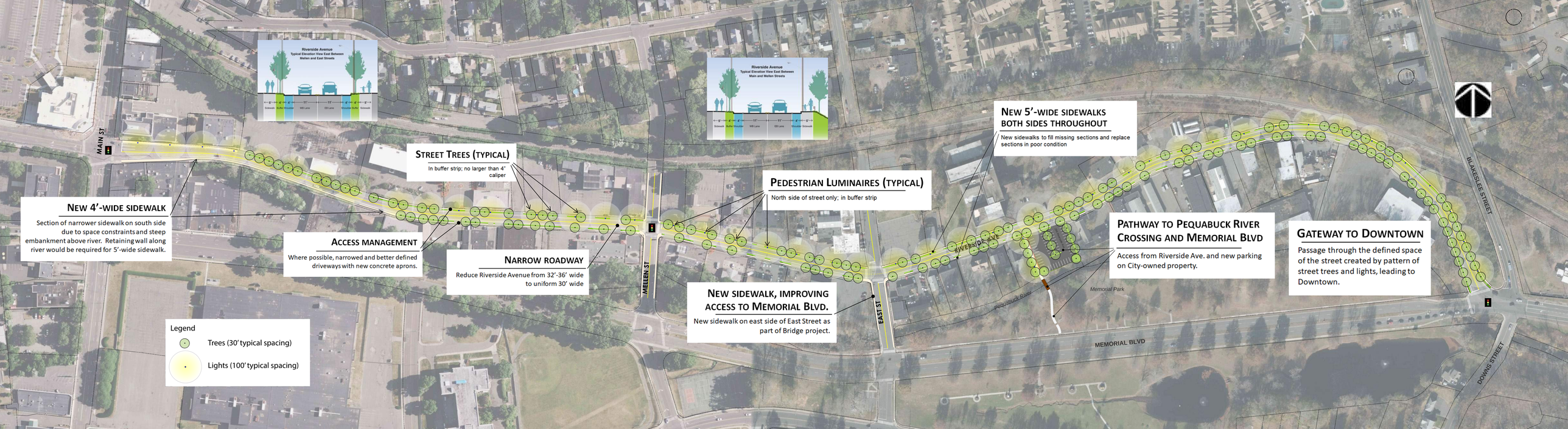
  Funding for the CCGP beyond FY2020 will be subject to future Capital Budget approvals by the General Assembly and Governor as part of the biennium budget process.

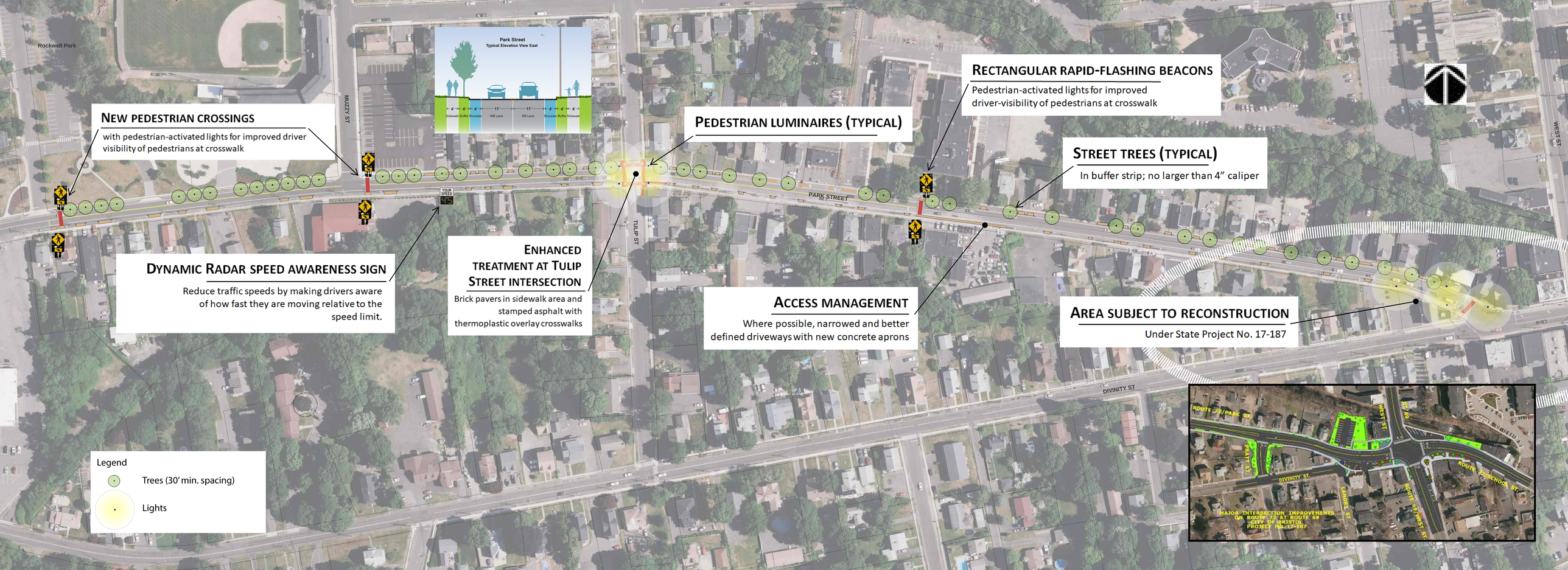
- **CTDOT Project Funding.** This funding scenario involves CTDOT initiating, designing and constructing the project(s) based on transportation-related warrants it deems to be priority. Transportation deficiencies, such as traffic operations/congestion relief, roadway safety, pedestrian and bicyclist accommodation and safety, structural deficiencies, system linkage, and other roadway deficiencies, drive project initiation. Stand-alone streetscape or beautification projects are not initiated, but may be integrated into transportation projects at CTDOT's discretion, with the municipality often contributing toward the streetscape construction costs and maintenance. CTDOT roadway projects are funded through various Federal sources with a State match.

- **Combined Funding.** It's possible that more than one project with different funding sources could be assembled into a single, comprehensive project or series of projects.

APPENDIX

Concept Plans


Riverside Avenue
Typical Elevation View East Between Main and East Streets
Sidewalk
Buffer
Shoulder
WB Lane
EB Lane
Shoulder
Buffer
Sidewalk
Riverside Avenue
Typical Elevation View East Between Main and Mellen Streets
Sidewalk
Buffer
Shoulder
WB Lane
EB Lane
Shoulder
Buffer
Sidewalk
MAIN ST
MELLEN ST
EAST ST
RIVERSIDE AVE
Pequabuck River
Memorial Park
MEMORIAL BLVD
BLAKESLEE STREET
DOWNS STREET
NEW 4'-WIDE SIDEWALK
Section of narrower sidewalk on south side due to space constraints and steep embankment above river. Retaining wall along river would be required for 5'-wide sidewalk.
STREET TREES (TYPICAL)
In buffer strip; no larger than 4" caliper
ACCESS MANAGEMENT
Where possible, narrowed and better defined driveways with new concrete aprons.
NARROW ROADWAY
Reduce Riverside Avenue from 32'-36' wide to uniform 30' wide
PEDESTRIAN LUMINAIRES (TYPICAL)
North side of street only; in buffer strip
NEW SIDEWALK, IMPROVING ACCESS TO MEMORIAL BLVD.
New sidewalk on east side of East Street as part of Bridge project.
NEW 5'-WIDE SIDEWALKS BOTH SIDES THROUGHOUT
New sidewalks to fill missing sections and replace sections in poor condition
PATHWAY TO PEQUABUCK RIVER CROSSING AND MEMORIAL BLVD
Access from Riverside Ave. and new parking on City-owned property.
GATEWAY TO DOWNTOWN
Passage through the defined space of the street created by pattern of street trees and lights, leading to Downtown.
Legend
Trees (30' typical spacing)
Lights (100' typical spacing)


Rockwell Park
MUZZY ST
TULIP ST
PARK STREET
WEST ST
DIVINITY ST
YOUR SPEED
Park Street
Typical Elevation View East
4'
Sidewalk
Buffer
Shoulder
11'
WB Lane
EB Lane
NEW PEDESTRIAN CROSSINGS
with pedestrian-activated lights for improved driver visibility of pedestrians at crosswalk
DYNAMIC RADAR SPEED AWARENESS SIGN
Reduce traffic speeds by making drivers aware of how fast they are moving relative to the speed limit.
ENHANCED TREATMENT AT TULIP STREET INTERSECTION
Brick pavers in sidewalk area and stamped asphalt with thermoplastic overlay crosswalks
PEDESTRIAN LUMINAIRES (TYPICAL)
RECTANGULAR RAPID-FLASHING BEACONS
Pedestrian-activated lights for improved driver-visibility of pedestrians at crosswalk
STREET TREES (TYPICAL)
In buffer strip; no larger than 4" caliper
ACCESS MANAGEMENT
Where possible, narrowed and better defined driveways with new concrete aprons
AREA SUBJECT TO RECONSTRUCTION
Under State Project No. 17-187
Legend
Trees (30' min. spacing)
Lights
ROUTE 72/PARK ST
ROUTE 69
PRATT ST
DIVINITY ST
LAMBERT ST
ROUTE 69/WEST ST
MAJOR INTERSECTION IMPROVEMENTS ON ROUTE 72 AT ROUTE 69 CITY OF BRISTOL PROJECT NO. 17-187